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2004 Agricultural Resource Management Survey (ARMS)

Phase II - Field Crop Chemical Usage
and Production Practices

Interviewer's Manual

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Chapter 1 - ARMS Purpose

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

Specific commodities are rotated every 5-6 years to focus on resource use and production costs for those commodities. Other commodities appear from time to time to address policy relevant resource use or financial issues. National irrigation use, animal waste management, risk management strategies, and genetically-modified crops current topics of interest.

The ARMS is conducted in three phases. The initial screening phase, conducted from May through July, collects general farm data such as crops grown and the gross value of sales. Screening survey data are used to identify in-business operations, multiple operating arrangements, and operations having the targeted commodities. With screening data, we can choose respondents for subsequent phases based on whether they have commodities of interest.

The second phase (Phase II), is conducted from October through December. This phase focuses on chemical use and other production practices for target commodities. The target commodities for the 2004 Phase II Production Practices and Costs Report (PPCR) are peanuts, winter wheat, durum wheat, and all other spring wheat. The target commodity for the 2004 Phase II Production Practices Report (PPR) is soybeans.

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

For 2004, all Phase II respondents completing Production Practices and Costs Report (PPCR) will be asked to complete a Phase III follow-on report to obtain financial data for the entire operation. It is vital that both the Phase II and Phase III questionnaires be completed for these operations. Data from both phases provide the link between agricultural resource use and farm financial conditions. This is the cornerstone of the ARMS design.

Uses of ARMS Data

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

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

Specifically, the ARMS:

- gathers information about the relationships among agricultural production, resources, and the environment. ARMS data provide the necessary background information to support evaluations of these relationships. The data are used to understand the relevant factors in producing high quality food and fiber products while maintaining the long term viability of the natural resource base.
- determines what it costs to produce various crop and livestock commodities, and the relative importance of various production expense items.
- helps determine net farm income and provides data on the financial situation of farm and ranch businesses, including the amount of debt. ARMS data provide the only national perspective on the annual changes in the financial conditions of production agriculture.
- provides the farm sector portion of the Gross Domestic Product (GDP) for the Nation. If ARMS data were not available, the Bureau of Economic Analysis (BEA) would have to conduct their own survey of farm operators to collect this data.
- helps determine the characteristics and financial situation of agricultural producers and their households, including information on management strategies and off-farm income.

Pesticide Data Program

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

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

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

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

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

The important benefits gained from responding to the survey are:

- Growers have a chance to tell how they use chemicals responsibly to maintain a safe and abundant food supply.
- The survey results are official USDA estimates and help to establish the facts about chemical use. Accurate data can be used to lessen concern relating to marketing and exports to other countries.

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

Natural Resource Data and Farm Practices

The 2002 Farm Bill (official title: The Farm Security and Rural Investment Act of 2002) emphasizes conservation on “working land” (i.e., conservation programs that protect and enhance natural resources while keeping farmland in production) by increasing funding for the Environmental Quality Incentives Program (EQIP) and establishing a new Conservation Security Program (CSP). This increased funding reverses a trend which favored land retirement programs over spending on working lands. Costs for working lands conservation programs are estimated to increase from 7 percent of total conservation program costs to over 40 percent of total conservation program costs by 2007.

<http://www.fsa.usda.gov/pas/farmbill/readfaqs.asp?catcode=9&faqid=14>

The EQIP was established by the 1996 Farm Act as a new program to consolidate and better target the functions of the ACP, WQIP, GPCP, and Colorado River Basin Salinity Program. The objective of EQIP, like its predecessor programs, is to encourage farmers and ranchers to adopt practices that reduce environmental and resource problems through 5- to 10- year contracts providing education, technical assistance, and financial assistance, targeted to watersheds, regions, or areas of special environmental sensitivity identified as priority areas.

The CSP is a newly created program that will provide payments to producers for maintaining or adopting structural and/or land management practices on private agricultural land that address a wide range of local and/or national resource concerns such as soil, water, or wildlife habitat. As with EQIP, a wide range of practices can be subsidized. But CSP will focus on land-based practices and specifically excludes livestock waste handling facilities.

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

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

Cost of Production

Congressional or USDA mandates exist for the development of annual estimates of the cost of producing wheat, feed grains, cotton, peanuts, rice, tobacco, sugar, and dairy commodities. Peanuts, Winter Wheat, Durum Wheat, and Other Spring Wheat are the cost of production commodities targeted for the 2004 ARMS Phase II.

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

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

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

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

Income, Financial, and Household Data

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

The 2002 Farm Bill changes several commodity provisions from the 1996 Farm Bill which may effect the financial well-being of commodity producers. Major changes include: higher loan rates for most crops; direct payments for wheat, feed grains, cotton, and rice (previously called production flexibility contract payments); expanded eligibility for direct payments to producers of oilseeds, such as soybeans; additional payments (called counter-cyclical payments) to farmers when commodity prices fall below their target prices; and an option for producers to update the bases and yields used to calculate counter-cyclical payments. Commodity program data from Phase III will be helpful in assessing the impact of the 2002 Farm Bill on the financial performance of commodity producers.

Publication of ARMS

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

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

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

Farm Income at <http://www.ers.usda.gov/Data/FarmIncome/>

Farm Balance Sheets at
<http://www.ers.usda.gov/Data/FarmBalanceSheet/>

Cost of Production at: <http://www.ers.usda.gov/Data/CostsAndReturns/>

The NASS publication, Agricultural Chemical Usage - Field Crops, provides estimates of acreage treated with fertilizer and chemicals and total amounts applied, using data from the ARMS Phase II. The results of the 2004 Phase II will be released in May 2005.

NASS publishes Farm Production Expenditures using data from Phase III. This report shows expenditures for the U.S., 10 farm production regions, 5 U.S. economic sales classes, and U.S. crop and livestock farms. The 2004 survey results will be released in July 2005.

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

Agricultural Resources and Environmental Indicators. Research report issued October 2003. This ERS basebook contains a wealth of information covering a broad range of subjects in resource and environmental economics. Topics include land use, quality, and ownership; farm real estate values; water use and quality; fertilizer, pesticides, energy, and farm machinery; technology; and the conservation reserve, compliance, wetlands, and non-USDA programs that affect agriculture. (see on the Internet at: <http://www.ers.usda.gov/publications/arei/ah722/>)

Agricultural Resource Management Survey for 2004 Phase II - Production Practices Interviewer's Manual

Adoption of Bioengineered Crops. Report Issued May 2002. Use of crop biotechnology products, such as genetically engineered (GE) crops with input traits for pest management, has risen dramatically since commercial approval in the mid-1990s. This report addresses several of the economic dimensions regarding farmer adoption of bioengineered crops, including herbicide tolerant and insect-resistant varieties. In particular, the report examines: (1) the extent of adoption of bioengineered crops, their diffusion path, and expected adoption rates over the next few years; (2) factors affecting the adoption of bioengineered crops; and (3) farm-level impacts of the adoption of bioengineered crops. Data used in the analysis are mostly from USDA surveys. <http://www.ers.usda.gov/publications/aer810/aer810fm.pdf>

Genetically Engineered Crops for Pest Management in U.S. Agriculture. Research report issued May 2000. Adoption of genetically engineered crops with traits for pest management has risen dramatically since their commercial introduction in the mid-1990's. The farm-level impacts of such crops on pesticide use, yields, and net returns vary with the crop and technology examined. Adoption of herbicide-tolerant cotton led to significant increases in yields and net returns, but was not associated with significant changes in herbicide use. On the other hand, increases in adoption of herbicide-tolerant soybeans led to small but significant increases in yields, no changes in net returns, and significant decreases in herbicide use. Adoption of Bt cotton in the Southeast significantly increased yields and net returns and significantly reduced insecticide use. (see at: <http://www.ers.usda.gov/publications/aer786/>)

Pest Management in U.S. Agriculture. Research report issued October 1999. This report describes the use of pest management practices, including integrated pest management (IPM), for major field crops and selected fruits and vegetables. The data came chiefly from the 1996 Agricultural Resource Study (ARMS). Because different pest classes may dominate among different crops and regions, requiring different pest management techniques to control them, the extent of adoption of pest management practices varies widely. For example, insects are a major pest class in cotton production, while minor for soybeans. As insect management has a wider variety of nonchemical techniques than weed control, cotton growers are expected to be further ahead on the IPM continuum than soybean producers. (see at: <http://www.ers.usda.gov/publications/ah717/>)

Agricultural Resource Management Survey for 2004 Phase II - Production Practices Interviewer's Manual

Annual Report to Congress on the Status of Family Farms

Financial Performance of U.S. Farm Businesses

Farm Operating and Financial Characteristics

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

The Economic Well-Being of Farm Operator Households

National Financial Summary

Productivity & Efficiency Statistics

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

Exhibit 1: Example of a Commodity Account

The example on the next page shows that in 2002, wheat growers, on average, produced \$95.17 worth of wheat per acre. This is the gross value of producing an acre of wheat.

The value of wheat production is offset by expenses. There are two parts to expenses: Operating Costs and Allocated Overhead. Operating costs represent direct costs paid to produce an acre of wheat. These include seed, fertilizer, pesticides, fuel and electricity, repairs, and purchased irrigation water. These amounted to \$57.07 for wheat production in 2002. Subtracting operating costs from the gross cash value of production, a **cash return** of \$38.10 is estimated in 2002 for each acre of wheat grown. Unfortunately, this isn't the end of the story.

Added to the operating costs are allocated overhead costs. These represent the portion of a farm's overhead costs 'charged', or allocated, to wheat production. Overhead costs are expenses paid by an operation regardless of what crops or livestock are produced. In 2002, each acre of wheat was 'charged' \$118.56 as a share of the entire farm's overhead expenses.

Included in the allocated overhead are values for many expenses that are not 'cash expenses'. These expenses are not paid by the operation in the common sense of the term 'paid'. The value of these items, commonly called 'non-cash' expenses, are measures of the economic cost of producing the commodity. For instance, if a farm operator's labor is given a value of \$18.00 per hour, and he spends an average of ½ hour over the course of the year working to grow an acre of wheat, then his labor contributes \$9.00 to the cost of growing the wheat, even if he is self-employed and thus, not paid directly in the traditional sense. In addition to the cost of unpaid labor, non-cash expenses such as depreciation, the fair rental value of land, and the cost of capital required to farm, are charged to the commodity.

When the 'non-cash' expenses are added to cash expenses, the economic cost of producing an acre of wheat rises to \$175.63. Subtracting this from the value of production results in an **economic loss** of -\$80.46 per acre of wheat in 2002. In this simple example, the value of the operator's management and risk to produce wheat in 2002 was -\$80.46.

However, this is not the final word on the costs and returns of wheat production. Government payments, including loan deficiency payments, are not included in the account but are received by most wheat producers. These helped to offset the economic loss measured in 2002. Also, the wheat production is valued at the harvest-period price, typically the lowest price during the year. Costs and returns associated with storing and marketing the wheat are not included in this accounting of wheat production, and may also offset some of the economic loss in 2002.

Agricultural Resource Management Survey for 2004
Phase II - Production Practices Interviewer's Manual

Commodity Account, Wheat
Source: Economic Research Service (ERS), USDA

U.S. Wheat 2002 Gross Value of Production (excluding direct Government payments)	Dollars per Planted acre	
Harvest-period price (dollars/bu.)	3.28	
Yield (bu./planted acre)	27.90	
Primary Product: Wheat Grain	91.51	
Secondary Product: Straw/Grazing	3.66	
Total gross value of production		95.17

U.S. Wheat production cash costs and returns, 2002		
Operating Costs:		
Seed	6.65	
Fertilizer	17.71	
Chemicals	7.13	
Custom operations	5.67	
Fuel, lube, and electricity	8.67	
Repairs	10.15	
Purchased irrigation water	0.61	
Interest on operating capital	0.48	
Total operating costs	57.07	
Allocated overhead:		
General farm overhead	7.25	
Taxes and insurance	3.90	
Hired labor	2.53	
Opportunity cost of unpaid labor	16.72	
Opportunity cost of land (rental rate)	39.19	
Capital recovery of machinery and equipment	48.97	
Total allocated overhead	118.56	
Total costs listed	-	175.63
Gross value of production less operating costs	=	38.10
Gross value of production less costs listed	=	-80.46

Chapter 2 - Terms and Definitions

Enumerators working on the ARMS should be familiar with the definitions of the terms listed below. Descriptions of irrigation systems have been described in Chapter 5 of this manual.

Actual Nutrients - The reporting primary plant nutrients expressed in terms of active ingredients or units of nitrogen, phosphorus, and potassium applied. A unit equals 1 pound.

Active Ingredients - The ingredients in fertilizer or pesticides which chemically react with soil, plant, animal, or pest to give the desired effect.

Adjuvant - Chemical added to a pesticide to increase its effectiveness or safety.

Beneficial Insects - Insects collected and introduced into locations because of their value in biologic control as prey on harmful insects and parasites. Natural insect enemies used to control important insect pests.

Carryover - [Grain Stocks] The supplies, volume, or stock of a farm commodity not yet used at the end of a marketing year; carried over into the next marketing year. [Pesticides] Chemical pesticide residuals remaining in the soil a year or more after being applied. Residual levels are influenced by chemical type, amount or rainfall, and soil type. The carryover from some chemicals may effect the growth of certain crops planted in later years.

Commodity - Any agricultural or agricultural by-product available for sale.

Confidentiality - The assurance for NASS to survey respondents, backed by federal law, that individual information collected on authorized USDA surveys will not be released to any person, organization or institution, including court subpoenas. See the "NASDA Employee Handbook" for regulations.

Conservation Tillage - Any of several tillage and planting methods that leave a minimum of 30 percent of the soil surface covered by crop residue following planting. The method should provide for seed germination, plant growth, and weed control yet maintain effective ground cover throughout the year and disturb the soil as little as possible. It reduces soil

loss and energy use while maintaining crop yields and quality. Weeds are controlled primarily with herbicides.

Contour Farming - Field operations such as plowing, planting, cultivating, and harvesting at right angles to the ground's natural slope to reduce soil erosion, protect soil fertility, and use water more efficiently. Furrows, crop rows, and wheel tracks across the slope act as miniature terraces.

Cooperative State Research, Education, & Extension Service (CSREES) - A USDA agency providing farmers and rural people leadership, evaluation, and coordination in support of state and county educational programs. It also provides access to agricultural research and information on federal regulations and policy, food safety, agricultural marketing, disaster awareness, sustainable agriculture, waste management, water quality, and youth at risk. The former Extension Service is now a part of this Agency.

Cost of Production - The average amount in dollars per unit used in growing or raising a farm product, including all purchased inputs and sometimes including allowances for management and the use of owned land. The cost may be expressed in units of a bushel, pound, ton or per-acre, depending on the product involved.

Cropland - Land which can produce a crop for harvest (pasture and timber are not considered crops). Cropland includes land cropped, idle land suitable for cropping, land in orchards, etc. Do not include woodland, marshes, or land suitable only for pasture.

Crop Insurance - Any Federal, state, or private insurance (multipurpose or specific).

Crop Rotation - The growing of different crops in a repeating sequence on the same land.

Date, Due - [Enumerators] The date assigned materials must be received in the State office. [State office] The date assigned materials must be received in Headquarters.

Date, Reference - The date used as a reference point for asking respondents survey questions. For example, the reference date for the Agricultural Surveys is the first day of the month, for ARMS it's a specific year.

Date, Release - The date the survey results are published and released. See the NASDA EMPLOYEE HANDBOOK for a calendar of the various report release dates.

Defoliant - A chemical agent that causes the leaves to drop from a plant. Often used with some crops to facilitate harvest.

Double Crop - The growing of two crops for harvest in one year from the same field.

Editing - Reviewing entries for reasonableness and validity completed questionnaires. Unusual but correct responses should be flagged and explained with notes indicating it was verified with the respondent. With impossible data relationships, probe for the correct response.

EIN - Employer Identification Number.

Fallow - Cropland left uncropped during one growing season to conserve moisture in the soil, control weeds and allow the decomposition of crop residue.

Farm - Land under one operating arrangement on which there were or could be sales of a least \$1,000 worth of crops, livestock, poultry, or other agricultural products during the year.

Fertilizer - Any material put on or in the soil or on plant leaves to improve the quality or quantity of plant growth. See "Micronutrients," "Nitrogen," "Phosphate," "Potash," and "Trace Element."

Fertilizer Analysis - The percentage of nitrogen, phosphate, and potash (N, P₂O₅, K₂O), specified in that order, contained in a blend of fertilizer. Fertilizer may also be blended with various micronutrients or trace elements.

Field - A continuous area of land devoted to one crop or land use. Farmstead, pastureland, woods, wasteland, etc. are considered fields.

Fungicide - A chemical used to kill fungi.

Gallons per Minute - Measure of water flow-rate. The quantity of water flow (or pumped) during one continuous minute measured in gallon units.

Grassed Waterways - A natural drainage way within a field which is kept in grass to prevent soil erosion. Includes channels used as outlets for

terraces and for the disposal of runoff from diversion channels, stabilization structures, contoured rows, and natural depressions.

Harvested Acres - Acres of a crop actually harvested. May be smaller than planted acres if there is abandonment brought on by weather, pest damage, other disasters, or market prices too low to cover harvesting costs.

Hay - A crop which has been cut and cured by drying for storage; principally legumes, grasses, or grain crops.

Highly Erodible Land (HEL) - Erodibility is a function of rainfall, soil erodibility, field slope, and length. NRCS uses these characteristics and a measure of soil loss tolerance to construct an erodibility index. If the index is greater than 8, the field is highly erodible.

Herbicide - Any chemical used to control, suppress, or kill plants, or to severely interrupt their normal growth processes. Some kill essentially all plants, but others are selective.

Hundredweight (CWT) - A marketing term referring to 100 pound of a commodity. Abbreviated "cwt."

Idle Land - Farm land that is tillable and capable of producing a crop without major clearing of trees and stones or drainage of water but is not being cropped, pastured, or fallowed.

Implement - Any farm machine used to perform various field operations when raising crops.

Improvements - Houses or other buildings, fences, clearing or rocks, wells or other related capital assets that increase land's productivity or value.

Inaccessible - A sample unit which cannot be contacted, interviewed, etc., during the survey period.

Input - Items such as seed, fertilizer, chemicals, feed, machinery, fuel, labor, and land used in the production of an agricultural product.

Input Provider - The company or individual that sells or contributes products used in the production of agricultural commodities.

Insecticide - A chemical killer of insect pests.

Integrated Pest Management (IPM) - The control of one or more pests by a broad spectrum of techniques ranging from biological means to pesticides. The goal is to keep damage below certain economic levels without eliminating the pest completely.

Irrigation Set - The area of the field irrigated by an irrigation system as it moves across a field while not ceasing operation.

Landlord - The owner of land or buildings which are rented to another person for cash, a portion of the crop or livestock, other proceeds, or free.

Landplaster - A pure, natural gypsum ideal for a wide range of agricultural uses and has proven to be an excellent source of calcium and sulfur to benefit peanut production.

Lime - Ground limestone (calcium carbonate) that helps correct an acidic soil condition.

Military Time - A system of time as a unit of 24 hour day rather than as a time within AM or PM. See the NASDA Employee Handbook, Appendix A. Clock Hour Conservation, for a Military time table.

N-P-K - Chemical symbols for nitrogen, phosphorus and potassium, chief ingredients of fertilizer.

Natural Resources Conservation Service (NRCS) - A USDA agency charged with national soil and water conservation program in cooperation with landowners, operators, developers, community planning agencies, and other local, state, and federal agencies. Soil Conservation Service is now part of NRCS.

Nitrogen (N) - A chemical element essential to life and one of the primary plant nutrients. Animals get nitrogen from protein feeds, plants get it from soil, and some bacteria get it directly from air. Nitrogen is one of the three primary ingredients in complete fertilizers. Nitrogen contents is the X in a fertilizer's analysis of X-0-0.

Nonresponse - Failure of a respondent to reply to a survey questionnaire; may be item nonresponse (refuse to answer one or more questions), survey nonresponse (refuse to answer any or most of the questions), or inability of enumerator to locate respondent during the survey period.

No-till - Method of planting crops without seedbed preparation. Seeds are planted directly into the previous crops stubble. Soil disturbance is limited to small slits in the soil needed for seeding. There is usually no cultivation during crop production with chemicals used for weed control.

Operator - The person responsible for all or most of the day-to-day decisions such as planting, harvesting, feeding, or marketing for the tract or total land operated. The operator could be the owner, hired manager, cash tenant, share tenant or a partner. If land is rented or worked on shares, the tenant or renter is the operator.

Out-of-business - A previous farm or ranch operator who no longer makes the day-to-day decisions on land suitable for agriculture; raises no crops, livestock, or poultry; has no on-farm grain storage facilities. They may own farmland which is being operated by someone else. See “Retired”, and “Sold-out.”

Partner - An individual within a partnership.

Pesticide - A substance or mixture of substance to control insects, rodents, fungi, weeds, and other forms of plant or animal life considered to be pests. Pesticides include insecticides, fungicides, herbicides, and nematocides.

Phosphate (P₂O₅) - A term indicating a fertilizer which supplies phosphorus, one of the three primary ingredients in a complete fertilizer. The phosphate content in a fertilizer’s analysis is indicated as the XX’s in 0-XX-0.

Plant Tissue Test - Plant tissue analysis provides information on how the plant is using particular nutrients and gives clues for deciphering nutrient deficiency or excess problems.

Potash (K₂O) - A term used to indicate fertilizers which supply high levels of potassium. The potash content in a fertilizer’s analysis is indicated as the XX’s in 0-0-XX.

Questionnaire - A form or computer program (CATI, CAPI) used to ask specific questions from and to record the response given by selected sample units to the survey questions.

Refusal - A person representing a sample unit who will not cooperate in the survey and who refuses to provide sufficient information to satisfactorily complete the questionnaire, or who will not give an enumerator permission to complete the field counts or measurements.

Rent - Reimbursement to the owner (landlord) from the user (tenant) for land, buildings, equipment, livestock, etc., used in production.

Rent, Cash - Fixed, predetermined dollar amount paid for the use of land, buildings, equipment, livestock, etc.

Rent, Share - Method of paying rent, where the owner receives a share of the crop, livestock (or product, such as milk or wool) as payment for use of land, buildings, equipment, livestock, etc.

Respondent - The person who provides the information necessary to complete a survey interview.

Sample, List - A sample of potential farm operators or agribusinesses selected from a LSF.

Sample, Probability - A sample where every sampling unit of the sampling frame (area or list) has a known, nonzero chance of being selected.

Sampling Frame - A population or list of all possible units which meet a specified criteria to draw a sample.

Sampling Unit - An identifiable unit of a sampling frame that may be selected when drawing a sample. For an area frame sample it may be a segment, tract or field and for a list frame sample it is a name.

Scouting - A process of checking a field for the presence of weeds, insects, or disease and gathering information about pest population levels, activity, size, and/or density.

Seed - An embryonic plant with sufficient nutrients required during germination and early growth until the plant is able to produce its own food.

SSN - Abbreviation for "Social Security Number."

Strip Cropping - Growing crops in a systematic arrangement of strips or bands to serve as barriers to wind and water erosion.

Sub-irrigation - Water supplied through underground tile or perforated pipe in sufficient amounts to maintain a water table close to the soil surface to supply water for crop needs.

Surface Water Sources - Water stored in natural ponds or lakes, flowing in streams and rivers, and water stored in man-made reservoirs.

Surfactant - A chemical added to a pesticide which improves the emulsifying, dispersing, spreading, and/or wetting properties of the pesticide.

Survey - The collection of data pertaining to specific sample units. A sample is selected and information collected from individual sampling units. Data reported by the selected sampling units, when summarized, provides an indication of what the total would be if all the sample units within the sampling frame had reported.

Survey Period - The time period during which survey data collection can occur. Primarily determined by the survey's reference date and due date. See "Data Collection", "Date, Due", and "Date, Reference."

Tank Mix - Two or more pesticide products mixed in the spray tank by the applicator immediately before application and applied to the field as a single treatment.

Terrace - Raised level areas of a field supported on one or more sides by a wall or bank of turf. Terraces are usually classified by the method of runoff disposal, the shape of the terrace cross section, or by the alignment between terraces.

Underground Outlets - Systems of water runoff control carrying water through and underground pipe to disposal areas. The underground outlet consists of vertical intake risers carrying water to an underground outlet such as tile drainage.

Wetlands - Land characterized by an abundance of moisture and is inundated by surface or ground water often enough to support a prevalence of vegetation adapted for saturated conditions.

Wetting Agent - Some soils, known as hydrophobic soils, are difficult to wet because they repel water. The infiltration of water into these soils can often be improved by applying a nonionic surfactant, more commonly

called a wetting agent. Wetting agents are detergent-like substances that reduce the surface tension of water, allowing it to penetrate and wet the soil more easily.

Worker - [Labor] Person doing work.

Yield Map - A map prepared from data collected by a yield monitor attached to harvesting equipment. A yield map shows the variation in yields for small areas within a field and is a key component in the detailed planning inherent in precision farming.

Yield Monitor - A monitor mounted on harvesting equipment that measures yields continuously as the harvester moves through a field. These yield measures can be tied to specific locations in the field through GIS and converted into yield maps. Such yield maps can then be compared with the fertilizer or pesticide application map of the next season.

Chapter 3 - Survey Procedures

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

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

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

You should already have these items on hand:

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

Questionnaire

For 2004, there are five questionnaire versions used to obtain chemical use and other production practices along with associated cost of production data: Version 2, the Peanut Production Practices and Costs Report (PPCR); Version 31, the Winter Wheat Production Practices and Costs Report (PPCR); Version 32, the Durum Wheat Production Practices and Costs Report (PPCR); Version 33, the Spring Wheat Production Practices and Costs Report (PPCR); and Version 6, the Soybean Production Practices Report (PPR).

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

Sections of the questionnaire are identified by letter and title. For example, Section D is "Pesticide Applications -- Selected Field." Chapter 5 discusses these sections. To help find instructions, the page number shows the letter of the section discussed on that page (i.e., A-5003).

Respondent Booklet

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

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

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

explaining in detail how he applied the material, when all you really wanted to know was that the material was “banded in the row” (method code 7).

Respondent Burden

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

Also, be aware of the estimate of average completion time in the Burden Statement. The estimated average completion time is based on experience with previous ARMS Phase II surveys and the judgement of NASS and the Office of Management and Budget (OMB). OMB is an agency that approves all surveys conducted by the federal government. The expected average interview length for the PPCR is 65 minutes and the expected average interview length for the PPR is 35 minutes. Burden statements are printed on the front cover of the Respondent Booklet.

Questionnaire Format

The following formatting conventions apply to the ARMS Phase II questionnaire.

Interviewer Instructions

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

Figure 1 Example of interviewer instructions.

How many acres of peanuts did this operation plant for the 2004 crop year? *[If no acres planted, review information on the Screening Survey Information Form. Make notes, then go to Item 4 of Conclusion, on back page.]*

TOTAL PLANTED ACRES
. ____

Include Statements and Check Lists

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

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

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

Of the total [<i>Item 1</i>], how many were planted for--	ACRES
a. Winter wheat? ____

Text Fill-ins

Questions in table headers frequently refer to text in the rows used to FILL IN the wording of the question. In this example, the question to ask is "In 2004, did your land-use practices for this field include--?"

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

In 2004, did your land-use practices for this field include--	
a. terraces? YES=1	CODE

Instructions for Respondents

Prompts, "includes and excludes," and other instructions for respondents are in italics and enclosed in parentheses. These prompts are to help you and the respondent when a question arises as to the intent or meaning of the question. Read these when needed to clarify the meaning of the question.

Figure 4 Example of instructions to read to respondents.

What was the total quantity of water applied to this field during the entire growing season? (<i>Include ALL water used from both on-farm and off-farm sources.</i>)	INCHES PER ACRE
---	-----------------

Optional Wording

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

Figure 5 Example of 'optional question wording'.

Did you rotate or tank mix pesticides for the primary reason of keeping pests from becoming resistant to pesticides in this field (<i>use pesticides with different mechanisms of action</i>)?	YES=1
---	-------

Item Code Boxes for Interviewer Use

Code boxes for interviewer use generally have thin solid lines.

Figure 6 Example of code boxes for interviewer use.

Did you use water management practices, such as controlled drainage or irrigation scheduling, to control pests in this field?	YES = 1	CODE
--	---------	------

Item Code Boxes with Decimal Points

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

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

Figure 7 Example of code boxes for recording data to one or more decimal places.

	DOLLARS & CENTS PER ACRE
<i>[If field is CASH RENTED, ask--]</i>	
What was the cash rent paid per acre for this 2004 peanut crop?	• <u> </u> <u> </u>

Item Code Boxes for Recording Dates

Some item code boxes are set up for recording dates in MM DD YY format. These cells have six preprinted underlines. MM stands for the two digits that refer to the month, DD is for the two digit date for the day, and YY is for the two digits for the year. For example, May 1, 2004, should be entered as

Figure 8 Example of a code box for recording a date value.

	MM DD YY
On what date was this field planted?	_____

Office Use Boxes

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

Figure 9 Example of an 'office use' box.



Yes / No Questions

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

YES/NO Check Boxes

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

Figure 10 Example of a Yes / No check box question.

Was the cotton crop on this field covered by Crop Insurance in 2004?	CODE
YES - <i>[Enter code 1 and continue.]</i> NO - <i>[Go to Section C.]</i>	

YES=1 Boxes

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

Figure 11 Example of a 'Yes = 1' question.

	CODE
Has harvest of this field been completed? YES = 1	

Multiple Choice Questions with Coded Response Categories

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

Figure 12 Example of a question with coded response categories.

Was the source of the winter wheat seed--

- | |
|--|
| 1 Purchased?
2 Homegrown or traded?
3 Both ? |
|--|

..... CODE | |

Questions with More than One Sub-part

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

Direction Through Tables Showed by an Arrow

Figure 13 Example of a question with multiple subparts.

Was the amount of nitrogen you decided to apply on this field based on --

- | | |
|--|--------|
| a. Results of a soil or plant tissue test? | YES= 1 |
| b. Crop consultant recommendation? | YES= 1 |
| c. Fertilizer dealer recommendation? | YES= 1 |
| d. Extension Service recommendation? | YES= 1 |
| e. Cost of nitrogen and/or expected commodity price? | YES= 1 |
| f. Contractor recommendation? | YES=1 |
| g. Routine practice ? | YES= 1 |

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

Entering Data

Figure 14 Arrows indicate the direction to follow when completing a table.

L I N E	2 → → →	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	7 How many acres were treated in this application ? ACRES . _ _
	MATERIALS USED <i>[Enter percentage analysis or actual pounds of plant nutrients applied per acre.]</i>					
01						

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

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

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

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

For YES/NO questions, enter code 1 if the answer to the question is YES. If the answer is NO, most often you must enter a dash in the box to show that you asked the question and the respondent answered NO. Since you

are not entering a code number for NO, this is the only way to show that the answer was NO.

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

Record data to the nearest whole number, unless a decimal point is in the box. Place numbers correctly in relation to decimal points, and fill in every space printed after them. Use zeros as fill when answers are not given to as many decimal places as required by the data cell.

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

Planning Your Work

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

Mark the location of each operation assigned to you on a highway map before you start to interview. Show the location by a small circle with the ID number written beside it. Use this map to plan your daily travel; this will help keep travel expenses down and save time.

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

Interviewing

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

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

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

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

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

Respondents often ask how long the interview will take. Never contradict the Burden Statement printed on the Respondent Booklet; however, adding to it is okay. For example, you might say something like this: "The official nationwide average for this survey is 65 minutes, but the interviews I have done in this area averaged about __ minutes." Be honest about the average time, even if your interviews average longer than the time estimate in the Burden Statement.

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

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

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

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

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

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

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

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

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

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

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

Never erase a note unless it is wrong!

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

Framework and Reference Period for Reporting Data

The ARMS questionnaire is designed to collect information about production practices used and expense items associated with the 2004 crop of the randomly selected field. Many of these expense items should be reported in the dollar per acre cost for the selected field.

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

Field operations data are reported **beginning** with the first tillage operation **after** removal of the most recent crop before the 2004 target crop from this field, and **ending** with the harvest and hauling of the 2004 crop to storage or first point of sale.

Nonresponse

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

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

The key to reducing the chances of getting refusals is to be courteous and friendly, but persistent. Try to get cooperation by explaining the purpose of the survey, the need for accurate agricultural statistics, and the

confidentiality of the data. Make use of materials explaining the survey purpose provided by your State Office.

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

Supervision

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

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

Completed Questionnaires

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

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

Chapter 4 - Screening

Face Page

Introduction

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

Some operators may have already heard about the ARMS on radio or television farm show broadcasts or short spots. They may also have read about the survey in a pre-survey letter from the State office or in newspaper or farm magazine articles.

When making your introduction, remind the respondent that data they report will be kept strictly confidential. All information they provide will only be used to make state, regional, and national estimates. Mention that some farm records, particularly records of fertilizer or pesticide applications, will be useful along with any notes or records of when field operations took place.

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

Response Codes

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

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

Code 5 - **Out of scope**: Operations, such as prison farms, private or university research farms, high school FFA farms, not-for-profit farms operated by religious organizations, and Indian reservations produce agricultural commodities, but do not meet the ARMS definition of a

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

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

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

Starting Time

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

Name, Address, and Partners Verification

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

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

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

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

Screening Survey Information Form

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

The Screening Survey Information Form shows:

- acreage of the target commodity reported in Screening Survey.
- type of operation reported (individual, partnership, managed).
- who reported in Screening Survey.
- how the screening data was obtained.
- the ID for the enumerator who conducted the screening interview.
- the sequence (sample) number. This number also appears on the ID label. This sequence (sample) number is used in marking field locations on maps.

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

Screening Box on Face Page

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

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

Completing the Screening Supplement

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

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

If an operation was in business during part of 2004 but went out of business during the year, **complete a questionnaire for the part of the year during which the operation did business**. If the operation was taken over by another operator or operation when it went out of business, make a note of this. This note should include a name, address, phone number, and any other pertinent information about the new operation.

There are two versions of the Screening Supplement. The version used for opDomStatus 99 records determines if the selected operation is in-business for 2004. The second version, used for operations that are NOT opDomStatus 99 operations, determines if the selected operation is in-business, and obtains additional information about other operations the target name is involved in. The State Office will insert the correct version into the questionnaire for you to use if the operation requires re-screening in Phase II.

Item 1: Other Operation Name

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

Item 2: Crops, Livestock or Poultry

Check YES if the operation grew **any** crop (field crops, fruit/nut crops, vegetables, oilseeds, specialty crops, hay) or had cattle, hogs, sheep, poultry or other livestock during 2004 on the total land operated. If YES, go to Item 6. If NO, continue with Item 3.

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

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

Exclude: home gardens, crops received in the 2004 crop year as payment for land rented to someone else, and crops grown by anyone other than the target name on land this operation rents to others.

This screening question would also be checked YES if the target name had any livestock or poultry, regardless of ownership, on the total acres operated at any time during 2004.

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

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

Item 3: Sales of Agricultural Products or Receipt of Government Agricultural Payments

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

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

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

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

Item 4: Out-of-Business Determination

If both items 2 and 3 are NO, then the selected operation is considered to be out-of-business for 2004.

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

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

Item 5: Enumerator Action

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

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

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- 1) On the Screening Supplement, enter code "9" for the reporting unit in item 6 (cell 0921).
- 2) Go to the questionnaire Face Page and enter code "3" in cell 0910.
- 3) Go to the questionnaire Back Page and complete the administrative items inside the large black box at the bottom of the back page, including Respondent code, Ending Time, Date, and Enumerator ID.

Item 6: Decision-Maker For This Operation

This item is only completed if the operation is in-business for 2004 (item 2 or 3 is checked 'YES').

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

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

When an individual operation is reported, enter code 1.

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

When a manager is reported, enter code 8.

Item 7: Other Operations

This item is only completed for non-opDomStatus 99 operations that are in-business during 2004.

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

This question determines if the target name made day-to-day decisions for any other operations in 2004. Each additional operation must be listed or verified on the back side of the Screening Supplement. Additional copies of the Screening Supplement should be used if there is more than one additional operation. The information collected on the Screening Supplement will be used to update your State's list sampling frame and to adjust the data collected in the questionnaire to represent multiple operations.

If the Operator Does Not Have Other Operations

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

If the Operator Has Other Operations:

Item 7a - Total Number of Operating Arrangements

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

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

Item 7b - Identifying Additional Operating Arrangements

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

Mark out any operations the target name was not associated with in 2004. If any partner names are not listed, add them.

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

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

For each of the additional operations, check the appropriate box to explain how the day-to-day decisions were made in 2004.

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

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

Special Situations

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

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

If the label for the operation on the Face Page is a managed operation and was still in business in 2004 under a new hired manager, you will contact the new hired manager and collect data for the operation named on the Face Page. You will also need to contact the original target name to verify any other operations listed, and if that originally selected target individual has additional operations you will list them on one or more Screening Supplement(s).

Chapter 5 - Completing the Questionnaire

Overview

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

Chapter 5 contains question-by-question instructions for every item in every section of the questionnaires for Phase II. There are 5 questionnaire versions for 2004: Peanut PPCR (V2); Winter Wheat PPCR (V31); Durum Wheat PPCR (V32); Other Spring Wheat PPCR (V33); Soybean PPR (V6). The ARMS Phase II questionnaire sections are listed in Exhibit 5.1 at the end of this overview.

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

1. The notation ***V#*** (in BOLD ITALICS) appears under the question item number in the question-by-question instructions in this manual. This indicates version(s) in which the question appears. For example, if the notation ***V2, V33*** appears, this indicates that the item applies only to Versions 2 and 33.
2. The name of the Crop(s) for which the question is asked appears in *italics* beneath the ***V#*** indication.

For example, the following notation indicates that the question only applies to questionnaire versions 2 (Peanuts) and 6 (Soybeans):

V2, V6
Peanuts, Soybeans

3. **If there is no version notation, the question is asked in all versions.**

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

Exhibit 5.1: Questionnaire Sections

Section Section Title

- A Target Commodity Field Selection
 - B Field Characteristics
 - C Fertilizer and Nutrient Applications
 - D Pesticide Applications
 - E Pest Management Practices
 - F Field Operations
 - G Irrigation
 - H Landlord/Contractor Costs
-

Section A - Target Commodity Field Selection

What is Section A for anyway?

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

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

Screening Survey Information

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

Item 1: Total Acreage of Target Commodity

Enter the total number of acres of the target commodity that this operation **planted for any purpose** for the 2004 crop year. For Wheat, enter acres planted to all wheat including winter (acres planted in fall/winter 2003), durum, and other spring.

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

INCLUDE:

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

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- 2) acres planted to the target crop and later replanted to the same crop. Even if the operator had to replant some of the acres (poor seed germination and weather are common causes of replanting), count these acres only one time.
- 3) target crop acres which were later plowed down and planted to some other crop for harvest.

EXCLUDE:

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

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

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

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

If no target crop acres are reported in Item 1, review the information on the Screening Survey Information Form. Make explicit notes about the reason why the current report of zero acres is different from the information reported on the Screening Survey Information Form. If the operator has no

target crop acres, then go to Item 4 of the Conclusion, and conclude the interview. This is considered a 'complete' interview.

Item 1(a)(b)(c): Type of Wheat Acres

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Record the number of acres of Winter Wheat planted in Item 1(a) and/or the number of acres of Durum Wheat planted in Item 1(b) and/or the number of acres of Spring Wheat other than Durum in Item 1(c). The total of Items 1(a), 1(b), and 1(c) must equal the total planted acre in Item 1.

Item 2: Total Number of Fields

Item 2 asks for the number of fields planted to the target commodity on the total acres operated for the 2004 crop. Do not skip this question, rush through it, or accept vague estimates of the number of fields. It is absolutely essential that this question be enumerated correctly. The accuracy with which statisticians can make estimates from the one selected field to represent the whole commodity enterprise is seriously jeopardized if this item is incorrect. This total number of fields will be used to expand the field level data collected in this questionnaire.

CAUTION: For Wheat versions, the total number of fields planted (Item 2) relates specifically to the targeted wheat commodity. Please note the examples below.

Example 1: A total of 150 acres of Winter Wheat and Durum Wheat were grown by the same operator. The operator is sampled for Durum Wheat. Of the 150 acres of wheat, 75 were planted to Durum. Record the total number of Durum Wheat fields planted since the operator was sampled for Durum.

Example 2: A total of 150 acres of wheat was grown by the operator. The operator is sampled for Durum Wheat, however, all 150 acres were planted to Winter Wheat. In this case, there are zero fields planted to Durum Wheat therefore, this questionnaire should be coded as a no target crop.

If the operator had only 1 field of the target commodity, enter a "1" in Item 3 and a "1" in Item 5. Then go to Item 6 and explain to the

respondent that the remainder of the questions will be about this specific field.

If the operator has more than 1 field of the target commodity, enter the number of fields in Item 2 and continue with Item 3.

In some instances, the respondent may begin listing the target commodity fields in order to determine a count of fields. If this happens, you should be prepared to enter the fields in Item 3 and then return to Item 2 to record the total number of fields. The important things to remember are: All fields must be listed to ensure a random selection; and, the total number of fields must be accurate to ensure the data are correctly expanded.

Note: For Version 33 Spring Wheat, the fields of interest are fields other than Durum. If durum wheat is grown in your State, please exclude these fields.

Item 3: Identification of Fields

Item 3 uniquely identifies every target commodity field. It is extremely important that all fields are listed and that the actual number of fields are accurately recorded in Item 2.

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

After listing all individual fields, the operator may report a more accurate number of total fields. In this situation, update the number of fields in Item 2 to reflect the correct number.

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

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

identification system is used, as long as the respondent can list the fields by names, numbers, or other description, and knows which field is which.

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

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

Item 4: Random Number Selection

If there is only ONE target commodity field (Item 2 is 1), enter "1" for Item 4 and go to Item 5.

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

The State Office will place a Random Number Label (see Figure 2 on page A-5010) on the Field Selection page in each questionnaire. Read across the FLD (field) line to match the number of fields you listed in Item 2. On the SEL (selected) line immediately below the FLD line is the number of the randomly selected field.

Circle the pair of numbers on the label associated with the last numbered field line in Item 3. Write the randomly selected field number in Item 4. Circle the randomly selected field in the Item 3 listing. This helps both you and the respondent identify the randomly selected field.

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

Item 5: Informing Respondent of Field Selection

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

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

Item 6: Acres in the Target Field

V6

Soybeans

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

Field Selection Grid Supplement

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

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

Mapping Fields on the Field Selection Grid Supplement

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

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

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

Using Farm/Ranch Maps

If the respondent has a farm or ranch map for you to write on, locate and mark (an X is fine) up to 18 of the operation's target commodity fields. 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.

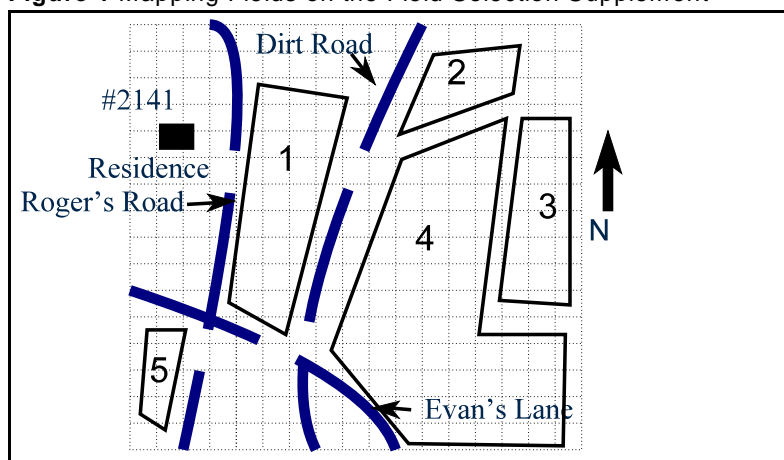
Some operators have copies of maps or aerial photos from their local county office of USDA's Farm Service Agency (FSA). The operator's fields are drawn off on these maps or aerial photos and identified with letters and numbers. These maps may also be helpful in the field selection process for this survey. On these FSA field maps, identify the operation's fields planted to 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 3.

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

Numbering the Fields

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

Figure 1 Mapping Fields on the Field Selection Supplement



Example 1: Random Field Selection

The respondent tells you that there are 5 fields of the target commodity in the operation, but does not have identifying names or numbers for them. The respondent does not feel confident about describing them very well, but says drawing them would help. Refer to Figure 1.

- 1) For Item 2, enter "5".
- 2) Get a Field Selection Grid Supplement. Copy the ID, Tract and Subtract from the questionnaire to the supplement and enter the commodity name.
OR You may use a map of fields supplied by the respondent.
- 3) Draw the 5 fields on the grid (or map) in relation to the operator's residence.
- 4) Number the fields drawn on the grid (map). Continue with Item 3, and list the 5 fields as the respondent identifies them.

- 5) Locate the number 5 on the FLD line of the Random Number Label (Figure 2).

Figure 2 Example of a Random Number Label

Target commodity									
FLD:	1	2	3	4	5	6	7	8	9
SEL:	1	2	2	4	1	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 random number selected is '1'. The target commodity field listed on line 1 of Item 3 is selected as the random field. Circle field 1 in the Item 3 listing and on the grid (or map).
- 7) Record the randomly selected field number, number 1, in Item 4.
- 8) Identify this field for the respondent as the selected field for this interview. Be sure that the respondent knows which field this is. Tell the respondent that most of your questions will be about this selected field, and that these questions should be answered with information about this field only.

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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 the target commodity, the respondent called field #1 "45 acres on Smitty's." Several times during the interview, refer to this field using these same words. For example, when you ask Item 1 in Section C, say, "Were commercial fertilizers applied to these 45 acres on Smitty's for the 2004 target commodity crop?"

Section B - Field Characteristics

V2, V31, V32, V33

*Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat
All PPCR Versions unless otherwise noted.*

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

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

Data from Section B are also used to study land tenure, conservation practices, and adoption of new technologies such as genetically modified seed technology.

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

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

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

Item 1: Field Acres

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

Item 2: Tenure Arrangement

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

INCLUDE:

- 1) acres in the field for which is owned by the operation (**CODE=1**).
- 2) acres in the field for which the operator paid a predetermined fixed cash rent (**CODE=2**).
- 3) acres in the field for which the operator paid a flexible cash rent (**CODE=3**). The cash rent may have depended upon the resulting yield, market price, or some other factor.
- 4) acres in the field for which the operator paid the landlord a share of the crop (either standing or harvested), (**CODE=4**). Include acres planted on share rented land, even if the crop was plowed under or abandoned and, therefore, the landlord's share was zero, as long as the rental agreement specified the rental fee was to be a share of the crop grown.
- 5) acres in the field for which the operator paid some combination of cash and a share of the crop (**CODE=5**). The rent may include a fixed or flexible cash payment supplemented with a share of the crop.
- 6) acres in the field belonging to others (private individuals, federal, state, railroad, etc.) which the operator used rent free (**CODE=6**). 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

If the selected field is cash rented (**Item 2 = 2, 3 or 5**), ask how much was paid in cash rent. Record cash rent in dollars and cents per acre. If this figure cannot be obtained, ask for the total dollars paid in cash rent for the field and write in a comment.

Item 4: Landlord's Share of the Crop

If the selected field is share rented (**Item 2 = 4 or 5**), record the percent of total production from the selected field that belonged to the landlord.

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

Item 5: Year Began Operating Field

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

Record the year **this operator** began operating land inside the field. If part of the field is owned, and part is rented, enter the earliest of either the year of the lease arrangement or when the part of the field was purchased. If 2004 was the first year the field was farmed by the operator, enter '2004'.

Item 6: Type of Peanuts Planted

V2

Peanuts

There are four types of peanuts that are most popular: Spanish, Runner, Virginia, and Valencia. Certain types are preferred for particular uses because of differences in flavor, oil content, size, and shape. Most peanuts marketed in the shell are the Virginia type, along with some Valencias selected for large size and the attractive appearance of the shell. Spanish peanuts are used mostly for peanut candy, salted nuts, and peanut butter. Most Runners are used to make peanut butter. The various types are distinguished by branching habit and branch length. There are numerous varieties of each type of peanut. There are two main growth forms: bunch and runner. Bunch types grow upright, while runner types grow near the ground. Enter "1" for Runner, "2" for Spanish, "3" for Virginia, or "4" for Valencia.

Item 7: Planting Date

Record the date the selected field was planted. If the field was reseeded or replanted to the target commodity, 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. For Winter Wheat, expect the planting date to be in the fall or winter of 2003. Please probe if respondent reports a 2004 date.

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 22, 2004, will be entered as 0 5 2 2 0 4.

Item 7a: Harvest Intention

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Enter the code that best describes the operator's harvesting intention at planting. Enter a '1' if the field was intended for both grain and grazing, enter a '2' for grain only, enter a '3' if for grazing only, and enter a '4' for cover crop. If the operator had intentions for any other use, enter code '5' and specify the use.

Item 8: Organic Acres

Organic farming standards differ fundamentally from conventional ones in their primary focus on management practices that promote and enhance ecological harmony. If the target commodity in the selected field was planted with the intention of being harvested as organic, enter a "1" in the code box.

Item 9: Average Row Width

V2

Peanuts

Enter the average row width in whole inches.

Item 10: Seeding Rate

Determine the initial (first) seeding rate per acre for the selected field. Do NOT include any reseeding or over seeding (full or partial) as part of this rate. Enter the RATE of seeding and also the UNIT for the seeding rate. Record the units to the nearest TENTH (1/10). For example, if the operator responds in pounds per acre, be sure to record the tenths of pounds.

Valid codes for the seeding rate units are:

- 1 = **Pounds** (V2, V31, V32, V33)
- 2 = **Cwt** (hundredweight, 100 pounds) (V31, V32, V33)
- 3 = **Tons** (V31, V32, V33)
- 4 = **Bushels** (V31, V32, V33)
- 23 = **50 Lb Bags** (V31, V32, V33)
- 25 = **Kernels/Seeds** (V31, V32, V33)
- 38 = **Seeds per Foot** (V2)

For example, a seeding rate of 1 bushel for each 3 acres of winter wheat (i.e. one-third bushel per acre) would be recorded as 0.3 units per acre with 4 as the unit code.

Item 11: Acres Replanted

Record the total number of acres of the selected field that were replanted to the target commodity. Enter acres to the nearest TENTH of an acre. If some acres were replanted more than once, count them again: number of acres replanted times number of times replanted. Example: In a 30 acre field, if 10 acres were replanted three times and 10 acres were replanted once, the total acres replanted would be 40.0 acres.

Item 12: Seed Source

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

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

Code 2 - **Homegrown or Traded**: "Homegrown" is seed grown on the farm by the respondent and used for planting the selected field in 2004. "Traded" is when the operator received seed with no cash

changing hands, such as swapping use of harvesting equipment with a neighbor for seed in return.

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.

Item 12a: Use of Inoculants on the Seed

V2

Peanuts

The physical process of applying specific Nitrogen fixing bacteria to seed or soil at or before planting is called inoculation. The purpose of inoculation of peanut seed is to coat the seeds with a sufficiently high number of viable Nitrogen fixing bacteria of the correct strain to provide early and effective nodulation. Inoculation prevents nitrogen deficiency without the farmer-applied nitrogen.

Enter a "1" if inoculants were used on the seed planted in the selected field.

Item 12a(1): Cost of Inoculants

V2

Peanuts

Record the cost of inoculants in dollars and cents per acre or record the total dollars spent for the inoculants used on the seed planted in the field.

Item 12b: Percent of Seed Grown by the Operation

If any of the seed used was grown on this operation or traded, then record the amount of homegrown or traded seed used in the selected field expressed as a percent.

Item 12b(1): Cost of Cleaning and Treating Seed

The seed used may have been treated with an insecticide or fungicide prior to planting. Record the cost of this seed treatment in dollars and cents per bushel. **Exclude** the cost of chemicals applied at planting time, these will be obtained in the Pesticide Applications section.

Item 13: Seed Cost

Record the per unit cost of the purchased seed for the selected field. If purchased seed was used on this field, record the cost per unit for the portion that was purchased only.

Include landlord and contractor share.

Include costs for seed treatments and any technology fees charged by the seed target commodity company .

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

Example: The seed cost \$250.00 per ton.

Item 14: Reason for Choosing NON GM Herbicide Resistant Wheat Seed

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Show the respondent in the Respondent Booklet the list of reasons for choosing non GM herbicide resistant wheat seed. Ask the respondent to choose the code that best describes his reason for choosing a non GM variety. **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 15: Likelihood of Planting GM Herbicide Resistant Wheat Seed

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Resistant seed varieties usually add to the cost of producing a particular crop. For this reason, analysts are interested in if a producer would incur the additional cost. This item is intended to determine the likelihood of a producer of planting a GM herbicide resistant wheat seed.

Show the operator the list in the Respondent Booklet.

Item 16: Harvest Complete at Time of Interview

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

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

Item 17: Acres Harvested and Yield

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

Item 17a: Acres Harvested for Peanuts/Grain

V2

Peanuts

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

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Determine acres in the selected field harvested for grain. 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 for the target commodity crop. Record acres to the nearest TENTH of an acre.

Item 17a(1): Yield per Acre

If the selected field has been harvested, record the average yield per acre for the purpose indicated. Record the yield per acre to the nearest tenth of a unit in column 2 and the unit code in column 3.

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

Item 17b: Acres Harvested for Silage or Green Chop

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Determine acres in the selected field harvested for silage or green chop. 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 for the target commodity crop. Record acres to the nearest TENTH of an acre.

Item 17b(1): Yield Per Acre

If the selected field has been harvested for silage or green chop, record the average yield per acre to the nearest tenth of a **ton** per acre.

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

Item 17c: Acres for Commercial Seed Contract

Determine acres in the selected field grown for commercial seed under contract. Record acres to the nearest TENTH of an acre.

Item 17c(1): Yield per Acre

If the selected field has been harvested, record the average yield per acre for the purpose indicated. Record the yield per acre to the nearest tenth of a unit in column 2 and the unit code in column 3.

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

Item 17d: Acres Abandoned

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

Do not count acres for other uses as acres abandoned and vice versa. Acres abandoned are those that were planted with the intention of harvest, but then abandoned prior to harvest for any number of reasons. Acres used for other purposes must be explained in a note!

Item 18: Peanut Hay/Wheat Straw

V2

Peanuts

If peanut hay was harvested from the selected field, enter code "1" and continue with item 19, otherwise, goto item 21.

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

If wheat straw was harvested from the selected field, enter code "1" and continue with item 19, otherwise, goto item 20.

Item 19: Peanut Hay/Wheat Straw Acres

V2

Peanuts

Record the number of acres of peanut hay harvested from the selected field to TENTHS of acres.

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Record the number of acres of wheat straw harvested from the selected field to TENTHS of acres.

Item 19a: Tons of Peanut Hay/Wheat Straw

Determine the total tons of peanut hay/wheat straw harvested from the selected field. Work area is provided for your use in calculating total tons. If the respondent can provide tons per acre, calculate total tons by multiplying tons per acre times acres recorded in Item 19. If the respondent can provide total bales and bale weight harvested, calculate total tons by multiplying number of bales times pounds per bale divided by 2000.

Item 19b: Landlord Share of Peanut Hay/Wheat Straw

Record the Landlord's share of the total peanut hay/wheat straw harvested from the selected field, either in terms of percent of the field's harvest or tons.

Item 19c: Cost of Baler Twine/Wire

Record total cost of baler twine/wire used to bale the peanut hay/wheat straw from the selected field in whole dollars.

Item 19d: Price Received for Peanut Hay/Wheat Straw

If any of the peanut hay/wheat straw harvested from the selected field was sold, record the total dollars received per TON.

Item 20: Type of Livestock Grazed Selected Field

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

Enter the code that identifies the type of livestock that grazed the selected field before harvest. If livestock did not graze the selected field, enter code '4' and goto item 21.

Item 20a: Head of Livestock Grazed Selected Field

If livestock grazed the selected wheat field, enter the number of head regardless of ownership.

Item 20b: Number of Days Livestock Grazed

If livestock grazed the selected wheat field, enter the total number of days grazed regardless of ownership.

Item 20c: Amount Received from Others for Livestock Grazing

If livestock grazed the selected field but were not owned by the operator, record the amount received from others for livestock grazing.

Item 21: Crops Planted in Previous Years

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

In the series of Items 21a-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 2001.

Include cover crops planted during the indicated period.

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

If a crop was growing on the field during a particular time period, but it was not planted during that period, then code 318 (no crop planted during time period) should be entered in the appropriate cell. Perennial crops, such as alfalfa, clover, or other grasses, should only be captured in the time period during which they were actually seeded. The **one exception** to this rule is Item 21f (SPRING/SUMMER of 2001). If a perennial crop was growing on the field at that time, it should be recorded, even if it was not planted at that time.

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

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

General Instructions for Completing Item 21

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

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

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

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

After recording the crop planted during each period, ask if that crop was irrigated. After asking if the crop was irrigated, ask if that crop was no-tilled. If no crop was planted, then leave the irrigated and no-tilled cells blank.

No-till is a tillage system in which crop residue is left on the soil and the soil is left undisturbed from prior harvest to no-till planting, except for nutrient injection.

Item 21a: Crop Planted Fall 2003

V2, V32, V33

Peanuts, Durum Wheat, Other Spring Wheat

Record the code for the crop **planted** on the selected field in the fall of 2003. If a crop was planted, it would likely be a cover crop or a winter crop. If a crop was planted during the fall of 2003, ask if that crop was irrigated. Also, ask if the crop was no-tilled.

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

Item 21b: Crop Planted Spring/Summer 2003

Record the code for the crop **planted** on the selected field in the spring/summer of 2003. If a crop was planted during the spring/summer of 2003, ask if that crop was irrigated. Also, ask if the crop was no-tilled.

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

Item 21c: Crop Planted Fall 2002

Record the code for the crop **planted** on the selected field in the fall of 2002. If a crop was planted, it would likely be a cover crop or a winter crop. If a crop was planted during the fall of 2002, ask if that crop was irrigated. Also, ask if the crop was no-tilled.

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

Item 21d: Crop Planted Spring/Summer 2002

Record the code for the crop **planted** on the selected field in the spring/summer of 2002. If a crop was planted during the spring/summer of 2002, ask if that crop was irrigated. Also, ask if the crop was no-tilled.

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

Item 21e: Crop Planted Fall 2001

Record the code for the crop **planted** on the selected field in the fall of 2001. If a crop was planted, it would likely be a cover crop or a winter crop. If a crop was planted during the fall of 2001, ask if that crop was irrigated. Also, ask if the crop was no-tilled.

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

Item 21f: Crop Planted Spring/Summer 2001

Record the code for the crop **planted** on the selected field in the spring/summer of 2001. If a crop was planted during the spring/summer of 2001, ask if that crop was irrigated. Also, ask if the crop was no-tilled.

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

If a perennial crop, such as alfalfa, clover, or other grasses, was growing on the selected field in the spring/summer of 2001, enter the code for the perennial crop, even if it was not planted during this period.

Examples of Completing Item 21 Crop Codes

The following examples demonstrate how to complete Item 21.

Example 1: Crop Rotation: Continuous Crop Example

Continuous wheat, not irrigated and using a tillage system other than no-till (i.e., columns 2 and 3 are left blank)

Items 21b, 21d, and 21f are coded with '16 ' for peanuts.

Items 21a, 21c, and 21e are coded with 318, even though this is only a normal time period between continuous crops. No crop was **PLANTED** on the selected field during these fall periods.

Figure 1: Previously planted crops, continuous crop peanuts.

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 2003?	Crop Name	none
		Crop Code	318
b.	SPRING/SUMMER of 2003?	Crop Name	peanuts
		Crop Code	16
c.	FALL of 2002?	Crop Name	none
		Crop Code	318
d.	SPRING/SUMMER of 2002?	Crop Name	peanuts
		Crop Code	16
e.	FALL of 2001?	Crop Name	none
		Crop Code	318
f.	SPRING/SUMMER of 2001?	Crop Name	peanuts

Example 2: Crop Rotation: Perennial (hay) Crop Example

Alfalfa crop planted prior to the spring 2001. Target crop planted in spring of 2004.

Figure 2 Previously planted crops, perennial crop example.

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

What crop was planted on this field –

a.	FALL of 2003?	Crop Name	alf growing
		Crop Code	318
b.	SPRING/SUMMER of 2003?	Crop Name	alf growing
		Crop Code	318
c.	FALL of 2002?	Crop Name	alf growing
		Crop Code	318
d.	SPRING/SUMMER of 2002?	Crop Name	alf growing
		Crop Code	318
e.	FALL of 2001	Crop Name	alf growing
		Crop Code	318
f.	SPRING/SUMMER of 2001?	Crop Name	alf. hay
		Crop Code	1

Item 22: Land-Use Practices

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

Determine whether the land use practices in Items 22a-h were used on the selected field for the target commodity. Include land not planted to the target commodity if the operator considers it to be part of the selected field. For example, the target commodity may be strip cropped with alfalfa in the same field. Only the acres planted to the target commodity were counted in Item 1. However, since the entire field features strip cropping, the answer to Item 22f described below would be code 1= YES.

Each of the individual Items 22a, 22b, 22c, 22d, 22e, 22f, 22g and 22h must be asked. The operator may use more than one of the land use practices listed. Enter code “1” = YES for each practice the operator used.

Item 22a: Terraces

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

Enter code '1' if the selected field has terraces.

Item 22b: Temporary or Permanent Levees

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

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

Enter code '1' if the selected field has temporary or permanent levees.

Item 22c: Grassed Waterways

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

Enter code '1' if grassed waterways are in the selected field.

Item 22d: Filter Strips or Riparian Buffers

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

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

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

Item 22e: Contour Farming

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

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

Item 22f: Strip Cropping

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

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

Items 22g & 22h: Agricultural Drainage

Agricultural drainage is the removal of excess water from the soil surface and/or soil profile of cropland, by either gravity or artificial means.

Subsurface or tile drainage is designed to remove excess water ***from the soil profile***. The water table is controlled through a series of perforated drainage pipes (tile or plastic tubing) that are installed below the soil surface, usually just below the root zone. Subsurface drainage pipes are typically installed at a depth of 30 to 40 inches, and at a spacing of 20 to 80 feet. A subsurface drainage network for a field generally outlets to an open ditch or stream. A ***channel or diversion (ditch) drainage system*** is designed to remove standing water ***from the soil surface***. A ditch drainage system involves the construction of open ditches within and/or

around the field perimeter to catch and direct the flow of excess surface water.

Item 22g: Underground Outlets

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

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

Item 22h: Other Drainage or Diversions

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

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

Item 23: NRCS Classification of Highly Erodible Land

The Natural Resource Conservation Service (NRCS) would have evaluated the selected field and notified the operator of its classification if the operator had requested any kind of federal program benefits for the selected field.

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

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

Item 24: Wetland Designation

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.

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

General Information on Assistance and Cost-Sharing

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

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

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

Item 25: Assistance Provided for Conservation Practices

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

Item 26: Cost Sharing Assistance for Conservation Practices

Enter a code "1" if either the operator or the landlord received cost-sharing or incentive payments from any source in the last year for conservation practices or systems on the selected field. Exclude rental payments for keeping land in grassed waterways, filter strips or riparian buffers as reported in Items 22c & 22d, but include cost-sharing for establishing these practices.

Item 27: Management Plans

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

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For each of the Items 27a, 27b, 27c, 27d and 27e enter a code "1" if a written plan of the type described covered the selected field during 2004. If a written plan was in place, enter the year that the plan was first implemented on this field.

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

Item 28: Technical Assistance with Management Plans

The 2002 Farm Bill directed NRCS to implement a program that allowed non-Federal persons to provide technical assistance to farmers concerning the major conservation programs (i.e., CRP, CSP, EQIP, WRP, GRP, etc.). Such persons, known as Technical Service Providers (TSP), could prepare any of the plans listed in item 27.

If respondent reported any written plans covering this field (Items 27a - 27e), enter code of "1" and continue with Item 28a.

Item 28a: Cost for Technical Assistance

Record the total cost for the technical assistance provided to develop a written plan covering this target field either in dollars and cents per acre or total dollars.

Item 29: Crop Insurance

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

If the selected field is covered by Crop Insurance in 2004, enter "1" and continue with Items 29a - 29e. Otherwise, continue with Section C. The questions in this item relate to the types of insurance the operation purchased in 2004 for this field. For each of the Items 29a - 29e, enter a code "1" if the selected field is covered by the type insurance described.

Item 29a: Basic Catastrophic Insurance (CAT)

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

Enter a code "1" if the operation purchased basic catastrophic insurance (CAT coverage) in 2004 for this field.

Item 29b: Buy-up Catastrophic Insurance

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

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

Item 29c: Revenue Insurance

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

Item 29d: Other Federal Insurance

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

Item 29e: Other Private Insurance

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

Section C - Fertilizer and Nutrient Applications

All Versions unless otherwise noted.

What is Section C for? How is the Information Used?

The purpose of this section is to identify fertilizers and nutrients used to produce the 2004 target commodity crop on the selected field.

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

Specifically, fertilizer application data are used to analyze water quality and agricultural productivity issues and policies. Fertilizer data enable a determination of the geographic extent and intensity of use.

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

Use of Supplements

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

Copy the identification as it appears on the questionnaire to the identification box on the supplement. Assign the next Table number (002, 003, 004, etc.) to each additional supplement used. You begin numbering the supplements with Table 002 because Table 001 appears in the questionnaire. Use as many supplements as you need.

Item 1: Screening for Fertilizer Applications

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

Include:

- all chemical fertilizer materials applied specifically for the 2004 crop,
- fertilizer applied in the fall of 2003 if no crop was grown,
- fertilizers applied during the summer of 2003 or earlier years if the selected field was fallow in 2003,
- fertilizers applied by custom applicators,
- nitrogen products applied with herbicides to make the herbicide more effective,
- commercially prepared manure products.

Exclude:

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

Item 2: Enumerator Action

If commercial fertilizers were applied to the field for the 2004 crop, continue. If no commercial fertilizers were applied to the selected field, skip to Item 5.

Item 2: Enumerator Action

If commercial fertilizers were applied to the field for the 2004 crop, continue. If no commercial fertilizers were applied to the selected field, skip to Section D.

Item 3: Number of Commercial Fertilizer Applications

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

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

Ask the operator how many applications of commercial fertilizer were made to the selected field. Include aerial applications. The application can be made to all or part of the field.

Item 4: Fertilizer Applications Table

Column 2: Materials Used

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

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

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

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

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

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

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

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

Percent Analysis

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

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

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

No fertilizer reported by analysis will have total N-P₂O₅-K₂O analysis of more than 85. Carrier or filler material makes up the rest of the total weight for commercial fertilizers. If a farmer reports 35-45-20, he's probably reporting pounds of actual nutrients instead of analysis since the three amounts (35 + 45 + 20) add up to more than 85 percent.

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

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

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

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

$$\text{P}_2\text{O}_5 \quad (150 \div 400) \times .46 = .173 \text{ (or 17\%)}$$

because 46 percent of the 150 pounds was available Phosphorus.

$$\text{K}_2\text{O} \quad (250 \div 400) \times .60 = .375 \text{ (or 38\%)}$$

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

Actual Plant Nutrients

Another way farmers might report fertilizer use is in terms of Actual Plant Nutrients (AN) 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, P₂O₅, or K₂O, this is usually a clue that they are reporting pounds of actual nutrients. Fertilizer materials will amount to more than the actual nutrient contents of the products applied, because part of the material applied is carrier material, just like when the farmer reports by percent analysis.

For example, if the farmer reported that he applied 100 units of Nitrogen in the form of anhydrous ammonia, he would have applied about 122 pounds of 82% nitrogen ($100 \div .82 = 122$). 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 the quantity applied is correct. One way to do this is to ask (when units were reported) if the actual weight of material applied was more than the number of units reported.

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

Other Methods of Reporting Fertilizer Use

Farmers may also report fertilizers by name. The Respondent Booklet shows some of the more common fertilizers with their usual analysis.

Anhydrous ammonia is the strongest nitrogen fertilizer available. It must be stored in a tank under pressure. It is applied by injection into the ground or into irrigation water. Anhydrous is a liquid when under pressure, but turns into a gas when released and is lost if not injected into the soil. Anhydrous ammonia is a very popular fertilizer because it is often cheaper (per pound of nutrient) than other forms. It may be reported as "anhydrous", "gas", "NH₃", "82-0-0", "units of nitrogen", or as "pounds of actual nitrogen" (N).

Aqua ammonia is one of the more common types of liquid nitrogen fertilizers. It is made up of anhydrous ammonia and water and is often

used in Western states. It may be reported in pounds (actual N) or gallons (material or product). Although it is a liquid, it is usually reported in pounds of actual N.

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

Calcium nitrate contains not less than 15 percent nitrogen and 19 percent calcium. Limestone or lime contains 40 percent calcium and 12 percent carbonate. Approximately 100 pounds of limestone contains the calcium equivalent of 210 pounds of calcium nitrate ($100 * .4 = 40$ pounds and $210 * .19 = 40$ pounds). For example, if 200 pounds per acre of calcium nitrate were applied to the selected field, "15" would be recorded in column 2 (Nitrogen), "200" in column 3 (quantity) and a "1" in column 4 (pounds). ***Don't forget*** that you must also report the limestone amount in Item 14b. In this example, $.475 (19/40) * 200 = 95$ so, 95 would be added to the total quantity of lime applied and reported in Item 14b.

With many of the other fertilizers listed in the Respondent Booklet, 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 the Respondent Booklet.

Column 3: Quantity Applied per Acre

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

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

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

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

$$1200 \text{ pounds} \div 60 \text{ acres} = 20 \text{ pounds per acre}$$

Column 4: Material Unit Code

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.

Column 5: When Applied

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

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

Column 6: How Applied

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

The Application Method codes are:

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

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

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

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

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

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

Code 7 - **Banded or Sidedressed 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.

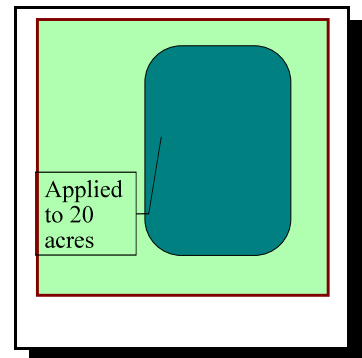
Fertilizer products applied at-planting are generally granular formulations and are placed in a 3 to 4 inch band on either side or above the seed. Early growing-season applications are also applied (either liquid or granular) on either side of the crop row.

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

Column 7: Acres Treated

When only a portion of the field area is treated it is called a **partial field treatment**. All land areas within the indicated area were not treated with the fertilizer application. For example, if the farmer applied 320 pounds of 18-46-0 to 20 acres in the center of a 40 acre field after the crop emerged, the line of the fertilizer table would be completed as follows. Note the amount per acre is calculated as 320 pounds \div 20.0 acres treated = 16 pounds per acre.

Figure 5 Partial field fertilizer treatment



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Figure 6 Recording a partial field fertilizer treatment

LINE	2 → → → MATERIALS USED [Enter percentage analysis or actual pounds of plant nutrients applied per acre.]			3 What quantity was applied per acre? [Leave this column blank if actual nutrients were reported.]	4 [Enter material unit code.]	5 When was this applied?	6 How was this applied?	7 How many acres were treated in this application?
	N Nitrogen	P ₂ O ₅ Phosphate	K ₂ O Potash	19 POUNDS of ACTUAL NUTRIENTS	1 POUNDS 12 GALLONS	1 In the Fall before seeding 2 In the Spring before seeding 3 At seeding 4 After seeding	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	ACRES
01	18	46	—	16	1	4	7	20.0

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

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

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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Figure 7 Example of a completed fertilizer application table.

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

In the above example:

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

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

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

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

Item 5: Sulfur Applications

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

If sulfur (S) was applied as a specific nutrient application to the selected target commodity field for the 2004 crop, enter code "1" for YES and ask Item 5a.

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 dominum 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.

Item 5a: Sulfur Application Rate

If sulfur was applied to the selected field (Item 5 is code "1" = YES), then record pounds of sulfur applied per acre to the nearest hundredth (for example, 2.50). 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, ammonium sulfate contains 24 pounds of sulfur per hundred pounds of material, ammonium thiosulphate contains 26 pounds of sulfur per hundred pounds of material applied, and potassium sulfate contains 18 pounds of sulfur per hundred pounds of material applied. The percent analysis and application rate per acre can be used to calculate the quantity of sulfur applied per acre, which is entered in Item 16a. Be sure to record in notes all the necessary information for the State Office to make calculations.

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

Item 6: Gypsum/Landplaster

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Crops use gypsum/landplaster as a source of calcium. Calcium contained in gypsum is relatively water-soluble and enters into soil solution.

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

Item 7: Fertilizer Custom Costs

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

If any of the fertilizer applications were made by custom applicators continue with item 7a, otherwise goto item 8.

Item 7a: 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 7b. If no, skip to Item 8 to obtain the total costs of materials, including the custom application charge.

Item 7b: Custom Application Charge

Record the amount spent for CUSTOM APPLICATION of fertilizers on the selected field for the 2004 crop. Include landlord and contractor costs. Record only the application cost. Do NOT include the cost of the fertilizer 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 8 and skip Item 7b.

Note: It is common for a combined custom application of fertilizer and pesticide to be made at one price. If this is the case, the materials cost shall be listed under fertilizer materials cost and an appropriate comment explaining the situation is needed.

Item 8: Total Fertilizer Material Costs

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Record the TOTAL COST of MATERIALS for all fertilizer, soil conditioners, micronutrients, etc., applied to the selected field for the 2004 crop of the commodity. If the field was fallow during 2003, include materials applied during the fallow period. **Include** landlord and contractor 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. If skip row cotton planted in the selected field **include** cost of fertilizers applied to skips.

Note: Even in cases where no fertilizers were applied, you must still ask Item 8. Though micronutrient applications are excluded from the Fertilizer table, the cost of applying them is included here in Item 8.

Item 9: Yield Goal

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Recommended fertilizer application rates are often based on the yield goal of the producer. Estimates of producer yield goal compared with actual yield gives some indication of how realistic producer's expectations are. It also gives an indication of how unexpected conditions, such as droughts or pest infestations, may have affected yields. Furthermore, assessing the impact of adopting different nutrient practices requires information on the producers pre-season expected yield or yield goal which can be much different from actual yield.

Item 10: Soil or Plant Tissue Test

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

If a soil or plant tissue test was performed for the 2004 crop in the selected field, continue with item 11. If a soil or plant tissue test was not performed, skip to item 15.

Item 11: Phosphorus Soil Test

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

If a SOIL test for phosphorus was done on the selected target commodity field, enter code "1" for YES then ask Item 11a. If no phosphorus soil test was done, go to Item 12. The test may have been done in 2004 or in the Fall of 2003 for preparing for the 2004 crop on the field.

Item 11a: Pounds of Phosphorus Recommended

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

Item 12: Nitrogen Soil Test

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

If a SOIL test for nitrogen was done on the selected target commodity field, enter code "1" for YES then ask Item 12a. If no nitrogen soil test was done, go to Item 13. The test may have been done in 2004 or in the Fall of 2003 for preparing for the 2004 crop on the field.

Item 12a: Pounds of Nitrogen Recommended

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

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

Item 13: Plant Tissue Test

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Plant tissue tests are done on plants for nutrient deficiency 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 2003 crop) to determine the needs for this year's crop (the 2004 target commodity crop).

Item 14: Cost of Soil/Plant Tests

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Record the total cost in dollars of the soil or plant tissue tests for nutrient deficiency performed on the selected field for the 2004 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 2003 for the 2004 crop on the selected field. Include landlord and contractor costs.

Sometimes, the farmer is unable to separate the costs of these tests from the cost of fertilizer or custom application charges, especially if the fertilizer dealer or custom applicator does the test. If the fee was included in the cost of the materials or custom applications reported in Section D, leave the cell blank and **complete 14a.**

Item 14a: Reason Test Performed at No Cost

If a soil or plant tissue test was done on the selected target commodity field at no cost, enter the code that best explains why.

Item 15: Enumerator Action

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Refer back to the fertilizer application table (Item 4). If the table is complete, and no Nitrogen was applied (column 2 contains no entries for N for the selected field), skip to Item 18.

If the table was refused or coded incomplete, ask the respondent if any nitrogen was applied for the 2004 target crop in the selected field.

If nitrogen was applied, complete Items 16, 17, and 18.

Item 16: Reason for Nitrogen Application Rate

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Items 16a-g obtain the reasons the operator had for deciding how much nitrogen to apply to the selected field. Each of these must be asked. If nitrogen was **not** applied, do not ask this question.

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

It is also possible for the operator to say NO to all Items 16a-g. If this happens, it will be apparent that the operator based decisions on some reason besides those named in Items 16a-g, because these are all NO.

In Item 16a, if the operator based the decision on the results of a soil or plant tissue test, enter code "1" for YES.

In Item 16b, if the operator followed the recommendation of a crop consultant, enter code "1" for YES.

In Item 16c, if the operator followed the recommendation of a fertilizer dealer, enter code "1" for YES.

In Item 16d, if the operator followed the recommendation of an Extension Service agent or publication, enter code "1" for YES.

In Item 16e, if the operator based his decision on the expected economic return (the increased return from higher production more than offsets the cost of the nitrogen applied), enter code "1" for YES.

In Item 16f, if the operator followed the recommendation of their Contractor, enter code "1" for YES.

In Item 16g, if the operator decided how much nitrogen to apply based on his own past experience or it was a routine practice for this crop in this field, enter code "1" for YES.

Item 17: Use of Product to Slow Breakdown of Nitrogen

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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 18: Lime Applications

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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

Item 18a: 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 18b: Lime Rate

Record tons of lime applied per acre to the selected target 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.

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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 17b.

Item 18c: Lime Cost to Landlord

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

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

Item 19: Manure and Raw Nutrient Applications

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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

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

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

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

Item 19a: Acres on Which Manure Applied

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

Item 19b: Amount Applied

Record the amount of manure applied to the selected field. Enter the code for either gallons, tons **OR** bushels **AND** units per acre **OR** total units. All figures must be entered to the nearest hundredth (example: 10.85). Only one unit should be completed. If the operator tells you that part of the total amount applied was dry, measured in tons, and part of the amount applied was liquid, measured in gallons, one of these units must be converted. Record this in notes so that the total amount of manure applied to the field can be calculated in the State Office.

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

Items 19c & 19d: Manure Transport

It is important to collect information about the distance between the site where manure is stored and where it is applied, and about the capacity of the manure spreader to determine the cost of transporting manure. The cost of transporting manure for field application is an important factor that determines the value of manure applied.

Record the number of miles the hauling distance is between the manure storage and the selected field in Item 19c. Enter miles to the nearest TENTH (example: a half mile must be entered as: 0 . 5).

Enter the total capacity for the manure spreader in either gallons, tons **OR** bushels **AND** unit per acre **OR** total units. All figures must be entered to the nearest hundredth (example: 10.85). Only one unit should be completed.

Item 19e: When Manure Applied

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

Enter the percent of manure applied in the fall before planting of the target crop in Item 19e(1). Enter the percent of manure applied in the spring before planting of the target crop in Item 19e(2). Enter the percent of manure applied after planting of the target crop in Item 19e(3).

The total of Items 19e(1) + 19e(2) + 19e(3) must equal 100.

Item 19f: Form of the Manure

Lagoon liquid manure is from lagoons or holding ponds

Slurry liquid manure is from in-ground tanks, basins, or pits OR from above-ground tanks, silos, or other manure tanks.

Semi-dry or dry manure is from barns, sheds, or embankment

Determine if the manure was lagoon liquid (code 1), slurry liquid (code 2), or semi-dry or dry (code 3).

Item 19g: Application Method

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

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

The manure application method codes are:

Code 1 - Broadcast or sprayed without Incorporation: Manure is applied to the entire surface area by land application equipment.

Code 2 - Broadcast or sprayed with Incorporation: 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 - **Injected or Knifed-in:** Manure is injected under pressure into the soil.

Code 4 - **Sprayed using Irrigation System:** Manure is applied thru irrigation system.

Item 19h: Type of Raw Nutrient

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

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

The code list for the type of livestock manure is:

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

Item 19i: Source of Manure

Determine if the manure was produced on this operation (code 1), purchased (code 2), obtained at no cost from some other source (code 3), or obtained with compensation (code 4).

Item 20: Manure Application Rate Restrictions

V2, V31, V32, V33
Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Because of the increasing regulation of manure applications by Government (State and Local) and because regulations are not implemented uniformly, it is important to quantify the extent of farm

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operators experience with manure regulations. Responses will identify which entity is the most likely to be doing the regulating, what differences might exist between locales, and to what extent manure applications, when regulated, are being governed by nitrogen or phosphorous application rate protocols.

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

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

If phosphorus requirement of the crop was the basis of the restriction which influenced the manure application on this field, enter code "1" in Item 20a(2).

Section D - Pesticide Applications

All Versions except where noted.

What is Section D for? How is the Information Used?

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

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

Include all chemicals applied for the 2004 crop on the selected field.

Exclude:

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

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

- 2) The use of adjuvants.

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

doubt about whether a product should be included, record it anyway and write notes to explain the situation.

Use of Supplements

The Pesticide Applications table contains a column for entering the number of applications of a specified pesticide. This column (column 11) allows you to combine multiple applications of the same pesticide, at the same rate, and covering the same area on 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 the ARMS Phase II **Pesticides Supplement** booklet. Copy the identification as it appears on the main questionnaire to the identification box on the supplement. Assign the next Table number (002, 003, 004, etc.) to each additional supplement used. Begin numbering the supplements with Table 002 because Table 001 already appears in the questionnaire. Use as many supplements as you need.

Use of Records

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

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

Use of the Respondent Booklet

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

Some respondents may be willing to use the booklet and to report the product code for each of the products they used. You should encourage

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this since it makes the job of enumeration easier as well as making reporting faster and more accurate.

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

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

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

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

Gramoxone Extra		
4314	Gramoxone Extra 2.5 L	H
9037	Gramoxone Extra 2.5 L	MD

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

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

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

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

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

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

Item 1: Pesticide Applications

Determine if any pesticides were applied to the selected commodity field for the 2004 crop. Include herbicides, insecticides, fungicides, defoliant, and other pesticides.

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

Exclude fertilizers and seed treatments. The respondent may report foliar fertilizer sprays, especially if they were part of a tank mix. Fertilizer applications should not be recorded in this section; they should have been recorded in the fertilizer section.

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

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

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

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

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

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

Column 2: Product Code

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

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

Recording the product name in the NOTES column also assists the State Office in editing the questionnaire and in verifying unusual applications

and/or rates. Therefore, you are encouraged to record the product name in the NOTES column.

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

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

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

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

Column 3: Product Form (Liquid/Dry)

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

Common form abbreviations are:

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

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

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

DF (Dry Flowable): 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 as a percentage.

Column 4: Tank Mix

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.

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

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

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

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Figure 8 Recording pesticide tank mix information

		APPLICATION CODES for column 9											
		1 Broadcast, ground without incorporation 2 Broadcast, ground with incorporation	3 Broadcast, by air 4 In Seed Furrow 5 Irrigation water	6 Chisel, Injected or Knifed in 7 Banded In or Over Row 8 Foliar or Directed Spray 9 Spot treatment									
		↓											
L I N E	2	3	4	5	6	or	7	8	9	10	11	12	
	What products were applied to this field? [Use product codes from Respondent Booklet.]	Was this product bought in liquid or dry form? [Enter L or D]	Was this part of a tank mix? [If tank mix, enter line number of first product in mix.]	When was this applied? 1 Before planting 3 At planting 4 After planting 5 Defoliation prior to harvest	How much was applied per acre per application?		What was the total amount applied per application in this field?	[Enter unit code.] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Liquid Ounces 28 Dry Ounces 30 Grams	How was this product applied? [Enter code from above.]	How many acres in this field were treated with this product?	What was the number of times applied?	Were these applications made by-- [Enter code from above.]	
NOTES													
Far-go granular 10%	01	4211	D	---	1		12.00	. _ _	1	6	5.0	1	2
Banvel (4L)	02	4136	L	2	4		. 1.0 0	14	1	5.0	1	1	2
Express DF	03	4205	D	2	4		.13	. _ _	15	1	5.0	1	2

In this example,

- Product lines 2 and 3 are in a tank mix.
- For products mixed in a tank mix, columns 4, 5, 9, 10, 11, and 12 must be the same.

Column 5: When Applied

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

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

“At-planting” herbicide or insecticide materials are applied at the time the crop is planted. These applications may be band treatments covering a small section of the row over the seed furrow or broadcast treatments covering the entire soil surface.

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

Column 6 or 7: Application Rate

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

Column 6: Rate per Acre per Application

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

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

With variable rate technology and for spot treatments, application rates for a particular product or tank mix may vary across the field. In these cases, **Do Not Attempt to Obtain** a rate per acre instead, obtain the total amount applied to the field using Column 7.

Column 7: Total Amount Applied per Application

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 target commodity field. This figure should be a total quantity for one application, **NOT** the “sum total” of multiple applications.

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

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

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

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- 2) the number of gallons in each tank applied, and
- 3) the number of tanks used to cover the acres,

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

Other ways of reporting include parts per million (PPM) . 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 CARRIERS 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.

Column 8: Unit Code

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 - **Liquid Ounces**
- Code 28 - **Dry 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:

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

BE SURE to keep the unit code and product formulation consistent. If the operator purchased a LIQUID pesticide product, the unit code must be liquid ounces, pints, quarts, or gallons. If a DRY pesticide product (granular, wettable powder, or dry flowable) was used, the unit code must be dry ounces, pounds, or grams. If the form of product conflicts with the reported unit code, perhaps the wrong product code was recorded. Check the Respondent Booklet to see if there are other formulations.

Column 9: How Applied

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 (or plant 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.

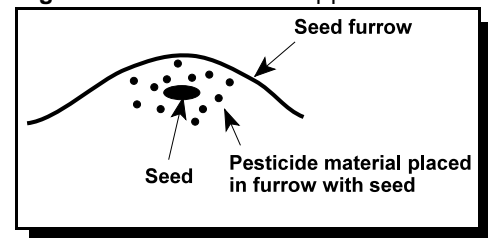
Code 2 - Broadcast, Ground with Incorporation: Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by land application equipment. Application

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. This cultivation activity would also be reported in the Field Operations table.

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

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

Figure 9 In seed furrow application



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

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

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

Code 7 - Banded or Sidedressed 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 is applied only to scattered spots in the field, such that the area treated is undefined. *See the following explanation of the difference between a spot treatment and a partial field treatment.* Spot applications are generally made to control specific weed problems or insects such as grasshoppers at the edges of a field. Spot applications of fungicides are unlikely.

Spot Treatment vs. Partial Field Treatment

Spot treatments should not be confused with treatment of part of a field. When an application is made only to a portion of a field, the treated acreage can be discerned. For example, the north half of a 40 acre field or ten areas throughout a field totaling 20 acres. Such partial field treatments should be reported like any other applications, including acres treated and an application code between 1 and 8.

With spot treatments, acreage is impossible to determine. A spot treatment might involve walking or riding around with a tank on the applicator's back, spraying a herbicide on problem weeds. Spot treatments to field crops are rare and should be verified.

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If spot treatments were made in the selected field, enter the product code (column 2), product form (column 3), when applied (column 5), **the total amount applied (column 7)**, unit (column 8), **application code '9'** (column 9), times applied (column 11), who applied (column 12), and cost per unit (Optional ④).

IMPORTANT: For spot treatments, **do not enter a rate per acre (column 6) or acres treated (column 10)**, since acreage is, by definition, not known for spot treatments.

Spot treatment example: A farmer with a 40 acre field of target commodity identified a small area along a road with severe thistle infestation, and decided to spot treat these areas with Roundup Ultra. He used 2 ounces to spot treat the thistles over 8 acres of the field next to the road (but the total area of the spots treated cannot be estimated). The line of the pesticide table for this application would be completed as shown below.

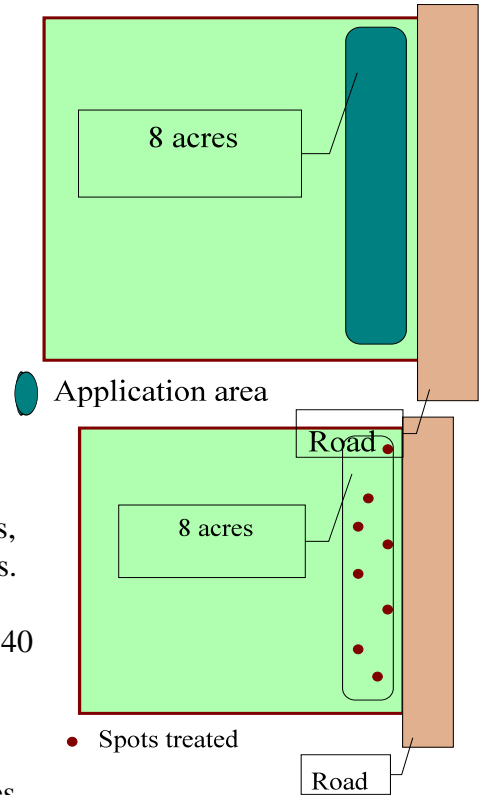


Figure 11 Recording a spot pesticide treatment

L I N E	2 What products were applied to this field? <small>[Use product codes from Respondent Booklet.]</small>	3 Was this product bought in liquid or dry form? <small>[Enter L or D]</small>	4 Was this part of a tank mix? <small>[If tank mix, enter line number of first product in mix.]</small>	5 When was this applied? 1 Before planting 3 At planting 4 After planting 5 Defoliation prior to harvest	6 or 7 How much was applied per acre per application? What was the total amount applied per application in this field?	8 <small>[Enter unit code.]</small> 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Liquid Ounces 28 Dry Ounces 30 Grams	9 How was this product applied? <small>[Enter code from above.]</small>	10 How many acres in this field were treated with this product?	11 What was the number of times applied?	12 Were these applications made by-- <small>[Enter code from above.]</small>		
NOTES												
Roundup Ultra	01 4561	L	—	4	2.00	15	9	.	1	1		

APPLICATION CODES for column 9

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



Partial field treatment example: A farmer with a 40 acre field of potatoes identified an area along a road with a severe blight problem, and

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decided to treat the area with Blite-Out. He applied 4 ounces per acre of the product as a direct spray on the foliage over 8 acres of the field next to the road. The line of the pesticide table for this application would be completed as shown below.

Figure 13 Recording a partial field pesticide treatment

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

NOTES	LINE	2 What products were applied to this field? [Use product codes from Respondent Booklet.]	3 Was this product bought in liquid or dry form? [Enter L or D]	4 Was this part of a tank mix? [If tank mix, enter line number of first product in mix.]	5 When was this applied? 1 Before planting 3 At planting 4 After planting 5 Defoliation prior to harvest	6 How much was applied per acre per application?	7 What was the total amount applied per application in this field?	8 [Enter unit code.] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Liquid Ounces 28 Dry 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 Were these applications made by-- [Enter code from above.]
Roundup Ultra	01	4561	L	—	4	4.00	. _ _	15	8	8.0	1	1

Note that this application covers a measurable portion of the field and the application method can be described by an application code of 1 through 8. The portion of the field treated does not need to be contiguous to be measurable, i.e., several areas that total 8 acres would be recorded in the same way provided that the applicator adjusted his sprayer to apply at 4.00 ounces per acre.

Column 10: Acres Treated

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.

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

Never record treatment acres in these questionnaires.

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

- 1) recording each event on a separate line, or
- 2) combining applications on one line and noting number of times in the next column, column 11.

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

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

Column 11: Number of Applications

If the same product is applied more than once:

1. At the same rate, (Column 6 or 7)
2. In the same time period before, at, or after planting, (Column 5),
3. Using the same method of application, (Column 9), and
4. 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, a different method, 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.

Column 12: Who Applied

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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.

If “who applied” was different for a multiple application line (Column 11>1), use the code for who made the most applications.

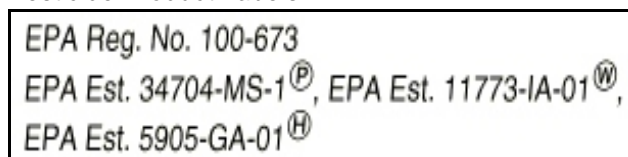
Item 2: Information for Unlisted Pesticides

If you could not find a product in the Pesticide Code List in the Respondent Booklet when completing Item 1, complete the table in Item 2 to provide the information needed to classify and summarize unlisted products. First, record the line number of the pesticide application that the information refers to. Then record what it was used for (herbicide, insecticide, fungicide). Next record the EPA registration number, if it is available, or the name and formulation of the product. Record whether the product was liquid or dry when it was purchased. Finally, record where the product was purchased. This will assist the State Office if questions arise about the product and additional information is needed.

The EPA Product Registration number (refer to Figure 16 below) is printed on the product label. These numbers are several digits long and look somewhat like many bank and credit card account numbers, such as 312-19-18713 and 2980-4. EPA Product Registration numbers are not the same thing as EPA Establishment numbers. In this example, the EPA Product Registration number is **100-673**. EPA Establishment numbers (EPA Est.) indicate which companies are also licensed to market the product, but do not uniquely identify the product.

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Figure 14 EPA Numbers that appear on Pesticide Product Labels



If the respondent does not know the EPA product number or the trade name and formulation, record as much information about the product as you can, especially the "where purchased." This information will enable identification of the product in the State Office. The "where purchased" is important because if more information is needed, we can then call the dealer.

For example, if the operator has a pesticide applied by a custom applicator, he/she might not know the formulation of the product, but if the "where purchased" is recorded the State Office can check to get the correct formulation.

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

Figure 15 Providing information needed for unlisted pesticide products.

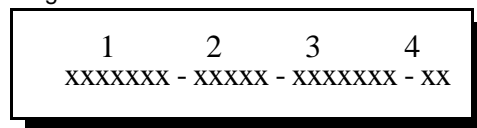
2. [For pesticides not listed in Respondent Booklet, specify--]

LINE	Pesticide Type <small>(Herbicide, Insecticide Fungicide, etc.)</small>	EPA No. or Tradename and Formulation	Form Purchased <small>(Liquid or Dry)</small>	Where Purchased <small>[Ask only if EPA No. cannot be reported.]</small>
22	<i>Insecticide</i>	<i>Danitol 2.4 EC, EPA # 39398-17</i>	<i>Liquid</i>	<i>Midland Chem Supply</i>

What's in a Registration Number?

All pesticide products, if properly registered, are identified by a unique number which is required to be located on the front panel of the label. This "registration number" is composed of several components, each of which has a specific meaning. These individual components are separated by a "-". Those products registered in California, have an extra component which identifies individual brand name registrations.

Figure 16 Layout of an EPA Registration Number



1. Firm or Establishment Number - This component identifies the company that is the primary registrant with the USEPA. The number may be as long as seven digits, or as short as 1. California assigns their own unique firm numbers to companies that register products which are not required to be registered by USEPA.
2. Product or Label Number - This five or less digit number is generally assigned sequentially to each company's individual product as it is registered with the USEPA.
3. Distributor or Sub-Registrant's Number - This number identifies any company that is marketing a product owned by another company, generally the primary registrant. This type of registration is called a distributor registration or a sub-registration and is allowed under existing agreement certified by the USEPA. For a product registered in California, this number represents the company that holds the license for pesticide registration within the state.
4. California Revision Code - California requires companies to register and license individual brand names. The revision code, a sequence of (2) alphabetic letters, creates a unique identifier for each product. A single product may have many brand names registered within the state. Unique revision codes assigned to each one allows for identification of the specific brand name in question. These alphabetic letters may or may not appear on actual product labeling.

Item 3: Pesticide Custom Costs

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

You will know if any of the pesticide applications were made by custom applicators by looking at Column 12 in the Pesticide Table. Ask this question only if any CUSTOM applications were reported (code 2 entered in Column 12).

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 2004 crop. Include landlord and contractor costs. 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, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Record the TOTAL MATERIALS cost for all insecticides, herbicides, fungicides, surfactants, wetting agents, defoliant and growth regulators applied to the selected field for the 2004 crop. Include landlord and contractor costs.

If the field was fallow during 2003, include materials applied during the fallow period. Include materials applied to this field before planting. If custom applied, include the cost of materials ONLY, unless materials and application costs cannot be separated. Record the cost in dollars and cents per acre or in total dollars for the field.

Many operators know the cost per acre of chemicals and pesticides applied on their fields. Some operators will have records of chemical applications and the costs of chemicals applied on each field. Encourage the respondent to use records if they are available. You should always attempt to get the best figures from the respondent using this item. If the operator is unable to report the cost per acre or the total cost for chemical and pesticide materials used on the selected field, use the Dashed Column: Optional Item 4 in the Pesticide Table.

The Dashed Column: Optional Item 4 should only be used as a last resort, because operators may have a more accurate figure available that includes materials which are not captured in the Pesticide Table (such as surfactants and wetting agents).

Section E - Pest Management Practices

All Versions except where noted.

What is Section E for? How is the Information Used?

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

Several years ago, USDA, along with the U.S. Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA), presented joint testimony to Congress on a new, comprehensive, interagency effort designed to reduce the pesticide risks associated with agriculture. The threefold goal of this effort is:

- 1) to discourage the use of higher risk products;
- 2) to provide incentives for the development and commercialization of safer products; and
- 3) to encourage the use of alternative control methods which decrease the reliance on toxic and persistent chemicals.

Integrated Pest Management (IPM) is an approach used by farm operators to control pests in an environmentally responsible manner. IPM combines biological, cultural, and chemical methods of pest control such as monitoring of pest populations and use of natural enemies of pests. Other methods of cultural controls are used, including pest resistant crop varieties, traditional plowing and crop rotation, and use of pesticides when necessary.

Some producers may hire professionals to check their fields to determine the presence of pests. Proper identification of pest problems may reduce pesticide usage. These issues relate to and address food safety, water quality, and pesticide regulation. Data from these questions are vital to address these concerns.

Introduction and Definition of Pests

The introductory statement does two things to help the respondent:

- 1) It explains that you will be shifting gears for a while and asking the operator about pest management practices used on the selected field and how decisions are made regarding those practices.
- 2) It defines PESTS for the operators to include WEEDS, INSECTS, AND DISEASES. Many operators tend to focus on one kind of pest depending on the crop, but we are concerned about other types of pests as well.

For example, sorghum growers may think only about weeds as pests; cotton growers may focus only on insects as pests.

In this section, when the word PESTS is used, it refers to ALL three, WEEDS, INSECTS, AND DISEASES. If you don't introduce pests this broadly for all operators, operators may answer the questions with only one kind of pest in mind.

Item 1: Enumerator Action: Were Pesticides Used?

If any PESTICIDES were recorded in the Pesticide Table in Section D, then Items 2 thru 4 must be asked. Check back to responses recorded in Section D, Column 2 of Item 1. If no PESTICIDES were used, go to Item 10.

Item 2: Weather Data to Assist Determining Pesticide Applications

Weather data used by operators to determine either the need or when to make pesticide applications is another form of pest management. By using monitoring weather data, the timing of spraying fields may increase effectiveness, allow for a lower application rate, reduce drift, or decrease the total number of applications needed. Temperature and precipitation data can be used to determine whether a chemical application is likely needed. Fungi development is more likely to occur in damp conditions with low temperatures. If the operator monitored weather data to determine the need for or timing of pesticide applications, enter code "1".

Item 3: Biological Pesticides Applied

Determine if any biological pesticides were used for the 2004 crop year. A biological pesticide is a product such as an insect growth regulator, neem, or an active bacteria.

Neem is extracted from the seeds and leaves of the neem tree. The primary mode of action of neem is to cover the plant with this natural pesticide. The insect pests refuse to eat any plant covered with neem, eventually starving to death. Another effect is that it acts as a repellent and will not permit an insect to reproduce.

The active bacteria, **Bacillus thuringiensis (Bt)**, is a natural insecticide found in the soil and acts as a biological pesticide when it is applied to a crop. If the operator applied any biological pesticides to manage pests, enter code "1".

Item 4: Pesticides Rotated or Tank Mixed to Prevent Pest Resistance

A common pest management practice is to rotate (from one year to another) or tank mix chemicals with different mechanisms of action. By "different mechanisms of action" we mean HOW the chemical kills the pest (attacks the nervous system, digestive system, etc.). If the operator rotated products or tank mixed pesticides with different active ingredients to keep pests from becoming resistant to pesticides, code "1".

Item 5: Enumerator Action: Were Herbicides Used?

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

If any HERBICIDES were recorded in the Pesticide Table in Section D, then Items 6 & 7 must be asked. Check back to responses recorded in Section D, Column 2 of Item 1. All herbicide products have a code number in the series 4000-4999.

If no HERBICIDES were used, go to Item 8.

Item 6: Were Herbicides Applied *Before* Weeds Emerged?

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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 6a. If no, go to Item 7.

Item 6a: Reason for Applying Herbicides *Before* Weeds Emerged

This question is to determine whether or not the operator's primary reason for using pre-emergence herbicides on the selected field was a direct result of:

- 1) Routine treatments of what weeds are usually present, or
- 2) Weed scouting from the previous year.

Item 7: Were Herbicides Applied *After* Weeds Emerged?

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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 8.

Item 7a: Reason for Applying Herbicides *After* Weeds Emerged

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

This question is to determine whether or not the operator's primary reason for using post emergence herbicides on the selected field was a direct result of:

- 1) Routine treatments of what weeds are usually present, or
- 2) Weed scouting from the current year.

Item 8: Enumerator Action: Were Insecticides Used?

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

If any INSECTICIDES were recorded in the Pesticide Table in Section D, check 'YES' for Item 8 and ask Item 9. 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.

If insecticides were not used, go to Item 10.

Item 9: Reason for Applying Insecticides

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

This question is to determine whether or not the operator's primary reason for applying insecticides on the selected field was a direct result of:

- 1) Routine treatments of expectations of what insects are usually present, or
- 2) Scouting for insect infestation.

Item 10: Method of Pest Scouting

Scouting is the primary method of monitoring pest populations which involves observations of pests in the field in order to estimate population levels. Regular crop scouting lets growers evaluate pest populations ahead of serious problems. Scouting may be done weekly during the growing season and even daily when infestations approach economic levels or weather conditions favor rapid development of specific pests. Scouting is defined as a deliberate effort to assess the pest situation in a whole field, not just in the edge, center, high or low areas. Enter the code that best represents the degree to which the respondent scouted to manage pests in the selected field.

Code 1 By conducting general observations while performing routine tasks: The operator checks for the presence of pests as routine field tasks are performed.

Code 2 By deliberately going to the field specifically for scouting activities: The operator deliberately scouts the field based on a planned or scheduled basis.

Code 3 Selected field was not scouted.

Item 11: Established Scouting Process Used

If the operator performed systematic or counting in their scouting routine or used pheromone or other insect lures or traps in the selected field, enter "1".

Item 12: Reason for Scouting Selected Field

Item 12a: Pest Advisory Warning

Under certain climatic conditions, the potential for pest infestation is higher than normal. The County, Cooperative or University Extension advisor, crop consultant or other advisory source will often issue a pest advisory warning - a recommendation that growers scout their fields for particular pests. If pests were scouted in the selected field due to a pest advisory warning, enter "1".

Item 12b: Pest Development Model

Pest monitoring consists primarily of "in field" scouting surveys. However, there are also area-wide programs that monitor pest development, population levels, migration and seasonal emergence of overwintering insects. These predictive models are used to forecast the time and development stage of pest infestations. Often, a trapping network is used in conjunction with a predictive degree-day model to forecast insect larval growth and development and predict when growers need to scout for particular pests. If pests were scouted in the selected field because of a pest development model, enter "1".

Item 13: Pest Scouting

Column 1: Was Field Scouted for Pests

Determine if the selected field was scouted for weeds, insects or diseases.

For each type of pest (Item 13a - weeds, Item 13b - insects and mites, Item 13c - diseases) for which the field was scouted, enter code "1" = YES, and

then ask items in columns 2 and 3, (infestation level) and (who did the majority of the scouting for this type of pest).

Column 2: Level of Infestation

If the selected field was scouted for weeds, insects, or diseases, record the code which best describes the situation in the 2004 crop year for the pest discovered.

Consider the pest(s) reported with a "YES=1" in column 1; this question asks if the weed, insect, or disease problem was worse than normal in 2004, about normal, or less of a problem than normal.

Column 3: Who Performed Scouting for Pests

Ask the respondent who did the majority of the scouting in the field for Item 13a (weeds), Item 13b(insects and mites), and Item 13c (diseases). If two or more people did equal amounts and there is no clear-cut major "scouter", enter the first (lowest) code of those scouting. If the operator, a partner, or a family member did the most scouting, enter code "1".

If most was done by an employee (other than the operator, a partner, or a family member), enter code "2". If most of the scouting was done by the dealer or an employee of a farm supply or chemical company, enter code "3". If a hired crop consultant or a commercial scouting service was used, enter code "4".

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

Item 14: Scouting Costs

V2, V3, V4

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Ask this question only if a hired crop consultant or commercial scout did the majority of the scouting for weeds, insects, or diseases. (code "4" appears in Column 3 of Item 13). 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 and contractor cost.

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 11.

If Column 3 of Item 13 does not contain a code "4", then go to Item 15.

Item 14a: Scouting Services Provided at No Cost

If an independent crop consultant or commercial scout did not charge for scouting performed for the selected field, be sure to make notes to indicate why there was no fee for the services.

Other Pest Management Practices

Items 15 through 35 identify specific practices and strategies used on the selected field for the 2004 target crop as part of an Integrated Pest Management program. For each of these items, it is important to read each question as worded to help the respondent focus on strategies used **ON THE SELECTED FIELD** for the 2004 crop. For most of these questions, the term pest covers weeds, insects, and/or diseases.

Each of these items asks if the operator used the procedure for the purpose of controlling pests on the selected field. If the procedure was used for this purpose, enter code "1". If the procedure was not used for the purpose of controlling pests, then enter a dash for NO and continue with the next item.

In some cases, the operator may have used a particular procedure, but not for the purpose of controlling pests. If this is the case, probe to verify that the operator's purpose was other than to control pests, by saying, for example, "Did you do that to control pests?" If the purpose for the procedure was not for controlling pests, then the answer to the question is NO and a dashed entry should be made.

Item 15: Records Kept to Track Pests

Only organized, formal records, must be considered not just notes jotted down on scraps of paper. It doesn't matter who kept the records -- it can be the operator or someone else. **Important Note: If scouting was performed by someone outside of the farm operation (Items 13a[ⓐ] or 13b[ⓐ] are coded "3" or "4"), some type of formal record should be**

provided to the operation. If not, please make a note as to why no records were provided.

If this field was scouted for pests, determine if some type of formal or organized written, electronic, or map records were kept for this field of specific pest activity, infestation levels or numbers of each type of pest listed.

Example : Formal Pest Record

A specific example of keeping formal pest records from a systematic scouting approach comes from the North Carolina Cooperative Extension Service. Three steps are recommended to scout for weeds:

- 1) make at least 10 stops in each field;
- 2) at each stop, mark off approximately 30 feet of row (10 paces);
- 3) record the type and number of weeds found within a 1-foot band in the row. Then record the scouting results on a “weed threshold worksheet” like the one below:

Figure 17 Example of information recorded in written scouting records.

Weed	Number Counted	Number of Stops	Number of Weeds per Stop

The information recorded on the worksheet is used with other information to determine whether herbicide treatment is necessary.

Item 16: Scouting Data Used to Compare to Infestation Threshold Guidelines

This question asks if the operator compared scouting data against published infestation threshold information to determine whether or not to take measures for pest control. With the presence of a pest, an operator may not choose to try to control that pest since it may not reach a damaging level. The crop could possibly outgrow the pest, or natural predators or disease may keep down the pest population. Enter code ‘1’ for YES and continue.

Item 17: Used Field Mapping of Previous Weed Problems

Ask if this operation used field mapping of previous year's weed problems to assist in making weed management decisions on the selected field this year. An operator may have used a topographic map from the National Resource and Conservation Service (old Agricultural Stabilization and Conservation Service). The operator may simply draw an outline of the fields, or may use a software program that allows for field mapping. By identifying trouble spots, the map can help in future pest management program plans. If this practice was used, enter code "1" for YES.

Item 18: Use of Diagnostic Laboratory

Determine if the operator or a crop consultant utilized the services of a diagnostic laboratory for the selected field. Enter code "1" if YES.

Item 19: Remove or Plow Down Crop Residues

By removing or plowing under crop debris after a crop is harvested, a vital habitat for pests is removed. Methods of removal could include baling, burning, and removing debris from the field. If the operator used this practice, then enter a code "1".

Item 20: Rotated Crops to Control Pests

Find out if crops were rotated in the past 3 years **for the purpose of controlling pests**. Pest control is only one of several reasons crops could have been rotated. Be sure to probe to ensure that the control of pests was a reason for rotating crops on this field. If the control of pests was a reason crops were rotated, then enter a code "1".

Item 21: Maintained Ground Covers

Determine if any ground covers, mulches, or physical barriers were maintained in or around the selected field to reduce pest problems. If this practice was used, enter code "1" for YES.

Item 22: Considered Pest Resistance When Selecting Seed Variety

Find out if the operator considered pest resistance offered by different seed varieties in selecting the variety planted in this field. This seed which has been bred to be resistant to a pest and should not be confused with herbicide resistant seed. Enter code "1" if YES.

Item 23: No-till or Minimum-till for Weed Control

Determine whether no-till or minimum-till was practiced on this field for weed control during the growing season after the target commodity was planted. If YES, enter code "1".

Item 24: Planting Location Practices

Another pest management practice is to determine where to plant a particular crop. Crop location can have a negative or positive impact on pest populations. As an example, a wind break could create a pocket for a certain pest infestation such as flies or weeds. A prominent shaded area can harbor mold or a rot that could also have a negative impact. If this practice was used, enter code "1" for YES.

Item 25: Adjusted Planting or Harvesting Dates

Find out if the planting or harvest date was adjusted on this field for the purpose of controlling pests. If yes, enter code "1".

Item 26: Adjusted Row Spacing or Plant Density

V2, V6
Peanuts, Soybeans

Find out if row spacing (width) or plant density (number of seeds planted per acre) were adjusted in this field for the purpose of controlling pests. Enter code "1" if YES.

Item 27: Trap Crop

V2, V6
Peanuts, Soybeans

If a trap crop was planted in any part of this field to manage insects, enter code "1".

Item 28: Beneficial Organisms

V2

Peanuts

If the operator applied or released any beneficial organisms such as nematodes, fungi, insects, etc. in the selected field to manage pests, enter "1".

Item 29: Biological Pest Control

V2

Peanuts

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. If this practice was used, enter code "1" and continue with item 29a.

Item 29a: Biological Pest Control Costs

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 2004 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 or contractor.

Item 30: Cultivation for Weed Control

V2, V6

Peanuts, Soybeans

Determine whether this field was cultivated for weed control during the growing season after soybeans were planted. If YES, enter code "1".

Item 30a: Number of Times Cultivated

If the field was cultivated for weed control, enter the number of times the field was cultivated in item 30a. This information about the number of cultivations will be useful in addressing the issue of substituting cultivation for herbicide use.

Item 31: Tilling, Chopping, Mowing, Burning

Eliminating habitat where pests can breed and grow is an important pest management strategy. Farmers often mow or otherwise maintain areas immediately adjacent to fields to minimize the habitat where insects live.

Find out if practices such as mowing, burning, tilling, and chopping of field edges, lanes or roadways, were used to slow or control the spreading of pests into the field. If yes, enter code "1".

Item 32: Cleaning of Equipment

Cleaning of equipment used in a field prevents carrying pests (such as weeds and disease) from one field to another. Find out if the operator cleaned the harvesting and/or tillage equipment used in this field to reduce or prevent the spread of pests to or from the selected field. If yes, enter code "1".

Item 33: Pest Management Information Sources

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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 2004 target commodity 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.

Starting with the most influential in determining the pest management practiced used, choose up to 3 sources..

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The codes for Pest Management Information Sources are:

Code 1 - Extension Advisor, Publications or Demonstrations (County, Cooperative or University). Many state extension services publish detailed bulletins on local pest densities and other pest management information on a regular basis as well as annual or periodic pest management reports, and conduct regular demonstrations on new technology.

Code 2 - Farm Supply or Chemical Dealer. Many farm supply or chemical dealers offer scouting and other pest management services to the farmers that buy inputs from them.

Code 3 - Commercial Scouting Service. Some consulting firms provide services that are focused exclusively on pest management. These firms will offer scouting services, and may offer other insect, weed, and/or disease management services.

Code 4 - Independent Crop Consultant or Pest Control Advisor/Custom Applicator. 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 - **Employee Pest Advisor.** The operation has an employee on their payroll who provides pest management expertise to the operation.

Code 9 - **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 10 for NONE.

Code 10 - **None:** No outside source of information was used. Use this code if the operator didn't use any outside source of information for pest control decisions, besides personal experience or judgment, etc.

Item 34: Pest Identification and Management Training

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Determine if the 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, 2003. Do not include seminars put on by chemical dealers or pesticide applicator training. If YES, enter a code "1".

Item 35: Flooded or Irrigated Field

V6

Soybeans

Find out if the selected field was flooded or irrigated for the 2004 crop. If yes, enter code "1".

Item 35a: Water Management Practices

Water management practices include irrigation scheduling, drainage control, and other water management practices. If water management practices were used to control pests in this field, enter code "1" in item 35(a).

Section F - Field Operations, Labor, and Custom Services

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

What is Section F for? How is the Information Used?

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

Machinery information is also used to compute the fuel, repair, and capital costs associated with producing the commodity. These items are a significant part of the overall cost of production for each commodity.

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

Item 1: Tractor Table

Include all tractors owned, rented, leased or borrowed by the operation and used to produce the target crop on **the selected field**. Tractors 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

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 3.

Column 2: Make and Model

List the make and model for each tractor used on the selected field, such as "John Deere 4050". Since PTO horsepower may need to be verified in the State Office, the make and model are important items.

List ALL tractors actually used **on the selected field for the 2004 crop**, DO NOT list all tractors used on the operation in 2004. Be sure to use the 2004 CROP YEAR, not calendar year, because some of the fieldwork for the crop may have been done in the fall of 2003.

Column 3: Model Year

List the model year for each tractor recorded in Column 2, using all four digits. For example, if the model year is 2000, enter 2 0 0 0.

Column 4: Drive

Enter the code for the type of drive for the tractor listed in Column 2:

- Code 2 - **2-Wheel Drive**
- Code 3 - **2-Wheel Drive With Front Wheel Assist**
- Code 4 - **4-Wheel Drive**
- Code 5 - **Crawler or other tracked tractors**
- Code 6 - **Other tractors**

Column 5: PTO HP

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.

Column 6: Fuel Type

Enter the code for the type of fuel used by the tractor:

- Code 1 - **Diesel**
- Code 2 - **Gasoline**
- Code 3 - **LP Gas** (Liquefied Petroleum or Propane)
- Code 9 - **Other**

In many states, products sold as gasoline contain ethanol. For the purposes of this survey, if the product is sold as gasoline or gasohol,

record it as gasoline (code "2"). If the fuel used is ethanol or mostly ethanol, use code "9", and note so in the margin.

Item 2: Self-propelled Harvesting Equipment

V2

Peanuts

If a self-propelled harvester was used to harvest the selected field, record "1" and continue with item 2(a) and record the model year else goto item 3.

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

If a self-propelled harvester and/or swather was used on the selected field, record "1" in item 2 and continue with item 2(a) and 2(b) and record the model year.

Item 2a: Model Year of Self-propelled Harvester

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Record the model year of the harvesting equipment used on the selected field. If more than one self-propelled harvester or swather was used on the selected field, record the average model year.

Item 2b : Model Year of Self-propelled Swather

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Record the model year of the swather used on the selected field. If more than one self-propelled swather was used on the selected field, record the average model year.

Item 2c : Use of Defoliant

V31, V32, V33

Winter Wheat, Durum Wheat, Other Spring Wheat

If a defoliant was used instead of a self-propelled harvester on the selected field, enter "1".

Field Operations Table

Obtain all equipment operations starting after the harvest of the previous crop and continuing ***through harvest and hauling the target crop from the field to storage or point of sale.*** Custom operations and pesticide and fertilizer applications are included. In addition, list all secondary product (hay or straw) operations.

Exclude equipment used to apply lime or gypsum or landplaster.

Use of Supplements

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.

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 2004 crop year, but abandoned and plowed under before the target crop was planted, begin with the operation of plowing down the abandoned crop.

Cover crop: If a cover crop was planted in the field after the harvest of the previous crop and plowed under before the target crop was planted, begin with the operation of plowing down the cover crop.

New renter: If the operator is a new renter of the field, field operations should be recorded for all operations performed by the renter since the last harvest and he should also report operations performed by another operator, if he knows what operations were done.

Planting on newly cleared land: Field operations should begin to be recorded with land forming and tillage after the clearing.

Replanting the target crop: If the selected target commodity field 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 3: Field Operations

Record field operations performed by equipment in the order they occurred.

- If this field was in fallow (idle, diverted) in 2003, record operations starting with the fall of 2002.
- If a crop was grown in 2003, begin with the first operation after the 2003 crop was harvested.
- If a crop was planted for 2004 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 field after harvesting the crop previously grown on the selected field.

Start by asking what happened after harvest of the preceding crop and then keep going in the order that the operations were performed. The sequence of operations and implements must be numbered accurately because it is very important for determining residue levels.

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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.

After recording operations through planting, continue to list the operations through harvest and hauling of the target crop from this field. Record operations in the order they occurred AND maintain the order of tandem hook-ups. Enter the SEQUENCE NUMBER of each operation in the order it occurred. List all implements used on this field *beginning with the first trip over the field after harvest of the preceding crop and continuing through hauling it out of the field to storage or point of sale, including hay or straw operations.*

If this field was fallow (idle, diverted) during 2003, list operations starting with the fall of 2002.

Include:

- plowing,
- corrugation,
- land preparation,
- planting,
- harvesting operations,
- hauling operations,
- raking and baling 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 commodity 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 equals 2), then two field operations would be recorded in the Field Operations Table.

If any of the target commodity 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 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.

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

Column 2: Operation Sequence Number

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.

Implements in tandem hook-ups should be entered on separate lines. For a tandem or multiple hookup of individual tillage implements, record the first implement of the set in Column 3 and its implement code in Column 4. When you record the second implement on the next line, keep the same SEQUENCE NUMBER in Column 2 that was entered for the first implement in the set. If more than two implements are in such a set, list them in the appropriate hookup order, each one on its own line, and record the same SEQUENCE NUMBER for all the implements in that same set.

For example, you've just enumerated the first operation (a chisel plow) on the selected field. Then for the next operation, the operator tells you that he used a flex-tine tooth connected to a field cultivator. After this operation, the respondent reported that he planted. You would record this as follows:

Example 4: Recording operation sequence numbers

2 S E Q U E N C E N o.	3 What operation or equipment was used?	4 [Record machine code from Respondent Booklet.] CODE
1	chisel plow	01
2	field cultivator	21
2	flex-tine tooth	33
3	conventional planter	114

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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 5: Correcting operation sequence numbers

2 S E Q U E N C E N o.	3 What operation or equipment was used?	4 <i>[Record machine code from Respondent Booklet.]</i> CODE
1	chisel plow	01
2	field cultivator	21
2	flex-tine tooth	33
3 4	conventional planter	114
3	soil finisher	66
5	...	
6	...	

Column 3: Equipment Used

Record either the operation or the equipment the operator reported, such as a plow, disk, harrow, planter, etc. 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. One of the last entries should be equipment used for hauling the harvested target commodity 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.

Column 4: Equipment Code

For each operation SEQUENCE NUMBER in Column 2, record the appropriate implement in Column 3 and the appropriate code in Column 4. The codes are listed in the Respondent Booklet. **If the implement is not listed in the Respondent Booklet, write a description of that implement in notes on the questionnaire. Probe to see if any names in the Respondent Booklet may be applicable.**

For a tandem or multiple hookup of individual implements, record each implement of the set in separate lines and enter the appropriate implement code in Column 4. Maintain the order of tandem hook-ups. Retain the same SEQUENCE NUMBER in Column 2.

Treat the attachment of two implements of the same type (for example, two plows hooked side-by-side) for the purpose of allowing wider

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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.

Column 5: Equipment Operator

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. This information will be used (along with the *acres per hour* and *acres covered* recorded in Column 9 and 10) to determine the labor usage on the field by type of worker. This method of collecting labor within the Field Operations Table saves us from having to count these hours again the Labor Table. The Labor Table will only account for non-machinery hours.

The types of workers are:

- Code 1 - **You (The Operator)**
- Code 2 - **Partner**

Code 3 - **Unpaid Worker**

Code 4 - **Paid Part-time or Seasonal Worker**

Code 5 - **Paid Full-time Worker**

Code 6 - **Custom Applicator**

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 two people alternated performing a single field operation, record the code for the person who operated the machine over the most acres.

For operations conducted by CUSTOM OPERATORS, with Code 6 entered in Column 5, go to Column 11. Columns 6, 7, 8, 9, and 10 should not be completed for custom operations.

Leave this column blank for the second, third, etc. equipment involved in tandem operations.

Column 6: Equipment Size

Enter the width of the area covered by the equipment on a single pass over the field. **Size means the swath covered by the machine, not necessarily how wide the equipment is.** For instance, a broadcast fertilizer spreader may be only 6 feet wide, but it can spread fertilizer over a swath of 35 feet. In this case, "35" would be the right entry in Column 6, and code "1" for feet should be entered in Column 7. Report size in terms of swath for all machines except for the hauling operations. For hauling operations using trucks, carts, or wagons, record the size in terms of pounds, bushels, or tons.

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.

Column 7: Size Code

Enter the code for the unit of width associated with the swath size recorded in Column 6. The unit codes for width are:

Code 1 - **Feet**

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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.

Column 8: Tractor Used

Enter the line number of the tractor (from the Tractor Table - Item 1) that was used to pull the equipment. If a self-propelled equipment (including harvesters) was used, 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 is used to pull the piece of equipment, enter the truck code from the Respondent Booklet in column 8.** For example, if a chemical applicator is mounted on the back of a single-axle truck, column 4 would be code 96 and column 8 would be code 301. If a single axle truck was used for hauling, column 4 would be code 301 and column 8 would be code 99.

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.

Column 9: Acres Covered

Record the number of acres covered for this operation on the selected field. Enter the number of acres covered on a single pass of the equipment over the field, not the total for multiple passes of the same equipment over the field. Multiple passes of the same equipment should be recorded on separate lines as separate operations in the correct sequence.

If only part of the field was covered, enter the number of acres in the part of the field covered. If more than one piece of equipment operated on the field at the same time, such as more than one combine doing harvesting, enter each piece of equipment on separate lines, along with the acres covered by each.

Record acres covered to the nearest TENTH of an acre.

Land forming equipment includes machines used to make or close ditches, or to change the slope of the land. The field acreage covered is not a good indicator of total machine use. For land forming equipment, Column 9 should be completed by recording the **total hours** that the equipment was used in the target commodity production. 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.

Column 10: Acres Covered Per Hour

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,

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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.

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.

Column 11: Month and Year of Operation

This information is needed to allow wind erosion to be considered in identifying the tillage system.

Record the number of the month and year when the operation was performed. Use the four digit MM YY format for recording the month and year number. For example, operations completed in April 2004 are recorded as 0 4 0 4.

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 may also be commonly done as tandem operations with another operation. Each separate item of equipment must be identified to calculate costs or identify the tillage system used.

When a farmer reports a tandem field operation:

1. Record the first piece of equipment just like any single machine field operation. Record the SEQUENCE NUMBER in Column 2 in order from the previous operation. Enter the data for all remaining columns on that line.
2. On the next line, record the tandem operation in Column 3 and the machinery code of the second piece of equipment in Column 4. Record the same SEQUENCE NUMBER as the operation entered on the previous line in Column 2.

For equipment other than trailers and carts pulled behind trucks, skip Columns 5, 6, 7, 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.

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 1: Field Operations, Tandem and Custom

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

- * operation 1 occurred in 2002 because the field was fallow in 2003.
- * operations 3, 4, and 7 are tandem operations. Columns 5 - 11 are left blank for tandem tillage and chemical application operations.
- * operations 4 and 9 are custom operations, leave columns 6 - 10 blank,
- * fertilizer and pesticide applications accounted for (operations 7, 9),
- * hours (not acres) are entered in column 9 for the hauling operations (operations 11, 12) 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 99 Self-Propelled 1/ 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	10 02
2	stubble-mulch	7	1	16	1	1	165.6	18.0	11 03
3	chisel	1	1	16	1	1	165.6	20.0	03 04
3	stubble mulch	7							
3	cond. harrow	31							
4	subsoiler	8	6						04 04
4	stubble mulch	7							
4	cond. harrow	31							
5	heavy cult.	26	1	12	1	1	165.6	15.0	04 04
6	heavy cult.	26	1	12	1	1	165.6	15.0	04 04
7	heavy cult.	26	1	12	1	1	165.6	12.0	05 04
7	fert. attach.	72							
8	planter	114	1	6	2	1	165.6	10.5	05 04
9	airplane spray	91	6						05 04
10	combine	121	1	20	1	99	165.6	10.0	10 04
11	truck	301	3	150	5	99	18.0		10 04
12	wagon	194	3	200	5	301	18.0		10 04

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Example 2: Field Operations, Target Crop Abandoned

The following example illustrates coding operations for a target commodity field that is planted, replanted, and then abandoned when target commodity is grown in the selected field. 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 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? MM YY
				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 99 Self-Propelled 1/ 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	10 03
2	stubble-mulch	7	1	16	1	1	165.6	18.0	03 04
3	chisel	1	1	16	1	1	165.6	20.0	03 04
3	stubble mulch	7							
3	cond. harrow	31							
4	subsoiler	8	6						04 04
4	stubble mulch	7							
4	cond. harrow	31							
5	heavy cult.	26	1	12	1	1	165.6	15.0	04 04
6	heavy cult.	26	1	12	1	1	165.6	15.0	04 04
7	heavy cult.	26	1	12	1	1	165.6	12.0	05 04
7	fert. attach.	72							
8	planter	114	1	6	2	1	165.6	10.5	05 04
9	airplane spray	91	6						05 04

Field abandoned in June.

Item 4: Labor Used on the Field

Acres covered and *acres per hour* from the Field Operations Table will be used to calculate labor hours spent operating machines for each field operation. This data will be combined with non-machine labor hours collected in Item 4 to estimate the total labor hours used to produce the target commodity on the selected field.

The Labor Table, Item 4, is the only place where labor hours spent on the selected field for activities *other than* operating machines is collected.

Column 1: Type of Workers

First, identify all the workers that worked on this selected field. Include workers who operated machinery in addition to those who did not. Exclude custom and contract workers. Group the workers into types as either: 1) operators, partners, family members, and other unpaid workers, 2) full-time hired workers, or 3) part-time or seasonal hired workers.

Columns 1a - 1c Hours Spent by Type of Worker

For each type of worker listed, record the total hours worked on **this selected field only** for each of the activities listed in columns 1a-1c. This includes such activities as:

- * scouting for weeds and insects (Column 1a),
- * irrigating (Column 1b),
- * time spent moving machinery and equipment to and from the field (Column 1c),
- * time spent repairing farm machinery and equipment (Column 1c),
- * time spent loading materials into equipment (Column 1c),
- * time spent on manual weeding and manual thinning (Column 1c),
- * time spent on manual rock picking (Column 1c),
- * management activities associated with the selected field only (Column 1c), and
- * other hours working in the field but not operating equipment (Column 1c).

If multiple workers of the same type performed an activity, add the total amount hours that each one worked on the activity. **Include** only the work performed on the selected field. **Exclude** labor provided by contract or custom laborers.

Items 5 & 6: Wage Rate For Paid Workers

For PAID workers only, record the cash wage rate paid for ALL the work performed on this field. **Exclude** payroll taxes and benefits. Wages for full-time hired workers should be recorded in Item 5. Wages for part-time or seasonal workers should be recorded in Item 6. Enter the wage rate in dollars and cents per hour. **Include wages paid for operating machinery (Item 3, column 5 = 4 or 5) and for work other than operating machinery (i.e. scouting, irrigating, and overhead activities).**

If multiple workers of the same type were used, enter the average wage per hour paid to each type of worker. Do not multiply the average wage per worker times the number of workers! If two workers are paid \$5.50 each per hour, enter 5.50, not 11.00.

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".

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 7: Contract Labor Costs

If any contract labor was used in the selected target commodity field, enter code "1" for YES in item 7 and record the average cost per acre for contract labor on this field in item 7a. Enter the average cost per acre in dollars and cents. Include costs paid by landlords and contractors.

Item 8: Percent of Unpaid Work Done by Those Under 16

Considering the total hours worked by unpaid workers on this field, 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 Item 4, Column 1a - 1c (which accounts for only non-machine hours).

We will value unpaid labor hours dedicated to the target crop with an appropriate wage rate to estimate the economic cost of unpaid labor.

Since younger workers are often paid less than more experienced workers, we want to separate unpaid labor hours for workers under 16 so we can value their labor at a different wage rate.

Item 9: Custom Services

Custom operations performed on the field in 2003 for the 2004 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).

Column 1: Custom Service

Several custom services are listed. Since ALL custom machinery operations were obtained in the Field Operations Table, refer back to the Field Operations Table and identify which custom services listed in Column 1 were performed on the selected field. Mark the check box in Column 1 for each custom operation reported in the Field Operations Table. Ask Column 2 for each item marked.

Column 2: Cost Per Acre For the Custom Service

Record the operation's cost per acre for each custom operation or agricultural service done on the field. Include all custom work service fees paid by landlords and contractors. Record the cost in dollars and cents per acre.

Item 10: Technical or Consultant Services

Item 10a - 10g asks a series of questions about the hiring of any technical or consultant services for this field in 2004. Enter a code of "1" for all that apply.

Crop consultants, who offer producers recommendations on nutrients, pest control, irrigation, and other cropping practices, are becoming more common. In the past we had only asked specifically about pest scouting services. This question explicitly asks whether a crop consultant was hired for this field and ascertains what type of service was provided. A follow-

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up question asks about the cost of this service, if the cost was not collected in other sections of the questionnaire.

Item 11: Cost of Technical or Consultant Services

If any “YES” responses recorded for any Items 10a thru 10g, record the total cost of these services. Be sure to include landlord/contractor costs but exclude any of these services if they were reported previously.

Item 12: Yield Monitor

Determine if the harvesting equipment (combine) used or to be used on the selected field has (had) a yield monitor.

A yield monitor is a piece of equipment mounted on harvesting equipment (e.g., combine) to measure the yield at regular intervals as the combine moves through the field. These yield measurements may or may not be tied to specific locations in the field through a global positioning system (GPS), which uses information from satellites to pinpoint field locations.

If a yield monitor was (will be) used, continue with Item 12a and 12b. If a yield monitor was not used, go to Item 13.

Item 12a: Yield Map

If the yield measurements are tied to specific locations using the GPS, a map can be produced of yields across the field using the information from the yield monitor. If a yield map was produced from the target commodity harvest, enter code ‘1’ else go to item 12b.

Item 12b: Reasons for Using Yield Monitor

Item 12b asks a series of questions about the use of yield monitor data (regardless of whether the respondent produced a yield map). Enter a code for all that apply:

(1): Yield monitors are equipped with a sensor to monitor the moisture content of the crop during harvest. Ask the respondent whether the information from the moisture sensor was used to decide whether all or only part of the crop needed to be dried prior to storage or marketing.

(2): Yields across a field may vary because of drainage problems. Ask the respondent whether the yield monitor information was used (or will be used) to add or improve tile drainage on this field.

(3): On irrigated fields, yields may vary because of problems with irrigation equipment or irrigation water application. Ask the respondent if the yield monitor information was used (or will be used) to add or change irrigation equipment or improve irrigation water application.

(4): Farmers may conduct in-field agronomic experiments to collect information on different seed varieties, fertilizer application rates, or herbicides. Ask the respondents if the yield monitor was used (or will be used) to help record the yields from these in-field experiments.

(5): Yield data from a specific field may be useful in determining the level of payment for leased land. Ask the respondent if the yield monitor information was used (or will be used) to negotiate new crop leases.

(6): Average yield information for a field or part of a field may serve a variety of uses besides leases. Ask the respondent if the yield monitor information was used (or will be used) to document yields for crop insurance, real estate tax, or farm program purposes.

(7): The total crop production from a field may have to be divided between the landlord and tenant or between several partners. Ask the respondent if the yield monitor information was used to accurately divide the crop among partners and/or with the landlord.

(8): If the yield monitor information was used for other uses, ask the respondent to specify those uses. Write those uses on the blank line for editing at the State office.

Item 13: Soil Properties or Soil Types Measured and Geo-Referenced Using Global Positioning Satellite Systems (GPS) Technologies

Ask the respondent if the different soil properties or soil types on this field were sampled and mapped using GPS. This is a process of taking soil samples from precise locations across the field or using a machine to measure soil electrical conductivity for the purpose of creating a geo-referenced 'map' of conditions across the field. Using GPS while collecting the data on soil properties allows a geo-referenced map to be produced and stored.

The information derived from a geo-referenced map includes soil nutrient levels, soil conditions, and soil type that may vary across the field. This information can then be used by equipment outfitted with (GPS) to apply specific nutrients or chemicals to specific areas of the field.

Although such data collection can be expensive and labor intensive, the benefits can include reducing chemical applications and costs, and improving yields. Grid sampling, when properly used in conjunction with variable rate chemical applications, may help reduce the expense and use of crop chemicals by applying only what is needed where it is needed.

Item 13a: Map Produced Based on Soil Tests

This question is intended to refine the type of precision agriculture technologies that farmers are adopting. If a map was produced based on soil tests linked to a GPS unit, enter code '1' for YES and continue.

Item 13b: Map Produced Based on Electrical Conductivity of the Soil

Again, this question is intended to refine our basic understanding of precision agriculture technologies that farmers are adopting. Soil electrical conductivity (EC) can be used to identify and quantify contrasting soil attributes within a field. Machines/monitoring devices (Veris is the brand name of one such machine) are commercially available which use GPS and soil EC to generate a detailed map of these soil attributes. If a map was produced based on EC, enter code '1' for YES and continue.

Item 14: Use of Remote Sensing

Remote sensing is an emerging technology available to field crop producers. While aerial photography is the most common form of commercial remote sensing currently available, on-the-go sensors and satellites have or will soon have the same capability. As the number of producers using various aspects of precision agriculture technologies grows, they will also become aware of the potential for remote sensing.

Enter a code "1" for YES if the an airplane or satellite was used to produce an image or photograph of the field either before or during the 2004 growing season.

Item 15a - 15c: Use of Variable Rate Technology (VRT)

Ask if variable rate technology was used to fertilize the field (Item 15a), seed the target commodity crop (Item 15b), or to apply pesticides (Item 15c).

If Item 15a is YES, then ask if a variable rate applicator was used for one or more of the following fertilizer, lime, or manure applications:

Item 15a(1):

- a. Nitrogen applications
- b. Phosphorous applications
- c. Potash applications
- d. Lime applications
- e. Manure applications

Item 16: Use of a Guidance or Parallel Swathing System

Parallel swathing and guidance systems are devices linked to GPS signals that allow drivers of tractors and self-propelled machines to accurately navigate fields in parallel swaths. Such devices can be used during planting, tillage, and chemical applications to minimize double applications and skipped areas. If a guidance or parallel swathing system was used on the selected field, enter code "1" for YES.

Section G - Irrigation

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

What is Section G for? How is the Information Used?

These questions are designed to identify operating characteristics of irrigation system(s) and the amount and source of water used on the selected commodity field.

There can be more than one type of irrigation system used on a particular crop field.

Most irrigation methods use either pressurized or gravity-flow systems. Pressurized systems use various sprinkler or low-flow drip/trickle systems. Gravity-flow systems use various flood or furrow irrigation systems and subirrigation systems.

How water is applied depends on the crop, the physical features of the land (slopes, hills, and gullies), the type of soil, the amount of water available, how well special equipment would work, and the cost. To conserve both water and money, farmers try to control the amount of water applied and the distribution of water across a field. When crops are over-watered, minerals are washed from the soil, salts build up and soil erodes. When water is not applied uniformly across a field, crop yield is reduced.

Item 1: Acres of Target Commodity 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 2004 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:

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- * acreage in the selected field which could have been irrigated (facilities were available) but which were not irrigated for the 2004 crop.
- * land in and around the selected field in irrigation ditches, trenches, borders, levees and skip rows.
- * fringe areas of the selected field (generally in fields with sprinkler systems such as center pivot systems) which did not receive water.

Item 2: Irrigation Operations

Include only the irrigation system(s) used to irrigate the selected field for the 2004 crop year.

You will record information for up to two systems used on the target crop for the 2004 crop year. If only one system was used on this field, then use only Column 1 for responses to Items 2b - 2k. Items 2b - 2k will apply only to the irrigation system types listed in Item 2a.

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

Item 2a: Type of System

Refer the operator to the Irrigation System Types Codes in the Respondent Booklet and record the System Type Code for the irrigation system used to irrigate most of the acres of the target crop on the selected field during the 2004 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)

Gravity Systems

- Code 9 - Other Pressure System -- Specify Type
- 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 - Open Discharge from Well or Pump
- Code 19 - Other Gravity System -- Specify Type

Each of these irrigation systems is described in Exhibits 5.1 and 5.2 at the end of this section. The descriptions are designed to explain system characteristics and how the system applies the water to the field.

These systems are on-farm, field-level irrigation technologies and do not describe the water distribution systems of an irrigation district or company.

Exhibit 5.1 includes descriptions of end-tow sprinkler and carousel sprinkler-traveler systems. If either of these systems are used on the field, enter them as a side roll/wheel line system using a code "3".

Also provided are descriptions of several big-gun systems, including self-propelled big-gun system, reel-type hose pull and reel-type cable pull systems that use large gun-type sprinklers. Each of these systems should be entered as a big-gun system using a code "7".

Flood irrigation is a gravity based irrigation system where the water applied is allowed to flow across all or part of a field between levees, dikes, or borders. However, for water management and cost reasons, it is important to recognize how the water is applied to the field. Therefore, the flood irrigation system type can vary depending on how the water is applied to the field. A flood irrigation system can consist of any gravity system type, except system type 17 (and it is also unlikely for system type 16).

For example, if the field was flood irrigated (the water applied is allowed to flow across the field between levees, dikes, or borders), but the water

was applied to the field using a siphon tube or portal/ditch-gate system, then record the flood irrigation system type as either a 10, 11, 12 or 13. Record a code 10 if the field was flood irrigated by applying water from an unlined ditch using a siphon tube system, or a code 11 if the siphon tube system applied water from a lined ditch. Record a code 12 if the field was flood irrigated by applying water from an unlined ditch using a portal/ditch-gate system, or a code 13 if the portal/ditch-gate system applied the water from a lined ditch. If water is applied to the field through a single discharge from a well or pump and allowed to flood all or part of the field (between levees, dikes, or borders), code the irrigation system as 18.

Item 2b: Total Quantity of Water Applied

Record the total quantity of water applied to the target commodity in the selected field during the entire 2004 crop year either (1) in inches per acre, or (2) total acre feet applied to the selected field. **Include** water that was applied during pre-plant irrigations either to soften the soil for planting or to improve the soil profile.

Record this separately for each Irrigation System Type recorded in Item 2a. Include any pre-plant water application.

Item 2b(1) & 2b(2): Estimating Water Applied

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

Item 2b(1): Total Hours Water Applied

The operator should estimate the total hours that water was applied to the selected crop in the field during the 2004 growing season. This should be obtained separately for each irrigation system. The total hours the system operated may range from one to greater than 1000 hours.

Irrigation may occur continuously for days, or even weeks. For example, if the irrigation occurs continuously (every day for 5 weeks), then the total number of hours this system irrigated the field was 840. This is computed as follows:

$$(5 \text{ weeks}) * (7 \text{ days/week}) * (24 \text{ hours/day}) = 840 \text{ hours}$$

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Another example, if a system was used to irrigate a field three different times during the growing season - once continuously for six days, the second time for eight days (but only from 8 p.m. to 8 a.m. daily), and the third time continuously for six more days - then the total number of hours this system irrigated this field was 384. This is computed as follows:

First irrigation:	6 days (irrigation non-stop, day and night)	$6 \times 24 = 144$ hours
Second irrigation:	8 days (irrigation from 8 p.m. to 8 a.m. daily)	$8 \times 12 = 96$ hours
Third irrigation:	6 days (irrigation non-stop, day and night)	$6 \times 24 = 144$ hours
		Total = 384 hours

Item 2b(2): Average Gallons Per Minute

Record the operator's best estimate of the average gallons per minute that the irrigation system(s) applied water to the selected field during the hours of irrigation reported in Item 2b(1). Convert cubic feet per second (cfs) to gallons per minute (gpm) by multiplying by 450, therefore 1 cfs = 450 gpm. NOTE: This value may be the same as the value in Item 2j.

Item 2c: Percent Surface Water Used

Water sources can involve surface water and/or ground water (water from wells). Sometimes the same acres are irrigated using more than one source of water. Record the operator's best estimate of the percent of all the water used to irrigate the selected field from surface water sources.

Sometimes a single irrigation system uses more than one source of water. For each system type reported in Item 2a, record the operator's best estimate of the percent of the total water the system used to irrigate the selected field from surface water sources. The percent for each system can range from zero to 100 percent.

Surface water is water stored in natural ponds or lakes, flowing in streams and rivers, and water stored in man-made reservoirs. Surface water can originate on the farm or from off-farm sources. Water sources are different from water suppliers. Here, it does not matter who supplied the water to the farm.

Item 2d: Number of Times Field Was Irrigated

The number of times a field is irrigated during the growing season will vary across farms depending upon the system, and other characteristics such as soil type and season weather. The number of times a field is irrigated during the crop year can be useful in estimating both the total quantity of water applied and total costs of irrigation for the field.

Record the number of times the selected field was irrigated during the 2004 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 2004 target crop for the selected field. Include any pre-plant water applications.

For each irrigation system reported in Item 2a , record the number of times each system was used to irrigate the selected field for the 2004 crop.

For example, if a system was actively irrigating a field first for 6 days, later for 8 more days, later still for 5 more days, and finally later for 4 more days, then this system irrigated this field 4 times during the growing season.

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

The number of times a field is irrigated can also be estimated by the number of times the irrigation system covers the entire field. For example, if a field is irrigated continuously until the entire field is irrigated (that is, it takes 2 days to cover the entire field), and then the irrigation system set still (not in operation) for a period of time, the number of times the field is irrigated during the crop year can be recorded as the number of times the irrigation system covered the field during the crop year.

Item 2e: Pump Type

To apply water to a field, some irrigation systems may have to lift the water from a well and/or put the water under pressure to distribute it across the field. Pressurized systems must use a pump. For each system reported, identify and record the code for the most common pump type used to lift and/or distribute water across the field.

The Codes for Pump Types Are:

- Code 1 - **Turbine**
- Code 2 - **Submersible**
- Code 3 - **Centrifugal**
- Code 4 - **Booster**
- Code 5 - **Siphon**
- Code 99 - **No Pump**

If more than one pump is used with a single system, such as a booster pump, etc., record the pump type for the pump closest to the water source for the field.

Exclude pumps owned and operated by an irrigation company or district even if the respondent is part-owner of the irrigation company.

Sprinkler irrigation systems generally use **centrifugal**, deep well turbine, or **submersible** type pumps. Turbine and submersible pumps are generally used where it is necessary to lift the water more than 25 feet.

Turbine and **centrifugal** pumps differ in the design of the impellers used to move water through the pump. Impellers are devices internal to the pump used to create water force (or pressure) to lift and/or distribute the water across a field or block.

For an ordinary deep-well **turbine pump**, the impeller is suspended vertically on the end of a drive shaft (submerged below the water level) within a long discharge pipe, but the motor is above ground.

A **submersible pump** is a deep-well pump, usually turbine, with a direct-connect electric motor placed below the submerged impeller. This pump eliminates the need for a long drive shaft required for ordinary turbine pumps. Its principle advantage is that this pump type can be used in very deep wells or crooked wells where long drive shafts for ordinary turbine pumps are impractical. For the pump type, the motor is submerged.

A **booster pump** is generally a relatively small horsepower pump used to provide added lift or pressure when the pump at the water source does not provide adequate pressure for field or block water distribution.

A **siphon pump** is generally used to prime a large siphon tube that transfers water from a mainline water-supply to a ditch or canal providing water to the field or block.

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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 2j.

Item 2f: Average Pumping Rate

For each system reported, enter the average pumping rate in gallons per minute (GPM) for the pump type recorded for that system. Report the pumping rate(s) used during normal operation. NOTE: This may be the same value as entered in item 2b(2) above.

Item 2g: System Operating Pressure

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

Only ask this item whenever a pressure irrigation system is used (Item 2a is code 1-9). Enter the average system operating pressure in pounds per square inch (PSI). Report the system operating pressure used during normal operation.

Item 2h: Pump Motor Type

Systems using a pump to deliver water to the field require a motor. Enter the code to identify the fuel or power type for the pump motor type entered in Item 2e.

If a tractor was used, enter the motor type of the tractor.

The codes for motor type are:

- Code 1 - **Diesel**
- Code 2 - **Gasoline**
- Code 3 - **LP Gas**
- Code 4 - **Natural Gas**
- Code 5 - **Electricity**
- Code 6 - **Solar Power**

Item 2i: Average Pump Motor Size

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

Item 2j: Average Flow Rate

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

If no pump was used with a system, then the respondent should estimate the average flow rate in gallons per minute when the irrigation system applied water to the selected field. NOTE: This may be the same value as entered in item 2b(2) above.

Convert responses in cubic feet per second (cfs) to gallons per minute (gpm) by multiplying by 450, therefore, 1 cfs = 450 gpm.

Item 2k: Other Acres Irrigated Using System(s)

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 2004 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. If no water was purchased, go to Item 4.

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

If water was purchased (Item 3 = "1"), record the operator's best estimate of the percent of all the water applied to the selected field during the 2004 growing season that was purchased from off-farm water sources. The percent may range from zero to 100.

Item 3b: Purchased Water Cost

Record either: (1) the per acre cost for purchased water; or (2) the total cost of ALL water purchased from off-farm water sources that was used to irrigate the **selected target commodity in the selected field** for the 2004 growing season. Purchased water costs include water fees and costs to deliver off-farm water to this field.

Include in the expenses associated with purchasing the off-farm water used on the selected field:

- * fees associated with the water quantity;
- * all fees not associated with water quantities, such as fees charged on a per acre basis to cover water delivery and maintenance costs incurred by the off-farm water supplier; and
- * any purchased water costs paid for by the landlord or contractor.

Exclude any costs associated with pumping or distributing the water on the farm or the selected field.

Item 4: Replacement Cost for Siphon Tubes

Ask this item only if a siphon-tube gravity system was used to irrigate the selected field of the target crop during the 2004 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

Ask this item only if poly pipe was used to irrigate the selected field of the target crop during the 2004 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

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 2004 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 2004 growing season.

Item 7: Water From Wells

If water from wells (ground water) was used to irrigate the selected target commodity field for the 2004 crop, enter code "1" for YES and continue. If water from wells was not used to irrigate the selected field, go to Item 8.

Item 7a: Number of Wells

Record the number of wells used to irrigate the selected field during the 2004 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

Record the average diameter of the outer well casing of all wells that irrigated the selected field during 2004. 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

Record the average pumping depth (in feet) of wells that irrigated the selected field during 2004.

Well pumping depths depend on the water table level and the amount of draw down on the water table during pumping. In other words, pumping depth is the depth to water at the start of the irrigation season, plus an average decline in the water level caused by pumping during the irrigation season.

Item 7d: Water Meter or Other Flow Measurement Device

Water meters and other flow measurement devices serve as a valuable tool for detecting and measuring the amount of water used. If the well(s) used to irrigate the selected field had a water meter or another type of flow measurement device, enter code '1'.

Item 7e: Other Acres Irrigated From These Wells

Often a well may be used to supply water to more than one field. If other fields were irrigated using water pumped from the same well(s), enter code '1'.

Item 7e(1): Acres Irrigated

Record the number of other acres (for fields other than the selected target commodity field) that were irrigated using water pumped from the well(s) that supplied water to the target field.

Item 8: Additional Pipe Used

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 2004. 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

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

Record the diameter in inches of the additional mainline or lateral pipe used. If there are different diameters of pipe used, record the average diameter in inches.

Item 8c: Feet of Additional Pipe Used

Enter the total feet of mainline or lateral pipe used to carry water to the selected field during 2004. Exclude pipe that is part of the irrigation system, such as gated pipe, sprinkler pipe, etc.

Item 9: Field Run-Off

Refer the operator to the list of field run-off options in the Respondent Booklet and record the code the operator indicates best describes what happens to the **majority** of the run-off from irrigation for the selected field.

Field run-off is the portion of the irrigation water applied to the field that does not soak into the soil where the crop is growing. This 'extra' water flows across a field and either collects to form a pool at the end of the

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field, or it flows off the field. The pool of extra water is not large enough or doesn't last long enough to prevent normal farming operations for the field.

This question is a multiple choice question. Be sure to read ALL of the items in the Run-Off Code List before accepting an answer from the respondent. The respondent may want to answer before hearing all the possible answers, and one of the later codes may be the best answer.

Do not ask "Was there any run-off from this field?" or "What happens to the run-off from this field?". These questions are not correct. Many operators will say there is no run-off when, in fact, one of the other codes is what really happens. The respondent will not know that these codes are acceptable answers if you don't read ALL of them before accepting an answer.

The codes describing field run-off are:

Code 1 - Retained at the End of the Field: This is when the pool of extra water is held at the end of the field because the field is bordered or there is a natural basin at the end of the field. The run-off is not re-used for irrigation.

Code 2 - Reused to Irrigate on the Farm: Extra irrigation water from the field collects in an on-farm lake, pond, or pit below the field, and is re-used to irrigate the same field or another field on the farm.

Code 3 - Collected in Evaporation Ponds on the Farm: The extra irrigation water collects in an on-farm pond or pit below the field and is not re-used for irrigation. Instead, it remains in the pond or pit until it evaporates. Evaporation ponds are sometimes used for disposal of poor quality drainage flows.

Code 4 - Drains from the Farm: Run-off drains off the field and away from the farm through man-made drainage ditches or natural water courses. Run-off drained from a farm may be recovered by another farm or it may re-enter the water supply downstream as return flow.

Code 5 - No Run-off: Irrigation water is applied to the field so that no extra water collects at the end of the field or drains from the field.

Item 10: Water Management Practices

Water management practices include irrigation scheduling, drainage control, and other water management practices. Find out if water management practices were used to control pests in this field. If yes, enter code "1".

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Exhibit 5.1: Types of PRESSURE Irrigation Systems

Hand-move Sprinkler System (Code 1)	Portable pipe system, usually aluminum pipe, which must be moved by hand one or more times per day during irrigation periods. Irrigation requirements of the field are met by successive moves of the system to water one strip of the field at a time (an irrigation set). The system's sprinklers can use a variety of orifice sizes and configurations. The system may be adapted to most soil types, topography, field size and shapes; however, it is not suited for all crops since tall crops, such as corn, hinder pipe movement. The sprinkler line(s) are served water by mainlines of aluminum or PVC that may be buried or above ground.
Solid-set or Permanent Sprinkler Systems (Code 2)	A buried pipe system with only the risers and sprinklers above ground, or a portable pipe system which is placed in the field at the start of the irrigation season and left in place to the season end. Both of these system types require no labor to move the system to a new location once established for the irrigation season. Adapted to most crops, soil types, topography, field sizes and shapes.
Side-roll or Wheel-line Sprinkler Systems (Code 3)	A wheel-move, lateral-line system which moves as a unit in fixed increments (irrigation sets) across the field. The system is powered by a small gasoline engine that is manually operated. The system is stationary while irrigation is taking place. Some variations of the system may have tow lines trailing the main lateral line with additional sprinklers on each tow line. Tow line systems irrigate a wider strip at each set, up to 180 feet compared to the 60-foot strip of standard side-roll systems. Wheels are generally spaced 40 feet apart and are 5-7 foot in diameter, with the main system pipe serving as an axle in the middle of the wheel. The system is designed for reasonably flat, rectangular or square fields and is suited to crops less than 4 feet in height. The sprinkler may use flexible hose, aluminum pipe, or PVC pipe to connect to mainlines (above or below ground) or on-site pressurization pumps.
End-tow Sprinkler System <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.

**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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Center Pivot or Linear Move, with Sprinklers less than 2 Feet above the Ground (Code 6)	Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes suspended below the system's main water-supply pipe and are located less than 2 feet above the ground. This includes low pressure precision application systems (LEPA) and other below-the-crop-canopy systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers suspended to within 2 feet of the ground tend to be very low pressure (below 15 psi) and use spray nozzles and bubblers. Some units may run water directly on the ground using a cloth-like extension attached to the drop tube.
Big Gun (Code 7)	A single, large gun-type sprinkler mounted on a trailer, carriage, or skid. Water is supplied to the sprinkler through a flexible hose. The mounted gun sprinkler is either pulled across a field or moved across a field using a self-propelled drive system for each irrigation set. An irrigation set is the area of the field that is irrigated by the gun sprinkler as it moves across the field. When an irrigation set is completed, the entire system is moved and the process repeated. The system is designed for straight rows, flat topography, and medium to high infiltration soils. It is best suited for crops that can withstand heavy bursts of water. Systems are high pressure, greater than 60 psi. Three specialty-type big-gun systems are defined below, including a self-propelled gun traveler system, a reel-type hose pull system, and a reel-type cable pull system.
Self-propelled Gun Traveler <i>INCLUDE as a big gun system (Code 7).</i>	Single, large gun on a four-wheel trailer. Self propelled by a separate engine or a hydraulic continuous move. Water is supplied through a flexible hose. Systems are high pressure, greater than 60 psi.
Reel-type Hose Pull <i>INCLUDE as a big gun system (Code 7).</i>	Single, large gun-type sprinkler on a carriage. A flexible, but noncollapsible hose is attached to a large reel at one end of the field. The carriage and sprinkler is attached to the unrolled hose and stationed at the other end of the field. Water movement through the hose activates a drive system that rolls the hose on the reel, drawing the sprinkler and carriage across the field. When an irrigation set is completed, the reel, sprinkler, and carriage may be moved and the process repeated. Systems are high pressure, greater than 60 psi.
Reel-type Cable Pull <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.

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Exhibit 5.2: Types of GRAVITY-FLOW Irrigation Systems

Siphon-tube System with Unlined Ditches (Code 10)	System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from an unlined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.
Siphon-tube System with Lined Ditches (Code 11)	System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from a lined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.
Portal- or Ditch-gate System with Unlined Ditches (Code 12)	System uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from an unlined ditch across the head of the field. Portals in the ditch bank can be of any diameter and are covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.
Portal- or Ditch-gate System with Lined Ditches (Code 13)	System uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from a lined ditch across the head of the field. Portals in the ditch bank can be of any diameter and covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.
Poly Pipe System (Code 14)	A system using a flexible, collapsible, plastic (polyethylene) tube up to 18 inches in diameter. The poly-tubing is unrolled along the head of the field and holes punched or closeable gates installed to match furrow, border, or dike width. A well or supply canal provides water to the tube. The tube is installed at the beginning of the irrigation season, and since it lays flat when not in use, can remain in the field the entire season. The tubing may be reused for more than one year, but single season use is most common.

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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 Cabledation, Not Poly) (Code 16)	A system using rigid PVC plastic or aluminum pipe with manually-operated closeable gates at regular intervals, but with an automated water-control system . Automated water control is achieved by (1) using a surge valve to alternate pipe sets receiving water, (2) using a moveable plug inside the gated pipe, controlled by a cable, to adjust the water flow from open gates, or (3) other automated methods using gated pipe to control water flow and improve the uniformity of water applications, such as pneumatically controlled bladders to regulate water flow on individual gates. Gated pipe is installed across the head of the field, but may need to be removed for cultural operations or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Improved gated pipe is very unlikely to be used for flood irrigation. It would defeat the purpose of the improved system. The pipe is reused for many years.
Sub-irrigation (Code 17)	Maintenance of a water table at a predetermined depth below the field surface by using ditches or sub-surface drains and water-control structures. Water is added or removed as needed to maintain the water level of the water table at a specific depth using the ditches or drains. Lateral movement of water through the soil provides water to the crop root zone. Conditions for use of this system are limited. Land must be flat and suitable for rapid lateral water movement. The irrigation system may also be used as a drainage system.
Open discharge from well or pump (Code 18)	Open discharge from well or pump occurs where there is only one point of discharge into the field. This system is often used in conjunction with levees or dikes to maintain an even water depth throughout the field. The water remains on the soil until irrigation needs are met, at which time the water is either drained from the field or allowed to infiltrate the soil. Land forming is often required with this system.

Section H - Landlord/Contractor Costs

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

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 and/or contractors to produce the target crop. Landlord and/or contractor costs should have been included in the variable expense items asked in the previous sections. This section identifies how much of that cost was paid by the landlord or contractor. This information is primarily used to establish the value of land under share rental arrangements. In share rental arrangements, the value of the land for crop production is computed as the value of the landlord's share of the crop less costs paid by the landlord.

Item 1: Cost of Inputs Provided by Landlord and Contractor

Ask the respondent for the total cost of all inputs provided by any landlord(s) or contractor(s) for all or part of for the 2004 selected target commodity field.

If the field has more than one landlord or contractor, record the total dollars or dollars and cents per acre paid by all landlords.

If landlords or contractors did NOT pay any of these costs, skip to the conclusion section on the back page.

Back Cover - Conclusion

Item 1: Location of Selected Field

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Tell the respondent that you need to mark the location of the selected field of the target commodity on a map.

Ask the respondent what county the selected field is located in, and record the county name in the space provided.

A field description box has been added for your use in better describing the location of the field.

V2

Peanuts

Location of the Selected Field - North Carolina Only

Field location boxes for your use in recording the Latitude and Longitude of the field. To obtain the latitude and longitude, enter the sample field 15 paces. Using the GPS unit, record the latitude and longitude. Where *dd*=degrees, *mm*=minutes, and *ss*= seconds.

If the latitude and longitude readings are NOT recorded, the field MUST be mapped on a county map as described in Item 2 below. If the latitude/longitude is recorded, DO NOT mark the target commodity field on the county map.

V31, V33

Winter Wheat, Other Spring Wheat

Location of the Selected Field - Washington Only

Field location boxes for your use in recording the Latitude and Longitude of the field. To obtain the latitude and longitude, enter the sample field 15 paces. Using the GPS unit, record the latitude and longitude. Where *dd*=degrees, *mm*=minutes, and *ss*= seconds.

In situations where it's not possible to get latitude and longitude readings, the field MUST be mapped on a county map as described in Item 2 below. Your State Office will provide special instructions for samples that must

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have both the latitude/longitude reading as well as marking the field on the county map for research purposes.

Item 2: Marking Field Locations on the Map

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

NOTE: If you do not have a map for the county the field is located in, you should contact the State Office or your Supervisor to obtain the correct map. Be sure to record enough information (such as legal description, township, range, section, etc.) from the respondent to allow you to locate the field on the correct map when you receive it.

Mark the location of the selected field of the target commodity with an "X" on the county maps provided by the Office. Verify with the respondent that you have located the field correctly. Be sure that the "X" you mark on the map is in the county named in Item 1.

Next to the "X", record "1-" followed by the sequence (sample) number that appears on the label on the Face Page of the questionnaire. The "1" indicates that this is an ARMS survey sample. This identification code is needed to link the "X" on the map with the data in the completed questionnaire.

NASS will use this "X" to determine the longitude and latitude in degrees, minutes and seconds for the selected target commodity field for each sampled operation. ERS will use this information to access the Natural Resources Conservation Service's (NRCS, formerly Soil Conservation Service) Soils V Database. This data base contains soil type, slope, leaching characteristics and other geologic information used for analysis.

Item 3: Re-contact in the Spring 2004

V2, V31, V32, V33

Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat

Inform respondents that they will be re-contacted in February or March of 2004 to collect additional information to complete the profile of their operations for the Agricultural Resource Management Survey. 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 2004 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 Survey. More importantly, the hundreds of similar operations the selected farm represents would not be reflected in official USDA estimates.

Emphasize that you will call to make an appointment for a time convenient to the respondent for conducting the Spring interview.

Item 4: Survey Results or Other Agency Publications

After completing the interview, offer the results of the survey or other Agency or State Office publications to the respondent. A number of publications will result from the ARMS, and they will be published in a variety of sources. Many of these are explained in Chapter 1 of this Manual. In addition, there may be other releases from NASS or your State Office that responding farm operators may be interested in. We would like to serve the respondents better by providing survey results and other information that they will find useful and interesting.

Your Survey Statistician will explain which publications from Headquarters or from your State Office to offer to participants in the ARMS. The Survey Statistician will instruct you how to record requests for information from each respondent, if any Release order forms need to be filled out, or if any additional coding is required on the questionnaire.

If the respondent would like a free copy of the survey results, enter a code '1' in cell 0099.

Items 5a, 5b, 5c: Records Use

Do not ask these remaining questions of the Respondent. They are only for administrative purposes and analysis. You should fill them out after the interview is completed.

Analysts and other data users are interested in comparing reported data with the use of records. The use of records should indicate data are of a higher quality. Enter a code "1" to indicate the respondent referred to and used written records when reporting the indicated items.

Item 5a: Fertilizer Data

If farm records were used for completing the majority of the **fertilizer** data items in the questionnaire, enter code "1"=YES in cell 0011.

Item 5b: Pesticide Data

If farm records were used for completing the majority of the **pesticide** data items in the questionnaire, enter code "1" in cell 0012.

Item 5c: Expense Data

*V2, V31, V32, V33
Peanuts, Winter Wheat, Durum Wheat, Other Spring Wheat*

Indicate whether farm/ranch records were used for the completing most of the **expense** items in the questionnaire. Enter "1" in cell 13 for YES.

Item 6: Supplements Used

Record the total number of each type of supplement used in completing this interview in the designated cell. These items are important to provide a means to check for misplaced or lost supplement sheets during the computer edit. Be sure all of the supplements are inside the questionnaire before mailing the questionnaire or turning it over to a supervisor.

Administrative Items

Respondent Code

The respondent code identifies the person who was interviewed. Enter the code identifying the person who provided most of the data in cell 0101.

Code 1 = **Operator or Manager**

Code 2 = **Operator's Spouse**

Code 3 = **Accountant or Bookkeeper**

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

Code 8 = **Office Hold**

Code 9 = **Partner**

Record the respondent's name and phone number.

Ending Time

Record the ending time of the interview in cell 0005. If more than one person was interviewed or it took more than one appointment to complete the interview, times should reflect the approximate total time for the questionnaire. Exclude the time you spend reviewing the questionnaire or verifying calculations by yourself after you have completed the interview. Be sure the ending time is after the beginning time entered on the face page. Use military time.

Date

Record the date the questionnaire was completed. Enter the date in MMDDYY format on the lines provided in cell 0007. For example, if the interview was completed on November 6, 2004, enter the month and day 1 1 0 6 in the date cell. The 2-digit year is already preprinted on the questionnaire.

Enumerator Name

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

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

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

This is a reference to be used for surveys requiring tractor manufacturer, make, model, model series, fuel type, and power take-off (PTO) horsepower.

The tractor power take-off horsepower ratings in this listing are taken from Nebraska tests, manufacturer's rating and engine brake horsepower adjusted to power take-off.

Designation Key

Fuel type

Model Series

DIST - Distillates

DSL - Diesel

SER - Series

GAS - Leaded/Unleaded Gasoline

LPG - LP Gasoline

Other Abbreviations

2WD - 2 Wheel Drive

4WD - 4 Wheel Drive

ART - Articulated

FWA - Front Wheel Assist

MFWD - Mechanical Front Wheel Drive

NOTE....Confusion can occur in attempting to find the tractor PTO horsepower for a specific model number. For instance, when an International Harvester (IH) model tractor is incorrectly designated as a JI Case model or vice versa, it will be necessary to check the same model number under JI Case and vice versa.

Source: ① Implement and Tractor, Argus Agronomics, P.O. Box 1420, Clarksdale, Mississippi, 38614. ② Tractor Demographic Survey conducted by NASS during April - May 2002.

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

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BERTOLINI	2
BIG BUD	2
BI-TRACTOR S.R.L.	2
BOLENS	2
BOMBARDIER	3
BRITISH COUNTY	3
BUCYRUS-ERIE	3
CAMECO	3
CARRARO	3
CASE/DAVID BROWN (BOWEN)	3
200B Series	3
300 Series	3
300B Series	3
400 Series	3
400B Series	3
530 Series	4
600 Series	4
600B Series	4
630 Series	4
700 Series	4
700B Series	4
730 Series (730-730CK)	4
800 Series	4
800B, Series	4
830 Series	4
830 Comfort King Series	4
870 Series	4
900B Series	4
930 Series	5
CASE/INTERNATIONAL	5
CASE/INT'L/STEIGER	6
CASE CRAWLERS	6
CATERPILLAR	6
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DAIZING	7
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NUFFIELD (BLMC) (BMC)	24
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APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

<u>SPECIAL HP CODES</u>	<u>PTO-HP</u>	<u>ALLIS-CHALMERS contd.</u>	<u>PTO-HP</u>
Animals (horses, mules, etc.)	1	HD-6B, 6A, 6E, Dsl	62
Pickup Truck	2	HD-7W, Dsl	70
All-terrain vehicles	3	HD-10W, HD-10, Dsl	85
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		HD-14, Dsl	105
		HD-15, Dsl	115
		HD-16	122
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		HD-19, Dsl	150
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		HD-21	157
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		K	32
		L, L-O	40
		M	48
		RC	22
		S-O	35
		U, Gas	22
		UC	22
		2WC, Gas, Dist	30
		WD, Gas	35
		WD, Dist	26
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		WD-45, Dist	33
		WF, Gas, Dist	30
		WK, WK-O	48
		WS	48
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		4W-305, Dsl	250
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		200, Dsl	93
		210, Dsl	122
		220, Dsl	136
		440, Dsl	190
		650, Dsl	90
		706, 706C, Dsl	45
		715, Dsl	54
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4650, Dsl	40		
4660, Dsl	52		
5670, 6670, Dsl	63		
5680, 6680, Dsl	73		
6690, Dsl	81		
8765, Dsl	85		
7600, Dsl	89		
7630, Dsl	115		
7650, Dsl	128		
8610, Dsl	103		
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D-10, Gas, Ser. III	33		
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D-15, Gas, Dsl, LPG, Ser. I	38		
D-15, Gas, Dsl, LPG, Ser. II	45		
D-17, Gas,	53		
D-17, Dsl, LPG	51		
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D-19, Dsl, LPG	66		
D-21, Dsl	103		
D-21, Dsl, Ser. II	128		
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G, Gas	10		
H-3, Gas, HD3, Dsl Crawler	32		
H-4, Gas, HD4, Dsl Crawler	40		
HD-5B, 5A, Dsl	48		

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

<u>ALLIS-CHALMERS, contd.</u>	<u>PTO-HP</u>	<u>BELARUS (MINSK) contd.</u>	<u>PTO-HP</u>
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5020, Dsl	22	500, 500A, Dsl	63
5030, Dsl	26	502, Dsl	63
5040, 6040, 6140, Dsl	40	505M, 525M, Dsl	61
5045, Dsl	44	520, 520A, Dsl	63
5050, Dsl	51	522, Dsl	63
6060, Dsl	64	560M, 562M, Dsl	61
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7080, Dsl	182	7100M, Dsl, 4WD, Art	286
7200, Dsl	124		
7580, Dsl, 4WD	186	<u>BERTOLINI</u>	
8010, Dsl	106	510, MK2, Dsl	16
8030, Dsl	133	530, Dsl	30
8050, Dsl	152		
8070, Dsl	170	<u>BIG BUD</u>	
8550, Dsl, 4WD	254	360/10, Dsl	306
		360/30, Dsl, 4WD, Art	306
<u>AVCO, NEW IDEA (Power Units)</u>		400/20, Dsl	344
8550, Dsl, 4WD	254	400/30, Dsl, 4WD, Art	340
700-703, Gas, Dsl	94	450/50, Dsl	420
704-706, Gas, Dsl	102	525/20, Dsl	421
707-708, Dsl	120	525/50, Dsl, 4WD, Art	421
709, Dsl	150	650/50, Dsl, 4WD, Art	552
800, Dsl	120	747, Dsl	670
801, 802, Dsl	150		
803A, Dsl	220	<u>BI-TRACTOR S.R.L.</u>	
		T-232, Dsl	39
<u>BELARUS (MINSK)</u>		T-434, Dsl	69
MTZ 80, Dsl, MTZ 180	75		
T25, Dsl	29	<u>BOLENS</u>	
200, 220 Dsl	19	All Gas Models	13
250, 250A, Dsl	25	G152, G154, Dsl	13
310, Dsl	29	G172, G174, Dsl	15
400, 400A, Dsl	51	G192, G194, Dsl	18
405, 425 Dsl	51	G242, G244, Dsl	24
420, 420A, Dsl	51	G272, G274, Gas.	17

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

BOLENS contd.

	PTO-HP
G292, G294, Dsl	27
G1502, G1504, G1704, Dsl	N/A
G2102, G2104, Dsl	N/A
G2702, G2704, Dsl	N/A
G16XL, G16XT, Dsl	14
H16XL, H16XT, Dsl	14
H18XL, Gas	15
HT 20, Dsl	17
HT 23, Gas	20
QT 17, Gas	15

BOMBARDIER

B-10, Dsl	140
Bombi, Gas	34
BT-12, Dsl	133
BR-100, Gas	34
BR-400, Dsl	190
Muskeg. Carrier, Dsl	70
Muskeg-Tractor, Dsl	70
Skidozer, 252D, Dsl	70
Snow Mobile, Gas	100
SW-48DA, Dsl	70
SW-48FA, Gas	101
SW-48HD, Dsl	89
Terra-flex, TF-20, TF-60	101
Terra-flex, TF-110 M	93
Terra-flex, TF-110 S. R	93
Terra-flex, TF-140	93
Terra-flex, TF-160, Dsl	93
Terra-flex, TF-240	140
Terra-flex, TF-300TT, Dsl	175
Terra-flex, TF-360, Dsl	233
Terra-flex, TF-600 (Dual)	280
Terra-flex, TF-900 (Dual)	350
Valmet, BT-12	190

BRITISH COUNTY

1884, Dsl	163
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BUCYRUS-ERIE

140, 160, 190, Dsl	85
194-4, Dsl	117
200-4, Dsl	195

CAMECO

	PTO-HP
Cameco 205, Dsl	86
Cameco 235B, Dsl	116
Cameco 305B, Dsl	142
Cameco 405 (all models), Dsl	181
115, Dsl	86
225B, Dsl	116

CARRARO

13804, Dsl	120
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CASE/DAVID BROWN (BOWEN)

120, Gas	10
155, 195, Gas	12
200G	30

200B Series

210B, 211B, Gas	31
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300 Series

300, 301, 302, Dsl	31
310, 311, 312, 350, 351, Gas	33

300B Series

300B, 310B, 310E, Gas, Dsl	33
311B, Gas	33
380CK, Dsl	43

400 Series

400, Dsl, Super D, Spec. D	49
401, Dsl, Super Dsl	49
402, 403, 405, Dsl	49
410, 412, 413, 415, Gas	53
411, Gas, Super Gas	53

400B Series

400B, Gas	37
410B, 411B, Gas	37
430, 431, Gas, Dsl	34
440, 441, Gas, Dsl	34
470, Gas, Dsl	40
480LV, 480B, 480CK, 480D, Dsl	43
484, 485	43
500, Dsl	64
500B, 510B, 511B, Gas	45

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

CASE/DAVID BROWN contd.	PTO-HP
<u>530 Series</u>	
530 Gas, Dsl	41
530 Gas	40
531, 531C, Dsl	41
540, Gas, Dsl	41
541C, 541 Gas	41
570 Gas, Dsl	42
580B, 584C, Gas	53
580D, 580CK-C, Dsl	53
586, Gas	53
<u>600 Series</u>	
600, Dsl	64
610, LPG	64
<u>600B Series</u>	
610B, 611B, 614B, Gas, LPG	45
<u>630 Series</u>	
630, 631, Dsl	48
632, Dsl	51
640C, 640, Gas	49
642, Gas	48
634C, Gas	49
644C, Gas	51
680C, Gas, Dsl	51
<u>700 Series</u>	
700, 701, 702, 703, 705, Dsl	64
710, 711, 712, 713, 715, Gas	64
<u>700B Series</u>	
700B, 701B, Dsl	52
702B, 703B, Dsl	52
710B, 711B, Gas, LPG	54
712B, 713B, Gas, LPG	54
<u>730 Series (730-730CK)</u>	
730, 731C, 731, Dsl	56
732C, Dsl	56
740, 740B, Gas, LPG	58
741C, 741, Gas, LPG	58
770 Gas	55

CASE/DAVID BROWN contd.	PTO-HP
770 Dsl	60
780 Dsl	42
<u>800 Series</u>	
800, 801, 802, Dsl	52
810, 811, 812, Gas	54
<u>800B, Series</u>	
800B, 801B, Dsl	54
802B, 803B, Dsl	54
803B, Dsl	54
810B, 811B, Gas, LPG	56
812B, 813B, Gas, LPG	56
<u>830 Series</u>	
831, 831C, Dsl	64
832, 832C, Dsl	64
833, Dsl	64
840, Gas, LP	66
841, 841C, Gas, LP	66
842, 842C, Gas, LP	66
843, 843C, Gas, LP	66
<u>830 Comfort King Series</u>	
830CK, 830C-CK, Dsl	64
830CK Gas, LPG	64
831CK, 831C-CK, Dsl	64
832CK, 832C-CK, Dsl	64
841CK, 841C-CK, Gas, LPG	64
842CK, 842C-CK, Gas, LPG	64
<u>870 Series</u>	
870 Manual or PS, Dsl	80
870 Manual or PS, Gas	71
880, Dsl	42
885, Dsl	43
885, Gas	39
900 Dsl	71
910 LPG	71
<u>900B Series</u>	
900B, Dsl	71
910B, LPG	71

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

CASE/DAVID BROWN contd. PTO-HP

930 Series

W930, Dsl	80
930, Gas, Dsl, LPG	80
930CK, Gas, Dsl (931)	85
940, Gas, Dsl, LPG	80
941CK, Gas, Dsl	85
970, Gas	85
970, Dsl	93
990, David Brown, Dsl	53
995, David Brown, Dsl	58
996, Dsl	58
1030, 1031, 1032, Dsl	102
1070, Dsl	104
1090, Dsl	107
1170, 1175, Dsl	122
1190, 1194, Dsl	43
1200, Dsl	65
1200, TK, Dsl, 4WD	120
1210, 1212, Dsl, D. Brown	66
1270, Dsl, Turbo	136
1270, Dsl	127
1290, Dsl	54
1294, Dsl, 2/4WD	55
1370, Dsl, Turbo	156
1370, Dsl	145
1390, Dsl	60
1394, Dsl, 2/4WD	65
1410, 1412, Dsl, D. Brown	81
1470, Dsl, 1470 TK-4WD	145
1490, Dsl	70
1494, Dsl, 2/4WD	75
1570, Dsl, Turbo	180
1594, Dsl, 2/4WD	85
1690, Dsl	90
1896, Dsl	96
2090, Dsl	109
2094, Dsl, 2/4WD	110
2096, Dsl	116
2290, Dsl	129
2294, Dsl, 2/4WD	130
2390, Dsl	160
2394, Dsl, 2WD	160
2470, Dsl, Turbo, 4WD	145

CASE/DAVID BROWN contd. PTO-HP

2590, Dsl	180
2594, Dsl, 2WD	180
2670, Dsl, 4WD, Turbo	219
2870, Dsl, Turbo	252
3294, Dsl, 4WD	162
4490, Dsl, 4WD	175
4690, Dsl, 4WD, Turbo, I.C.	220
4694, Dsl, 4WD, Turbo, I.C.	220
4894, Dsl, 4WD, Turbo, I.C.	253
4994, Dsl, Turbo, I.C.	344
D, DC1, Gas, Dist.	35
D. std tread, Gas, Dist.	35
DC, DC3, DC4, Gas	37
DO, orchard, Gas, Dist	35
L. Dist.	40
LA, Dist.	49
LA, Gas, LPG	59
M-B4-94 Dsl	73
R, RT, RC, Gas	24
SC, S, SO, Gas	32
SC, S, SO, Dist	25
VA-14, VAC, VAS, VAO, Gas	21
VAC, Dist	18

CASE/INTERNATIONAL

235, Dsl	15
235, Hydro, Dsl	15
245, Dsl	18
255, Dsl	21
265, Offset, Dsl	24
275, Dsl	27
395, Utility, Dsl	35
495, Utility, Orchard, Dsl	43
595, Orchard, Dsl	52
595, Utility, Rowcrop, Dsl	53
685, Dsl	61
695, Utility, Rowcrop, Dsl	61
695, Orchard, Dsl	62
895, Utility, Rowcrop, Dsl	73
995, Utility, Rowcrop, Turbo, Dsl	85
995, Orchard, Turbo, Dsl	85
1120, Dsl	17
1130, Dsl	20
1140, Dsl	23
2096, Dsl	116

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

CASE/INTERNATIONAL contd. PTO-HP

3220, Utility, Dsl	42
3230, Utility, Dsl	52
4210, Utility, Rowcrop, Dsl	62
4230, Utility, Rowcrop, Dsl	72
4240, Utility, Rowcrop, Turbo, Dsl	85
4494, Dsl, 4WD	175
4694, Dsl, 4WD, Turbo, IC	220
4894, Dsl, 4WD, Turbo, IC	253
4994, Dsl, Turbo, IC	344
5120, Dsl	77
5130, Dsl	86
5140, Dsl	94
5220, Dsl	80
5230, Dsl	86
5240, Dsl, Turbo	94
5250, Dsl, Turbo	112
7110, Dsl, Turbo	132
7120, Dsl, Turbo	152
7130, Dsl, Turbo	173
7140, Dsl, Turbo	198
7150, Dsl, Turbo	217
9110, Puma, Dsl, Art	168
9130, Wildcat, Dsl, Art	191
9150, Cougar, Dsl, Art	246
9170, Dsl, Art	308
9180, Lion, Dsl, Art	344
9210, Dsl, 4WD, Art	168
9230, Dsl, 4WD, Art	199
9240, Dsl, 4WD	200
9250, Dsl, 4WD, Art	266
9260, Dsl, 4WD	266
9270, Dsl, 4WD, Art	308
9280, Dsl, 4WD, Art	345

CASE/INT'L/STEIGER

9210, Dsl, 4WD, Art	168
9230, Dsl, 4WD, Art	199
9240, Dsl, 4WD	200
9250, Dsl, 4WD, Art	266
9260, Dsl, 4WD	266
9270, Dsl, 4WD, Art	308
9280, Dsl, 4WD, Art	345

CASE CRAWLERS

300, D310, Gas, Dsl	37
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320, Gas	33
350B, 350, Dsl	33
400 Gas, Dsl	36
420, 420B, Gas	36
D420C, Gas, Dsl	36
G420, Gas	36
GT-30	55
M3, M3B	40
UNIMOG, Dsl	75
W14, Dsl	80
450, 450B, 450C Gas, Dsl	40
500, 520, Gas, Dsl	35
550G, Dsl	41
600B, 600, Gas, Dsl	45
650G, Dsl	49
610B, 750, Dsl	45
800C, 800BR, 810C, Gas, Dsl	50
850, 850C, 850D, Gas, Dsl	50
850, Dsl	64
850G, Dsl	56
1000Br, 1000C, 1000D, Dsl, LPG	55
1010C, Dsl	56
1150 (all Models), Dsl	67
1150E, Dsl	75
1150G, Dsl	73
1200 TK, Dsl	120
1450, 1450B, Dsl	85
1550, Dsl	100
22	52
25, 30, 40	56
50	58

CATERPILLAR

55, CH	225
70	64
75	70
85	302
Cletrac OC-18	170
D2, D3, Dsl	52
D3C SA	101
D4B SA, Dsl	86
D4E SA, Dsl	74
D5B SA, Dsl	90
D6 SA, Dsl	145
D6D SA, Dsl	125
D7G SA, Dsl	200

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

D8, Dsl, Fuel Oil 254
D8L SA 335
D9, D9 Dual, Dsl 860
D9 Single, Dsl 430
D10, Dsl 732
R2, Dsl 52
R3, Dsl 62
R5, Dsl 105
RD4, Dsl 80
RD7, Dsl 209
RD8, Dsl 314
RD20, Dsl 170

CATERPILLAR/CHALLENGER

65B, Dsl, 4WD 245
65C, 70C, Dsl 250
75C, Dsl, 4WD 280
85C, Dsl 305

CBT/ANTONIO CARRARO

Bitrac HS, Dsl, 4WD 27
Tigrone Tritrac 5500, Dsl, 4WD 40
Tigrone Tritrac 7700, Dsl, 4WD 54
Super Tiger Tritrac 7700, Dsl,
4WD, Art 54

CBT/MULLER

TM310, Dsl, 4WD, Art 310

CBT/U.S.A.

2070, Dsl 52
2080, Dsl 55
8060, Dsl, 2/4WD 108
8240, Dsl, 2/4WD 70
8260, Dsl, 2/4WD 111

CENTAUR

AG-140, Gas 27
KV-48, KV-38, Gas 27
TA, Gas 27

COCKSHUTT

20, 2 & 3, Gas 29

COCKSHUTT, contd. PTO-HP

30, 35, Gas, Dsl 32

40, 40D4, Golden Eagle, Gas, Dsl 43
50, 50-D, Gas Dsl 56
540, Gas, Dsl (500) 38
550-D, Dsl (500), 550, Gas 38
560-D, Dsl (500) 49
570G, 570-D, Dsl (500) 61
1350, Dsl 60
Golden Arrow, Dsl 45

CO-OP

E-2, Gas 29
E-3, Gas 32
E-4, Gas 43
E-5, E-5D, Gas, Dsl 56

CORBITT

G-50, Dsl 30

CUB CADET

27, Dsl 27

DAIMLER BENZ

30, Dsl 30

DAIZING

Dsl 56

DAVID BROWN/CASE

25, 211-B, Gas 27
411-B, 611-B, Gas 42
701-B, Dsl 57
711-B, LPG 57
770, Dsl, Selectamatic 32
780, 880, Dsl 42
811-B, LPG 42
850, Gas, Dsl 42
885, 380, Gas (Case) 39
885, 380, Dsl (Case) 43
900-B, Dsl 65
910-B, LPG 65
950, Dsl 40
990, Dsl, Selectamatic 52
995, 996, Dsl 59
1200 Selectamatic, Dsl 65
1210, Dsl (Case) 65
1212, Dsl 65

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

DAVID BROWN/CASE contd. PTO-HP
 1410, Dsl (Case) 81
 1412, Dsl 81
 3800, Gas, Selectamatic 39
 4600, Selectamatic, Gas 46

DEUTZ-ALLIS

4W305, Dsl 250
 5215 HST, Dsl 14
 5215 SYN, Dsl 15
 5220 HST, Dsl 17
 5220, Dsl 21
 5230, Dsl 26
 6150, Dsl 54
 6240, Dsl 44
 6250, Dsl 51
 6260, Dsl 57
 6265, Dsl 66
 6275, Dsl 71
 7085, Dsl 85
 7110, Dsl 110
 7120, Dsl 123
 7145, Dsl 145
 8010, Dsl 107
 8030, Dsl 134
 8050, Dsl 152
 8070, Dsl 170
 9130, Dsl, Turbo 135
 9150, Dsl, Turbo 151
 9170, Dsl, Turbo 173
 9190, Dsl, Turbo 194

DEUTZ-FAHR. CAN.COOP.IMP.LTD.

126, Dsl 140
 2505, 2506, Dsl 32
 3005, 3006, D3006, Dsl 32
 4005, 4006, D4006A, Dsl 37
 4505, D4506, 4506A, D4507, Dsl 43
 5005, D5006, Dsl 51
 D5206, D5206A, Dsl 52
 D5207, D5207A, Dsl 51
 5505, D5506, Dsl 56
 6005, D6006, D6006A, Dsl 66
 D6206, 6206A, Dsl 60
 D6207, D6207A, Dsl 60

DEUTZ-FAHR. C.C.I.L. PTO-HP
 D6507, D6507C, Dsl, 2/4WD 60
 D6806, 6806A, Dsl 68
 D6807, D6807A, Dsl 68
 D7007, D7007C, Dsl, 2/4WD 68
 D7206, D7206A, Dsl 71
 D7807, D7807A & C, Dsl, 2/4WD 73
 D8005, D8006, 8006A, Dsl 86
 D9006, D9006A, Dsl 96
 D10006A, 10006A, Dsl, 4WD 105
 D13006, 13006A, Dsl 126
 DX 90, DX 90A, Dsl 84
 DX 110, DX 110A, Dsl 100
 DX 120, DX 120A, Dsl 111
 DX 130, DX 130A, Dsl 121
 DX 140, DX 140A, Dsl 131
 DX 160, DX 160A, Dsl 145

DODGE

Power Wagon, 645 42

EAGLE

6A, Gas 42

EARTH MASTER

C Series, Gas 27

EBRO

160E, Dsl 57
 350, Dsl 45
 460, Dsl 57
 470, Dsl 65
 480, 684E, Dsl 78

EIMCO

Eimco 74

FARMERS UNION CENTRAL

Co-op No. 3G, Gas 30
 Co-op No. 3LF, Gas 30

FERGUSON

F-40, HI40, Gas 33
 TE-20, TO-20, Gas 25
 TO-30, Gas 29

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

<u>FERGUSON, contd.</u>	PTO-HP
TO-35, Gas, Dsl	33

<u>FERRARI</u>	
75, Dsl	30
76, Dsl	35
85, Dsl	42
F86, Dsl	43
F95, F94, Dsl	23
F94RS, Dsl	34

<u>FIAT-AGRI-POWER (MENARD)</u>	
4000, Dsl	46
7000, Dsl	72
8000, Dsl	90
9000, Dsl	113
11000, Dsl	133

<u>FIAT-ALLIS (CRAWLERS)</u>	
5C, Dsl	48
7C, Dsl	61
8BLPG, 831, Dsl	76
A09, Dsl	74
10C, Dsl	91
10-CLGP, 10C, Dsl	105
11B, Dsl	115
14-CTA, 14-CLGP, 14C, Dsl	130
16B, Dsl	161
FD-20, Dsl	192
21B, Dsl	225
FD-30, Dsl	258
31, Dsl	365
41B, Dsl	451
41B, Dsl	432

<u>FORD-NEW HOLLAND</u>	
A-62 Wheel Loader, Dsl	83
A-62 Wheel Loader, Dsl, 4WD Art	100
A-64 Wheel Loader, Dsl	112
A-64 Wheel Loader, Dsl, 4WD Art	121
A-66 Wheel Loader, Dsl	135
A-66 Wheel Loader, Dsl, 4WD Art	150
<u>FORD-NH, contd.</u>	PTO-HP

Country 4, Dsl	47
Country 6, Dsl	68
Country Super 4 Dsl	65
Country Super 6 Dsl	85
Country (British Ford) 1884, Dsl	155
CL-25, Dsl, Gas, 4WD Skid	17
CL-30, Dsl, Gas, 4WD Skid	26
CL-45, Dsl, 4WD Skid	26
CL-55, Dsl, 4WD Skid	38
CL-65, Dsl, 4WD Skid	54
FMD 12-14-72 and 96, Dsl	38
Fordson Dextra, Dsl	31
Fordson Power Major, Dsl	48
Fordson, Gas, Dist	24
Fordson, Super Four, Dsl	35
Fordson, Super Major, Dsl	34
2N, Gas	25
8N, Gas	26
8N, Dist	22
8 NAN, Gas	26
9N, Gas	25
12, Dsl	38
FW-20, Dsl, 4WD	184
FW-30, Dsl, 4WD	24
FW-40, Dsl, 4WD	265
FW-60, Dsl, 4WD	328
NAA, Gas	31
NAA, Golden Jubilee, Gas	31
New Fordson Major, Dsl	35
TW-05, Dsl, 2/4WD	106
TW-10, Dsl	110
TW-15, Dsl, 2/4WD	121
TW-20, Dsl	135
TW-25, Dsl, 2/4WD	141
TW-30, Dsl	163
TW-35, Dsl, 2/4WD	171
110-112T, Dsl	23
231 Ind., (LCG), Gas	32
276, Dsl, Art	100
335, CS, Gas, Ind	38
340 Ind., Gas, Dsl	38
340A, Dsl	40
420 Ind., Gas	38
<u>FORD-NH, contd.</u>	PTO-HP
420 Ind., Dsl	40

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

431, LCG, Gas, Dsl	52	1100, Dsl	11
445 Ind., Gas, Dsl	41	1110, AB3, Dsl, 2/4WD	12
445, Dsl	45	1120, Dsl	13
515 Ind., Gas, Dsl	48	1156, Dsl, Art	N/A
531 Ind., (LCG) Gas	56	1200, 1215, 1300, Dsl	14
531CS, Gas, Dsl	48	1210, AC3, Dsl, 2/4WD	14
535 Ind., Gas, Dsl	48	1220, Dsl	15
540 Ind., Dsl	48	1310, AE3, Dsl, 2/4WD	17
540A, Dsl	55	1320, 1500, Dsl	17
541, Gas, Dsl, LPG	33	1510, AH3, Dsl, 2/4WD	20
545 Ind., Gas, Dsl	48	1520, Dsl	20
545, Dsl	52	1600, 1700, 1715, Dsl	23
550 CS Gas, Dsl	48	1710, AL3, Dsl, 2/4WD, Offset	24
555 Ind., Gas, Dsl	48	1720, Dsl	24
555, 555 Special, Dsl	54	1900, Dsl	27
600, Gas, LPG	31	1910, Dsl, 2/4WD	29
601, Gas, Dsl, LPG	33	1920, Dsl	29
611, 621, 631, 641, Gas, Dsl, LPG	33	2000 Super D, Gas, Dsl	39
620, Gas, LPG	31	2000 4-Speed, 8-Speed, Gas	31
630, 640, 650, 660, Gas, LPG	31	2000 4-Speed, 8-Speed, Dsl	39
651, 661, 671, 681, Gas, Dsl, LPG	33	2100, Gas, Dsl	31
700, 740, Gas	32	2110, Dsl	31
701, 741, Gas, Dsl, LPG	33	2120, Dsl	35
750 Ind., Dsl	83	2310, BS3, Dsl	32
755, Dsl	91	2600, BA1, BA113C, BA2, Gas/Dsl	32
756, Dsl, Art	168	2610, BA3, Dsl	37
771, Gas, Dsl, LPG	33	2810, Dsl	33
801, 811, 821, Gas, Dsl, LPG	44	2910, BA4, Dsl	37
800, 820, 840, 850, 860, Gas	45	2910LCG, Dsl	36
800, 820, 840, 850, 860, LP	40	3000, Select-o-Speed, Gas, Dsl	34
836G, Dsl, Art	193	3000, 4-6 Speed, Gas	38
836PS, Dsl, Art	181	3000, 4-6 Speed, Dsl	41
841, 851, Gas, Dsl, LPG	44	3000, 6 Speed	41
846, Dsl, 4WD, Art	202	3000, 8-12 Speed	38
856, Dsl, Art	209	3100, Dsl	39
861, 871, 881, Gas, Dsl, LPG	44	3100, Gas	38
876, Dsl, 4WD, Art	246	3230, Dsl	32
900, 950, 960, Gas	46	3300, Gas, Dsl	40
901, 941, 951, Gas, Dsl, LPG	44	3310, Dsl	40
936, Dsl	N/A	3330, Gas	40
946, Dsl, 4WD, Art	286	3415, 3430, Dsl	38
956, Dsl	N/A		
961, 971, 981, Gas, Dsl, LPG	44		
FORD-NH, contd.	PTO-HP	FORD-NH, contd.	PTO-HP
976, Dsl, 4WD, Art	290	3600, CA1, CA2, CN1, CN2, CV1, CV2, CX1, CX2, 3610, CA3, CX3,	
1000, Dsl	23		

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

Dsl	42	7530, Hi-Clear, Dsl	91
3830, Narrow, Dsl	45	7600, FA1, FA2, Dsl, Turbo	84
3910, CA4, CN4, Dsl	43	7610, FA3, Dsl, Turbo	87
3930, Dsl	45	7700, FC2, Dsl, Turbo	84
4000, Gas, Dsl, pre 1968	45	7710, FC3, Dsl, Turbo	87
4000, 8 Speed, Gas, Dsl	52	7810, Dsl	90
4000, SOS, Dsl	51	7910, Dsl	86
4000, Gas	50	8000, Dsl, Dual Power	106
4030, Narrow, Dsl	51	8000, Dsl, 8 Spd	110
4100, KA1, KA2, Gas	45	8200, Dsl	106
4110, KA3, KN3, Dsl	48	8210, Dsl	95
4140, SU, Gas, Dsl	45	8340, Dsl	106
4200, 4330, 4340, Gas, Dsl	45	8530, Dsl	105
4230, Narrow, Dsl	62	8600, GC1, Dsl 8 Spd, Dual	106
4430, Narrow, Dsl	70	8630, Dsl, Turbo	121
4600, DA2, DA1, SU, DS2, DY1, DY2, DX1 DX2, Gas, Dsl	52	8700, GC2, Dsl	111
4610, DA3, DY3, DN3, SU, Gas, Dsl	53	8730, Dsl, Turbo	140
4630, Dsl	55	8830, Dsl	170
5000, Dsl, Super Major	48	9000, Dsl, Dual Power	131
5000 Select-o-Speed 10-Speed, Gas, Dsl, (post 1968)	66	9030 Bidirect., Dsl, 4WD, Art	102
5000-8, Gas, Dsl	67	9200, Dsl	131
5030, , 2/4WD, Dsl	62	9480, 9482, Dsl	300
5100, Dsl	55	9600, HC1, Dsl	131
5100, Gas	59	9700, HC2, Hcl, Dsl	136
5200, 5340, Dsl	66		
5530, Hi-Clear, Dsl	62	<u>FRANKLIN</u>	
5600, LA1, LA2 Dsl	60	170XL, 190XL, 195XL, Dsl	96
5610, LA3, Dsl	63		
5810, Dsl	63	<u>GBT</u>	
5900, Dsl	62	986, Dsl	20
6000, Gas, Dsl	66	991, Dsl	24
Commander 6000, Dsl	66	993, Dsl	30
Commander 6000, Gas	64	997, Dsl	34
6100, Gas, Dsl	62	2000, 3000, Gas	27
6530, Hi-Clear	70	4000, Gas, Dsl	36
6600, EA1, EA2, EC1, EY1, EY2, Gas, Dsl	70		
6610, EA3, EY3, Dsl	72	<u>GIBSON</u>	
6700, EC2, Dsl	70	H, Gas	34
6710, EC3, Dsl	72	I, Gas	35
<u>FORD-NH, contd..</u>	<u>PTO-HP</u>	<u>GLOBAL</u>	
7000, Dsl	80	Model B	30
7100, 7200, Dsl	83		
		<u>GOLDONI</u>	
		834, 1040 SC, Dsl	34

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

GRAVELY	PTO-HP
9000 GMT, Gas	22

HARRIS

4 WDR and FWD-C	50
Power Horse	50

HEFTY

A-616, Gas	16
F, F-NT, Gas	24
G, GW, Gas	24
G, Dsl	27
HG, Gas	24
HI, Dsl	27

HESSTON-FIAT

F110, F110DT, Dsl	98
F130, F130DT, Dsl, Turbo	115
44-23, Dsl, 4WD	200
44-28, Dsl, 4WD	252
44-33, Dsl	295
44-35, Dsl	310
45-66, 45-66DT, Dsl	39
55-46, Dsl	45
55-46DT, Dsl	46
55-56, 55-56DT, Dsl	45
55-66, 55-66DT, Dsl	46
55-76F, 55-76FDT Dsl	45
60-66, 60-66DT, Dsl	51
60-75CV, Crawler	54
60-76F, 60-76FDT, Dsl	51
60-90, 60-90DT, Dsl	51
65-46, Dsl	58
65-56, 65-56DT, Dsl	60
70-65CM	N/A
70-66, 70-66DT, Dsl	63
70-75C, 70-75CM, Crawler	63
70-76F, 70-76FDT, 70-76V, Dsl	62
70-90, 70-90DT, Dsl	62
80-66, 80-66DT, Dsl	70
80-75C, Crawler	72
80-76F, 80-76FDT, Dsl	70
80-90, 80-90DT, Dsl	71
90C, Dsl Crawler	84
90-90, 90-90DT, Dsl	81

HESSTON-FIAT, contd.	PTO-HP
95-55C, Crawler	80
100-90, 100-90DT, Dsl	91
120C, Dsl Crawler	110
130-90, 130-90DT, Dsl	107
140-90, 140-90DT, Dsl	123
160-90, 160-90DT, Dsl	143
180-90, 180-90DT, Dsl	163
300, 311C, Dsl	33
405C, Dsl, Crawler	70
411C, 411R, Dsl, Crawler	42
420, 420DT, Dsl	42
450, 460, 470, Dsl	42
450-8, Crawler, Dsl	42
455C, Crawler, Dsl	45
466DT, 466, Dsl	45
470 Crawler, Dsl	42
480, 480DT, 480-8, 480-8DT, Dsl	43
500, 500S, 500DT, Dsl	47
505C, 566, Dsl	51
540S, 540DT, Dsl, 540DTS	52
570, 570DT, 580, 580DT, Dsl	52
586DT, Dsl	51
605C, 665C, Dsl, Crawler	66
640, 640DT, Dsl	62
665C-665CM-DST, Crawler	57
666, 666DT, 670, 670DT, Dsl	62
680, 680DT, Dsl	63
702, Gas	26
766, 766DT, 780, 780DT, Dsl	70
805C, Dsl, Crawler	85
850 Super, 850 DTS, Dsl	80
880, 880DT, 880-5, 880-5DT, Dsl	81
955C, Dsl, Crawler	88
980, 980DT, Dsl	91
995C, Dsl, Crawler	76
1000S, 1000DTS, Dsl	96
1180, 1180DT, Turbo, Dsl	108
1300S, 1300DTS, Dsl	128
1380, 1380DT, Dsl	123
1580, 1580DT, Dsl, Turbo	141
1880, 1880DT, Dsl	160
T20C, Dsl, Crawler	75

HINOMOTO

PTO-HP

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

E-150, Dsl 16
 E-180, Dsl 18
 E-230, Dsl 24
 E-280, Dsl 28

HINES

H-1500, H-1600, Gas 16

HOLDER

A-18, Dsl 14
 A-30, Dsl 24
 A-45, Dsl 32
 A-50, A-62, Dsl, 4WD, Art 56
 A-55, A-60, Dsl 42
 A-65, Dsl, 4WD, Art 64

HUBER

B, LC, Gas 34

HYDRO-POWER

Hydratiller, 210, Dsl 180
 Hydratiller, 350, Dsl 300
 Hydratiller, 600, Dsl 515

IMT TRACTOR CO.

536 Orchard Vineyard 36
 539, Dsl 35
 542, Dsl 37
 549DV, Dsl, 4WD 40
 560, Dsl 52
 565DV, Dsl, 4WD 55
 577, 577DV, Dsl, 4WD 65
 C-26, Gas 30
 D-16, DE, DF, Dsl 30

INTERNATIONAL HARVESTER/

FARMALL

10-20, Dist, Gas 20
 15-30, Dist, Gas 30
 22-36, Gas 36
 100, 125, Gas, Dsl 20
 140, Gas 24
 154, Gas 30
 184, Gas 21

IH/FARMALL, contd..

PTO-HP

185, Gas 25
 234, 235, Dsl 15
 235, Hydro, Dsl 15
 238, Dsl, Ind 32
 240, Utility, Gas 31
 240A, Dsl 43
 240AHS, Dsl 46
 244, 245, Dsl 18
 250A, 250AHS, Hydro, Dsl 51
 254, Gas, Dsl 21
 255, Dsl 21
 265, Offset, Dsl 24
 274, 275, Dsl 27
 284, 8 Speed, Dsl 27
 284, Gas 26
 300 Utility, Gas, LPG 42
 330 Utility, Gas 34
 350 Utility, Gas, Dsl, LPG 44
 354, Gas, Dsl 33
 364, Gas, Dsl 36
 383, 384, Dsl 39
 385, Dsl 35
 400, W400, Gas, Dsl, LPG 49
 404, Gas, LPG 37
 424, Gas, Dsl 37
 444, Gas, Dsl 38
 450, Dsl 49
 454, Gas 38
 454, Dsl 40
 460, Utility, Gas, Dsl, LPG 50
 464, Gas, Dsl 45
 483, 484, 485, Dsl 42
 500, Gas, Dsl, Crawler 37
 504, Gas, Dsl, LPG 45
 524, Unknown N/A
 544, Gas, Dsl 54
 544 Hydro, Gas, Dsl 54
 560, Gas, Dsl, LPG 61
 574, Gas, Dsl 53
 584, Dsl 53
 585 Utility/RCrop, Dsl 53
 600, Gas, Dsl, LPG 58
 606, Gas, Dsl, LPG 54
 650, Gas, Dsl, LPG 61
IH/FARMALL **PTO-HP**
 656, Gas, Dsl, Hydro 63

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

656, Dsl	63	2300, Dsl	33
660, Gas, Dsl, LPG	81	2400B, Dsl	43
664, Dsl	53	2404, Gas, Dsl	37
666, Gas, Dsl	68	2424, Dsl	37
674, Dsl	62	2444, Dsl	38
674, Gas	59	2500B, Hydro, Dsl	51
684, Gas, Dsl	63	2504, Dsl	45
685, Utility, R/Crop, Dsl	61	2544, Gas, Dsl	54
686, Gas, Dsl	66	2606, Gas, Dsl, LPG	54
706, Gas, Dsl, LPG	75	2656, Gas, Dsl, Hydro	63
755, 756, Gas, Dsl	75	2706, Gas, Dsl, LPG	75
766, Gas	79	2756, Gas, Dsl	75
766, Dsl	85	2806, Gas, Dsl, LPG	94
784, Dsl	67	2826, Dsl	92
786, Dsl	80	2856, Dsl	100
806, Gas, Dsl, LPG	94	3088, Dsl	80
826, Dsl,	92	3288, Dsl	90
826 Hydro., Dsl	85	3388, Dsl, 4WD	131
856, Dsl,	100	3488, Dsl	112
884, Utility, Dsl	68	3500A, Hydro, Gas, Dsl	40
884, Row Crop, Dsl	72	3588, Dsl, 4WD	150
885, Util/Row Crop, Dsl	73	3616, Dsl	60
886, Dsl	86	3688, Dsl	113
966, Dsl	100	3788, Dsl, 4WD	171
986, Dsl	106	4100, Dsl, 4WD	135
1026, I-21026, Dsl	112	4156, Dsl, 4WD	140
1066, Turbo, Hydro, Dsl	114	4166, 4186, Dsl, 4WD	151
1066, Turbo, Dsl	126	4300, Dsl, 4WD	160
1086, Dsl	131	4366, Dsl, 4WD	195
1206, Turbo, Dsl, I-21206	113	4386, Dsl, 4WD	204
1256, Turbo, Dsl	116	4500A, Dsl	29
1394, Dsl	65	4500B, Dsl	49
1455, Dsl	130	4568, 4586, Dsl, 4WD	268
1456, Turbo, Dsl	132	4786, Dsl, 4WD	309
1466, Turbo, Dsl, 2/4WD	145	5088, Dsl	136
1468, Dsl	145	5120, Dsl	77
1486, Dsl	146	5130, Dsl	86
1494, Dsl	75	5140, Dsl	94
1566, Dsl	161	5288, Dsl	162
1568, Dsl	151	5488, Dsl	187
1586, Dsl	162	6388, Dsl	131
1594, Dsl	86	6588, Dsl	150
1896, Dsl	96	6788, Dsl	170
<u>IH/FARMALL, contd..</u>		<u>IH/FARMALL, contd..</u>	
2096, Dsl	116	7110, Dsl	132
<u>PTO-HP</u>		<u>PTO-HP</u>	

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

7120, Dsl	152	Farmall 300, Gas, LPG	38
7130, Dsl	173	Farmall 340, Gas, I-340	35
7140, Dsl	198	Farmall 340, Dsl	39
7388, Dsl	205	Farmall 350, Gas, Dsl, LPG	40
7588, Dsl	274	Farmall 400, Gas, Dsl	49
7788, Dsl	309	Farmall 404, Gas	37
9110, Puma, Dsl, Art	168	Farmall 450, IW-450, Gas, LPG	54
9130, Wildcat, Dsl, Art	191	Farmall 450, Dsl	59
9150, Cougar, Dsl, Art	246	Farmall 460, Gas, Dsl, LPG	50
9170, Dsl, Art	308	Farmall 504, Gas, Dsl, LPG	45
9180, Lion, Dsl, Art	344	Farmall 544, Hydro, Gas, Dsl	54
9190	N/A	Farmall 560, Gas, Dsl, LPG	61
B-16, B-250, Gas	30	Farmall 600, Gas, Dsl	58
B-275, Dsl	33	Farmall 650, Gas, Dsl, LPG	63
B-414, Gas, Dsl	36	Farmall 656, Gas, Dsl	63
F-30, Gas	30	Farmall 756 Dsl	75
Hydro 70, Gas, Dsl	70	Farmall 766, Gas	75
Hydro 84, Dsl	59	Farmall 766, Dsl	85
Hydro 86, Gas, Dsl	70	Farmall 806, Dsl	94
Hydro 100, Dsl	104	Farmall 826, Dsl	92
Hydro 140, Gas	23	Farmall 826, Dsl, Hydro	85
Hydro 186, Dsl	105	Farmall 856, Dsl	100
Hydro 235, Dsl	15	Farmall 886, Dsl	86
Hydro 245, Dsl	18	Farmall 966, Dsl, Hydro	91
Hydro 255, Dsl	21	Farmall 1026, Dsl, Hydro	112
Hydro 265 Offset, Dsl	24	Farmall 1066, Dsl, Hydro,	
Hydro 275, Dsl	27	Turbo	114
Hydro 348, Dsl	113	Farmall 1206, Turbo, Dsl	113
Hydro 385, Dsl	35	Farmall 1256, Dsl	116
Hydro 485, Dsl	43	Farmall 1456, Dsl	132
Hydro 585 Utility, Dsl	53	Farmall 1466, Turbo, Dsl	146
Hydro 666, Gas, Dsl	70	Farmall 1468, Dsl	145
Hydro 21026, Dsl	112	Farmall 1566, Dsl	161
21026, Dsl	113	Farmall 2806, Dsl	94
21256, Dsl	116	Farmall A, AR, AB, AV, Gas	20
21456, Dsl	132	Farmall B, BN, Gas	20
Farmall 100, I-100, Gas	20	Farmall C, Gas	20
Farmall 130, I-130, Gas	22	Farmall Cub, Cub 154, Gas	12
Farmall 140, Gas	23	Farmall F-12, 14, SA, SAV,	
Farmall 186, Dsl	105	Gas	13
Farmall 200, I-200, Gas	24	Farmall F-20, Gas	23
Farmall 230, Gas	28	Farmall H, HV, Gas	26
Farmall 240, Gas	31		

IH/FARMALL, contd..

Farmall 250 TC, ASYN, Gas

PTO-HP

60

IH/FARMALL, contd..

Farmall M, MV, MD, MTA, Gas,

PTO-HP

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

Dsl	37
Farmall "Old" Gas, Dist	20
Farmall Super A, C, Gas	24
Farmall Super H Gas	33
Farmall Super, M, MD, MTA, Gas, Dsl, LPG	47
Industrial 20	20
I-140, Gas	23
McCormick, B-275, Dsl	32
Super W-4, Gas	35
Super W-6, W-6, Gas, LPG	49
Super WD-5, Dsl	49
Super WD-9, WDR-9, Dsl	65
T-4, Gas, Crawler	33
T-5, TD5, Gas, Dsl, Crawler	36
T-6, TD-6, Gas, Dsl, Crawler	48
T-9, TD9, Dsl, Crawler	69
T-9, Gas, Crawler	46
T-35, Dsl	43
T-40, Dsl	65
T-340, T-340A, Gas, Crawler	36
T-350, Gas, Dsl	43
T-500, Gas, Dsl	37
500 Series E, Dsl	40
TD-7, Dsl	48
TD-8, Dsl	65
TD-14, Dsl, Crawler	91
TD-14A, Dsl, Crawler	72
TD-15B, Dsl	95
TD-15C, Dsl	115
TD-18, (1939-49) Gas	105
TD-18, (1956-58) Dsl	105
TD-18A, Dsl	105
TD-20E, Dsl	173
TD-24, Dsl	247
TD-25B, TD-25C, Dsl	255
TD-34D, TD-35, TD-40, Dsl	260
TD-340, TD-340A, Dsl, Crawler	40
Tractor	90
W-4 and 04, Gas	33
W-6 and 06, Gas, Dsl	48
W-6, Fuel Oil	34
<u>IH/FARMALL, contd..</u>	
W-9, WR-9, Gas	49

W-12, Gas	33
W-30, Gas	48
W-400, Gas, Dsl, LPG	50
W-450, Gas, LPG	53
WD-9, WDR-9, Dsl n	51
WD-40, Dsl	48
WK-40, Gas	48

ISUZU

120, 130, Dsl	26
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JCB

JCB 3, Dsl	60
JCB 3C, Dsl	60
5 CB, 3D, Dsl	60
Fastrac 155, Dsl	138
Fastrac 185, Dsl	161

JACOBSEN

G-20, Dsl	40
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JOHN DEERE

40, T, U, W, H, C, S, Gas	24
40-C, Crawler	24
40-S, Dist	20
50, Gas, LPG	31
50, Dist	25
60, Gas, LP	40
60, 70, Dist	43
70, Gas, Dsl, LPG	50
80, Dsl	65
110, 112, Gas	12
210C	36
300	37
301-A, Gas, Dsl	37
302, Gas, Dsl	44
310	45
320, Gas, Dist	25
330, Gas	30
350B, Dsl Crawler	39
380	47
401-B, Gas, Dsl	54
420-C, Gas, Crawler	29
420, Gas	28
420, Dist	23
430-C, Gas, Crawler	30

PTO-HP

IH/FARMALL, contd..

W-9, WR-9, Gas	49
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APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

430, Gas, LPG, Dist	30		
435D, Dsl	33		
440C, Crawler, Gas, Dsl	32		
440 ID, Dsl	32		
440 I, Gas	32		
450 C, Dsl	40	1450, Dsl	50
480 B, 510	73	1520, Gas, Dsl	47
520, Dist	25	1530, Dsl	45
520, Gas, LP	37	1630, Dsl	50
530, Gas, Dist	42	1650, 1830, Dsl	60
620, Dist	35	2010C, Gas, Dsl, Crawler	48
620, Gas, LP	48	2010 RU, Gas, Dsl	47
630, Gas, Dist	48	2020, Gas, Dsl	54
650, Dsl	15	2030, Gas, Dsl	60
655, Dsl	11	2040, Dsl	41
670 Dsl	16	2130, Dsl	66
720, Dist	44	2150, Dsl	47
720, Gas, Dsl, LPG	57	2155, Dsl	46
730, Gas, Dsl	57	2240, 2255V, Dsl	50
750, Dsl	19	2255, Dsl	45
755, Dsl	15	2350, Dsl	56
770, Dsl	20	2355, Dsl	57
820, Dsl 2 Cyl	73	2355N, Dsl	55
820, Dsl 3 Cyl	33	2410 Powershift, Gas	47
830, Dsl 2 Cyl	75	2440, Dsl	60
830, Dsl 3 Cyl	35	2510, Powershift, Gas, Dsl	50
840, Dsl	36	2510, Gas, Dsl, Syncro/Shift	54
850, Dsl	22	2520, Gas, Dsl	60
855, Dsl	19	2520, Dsl, Syncro/Shift	61
870, Dsl	25	2520, Dsl, Syncro/Shift	56
900HC	22	2520, P.S. Gas, Dsl	56
920, Dsl	36	2520, S.R. Gas, Dsl	60
950, 955, Dsl	27	2530, Gas, Dsl	63
970, Dsl	30	2550, 2555, Dsl	66
1010C, Gas, Dsl, Crawler	35	2630, 2640, Dsl	70
1010 RU, Gas, Dsl	36	2750, Dsl	75
1020, Gas, Dsl	39	2755, Dsl	77
1030, Dsl	40	2840, 2855N, Dsl	80
1050, Dsl	33	2940, Dsl	81
1070, Dsl	35	2950, Dsl	85
		2955, Dsl	86
JOHN DEERE, contd..	PTO-HP	3010, Gas, LPG	55
1120, Dsl	43	3010, Dsl	59
1150, Dsl	33	3020, PS, SR	71
1250, Dsl	40	3020, Gas, Dsl, LPG,	

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

(Syncro/Shift)	70	6030, Dsl	176
3020, Gas, Dsl, LPG,(Power Shift)	65	6200, 6200L, Dsl, Turbo	67
3030, Gas, Dsl, LPG	59	6300, 6300L, Dsl, Turbo	76
3140, Dsl	81	6400, 6400L, Dsl, Turbo	85
3150, 3155, Dsl	96		
4000, Gas, Dsl	98	JOHN DEERE, contd..	PTO-HP
4010, Gas, Dsl, LPG	82	6500L, Dsl, Turbo	95
4020, PS, SR, Gas, Dsl, LPG	95	7020, Dsl, 4WD	146
4025, Export, Dsl	95	7200, Dsl, Turbo	92
4030, QR, Gas, Dsl (1973)	80	7400, Dsl, Turbo	100
4040, SR, PS, Dsl	90	7520, Dsl, 4WD	176
4050, Dsl	106	7600, Dsl, Turbo	110
4050, Hi-Crop, Dsl	100	7700, Dsl, Turbo	125
4055, Dsl	105	7800, Dsl, Turbo	145
4100	17	8010, 8020, Dsl, 4WD	150
4230, QR, Gas, Dsl (1973)	100	8100, Dsl	160
4240, PS, SR, Dsl	110	8200, Dsl	180
4250, Dsl	121	8430, Dsl, 4WD	178
4250, Hi-Crop, Dsl	120	8440, Dsl, 4WD	180
4255, Dsl	120	8450, Dsl, 4WD, Art	187
4280, Dsl, Australian	98	8560, Dsl, 4WD, Art	203
4320, Dsl	117	8570, Dsl, Art	208
4401-C, Dsl, Crawler	32	8630, 8640, Dsl, 4WD	229
4440, QR, Dsl	131	8650, Dsl, 4WD, Art	239
4430, QR, Dsl	126	8760, Dsl, 4WD, Art	257
4450, 4455, Dsl	140	8770, Dsl, Art	259
4480, Dsl, Australian	110	8850, Dsl, 4WD, Art	304
4520, SR, PS, Dsl	123	8870, Dsl, Art	303
4555, 4560, Dsl	155	8960, Dsl, 4WD, Art	333
4620, PA, SR, Dsl	136	8970, Dsl, Art	354
4630, S, SR, Dsl	150	A, Dist	34
4640, PS, SR, Dsl	156	A, AR, AO, AN, AW, Gas	38
4650, Dsl	165	B, BN, BW, Gas	28
4755, 4760, Dsl	175	B, BR, BO, Dist	24
4840, Dsl	181	D, Dist	36
4850, Dsl	193	G, GN, GW, Dist	38
4955, 4960, Dsl	200	GP, Gas, Dist	33
5010, Dsl	121	H, L, LA, Gas, Dist	30
5020, Dsl, SR	137	M, Dist	30
5200, Dsl	40	MC, MT, Gas, Crawler	30
5300, Dsl	50	R, Dsl	49
5400, Dsl, Turbo	60		
5410, Dsl	65	KIOTI	
5500, Dsl	73	LB1714, Dsl	15
5500 N	73	LB1914, Dsl	16
5510, Dsl	75	LB2202, LB2204, LB2214, Dsl	19

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

LB2614, Dsl	22	F2000	16
		L175, Gas, Dsl	15
<u>KNUDSON</u>		L185 (all models), Dsl	15
Hillside, Dsl	310	L200, Dsl	19
Tractor-Hauler, Dsl	300	L210, Dsl	19
4360, Hillside, Dsl	356	L225, Dsl	22
<u>KNUDSON, contd.</u>	<u>PTO-HP</u>	<u>KUBOTA, contd.</u>	<u>PTO-HP</u>
4400, Hillside, Dsl	396	L235 (all models), Dsl	19
		L245 (all models), Dsl	22
<u>KOMATSU</u>		L260, Dsl	24
D50A, Dsl	74	L275 (all models), Dsl	23
D53A, Dsl	91	L285, Dsl	26
D60-6, Dsl	180	L295 (all models), Dsl	26
D60A-65A	115	L305 (all models), Dsl	26
D60F-8, Dsl	172	L345 (all models), Dsl	29
D80F-18, Dsl	208	L355SS, Dsl, 4WD	29
D85A, Dsl	148	L1450 (all models)	40
D150-1, Dsl	348	L2050 (all models), Dsl	20
D150A-1, Dsl	240	L2250 (all models), Dsl	21
D155A, Dsl	264	L2350 (all models), Dsl	21
D855A, Dsl	338	L2550 (all models), Dsl	24
		L2650 (all models), Dsl	24
<u>KRAMER-ALLRAD</u>		L2850 (all models), Dsl	27
914, Dsl	100	L2900 (all models), Dsl	25
KL-400, Dsl	33	L2950 (all models), Dsl	26
1014, Dsl	110	L3250F/DT	32
		L3300 (all models), Dsl	28
<u>K-D</u>		L3350 (all models), Dsl	33
KD 355, Gas, Dsl	42	L3450 (all models), Dsl	30
KD 452, Gas, Dsl	42	L3600 (all models), Dsl	31
		L3650 (all models), Dsl	33
<u>KUBOTA</u>		L3750 (all models), Dsl	37
B1550, Dsl	N/A	L4150 (all models), Dsl	41
B1750, Dsl	17	L4200 (all models), Dsl	37
B2150, Dsl	20	L4350 (all models), Dsl	38
B4200 (all models), Dsl	10	L4850 (all models), Dsl	43
B5100 (all models), Dsl	10	L5450 (all models), Dsl	49
B5200 (all models), Dsl	12	M4000 (all models), Dsl	40
B6000 (all models), Dsl	12	M4030 (all models), Dsl	42
B6100 (all models), Dsl	11	M4050 (all models), Dsl	42
B6200 (all models), Dsl	13	M4500 (all models), Dsl	50
B7100 (all models), Dsl	13	M4950 (all models), Dsl	50
B7200 (all models), Dsl	14	M5030 (all models), Dsl	50
B8200 (all models), Dsl	16	M5500 (all models), Dsl	53
B9200 (all models), Dsl	18	M5950 (all models), Dsl	58

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

M6030 (all models), Dsl	57
M6950 (all models), Dsl	66
M7030 (all models), Dsl	68
M7500 (all models), Dsl	72
M7580 (all models), Dsl	70
M7950 (all models), Dsl	75

<u>KUBOTA, contd</u>	<u>PTO-HP</u>
M8030 (all models), Dsl	77
M8580 (all models), Dsl	80
M8950 (all models), Dsl, Turbo	86
M9580 (all models), Dsl, Turbo	91
RU, Gas	15

<u>LAMBORGHINI</u>	
55C, Dsl, Crawler	55
70C, Dsl, Crawler	70
80C, Dsl, Crawler	80
C352, C352L, C352S, C352SL, Dsl	32
C362, C362S, Dsl	33
C-453, C453S, Dsl	46
C503, Dsl	44
C533, C533S, Dsl	57
C553, L, LL, & S, Dsl	50
C603, Dsl	53
C653, C653L, Dsl	60
C754, C754L, Dsl	79
C764, Dsl	68
Explorer 65 C, Dsl	65
Explorer 75 C, Dsl	75
1356 DT, Dsl	125
R235, R2, B5, DT, Dsl	32
R503, R503DT, Dsl	54
R603, R603DT, Dsl	53
R653, R653DT, Dsl	58
R654, R654DT, Dsl	63
R704, Dsl	68
R753DT, Dsl	67
R754, Dsl	67
R784, R784DT, Dsl	74
R804, Dsl	77
R854, R854DT, Dsl	75
R904, Dsl	86
R955, R955DT, Dsl	86
R1056, R1056DT, Dsl	92
R1156, R1156DT, Dsl	112

R1256, R1256DT, Dsl	114
R1356DT, Dsl	125
R1556DT, Dsl	152

<u>LANDINI</u>	
50 R or DT, Dsl	42

<u>LANDINI, contd.</u>	<u>PTO-HP</u>
60 R or DT, Dsl	53
65 (all models), Dsl	57
75 (all models), Dsl	66
85 (all models), Dsl	75
95 R or DT	80
5500, Dsl	44
5560 (all models), Dsl	42
5560V R or DT, Dsl	41
5830 R or DT, Dsl	42
5860 R or DT, Dsl	42
6060 R or DT, Dsl	53
6060 (all models), Dsl	48
6500, Dsl	60
6530F R or DT, Dsl	57
6560 (all models), Dsl	57
6830 R or DT, Dsl	57
6860 R or DT, Dsl	57
6880 R or DT, Dsl	57
7500, Dsl	67
7560 (all models), Dsl	66
7830 R or DT, Dsl	63
7860 (all models), Dsl	66
7880 R or DT, Dsl	66
8500, Dsl	70
8530 (all models), Dsl	68
8550, DT, Dsl	68
8560 (all models), Dsl	75
8830 R or DT, Dsl	68
8860 (all models), Dsl	75
8880 (all models), Dsl	75
9880 (all models), Dsl	88
10000 R or DT, Dsl	94
12500, Dsl	100
13000 R or DT, Dsl	101
14500 R or DT, Dsl	121

<u>LANDROVER</u>	
88, Gas	30

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

LELY

400, Dsl	344
420, Dsl	360
456, Dsl	392
530, Dsl	456

350, Dsl	32
360, Dsl	36
360C, Dsl	36
445DT, U445, UTB445, Dsl	42
460 (all models), Dsl	42

LEYLAND/MARSHALL PTO-HP

154, Gas, Dsl	26
235, Dsl	32
245, 245 Synchro, Dsl	40
255, Dsl	48
262, 262 Synchro	53
270, Synchro	64
272, 272 Synchro	64
272 Turbo, Dsl	65
282, Dsl	74
285, Dsl	75
342, Dsl	44
344, 345, Gas, (3/45)	40
384, Dsl	64
425, Gas, (4/25)	26
462, Dsl	53
465, Dsl, (4/65)	64
472, Dsl	64
482, Dsl	74
485, Dsl	75
460, Dsl	47
500 (502/504), Dsl	40
600 (602/604), Dsl	62
700 (702/704), Dsl	72
800 (802/804), Dsl	82
1042, Gas, Dsl	36
1060, Dsl	37
2100, Dsl	88
4100, Dsl	90
Mini-Gas	27

LINSDAY

23, 33A, 55, 80, Gas	40
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LONG

5-N-1, Dsl	55
246C, Dsl	42
260C, Dsl	24
260 CP.S, Dsl	24
310 (all models), Dsl	28

LONG, contd. PTO-HP

510 (all models), Dsl	49
610 (all models), Dsl	64
660, Dsl	63
900, 900DT, Dsl	73
901DT, Dsl, 4WD	73
910, 910DT, Dsl	73
1100, Dsl	95
1110, 1110DT, Dsl	92
1300 (all models), Dsl	105
2460 DTC, SD, Dsl	42
2510 (all models), Dsl	49
2610 (all models), Dsl	64

MASSEY-FERGUSON (MASSEY-HARRIS)

A, Dsl	24
R9500 Spec, Dsl	98
UTB, U550, Dsl	54
U550, 560, 560DT, Dsl	54
MF-20, Gas	24
MF-25, Dsl	24
MF-T030, Gas, Dsl	33
MF-35, Gas, Dsl	37
MF-40, Gas	33
MF-44 St., 44, Gas, Dsl	44
MF-50, MH-50, Gas, LPG	32
MF-50, Dsl	38
MF-60, Dsl	58
MF-65, Gas, Dsl	47
MF-65, LP	43
MF-65, Dslmatic	50
MF-85, Gas, Dsl, LPG	61
MF-88, Gas, Dsl, LPG	63
MF-Super 90, Gas, Dsl, LPG	69
MF-97, Dsl, LPG	81
MF-98, Dsl, GM	94
MF-130, Gas, Dsl	27
MF-135, Gas, Dsl	37
MF-150, 154, Gas, Dsl	38
MF-154-4, Dsl, 154-S	42

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

MF-160, Gas	47
MF-165, Gas, Dsl	52
MF-174S, Dsl, 2/4WD	57
MF-175, Gas	62
MF-175, Dsl	63

MF-396, Dsl	88
MF-398, Dsl, Turbo, 2/4WD	80
MF-399, Dsl, 2/4WD	90
MF-400, Dsl	80
MF-480, Dsl	179

MASSEY-FERGUSON (MASSEY-HARRIS), contd.

PTO-HP

MF-180, Gas, Dsl	63
MF-184-4, Dsl, 4WD	62
MF-185, Dsl	63
MF-194F, Dsl, 2/4WD	68
MF-200, Dsl, Crawler	40
MF-202, MF-203, MF-204, Dsl	16
MF-205, 205-4, Dsl, 4WD	16
MF-210, 210-4, Dsl, 4WD	22
MF-220, 220-4, Dsl, 4WD	26
MF-230, Gas, Dsl	35
MF-231, Dsl	34
MF-235, MF-245, Gas, Dsl	42
MF-240, Dsl	41
MF-250, Dsl	40
MF-250, MF-254, Dsl	42
MF-253, Dsl, Turbo	45
MF-255, Gas, Dsl	53
MF 261, Dsl	52
MF-265, Dsl	61
MF-270, Dsl	55
MF-274, Dsl, 4WD	55
MF-275, MF-283, Dsl	67
MF-285, Dsl	82
MF-290, Dsl	65
MF-294, Dsl, 4WD	67
MF-298, Dsl	78
MF-300, Dsl	59
MF-360, Dsl, Turbo, 2/4WD	50
MF-362, Dsl	55
MF-364S, Dsl	50
MF-374S, Dsl	57
MF-375, 2/4WD	60
MF-383, 383WRC, Dsl, 2/4WD	73
MF-384S, Dsl	65
MF-390, Dsl, 2/4WD	70
MF-390T, Dsl, Turbo	80
MF-393, Dsl, Turbo	83
MF-394S, Dsl	73

MASSEY-FERGUSON (MASSEY-HARRIS), contd.

PTO-HP

MF-500, Dsl	116
MF-600C, Dsl	134
MF-670, Dsl, 2/4WD	55
MF-690, Dsl, 2/4WD	65
MF-698, Dsl, 2/4WD	78
MF-699, Dsl, 2/4WD	86
MF-700C, Dsl	153
MF-1010, Dsl, 2/4WD	13
MF-1010HST, Dsl	12
MF-1020, Dsl, 2/4WD	17
MF-1020 HST, Dsl, 2/4WD	15
MF-1030, MF-1030L, Dsl, 2/4WD	23
MF-1035, Dsl, 2/4WD	26
MF-1040, Dsl, 2/4WD	27
MF-1045 Dsl, 2/4WD	30
MF-1080, MF-1085, Dsl	81
MF-1100, Gas	94
MF-1100, Dsl	90
MF-1105, Dsl	101
MF-1130, Turbo, Dsl	121
MF-1135, Dsl	121
MF-1140, Dsl	26
MF-1145, Dsl	31
MF-1150, Dsl	136
MF-1155, Dsl	141
MF-1160, Dsl	37
MF-1180, Dsl	46
MF-1190, Dsl, Turbo	53
MF-1210 (all models), Dsl	15
MF-1220 Dsl	17
MF-1220H Dsl	16
MF-1230 Dsl	22
MF-1230H Dsl	20
MF-1240 Dsl	23
MF-1250 Dsl	26
MF-1260, Dsl, Turbo	31
MF-1500, Dsl, 4WD	180
MF-1505, Dsl, 4WD	174

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

MF-1800, Dsl, 4WD	216
MF-1805, Dsl, 4WD	193
MF-1965, Dsl	136
MF-2135, Gas, Dsl	33
MF-2640, Dsl	90

MF-50C, MF-50A, Dsl	54
MF-60, Dsl	58
21 Colt, Gas	25
22 Rt Std.,22K,RC,Std.Gas	31
23 Mustang, Pacemaker, Gas	31

MASSEY-FERGUSON (MASSEY-HARRIS), contd.

	PTO-HP
MF-2675, Dsl	103
MF-2705, Dsl, R. Crop	121
MF-2705, Dsl, Western	122
MF-2745, Dsl	143
MF-2770, MF-2775, Dsl	166
MF-2800, MF-2805, Dsl	195
MF-3050, Dsl, 2/4WD	63
MF-3060, Dsl, 2/4WD	70
MF-3070, Dsl, Turbo, 2/4WD	82
MF-3075, Dsl, Turbo	86
MF-3090, Dsl, 2/4WD	101
MF-3120, Dsl, Turbo	100
MF-3140, Dsl, Turbo	115
MF-3165, Gas, Dsl	37
MF-3505, Dsl, 2/4WD	90
MF-3525, Dsl, 2/4WD	105
MF-3545, Dsl, 2/4WD	125
MF-3630, Dsl	115
MF-3650, Dsl	130
MF-3660, Dsl, Turbo	140
MF-3670, Dsl, Turbo	154
MF-3680, Dsl, Turbo	160
MF-3690, Dsl, Turbo	170
MF-4800, Dsl	179
MF-4840, Dsl	211
MF-4880, Dsl	273
MF-4900, Dsl	320
MF-5200, Dsl, 4WD, Art	N/A
MF-6500, Dsl	62
TO-35, Dsl	33

MASSEY-FERGUSON (MF) (INDUSTRIAL)

MF-20C, MF20, MF-30B, Gas, Dsl	38
MF-30, Gas, Dsl	52
MF-31, Dsl	53
MF-40B, Dsl	46
MF-40, Gas, Dsl	38

MASSEY-FERGUSON (MF)

INDUSTRIAL	PTO-HP
30 RC,Std.,30K,RC,Std.,Gas	34
33RC, Std., Gas, Dsl	44
33, Gas, Dsl	40
44, Gas	46
44, Dsl	42
44, Dist	38
44, Special, Gas	49
44-6, Dsl	44
44-6, Gas	38
44-6, Gas	46
50, 82 Gas	33
55, 55D, Gas, Dsl	59
55, Dist	52
333, RS, RT, Gas	42
333, RS, RT, Dsl	37
444, RS, RT, Dsl, LP. Gas	49
555, Gas, Dsl	52
MH-50, Gas	33
MF-88, Gas, LPG	63
MF-98, Dsl, LPG	94
MF-302, MF-303, Gas, Dsl	38
MF-304, Gas, Dsl	52
11 Pony, Gas	12
16-Pacer, Gas	19

MEMO

511A/513	51
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MERCEDES-BENZ

1200 UNIMOG, Dsl	112
Hurlimann, Dsl, FWA	100

MERCER ROBINSON

FD33, 30D, BD, Dsl	32
FG30, 30CK, Gas	32

MINNEAPOLIS MOLINE (OLIVER, WHITE)

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

NEW HOLLAND

TN 90 85

OLIVER (M.M. WHITE)

60RC, Std, UK N/A
 66, Gas, Dsl 25
 70RC, Std, UK N/A
 77, Gas, Dsl, LPG 37

1950, 1950T, Dsl 106
 1955, Dsl, LPG 108
 2050, Dsl 118
 2055, Dsl, LPG 118
 2150, Dsl 131
 2155, Dsl, LPG 141
 2255, Dsl 141
 2455, Dsl, LPG 110

OLIVER (M.M. WHITE),

<u>contd.</u>	<u>PTO-HP</u>
80RC, Std, UK	N/A
88, Gas, Dsl	43
90, 99, Gas, Dsl	55
440, Gas	25
500, Gas, Dsl	38
550, Dsl	39
550, Gas	41
600, Dsl	52
660, Gas, Dsl	45
770, Gas, Dsl, LPG	50
880, Gas, Dsl	60
950, Gas, Dsl	67
990, GM, Dsl	84
995, Lugmatic, Dsl	85
1250, 1250A, Gas, Dsl	35
1255, Dsl	38
1265, Dsl	38
G1350, Dsl, LPG	141
1355, 1365, Dsl	51
1450, 1465, Dsl	55
1550, Gas, Dsl, LPG	53
1555, Gas, Dsl	57
1600, Gas, Dsl, LPG	57
1650, Gas, LPG	66
1655, Gas, Dsl	71
1750, Gas, Dsl	80
1755, Gas, Dsl	87
1800, Gas, Dsl	72
1800B, Gas, Dsl, LPG	80
1800B-4, Dsl, LPG	77
1850, Gas, Dsl, LPG	93
1855, Gas, Dsl	99
1865, Dsl, LPG	97
1900, Dsl	89
1900B, B-4, Dsl	85

OLIVER (M.M. WHITE)

<u>contd.</u>	<u>PTO-HP</u>
2655, Dsl, LPG	143
2844, (now 90), Dsl	55
8100, B-4, Dsl	55
A4T-1600, Dsl, LPG	143
AD, Dsl	45
AG6, Gas	45
B, Gas, Dsl	45
Cletrac BG, Fuel Oil	45
Cletrac BG, Gas	45
Cletrac CG	45
Cletrac FD	55
Cletrac FG	55
Cletrac GB	45
Cletrac HG	45
D, DD, DG, Gas, Dsl	71
FD6, UK	N/A
FDLC, UK	N/A
FDE, UK	N/A
G1050, Gas, Dsl	111
HG, UK	N/A
HGF, UK	N/A
HGR, UK	N/A
MGI, UK	N/A
HG or OC 3, Gas, Dsl	30
OC-4, OC-4-3-G, Gas, Dsl	25
OC-4-3-D, Gas, Dsl	25
OC-6, G, D, Gas, Dsl	34
OC-9, Dsl	51
OC-12, G, D, Gas, Dsl	58
OC-15, OC-18, Dsl	100
Super 44, Gas	28
Super 55, Super 66, Gas, Dsl	34
Super 77, Gas, Dsl, LPG	45
Super 88, Gas, Dsl	55
Super 99, Dsl	62

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

Tiger Six 105 Expt, 4RM, Dsl 102
 Tiger 100, 100 4RM, Dsl 90
 Trident 130, Dsl 116
 Vigneron 60, Dsl, 4WD 52
 Vineyard 62, Dsl, 2/4WD 57
 345RM, Dsl 31

S.A.M.E., contd. PTO-HP
 454RM, Dsl 41
 604RM, Dsl 51
 704RM, Dsl 60
 805RM, Dsl 71

SATOH (Mitsubishi)
 Beaver, Dsl 12
 Beaver III, Dsl 14
 Beaver S-370, II, Dsl 12
 Beaver S-372, MT-372, Dsl 12
 Beaver S-373, Dsl 14
 Bison, Dsl 26
 Bison AG, ES, Gas 22
 Bison, S650G, Gas 23
 Bison S-670, Dsl 25
 Bison S-6700, Dsl 25
 Bison WTT, Gas 22
 Buck S-470, Dsl 15
 Bull S-630, Dsl 22
 Elk, Gas 17
 MT108H, MT180HD, Dsl, 2WD 15
 180L, Dsl 15
 MT108, Dsl 13
 MT210, MT210D, Dsl 18
 MT250, MT250D, Dsl 22
 MT300, Dsl 25
 S550G, Gas 17
 S650G, Gas 25
 S750, Stallion, S-7500, Dsl 33

SILVER KING
 446, Gas 27

SIMPLICITY
 9523, Gas 21

SOMECA
 DA-50 50

Som-45 45
 1622, Gas 16

SPEEDEX
 1630, Gas 16

STEIGER
 Bearcat I, Dsl 192
 Bearcat II, RC-225/188, Dsl 210
 Bearcat II, ST-225, Dsl 199
 Bearcat II, RC-225, Dsl 209
 Bearcat III, ST-220, Dsl 205
 Bearcat III, ST-225, PT-225,
 Dsl 210
 Bearcat IV, CM-225, Dsl 225
 Bearcat IV, KM-225, Dsl 225
 Bearcat ST 300/70, Dsl 260
 Cougar I, II, Dsl 265
 Cougar II, ST-300, Dsl 260
 Cougar III, ST-250, Dsl 271
 Cougar III, PTA-251, Dsl 247
 Cougar III, ST-251, Dsl 242
 Cougar III, ST-270, Dsl 266
 Cougar III, PT-270, Dsl 259
 Cougar III, PTA-270, Dsl 259
 Cougar III, PTA-280, Dsl 290
 Cougar III, ST-280, Dsl 294
 Cougar IV, CM-250, Dsl 250
 Cougar IV, CM-280, Dsl 280
 Cougar IV, KM-280, Dsl 280
 Cougar IV, Steiger-Matic,
 CS-280, Dsl 275
 Cougar IV, Steiger-Matic,
 KS-280, Dsl 275
 Cougar PTA-280 262
 Cougar CR-1225, Dsl 195
 Cougar KR-1225, Dsl 190
 Cougar CR-1280, Dsl 250
 Cougar KR-1280, Dsl 250
 Cougar 1000, Dsl 260
 Cougar 9150, Dsl 246
 Lion 1000, Lion 9180, Dsl 340
 Panther CP1325, Dsl 300
 Panther CP1360, Dsl 335
 Panther CP1400, Dsl 400
 Panther KP1325, Dsl 301

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

Panther KP1360, Dsl	326
Panther KP1400, Dsl	406
Panther II, St-310, Dsl	267
Panther III, PTA-297, Dsl	320
Panther III, PTA-310, Dsl	290

STEIGER, contd..

PTO-HP

Panther III, PTA-325, Dsl	323
Panther III, PTA-350, Dsl	350
Panther III, ST-310, Dsl	295
Panther III, ST-320, Dsl	314
Panther III, ST-325, Dsl	332
Panther III, ST-350, Dsl	355
Panther IV, CM-325, Dsl	325
Panther IV, CM-360, Dsl	360
Panther IV, CS-325, Dsl	325
Panther IV, CS-360, Dsl	360
Panther IV, KM-325, Dsl	325
Panther IV, KM-360, Dsl	360
Panther IV, KS-325, Dsl	325
Panther IV, KS-360, Dsl	360
Panther 1000, Dsl	300
Panther 9170, Dsl	300
PTA-325	323
Puma 1000, Puma 9110, Dsl	168
Sup Wildcat I, Dsl	172
Sup Wildcat II, RC-200, Dsl	175
Sup Wildcat II, ST-200, Dsl	172
Turbo Tiger I, Dsl	280
Turbo Tiger II, ST-320, Dsl	283
Tiger I/236, Dsl	270
Tiger III, ST-450	415
Tiger III, ST-470, Dsl	450
Tiger IV, KP-525, Dsl	488
Wildcat Ser I, Dsl	160
Wildcat Ser III, ST-210, RC-210, Dsl	200
Wildcat 1000	190
Wildcat 9130, Dsl	191

STEIGER, INDUSTRIAL

CU360, Dsl	310
CU325, Dsl	280
CU280, Dsl	240
545, Dsl	50

STEYR-DAIMLER-PUCH STORMSALES

548, 548A, Dsl	50
658, Dsl	56
760, 768, 768A, Dsl	65
980, Dsl	35

STEYR-DAIMLER-PUCH G. STORM

SALES, contd.

PTO-HP

988, 988A, Dsl	85
1100, 1108, 1108A, Dsl	115
8060, Dsl	53
8070, Dsl	62
8080, Dsl	76
8100, 8100A, Dsl	92
8120, 8120A, Dsl	120
8140, 8140A, Dsl	135
8160, 8160A, Dsl	155
8170, Dsl	165

SUZUE

150, 170, Dsl	17
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TAISHAN

China, Dsl, 4WD	50
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TEREX CRAWLERS

80-30, Dsl	186
82-20, Dsl	148
82-30B, Dsl	202
82-50, Dsl	305

TERRA POWER

U-260, Dsl	28
U-350, Dsl	32
U-445, U-445 DTC, Dsl	42
445 SM Crawler, Dsl	42
U-530, 530 DTC, Dsl	52
U-550, 550 DT, 550 DTC, Dsl	54
U-640, U640 DTC, Dsl	62
650M, 651M, Dsl	61
U-650, U650 DT, Dsl	61
U-800, U800 DT, Dsl	80
U-850, U850 DTC, Dsl	85
U-1010, U1010 DT, Dsl	100

TERRAMITE

T-5, Gas, Dsl	18
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APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

TOSELLI (AGRIFUL)

235, Dsl	34
345, Dsl	51

TRACKLESS **PTO-HP**

Dsl	61
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TRACTO-CORP

Dsl	55
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TROJAN

124	18
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TUFF-BILT TRI-TRACTOR

Gas, Dsl	15
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UNIMOG

30, U-900, Dsl	75
U-1200, Dsl	108

UNIVERSAL

U300, Dsl	27
U340, Dsl	30
U350, Dsl	36
U445, Dsl	43
U450, Dsl	42
U530, U550, Dsl	49
U650, Dsl	64
U800, Dsl	72
U800T, Dsl	80
U850, Dsl	85
U1010DT, Dsl	100

UPTON'S ENGINEERING

(AUSTRALIA)

HT-14/350, Dsl	305
MT-855, Dsl	261

U.S. TRACTOR CORP.

USTRAC, 10A, Dsl	150
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URUS

C-35, C-325, C-335, Dsl	30
C-350, Dsl	43

VALMET

1203, Dsl	116
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VALPADANA **PTO-HP**

Dsl	55
4RM, 20, Dsl	23
4RM, 20/26, Dsl	23
4RM, 180, Dsl	16
4RM, 260, Dsl	23
4RM, 300, 4RM, 330, Dsl	29
4RM, 350, Dsl	30
4RM, 450, Dsl	39
4RM, 550, Dsl	48

VERSATILE

100, Gas, Dsl	85
118, Dsl, 4WD	101
125, Gas, 4WD	108
145, Dsl, 4WD	125
150, Dsl, 4WD	54
150 Series 2, Dsl, 4WD	62
160, Dsl, 4WD	70
165, Dsl	16
185, Dsl	95
226, Dsl	22
256, Dsl, 4WD	84
276, Dsl	27
300, Dsl, 4WD	103
500, Dsl, 4WD	160
555, Dsl, 4WD	182
700, Series II, Dsl, 4WD	185
750, Series II, Dsl, 4WD	195
800, Series II, Dsl, 4WD	208
825, Series II, Dsl, 4WD	221
835, Series III, Dsl, 4WD	198
850, 855, Dsl, 4WD	212
875, Dsl, 4WD	247
895, Dsl, 4WD	294
900, Dsl, 4WD	282
925, Series III, Dsl, 4WD	300
935, Dsl, 4WD	282
945, Series III, Dsl, 4WD	308
950, Dsl, 4WD	300
955, Series III, Dsl, 4WD	320
975, Series III, Dsl, 4WD	330
1150, Dsl, 4WD	430

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

		Oliver 1655, Gas, Dsl, LPG	71
<u>VOLVO</u>	<u>PTO-HP</u>	<u>WHITE-NEW IDEA (M. M. OLIVER),</u>	
T-55	55	<u>contd.</u>	<u>PTO-HP</u>
T-425	25	Oliver 1755, Gas, Dsl	87
		Oliver 1855, Gas, Dsl	99
<u>WAGNER</u>		Oliver 1955, Dsl, 2/4WD	108
TR-9, Dsl	85	Oliver 2255, Dsl, 2/4WD	147
TR-14A, Dsl	140	Oliver 2455, Dsl	110
WA-4, Dsl	85	Oliver 2655, Dsl, LPG	143
		2-30, 2-32, Dsl	28
<u>WALTANNA</u>		2-35, Dsl	33
4-175, Dsl	152	2-44, 2-45, Dsl	43
4-200, Dsl	174	2-50, Dsl	47
4-250, Dsl	218	2-55, Dsl	53
4-300, Dsl	261	2-60, 2-65, Dsl	63
4-360, Dsl	313	2-62, Dsl	61
		2-70, Gas, Dsl	71
<u>WAVERLY</u>		2-75, Dsl	75
Gas	16	2-85, Dsl	86
Waverly Hydro, Gas	25	2-88, Dsl	87
		2-105, Dsl	106
<u>WHITE/MCKEE/EBRO, INC.L</u>		2-110, Dsl, Turbo	111
350, Dsl	45	2-135, Dsl, Turbo	138
460, Dsl	57	2-150, Dsl	147
470, Dsl	67	2-155, Dsl, Turbo, 2/4WD	158
480, Dsl	79	2-180, Dsl, 2/4WD	182
		4-150, 4-175, Dsl	152
<u>WHITE-NEW IDEA (M. M. OLIVER)</u>		4-180, 4-210, Dsl	182
F16, Dsl	14	4-225, Dsl, 4WD, Art	196
FB16H, Dsl	14	4-270, Dsl, 4WD, Art	239
FB21, Dsl	19	60, Dsl	61
FB31, Dsl	25	80, Dsl	81
FB37, Dsl	30	100, Dsl	94
FB43, Dsl	39	120, Dsl	119
FB185, Dsl	188	140, Dsl	139
MM G955, Dsl, LPG	98	160, Dsl	162
MM G1355, Dsl, LPG	143	185, Dsl	188
MM-A4T-1600, Dsl, LPG	143	700, Dsl (Canada)	78
Oliver 550, Gas	40	2655/137, Dsl	137
Oliver 1255, Dsl	38		
Oliver 1265, Dsl, 2/4WD	40	<u>WICHITA</u>	
Oliver 1365, Dsl, 2/4WD	51	270R, Gas	25
Oliver 1405, Dsl	52		
Oliver 1465, Dsl	71	<u>WILLYS MOTORS</u>	
Oliver 1555, Gas, Dsl, LPG	53	Farm Jeep, Gas	36

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

Univ. Jeep CJ-3A, Gas 30 7045, 7045-1, Dsl, 2/4WD 60

WOODS & COPELAND	PTO-HP
301 C, Dsl	250
320 C, Dsl	275
375 C, Dsl	322
450 C, Dsl	387
475 C, Dsl	410
600 C, Dsl	520

YANMAR

YM 135, 135D, Dsl	11
YM 140, 140D, Dsl	N/A
TM 147, 147D, Dsl	N/A
YM 155, 155D, Dsl	12
YM 160, Dsl	16
YM 165, YM 165D, Dsl	16
YM 169, 169D, Nur.Spec, Dsl	N/A
YM 180, 180D, Dsl	15
YM 186, 186D, Dsl	15
YM 187, 187D, Dsl	N/A
YM 195, 195D, Dsl	19
YM 220, 220D, Dsl	19
YM 226, YM 226D, Dsl	19
YM 240, 240D, Dsl	20
YM 276, YM 276D, Dsl	23
YM 330, 330D, Dsl	27
YM 336, 336D, Dsl	27
YM 350, 350D, Dsl	50

ZETOR

50 Super, Dsl	40
2011, Dsl	21
3011, Dsl	34
3320, 3340, Dsl,	43
4011, Dsl	48
4320, 4340, Dsl	53
5011, 5011-1, Dsl	45
5211, 5213, 5243, 5245, Dsl	43
5511, Dsl	51
6011, 6011-1, Dsl, 2/4WD	52
6045, 6045-1, Dsl, 2/4WD	52
6211, 6245, Dsl	53
6320, 6340, Dsl	66
6711, Dsl	58
7011, 7011-1, Dsl	64

ZETOR, contd.	PTO-HP
7065, Dsl	65
7211, 7245, Dsl	58
7711, 7745, Dsl	66
8011, 8011-1, Dsl	77
8045, 8045-1, Dsl, 2/4WD	69
8111, 8145, 8211, 8245, Dsl	71
10011, Dsl	95
10045, 10045-1, Dsl, 4WD	86
10111, 10145, Dsl	88
10211, 10245, Dsl	88
12011, Dsl	108
12045, 12045-1, Dsl, 4WD	105
12111, 12145, Dsl	102
12211, 12245, Dsl	102
16011, Dsl	150
16045, 16045-1, Dsl, 4WD	138
16145, 16245, Dsl	136

APPENDIX G - TRACTOR POWER TAKE-OFF HORSEPOWER RATINGS

APPENDIX H - FARM MACHINERY AND EQUIPMENT

Many of the equipment items have a number at the end of their name. This number represents the standardized code that is to be used in identifying equipment types in survey questionnaires.

Plows

Chisel Plow (1)	H - 1
Coulter-Plow (2)	H - 1
Deep Ripper (3)	H - 1
Disk Plow (4)	H - 1
Moldboard Plows (Regular, Two-way) (5 & 6)	H - 1
Stubble-mulch Plow (Noble Blade, Sweep, Hoeme McKeroy Plow) (7)	H - 2
Subsoil Plow, Subsoil Chisel, V-ripper (8)	H - 2

Disks

Disk-chisels (Mulch-tiller) (9)	H - 2
Offset Disk, Light or Heavy Duty (10 & 11)	H - 2
One-way (Disk-tiller) (12)	H - 2
Single Disk (13)	H - 3
Tandem-disk (Regular, Plowing or Heavy Duty) (14 & 15)	H - 3
Paraplow (16)	H - 3

Cultivators

Field cultivator (regular digger, danish tined, swedish tined, s-tine cultivator, vibra-shank harrow, lilliston tiller) (21)	H - 3
Furrow-out Cultivator (22)	H - 3
Rotary Hoe (23)	H - 4
Row Cultivator (Shank, Rolling, Lister, Disk) (24 & 25)	H - 4
Field Cultivator, Heavy Duty (Duckfoot Cultivator) (26)	H - 4
Marker (27)	H - 4
Fallow Master (28)	H - 4

Harrows (Drags)

Heavy Harrow (30)	H - 4
Field conditioner, seed bed conditioner, soil conditioner, scratcher (31)	H - 4
Finishing Harrow (harrogator) (32)	H - 5
Flex-tine tooth (coil line, multi-weeder) (33 & 34)	H - 5
Rail, Pipe, Log, Plank, Etc. (35)	H - 5
Rod Weeder (36)	H - 5
Roller Harrow (37)	H - 5
Spike Tooth Harrow (38)	H - 5
Spring Tooth Harrow (39)	H - 5
Powered Spike Tooth Harrow (40)	H - 6

APPENDIX H - FARM MACHINERY AND EQUIPMENT

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Bedder Shapers

Bedder-shaper (Crowder) (41)	H - 6
Bed-shaper, Bed Former (42)	H - 6
Disk (Hipper) (43)	H - 6
Disk (Row) (44)	H - 6
Float (45)	H - 6
Lister (Middle Buster or Breaker) (46)	H - 6
Rotovator-bedder (47)	H - 6
Seed Bed Roller, Flat Roller (48)	H - 6
Subsoil-bedder, Subsoiler (Ripper-hipper, Tiller, No-till Disk Bedder) (49)	H - 7
Discovator (50)	H - 7

Packers

Culti-packer (Pulverizer) (51)	H - 7
Plow Packer (52)	H - 7
Roller Packer (Smooth & Flat) (53)	H - 7

Miscellaneous Tillage

Landall, Do-all, Till-all, Mix-n-till (61)	H - 7
Mulch-treader, Picker-treader, Skew Treader (62)	H - 7
Roto-tiller (Rotary Tiller) (63)	H - 8
Roterra, Lely (64)	H - 8
Sand-fighter (65)	H - 8
Soil Finisher (Finishing Tool, Mulch Finisher, Tri-tiller, Task Master) (66)	H - 8
Root Crown Puller (67)	H - 8

Fertilizer Applicators

Aerial, Fixed or Rotary Wing (71)	H - 8
Attachment to Implement (72)	H - 8
Manure Spreader (73)	H - 9
Self-propelled (74)	H - 9
Truck Spreader (75)	H - 9

Fertilizer Applicators, Tractor Mounted

Anhydrous (76)	H - 9
Dry (77)	H - 9
Liquid (78)	H - 9

Fertilizer Applicators, Trailer Mounted

Anhydrous (79)	H - 9
Dry (80)	H - 10
Liquid (81)	H - 10

APPENDIX H - FARM MACHINERY AND EQUIPMENT

Chemical Applicators

Aerial (Fixed or Rotary Wing) (91)	H - 10
Attachment to Implement (92)	H - 10
Large Self-propelled or Truck (93)	H - 10
Motorcycle or Atv Sprayer (94)	H - 10
Small Self-propelled Sprayer (Spra-coupe, Hi-cycle) (95)	H - 10
Small Truck (Pick-up with Slide-in Unit, Skid Mounted) (96)	H - 10
Tractor Mounted (97)	H - 11
Trailer Mounted (98)	H - 11

Drills and Seeders

Aerial Seeding (101)	H - 11
Broadcast Seeder (102)	H - 11
Drill-air Delivery (103)	H - 11
Grain Drill (Lister Disk) (104)	H - 11
No-till, Minimum-till Drill, Zero-conventional (105)	H - 11
Grain Drill (Plain) (106)	H - 11
Press Drill (Disk or Hoe) (107)	H - 12

Planters

Bedder-shaper (111)	H - 12
Lister-bedder Planter (112)	H - 12
No-till, Minimum-till (113)	H - 12
Conventional, Row Crop Planter, All Crop Planter, (114)	H - 12
Air Delivery (115)	H - 12
Planter, Ridge till (116)	H - 12

Harvesting Equipment

Combine, All Types (121 - 125 & 128 - 132)	H - 13
Windrower-swather (PTO & Self-propelled) (126, 127)	H - 13
Corn Picker (133)	H - 13
Hand Harvest (134)	H - 13
Tassel Stalker (135)	H - 13

Mowers and Balers

Amish Harvest (141)	H - 13
Bale Wagon (PTO & Self-propelled) (142, 143)	H - 14
Bale Loader (144)	H - 14
Balers (PTO & Self-propelled) (145-148)	H - 14
Rotary Mower-cutter, Chopper, Bush Hog (149)	H - 14
Mower Conditioner PTO (150)	H - 14
Mower Conditioner, Self-propelled (151)	H - 14

APPENDIX H - FARM MACHINERY AND EQUIPMENT

Disk Mower (152)	H - 14
Drum Mower (152)	H - 15
Flail Mower Shredder (Rotary Chopper) (153)	H - 15
Sickle Mower (154)	H - 15
Dump-rake (155)	H - 15
Rake Side Delivery (156)	H - 15
Wheel-rake (157)	H - 15
Stacker Mover (158)	H - 15
Stacker Automatic (159)	H - 16
Front End Loader (160)	H - 16
Round Bale Mover (161)	H - 16

Land Forming or Shaping Equipment

Backhoe (171)	H - 16
Disk Border Maker (172)	H - 16
Ditch Closer (173)	H - 16
Ditcher (Vee Rotary) (174)	H - 16
Levee Plow Disk (175)	H - 16
Quarter Drain Machine (176)	H - 17
Rear Mounted Blade (177)	H - 17
Corrugator (178)	H - 17
Land Plane Leveler (180)	H - 17
Laser Planer (181)	H - 17
Gate Setter (182)	H - 17
Bulldozer (183)	H - 17

Hauling Equipment

General Purpose Wagon or Cart (194)	H - 18
Hay Wagon (195)	H - 18
Gravity Wagon (208)	H - 18
Grain Cart with Auger (209)	H - 18
Forage Wagon (221)	H - 18
Dump Wagon (222)	H - 18

Other Implements

Burn Buggy (191)	H - 18
Chaff/straw Saver (192)	H - 18
Electric-discharge Weed Killer (193)	H - 18
Off-field Thresher (196)	H - 19
Rock Picker (197)	H - 19
Rock Windrower or Rock Rake (198)	H - 19
Rodent (Gopher) Killer (199)	H - 19
Roller Groover (200)	H - 19
Rubber-wheeled Weed Puller (201)	H - 19
Shredder Flail (202)	H - 19
Shredder Rotary (203)	H - 19

APPENDIX H - FARM MACHINERY AND EQUIPMENT

Silage Harvester (204)	H - 20
Stalk Shredder, Cutter (205)	H - 20
Swath Roller (206)	H - 20
Tractor or Truck - No Attachments (207)	H - 20
Flame Thrower (223)	H - 20

Cotton Equipment

Chopper, Stalk Cutter (211)	H - 20
Module Builder (212)	H - 20
Gleaner (213)	H - 20
Picker, Mounted, Sp (214, 215)	H - 21
Rood Machine (216)	H - 21
Stripper, Mounted, Pull Type, Sp (217 - 219)	H - 21
Trailer (220)	H - 21

Tobacco Equipment

Mechanical Harvester (Combine), Multi-pass (251)	H - 21
Mechanical Harvester (Combine), Last-over (252)	H - 21
Mechanical Harvester (Combine), Once-over (253)	H - 21
Primer, Field Box Filling (254)	H - 22
Primer, Field Racking (255)	H - 22
Primer, Field Looping on Sticks (256)	H - 22
Primer, Other (257)	H - 22
Trailer, Harvest (258)	H - 22
Transplanter, Regular (259)	H - 22
Transplant Digger, Mechanical (260)	H - 22
Tying Machine (261)	H - 23
Topper, 2 Row (265)	H - 23
Topper, 4 Row (266)	H - 23
Mechanical Harvester (PTO), Multi-pass (267)	H - 23
Mechanical Harvester (PTO), Once-over (269)	H - 23
Transplanter, Carousel (270)	H - 23

Peanut Equipment

Combine, PTO (281)	H - 23
Digger-shaker (282)	H - 23
Shaker-inverter (283)	H - 24
Reshaker-conditioner (284)	H - 24
Vine Cutter (285)	H - 24
Wagon (286)	H - 24

Sugarbeet Equipment

Beater (231)	H - 24
Harvester (regular or direct) (233)	H - 24
Harvester (tank) (234)	H - 24
Harvester (other) (235)	H - 24

APPENDIX H - FARM MACHINERY AND EQUIPMENT

Thinner (mechanical, electronic) (236)	H - 25
Thinner (mechanical, random) (237)	H - 25
Planter (238)	H - 25
Topper (239)	H - 25

Sprinkler Irrigation Systems

Hand-move Sprinkler System (1)	H - 25
Solid-set Sprinkler Systems (2)	H - 26
Permanent Sprinkler System - <i>Use solid set sprinkler system (2)</i>	H - 26
Side-roll or Wheel-line Sprinkler Systems (3)	H - 26
End-tow Sprinkler System - <i>Use side-roll system (3)</i>	H - 26
Carousel Sprinkler-traveler System - <i>Use side-roll system (3)</i>	H - 27
Center Pivot or Linear Move with Sprinklers on Main Line (4)	H - 27
Center Pivot or Linear Move, with Sprinklers below the Main Line, but More than 2 Feet above the Ground (5)	H - 27
Center Pivot or Linear Move, with Sprinklers less than 2 Feet above the Ground (6)	H - 28
Big Gun (7)	H - 28
Self-propelled Gun Traveler - <i>Use big gun system (7)</i>	H - 29
Reel-type Hose Pull - <i>Use big gun system (7)</i>	H - 29
Reel-type Cable Pull - <i>Use big gun system (7)</i>	H - 29
Low-flow Irrigation System (Drip, Trickle, Micro Sprinkler) (8)	H - 29

Gravity-flow Irrigation Systems

Siphon-tube from Unlined Ditches (10)	H - 30
Siphon-tube System from Lined Ditches (11)	H - 30
Portal- or Ditch-gate System from Unlined Ditches (12)	H - 30
Portal- or Ditch-gate System from Lined Ditches (13)	H - 31
Poly Pipe System (14)	H - 31
Gated Pipe (Not Poly) (15)	H - 31
Improved Gated Pipe System (Surge Flow or Cablegation, Not Poly) (16)	H - 32
Sub-irrigation (17)	H - 32
Open Discharge from Well or Pump System (18)	H - 32
Contour-levee	H - 33
Corrugation	H - 33
Graded-border	H - 33
Level-border (Basin)	H - 33
Level-furrow	H - 34
Graded-furrow	H - 34
Contour-furrow	H - 34
Contour-ditch	H - 34

Plows

Chisel Plow (1)

A primary tillage machine either integral or trailing that consists of three or more ranks or bars upon which either rigid or spring trip standards are attached. The shanks are usually spaced 12 inches apart overall. A variety of ground engaging tools may be used ranging from narrow points or shovels to 18 inch wide sweeps. Chisel plows may be used to a maximum depth of 10 inches.

Coulter-plow (2)

A multi-purpose machine with one or two ranks of plow coulters, usually smooth or notched rim, followed by two or three ranks of chisel standards with a wide selection of ground engaging tools. The main purpose of the coulters is to cut through the crop residue in order to reduce plugging of the chisel standards. This is a primary tillage tool.

Deep Ripper (3)

Similar to v-ripper (code 8). For deep plowing or breaking.

Disk Plow (4)

A machine doing essentially the same work as a moldboard plow but which has from one to ten large disks set at an angle to the direction of travel. The disks are mounted on individual beams or shanks. It is used in hard ground and where a regular moldboard plow does not scour well.

Moldboard Plows (Regular, Two-way) (5 & 6)

A machine with one or more (up to 18) curved metal plates (bottoms or moldboards) that engage the soil to a depth of up to 12 inches. The curvature of the moldboard causes the soil or furrow slice to be completely inverted. This action pulverizes the soil and buries almost all of the crop residue or stubble. Moldboard plows may be made with one set of moldboards or with two sets. The two-way plow has two sets of moldboards, one left-handed and the other right. This allows the plow to be rotated so that all of the soil can be turned in the same direction and eliminate dead furrows. Moldboard plows are often used in irrigated areas to help maintain the level and slope of a field for furrow or bench irrigation.

Stubble-mulch Plow (Noble Blade, Sweep, Hoeme McKeroy Plow) (7)

Usually a tool bar or trailing machine with one or more standards that can be fitted with sweeps of various angles of penetration and several widths. A sweep does not turn the soil over, it slightly mixes soil and stubble.

Subsoil Plow, Subsoil Chisel, V-ripper (8)

A heavy tillage tool either toolbar mounted or trailing having from one to 13 heavy shanks often with a parabolic curve. These shank standards usually are fitted with replacement chisel points and penetrates the soil up to 22 inches. The standards can be fitted with various auxiliary tools such as knives or lister bottoms. This allows the machine to deep-rip the soil and form beds at the same time.

Disks

Disk-chisels (Mulch-tiller) (9)

A multi-purpose machine; a single disk followed by two or more ranks of chisel shanks.

Offset Disk, Light or Heavy Duty (10 & 11)

A simple offset disk is the equivalent of one side of a tandem. All disks in each rank throw the soil in the same direction. Offset disks may vary in size from five feet to 35 feet or larger. The larger offsets have several disk units in each rank to gain flexibility. Disk blades may be cone-shaped or spherical and have diameters as large as 30 inches for extra heavy duty conditions.

One-way (Disk-tiller) (12)

A machine used mainly in the plains and northwestern areas as a primary tillage tool. It consists of a series of spherical disk blades, 20-60 inches in diameter, set on a single solid shaft that throws the soil in one direction. Sizes range from ten to twenty feet with multiple hitches available. One-ways have been replaced to some extent by chisel plows in many areas.

Single Disk (13)

Two sets of disk blades that throw the soil out from the center when angled. Size may vary from five to 40 or more feet. Used primarily as a secondary tillage tool. Most single disks have been replaced by tandems, offset or chisel plows.

Tandem-disk (Regular, Plowing or Heavy Duty) (14 & 15)

Two gangs of disk blades configured in tandem; the front set throws the soil outward and the rear set throws it inward. The cut width may vary from 5 feet up to 35 or more feet. Spacing between blades may vary widely with 7, 9, and 11 inch spacing most common. The diameter of each blade may range from 16 to 24 inches. Each blade may be either cone-shaped or spherical. The cone-shaped blades are used in heavy soil conditions for primary tillage. They may be integral, 3 point hitch, trailing, double tandem or other configurations.

Paraplow (16)

An implement with narrow shafts with flaps at the bottom which create a nearly undisturbed surface layer while loosening and lifting a 20 inch subsurface furrow. It provides hardpan penetration like a moldboard plow, while maintaining surface residue similar to no till.

Cultivators

Field Cultivator (regular digger, danish tined, swedish tined, s-tine cultivator, vibra-shank harrow, lilliston tiller) (21)

An Implement Similar to the Chisel Plow Except of Lighter Construction and with the Shanks Closer Together, about Six Inches Overall. The shanks are usually of a spring steel, vibra-shank type. Ground engaging tools may be points, shovels or sweeps. Size may range as wide as 70-80 feet. Used primarily as a secondary tillage machine.

Furrow-out Cultivator (22)

A row cultivator of the shovel variety where a fairly large shovel is placed to operate between the rows and open a furrow for irrigation. Thus, weeds are cultivated out and irrigation ditches are formed in one pass.

Rotary Hoe (23)

A series of curved spider wheels attached either to a solid shaft or in segments of two to four wheels for flexibility. Usually used to kill small weeds in summer fallow or row crops and sometimes as a wind erosion stop-gap. Rotary hoes are usually pulled at speeds of 6 mph and above and may be hitched to cover up to 50 feet or more.

Row Cultivator (Shank, Rolling, Lister, Disk) (24 & 25)

An implement with shanks arranged in such a manner that rows of crops can pass through without damage while the weeds are removed. The shanks or standards may be fitted with shovels, disks or spider-wheels set at an angle to the direction of travel. Size can vary from one to twenty-four rows. Most are rear tool-bar or front mounted on tractors.

Field Cultivator, Heavy Duty (Duckfoot Cultivator) (26)

Same as regular field cultivator except heavier construction and may have "duckfoot" shanks.

Marker (27)

An implement similar to a light row cultivator, that makes a shallow furrow at the designated row width for a planter to follow.

Fallow Master (28)

A sweep type implement with 20" shank spacing and 26" sweeps that vary in width, usually between 20' and 50'. The equipment is similar to a field cultivator (21) and heavy duty field cultivator (26), but these equipment have narrower shank spacing and sweep widths.

Harrows (Drags)

Heavy Harrow (30)

Field conditioner, seed bed conditioner, soil conditioner, scratcher (31)

A Lightweight Wheeled Tillage Tool, Usually Two or Three Bars or Ranks of Spring Steel Teeth Spaced 12-18 Inches Apart. Tine-tooth attachment available 30-60 feet wide.

Finishing Harrow (harrogator) (32)

Spiral Cutting Blade Reels Followed by Spike Teeth or Field Cultivator Shanks, (2 or More Ranks) Possibly Another Rank of Spiral Knives and a Smoothing Board of Wood or Steel.

Flex-tine tooth (coil line, multi-weeder) (33 & 34)

Usually 5.5 to 6 Foot Sections of Five Bars or Ranks with Spring Steel Teeth Usually 5/16 Inches in Diameter and about 10 Inches Long. Teeth are formed in a spring coil and bolted to the bar, or set in rubber and bolted to the bar. Usually 50 teeth per 6 foot section. At field speed, 3.5 - 5 mph, the tines vibrate in a circular motion to break clods, smooth seedbeds and kill weeds.

Rail, Pipe, Log, Plank, Etc. (35)

Make shift device used alone or with another implement to smooth soil or crunch clods.

Rod Weeder (36)

A steel, reverse rotating rod usually square, 7/8 or 1 inch in diameter, on shanks. Power for rod rotation is either ground driven or by hydraulics. Sections are normally 10 ft. wide and may range up to 80 ft. Used in summer fallow areas and on relatively rock-free ground.

Roller Harrow (37)

Two ranks of packer rollers (smooth "vee", toothed "vee", crow foot, sprocket, birdfoot, or serrated type) with two or more ranks of chisel- type teeth in between. Packer roller wheels turn independently of each other. Ten to 16 feet in size.

Spike Tooth Harrow (38)

Usually 5-6 foot sections of five bars or ranks with 7-8 steel spikes or teeth per bar. Angle of spikes is adjustable. Can be hitched up to 8 or 10 sections in one unit.

Spring Tooth Harrow (39)

Usually built in sections, 3-4 feet in width. Some wheeled models have a ten foot center section with extension wings up to a 57 feet. Teeth are spaced 12 inches on 3 bar models and 18 inches on 4 bar models. Spring steel teeth are about 1.75 inches wide with a single or double curve. The wheel-less, drag models have metal skids for transport and depth control.

Powered Spike Tooth Harrow (40)

A harrow with spike tine teeth in two rows that move back and forth. Powered by PTO.

Bedder shapers

Bedder-Shaper (Crowder) (41)

A bedder with a forming device that flattens or shapes the bed in preparation for seeding. Shapers are sometimes used as single toolbar implements.

Bed-Shaper, Bed Former (42)

Similar to bedder-shaper (coded 41)

Disk (Hipper) (43)

An implement usually 2-8 rows used to make beds for seeding using disk blades. Can also be used to break or bust the beds.

Disk (Row) (44)

Similar to disk (hipper) coded 43.

Float (45)

A device, usually homemade, used for minor rough leveling. Soil moving bars or blades may be made of wood or metal.

Lister (Middle Buster or Breaker) (46)

Same as bedder but lister (plow type) bottoms. Different types of bottoms available (hard land, general purpose, soft land and planter sweeps).

Rotovator-bedder (47)

Same as lister bedder except uses PTO powered knives to form beds.

Seed Bed Roller, Flat Roller (48)

Flat or concave rim wheel rollers. Packs soil in rows immediately before or after planting.

Subsoil-bedder, Subsoiler (Ripper-hipper, Tiller, No-till Disk Bedder) (49)

Any type bedder either attached to a subsoil shank or as a separate bedder attached behind a subsoiler shank.

Discovator (50)

A multi-tillage machine made up of disk blades, a drag, and a harrow.

Packers

Culti-packer (Pulverizer) (51)

An implement with a series of heavy crowfoot, inverted v-rim or serrated rim wheels running independently on a shaft. May be a single or tandem unit. Main uses of this implement are to firm the seed beds and reduce the size of clods and lumps of soil.

Plow Packer (52)

A packer designed to be pulled behind a moldboard plow with or without a drill. Packer unit may be spiral rod, crowfoot, inverted v, cogged or other.

Roller Packer (Smooth & Flat) (53)

Smooth roller or flat wheels on a shaft used to firm seed bed and crush clods.

Miscellaneous tillage

Landall, Do-all, Till-all, Mix-n-till (61)

Multi-tillage machine made of up to 2 to 4 ranks of shovels, disks, coulters, blades or basket rollers. Usually disk blades, followed by shovels, and then reel and spikes or basket rollers.

Mulch-treader, Picker-treader, Skew Treader (62)

Implement with tined wheels on a gang shaft angled like a section of a tandem or single disk. Used as a separate machine or an attachment behind a stubble mulch plow. Tined wheels resemble rotary hoe wheels.

Roto-tiller (Rotary Tiller) (63)

A series of bolo or slicer blades attached to a rotating shaft. Used as a primary or secondary tillage implement. Can be used in tandem with planting equipment as a minimum-till system. Mounted motor or PTO powered.

Roterra, Lely (64)

A machine with several sets of counter-rotating vertical tines that rotate with an overlapping action. It stirs the soil without turning it over. With attachments, tillage, planting, pesticide application and incorporation are possible in one trip.

Sand-fighter (65)

An implement used as an aid in controlling wind erosion. Essentially a shaft or bar with a frame and bearings to allow the shaft to rotate. Blades or teeth, about 10 inches long and 2-3 inches wide, are welded to the shaft. The teeth enter the soil as the machine is pulled forward, roughening the soil. Sizes range up to 24 rows.

Soil Finisher (Finishing Tool, Mulch Finisher, Tri-tiller, Task Master) (66)

A multi-tillage machine made up of disk blades, followed by field cultivator shanks, and ending with some type of harrow or drag.

Root Crown Puller (67)

Pulls or cuts the roots. Available in 2 - 12-row and larger. Advantageous in minimum-tillage practices.

Fertilizer Applicators

Aerial, Fixed or Rotary Wing (71)

Airplanes or helicopters with fertilizer distribution attachments. Commonly used in rice production, but also used for other crops where field sizes and the surrounding area permits.

Attachment to Implement (72)

Usually drop dry-type attached to a drill or planter but may be liquid or gas type that is injected into the soil.

Manure Spreader (73)

Any type; apron with rear beater, flail or liquid spreader with pump spreader.

Self-propelled (74)

A self-powered implement; may spread dry or liquid fertilizer, usually dry.

Truck Spreader (75)

Any applicator mounted on a truck. These usually are dry broadcast-type spreaders.

Fertilizer Applicators, Tractor Mounted

Anhydrous (76)

Supply tank with chisel shanks and injectors on tool bar. Not commonly used.

Dry (77)

(Includes lime/gypsum applicators) three point hitch mounted: single or dual spinners with supply tank. Pneumatic: air delivery system through hoses to soil surface or below surface with hollow hoe shanks. The supply and distribution system is mounted on a tool bar. Drill-type: drill type hopper with agitator and metering device to drop material on the surface of the soil.

Liquid (78)

Usually spray nozzles or injector units on a tool bar.

Fertilizer Applicators, Trailer Mounted

Anhydrous (79)

Usually a 2 or 4 wheel supply trailer feeding a chisel plow with injector tubes on each shank. Can be high or low pressure type.

Dry (80)

(Includes lime/gypsum applicators) - distributes the material by revolving spinner, or a pneumatic system through tubes to soil surface or below; also the agitator metered bottom drop drill-type.

Liquid (81)

Various configurations of two or four wheel trailers. Most use a boom with spray nozzles to surface or foliage apply the material. PTO or mounted engine powered.

Chemical Applicators

Aerial (Fixed or Rotary Wing) (91)

Airplane or helicopter with tanks and a spray boom to apply pesticides at very low altitudes.

Attachment to Implement (92)

Granular or liquid spray unit attached to a tillage, cultivating or seeding implement.

Large Self-propelled or Truck (93)

Large converted truck or specially built machine to spray liquid or apply dry chemicals.

Motorcycle or Atv Sprayer (94)

A small spray unit mounted on a 3-wheel motor vehicle. Spray with a boom, with hand held guns or wiper type. Mostly used for spot spraying.

Small Self-propelled Sprayer (Spra-coupe, Hi-cycle) (95)

Light weight self-propelled implement, (spra-coupe) used on field crops such as wheat or barley.

Small Truck (Pick-up with Slide-in Unit, Skid Mounted) (96)

Spraying mechanisms with boom, wiper, recirculating, micro-spray/dry spinner or tube delivery.

Tractor Mounted (97)

Supply tanks and spreading mechanism mounted on a tractor. Material may be spread by boom, recirculating sprayers, rope or wick wipers, row type nozzles or air blast. Facilitates spraying while cultivating.

Trailer Mounted (98)

Supply tanks and spreading mechanism mounted on a trailer pulled by tractor or other power vehicle. All types of spreading mechanisms.

Drills and Seeders

Aerial Seeding (101)

Seeding by either fixed or rotary wing aircraft. Seeding often in rice areas and occasionally with other crops.

Broadcast Seeder (102)

Spinner type seeder, either tractor mounted (PTO or electric) or trailer mounted (wheel driven).

Drill-Air Delivery (103)

Same as conventional drill except seed is taken from a supply box through a manifold and blown by air through tubes to the seeding points.

Grain Drill (Lister Disk) (104)

Uses lister bottoms, shovels, or hoes to prepare soil for seeds.

No-till, Minimum-till Drill, Zero-conventional (105)

Usually fluted or ripped coulters that open up narrow prepared soil areas for the single or double disk drill shoes to deposit the seed in otherwise untilled soil. Herbicide attachments are available. Modified chisel plows with coulters are also used.

Grain Drill (Plain) (106)

Seeder with seed box, metered seed feed through tubes to single or double disk openers. Tubes spaced 7", 9" or 10". May have fertilizer attachment.

Press Drill (Disk or Hoe) (107)

Drill with disks or lister bottoms with press wheels to firm soil around seed.

Planters

Bedder-Shaper (111)

Plants upon a bed formed by disks or lister bottoms and shaped by a metal smoothing form into a flat bed. Used mostly in the south for cotton, peanuts and sorghums.

Lister-Bedder Planter (112)

Planter mechanism either plate type or plateless, air or otherwise actuated. Seed is deposited in furrows made by lister bottoms either hard land or soft land type (may be equipped with fertilizer, insecticide, and/or herbicide attachments).

No-till, Minimum-till (113)

Fluted, rippled, or smooth coulters and/or subsoil shanks used to disturb the untilled soil in a narrow band for the planter units to deposit seeds. Usually used in conjunction with fertilizers, herbicides and insecticides.

Conventional, Row Crop Planter, All Crop Planter, (114)

Plate or plateless metering devices that drop seed through a boot or shank in a seed furrow or bed opened by a shoe or disk. Seed is covered by a press wheel. Planters may be trail type - wheel carried or tool bar mounted. Widths range from two to twenty-four rows.

Air Delivery (115)

Same as conventional planter except seed is taken from a supply box through a manifold and blown by air through tubes to the seeding points.

Planter, Ridge till (116)

Same as no-till planter except with sweeps or disk blades for cutting the top of preformed ridges and depositing the residue between the rows.

Harvesting Equipment

Combine, All Types (121 - 125 & 128 - 132)

Self-propelled or PTO implement for harvesting standing crops or gather crops from windrows or swaths. It separates the crop from the straw, stalks, cobs and husks, cleans and elevates it into a holding tank for immediate or eventual delivery into a truck, wagon or grain cart. Self-propelled units may have 2 wheels, 4 wheels or track drives and can be set up for rice, barley, peanuts, beans, all small grains, and soybeans. They may have rigid or flexible cutter bars, bat or pick-up reels or windrow pickups, and may be fitted as hillside, sidehill or level land machines. Special barley and other row crop heads are available.

Windrower-Swather (PTO & Self-propelled) (126, 127)

A machine, either self-propelled or PTO, that cuts the standing hay or ripened grain with a reciprocating sickle aided by a revolving reel of four or more bats or sails. Cut material is deposited on a platform, either draper or auger type. The auger or drapers move the cut material either to the end or the center of the platform where it is discharged onto the ground in a "windrow" or "swath". The swather may have metal and/or rubber rollers for the hay to pass through. This "conditions" or "crimps" the hay to allow more rapid and uniform curing.

Corn Picker (133)

A corn harvesting machine, usually PTO powered, that removes the ears from the corn stalk.

Hand Harvest (134)

Picked by hand, no machines.

Tassel Stalker (135)

Mowers and Balers

Amish Harvest (141)

Non-motorized device for harvesting hay.

Bale Wagon (PTO & Self-propelled) (142, 143)

A wide range of wagons or trailers from the simple, wide flat bed used to haul bales to a sophisticated, self-propelled (or PTO) unit that collects and stacks bales. This stacking ability allows the baler to be unloaded by power to form a compact stack of bales. Some units also can pick up stacked bales for transport.

Bale Loader (144)

A device, either ground or engine driven, that picks up the bales from the ground and deposits the bales onto the truck or trailer as it moves down the windrow of bales. Largely used for small rectangular bales but models for the large round bales are available.

Balers (PTO & Self-propelled) (145-148)

Balers pick the hay or straw up from a windrow and compact it into either round or square bales which may be small (40 - 125 pounds) or large (1000 to 2000 pounds). Balers may be motor mounted, PTO or self-propelled.

Rotary Mower-cutter, Chopper, Bush Hog (149)

A machine used largely to cut weeds and roadsides but may be used to harvest a crop for hay or to shred crop residue. Sizes range from 4 to 20 or more feet of cut when hitched in multiple units. Available in integral, semi-mounted and pull-type. Mostly PTO powered. Cuts by means of a rapidly rotating blade either rigid or flexible.

Mower Conditioner PTO (150)

Consists of a cutterbar, a reel, a pair of full width conditioning rolls, and a deflector. Width ranges from 7 to 12 feet.

Mower Conditioner, Self-propelled (151)

Self-propelled machine, similar to mower conditioner (code 150).

Disk Mower (152)

A mower with a number of cutting blades on rotating disks mounted on a bar. The disks are driven from the bottom by a series of flat gears.

Drum Mower (152)

A series of rotary drums or cylinders with blades attached. The drums are driven by an enclosed gear or chain train from the top. PTO powered.

Flail Mower Shredder (Rotary Chopper) (153)

A machine that mows, cuts or shreds crops by means of steel blades or knives on a horizontal rotating shaft or drum. The high speed of the drum (about 1850-2000 rpm) cause the hinged knives to cut or shred the crop. Can be used to harvest hay or to shred crop residue. Ranges in size from 5 to 15 feet or more.

Sickle Mower (154)

A machine with a reciprocating sickle running in a cutter bar with guards and ledger plates. Mowers may be 3 point mounted, semi-mounted, belly mounted or trail type. Usual sizes are 7 to 9 foot sickle or cutter bars but some heavy cutters are only 5 foot.

Dump-Rake (155)

A series of large "c" shaped teeth attached a bar or frame. This frame can be raised or lowered alternately to pick up the hay and "dump" it into windrows. Either ground or PTO powered. Sizes range from 8 to 32 or more feet.

Rake Side Delivery (156)

A rake with a four or five bar reel and set at an angle to the direction of travel. The reel rotates, either PTO or ground driven, in the opposite direction of the carrier or tractor wheels. This motion along with the angle sweeps the crop into a windrow on the left or the right. Raking swath is 7 to 9 feet.

Wheel-rake (157)

A series of overlapping wheels, four to five feet in diameter with spring teeth on the rim of the wheels. The wheels are mounted on a bar or frame at 10 to 60 degree angles to the direction of travel. The wheels are turned by contact with the crop and the ground. The 5 wheel rake covers about 16 3/4 feet and the 7 wheel about 20 feet.

Stacker Mover (158)

A forklift-like device for moving hay stacks.

Stacker Automatic (159)

A device for compacting hay.

Front End Loader (160)

Small bulldozer with scoop or bucket in front.

Round Bale Mover (161)

A prong-like attachment to a tractor or other equipment used to move round hay bales. The tractor normally backs the prong into the bale, lifts the bale off of the ground using hydraulic or PTO assist, and moves the bale.

Land Forming or Shaping Equipment

Backhoe (171)

Large shovel or scoop operated with a mechanical arm. Often used for ditch digging.

Disk Border Maker (172)

Set of two single disks or two sets of 3 or more disks used to make borders for irrigation. Can be reversed to tear down borders. Usually mounted on a tool bar.

Ditch Closer (173)

A machine usually mounted on a 3-point hitch or on wheels pulled behind a tractor that pulls dirt together to fill in an irrigation or drainage ditch.

Ditcher (Vee Rotary) (174)

A machine either with a vee shaped blade or a rotary auger or fan that is used to cut field irrigation or drainage ditches. Either 3-point or trail mounted.

Levee Plow Disk (175)

A machine used to throw up levees or ridges between rice fields. Most machines have two sets of disks, each with one to three disk blades that throw the soil up into a levee. Most disks are tool-bar mounted. Disk sets can be reversed to tear down the levees.

Quarter Drain Machine (176)

A machine mounted on a tractor that is used to clean out the quarter drains in the field. This operation is performed several times a year to keep open the drains leaving the field.

Rear Mounted Blade (177)

A curved blade, 5 to 8 feet long and 15 to 24 inches deep, attached to the 3-point hitch of a tractor. Most can be angled sideways and up and down from ground level either manually or hydraulically. Used for ditching, back filling, scraping and rough leveling.

Corrugator (178)

A device that produces vee shaped indentions in the soil to aid in the distribution of irrigation water. The units may be mounted on a row cultivator or on a tool-bar.

Land Plane Leveler (180)

A machine used primarily to level land for irrigation or to improve drainage. This machine usually has two or more sets of wheels on a long wheel-base supporting one or more bowls, blades or baskets that are intended to carry soil from high points to low areas in a field.

Laser Planer (181)

Similar to land plane leveler (coded 180) which uses a laser beam for precise leveling.

Gate Setter (182)

Tractor implement like a chainsaw, except larger. Digs out dirt with small shovels on a chain. Used to dig out dirt from levees for gate placement.

Bulldozer (183)

Land forming equipment used for building terraces.

Hauling Equipment

General Purpose Wagon or Cart (194)

Wagon with or without sides used for many purposes such as hauling grain, sugarbeets, vegetables, and fruit, among other commodities.

Hay Wagon (195)

Flat-bed wagon used to haul hay.

Gravity Wagon (208)

Wagon with sloping sides that direct grain to an opening at the bottom.

Grain Cart with Auger (209)

Cart with sloping sides that direct grain to an auger at the bottom. Often used to collect grain from a harvester in the field and load the grain in a truck.

Dump wagon (221) / Forage Wagon

Other Implements

Burn Buggy (191)

Homemade device used to burn after-harvest residue in rice production.

Chaff/Straw Saver (192)

Attachment pulled behind a combine that bunches or stacks chaff and/or straw as it comes from the combine. The small stacks are left in the field for later retrieval.

Electric-Discharge Weed Killer (193)

A machine that produces an electric charge which uses the weed plant to complete an electrical circuit to the ground. Current causes plant cells to rupture, killing the plant. Weeds must be taller than the plants for the method to be feasible. Utilizes a 50 kw generator powered by a 1000 rpm - PTO on a minimum 120 hp tractor.

Off-Field Thresher (196)

Stationary threshing machine.

Rock Picker (197)

Heavy duty machine with pick-up teeth or heavy duty rotating reels that deposits rocks and stones from "1" diameter to 500 pound boulders into a tank or bucket for removal from a field. Some rock pickers are equipped with elevators that deposit the rocks directly into a truck or trailer.

Rock Windrower or Rock Rake (198)

A heavy side-delivery or wheel-type rake that moves stones into windrows in order to speed up the process of rock picking.

Rodent (Gopher) Killer (199)

Machine with a sub-soil shank that allows poisoned bait to be injected into soil at the same depth as gopher burrows or runways. Fields are usually covered in a criss-cross pattern.

Roller Groover (200)

Pull-type device that forms ditches in the soil. Used in preparing rice acreage for seeding.

Rubber-Wheeled Weed Puller (201)

A series of paired rubber-tired wheels set touching one another and rotating in opposite directions. As the machine moves forward at a level above the crop but below the weed tops, the weeds are caught by the spinning wheels and are pulled out

Shredder Flail (202)

Same as flail mower. See 153.

Shredder Rotary (203)

Same as a rotary mower. See 149.

Silage Harvester (204)

Similar to forage harvester for chopping fodder.

Stalk Shredder, Cutter (205)

A rotobearer with hard metal rods or cutting blades attached to a revolving horizontal shaft.

Swath Roller (206)

Packing attachment about 8 ft. wide; hitches back to swather.

Tractor or Truck - No Attachments (207)

Tractor - a self propelled vehicle with a gasoline or diesel engine used to supply power to other machines in one of four ways (1) pulling at the drawbar; (2) rotary power from the power-take-off; (3) hydraulic power; and (4) electric power (direct current from a generator).

Truck - a sturdy, motorized vehicle primarily used for hauling.

Flame Thrower (223)

Cotton Equipment

Chopper, Stalk Cutter (211)

A machine with a ground driver reel with cutting blades, either angled or spiral, used to chop or cut cotton or other heavy stalks. Also does minor soil preparation.

Module Builder (212)

A four sided form having an openable rear door. It has a traversing, mechanical compactor and compressor for placing cotton into high density stacks.

Gleaner (213)

A cotton harvesting machine, usually ground driven or PTO, pulled by a tractor that gleanes or picks up loose cotton left after picking or stripping or perhaps before harvest began.

Picker, Mounted, Sp (214, 215)

A 2 or 4 row implement usually tractor mounted or self-propelled for picking mature cotton from bolls through an intricate arrangement of spindles and doffers. It deposits the cotton by means of an air stream into a holding basket. When full, the basket is emptied into a trailer or cart for delivery to a gin or module builder. Several trips may be made over a ripening field.

Rood Machine (216)

Cotton harvester which retrieves cotton from the ground through such means as air suction.

Stripper, Mounted, Pull Type, Sp (217 - 219)

Made as self-propelled, PTO, pulled, or tractor mounted machines that pull or strip all of the bolls from the plant at one time over. Stripping is accomplished by rotating brushed and rubber flaps. Strippers may be 2 - 6 rows or a platform type in some instances.

Trailer (220)

Used for transporting seed cotton from the picker or stripper to the gin.

Tobacco Equipment

Mechanical Harvester (Combine), Multi-pass (251)

A self-propelled or tractor drawn machine that is used more than 1 trip through a field and mechanically removes 4 to 6 leaves per plant per trip across the field.

Mechanical Harvester (Combine), Last-over (252)

An automatic harvester that is designed to mechanically remove the remaining leaves in a last pass through the field.

Mechanical Harvester (Combine), Once-over (253)

An automatic harvester that is designed to mechanically remove all the leaves from the stalk in one pass through the field. This machine is sometimes referred to as a stripper.

Primer, Field Box Filling (254)

Any of several different types of self-propelled or tractor drawn machines that allow workers to sit and prime tobacco. Workers in the field place tobacco leaves in big boxes used for curing.

Primer, Field Racking (255)

Any of several different types of self-propelled or tractor drawn machines that allow workers to sit and prime tobacco. Workers in the field place tobacco leaves in bulk racks used for curing.

Primer, Field Looping on Sticks (256)

Any of several types of self-propelled or tractor drawn machines that allow workers to sit and prime tobacco. Field workers take small bunches of tobacco and place the butt ends at both sides of tobacco sticks and then wrap twine around the bunches of tobacco until the sticks are filled.

Primer, Other (257)

Any of several different types of self-propelled or tractor drawn machines that allow workers to sit down and prime tobacco. Workers in the field or at the barns place tobacco for curing in other than machines 254, 255 and 256 above.

Trailer, Harvest (258)

A tractor or truck drawn trailer used to carry tobacco from the field to the barn.

Transplanter, Regular (259)

A power drawn transplanting machine is operated by a driver and carries 2, 4 or 8 persons on "setters". The persons on setters alternate in placing or guiding the plants into the mechanism which spaces them at the proper intervals in the row. The machine opens the furrow, dumps a measured quantity of water, sets the plant and draws the soil about the roots of the plants.

Transplant Digger, Mechanical (260)

A power drawn machine pulled across the plantbed that will dig transplants, shake off loose soil from their roots and stack them neatly in a box so that they can be fed into mechanical transplanters.

Tying Machine (261)

A machine that loops tobacco with an automatic tying or sewing machine. The tobacco leaves and sticks are placed on a moving conveyor belt which passes them under a sewing head. The leaves are attached to the stick by stitches at the butt end.

Topper, 2 Row (265)

A machine which removes the blossoms and sometimes the top leaves of the burley tobacco plant from two rows in one pass.

Topper, 4 Row (266)

A machine which removes the blossoms and sometimes the top leaves of the burley tobacco plant from four rows in one pass.

Mechanical Harvester (PTO), Multi-pass (267)

Mechanical harvester (PTO), last-over (268)

Mechanical Harvester (PTO), Once-over (269)

Transplanter, Carousel (270)

Peanut Equipment

Combine, PTO (281)

A Peanut Harvesting Machine That Picks up the Windrow of Peanuts Left by the Digger-shaker and Separates the Peanuts from the Vines. The peanuts go into a holding tank. Only PTO models are available. Peanut combines are used only on peanuts.

Digger-shaker (282)

A machine, usually 2 or 4 row, that lifts the peanuts, vine and all, by means of long angled knives, from the soil. The soil is shaken from the vines with reel or chain type shakers and vines are deposited in a windrow.

Shaker-Inverter (283)

Same as a digger-shaker except vines in windrow are inverted so the peanuts lay on the vines.

Reshaker-conditioner (284)

A machine used to fluff-up the windrows to enhance drying or conditioning.

Vine Cutter (285)

A device for cutting peanut vines from roots.

Wagon (286)

A wagon for hauling peanuts; can be used for drying peanuts.

Sugarbeet Equipment

Beater (231)

An implement used to remove the beet leaves before harvesting. Some models also chop the beet leaves for quicker decomposition. This implement is not used to save tops, however, a scalper, which uses knives or rotating disc to remove the crown core and bud from the top of the beet, may or may not be attached to the beater.

Harvester (regular or direct) (233)

An implement that digs and lifts beets from the ground, directly loading them into a cart or trailer in the field.

Harvester (tank) (234)

An implement that digs and lifts beets from the ground, directly loading them into a large storage tank attached to the machine. When full, the tank is emptied onto carts or trailers.

Harvester (other) (235)

Any other implement that digs and lifts beets from the ground excluding a regular, direct, or tank harvester.

Thinner (mechanical, electronic) (236)

An implement that use flexible toothed or knife weeders that are electronically activated to thin beets. This is done after the beets have grown to a stand - after the plants have developed from 8 to 10 leaves.

Thinner (mechanical, random) (237)

An implement that cultivates and skips measured distances to thin beets. This is done after the beets have grown to a stand - after the plants have developed from 8 to 10 leaves.

Planter (238)

An implement that uses seed plate metering devices (mechanical or air activated) to drop beet seed through a boot or shank into a seed bed opened by a shoe or disc.

Topper (topsaver) (239)

An implement that uses knives or rotating disc to remove tops, crown, core, and bud from the top of the beet. This implement is used to save tops and may not include a windrower attached, where the tops are windrowed for pick-up later or loaded by conveyer belt into a truck.

Sprinkler Irrigation Systems

Hand-Move Sprinkler System (1)

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

Solid-Set Sprinkler Systems (2)

A portable pipe system which is placed in the field at the start of the irrigation season and left in place to the season end. Requires no labor to move the system to a new location once established for the irrigation season. Adapted to most crops, soil types, topography, field sizes and shapes.

Permanent Sprinkler System - *Use solid set sprinkler system (2)*

Buried pipe system with only the risers and sprinklers above ground. This system has the same characteristics as the solid-set sprinkler system, except that the labor requirements are lower.

Side-Roll or Wheel-line Sprinkler Systems (3)

A wheel-move, lateral-line system which moves as a unit in fixed increments (irrigation sets) across the field. The system is powered by a small gasoline engine that is manually operated. The system is stationary while irrigation is taking place. Some variations of the system may have tow lines trailing the main lateral line with additional sprinklers on each tow line. Tow line systems irrigate a wider strip at each set, up to 180 feet compared to the 60-foot strip of standard side-roll systems. Wheels are generally spaced 40 feet apart and are 5-7 foot in diameter, with the main system pipe serving as an axle in the middle of the wheel. The system is designed for reasonably flat, rectangular or square fields and is suited to crops less than 4 feet in height. The sprinkler may use flexible hose, aluminum pipe, or PVC pipe to connect to mainlines (above or below ground) or on-site pressurization pumps.

End-Tow Sprinkler System - *Use side-roll system (3)*

Wheel or skid, lateral-line system which is end-towed via tractor to new locations in the field. The system is stationary while irrigation is taking place. System is designed for reasonably flat or slightly rolling, rectangular or square fields with an alley through the center of the field. Designed for hay and pasture irrigation, the system may be used on some row crops and orchards.

Carousel Sprinkler-traveler System - *Use side-roll system (3)*

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

Center Pivot or Linear Move with Sprinklers on Main Line (4)

Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers are located **directly on** the system's main water-supply pipe, which is supported by A-frame towers. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **directly** on the main water-supply line will tend to be **medium to higher pressure** (above 30 psi) and use impact sprinklers.

Center Pivot or Linear Move, with Sprinklers below the Main Line, but More than 2 Feet above the Ground (5)

Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes or booms suspended **below** the system's main water-supply pipe, but **more than 2 feet above the ground**. This includes most standard drop-tube sprinkler systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types,

and level to gently-rolling topography. Systems with sprinklers **below** the main water-supply line will tend to be **lower pressure** (below 30 psi), with spray nozzles rather than impact sprinklers.

Center Pivot or Linear Move, with Sprinklers less than 2 Feet above the Ground (6)

Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes suspended **below** the system's main water-supply pipe and are located less than 2 feet above the ground. This includes low pressure precision application systems (LEPA) and other below-the-crop-canopy systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **suspended to within 2 feet of the ground** tend to be **very low pressure** (below 15 psi) and use spray nozzles and bubblers. Some units may run water directly on the ground using a cloth-like extension attached to the drop tube.

Big Gun (7)

A single, large gun-type sprinkler mounted on a trailer, carriage, or skid. Water is supplied to the sprinkler through a flexible hose. The mounted gun sprinkler is either pulled across a field or moved across a field using a self-propelled drive system for each irrigation set. An irrigation set is the area of the field that is irrigated by the gun sprinkler as it moves across the field. When an irrigation set is completed, the entire system is moved and the process repeated. The system is designed for straight rows, flat topography, and medium to high infiltration soils. It is best suited for crops that can withstand heavy bursts of water. Systems are high pressure, greater than 60 psi. Three specialty-type big-gun systems are defined below, including a self-propelled gun traveler system, a reel-type hose pull system, and a reel-type cable pull system.

Self-Propelled Gun Traveler - *Use big gun system (7)*

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

Reel-type Hose Pull - *Use big gun system (7)*

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

Reel-type Cable Pull - *Use big gun system (7)*

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

Low-flow Irrigation System (Drip, Trickle, Micro Sprinkler) (8)

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

Gravity-Flow Irrigation Systems

Siphon-tube from Unlined Ditches (10)

System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from an unlined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.

Siphon-tube System from Lined Ditches (11)

System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from a lined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.

Portal- or Ditch-gate System from Unlined Ditches (12)

System uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from an unlined ditch across the head of the field. Portals in the ditch bank can be of any diameter and are covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.

Portal- or Ditch-gate System from Lined Ditches (13)

System uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from a lined ditch across the head of the field. Portals in the ditch bank can be of any diameter and covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.

Poly Pipe System (14)

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

Gated Pipe (Not Poly) (15)

A system using rigid PVC plastic or aluminum pipe with manually-operated closeable gates at regular intervals. The pipe is installed at the head of the field, but may need to be removed for cultural operations or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Gated-pipe systems may also be used on flood or corrugation water-control systems. The pipe is reused for many years.

Improved Gated Pipe System (Surge Flow or Cabling, Not Poly) (16)

A system using rigid PVC plastic or aluminum pipe with manually-operated closeable gates at regular intervals, but with an automated water-control system. Automated water control is achieved by (1) using a surge valve to alternate pipe sets receiving water, (2) using a moveable plug inside the gated pipe, controlled by a cable, to adjust the water flow from open gates, or (3) other automated methods using gated pipe to control water flow and improve the uniformity of water applications, such as pneumatically controlled bladders to regulate water flow on individual gates. Gated pipe is installed across the head of the field, but may need to be removed for cultural operations or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Improved gated pipe is very unlikely to be used for flood irrigation. It would defeat the purpose of the improved system. The pipe is reused for many years.

Sub-irrigation (17)

Maintenance of a water table at a predetermined depth below the field surface by using ditches or sub-surface drains and water-control structures. Water is added or removed as needed to maintain the water level of the water table at a specific depth using the ditches or drains. Lateral movement of water through the soil provides water to the crop root zone. Conditions for use of this system are limited. Land must be flat and suitable for rapid lateral water movement. The irrigation system may also be used as a drainage system.

Open Discharge from Well or Pump System (18)

Open discharge from well of pump occurs when there is only one point of discharge into the field. This system is often used in conjunction with levees or dikes to maintain an even water depth throughout the field. The water remains on the soil until irrigation needs are met, at which time the water is drained, allowed to infiltrate, or evaporates. Land forming is often required with this system. As a gravity irrigation system it can be used to irrigate a single contour/bay field or discharge water into the topmost multiple contour/levee/bay field. Do not use this system when discharging water into each bay of a multiple bay field.

Contour-levee - *Use the code for the type of system used to apply the water*

Completely flooded areas bounded by small contour levees and cross levees. Application rate is considerably larger than intake rate. Water remains on soil until irrigation needs are met with the excess drained away. Used for crops tolerant of flooding up to 12 hours such as rice, cotton, corn, soybeans, small grains, and grasses. Land forming is required and adequate surface drainage is essential. Irrigation water must be of good to excellent quality.

Corrugation - *Use the code for the type of system used to apply the water*

Partial surface flooding method. Water is applied in small evenly spaced channels. Initial streams are greater than soil intake rate. Must be cut back when water reaches lower unit to prevent runoff or having a tail water recovery system. Best suited to close growing, non-cultivated crops such as legumes, grasses, and small grains.

Graded-border - *Use the code for the type of system used to apply the water*

Type of controlled surface flooding. Field is divided into strips by parallel dikes. Strips should have little cross-slope. Best suited to soils with moderately low to moderately high intake rates. Used to irrigate legumes, grasses, small grains, orchards and vineyards.

Level-border (Basin) - *Use the code for the type of system used to apply the water*

Rapid application of water to level or nearly level area enclosed by dikes to retain water at uniform depth until it infiltrates the soil. Best suited to soils with moderate to slow intake rate and a moderate to high available water holding capacity. Can irrigate a number of crops without changing the basic layout or rate of application. Accurate land leveling is required. No irrigation water is lost by runoff.

Level-furrow - *Use the code for the type of system used to apply the water*

uses small channels without grade to irrigate crops planted in or between the furrows. A large stream of water is required and water remains at a uniform depth throughout the furrow until it infiltrates the soil. Best suited to soils having moderate to slow infiltration rate and moderate to high available moisture holding capacity. Best suited to row crops, but can be used for grass crops.

Graded-furrow

Application of water in small channels having continuous slope in direction of water movement to irrigate row crops. Best suited to sites where furrow grade does not exceed 1%. Fields must be well graded and tail water facilities should be installed. Not designed for light irrigation. Water is applied to furrows by gated pipe or from ditches by siphon tubes. Use the code for the type of system used to apply the water.

Contour-furrow

Similar to graded furrow, but furrows are laid on the contour to reduce slope. Can be used on all soils except light sandy soils and soils that crack. Use the code for the type of system used to apply the water.

Contour-ditch

Form of controlled surface flooding. Water is distributed from ditches running along the contour. Water is discharged through openings in ditch bank, by siphon tubes or a uniformly graded lower lip of ditch. Water flows in unconfined sheet down slope from one contour ditch to the next and collected in next ditch for reuse. Suited to noncultivated crops such as legumes, grasses, and small grains. Use the code for the type of system used to apply the water.