Attachment

Cropland Roadside Transect Survey

2008

Procedures for Using the
Cropland Roadside Transect Survey
for Obtaining Tillage/Crop Residue Data

Conservation Technology Information Center
1808 Kalberer Rd. Suite J100
West Lafayette, IN 47906
www.conservationinformation.org

A special thanks to Purdue University, Cooperative Extension Service, Water Quality Section for developing the original transect instructions.

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Revised & Simplified
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Introduction

The cropland roadside transect survey method is designed to gather information on tillage and crop residue management systems. In 2008, CTIC welcomes data collected voluntarily by conservation partnerships around the country. Any county in which this survey method is used is encouraged to submit the data using CTIC's web site, **www.crmsurvey.org**. Experience has been that counties with a grid road system, those with fields readily visible from the road, where crops are planted in a relatively short period of time, and where conservation tillage is being adopted are the most likely candidates for conducting a transect.

Crops, soils, and climate interaction dictate to some degree the adoption of high residue systems. Adoption of conservation tillage dramatically reduces nonpoint pollution, enhances soil quality, and enhances carbon accumulation in the soil. Some Midwest states have found the data so valuable that a transect survey has been completed on an annual basis by each county for a number of years. These counties can track changes in tillage practices due to changing weather conditions, as well as a means of documenting effective educational programs, equipment rental, and other affiliated activities.

The purpose of the survey is threefold: (1) to provide information that can be used by individual soil and water conservation districts and others in establishing priorities for educational or other programs, (2) to evaluate progress achieved in reaching county or statewide goals, and (3) to provide accurate data on the adoption of conservation tillage systems by crop for the CTIC National Crop Residue Management Survey. This makes the transect survey an ideal tool for assessment as well as measuring progress for locally led conservation. The transect survey will enable counties to have a higher level of confidence in their data for use in county programs and in the report submitted to CTIC. State and national data will have a correspondingly higher confidence level.

Many users use the National Crop Residue Management Survey to assess changes in conservation tillage systems. Each county submitting data is a key part of the team and your effort is greatly appreciated.

Statistical reliability of the cropland roadside survey method

When conducted properly, this cropland transect survey procedure provides a high degree of confidence in the data summaries. Users can have 90% or more confidence in the accuracy of the results. This level of reliability translates into data summaries that can help guide the local or state decision-making process. Several states have used transect data to allocate cost-share funds, develop new resource management goals, and to provide information to the general public about the positive impact of progress on land use trends. In general, few data sources have such a high level of reliability combined with quick data collection!

Selecting the crops

The crop list for the 2008 CRM survey includes 22 crops. Visit **www.crmsurvey.org** for more information.

Crops should be selected for each county from the following list:

corn	edible beans and peas	sunflowers
soybeans (full season)	barley	sugar beets
soybeans (double-cropped)	canola	sugarcane (only year planted)
cotton	forage crop (seeding year only)	tobacco
spring wheat	peanuts	vegetables and other crops
winter wheat	potatoes	permanent pasture
oats	rice	fallow
grain sorghum	rye	

Important: Make sure that the correct crops are chosen. For example, do not place dry edible beans in the soybean category or rye in the winter wheat category.
A worksheet is available from the CTIC Web site www.crmsurvey.org to record transect data.

Step 1 – Establishing and Marking the Route

The first step in conducting a tillage and crop residue management survey is to establish a driving route. Counties that conducted a transect in 2004 should use the same route, if it worked well. A county highway map should be used to draw a route that passes through all areas that are heavily used for crop production. Avoid large urbanized areas, forested land, rangeland, and heavily traveled federal and state highways when possible. Orientation or direction of the route (east to west or north to south) is not significant; however, it should be at least 110 miles long. Routes for counties with more than 300,000 cropland acres should pass through townships at least twice, particularly in areas where the land is heavily used for crop production. This avoids large gaps between passes through a county even though the mileage traveled is considerably longer. Routes typically traverse east to west through a county five to eight times (see Figure 1).

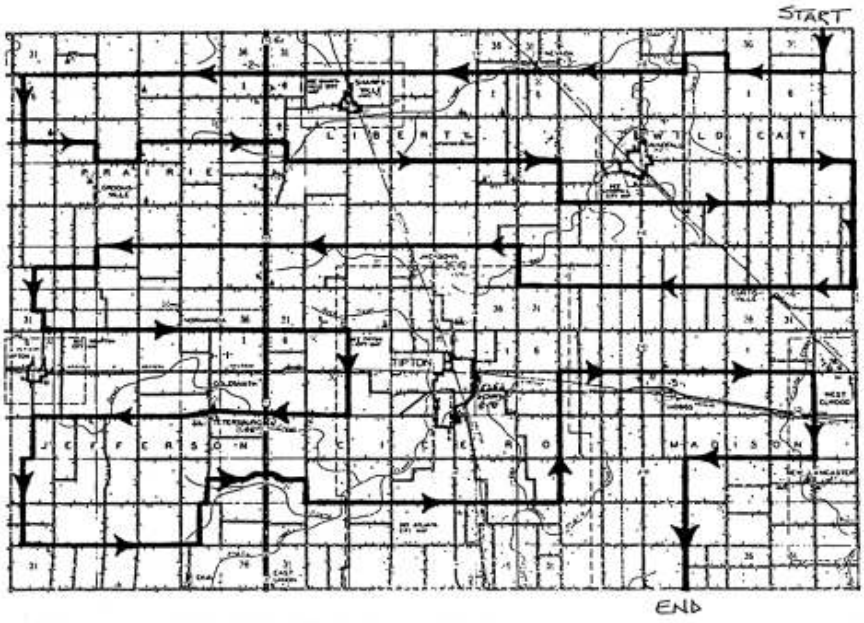

Figure 1. Sample county road transect route for Tipton County, Indiana. Note how the route bypasses towns (such as Tipton, Indiana located in the center of the county). This survey is applicable regardless of the layout of the county, i.e. counties need not be square to provide accurate results with this method.

Step 2 – Establishing the Survey Date and Team

Once the route is established and marked, schedule a date for conducting the survey. It should be after the majority of the main crops have been planted but before the crop canopy closes or the first row cultivation takes place. If a majority of the crops planted are spring-seeded, then the transect needs to be completed in late spring. If a majority of the crops in a county are fall-seeded, then the transect should be conducted in the fall after planting. If the percentage of fall-seeded crops is significant, but less than half, consider conducting the transect two times per year in order to capture the tillage systems being utilized for the spring and fall-seeded crops (or conduct the driving transect for the highest percentage [spring or fall] and estimate the tillage systems by crop for the other acreage). Conducting the survey at this time allows for easy "windshield observations" without stopping at each field.

Since the dates for conducting the county survey will depend upon local planting progress, flexibility in scheduling is recommended. For example, the northern half of a county may have had more rain than the southern half; therefore, a local team may survey the southern half of the county one week and finish the northern half two weeks later.

Next, assemble a survey team. It may consist of 2 to 4 individuals. Members may include the following: the NRCS district or soil conservationist, county Extension agriculture agent, the FSA county director, and a fourth person (perhaps a soil and water conservation district (SWCD) employee, supervisor, cooperator, or newspaper reporter) who can assist in making observations. At least one individual needs to be very familiar with tillage systems and estimating residue levels. When conducting the survey the following tasks need to be performed: driver, navigator who marks data collection points on the map, and data recorder, and occasionally someone will need to verify field observations (measuring residue, previous crop, etc.).

By getting a variety of people involved, the ability to assemble a full team for each day of surveying is greatly increased. Even if a SWCD supervisor or volunteer can only devote a half-day to collecting data, it will increase their understanding of the process while making a valuable contribution to the survey.

Step 3 – Collecting the Survey Data

The highway map will aid navigation across the county, especially if there are detours or road changes since the last transect.

Tillage practice by crop is the only information that will be collected for the 2007 survey. The simple data collection form, which can be customized for each county, will simply require a tick mark for each field that is a data collection point.

For counties with 300,000 cropland acres or less, data should be collected at one-half mile intervals, as indicated by the vehicle odometer. For counties that have between 300,000 and 450,000 cropland acres, a one-mile interval is recommended. For counties with greater than 450,000 acres, a 1.5 to 2.0 mile interval is recommended. To obtain a statistically reliable data set, **approximately 460 cropland sites will need** to be observed along the route.

Beginning at the start of the route, travel exactly one-half mile and stop. Observe fields on both sides, and record the appropriate information on the first data sheet. Since data is being collected from 2 fields, this will constitute 2 data collection points. Also mark the field location on the soil survey atlas sheet.

Another option would be to use a GPS receiver to mark the field location. Repeat the procedure at half-mile intervals (or desired interval) until the route is completed.

Important:

(A) If a data point is a cropland field but is not planted to a crop (hayland, CRP, etc) in 2007, then note it as unknown for tillage type.

(B) If a cropland field (pasture, farmstead, subdivision, etc.) is not encountered at the stopping point on one side of the road, record data only for the side with cropland. The non-cropland point becomes not applicable (NA).

(C) Only record data for fields where the tillage type/residue level is obvious. For example, if one is conducting a transect in the spring, it is futile to walk into a winter wheat field to try and determine tillage/residue level. Simply mark that field as unknown for tillage/residue level.

(D) If no cropland field is encountered on either side of the road, continue driving until cropland is observed on at least one side of the road. Record data and then proceed.

As the transect survey continues, the survey team should stop and check field conditions on a regular basis to insure correct estimates are being made for different crop, tillage, and residue conditions. Once the team has calibrated their visual estimates to match actual field conditions, stops can then be made less frequently. Many fields will contain very little residue or high residue levels if the field was no-tilled. Usually only borderline residue levels require closer examination. However, the team should plan to re-calibrate their visual estimates especially when entering a region of the county with different soil surface conditions due to changes in moisture, organic matter levels, stoniness, or crops grown.

Crop residue cover levels will be the most important data category to confirm with field measurements. Therefore, use the line-transect method as described in the National Agronomy Manual for confirming percent residue cover. Confirm visual estimates with field measurements in borderline cases. *But remember, never use end rows for field measurements*!
At the end of the route, count the number of cropland sites where data were recorded. If less than 460, randomly extend the route and record data at half-mile intervals until this number is met. *Do not count fields twice if a transect crosses over its previous route*. Be sure to mark the extended route on the county highway map.

In counties that are highly urbanized, wooded, etc., collecting data on 460 cropland sites may not be feasible. In this case, collect as much data as practical.

Step 4 – Crop Acreage and Percentage Calculation

The number of tick marks needs to be summed for each crop/tillage category and then summed for each crop. Dividing the sum in each category by the total for the crop will provide the percentage for each tillage system. (Yes, you will have to count and use your hand calculator.) For example, if there were 36 check marks for no-till corn, 22 for mulch-till corn, 28 for reduced-till corn, and 14 for conventional corn, the sum would be 100. So this county would have 36% no-till corn, 22% mulch-till corn, 28% reduced-till corn, and 14% conventional-till.

In addition to crop and tillage acres being reported, the total number of CRP acres should also be reported. Omit this if certain that data CRP data will be gotten from FSA. In addition, the total acres planted no-till into a cover crop should be recorded. This is to determine the extent of cover crops usage.

The county crop acreage will need to be adjusted to reflect 2008 crop acres. Sources of information regarding the acres of crops planted for each county are Farm Service Agency (FSA) farmer certification (usually available in mid-August) and/or the State Agricultural Statistics Service. The State Agricultural Statistics Service in most States will release a crop report by crop reporting district on June 30th. This report will be very valuable in estimating the change in crop acreage from the previous year. The National Agricultural Statistics Service (NASS) State home page will also have the previous year's crop acreage by county (double-cropped acres are included in the acreage report). Discussion with government agency partners and local knowledge should not be discounted.

The latest Crop Residue Management Survey results previously reported for every county in the U.S. are posted on the CTIC Web site www.crmsurvey.org using both the basic 8-crop and expanded 22-crop list. Counties need to access this Web site and update their 2007 crop acres. Users will update the acres for each crop/tillage category. The program will not allow you to exit if individual tillage/crop acres do not total the entered crop acres.

Tillage Definitions

Tillage Systems Definitions as featured in the *National Crop Residue Management Survey:*
The following set of definitions was established by CTIC and is recognized as a standard. They are used nationwide by many government agencies and private industry.

Conservation Tillage systems include no-till, ridge-till and mulch-till.
Any tillage and planting system that **covers 30 percent or more** of the soil surface with crop residue, after planting, to reduce soil erosion by water. Where soil erosion by wind is the primary concern, any system that maintains at least 1,000 pounds per acre of flat, small grain residue equivalent on the surface throughout the critical wind erosion period.

No-till/strip-till – The soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width (strips may involve only residue disturbance or may include soil disturbance). Planting or drilling is accomplished using disc openers, coulter(s), row cleaners, in-row chisels or rototillers. Weed control is accomplished primarily with crop protection products. Cultivation may be used for emergency weed control. Other common terms used to describe No-till include direct seeding, slot planting, zero-till, row-till, and slot-till.

No-till/strip-till

- Less than 1/3 of row disturbed
- Greater than 30% residue after planting
- Crop protection products used for weed control

Ridge-till – The soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Planting is completed on the ridge and usually involves the removal of the top of the ridge. Planting is completed with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges. Weed control is accomplished with

crop protection products (frequently banded) and/or cultivation. Ridges are rebuilt during row cultivation.

Ridge-till

- Less than 1/3 of row disturbed
- Greater than 30% residue after planting
- Top 1-2" of ridge removed at planting
- Crop protection products are usually banded
- Row cultivation is used for weed control and to rebuild ridges

Mulch-till – Full-width tillage that involves one or more tillage trips, disturbs the entire soil surface and is done prior to and/or during planting. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used. Weed control is accomplished with crop protection products and/or cultivation.

Mulch-till

- Entire field is tilled
- Greater than 30% residue after planting
- Usually one to 3 tillage trips
- Chisel plow, disk, field cultivator, and combination tools are used

Other Tillage Types:

Reduced-till (15-30% residue) **–** Full-width tillage that involves one or more tillage trips, disturbs the entire soil surface and is performed prior to and/or during planting. There is 15-30 percent residue cover after planting or 500 to 1,000 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Weed control is accomplished with crop protection products and/or row cultivation.

Reduced-till

- Entire field is tilled
- 15 to 30% residue after planting
- Usually one to 3 tillage trips (maybe more)
- Chisel plow, disk, field cultivator, and combination tools are used

Conventional-till or intensive-till – Full-width tillage that involves one or more tillage trips and disturbs the entire soil surface and is performed prior to and/or during planting. There is less than 15 percent residue cover after planting, or less than 500 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Generally involves plowing or intensive (numerous) tillage trips. Weed control is accomplished with crop protection products and/or row cultivation.

Conventional-till

- Entire field is tilled
- Less than 15% residue after planting

- Usually two to as many as four or more tillage trips are used involving the moldboard plow, chisel plow, disk, field cultivator, or combination tools**.**

APPENDIX

Background on Surveys

Transects have been used by a number of states to quantify the amount of various tillage systems being used by crop. Although the exact method of data collection and procedure varies, all sought to improve the accuracy of the amount of conservation tillage by county.

Cropland surveys designed to estimate the amount of conservation tillage being used on the land are a relatively new concept. The Conservation Technology Information Center (CTIC) initiated the annual National Crop Residue Management Survey in 1982. The data gathered for this national survey usually involved a meeting of minds and data. NRCS field office personnel (usually district conservationists) in each county were annually urged to utilize area agricultural statistical data and meet with others who may have information to arrive at "best estimates" for the national survey. NRCS district conservationists are often assisted by soil and water conservation district personnel, county extension agents, agribusiness, local farm organizations, and other interested parties to complete a survey form that denotes these best estimates, which are generally based on personal knowledge.

Another survey conducted on a national basis is the 5-year NRCS National Resources Inventory (NRI). These data are collected on some 22 parameters, including physical characteristics of the land and the effects of agronomic practices on soil erosion. The NRI is a "point" survey method, where points correspond to random locations within a field. The first NRI in 1977 contained limited data on conservation tillage systems, as did subsequent surveys in 1982, 1987, 1992, and 1997.

Use of the NRI to estimate accurate acreage of conservation tillage or to document annual cropland trends in a state or county is greatly limited. The NRI has proven valuable in development of national resource policies.

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For More Information

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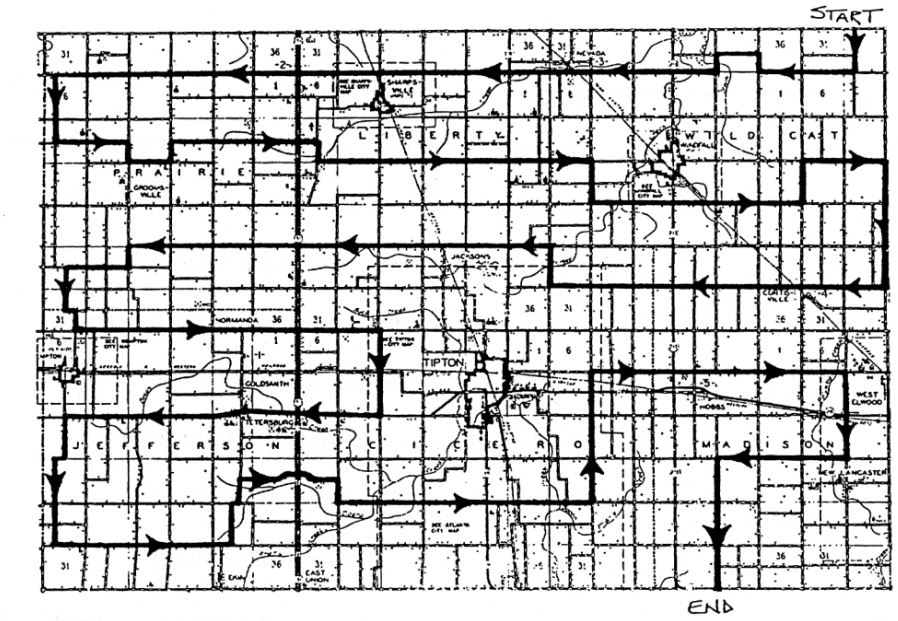

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Tillage Definitions

Tillage Systems Definitions as featured in the *National Crop Residue Management Survey:*
The following set of definitions was established by CTIC and is recognized as a standard. They are used nationwide by many government agencies and private industry.

Conservation Tillage systems include no-till, ridge-till and mulch-till.
Any tillage and planting system that **covers 30 percent or more** of the soil surface with crop residue, after planting, to reduce soil erosion by water. Where soil erosion by wind is the primary concern, any system that maintains at least 1,000 pounds per acre of flat, small grain residue equivalent on the surface throughout the critical wind erosion period.

No-till/strip-till – The soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width (strips may involve only residue disturbance or may include soil disturbance). Planting or drilling is accomplished using disc openers, coulter(s), row cleaners, in-row chisels or rototillers. Weed control is accomplished primarily with crop protection products. Cultivation may be used for emergency weed control. Other common terms used to describe No-till include direct seeding, slot planting, zero-till, row-till, and slot-till.

No-till/strip-till

- Less than 1/3 of row disturbed
- Greater than 30% residue after planting
- Crop protection products used for weed control

Ridge-till – The soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Planting is completed on the ridge and usually involves the removal of the top of the ridge. Planting is completed with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges. Weed control is accomplished with

crop protection products (frequently banded) and/or cultivation. Ridges are rebuilt during row cultivation.

Ridge-till

- Less than 1/3 of row disturbed
- Greater than 30% residue after planting
- Top 1-2" of ridge removed at planting
- Crop protection products are usually banded
- Row cultivation is used for weed control and to rebuild ridges

Mulch-till – Full-width tillage that involves one or more tillage trips, disturbs the entire soil surface and is done prior to and/or during planting. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used. Weed control is accomplished with crop protection products and/or cultivation.

Mulch-till

- Entire field is tilled
- Greater than 30% residue after planting
- Usually one to 3 tillage trips
- Chisel plow, disk, field cultivator, and combination tools are used

Other Tillage Types:

Reduced-till (15-30% residue) **–** Full-width tillage that involves one or more tillage trips, disturbs the entire soil surface and is performed prior to and/or during planting. There is 15-30 percent residue cover after planting or 500 to 1,000 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Weed control is accomplished with crop protection products and/or row cultivation.

Reduced-till

- Entire field is tilled
- 15 to 30% residue after planting
- Usually one to 3 tillage trips (maybe more)
- Chisel plow, disk, field cultivator, and combination tools are used

Conventional-till or intensive-till – Full-width tillage that involves one or more tillage trips and disturbs the entire soil surface and is performed prior to and/or during planting. There is less than 15 percent residue cover after planting, or less than 500 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Generally involves plowing or intensive (numerous) tillage trips. Weed control is accomplished with crop protection products and/or row cultivation.

Conventional-till

- Entire field is tilled
- Less than 15% residue after planting

- Usually two to as many as four or more tillage trips are used involving the moldboard plow, chisel plow, disk, field cultivator, or combination tools**.**

APPENDIX

Background on Surveys

Transects have been used by a number of states to quantify the amount of various tillage systems being used by crop. Although the exact method of data collection and procedure varies, all sought to improve the accuracy of the amount of conservation tillage by county.
Cropland surveys designed to estimate the amount of conservation tillage being used on the land are a relatively new concept. The Conservation Technology Information Center (CTIC) initiated the annual National Crop Residue Management Survey in 1982. The data gathered for this national survey usually involved a meeting of minds and data. NRCS field office personnel (usually district conservationists) in each county were annually urged to utilize area agricultural statistical data and meet with others who may have information to arrive at "best estimates" for the national survey. NRCS district conservationists are often assisted by soil and water conservation district personnel, county extension agents, agribusiness, local farm organizations, and other interested parties to complete a survey form that denotes these best estimates, which are generally based on personal knowledge.

Another survey conducted on a national basis is the 5-year NRCS National Resources Inventory (NRI). These data are collected on some 22 parameters, including physical characteristics of the land and the effects of agronomic practices on soil erosion. The NRI is a "point" survey method, where points correspond to random locations within a field. The first NRI in 1977 contained limited data on conservation tillage systems, as did subsequent surveys in 1982, 1987, 1992, and 1997.

Use of the NRI to estimate accurate acreage of conservation tillage or to document annual cropland trends in a state or county is greatly limited. The NRI has proven valuable in development of national resource policies.

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