EM 8558 • Reprinted January 1994

Whole Farm Case Studies: A How-To Guide

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Agricultural scientists recognize farmer knowledge and experience can provide important contributions to the development of new agricultural technologies. However, insufficient use has been made of this valuable resource because farmer knowledge and experience are difficult to collect, quantify, and evaluate. Some agricultural scientists argue that farmers' experiences and observations are unique to a specific site or situation, and information learned is not transferable to others. Scientists rely on research-based information derived from replicated experiments that are, for the most part, reductive in nature. Farmers, on the other hand, often question the relevance of small, controlled, and replicated plot research conducted on research stations rather than farms under normal farm constraints. The discussion about the relevance and value of scientific agricultural research and farmer knowledge quickly becomes complex.

How can scientists and farmers work together to incorporate their collective knowledge to make agricultural research more efficient and effective? One approach we have used is whole farm case studies (WFCS). Case studies offer a systematic means of compiling information in complicated areas of human endeavor, providing useful observations that go beyond the range of controlled experiments. Whole farm case studies can be used as a complement to, but not a replacement for, other methods of research. Whole farm case studies contribute the most when they are part of a larger research and extension program.

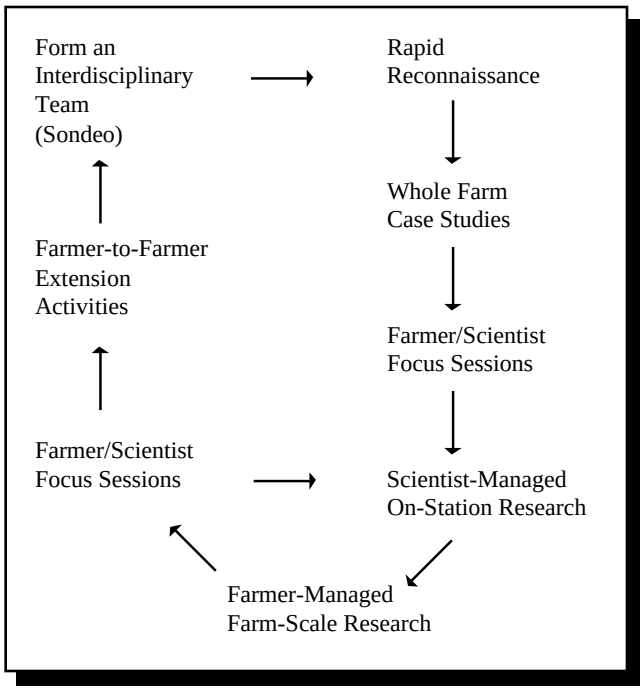

Figure 1.—*The western Oregon and Washington model for increasing farmer involvement in research and educational activities.*

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OREGON STATE UNIVERSITY EXTENSION SERVICE

Figure 1 shows how WFCS fit within a program in western Oregon and Washington that seeks to increase farmer participation in research and extension activities. This publication provides practical suggestions for design and management of whole farm case studies, using examples from a 2-year study conducted in western Oregon and Washington.

What are Whole Farm Case Studies?

A whole farm case study is a systematic examination over time of the biological, social, and economic factors of an entire farming system. The process is an examination of interactions among production practices, economic status, business management, and interrelations of farmers and employees. Because WFCS are designed and conducted to better understand entire systems, they are best conducted by interdisciplinary teams representing a diversity of fields within the biological and social sciences.

Whole farm case studies rely primarily, although not exclusively, on qualitative information difficult to obtain from controlled experiments. Case study research may reveal what traditional agricultural research cannot, and therefore is an excellent complement to quantitative research and economic analysis.

The case study approach has been used extensively in business, economics, and medicine. In agricultural situations, case studies can be conducted to develop a better understanding of a variety of production systems, human interactions within these systems, and identifying research and extension needs. The process also can serve as an important early step in forging new working relations among farmers, researchers, and extension personnel.

In April 1989, we began a study of 16 farms in western Oregon and Washington. The goal of our study was to develop a better understanding of farming systems, and to set directions for future research and educational activities in our region. The goal was not to compare farms within the study group; instead, we focused on different approaches to solving similar problems and farmer-developed innovations. We selected small fruit and vegetable farms in western Oregon and Washington for the study, and invited a variety of scientists representing a diversity of agricultural and social sciences to participate.

Conducting the Study

An advantage of the WFCS framework is the great flexibility within the process to address specific needs, interests, and goals of the participants.

The overall framework includes the following steps:

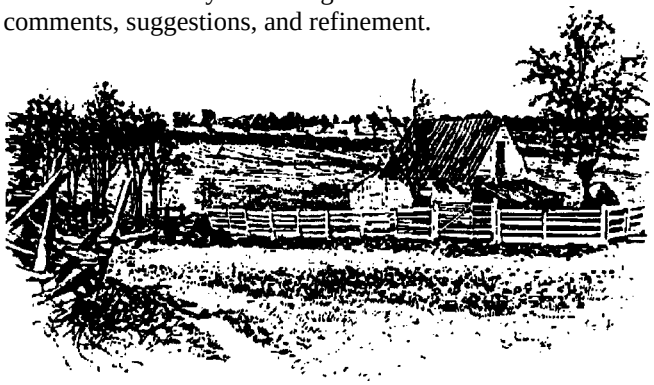
1. Develop an interdisciplinary team.
2. Design the study.
3. Collect and analyze the data.
4. Report results.

Developing an Interdisciplinary Team

Participation of biological and social scientists in the development and implementation of WFCS is critical to the success of a study. The interdisciplinary nature of the project requires a major time commitment by the individuals involved. The time commitment can be a serious limitation in recruiting individuals to participate. However, team members participating in the Oregon/Washington WFCS project stated that, despite the time commitment, the interaction with other team members provided them with new perspectives and enabled them to better see how their disciplinary expertise fits within farming systems.

Forming a Core Group

It's difficult for a large group of people to make complex decisions about the directions and course of action for a whole farm case study. Instead, a smaller core group can establish the basic design and overall objectives of the study. The core group should be composed of biological and social scientists to frame the study and outline areas of expertise necessary to conduct it. In the early stages of development, it's also appropriate to invite farmers to meetings to discuss goals, expected outcomes, and to provide direction for the study. Inviting farmers to participate during the early stages helps provide an integrated, farm-level perspective. The core group can then present a proposed outline for the study to the larger team for comments, suggestions, and refinement.



Areas of Expertise

The WFCS Team should include a wide range of disciplinary expertise to develop an understanding of the complex interactions of the farms in the study. The objectives and purpose of the study will determine the appropriate areas of expertise to include.

Because of our study goals, the Oregon and Washington WFCS team included individuals with expertise in agricultural economics, agronomy, anthropology, ecology, entomology, family studies, farming systems research and extension, home economics, horticulture, marketing, plant pathology, soil science, and weed science.

Team Size

The size of the study team is an important decision. Too small a team limits the available expertise, while too large a team may prove to be inefficient and frustrating for team members and farmers, resulting in a lack of commitment to the project. In the Oregon/Washington study, we had about 10 people working on the WFCS in each state. Because the study was conducted in two states, we chose to form separate teams in each state with similar areas of expertise. A single team to conduct the study would have been preferable, but travel time and expense considerations ruled out this option. To assure continuity, the project coordinator made all visits to every farm. Three other team members visited all 16 farms at least once during the study. Based on our experience, we think a team size of 6 to 10 people works well.

Coordination

Because of the complexity of the effort, it's essential to designate a project coordinator. If a single individual cannot be designated to fill this role, organizational tasks must be divided among team members. In our study, we found it necessary to have one person oversee the logistics of the study. The project coordinator was responsible for organizing meetings, making appointments, distributing project materials, arranging transportation, and carrying out other organizational tasks. In our study, the project coordinator committed approximately 50 percent of her time to the project for 2 years. It was a big time commitment, but we would not recommend a large study be conducted without this level of commitment.

Team Building

Team building is a continual process. At the beginning of the study, all team members should meet (one meeting or, ideally, a series of meetings) to identify team and individual goals and expectations. The early meetings allow team members to spend time getting to know each other and to understand each other's areas of expertise. For example, a soil scientist may understand the role of entomology in agricultural systems, but may not understand what a sociologist contributes to the study. To be effective, team members need to understand what each discipline contributes to the understanding of the farms. Communication across disciplines helps team members challenge their assumptions and gain new perspectives and insights into the farming systems under study.

Regular meetings to discuss findings, ideas, observations, and areas requiring further inquiry are important. A record of interaction between team members can help identify important connections useful in the analysis of the farms. We tape recorded and transcribed several of the debriefing meetings after farm visits. The transcripts allowed team members a chance to review the information and discussion at a later time.

Sometimes, distance and time considerations do not allow the entire team to meet in person to work on and discuss the project. We found telephone conference calls an effective way to meet, saving travel time and helping to lower the overall cost of conducting the study. Initially, telephone conferences were difficult to conduct, but we gradually became more comfortable with the format and found them to be quite effective.

Designing the Study

During the design phase, it's important to clarify the purpose and anticipated outcomes of the study. The study design needs to be flexible enough to allow for modification as new information emerges. Few studies will be carried out exactly as planned. In some respects, the process of conducting the study is one of the products of the exercise. It's important to have a plan, but it's equally important to recognize that the plan will change over time. Flexibility is a key to success.

In the Oregon/Washington study, we started with broadly stated goals and objectives and became progressively more specific. We wanted to identify sustainable production practices and cropping systems of

small fruit and vegetable operations in western Oregon and Washington. We decided to focus on pest and soil management strategies, and the social, biological, and economic factors that influence farmers' decisions.

Whole farm case studies generate a tremendous amount of information, most of it qualitative. While there is no standard format for designing and conducting WFCS, there are some important factors to consider:

- purpose(s) of the study,
- available time and budget resources,
- expertise of team members,
- interdisciplinary goals and expectations, and
- duration of the study.

Figure 2 outlines the methodology used in the western Oregon and Washington case study project. Once the objectives of the study are delineated, specific procedures to obtain the information desired must be established. For example, reviewing the literature, developing a time line for conducting the study, and listing information needs and methods to obtain the information can help clarify the process. Circulating the study time line to team members for comment and review forces team members to know their roles and responsibilities in the study.

Figure 2.—*An overview of the procedures used in the western Oregon and Washington whole farm case study (WFCS) project.*

Procedures

1. Form an interdisciplinary implementation team.
2. Obtain team agreement on overall study design.
3. Conduct sondeo to identify potential farmer participants.
4. Select farms for the WFCS.
5. Plan information needs and determine appropriate methods to obtain the desired information:
   - production system information;
   - social and economic information;
   - identify areas of expertise needed to analyze information collected.
6. Schedule visits to farms.
7. Analyze preliminary data.
8. Conduct Farmers' Forum to present preliminary findings and solicit ideas and reactions to findings.
9. Report findings.
10. Determine whether to continue farm monitoring or to end project.

Identifying Farmer Participants

The selection of the appropriate set of farms to study will depend on the goals of the effort. For example, if a team wanted to study a specific production constraint in a given cropping system, it might choose several farms of the same size, growing region, and crop mix. In the western Oregon and Washington study, our goal was to examine a wide range of vegetable and small fruit farms with varying production practices, acreage, management styles, and economic status. Part of the identification process includes establishing a list of selection criteria based on the goals of the study.

Methods of identifying farmer participants may include suggestions from team members, extension agents, farmers, farmer groups, or consultants. Before asking for names of farmers, it's important the purpose of the study be defined. In the Oregon and Washington study, we were looking for vegetable and small fruit operations where the principal operator had been involved with commercial farming for a minimum of 3 years. Additionally, we were looking for farmers who (in the opinion of the individual suggesting the farmer as a participant) appeared to be using or attempting to adopt innovative agricultural practices, and for farmers potentially willing to cooperate in future project activities.

To gain an accurate view of the farming operation, it's necessary to talk with as many partners, key employees, and family members as possible. Not everyone associated with a farm has the same perspective, views, or opinions about how the farm is run. Case 1 provides a few examples of what we learned about why farmers do what they do. Once we identified farmers potentially willing to participate, we scheduled a visit to each farm. We used a rapid appraisal technique known as a "sondeo." The sondeo method is commonly used in farming systems research and extension (FSR/E) programs. In Spanish, "sondeo" refers to the act of sounding, exploring, and fathoming. In a sondeo, interdisciplinary teams of social and agricultural scientists conduct informal, unstructured interviews with farmers. A sondeo can provide a rapid, preliminary

sketch of the farm systems under study and does not seek to provide the same type of statistical data commonly reported from more conventional research methods.

The primary difference between a sondeo and a whole farm case study is duration and depth. Sondeos are conducted to obtain a quick overview of a variety of farms. Each farm visit lasts 1-2 hours. Whole farm case studies are done to gain an in-depth understanding over a longer duration. A sondeo can be used to identify potential cooperators and to set in motion longer-term research and extension efforts that rely on direct farmer participation.

In the sondeo portion of the Oregon/ Washington WFCS, we interviewed people at 25 farms. At each farm, we asked participants to identify:

- problems and constraints,
- the role of family members in the operation,
- their opinions on research needs and environmental issues, and
- their response to change of agricultural policies and consumer preferences.

We then described the whole farm case study we were planning and asked farmers if they would be willing to participate in a longer-term study of their operation.

In our experience, the sondeo proved to be an effective method of collecting information and identifying farmer participants. The sondeo also served as an important first step in forging new relations among farmers, researchers, and extension personnel.

Data Collection

It's important for the team to list the primary data needs and to consider what will be done with the information once it's collected. After data needs are outlined, the team needs to identify the appropriate means of collecting the information. Using multiple methods and sources of obtaining information is a major strength of case study research. For example, data collection techniques might include observation, open-ended questions, structured interviews, or plant and soil analysis.

Taking accurate and copious notes is important to the process of documenting the farms. More than one person should be responsible for recording information. Differences in backgrounds, scholastic training, and areas of interest influence what individuals deem worthy of recording. When only one person takes notes, valuable information is lost. Ideally, all team members will record both information reported by the farmers and their observations of each farming operation. Copies of notes or reports should be given to the project coordinator for compilation and distribution to other team members.

In the Oregon and Washington study, the first two WFCS visits were fairly unstructured, but focused primarily on production issues. We asked questions about production practices such as row spacing, equipment, and pest problems. Figure 3 outlines the general topics of discussion for these two visits. For the production-focused questions, we designed note-taking forms listing specific topics to investigate. The forms left plenty of room for individual team members to take notes. We also learned a lot about farmer-developed innovations. See Case 2 for an example.

Establishing Rapport and Trust

The Oregon and Washington team felt it was important to establish a rapport with the farmers before delving into some of the more personal aspects of the business structure and operation. Because farming is such an integrated process, we learned much more than we had anticipated about labor issues,

Case 1. Understanding Farmers' motivation for cropping decisions

It's important to understand farmers' motivation for action before evaluating whether or not the action "makes sense." For example, crop acreage decisions—and subsequently, marketing outlets—are made on a number of factors besides profit considerations. Many farmers in the study grow crops with a marginal profit return in order to extend employment for laborers throughout the growing season. One grower is planning on adding nursery stock to his operation in order to keep his "best workers" employed throughout the year. Another in the study continuously plants strawberries on a field near their farm market stand not because they don't recognize the impact and benefits of crop rotation, but because it's such a boon to the marketing of their strawberries.

Another farm family in the study began growing broccoli several years ago in order to provide employment for teenagers in their rural area. They currently employ about 30 local high school kids to harvest broccoli from early July until the time school starts in the fall.

These examples emphasize the importance of talking with farmers about why they do what they do, rather than only talking to them about how they grow specific crops or where they market their produce.

marketing strategies, business organization, farm economics, and family involvement in the farming operation during our first two visits to the farms.

Later visits to the farms focused on the social and economic aspects of the operation, including things such as the economic status of the operation, off-farm employment, insurance coverage, and family relationships. We used an open-ended questionnaire developed for this purpose to capture the intricacies of each farming operation. Figure 4 presents a list of potential topics to cover during the social and economic phase of the study.

Data Analysis

Analyzing collected data should be an ongoing process. Shortly after completing a cycle of farm visits, team members should prepare written reports and then meet to discuss the findings with the entire team. At this meeting, the interdisciplinary team shares observations, and the group as a whole attempts to identify themes, trends, similarities, and differences among the farms visited. For example, the team may discuss the association of farm size with risk aversion, or family involvement in the operation with cropping patterns.

During debriefing sessions, it's important to keep notes of associations identified. In our study, the debriefing process led to development of research hypotheses and helped provide ideas for educational activities. On-farm and experiment station trials identified during the WFCS are now being conducted. Examples include cover crop variety trials, rearing and releasing beneficial insects in the field, and crop rotation studies. Educational activities including workshops, conferences, and newsletters provide information on topics learned through the case study process. For example, workshops for farmers and other agriculturalists have focused on:

- production practices information,
- estate planning,
- family business management,
- a variety of marketing approaches,
- innovative labor management strategies, and
- food safety issues.

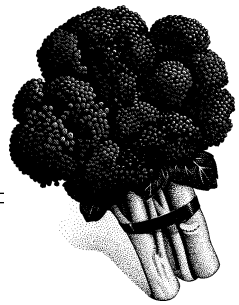
Analysis of qualitative information can be difficult and time consuming. Several good references are available to help determine how to accomplish your goals. A key to conducting successful qualitative studies is keeping accurate notes and carefully recording information learned.

Case 2. Innovative vegetation management in a broccoli production system

In the Willamette Valley, it's common for farmers to use a preplant incorporated herbicide, usually trifluralin (Treflan), to help control weeds in broccoli fields. Additionally, growers usually end up doing some hand-hoeing or cultivation to control weeds not killed by the herbicide. In some cases, Treflan has been known to adversely affect crop growth and yield. Because of this, one grower in the study made the decision to change from a primarily herbicide-oriented weed control program to one that relies primarily on cultivation to control weeds between rows. He direct-seeds all of his broccoli, and does in-row weed control while plants are being thinned. He uses a row spacing system of 38-34-34-38: 2 rows planted 34 inches apart, with 38 inches between the next set of rows. This system is based on the wheel base of his tractors. When he first implemented this system, he used an in-row spacing of 10 inches between plants. However, he notes consumer preferences are changing and smaller broccoli stalks are desired. To accommodate this change in the marketplace, he now thins to 6.25 inches between plants to get smaller-stalked broccoli.

When he stopped using herbicide on his broccoli plantings, the farmer noticed a weed shift in some fields. Chickweed, *Stellaria media*, a winter annual that normally was suppressed by Treflan, began to grow aggressively in some of his fields about harvest time. He sought information about the weed and determined that it wouldn't interfere with crop growth or harvest, and that it had potential to be a "free" winter annual cover crop. Since that time, he has encouraged the chickweed to grow by timing the final cultivation to not interfere with the establishment of the weed. After the last crop harvest, he mows the broccoli plants off just above the height of the chickweed, and allows the chickweed to become the dominant species in the field over the winter. The chickweed begins to die off as warmer weather arrives and is easily disked into the soil in the spring when he prepares a seedbed for the following crop.

Because of the involvement in WFCS, the farmer and university scientists are discussing and examining possible interactions—positive and negative—between chickweed, plant diseases, and crop growth and management.



Reporting

Results can be shared in reports, newsletters, displays, presentations, and journal articles. Additionally, it can be effective to bring all of the participants together in a "Farmers' Forum" to share production, marketing, and management ideas and experiences, and to obtain reactions to preliminary findings and final results of the

Figure 3.—*Suggested general information to collect about each farming operation.*

General Farm and Household Description

Farm size
Cropping mix and history
Soil types and topography
Marketing strategies
Family profile
Farming background
Perceived strengths and weaknesses

Production Practices Information

Cropping history and current mix
Crop rotation strategies
Livestock management
Equipment access
Pest control measures and prevention mechanisms
Sources of information
Perceived problems and barriers

Figure 4.—*Suggested social and economic information to collect about each farming operation.*

- Roles of family members in the farming operation
- Off-farm employment of family members
- Changes in roles, responsibilities over time
- Commitment to and identity with farming as an occupation
- Sources of business management information
- Estate plans
- Personal and business goals
- Household management
- Food procurement, utilization, and consumption habits
- Involvement in community and agricultural organizations
- Land holdings (leased, rented, owned)
- Equipment, building, and land values
- Capital sources
- Labor
- Business organization—proprietorship, incorporated, etc.
- Insurance coverage
- Business record-keeping system

study. The forum also can be used to refine research and education proposals for future projects.

Midway through the Oregon/Washington study, we scheduled a half-day Farmers' Forum and invited participants from all 16 farms to attend. During the forum, university team members presented an overview of preliminary findings from the whole farm case study visits. Some farmers participating in the study were asked to describe a unique aspect of their operation to the group. For example, several farmers employ innovative labor management strategies the team felt would be of interest to the other farmers. We asked some farmers to discuss their pest management or marketing strategies. And finally, we outlined some ideas for research and extension activities and asked farmers for their opinions on the proposed topics, methods, and approaches.

Pros and Cons of the Case Study Approach

The logistics of conducting this type of research can be challenging. Merely scheduling a day when team members can visit farms at a time convenient for the farmers is a time-consuming job. WFCS research also is expensive, primarily because of time involved with planning, data collection, discussion of findings, analysis, and reporting. The institutional "rewards" for conducting this type of research may be limited. Some people in the scientific community do not view case study research as a legitimate type of study because it's not quantitative. However, many refereed journals are beginning to accept articles on qualitative research, and some institutions are encouraging and rewarding interdisciplinary work.

The process of conducting WFCS improves communication among a wide group of people. Team members gain better understanding of the complexity of farms. A series of farm visits gives team members a chance to examine entire farming operations, not just components of agriculture within their area of expertise. Interdisciplinary teams increase awareness and bring new insights to farmers, researchers, and extension personnel. And the process identifies farmer-developed innovations.

Whole farm case studies are most useful when conducted with other research and educational activities. For example, WFCS can help formulate hypotheses and identify research topics, but they cannot substitute for

other forms of scientific research. When used as a single tool in a project, their value diminishes because much of the information learned will not be put to use. They can, however, provide insights into how systems work, and can help identify what is important to clientele. Most importantly, case study research provides an avenue for increasing farmer involvement in research and extension activities.

For More Information

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This originally was issued as a Working Paper in Economics, No. 93-103, funded by two USDA grants: "Information Delivery System for Use in Implementation of LISA Research and Technology" and "Evaluation and Design of Low-Input Sustainable Vegetable/Small Grain and Small Fruit Systems of Western Oregon and Washington."

Extension Service, Oregon State University, Corvallis, O.E. Smith, director. This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.

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