

OFFICIAL

PROJECT NUMBER NE-177 (Rev.)

TITLE Impacts of structural change in the dairy industry

DURATION October 1, 1996 through September 30, 2001

STATEMENT OF THE PROBLEM Dairy farming and the dairy industry are undergoing a tremendous structural transformation. The size, number and distribution of farms are changing. Labor and management structures are changing. Specialization is leading to changes in enterprise combinations. New technologies are changing the mix of capital, land and labor - and require new skills. The transformation has disrupted everyone from suppliers of inputs to consumers of dairy products and from individuals to families to communities, as they all try to adjust.

The problem is change, and not knowing how to manage it. Dairy farm families, dairy handlers, processors, retailers, consumers and communities, state and local officials, and national policy makers struggle to adapt to the changes. Lack of understanding of the changes leads to disorientation, dislocation, inappropriate family and business decisions, inappropriate policies and regulations, inefficient allocations of public and private resources, and losses of livelihood and way of life.

In order to manage change better, we need to know more about the changes, their causes, successful strategies for managing change and what makes some strategies more successful than others. (*See paragraph 17 in Responses to issues.*)

JUSTIFICATION Dairy farming is of national economic importance. U.S. dairy farmers sold \$17.8 billion worth of milk in 1992 - 11% of agricultural receipts (U.S. Dept of Commerce). In New York, Vermont and Wisconsin, dairying is the centerpiece of agriculture, accounting for more than 50% of agricultural income in that year. In California, Michigan, Minnesota, New Mexico, Pennsylvania, Texas and Maryland, it is regionally significant. These states have 3 or more counties in which dairying provides more than 50% of agricultural income.

The dislocation and disorientation resulting from the transformation of the dairy sector has substantial economic costs in mis-allocations of public and private resources. It also has substantial human costs as individuals and families try to cope with the shifting sand on which they discover their lives have been built. Between 1982 and 1992, more than 50,000 dairy farms (U.S. Dept. of Commerce, using the standard industrial classification [SIC]) left dairying. Where dairying is significant, what happens to the dairy farms is important to rural communities.

Conducting this research is urgent because the dairy industry is poised on the brink of extremely rapid and dramatic change. Watershed changes in the economic, social, technological and political environments are underway or approaching. Economic pressures have recently been tremendous. For example, in the 1994 Pennsylvania Dairy Farm Business Analysis, Ford cites a combined decline in profitability of 48% from 1992 to 1994 and cash-flow deficits in 57% of the farms. He then projects 1995 net farm income declining

33 to 50% more and concludes "Many [Pennsylvania] farms will be forced to consider exiting the industry after 1995 due to poor profitability."

Efforts to reduce government spending will take further support away from dairy programs. Abolition or restructuring of milk market orders will dramatically change markets and prices for milk. Free-trade initiatives will bring reductions in import restrictions and export subsidies. The diffusion of rBST and management-intensive grazing, and the rapid emergence of large-scale dairy operations will continue. Concern about environmental impacts of dairy farming is spreading. These changes will impact the whole U.S. dairy industry. Although extremely stressful, they create an unparalleled opportunity to gain understanding of the adaptation process, which will help the dairy industry to make the transformation less traumatic and less costly, to adapt to the new conditions and to flourish.

A key element to solving this problem is unbiased, sound information for planning, decision making and policy making. The private sector is not providing this information and is unlikely to provide it because of the difficulty of capturing the benefits of having and using it.

The structural transformation is national in extent and multifaceted, as is the disruption it causes. The combination of land, livestock, labor, and capital used on dairy farms across the U.S. has changed dramatically in recent years. Farm size and number give some indication. Farm size relates to both characteristics of farms and to their impact on communities. Capital investment, labor and management structure, and technologies used are all influenced by farm size. Environmental impacts of large farms are greater than those of small farms. Thus farm size is a key dimension in dairy-farm organization.

Between 1982 and 1992, average herd sizes on farms with milk cows increased 56% - from 39 to 61 cows (U.S. Dept of Commerce). Land bases, however, increased just 11% - from 303 to 336 acres/farm. In the same period, U.S. dairy-farm numbers (by SIC) declined by 44% - from 165,000 to 113,000. Variation among states is significant. Dairy-farm numbers declined in Texas and Minnesota by 2% and 39%, respectively, in this period. Herd sizes increased 98% and 5% in the two states. Acres/farm declined 5% in Texas and rose 17% in Minnesota. Upstart dairy state New Mexico actually showed an increase - 9% - in dairy farms and a remarkable 328% increase in average herd size. Thus, the transformation takes on a variety of forms.

The transformation of dairy farming in the U.S. can be traced in part to changes in the economic, social, technological and political environments at the national level. For example, adjusting for inflation, milk prices have declined almost 50% since 1982. The resulting cost-price squeeze has driven dairy-farm families to search for new financial, management and technological strategies on the farm and income-generating opportunities off the farm.

Increases in productivity have led to further declines in milk prices, more searches for new strategies and a long line of technological changes. Advances in dairy nutrition and genetics have increased animal productivity. Dairy rations have become more nutrient dense, making milk production less forage dependent. Mechanization of manure handling has taken the drudgery

out of dairying, made dairying more capital intensive, and increased labor efficiency. The introduction of recombinant bovine somatotropin (rBST) is resulting in increased production among those farmers who have adopted it, lower milk prices in general and in some states a niche market for rBST-free milk (Barham, et. al, 1995). Depending on the extent of rBST's diffusion, it could accelerate the trend toward fewer and larger dairy farms.

Other changes have been regionally based. Dairy manufacturing has shifted westward. Urban and suburban development pressures are problems in the Northeast and southern California. Water-quality concerns have stimulated regulation in northern states, air quality in the Southwest. Regulations on handling and disposal of manure differ, based on both community values and physical environment. Differences in cost structures of current dairy operations (based on soil, climate and current organizational structure) support different reinvestment and growth strategies. Labor markets off the farm vary enormously. The North American Free-trade agreement (NAFTA) will not affect states all states equally. Its most immediate impact may be to provide a market for surplus milk (Barham, Cornick and Cox), although the recent financial collapse in Mexico may dampen their import demand for a few years. The southwestern states that border Mexico are most likely to see farm structure change in response to increasing demand for milk. Large-scale dairy farms (with more than 1,000 cows) are becoming the norm in the West and Southwest. After 15 or so years of divergent evolution, the recent emergence of large-scale farms in traditionally small-farm (with less than 100 cows) areas such as the North Central and Northeast regions suggests that dairy farming across the country may be converging (Skidmore). No simple generalizations can be made at the national level.

The results of the changing operating environment can be seen nationally in the decline in dairy-farm numbers and growth in farm sizes, as the remaining farmers compensate for shrinking profit margins. The impacts of the changes in the operating environment vary. Consumers, some processors and some farmers have benefited. Other farmers, some input suppliers and some service providers have born heavy costs as they have closed their businesses and left chosen ways of life.

Dairy farms also influence the communities around them. The more dependent a community is on dairying, the more the community will be affected by changes in dairying. Impacts vary as farm numbers, tax bases, school populations and so on change. Community organizations and municipal governments will be impacted because many dairy-farm families are active in them. A dramatic decline in farm numbers can reduce milk supplies available to local processors, as well as reducing demand for goods and services from input suppliers and retailers (Love). It can tear asunder the basic social fabric of the community. Financial stress on farms has led to divorce and suicide. Social-service agencies may see case loads rise. Other government agencies are also impacted by the transformation. At the other extreme, dramatic growth - probably in herd size rather than farm numbers - would lead to expansion in demand for other goods and services, as well as the need for more hired labor. Milk processors, which face considerable economies of size, would have abundant supplies. In this case, the social fabric may also change dramatically, but in an expansive way. Changes in

farm structure can have major effects on the economic and social condition of rural communities and businesses.

A cooperative approach to this problem is both advantageous and necessary, because the transformation of the dairy industry is complex and national in scope. The complexity of the operating environment and the structural-change process means that efforts to untangle the contributions of the various factors will be significantly enhanced by taking an interdisciplinary approach.

Many of the changes in and around the dairy industry affect the whole country. Some of the changes are regional, however. The nationwide scope of the transformation means that, by cooperating, duplication of effort can be avoided and efficiency can be gained. Regional differences provide opportunities for making contrasts that could not be made within a state. The broader range of data will extend understanding of farm-environment-community relationships and allow more robust models to be developed. (See *paragraph 13 in Responses to issues.*)

The primary benefit to this work is improved management of structural change in the dairy industry. In order to manage the structural transformation better, we need to know what changes are occurring, what is causing them, what are more successful strategies for managing change, and what features and conditions make some strategies more successful than others. For farmers, processors, and input or information suppliers, the transformation raises questions about best ways to manage operations and plan investments. For agricultural policy makers and professionals, the transformation creates demands for effective responses and useful advice at many levels. For communities linked to the dairy industry, strategies for making the most of the opportunities and changes will be of interest. Documenting successful strategies for managing change and understanding what makes them successful will allow both industry and community members to manage change more successfully themselves. (See *paragraph 19 in Responses to issues.*)

This project will improve understanding of the transformation process, identify successful strategies for change and continue development of a conceptual model of the farm-environment-community interaction. Information generated will help members of the dairy industry to anticipate and solve problems, and make better plans. Practical lessons and experiences can be shared. The information will be disseminated through the three disciplines participating - rural sociology, animal science and agricultural economics. Many of the project members have extension, as well as research, appointments. Thus, results of the work will be circulated through journal, regional, extension and popular publications. Agriculture-related businesses (Kurtz) and members of the press (Quaife) are already looking for information on the changing structure of agriculture and will extend its circulation. The national extension initiative "Managing Change in Agriculture" (described below) is another outlet.

The proposed research is central to two current priorities identified by the Cooperative State Research, Education, & Extension Service (CSREES) of the U.S. Department of Agriculture. In October, 1995, CSREES established a new national extension initiative "Managing Change in Agriculture." This

initiative is based on "prospective changes in farm legislation and other major changes impacting the agricultural sector right now" (Bahn). Among the major changes are reduced federal programs, increased globalization of markets, accelerated industrialization of agriculture, new technologies, more powerful information systems, increased environmental concerns, more demanding consumers and changing demographic structure. The mission of this initiative is to help people, firms and communities make important strategic decisions that will enable them to manage successfully during this period of change. These people, firms and communities will, among other things:

- " - Develop effective strategies to adjust to change;
- Develop integrated systems approaches;
- Carefully evaluate and adopt technology;
- Choose survival and growth options using innovation and science-based knowledge;
- Understand and participate in resolution of public issues involving trade-offs between economic returns, environment, community, and other concerns."

The National Research Initiative Competitive Grants Program (U.S. Department of Agriculture, CSREES) has seven research areas. One of them is titled Markets, Trade and Rural Development. Its four program sub-areas are all related to the project described here:

- " assessment and evaluation of the sustainability implications for new production and marketing technologies on the surrounding environment and rural economies;
- " development of innovative research concepts and methods, data sets and/or their application to further the understanding of how technical, economic, and institutional factors affect the competitiveness of the U.S. agricultural, aquacultural, and forest product sectors in domestic and international markets;
- " understanding forces affecting rural areas; and
- " designing new approaches to rural development."

This project will add to our scientific base by expanding knowledge and understanding of the structural transformation the U.S. dairy industry is undergoing, by identifying successful strategies for managing this transformation process and by filling out a model of the farm-environment-community interactions. This approach, using researchers from different states and disciplines to study the complex changes affecting dairy farms, is transferable. Other studies aimed at furthering our understanding of how technical, economic, and institutional factors affect the competitiveness of U.S. agriculture will benefit from it.

While agriculture as a whole is changing, focusing on dairy to learn about the transformation is sensible for three reasons. First, a single commodity is less complicated than all of agriculture. Second, dairy farming is among the most widespread types of farming. It provides an opportunity to observe the impacts of a wide variety of conditions and environmental changes. Third, this period of great change makes dairy farming a productive subject of inquiry. A lot will be happening.

**RELATED
CURRENT AND
PREVIOUS
WORK**

This project rests on a broad and interdisciplinary foundation built by animal scientists, agricultural economists and rural sociologists studying structural change. They have observed changes in farm populations, characteristics, operations and performance, explored relationships among these changes and their antecedents, and begun developing models of the dairy-farm system.

The changing structure of dairy farming in the United States has been characterized by three major trends over the past 50 years. Milk production/cow has increased tremendously, due to advances in dairy technologies and management (Lyson and Gillespie; Gravert). Average herd size has grown, requiring increased amounts of hired labor (Gilbert and Akor). Milk production has shifted from the Mid-west toward the sunbelt (Lyson and Geisler).

Farm structure and structural change vary across the U.S. Considerable state-level diversity exists in dairy-farm size, productivity and organizational characteristics, and in processing-industry structure (Davidson and Schwarzweller, 1995). Differences in productivity growth have been attributed to differences in the classical factors of production - land, labor, capital and management (Lyson and Gillespie). States that have been able to substitute capital and management for labor and land at a faster rate have seen their milk production/cow increase over states with lower rates of substitution. Milk-market structure has been related to the persistence of family operations. Small-scale processors tend to buy from small-scale producers, while large-scale processors capture economies of size by seeking out or attracting large-scale producers.

While the trend toward fewer and larger dairies over the past 50 years shows no signs of abating, family labor operations may persist well into the future, especially in areas with a tradition of family dairy farming (Davidson and Schwarzweller, 1993). In the near term, at least, dairy farming in the U.S. is likely to be characterized by a dual structure of production (Gilbert and Akor; Lyson and Geisler).

Ag economists have conducted many studies of dairy farming. A small subset of them relate closely to dairy-farm structure. A few ag economists, seeking to explain why changes in farm structure occur, have begun building models using a conceptual framework of a farm as a system of interdependent parts. This farm system is frequently organized in representative farms, consisting of resources, enterprises, inputs, outputs and prices. The best farm-structure models incorporate two or three factors that influence structure. Zepeda and others examined associations among farm characteristics, technology adoption and farm structure. With Butler and Carter, she focused on the impact of bovine somatotropin on the California dairy industry. Working toward a whole-farm dairy-systems model, Smith, Klemme and Holmes have linked farm characteristics, production systems, herd performance and financial performance. (See *paragraph 11 in Responses to issues.*)

Others, not working directly on model development, have related farm structure and characteristics to one or more antecedents. Technology has been one theme. Carley and Fletcher, for instance, found that both farm

ownership arrangements (i.e., sole proprietor, partnership and corporation) and geographical characteristics were related to technology adoption and milk yield. Others have noted that cost-reducing, as opposed to production-enhancing, technologies and practices have been adopted more rapidly by smaller operations. The less capital-intensive operations using rotational grazing or purchasing all their feeds have been profitable for some producers in the current economic environment (Barham, Chavas and Klemme; Welsh). Bauman related three alternative feed-acquisition strategies to cost of production and size on Minnesota dairy farms. He suggested that the lower costs of purchased-forage operations may partially explain why the upper-midwest share of milk production is declining.

Ag economists and rural sociologists have related human resources to farm structure. Some of the work has focused on the concept of human capital, linking personal characteristics to management behavior (Rahm and Huffman). Ag economists working in the human-resource-management area have recognized the impacts of both human capital and organization on farm performance (Milligan, 1993).

A number of authors have examined on- and off-farm work of husbands and wives. Lyson (1985), Meara, and others have shown these labor allocations and other variables of social organization at the farm-household level to be related to enterprise mix, production system, mechanization, farm size, gender roles, age, education, off-farm demand for labor and farm income. The accessibility and availability of off-farm employment opportunities affect decisions to pursue particular agricultural enterprises (Lyson, 1986). Labor-intensive operations such as dairying require full-time, year-round labor and are not generally conducive to part-time farming strategies.

Some of the links between dairy farms and the surrounding social and business community and economic environment have been noted. In one community in Minnesota, Love observed that small farms interacted more with local businesses than large farms, and dairy farms interacted with these businesses more than cash-crop farms. Davidson and Schwarzweller (1993; 1995) noted that local processors are a key to the viability of dairy farming in a region and dairying may be one of the best ways to maintain the economic base in economically marginal regions. Morse et al. examined economic flows between dairy farms and the rest of two communities in Minnesota, while conducting rural-development programs aimed at retaining and expanding local businesses, including farms.

The influence of policy on farm structure has been another concern. Gladwin and Zabawa noted that price supports, other state and federal government programs, access to markets, and agricultural infrastructure affect farm structure. Dellenbarger et al. related changes in dairy-farm structure in Louisiana to changes in market conditions and to agricultural policy. Kaffka and Milligan (1989) noted that in addition to modern technologies, appropriate management practices and local value-added processing, policies that deliberately create positive externalities are also needed to sustain dairying.

Besides the models noted above and the usual survey and interview methods, some investigators have used the panel methodology proposed here for studying structural change. Since 1907, Stanton and others have maintained

a dairy-farm panel in Dryden, New York to track changes. Frese established farm-operator panels in Mississippi for a wide variety of projects, examining structural change among them. Panel studies are a powerful, although complicated methodology (Babbie; Blalock) - often as close to experimental conditions as social scientists get.

A search of the CRIS database yielded 13 state projects and eight regional projects relevant to the proposed work. Eight of the state projects are contributions to the NE-177 project and will not be discussed here. Five of the regional projects are production oriented. Of the three social-science or multi-disciplinary projects, one has terminated, one is NE-177 and the other is actually an information-exchange group, rather than a research project.

While three of the state projects are complementary, none duplicates the work proposed. Yonkers and Ford are building a farm-level model for relating dairy-farm structure to technology, the economic environment and government policy in Pennsylvania. Zepeda is developing a model that links technology and policy to structural change. Stanton, Casler and Knoblauch are using farm-level data from Illinois, Missouri, New York and Ontario to examine farming practices, size, environmental impacts and economic performance. Their objectives include identifying likely changes in the structure of the dairy industry over the next 2 decades. All three projects are missing both the human resource as a factor of farm structure and community impacts. Besides covering limited geographical areas, all three projects are missing both the human resource as a factor of farm structure and community impacts. Zepeda's and Stanton's models exclude the social and economic environments.

Other work continues on sub-systems. Pelsue is projecting the potential impact of seasonal dairying on the New England milk market. Two studies deal with impacts of farm structure on communities. Kelsey is relating changes in land use to local government finances in Pennsylvania. Levins is relating sustainable agricultural practices to environmental quality and rural-community viability in Minnesota.

Several regional research projects on dairying and the structure of agriculture exist or recently ended.

NC-119	Dairy herd management strategies for improved decision making and profitability
NC-185	Metabolic relationships in supply of nutrients for lactating cows
NC-198	Identification and analysis of issues influencing the competitiveness of the U.S. Dairy industry
NE-112	Resistance to mastitis in dairy cattle
NE-132	Environmental and economics impacts of nutrient flow in dairy forage systems
NE-148	Regulation of nutrient use in food-producing animals
NE-177	Organizational and structural change in the dairy industry
S-246	The transformation of agriculture: resources, technologies, and policies

NC-119, NC-185, NE-112, NE-132 and NE-148 are production oriented and will not be discussed here.

NC-198 is actually an information-exchange group, rather than a research project. The exchange group focuses on impacts on the dairy industry as a whole, rather than impacts on farms and communities. It functions by organizing workshops and seminars to share research findings and facilitate collaboration, rather than by organizing joint research activities.

NE-177 is the project proposed for revision here.

S-246 has just been concluded. It covered all of agriculture. While it did consider the influences of policy and technology on farm structure and of farm structure on the surrounding community, it did not consider the roles of the human or other farm resources, or social or economic environments in determining farm structure.

In summary, the literature identifying factors and conditions that affect dairy-farm organization and business outcomes is abundant in both production and social sciences. Investigators from animal science, agricultural economics and rural sociology have looked and are looking at structural change in the dairy industry, examining how and why it occurs. The underlying goal of much of this work has been understanding the change process.

The work has progressed to the development of partial models of the antecedents and consequences of structural change. The models have not yet been extended to cover the array of factors recognized to contribute to farm structure. As we move from understanding structural change to managing it, we need a comprehensive model of the antecedents and consequences of change. Technological, economic and political environments have been combined in models. The human resource, social environment and community are missing from these models.

A conceptual framework for a more comprehensive model - a farm-environment-community model - is being developed in the NE-177 project. It is based on the premise that farm organization is a function of characteristics of 1) resources on the farm and 2) the environment around the farm. The resource characteristics are internal factors and include characteristics of physical resources, such as soil drainage, and characteristics of human resources, such as training and goals. The environment around the farm includes the economic, social, political and technological environments, which are external factors. Farms are interdependent with their communities. Changes made on farms will also have impacts on the communities.

We now know what many of the pieces of the conceptual framework are. Some pieces, however, are not yet ready to put in the framework. Many of the examinations have been limited to a state or community. Many have focused on individual factors, rather than a class of factors, e.g., management-intensive grazing, rather than technology. To complete the conceptual framework, we need to fill out these categories and add the missing components. The next thing to do is develop a data set that includes the full range of factors and conditions influencing farm structure, using enough geographical areas to represent the range of conditions existing in the U.S.

With all the pieces, we will be ready to put the conceptual framework together. (See paragraph 3 in Responses to issues.)

- OBJECTIVES**
- 1** Determine the interrelationships among and relative importance of social, economic, technological and political environments, regional conditions, and entrepreneurial strategies affecting restructuring of the dairy industry in different dairy localities.

(The following states have agreed to work on this objective: Kentucky, Maryland, Michigan, Minnesota, New York, Ohio, Pennsylvania, Texas, Wisconsin.)
 - 2** Identify, examine and assess the effects of structural change in the dairy sector on local communities and related enterprises.

(The following states have agreed to work on this objective: Kentucky, Maryland, Maine, Michigan, Minnesota, New York, Pennsylvania, Texas, Wisconsin.)

PROCEDURE These procedures may be adjusted if more efficient or powerful methods of achieving the objectives are identified.

Procedures for Objective 1

To assess the dynamics of change at the farm level and provide information for completing the conceptual framework for the comprehensive model of farm structure, a coordinated, multi-state, multi-community panel study will be organized, secondary data assembled and key informants from the communities interviewed.

Each participating state will establish at least one panel of 30-50 dairy-farm families who are willing to participate in a 5-year study and who live in a dairy-farming community or contiguous area. The first community selected in each state will represent the mainstream of dairying in that state, socially and economically dependent on dairying. Second communities may represent other interesting, relevant and research-worthy situations. Rationales for selecting communities will be reviewed and ratified by the Committee. (See paragraphs 3, 5, 6, 14, and 17 in Responses to issues.) Five data-collection efforts will be conducted with these panels - a baseline survey, follow-up surveys, exit and entrance interviews, and off-year censuses. Data collected in the baseline survey will include farm characteristics, practices, operations and performance, labor, management and family structure, entrepreneurial strategies, family and business goals, perceptions and priorities, economic conditions, and non-farm employment. Both current status and changes in the last 3 years will be obtained. Follow-up surveys will focus on changes made, planned or observed in the above data categories, including new investments and major renovations. Entrance and exit interviews will be quite similar, focusing on why the family entered or exited dairying. Data will include perceptions of future economic conditions, current and expected farm performance, and special events (such as marriage, injury and death). The off-year censuses will note entrants, exits and major reorganizations occurring between years 1, 3 and 5. (See paragraph 15 in Responses to issues.)

These data-collection activities will be jointly planned and implemented. Wisconsin will lead a sub-committee charged with designing and producing common survey instruments and coordinating field work. Texas will provide advice on design to ensure statistical validity and provide for ease of data handling. (See *paragraph 7 in Responses to issues.*) Survey materials will be centrally produced. Implementation will be synchronized. (See *paragraph 8 in Responses to issues.*) Surveys will be conducted in winter, starting with 1996-97 for the baseline survey. Participating dairy farmers in each state will be interviewed directly or by phone a minimum of three times over the 5-year period. Entrants and "exiters" will be interviewed as they appear. Data management and analysis will be coordinated by Texas. (See *paragraph 8 in Responses to issues.*) Data will be summarized and analyzed initially at the state level. They will then be pooled in a common data set in Texas for further analysis.

To characterize the social and economic environments in the communities studied, secondary data will be assembled and key informants interviewed. Secondary data will provide characteristics of the local population and economic activity. Key informants will provide information about changes in infrastructure and other aspects of the operating environment, e.g., establishment of a cheese-processing plant, change in dairy-cooperative membership, and change in local or state water-quality regulations.

Secondary data from the Census of Agriculture, City and County Data Book, and other sources will be assembled in New York. These data will be used to formulate specific questions for later parts of the panel study, distributed to the states for in-state reports and analyses, and sent to Texas for merging with the panel data.

Open-ended interviews of county extension agents and other key informants will be designed jointly and conducted in the early fall in each state. Changes in the operating environment will be inventoried and may be used to formulate questions for the panel study. Interview summaries will be circulated among project members. Results will be coded for merging with pooled data.

Texas will merge the secondary and interview data with the pooled panel data. Panel sizes will probably decrease over time, resulting in a non-rectangular panel. Data on community characteristics will allow us to relate changes in the panel to local conditions. (See *paragraph 10 in Responses to issues.*) Using the combined, pooled data, regional analyses will be performed to assess the importance of the various factors influencing farm structure, compare changes in the operating environments, compare responses to the changes and develop statistical models of the relationships between environmental factors and structural change. Retrospective data in the baseline survey will provide a basis for examining the impacts of current changes in the technological, economic and political environments. These will form the basis for mid-project reports. Principles of and generalizations about dairy-farm restructuring will be assembled. They will contribute to development of the conceptual framework for a model of structural change in dairy farms. Later reports will cover factors and conditions influencing farm structure, elements of conceptual models and successful strategies for managing change. (See *paragraph 2 in Responses to issues.*)

Procedures for Objective 2

To assess the impacts of change in farm structure and provide information for defining the community-impact section of the conceptual model, two surveys will be conducted. The first addresses impacts of the changing dairy industry on businesses in the community. The second involves the more general impact of the changing industry on social well-being and quality of life in the community.

The business survey will focus on economic impact of dairy farms, and the size and economic strength of dairy-related businesses. Information obtained will include business activity and performance - percent of business assets and labor in dairy farms, percent of businesses that are dairy related, numbers of customers, levels of revenues, amount of farm-related business, and other impacts of farms. The quality-of-life survey will be drawn largely from standard quality-of-life instruments (Andrews) and will include perceptions of how changes in dairy farms affect their communities, e.g., in environmental quality (air and water), civic welfare (farm-neighbor interactions, characteristics of school systems, sources of community leadership and participation in community activities) and community satisfaction (e.g., satisfaction with community as a place: to raise children; that has what is needed for a happy life; and in which people are helpful). (See paragraphs 4 and 16 in Responses to issues.)

The same states will take responsibility for coordinating activities as for the farm-panel data. Both survey instruments will be developed and produced jointly and will be implemented in the same seasons (second and fourth summers) in all states participating in this objective. Local businesses, farm agencies and community groups (e.g., Kiwanis, Lions Club) will be inventoried and interview subjects drawn from them by purposive sampling. Up to 30 people, depending on the community, will be selected. Local business representatives, bankers, professionals and municipal officials will be interviewed individually and in groups for the business survey. The quality-of-life survey will be given to municipal and school officials, social-service providers and leaders of social, religious, environmental and service groups.

Interview data will be merged with panel data at the state level to characterize the communities studied. They will also be merged with the pooled data from Objective 1 to link changes in dairy farming to changes in the local community and provide data for developing the community-impact part of the model.

OUTCOMES

This study will add to our base of knowledge of how and why dairy-farm structure changes and what impacts the transformation has on communities. Methodologies for measuring community impacts will be developed. (See paragraph 16 in Responses to issues.) Relationships among antecedents and consequences of structural change will be detailed and pulled into a conceptual framework for an integrated model. Results of examining the change process and developing the model will be disseminated through journals, extension and popular publications, extension and professional meetings, and through contacts with consultants and decision makers in the dairy industry.

The primary outcome of this study will be better management of change in agriculture. Current patterns and consequences of change are not inevitable. Information generated will help farmers, managers of dairy-related businesses, local officials and policy makers to make better decisions and plans for adjusting to change. They will be better informed about the sources of change, factors influencing it, alternative strategies for managing it and expected outcomes of following those strategies. Decisions that are based on clear understanding of how and why change occurs will more frequently lead to desired outcomes than those based on anecdotal and incomplete information. (See paragraphs 12 and 19 in Responses to issues.)

Better understanding of the process will result in less dislocation and disorientation among all the people from input suppliers to dairy-product consumers. Awareness of alternative strategies and their outcomes will make rural community development more cost effective and result in a higher frequency of preferred results. Identification of possible outcomes will facilitate the development of public-policy goals, and through them make policy more effective. Recognizing possible outcomes and knowing which strategies lead to which outcomes will allow public- and private-sector decision makers to develop and choose strategies more in accord with their goals. Inappropriate investments and business decisions will be avoided. At the community level, economic growth will be distributed more where communities want it. Anticipation of environmental impacts, clarification of individual and community goals, recognition of both costs and benefits of change, and improved management of change will result in environmental cost levels that are preferred by the community, and more effective and socially desirable levels of regulation.

If the transformation is left unattended, unnecessary human and economic losses will occur. In the absence of solid, unbiased information public and private resources will be misallocated. For example, Western Kansas communities, which have been actively attracting large dairy farms because of their economic multipliers (Spahr), may find themselves in the position of Texas communities, trying to discourage further expansion because of environmental impacts (McIntosh).

ORGANIZATION The NE-177 Regional Technical Committee was organized in 1990. It operates according to procedures in the "Manual for Cooperative Research," dated 1992. The voting membership of the Committee includes one representative from each cooperating experiment station, appointed by the Station Director, and a representative of each cooperating USDA-CSREES research division. Other representatives of participating organizations, including the Administrative Advisor, Administrative Representative and CSREES representative, are nonvoting members. All voting members of the Technical Committee are eligible for office.

The primary role of the Technical Committee is coordinating the work of the project. Annual meetings are held for the purpose of conducting business related to the project.

The offices of the Regional Technical Committee are Chairperson, Vice-chairperson and Secretary. Subcommittees are named by the Chairperson. Two sub-committees will be established at the outset. A Survey

Sub-committee will be charged with designing and producing surveys, and coordinating fieldwork. A Data Sub-committee will be charged with assembling and managing the pooled data set, and coordinating analysis of the data. (See *paragraph 1, 8 and 18 in Responses to issues.*) The Chairperson, in accord with the Administrative Advisor, notifies the Technical Committee of the time and place of annual meetings, prepares agendas and presides at meetings of the Technical and Executive Committees. The Chairperson's responsibilities include preparation of annual and regional reports. The Vice-chairperson assists the Chairperson in all functions. The Secretary records minutes and performs other duties assigned by the Technical Committee or Administrative Advisor.

IMPACTS OF STRUCTURAL CHANGE IN THE DAIRY INDUSTRY

Signatures:

Alfred L. Bann 6/10/94
Administrative Advisor Date

Richard A. Jew 7-22-96
Chairman, Northeast Association of
Agricultural Experiment Station Directors Date

James R. Allen 7/19/96
Chairman, ~~Committee of Nine~~
Regional Research Committee Date

George S. Cofer 9-12-96
Administrator, CSREES Date

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PROJECT LEADERS AND RESOURCES
IN NORTHEAST REGIONAL RESEARCH PROJECT 177

TITLE: Impacts of structural change in the dairy industry

AREA OF WORK CODE: NEC 76

ADMINISTRATIVE ADVISOR: Alfred Barr

CSREES REPRESENTATIVE: Henry Tyrrell

PERSONNEL COMMITMENT TO PROJECT

Location	Participants	SY	PY	TY	Specialty
Ag. Experiment Stations					
Objectives 1 and 2					
Kentucky-U. of Kentucky	L Garkovich*	0.15			Social demography
	P Dyck	0.15			Human res. devt.
	W Crist	0.10			Dairy production
Maryland-U. of Maryland	R Peters*	0.25			Animal physiol.
	Other		0.33	0.30	
Michigan-Mich. State U.	H Schwarzweller*	0.20			Rural sociology
	J Bokemeier	0.20			Rural sociology
	Other		1.00		
Minnesota-U. of Minn.	J Conlin	0.05			Dairy farm mgt.
	W Lazarus*	0.05			Farm management
New York-Cornell U.	T Lyson	0.15			Developmt sociology
	G Gillespie*	0.20			Sociology of ag
	L Tauer	0.10			
	Other		0.25		
Pennsylvania-Penn State U.	C Sachs*	0.15			Rural sociology
Texas-Texas A&M U.	W McIntosh*	0.17			Rural sociology
	Other		0.50		
Wisconsin-U. of Wisconsin	B Barham	0.20			Economic devt.
	T Smith*	0.20			Dairy profitability
	Other		0.50		
Objective 1					
Ohio-Ohio State U.	F Allaire*	0.10			Animal sciences
Objective 2					
Maine-U. of Maine	S Smith*	0.20			Sustainable ag
	Other		0.50		
----- Total		2.62	3.08	0.30	

* Denotes official representative