SUSTAINABLE AGRICULTURE
AS A RURAL ECONOMIC DEVELOPMENT STRATEGY

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A Historical Perspective on Rural Economic Development

The fundamental purpose of economic development in "rural" areas has been realization of private and social benefits from the use of geographically fixed resources. People and money can move from one location to another in response to economic or social incentives. Thus, human and financial resources need not be developed or utilized in any specific geographic area, although very substantial relocation costs are often ignored. On the other hand, natural resources such as land, timber, minerals, landscapes, and climates must be utilized, at least initially, in their specific geographic location.

The historic purpose of most rural community development in the U.S. was to realize the potential economic value of agricultural land. Historical settlement patterns reflect historical land uses. The numbers of farmers or ranchers needed to manage the land resource largely determined rural population densities. The range lands of the West were sparsely populated because one rancher could manage a herd of cattle roaming over hundreds or even thousands of acres. Areas suited for truck farming or vegetable production, on the other hand, were more densely populated because of the high human input requirement for those enterprises. The Midwest was most suitable for diversified farming, resulting in rural settlement patterns characterized by scattered family farms.

Non-farm activities in rural communities also were closely related historically to numbers and types of farms. More economic services - mercantile, blacksmiths, banks, and saloons -- were needed in areas with larger farm populations. More people also needed more doctors, schools, churches and other social services. The distance between towns is said to be related to the distance that could be traveled by horse and wagon in a day. However, the sizes of these towns were related to the number of families needed to utilize the natural resources within horse and wagon distance.

Changing Perspectives of Rural Economic Development

The initial phase of rural development in much of the U.S. might be characterized as resource exploitation. Resources were treated as stocks of potential economic wealth to be transformed into products of market value. A sufficient number of lumberjacks, miners, or farmers moved into a region to exploit the natural resource base, whether it was standing timber, minerals below the ground, or productive agricultural soils. Farming practices of the 1800s were little different in concept from logging or mining. Land was cleared, plowed, and farmed until its productive ability was depleted. Farmers then moved on to new frontiers, leaving spent land to be restored by nature. Boom towns became ghost towns as the natural resource base was used up and the people moved on.

Farming methods in the early 1900s utilized livestock wastes and legume-based crop rotations to retain soil fertility, allowing farmers to keep land fertile long after continuous cash cropping might have depleted its initial productivity. Thus, many rural settlements survived to become more stable farming communities as farmers began to learn to sustain productivity from the land. However, soil erosion, by both water and wind, continued to be a major problem, culminating in the dust bowl days of the 1930s which drove the "Okies" to California and created ghost towns on the Great Plains.

A second wave of rural development might be characterized as resource substitution. This was the industrial era in agriculture of the mid-to-late1900s. New life was breathed into some declining rural communities by emerging agricultural technologies. Commercial fertilizers, for example, could be substituted for inherent fertility in the basic land resource. Irrigation could offset lack of rainfall. Weeds and insects could be controlled by pesticides in climates where they otherwise would have thrived. Terracing, conservation tillage, and wind breaks reduced soil loss. New technologies and inputs appeared to be effective substitutes for natural resources. Rural community development became less constrained by the inherent fertility of the local land resource.

Specialization, mechanization, and economies of scale, the trademarks of industrialization, were the hallmarks of increasing agricultural productivity. Commercial fertilizers and pesticides allowed farmers to break away from crop rotations and diversified crop and livestock farms. They could now specialize in crops, or livestock, or even in single crops, or single phases of the livestock business. By doing fewer things better, each farmer could do more. Mechanization and inexpensive fossil fuels allowed farmers to farm more acres or produce more livestock, and thus, achieve greater economies of scale. Input-intensive, industrial farming systems eventually dominated U.S. agriculture and became the model of efficient food production for the World.

<u>The Growing Costs on Industrialized Agriculture</u>

Industrialized farming systems, however, have begun to raise significant economic, environmental, and social concerns. First, there are growing indications of declining effectiveness of the inputs and technologies that supports specialized systems. Increased concentration of single crops within specific geographic regions increase pest pressures. In addition, many insects and weeds have become resistant to pesticides and require higher rates of application or new, more costly pesticides for control.

Previously fertile soils in some areas have lost organic matter and natural fertility through mono-cropping, conventional tillage, and removal of crop aftermath year after year. Lower organic matter has meant less microbial activity, less ability to hold water, and less availability of nutrients in root zones, meaning lower yields from a given level of water and fertilization or higher fertilizer and irrigation costs to maintain yields.

Water tables in some of the major irrigated areas are declining as rates of irrigation surpass rates of natural regeneration of aquifers, and irrigation supports some of the largest of the large farming operations. Salinization of soils is occurring in some of these areas as a consequence of continuous irrigation. Soil conservation rose to the top of the political agenda in 1980s, primarily because of rising soil erosion rates. Soil losses went up as farmers abandoned forage, grass, and legume based crop rotations in the 1960s and rose still further as farmers intensified row crop production for growing export markets during the 1970s.

Other costs of increasing specialization began to show up in the environment of farm families, farm workers, and rural residents. Health risks in handling pesticides, for example, have become a major issue in farm safety. Chemical contamination of farm and rural water supplies and risks of pesticide residues in food supplies are additional concerns. Nitrate leaching into groundwater may be attributed as much or more to organic sources, such as livestock waste and crop residues, as to the use of commercial fertilizer. However, this issue, as much as any other, increased awareness in rural areas of the potential environmental hazards of chemically dependent farming.

The industrialization of agriculture has also changed rural landscapes. Farmers planted "fence row to fence row" during the 1970s and many tore down the fences and plowed out the fence rows. Farming areas were no longer patchworks of fields, meadows, grassy hills, and valleys separated by rows of trees. Rural landscapes became field after field of corn, soybeans, wheat, and cotton across the hills and valleys. Timber was cleared to make room for cow herds. Livestock feeding and poultry production became concentrated into large confinement feed operations -- animal factories.

Larger, more specialized farming operations have meant fewer farming families. The number of farmers declined from about 6.5 million in the mid-1930s to less than 2 million by the mid-1990s. The only notable exception to the downward trend was during the export boom years of the 1970s. Fewer people are needed on farms with industrial farming technologies. Not only have purchased inputs been substituted for land and climate, but also machines have been substituted for labor, and technology has been substituted for management.

The unneeded human resources have been squeezed out of agriculture as a natural economic consequence of substitution of capital and technology-based inputs for human resources. Technological advances reduced costs of production and provided incentives for expanded production which, in turn, reduced market prices and ultimately reduced profits per unit or production. The profits went only to those farmers who adopted new technologies first. Those who lagged behind were forced to adopt in order to survive.

As profit margins continually narrowed, survival required more farmers simply remaining cost competitive. It simply took more and more acres and larger and larger investments just to generate a decent income for a family by farming. Those who couldn't adopt and expand quickly enough were forced to sell out to their more progressing or lucky neighbors. The continual repetition of this process kept numbers of farms declining, and ensured that incomes of those who survived were kept below incomes in economic sectors with growing employment.

Rural communities are as much the victims of a more productive agriculture as are displaced farm families. Rural America has consistently had lower levels of income, education, employment, health, nutrition, and community service than has urban America (Hyman). The agricultural technology treadmill has been a major contributor to chronic depression in many rural communities.

Historical trends would seem to justify the prevailing view that farming is no longer a positive factor in the economy of most rural communities. But the problem is not necessarily with agriculture in general but with industrialized, input-dependent systems of farming. And the sustainability of large-scale, specialized, industrial farming systems is being seriously questioned by society. The future of agriculture and of rural communities may be significantly impacted by the ways in which society addresses the sustainability questions.

Toward Sustainable Rural Community Development

For a rural community's development process to be sustainable, it must be linked to realization of values inherent in its geographically fixed resources. These resources represent the link between developmental purpose and place. Sustainable rural development must conserve non-renewable resources, protect the physical and social environment, provide an acceptable level of economic returns, and enhance the quality of life of those who work and live in rural communities.

Many communities may be overlooking the development potential of a significant agricultural resource base because they are operating with a conventional, industrial agricultural paradigm. The conventional wisdom is that fewer, larger farmers will continue to buy fewer inputs from local suppliers and will sell fewer commodities to local marketing firms and processors. This type of development will support fewer and fewer people in rural communities.

The alternative, sustainable agriculture paradigm is one based on substitution of internal resources, including labor and management, for externally purchased inputs. Sustainable farms systems will rely on management strategies such as crop rotation and integration of crop and livestock enterprises. Sustainable farming systems may require more farm operators, more farm labor, and more farm families than do conventional farming systems. In addition, operators of sustainable farms are motivated by environmental and social, as well as economic objectives. Thus, they may show a preference for local markets and local input supply sources if this preference does not threaten their economic survival. Substitution of management and labor for land and capital would reverse the industrial trends of the past. Thus, a sustainable agriculture may help reverse past rural population trends by supporting more, rather than fewer, people in rural communities.

Community Impacts of Alternative Agricultural Systems

Specific management practices associated with sustainable agriculture include: more incorporation of "natural" processes such as nutrient cycling, nitrogen fixation, and pest-predator relationships; reduction in off-farm inputs with greatest potential environmental risks; greater reliance on biological and genetic potential of plants and animals; improved matching of farming activities with resource limitations; and improved management and conservation of soil, water, energy, and biological resources (NRC, p. 4).

From a community economic standpoint, the shift toward the goal of sustainability is a shift from reliance on inputs external to the community, such as commercial fertilizer and pesticides, to reliance on resources that are internal to the community, such as labor and more intensive management. The fundamental question is whether this shift will result in significant increases in local employment and other economic activity.

"Arguments can be made in both directions regarding whether an agriculturally dependent community benefits more from a high production, high input system or from a comparably profitable reduced input system" (Lockeretz p. 75). Heffernan points out that the net impact of substituting local resources for external inputs will depend on the nature of the substitution. Reductions in the use of purchased inputs such as pesticides and fertilizers, for example, will reduce local business activity and employment. However, increases in returns to labor and management will increase local incomes and employment. The fundamental question is, which impact is larger?

Few commercial farm inputs are manufactured in rural communities. Local economic impacts of locally purchased inputs, in most cases, are associated only with the functions of wholesaling and retailing rather than manufacturing. The value added to pesticides and fertilizers by these local merchandising activities is typically only a small fraction of total purchase costs. In addition, local employment and income of local residents may account for only a fraction of the marginal value added locally.

On the other hand, increased returns to farmers in their managerial roles represent dollar-for-dollar increases in farm incomes that can be spent to generate additional non-farm income in the local community. Larger returns to labor provided by farm operators, family members, and locally hired workers may have similar dollar-for-dollar impact on the local economy. The full value of returns to management and labor, not just a fraction of the margin of value added locally, accrues as expendable income to residents of the local community.

Previous Research on Community Impacts

Sustainable agricultural systems must be (1) economically viable, (2) ecologically sound, and (3) socially responsible (Ikerd, Devino, and Traiyongwanich). All three conditions are necessary and none alone or in pairs is sufficient to ensure sustainability. Most previous studies of community impacts have been based on analysis of alternative scenarios, focusing on the economic comparisons of "conventional" and "alternative" systems of farming. "Alternative" scenarios have been developed to reflect farming systems that logically would be more ecologically sound and socially responsible than "conventional" systems. The economic consequences of the various scenarios are then compared to determine if the more ecologically sound and socially responsible systems are also more economically viable.

Most previous studies of the relationship between community economic impacts and sustainability have yielded inconclusive results. For example, Lockeretz compared the economics of high input conventional cropping systems with lower input alternatives in an attempt to draw conclusions regarding their impacts on local communities (1989). The underlying assumption was that lower input systems were more ecologically sound. Thus, lower input systems would contribute more to sustainability, if they made equal or greater contributions to the economic viability of the local community. The results from five regional comparisons were inconclusive with respect to overall sustainability.

In general, the lower input systems were found to contribute less per acre to the local economy than did the higher input systems, resulting in a conflict between the relative economic and ecological performance of the two types of cropping systems. This conflict was addressed through questions regarding the long run sustainability of higher input systems of farming. No attempt was made to assess quality of life or social responsible indicators such as farm size, self-employment, or viability of family farms in the local community.

A South Dakota study went beyond the work of Lockeretz in evaluating impacts of alternative farming systems on consumer spending and marketing services in addition to business spending for production inputs (Dobbs and Cole, 1992). The study paired five farms classified as "sustainable" with five "conventional" farms representing different regions of South Dakota. Data for the "sustainable" farms were gleaned from on-farm interviews, but four of the five "conventional" farms were "synthesizes" from various sources. The "sustainable" farms were virtually "organic" farms in that none used inorganic fertilizer and only one farm reported appreciable use of commercial pesticides.

First-round economic impacts on local input purchases and marketing services were clearly negative for the "sustainable" farms. Not only did the organic farms purchase fewer inputs and market fewer products per acre, but they also purchased more of their inputs and marketed more of their products outside the local community. Organic "inputs" and premium prices for organic products simply were not available locally.

First round effects on incomes of farm households clearly depended on whether organic premiums were included or excluded from the analysis. Without organized premiums, four of the five "conventional" farms produced more income per acre, but with premiums included, three of the five "sustainable" farms produced more income per acre. With organic premiums included, three of the five organic farms appeared to be more economically viable than their conventional counterparts and contributed as much or more than their conventional counterparts to the community -- including impacts on farm and non-farm incomes of local residents.

The authors questioned the sustainability of organic premiums, which would also seem to put in doubt the sustainability of organic farming. However, their more serious problem in drawing conclusions regarding sustainability is that the study omits any consideration of the social, or quality of life, dimension of sustainability, such as differences in size between conventional and sustainable farms.

A Case Study of Thirteen Missouri Counties

Development of Alternative Scenarios. The study that is reported in this paper was developed to evaluate alternative impacts of "conventional" and "alternative" agricultural systems on rural economies. A "conventional" farming system scenario was designed to reflect farming methods currently typical of Missouri farms and of current spending patterns of local farmers and county residents.

"Alternative" farming scenarios were developed to reflect more sustainable systems by utilizing increased use of crop rotations, more intensive input management strategies, and reduced tillage methods for cropping systems. Alternative livestock systems utilized more management-intensive grazing systems for beef cattle production, and assumed similar management options were possible for other types of livestock.

The alternative farming scenario was designed to achieve a balance of economic, ecological, and social benefits. An attempt was made to achieve ecological advantages over conventional farming systems while using the land in ways that would be profitable to local farmers and supportive of the local community. In other words, the alternative scenario was designed to reflect farming systems that might be more sustainable for the local community as well as for farmers. All farming systems were "synthesized" using secondary data from a variety of sources and opinions of individuals knowledgeable of farming in the state. Detailed descriptions of the two farming scenarios, methods of analysis, and the research base supporting production assumptions may be found in a 1994 Masters thesis by Traiyongwanich.

The alternative farming scenario represents a modest departure from conventional systems of farming in Missouri. For example, many sustainable agriculture advocates may view the alternative scenario's 50 percent reduction in commercial herbicide as little more than fine-tuning of conventional farming. However, the objective of this study was to evaluate alternatives that would be viewed as reasonable, not radical, departures from common farming practices. No claim is made that the alternative systems are truly sustainable, only that such systems might be expected to move farming in the direction of sustainability.

The alternative system of cattle production was represented by a management-intensive grazing system with 24 paddocks based on data from the Forage Systems Research Center (FSRC) in North Missouri (Moore, 1994). Conventional livestock production was represented by a three paddock grazing system, which likely overestimates the intensity of management of typical Missouri livestock operations. The alternative system would allow farmers to stock more than 50 percent more livestock on the same number of acres than would the conventional system. This assumption is consistent with historic results of research at the FSRC (Moore, 1994) and with on-farm experiences of farmers who have adopted similar systems in North Missouri.

The criteria used for ecological soundness in developing scenarios for this study were natural resource conservation and environmental protection. Indicators of increased resource conservation were reduced soil loss and lower energy use for the alternative systems. Indicators of greater environmental protection were lower agricultural chemical use and greater cropping diversity.

The single economic criterion used was farm income. The indicator used for farm income was the difference between direct costs of production and market value of farm products. Direct production costs included purchased inputs for crops and livestock and interest costs associated with animal ownership for livestock operations. The difference between market value and production costs was termed "direct farm income" to minimize confusion with other more familiar measures of farm income.

Criteria for social responsibility used in developing scenarios were employment opportunities, and utilization of local natural and human resources. Indicators of social responsibility were non-farm employment, and number of households, farm and non-farm, supported by farming.

Methods of Analysis

Conventional and alternative farming scenarios were developed for 13 Missouri counties. Four clusters of counties were selected, with each cluster representing a different geographic area of the state. Three clusters of three counties each were selected from the southeast, southwest, and west central regions. A four-county cluster was selected from northeast Missouri to coincide with the geographic boundaries of an ongoing sustainable community development project.

The conventional or base scenario for each county was based on 1992 USDA Census of Agriculture data. The underlying assumption was that very few farmers in Missouri would have been using farming methods that were identified with the "alternative" farming scenario as early as 1992. Thus, county level farm data for 1992 were used to reflect "conventional" farming practices.

Market values of agricultural products sold; crops, including nursery and greenhouse products, livestock, poultry, and their products; were used to represent total direct farm income. Total farm production expenses, itemized by census expense categories, were used to represent direct cost of production. Direct farm income estimates were calculated as differences between market value of products sold and farm production expenses. Direct farm income may differ from census data for net farm income, in that the net farm income includes return and cost items other than market value of products and farm production expenses. These other items would not likely be significantly affected by differences among scenarios in this study.

Census data for government payments, other farm-related income, and direct sales to individuals were added to direct farm income to estimate total net farm income. Data for average household income, for all county households, were taken from the U.S. Census of population. Total net farm income was divided by average income per household to estimate the number of households supported directly by farming. Data for numbers of farms per county were also taken from the 1992 USDA Census of Agriculture. Estimates of households supported by farming in a county were typically significantly smaller than total number of farms in a county, reflecting reliance of farm households on non-farm as well as farm income sources.

A micro-computer-based, community impact assessment program, developed specifically to assess impacts of changes in farming systems, was utilized to estimate the impacts of both conventional and alternative farming systems for each of the 13 counties (Love and Ikerd). The program translates farm income, costs, and net income data into community impacts in terms of total farm and non-farm household income and numbers of households supported by farming in the community.

Changes in direct farm income were treated as the first round effect, or "Direct Impacts," of farming on the local economy. "Indirect Impacts" occur as a consequence of farmers buying production additional inputs or services. Each dollar spent within the local community for feed, chemical and fertilizers suppliers; equipment dealers, lenders, other farmers, farm laborers, or for any type of production cost adds to the local economy. Farmers' purchases of production inputs create employment in the local agribusiness sector that in turn creates income to support local non-farm households. Thus, increased non-farm employment is considered an "indirect" or second round impact.

Substantial leakages typically occur between farmers' total cost of production and indirect income and employment impacts on the local community. A large portion of total production inputs and services may be purchased from sources outside the local community. In addition, only a small proportion of total cost may be retained in the local community, even when items are purchased locally. For example, only the "difference" between the price a local farmer pays a chemical dealer for pesticides and the price the dealer pays the outside manufacture is available to add anything to the local economy.

Additional indirect effects occur when local suppliers or service providers buy their materials or services. However, additional leakages occur because a large portion of suppliers' purchases may be made outside the community, and those goods and services bought inside the community may have been manufactured or assembled elsewhere. Additional leakages occur with each round of spending until additional impacts resulting from a given initial transaction eventually become negligible. The ratio of the ultimate total effect on local income divided by the initial local spending for production inputs is called an indirect impact multiplier.

Sales of farm commodities may also create indirect effects on the marketing, processing, or value-added sector of the local economy. Commodities sold locally generate sales commissions and other types of income for local marketing firms. Marketing firms may purchase supplies or employ local residents, resulting in indirect economic impacts similar to those associated with input purchases. As in the case of purchases, leakages occur at each round of activity, and eventually any additional impact from a given marketing transaction becomes negligible. Unfortunately, marketing costs associated with commodity sales are not reported in the Census of Agriculture. Marketing costs associated with procurement presumable are included as a portion of production expenses.

"Induced impacts" result whenever people spend money they earn from participating in the local economy. Obviously, those earning income from agricultural transactions include farmers and farm workers. Local consumption expenditures by farmers make up a major component of induced spending associated with farming. However, employees of local suppliers of agricultural inputs and other service providers also earn income linked to local agricultural transactions.

As in the case of indirect impacts, initial consumption expenditures have second, third, and higher round impacts. Those who work for local retailers spend part of their incomes for local goods and services, which in turn generates income for local residents who provide those goods and services. But, as in the case of indirect impacts, leakages at each round of consumption spending eventually reduce additional impacts from a given retail transaction until they become negligible. The ratio of the ultimate total effect on the local community divided by the initial local consumptive spending is called an induced impact multiplier.

The direct, indirect, and induced impact multipliers of interest in this particular study were those associated specifically with personal or household incomes. Thus, percentages of total farm production inputs and services purchased and produced locally were estimated and then translated into estimates of income generated for local residents. To accomplish this, estimates were made for each production input or service: (1) the percentage "purchased" from a local supplier and (2) the percentage "produced," manufactured, or otherwise generated from a local source.

These and other percentage estimates used in this study were solicited from panels of local experts and residents who collaborated in the study. No published data exists for the percentage of purchases made by farmers in a county that are made from suppliers within the county or the percentage of farm inputs or services that are produced or otherwise originate within the county where they are utilized. Neither is there any reliable data on consumptive spending of farm and non-farm residents within and outside of the counties where they live.

However, there is a great deal of general community knowledge among the people who live in rural communities. People who are involved in their communities know where farmers buy their feed, seed, fertilizers, fuel and chemicals. They know where farmers borrow money, hire workers, and rent land. Community-based Extension Specialists assembled groups of "local experts" to estimate the necessary percentages for local input procurement and consumptive spending patterns for each of the 13 counties. They used a variety of solicitation methods ranging from one-on-one interviews, to focus groups, to surveys. All data were then checked for internal consistency to ensure that each group of experts was using a common interpretation of the data needed for the study.

The local experts developed the estimates of the following for each county: (1) percent of each production expense item purchased locally, (2) percent of each production expense item produced locally, (3) percent of local purchases resulting in personal income of local residents, (4) percent of local production resulting in personal income of local residents, (5) percent of direct farm income going to local farmers - rather than landlords of others outside the county, (6) percentage of government payments going to local residents, (7) percentage of other farm related income going to local farmers, (8) percentage of direct sales for consumption sold to residents of the county, (9) percentage of farm income from all sources spent within the county, (10) percent of farm income spent locally resulting in personal income to other local residents, (11) percent of non-farm local personal income spent within the county, and (12) percent of local personal income resulting in personal income to other local residents.

These percentages were used to estimate the appropriate multipliers to translate farm production expenses and direct farm income into indirect income effects, through spending for farm inputs and services, and induced income effects, through consumptive spending of farmers and local employees of input and services suppliers. The sum of direct farm income effects, indirect income effects, and induced income effects provides estimates of the total impact of the farming sector on local incomes, and indirectly, on number of local households supported by farming. A community impact program template with sample county data is included as an appendix.

Results: Comparisons of Alternative Scenarios

Conventional Scenario: The conventional or base scenario was based on data reported in the Census of Agriculture for 1992. Census data indicate total value of marketing of farm products of $477 million for the thirteen counties included in the study. Total farm production expenses were reported at $383 million, resulting in total direct farm income of $94 million (Table 1). The 13 counties accounted for just over 10 percent of total farm value of agricultural production for the state of Missouri.

Table 1. Alternative Scenarios: Initial Impacts on Farm Costs and Returns and Patterns of Local versus Non-Local Purchases

All Table Values are Totals for Thirteen Missouri Counties	*Total Value Production*	*Total Prod. Expenses*	*Pct. Local Purchases*	*Pct. Local Production*
Conventional	$477,092	$382,692	73%	39%
Sustainable Farming	661,429	516,991	72%	79%
Sustainable Com. Development	661,429	516,991	86%	57%
Transition to Sustainable	569,075	449,840	80%	48%
Expert Expectations	546,014	433,055	78%	47%

Direct farm income in the 13 counties was sufficient to support nearly 4,900 farm households at county average levels of income per household (Table 2). Total number of farms in the 13 counties was nearly 12,000, indicating that well over half of total income of farm households in these counties came from non-farm sources. Missouri reported a total of 98,000 farms in the 1992 census. Comparisons among scenarios were all based on "households supported" by farming, rather than number of farms, as a means of dealing with the off-farm income issue.

Indirect and induced income effects reflect salaries, wages, and profits of non-farm households earned as a consequence of farm production inputs and consumption purchases. Estimated indirect and induced income effects within the 13 counties were sufficient to support nearly 4,300 additional households at county average levels. Thus, nearly 9,300 households were estimated to be either directly or indirectly supported by farming in the 13 counties under the 1992 base situation -- the conventional farming scenario (Table 2).

This total estimate was derived using estimates for individual county including percentages of production inputs and services purchased locally, percentages of consumption, purchases made locally, and local income generated as a consequence of production and consumption expenditures. The resulting total employment multiplier was 1.9, indicating that each household supported directly by farming resulted in 1.9 households in total supported by farming. For example 10 farming households would be expected to support themselves and 9 non-farm households.

Table 2. Alternative Scenarios: Number of households Supported, Directly and Indirectly, by Farming

All Table Values are Totals for Thirteen Missouri Counties	*Farm Households*	*Non-Farm Households*	*Total Households*	*Employ Multiplier*

Conventional	4,882	4,395	9,277	1.90
Sustainable Farming	6,994	6,134	13,128	1.88
Sustainable Com. Development	6,994	9.982	16,976	2.43
Transition to Sustainable	5,916	6,900	12,816	2.17
Expert Expectations	5,673	6,201	11,874	2.09

Individual county multipliers ranged from nearly 2.3 down to less than 1.4. Counties with higher multipliers were those with larger percentages of production inputs produced and purchased within the county and larger percentages of incomes spent with local retailers. The overall "within county" multiplier of 1.9, as expected, was smaller than "within state" multipliers, which are generally assumed to be in the 2.2 range for farming in Missouri. The difference reflects economic activity that takes place outside the local county but still within the state.

Sustainable Farming Scenario: The only difference between the conventional and "sustainable farming" scenarios were those related to differences in systems of farming. All percentages related to local input purchases, local production of inputs and services, and farm and non-farm consumption spending were the same in the conventional and sustainable farming scenarios. For the sustainable farming scenario, total market value of farm production and total costs of production inputs were adjusted from the 1992 conventional base levels to reflect differences between the conventional and sustainable farming scenarios outlined above (See Traiyongwanich for details of the process.). Separate calculations were made for livestock and crops to derive alternative levels of total revenue, total cost, and direct farm income for each county.

Total value of production sold was estimated at over $660 million for the sustainable farming scenario, an increase of 39 percent over the conventional scenario. Nearly all of the total was accounted for by increases in livestock sales as a consequence of higher stocking rates for cattle, made possible my management intensive grazing systems. Total market values of crops were essentially unchanged, but costs of inputs for crop production were substantially lower for the sustainable farming scenario.

Total production expenses were 35 percent higher for the sustainable scenario. Higher costs associated with higher stocking rates for livestock overshadowing lower production costs for crop production. One might logically question whether livestock other than beef could experience similar increases in production per acre under sustainable farming scenarios. More management intensive options exist for other species of livestock and for poultry, but are less well documented than is management intensive grazing. Beef was the dominant livestock enterprise in most counties included in this study, which further strengthens the assumption that data from beef production studies indicate potential for changes in livestock systems in general.

In general, one would expect an increase in direct farm income, due either to a reduction in production expenses, increase in value of production, or both, as a consequence of moving toward more sustainable farming systems. Total economic profit, after accounting for opportunity costs of the farm operator's and family labor and management, may or may not be greater under more sustainable farming scenarios. However, direct farm income reflects total returns to operator and family labor and management and profits combined, which would be expected to be greater for any system that effectively substitutes labor and management for land and capital.

The number of farm households supported by farming under the sustainable scenario was nearly 7,000, an increase of more than 2,100 or 43 percent over the conventional scenario. This result is similar to those of a 1994 Nebraska study comparing detailed economic data provided by 28 farmers, half of which were classified as "conventional" and the other half as "sustainable" (Kleinschmit, Ralston and Thompson, 1994). The "sustainable" farms were only about one-half as large, in terms of acres farmed, head of livestock and total sales, as those called conventional. However, the "sustainable" farmers actually reported a higher average farm income, or return over direct costs per farm, in spite of their smaller size.

A total of 169 people were supported on the 28 farms included in the Nebraska survey. It was estimated that 44 additional people could have been employed on the same number of acres with at least as high a per capita income if all farms in the survey area had been of the same average size as the "sustainable" farms. If all farms had been "conventional" the number supported would have been 22 less than the 169. Thus, their "all sustainable" scenarios would have supported about 45 percent more people than would have an "all conventional" scenario.

The Nebraska study did not address the issue of indirect and induced non-farm impacts. For the 13 Missouri counties, the number of non-farm households indirectly supported by farming increased from less than 4,400 to over 6,100, an increase of 1,700 or 40 percent over the base scenario. The percentage for non-farm households was smaller only because of increase economic impacts by the farm sector reduces the "relative" impact on the non-farm sector. Total of farm and non-farm households supported by farming increased from less than 9,300 up to over 13,000, an increase of 42 percent. The total employment multiplier dropped slightly from 1.90 to 1.88, due to the larger relative impact of the farm sector under the sustainable farming scenario.

<u>Sustainable Community Development Scenario</u>: The third scenario was labeled sustainable community development (SCD) because it assumed both changes in farming systems and changes in percentages of local purchases and of local production of inputs and services. Percentages associated with local consumption expenditures were unchanged for all five scenarios. Percentages of production inputs purchased locally were assumed to increase by amounts equal to half the distance between current levels and 100 percent. For example if base estimates indicated that 50 percent of production expenses resulted from purchases in the local county, the SCD scenario assumed that 75 percent were local purchases.

Local production of inputs and services was assumed to have lower ceiling levels than did local purchases of inputs. For example, inputs such as fuel, some fertilizers, and agricultural chemicals are not likely to be manufactured in rural Missouri counties, even though such inputs are commonly purchased in rural counties. Even if reliance on commercial inputs from outside sources is reduced, it is unlikely to approach elimination. The SCD scenario assumed that local production of inputs was increased to a level halfway between the base levels and 75 percent. For example if the base percentage was 35 percent, the SCD percentage would be raised 55 percent.

Increases in local purchases of inputs are logically consistent with shifts to increased numbers of smaller farming operations that are less reliant on commercial inputs. For example, an evaluation of detailed purchase records of 30 farmers in southern Minnesota in 1993 indicated that large farms tend to buy a smaller percentage of their inputs in local markets (Chism, 1993). The study also confirmed that more diversified farms with livestock as well as crops tend to spend more locally, at least up to a point.

The smaller livestock operations bought as much as 80-90 percent of their production inputs locally whereas larger operations bought only 30-40 percent of their production needs from local suppliers. The smaller operations were more likely to be diversified family farms. The Minnesota study found little difference in local versus non-local spending between smaller and larger crop farms, but the study did not attempt to differentiate between those with low-input and high-input farming operations.

For the 13 Missouri Counties, the Sustainable Community Development scenario resulted in a total of just under10,000 non-farm households supported by farming. This compares with less than 4,500 under the conventional scenario, an increase of 127 percent. The number of farm households was the same as for the sustainable farming scenario, 7,000 compared with 4,900 for the conventional scenario. Thus, total households supported by farming rose to nearly 17,000 compared with 13,000 for the sustainable farming scenario and 9,000 for the conventional scenario, an increase of 83 percent over the base scenario. The total local employment multiplier for the SCD scenario was 2.43 compared with about 1.9 for the two pervious scenarios. More than 1.4 non-farm households were employed indirectly somewhere in the county for each farm household employed directly by farming.

With the higher multiplier, the potential positive impacts associated with changes in local versus non-local spending patterns were approximately equal to the potential impact of changing from conventional to more sustainable farming systems. However, the two types of impacts are but two aspects or dimensions of the same phenomena - a change in philosophy or approach to earning a living from farming. The substitution of labor and management for land and capital associated with sustainable agriculture would result in smaller, more diversified, more locally connected farms. In general, operators of smaller, diversified farms would be expected to spend a larger proportion of whatever they spend for production needs in the local community.

Transition Scenario: The fourth scenarios represent an intermediate level of change, with resulting impacts between those of the conventional and sustainable community development scenarios. Results were calculated by assuming that half of each counties agricultural production would remain conventional while the other half shifts to sustainable farming approaches. Likewise, changes in percentages of local versus non-local purchases were assumed to be half way between those used in the conventional and SCD scenarios. Thus, the fourth scenario is labeled a "transition scenario."

The increase in households supported directly by farming was half as large as for the two pervious sustainable scenarios, by nature of the transition assumption -- an increase of 21 percent over the conventional scenario. The increases in non-farm households supported indirectly increased by 57 percent over the conventional scenario. This increase over conventional is compared with 40 percent for sustainable farming and 127 percent for the SCD scenario. Total households supported both directly and indirectly by the transition scenario was about 12,800. This was a 38 percent increase over the conventional scenario and compares with a 42 percent increase for the sustainable farming scenario and 83 percent for the SCD scenario.

Experts Expectations Scenario: The final scenario was based on estimates of the magnitude of changes in farming systems that the local "experts" thought might be experienced within the next five years. The experts' estimates of potential changes on a county by county basis resulted in total of almost 5,700 farm households supported by farming, an increase of 16 percent over the conventional scenario. This compares with a 21 percent increase for the sustainable farming scenario.

Percentage for local purchases and locally produced inputs were chosen to reflect similar relationships relative to conventional and sustainable farming scenarios. The result was an estimate of just over 6,200 non-farm households supported by farming, 700 less than for the transition scenario, but 1,800 more than for the conventional scenario. The resulting total numbers of households supported by farming, including both direct farm and indirect non-farm, were nearly 12,000 -- about 800 less than for the transition scenario, but more than 2,500 more than the conventional scenario. Total employment based on the expert's estimates of change within the next five year showed a 16 percent increase in farm households, a 41 percent increase in non-farm employment related to farming, and an increase of 28 percent in total local employment related to potential changes in agriculture.

Summary and Conclusions

The industrial era of the twentieth century has left many rural communities seemingly without a viable economic purpose for being. Many rural communities were settled to support mining, logging, or farming operations in the surrounding countryside. With the minerals depleted, the timber gone, and farms continuing to grow larger and fewer in these numbers communities are searching for new economic opportunities to help define their purpose for the future. Some have become bedroom communities for nearby urban areas. Others captured the value of local climate and landscapes to become tourist recreation areas. But, most have been left with far less desirable economic options. Their options are mostly low-skill, low-pay jobs and enterprises others don't want -- such as prisons, waste dumps, and factory livestock and poultry operations.

Many rural community leaders consider farming as an important part of their past, bur few see farming as a key development strategy for their future. Previously farming dependent communities are unlikely to see a return to agriculture as a dominant role in local economy. Future rural economies likely will be much more diverse than those of the past. However, agriculture can be a key component of that future diversity for many rural communities.

The conventional wisdom is that farms will continue to become larger and larger and fewer and fewer in numbers. If the conventional wisdom is true, then farming quite likely will be more of a liability than asset to rural community development. However, the conventional wisdom is being seriously challenged by the questions raised by the emerging sustainable development movement, of which sustainable agriculture is a part. Sustainable development will require economic development strategies that conserve and protect the local natural and human resource base. Sustainable agriculture will require the substitution of labor and management for land and capital - reversing the industrial trends of the past. The trend toward a sustainable agriculture will require more, smaller, more management intensive farms. Sustainable agriculture challenges the conventional wisdom. Thus, sustainable agriculture may be a key component of logical sustainable community development strategies in many rural areas.

No attempt is made in this study to prove that sustainable agriculture is a viable alternative to conventional agriculture. The proof of that proposition is reflected in changes that are taking place on thousands of farms across the country and around the world. The transition is in its very early stages and still represents a very small fraction of total farming operations and an even smaller fraction of total agricultural production. But the possibilities for farmers to earn a better living by farming less land with fewer capital inputs, by managing more intensively, are real.

This study does not attempt to answer the questions of if, how quickly, and to what extent sustainable farming will become significant and then dominant. The purpose of this study was to examine the potential impacts of such changes on rural communities, and thereby, to evaluate the potential of sustainable agriculture as a rural community development strategy. The speed and extent of the shift toward sustainability may well depend or whether or not people see its potential for tangible, immediate benefits in their lives.

The results of the study indicate that sustainable agriculture may be a viable rural economic development strategy for many rural communities, in Missouri and elsewhere. The thirteen Missouri counties included in this study were all classified as rural, but varied widely in their dependence on farming and reliance of local farmers and consumers on local suppliers and retailers. On a weighted average basis, weighted by value of farm production, farming supported just under 400 farm households per county in 1992. Another 370 non-farm households per county were supported indirectly by farming, for an average county total of just under 770 households.

A complete shift to the sustainable farming scenario would provide support for more than 165 additional farm households per county and more than 300 additional farm and non-farm households in total. The sustainable scenario used in this study reflects only very modest changes from current farming practices - primarily conservation tillage and better input management for crops and management intensive grazing systems for livestock. Nothing in the scenario would be considered a radical change for most Missouri farmers. Few community leaders would ignore the potential for creating 165 new self-employment opportunities and the means of supporting 300 new households in total in their counties.

A shift to a sustainable community development scenario would have even more dramatic impacts on the local economy. Changes in local versus non-local spending patterns magnify the indirect and induced impacts of changes in the farming sector of the economy. A successful SCD strategy could add 300 more non-farm households for a total increase of more than 600 households per county over the conventional scenario. It should be pointed out that added households in this study add far more than minimum wage or low pay jobs. Each household in the study is supported at the average household income level for the county. In many cases, current households may be supported by more than one full or part time job.

Obviously, the shift to more sustainable farming and community development strategies will take time, even under the most optimistic of scenarios. One reason industry hunting appears so attractive as an economic development strategy is that announcement can be made that "x" number of new jobs will be created within the next "y" period of time by the new industry coming to town. Sustainable development is a more long term strategy that must be based ob enhancing the inherent productivity capacity of the people within the community rather than providing jobs from outside. New industries can and do leave town just as suddenly as they arrive, leaving people with no marketable skills behind. Development that is achieved be the people, one-by-one over time, if far more likely to multiply than it is to subtract over the long run.

The transition and expert expectations scenarios provide insights to possible impacts over time periods similar to those that might be required for industry recruiting. The transition and expectations scenarios would each add about 300 households to the average county, on a weighted average basis.

At first glance it might appear that the experts, in this study, expect little more than a half-step toward sustainable farming - even in the very modest sense that it is represented here - to occur within the next five years. But, it is highly significant that the experts expectations reflected an increase, rather than decrease, in numbers of households supported by farming. Obviously, if sustainable agriculture and sustainable community development became proactive strategies common among Missouri's rural communities, changes could come much more quickly and be much more dramatic.

The results of this study point the potential for agriculture to become a key element in strategies for sustainable community development in many rural counties across Missouri and across the country. The first step in realizing that potential may be to recognize that it exists.

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