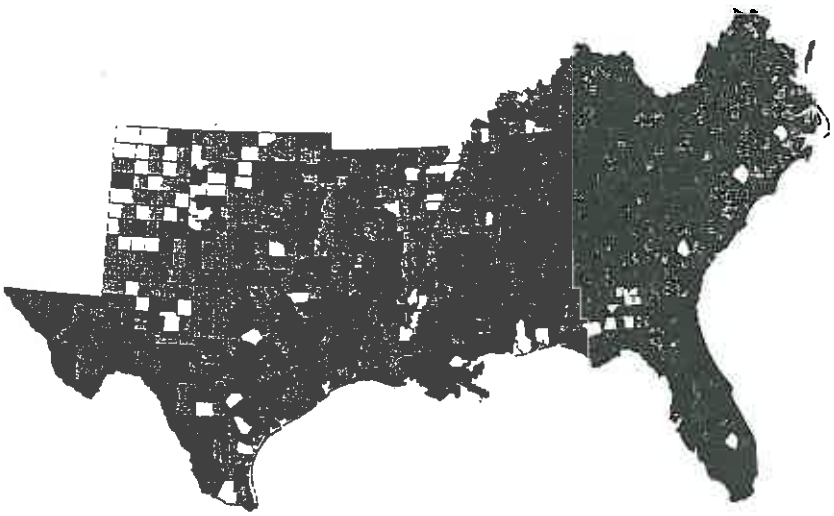
Southern Futures:

Opportunities for sustainable agricultural systems



Jim Worstell

Delta Land and Community, Inc.

A State of the South report
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Southern Futures

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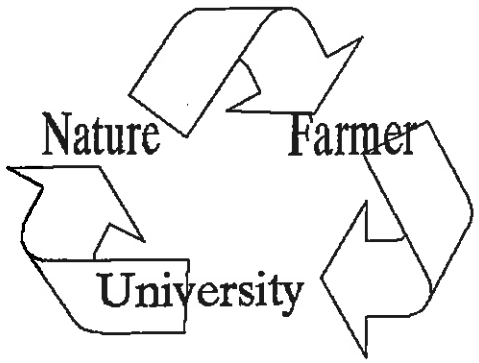
Section I. Systems and decision in agriculture.

Nature is managed to meet the needs and wants of people. The most basic of needs, food, is only obtained by farmers and gardeners altering Nature. Vast numbers of organisms are effected every time a farmer plows a field, sprays a pesticide, turns his cows out on a pasture. Beginning in 1862, the United States established universities in every state to help agriculture and rural America do a better job of managing Nature.

What is the status of this relationship between Nature, farmers and land grant universities? Farms are increasingly unprofitable yet agricultural production is higher than at any time in the country's history. Food processing companies expect an 18-20% return on their investment, while farmers get 2-3% if they are lucky. Farmers established some of the first environmental organizations (county soil and water conservation organizations), yet farmers are seen by environmentalists as a major source of pollution. These incongruencies have caused national concern that U.S. agriculture may not be sustainable--that we have an agricultural system which does not protect the environment or increase the viability of family farms.



The purpose of this book is to examine the possible futures of the relationship between farmers, Nature and American universities through a thorough examination of the region where U.S. agriculture began and which produces 37% of our food: the South. Southern land grant administrators contend that most of their research and education efforts are devoted to sustainability. In fact, as recently as three years ago, two Deans of Southern land grant colleges of agriculture said: "Everything we've done since 1930 is sustainable agriculture research", and, "Ninety per cent of what we do is sustainable agriculture research." Preliminary results from an internal analysis by Southern Agricultural Experiment Station Directors shows the same thing: nearly all traditional production research is seen as contributing to sustainable agriculture.

External analysts might disagree with their conclusion, but would likely agree that sustainable agriculture research has been consistent with mainstream agricultural research and education in concentrating on improving production practices. The 3 year study reported here began with the expectation that the results would be, consistent with that thinking, a reordering of traditional production research and education areas. And such areas as biocontrol did rank higher than expected in

surveys and focus groups of both Extension/NRCS and farmers. But the unexpected result of the study was the overwhelming consensus that marketing systems and rural development issues are crucial to sustainable agriculture and can no longer be neglected.

The study is the most comprehensive assessment of grassroots agricultural research and education priorities ever undertaken. Every major Southern agricultural research and education institution, sustainable agriculture organization and most mainstream farm organizations contributed. The study included a survey of Extension and USDA/NRCS staff in nearly 1200 counties, fifty-five focus groups from every agroecoregion in the 13 Southern states (involving more than 1000 farmers) and 10 opportunity workshops for farmers and researchers to reach consensus on the best bets for research/education projects in the South.

According to these results, lack of marketing alternatives is the key constraint to more sustainable agricultural systems in the Southern United States. The best opportunity for removing this constraint is creation of locally-owned, value-added enterprises through reformed research, education and public policy systems. Integration of sustainable practices with marketing alternatives is the most promising frontier for both sustainable agriculture and rural development research and education.

"Top priority: a complete overhaul of rural development efforts and farm financing with a focus on value-added industries and assistance to young farmers.

Northern High Plains Focus Group
Hereford, Texas

"#1 Long-term priority: market development policies."

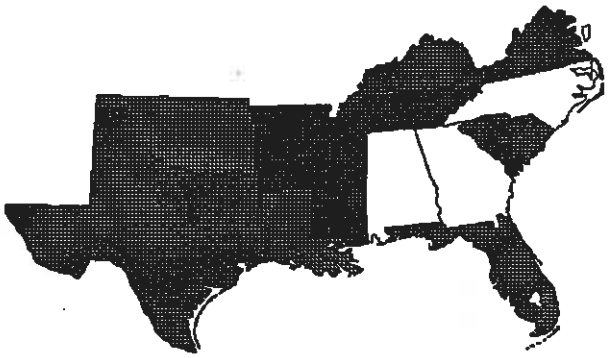
Georgia Piedmont Focus Group
Athens, Georgia

The above consensus statements illustrate the concern consistent among farmers and rural people from Hereford, Texas to Ocala, Florida; from Blytheville, Arkansas to New Iberia, Louisiana. The common desire expressed in the focus groups is for viable family-owned farms, vibrant small towns, productive soils, clean streams and springs, plentiful wildlife habitat and opportunities for the young to farm. This vision for the future has gradually been enshrined in our nation's laws from the 1862 Morrill Act establishing land grant universities to the 1990 Farm Bill.

With such a consensus on what rural areas should become, why do we have continuing and accelerating decline in farm numbers? Why do Mississippi Delta officials confide, "We have given up on water quality in the Delta"? Why are so many rural towns boarded up and dying? Why is the return on investment for integrated food processing companies 18-20% and only 2-3% for farms producing raw commodities? Why are skilled, hard-working farm families and rural communities impoverished and the environment degraded in areas of rich soils, plentiful water and abundant commodity production?

The purpose of this study was to find answers which are opportunities for sustainable futures for Southern agroecosystems.

Chapter 1. Forces in play with the future of Southern agriculture



"Farmers and environmentalists are natural allies."
Sierra Club activist

"The greater cultural tradition of the South has been one of exploitation of the land and its resources."
H.W. Odum

Farming began about 10,000 years ago in the Middle East. The food early farmers produced begat the division of labor which permitted civilization. Cities rose to grandeur, but the land which permitted this progress was not treated wisely. Dust from their eroded fields now buries hundreds of sophisticated cities. Other abandoned cities lie surrounded by barren rock. The "land of milk and honey" is now rock and ruin (Lowdermilk, 1933 and 1986). Similar examples are available from Africa and Europe (Butzer, 1982), though smaller ancient cities on these continents occasioned less destruction of the land.

In the Americas, the rise of cities was also often accompanied by destruction of the land. By 2000 years ago, cotton, peanuts, sunflowers and corn were being cultivated in Mexico and Peru to support great urban civilizations. Severe erosion in the Mexico City area is well documented during the heyday of the Aztecs and before (O'Hara et al., 1993).

But this agriculture could also transform wasteland into resources. In the Peruvian Andes are terraces constructed 1500 or more years ago on steep hills with thin soils unsuited for cultivation. Soils from these terraces is much higher quality than soils from surrounding uncultivated lands--including an increase of 1 to 4 feet in topsoil (Sandor and Eash, 1991) and increases in organic matter (Dick et al., 1994). Terraces from China and Southeast Asia have been farmed for 4000 years and also appear more fertile than surrounding land (King, 1911 and 1973). These examples illustrate the key question in the relationship between ecology and farming: what creates an agriculture which improves instead of destroying the land?

Plows first turned soil on the North American continent in coastal Virginia soon after settlement in 1607. In 1612, a new, mild strain of tobacco was introduced from the Caribbean and exports to Europe began. By 1624, an agricultural frenzy led to rows of tobacco in the streets of Jamestown, Virginia, destined for export to Europe.

Less than a hundred years after Jamestown, Virginia was settled, the first case of agriculturally induced erosion in the Americas had degraded tobacco country in Virginia and North Carolina.

But another species soon had a much wider impact. About two hundred years ago, a new type of upland cotton came from Mexico to South Carolina to merge with the social, political and industrial revolutions boiling in the U.S. Rapid growth of textile mills and availability of immigrating labor and management was accompanied by a demand that enabled cotton to quickly take up usable land in the Coastal Plain and spread into the more hilly Piedmont. The heavy clay soils of the Piedmont didn't suit cotton and they either wore out quickly or were abandoned to erosion.

As demand grew and soils were depleted, the wave of farmers planting cotton "passed like a devastating scourge." According to early historians such as Lewis Gray (1932), "Planters bought land as they might buy a wagon--with the expectation of wearing it out" (Doughty, 1989). Southerners, as the heirs to Jefferson's agrarianism, profess a profound attachment to the land (Lubick, 1989), yet H.W. Odum noted that: "the greater cultural tradition of the South has been one of exploitation of the land and its resources" (Goldfield, 1989).

In the early 1800s, production of cotton spread westward to Mississippi and Louisiana, then to Texas in response to the opening up of new land not depleted by short-sighted farming techniques. This westward expansion brought cotton back in touch with the edge of its ancestral homeland in Mexico. Here it encountered pests such as boll weevil which it had evaded for a hundred years by skipping from Mexico to South Carolina. The boll weevil crossed into Texas in 1892, eventually covering nearly all territory where cotton is grown. The weevil's spread caused declines in some areas where soil fertility was still sufficient. The rich Blacklands of East Texas went from 38% of Texas production to just 2.5% (Hearn and Fitt, 1992).

The exploitation of the land reached its peak in the South in about 1920 according to most analyses [see e.g. Melosi (1989) and Robinson (1989)], leaving especially degraded soils in the Piedmont--with gullies up to 150 feet deep reported in North Georgia. Meanwhile, in the western parts of the South, farmers soon to be called Okies were fleeing dust storms caused by wind erosion of ill-conceived farms.

Noone knows how much the soil and other resources have been degraded by agriculture in the South, because no one took a baseline in 1607. The earliest region-wide estimate found over half of Southern land to be significantly eroded with 31.4% having lost over a fourth of topsoil (Natural Resources Board, 1934). Historians can debate the exact numbers. We do know that degradation of natural systems was accompanied by 1970 in more pesticide use on cotton than on any crop in the world. Over half the 65 million kilograms of pesticides applied in the United States were applied to cotton. Some 2/3 of all pesticides used in the US in were applied in the South (Helms, 1989).

As the destruction was noticed, some Southerners fought back. By the 1920s in North Carolina, Hugh Hammond Bennett had launched a crusade for soil conservation, advocating vegetative and structural control. Bennett became the first chief of the Soil Erosion Services which evolved into the Soil Conservation Service (and, in 1994, into the Natural Resources Conservation Service). Under Bennett's evangelistic leadership, the South soon became the national leader in organizing

conservation districts (Helms, 1989).

Also soon after 1900 Seaman Knapp saw the potential for development in the South and established demonstration farms in Texas and Louisiana. Clinton Calloway became director of extension at Tuskegee University in 1905 and began sending the Jesup Wagon to educate Black Belt farmers (Harlan, 1975:410). These successes in improving farming through demonstration agents became established nationally as the Cooperative Extension Service through the Smith-Lever Act in 1914. These and similar efforts led to a seven-fold increase in gross agricultural production from 1880-1980 (Bawden, 1991). More recently, some cite the growth of hogs and poultry production in the South in the past few decades as signs of the strength of agriculture in the region. Hog production in North Carolina has risen to No 2 in the nation from No.7 in the last 10 years (Luter, 1994).

Also worthy of note are recent successes with IPM to reduce pesticide use. In Texas pesticide use on cotton is today a tenth the level of its peak (Pimentel et al., 1993), and has changed from being 3 times that of corn to half that of corn.

Such successes enable many to tout American agriculture as the most productive in the world and the only hope for feeding a planet which will probably add 3 billion people in 25 years to the five billion people already here. But despite the vast modernization and productivity of agriculture in the South, some still see agriculture as the big enemy of the environment. EPA believes major unaddressed environmental problems are caused by agriculture. Habitat destruction and alteration, loss of biological diversity, and pesticides and nutrients runoff are noted as especially troubling effects of agriculture in a 1990 EPA Science Advisory Board report (Robarge and Benforado, 1992). Others cite the success of vertical integration in hogs and chickens as showing the "increased dominance of fewer and fewer agribusiness operators and the final end of farming as a Southern way of life" (Wilson, 1989). The summer of 1995 showed what this final end might look like when eastern North Carolina was beleaguered by multiple hog waste spills--each over 1 million gallons and several of 8 million (Kidwell, 1995).

Aldo Leopold in 1945 was one of the first to state the now standard dichotomy:

> "[There is] an unresolved contest between two opposing philosophies of farm life. I suppose these have to be labeled for handy reference, although I distrust labels:
> 1. The farm is a food factory, and the criterion of success is salable products.
> 2. The farm is a place to live. The criterion of success is a harmonious balance between plants, animals and people; between the domestic and the wild; between utility and beauty (Benbrook, 1991).

Fifty years later, other Midwesterners create a similar dichotomy showing the direction outsiders feel Southerners have taken:

> It is pretty obvious when you look at changes in the hog industry, for instance, that there are two models for the future. Either you have farmers banding together to use the latest genetics and technology to be the low-cost producers, like in parts of Minnesota and Iowa, or you have food companies doing it themselves, like we're seeing happening in North Carolina and Southern states.

(Purdue University Professor M. Boehlje quoted in Eggerstrom, 1994).

Though there is truth in his characterization of the South, it is also obvious that Boehlje begs the question of whether least cost production of commodities is the only route for agricultural development.

Another set of trends hits agriculture from the outside. In the South since 1945, rural communities and agricultural production have changed to such an extent that farmers are no longer the dominant economic force in most rural areas. Land which once supported dozens of families now may support only one or not even that. The most likely fate of a family farm in the South in the 19th century was to be abandoned or become part of a monocultural plantation. In Texas land in cultivation declined from 30.6 million to 19 million acres from 1930 to 1970 alone (Richards, 1989).

Conversion of farmland to nonagricultural uses continues to accelerate across the South. Nationally, 1.5 million acres per year are lost and 200,000 acres per year are lost in the South. Furthermore the decline is highest in the most productive, higher rainfall areas (American Farmland Trust, 1991). When farmers are not making any money and the value of farmland continues to increase, only those devoted to farming as a lifestyle stay in. In 1993 farmland values rose 6%, the seventh consecutive rise in value since 1987 (Decker, 1994). When a farm is not profitable, the increase in value makes sale for development ever more attractive.

In the 1970s, one fourth of farms in the South were lost. A fourth of the remainder were lost in the 1980s. According to the most recent data, the South leads the nation in the rate of loss of farms. Most parts of the South are losing farms at the rate of about 2% per year. The Southeast (FL, AL, SC, GA) is losing farms at the highest rate in the nation with an expected loss of another 21% by 2002 (Harrington, 1994). Appalachian states (NC, KY, VA, TN, WV) with an annual rate of loss of 1.9% and the Delta states (AR, LA, MS) with an annual loss of 1.9% are all higher than any other region of the country.

Those farmers who haven't lost their farms are increasing being forced to take on "public jobs" to support their farming habit. In Kentucky, for example, two-thirds of farmers are part-time (Logsdon, 1994). Reduced real commodity prices combined with rising farm input costs, and the continuing trend in agriculture toward consolidation and contract farming have forced many family farmers to search for, at best, marketing and production alternatives and, at worst, city jobs.

Meanwhile some lingering pastoral inclinations or, perhaps, concern for family farms enables the Federal and State governments for pour vast sums into agriculture. Every year, the Federal government gives about $65 billion and each state gives upwards of $100 million to its land grant university and state Department of Agriculture to help create a food and fiber system which will meet the needs of our country.

The quantity and direction of these resources are under intense scrutiny. Some contend that agriculture is the target because of its declining political power and because for non-specialists "it is clearly much easier to conceive of the sustainability of agricultural . . . systems than of, say, industry and human settlements" (Barbier, 1989). The inexperience of people who have never farmed increasingly shapes everything from commodity programs to the types of research done at agricultural

colleges.

Export of raw agricultural commodities is another driving force in American agriculture. Agricultural economics departments throughout the nation are largely organized around the study of raw commodities. The basic assumption of industry participants in the President's Council on Sustainable Development's Sustainable Agriculture Task Force was that we must fight to be the least cost supplier of commodities in order to stay competitive in world markets (Kemp, 1994).

Which are the crucial forces? The above expresses just one way of looking at where we are and where we have been in agriculture in the South. Everyone views the constraints and opportunities differently. But when farmers come together there is remarkable unanimity regarding those constraints and opportunities.

Jackie and Joe Judice gathered twenty-eight prominent sugar cane growers interested in sustainable agriculture in New Iberia, Louisiana as part of the State of the South project. When divided randomly into two groups to independently establish their priorities, the results were **identical** on all but one point--both for short and long term priorities. Many common threads link all farmers interested in sustainable agriculture.

The purpose of this book is to present a viewpoint from the land. How do farmers and extension agents see the trends in agriculture and the best opportunities for improving agriculture? In short, what is the state of sustainability in Southern agricultural systems[1]? Most particularly we want to know the best opportunities for increasing the sustainability of Southern agricultural systems. The primary method of our study was to listen to the people who are closest to the land. Over the last three years thousands of people have participated in an effort to understand the relationship between agriculture and our environment. The area we studied stretches from where US agriculture began on the Coastal Plain to the High Plains to the Ohio River: the thirteen states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia.

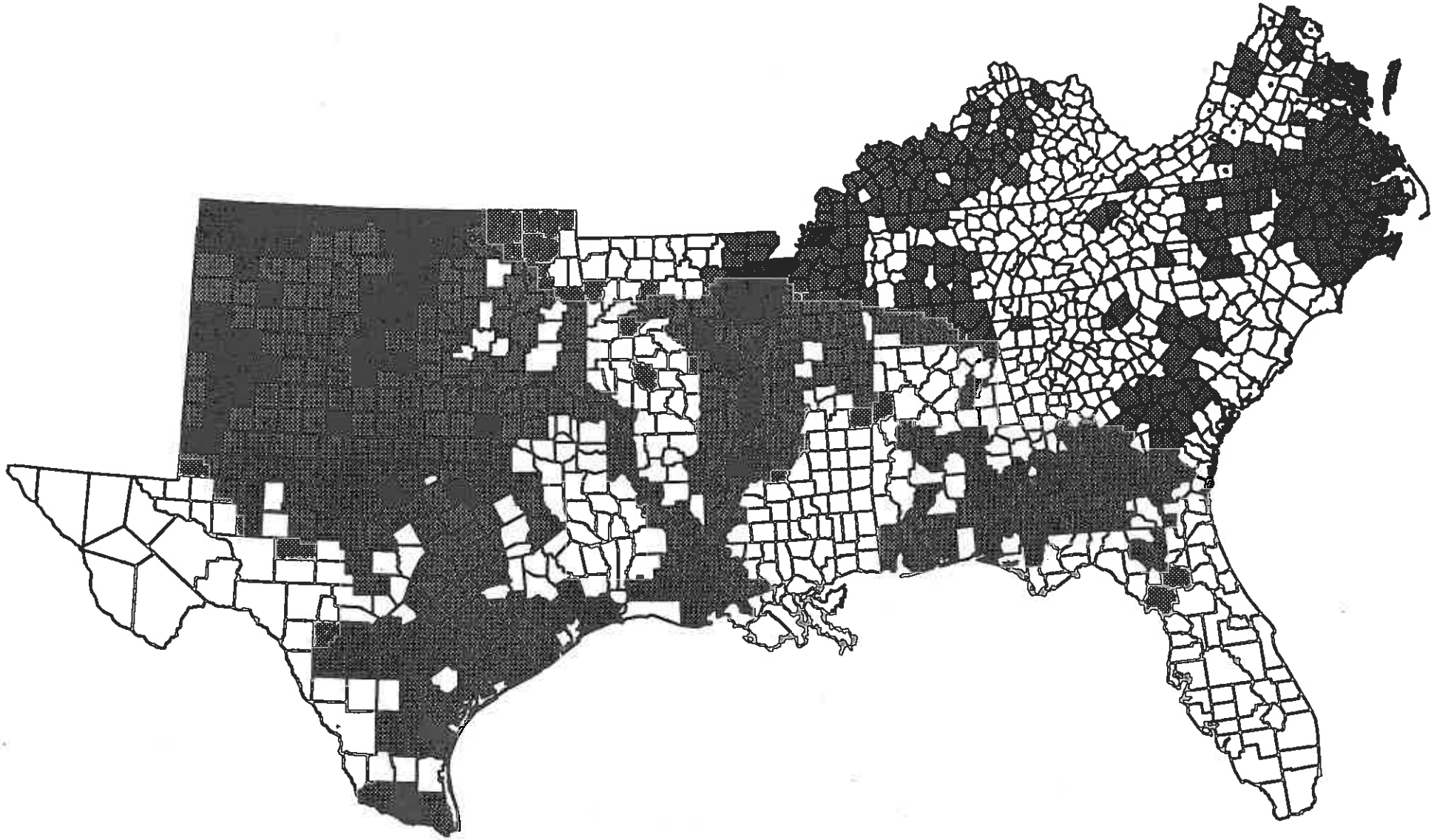
The possible futures of the South

"You're lucky. It's so much easier to get sustainable food systems in the South."
A University of Toronto food policy expert

Visitors from the Middle East, where agriculture began, seem to have one word for the South: "Lush." Southerners returning home and visitors from almost any other part of the country all experience the same phenomenon: a lush, green territory bursting with life. Hours can pass on the South's excellent highways seeing nothing but huge forests or verdant fields. The long growing season and abundant, evenly distributed rainfall make the South seem to many the best place to look for sustainable food systems (Friedman, 1994). Only in western Texas and Oklahoma is rainfall spotty and much of this area is underlain with good aquifers. In fact, the lack of rainfall has reduced insect pressure and helped make part of this area a center for organic grain production.

These conditions have helped the South to become home to nearly half the farms in the country (Harrington, 1994) and a stronger agrarian tradition than any other part of the country. Even the average town-dwelling Southerner has a closer

Map 1. Sustainable Agriculture Potential Index. Darkest counties have the highest estimated environmental problems from agriculture (see legend below). Counties with the most severe environmental problems induced by agriculture (N leaching, erosion and pesticide use) are ranked by multiplying acreage of the 10 major U.S. commodities by weights established for the environmental parameters by Tobey (1991).



connection to farming than in most other parts of the country. In much of the South, unbroken chains of farming families stretch back hundreds of years farther than in any other part of the country. The reach and importance of Southern agriculture is illustrated by such facts as: thirty-seven per cent of all food consumed in the US is grown in the 13 Southern states and half of North America's people live within a day's drive of the South.

Given this vast territory from El Paso to Miami to the Ohio River, how does one decide upon the most important areas? Our goal was to determine the best opportunities, the biggest bang for the buck, in sustainable agriculture. Where would improvements have the biggest impact on sustainability of agriculture in the South? The biggest impact will occur in the areas where agricultural production has the biggest effects on the environment.

To determine this, we began the project with analysis of environmental data bases. We selected the 10 major crops in the U.S. since most research and education money is available for these crops. Then we looked at erosion potential, nitrogen leaching and pesticide use on each of these crops on a county basis following the method of Tobey (1991). This reveals that the areas of the South with most potential for improvement are the High Plains of Texas and Oklahoma; the Blacklands of Texas; the Mississippi Delta; the Karst area of Kentucky, Tennessee and into Alabama; and the Coastal Plain area stretching from Alabama to Virginia (Map 1).

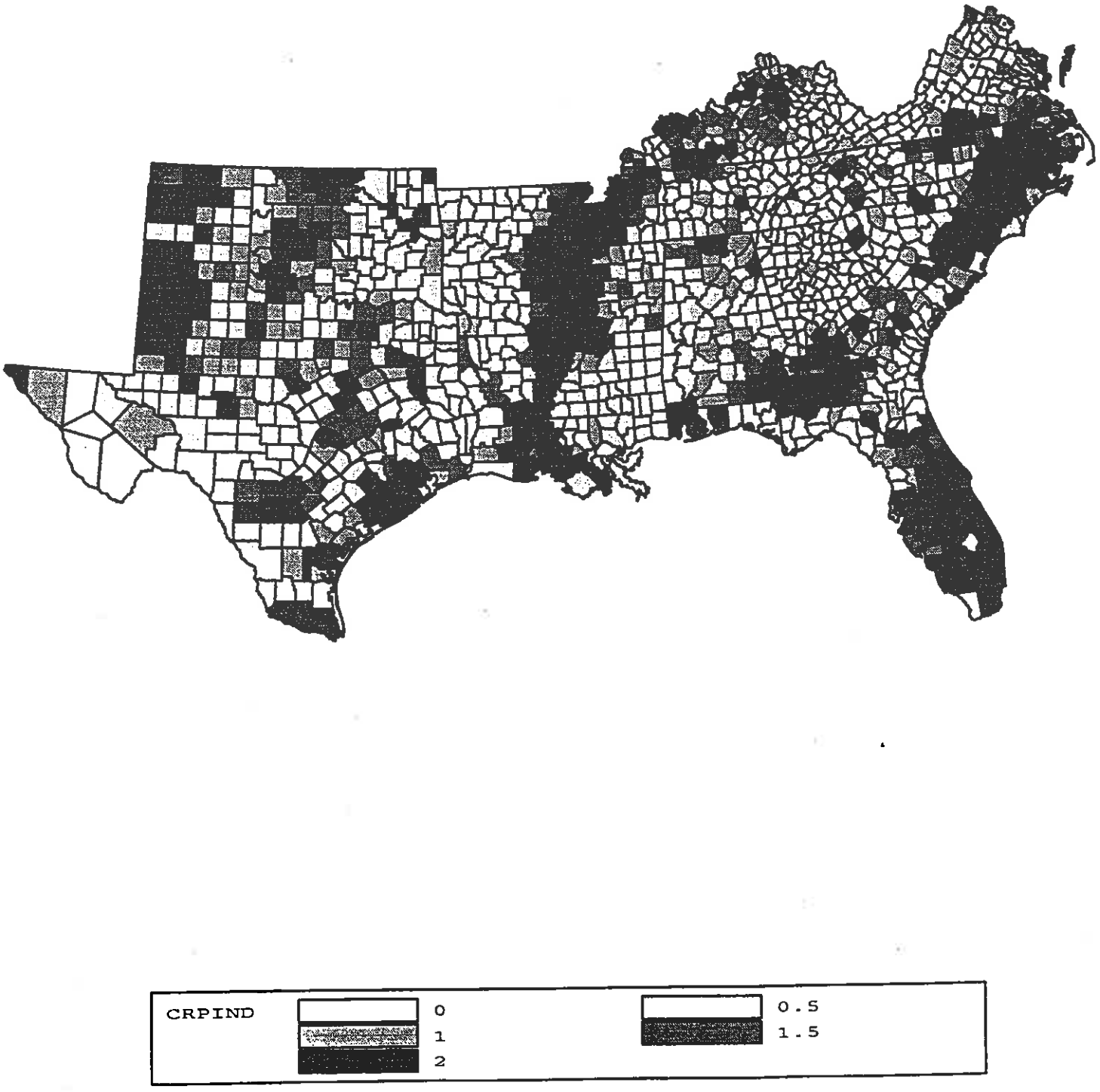
If fertilizer or pesticide sales alone are used to determine the areas most in need of work in sustainable agriculture, most of Florida is added to the above bioregions (Map 2). An almost infinite number of indices and maps can be generated depending on the indicators included and the weights given to each indicator. When poultry, hogs and beef cattle numbers are considered, areas such as Northwest Arkansas, coastal North Carolina and the High Plains of Texas merit increased attention. Rates of farm loss and asset decline are among other measures of unsustainability which support a focus on the High Plains, Blacklands, and Coastal Plain. Dependence on farm program payments is highest in the Delta of all regions of the South.

The most comprehensive work on creating indices and maps with the widest variety of environmental and economic indicators has been accomplished by Ralph Heimlich of USDA/ARS and published by the Henry A. Wallace Institute. One index of counties with both high potential for environmental problems and high dependence on farm program payments finds two regions of the South (the Delta and the Coastal Plain) to have more such counties than any other region of the country (Lynch and Smith, 1994: 12).

At the farm level, the final measure of sustainability is whether the farm survives. County-level loss of farms (Map 3) indicate highest levels in the Coastal Plain, Piedmont, Delta and bordering counties, and the High Plains.

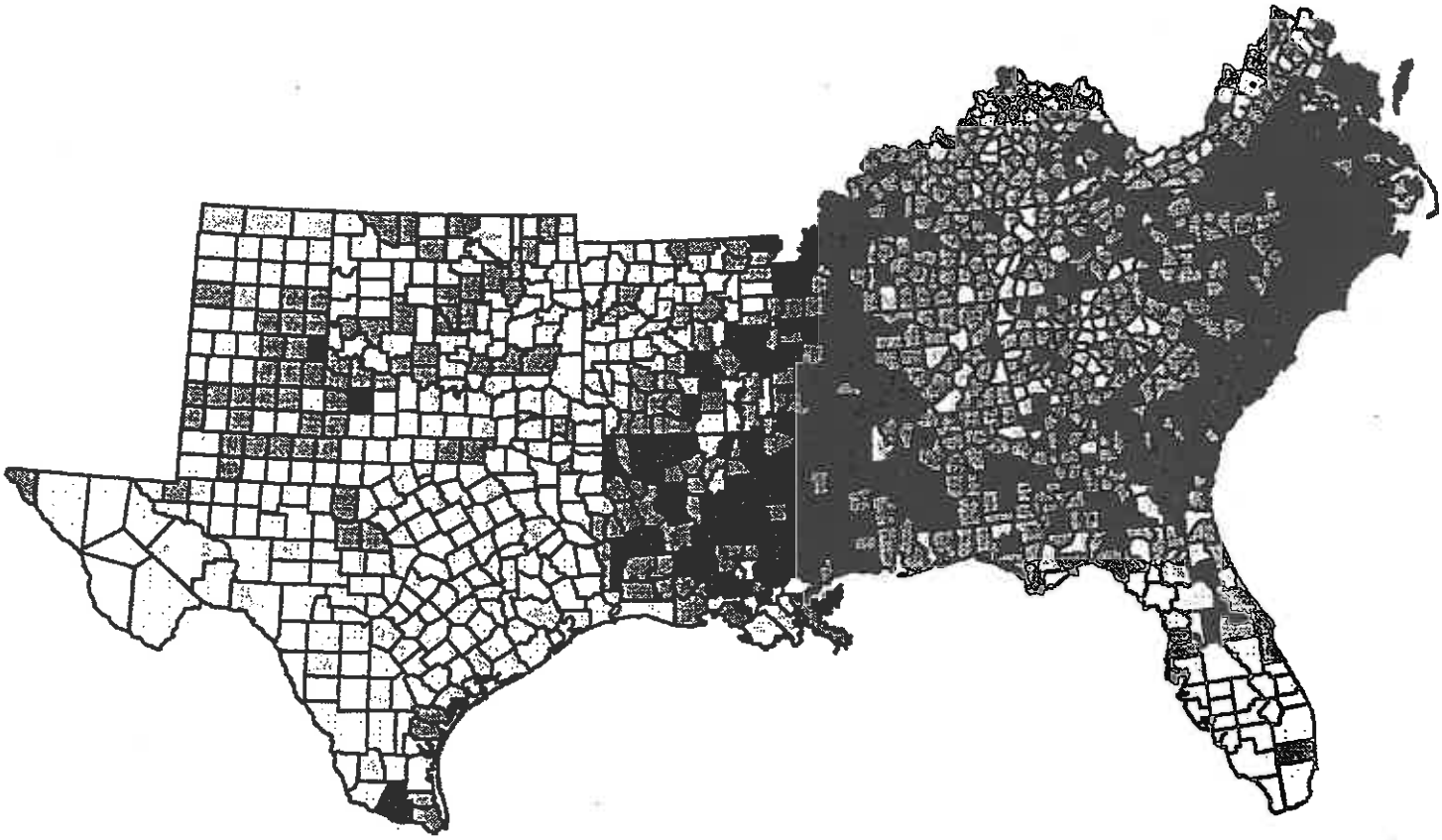
On a state level, these data even more vividly point up the counties with the most potential for environmental improvement. Poultry, pesticides and fertilizer databases give entirely different pictures about where the problems are: as maps of Arkansas (4a,b and c) illustrate. Poultry is concentrated in the northwest, pesticides i the sandy Delta soils where cotton is predominant, fertilizer use is greatest where rice is a dominant crop. Such maps of specific measures illustrate the limitations of any

Map 2. Alternative index for locations with greatest need for sustainable agriculture research and education program. Index combines pesticide and fertilizer sales figures from 1992 Census of Agriculture. See Debertin (1995) for details.



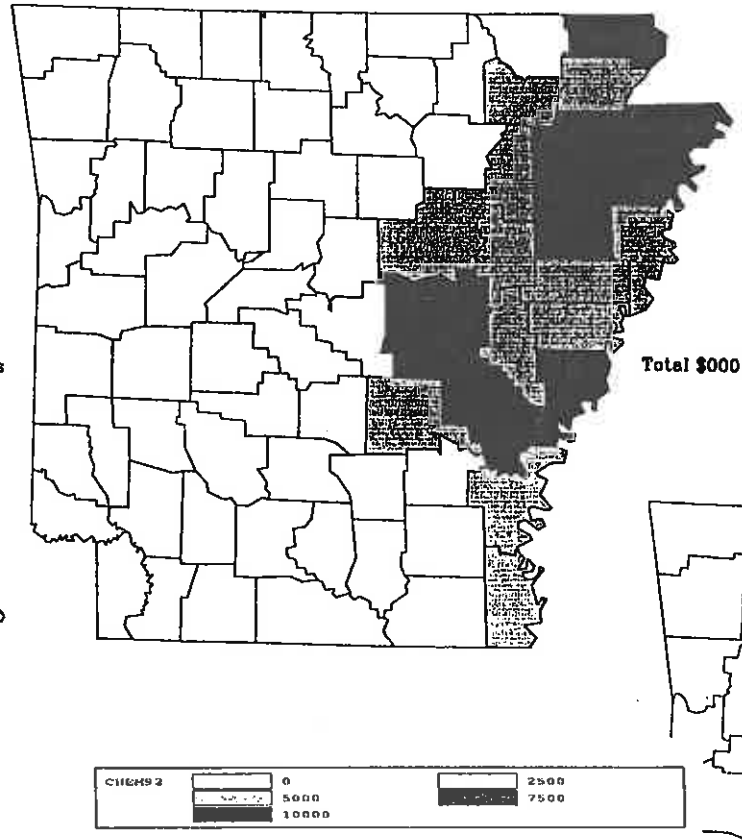
Map 3.

Percent Change in County–Level Farm Numbers, 1982–87 Agriculture Census

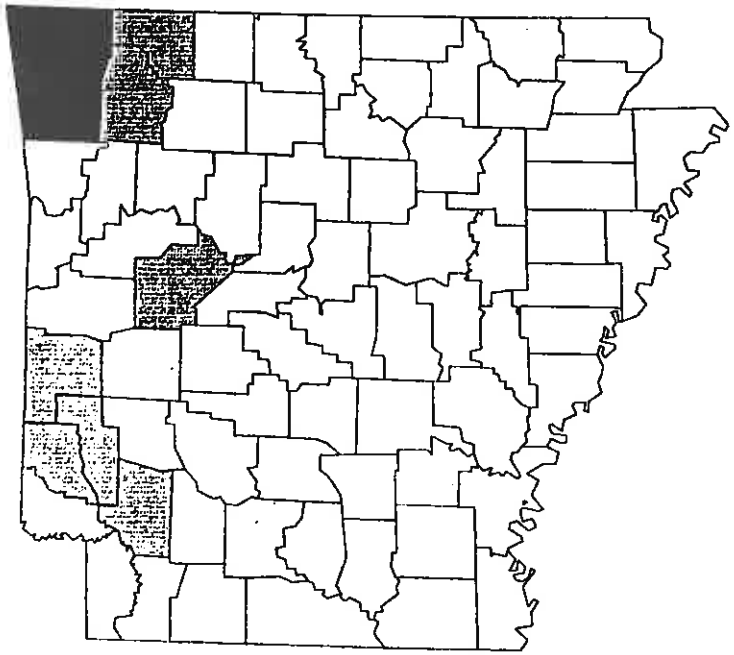


Map 4 a, b, c.

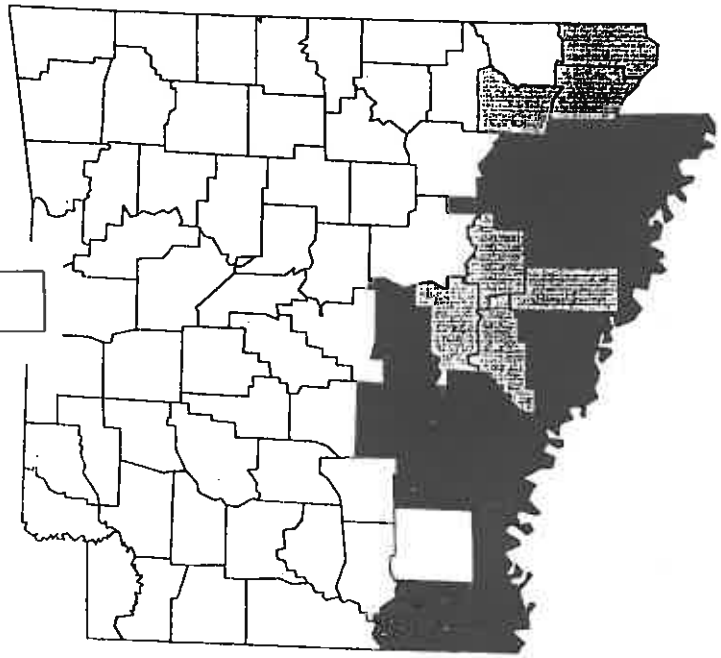
Total $000 Spent Per County, Fertilizers,Arkansas, 1992 Agriculture Census



County-Level Broiler Numbers (000,000), Arkansas, 1992 Agriculture Census



Total $000 Spent Per County, Pesticides, Arkansas, 1992 Agriculture Census



overall index of locations for need or potential regarding sustainable agriculture research and education.

Taken as a whole, however, these databases do give broad guidance about the major areas where sustainable agriculture research and education is needed. Focus groups and opportunity workshops detailed in following chapters were concentrated in the broad areas identified as most important by these databases. A number of additional databases explored for the State of the South project are covered in more detail by Debertin (1995).

Models, expert panels and real farmers

Given that these databases tell us generally where there is most potential for improvement, what methods will serve best to uncover opportunities for moving toward sustainability in these areas? Several different approaches have been taken: models, expert panels, surveys, focus groups.

A number of attempts have been made to model the US agricultural system and extrapolate into the future. Most widely cited is the Office of Technology Assessment study published in 1986 which predicted that 50,000 farms would be producing the vast majority of commodities by the year 2020. But this is just one of a number of modeling efforts. A recent review of these efforts notes that most fall somewhere between widely derided and obscure. These include Club of Rome Report, Global 2000 report under Carter administration, USDA's series of Rural Conservation Act (RCA) Appraisals and numerous reports by Office of Technology Assessment, Congressional Budget Office, Food and Agricultural Policy Institute (FAPRI) of Iowa State University. The summary conclusion regarding all these agricultural forecasts:

> "[W]ell-intentioned, skilled and informed people can produce forecasts based on what they believe to be the relevant data, but because they overlook some data or relationships or underestimate the ability of humans and institutions to adapt and to respond to economic and other incentives the forecasts eventually prove to be far from accurate." (Allen, 1993: 22)

A recent example from the South is the Kentucky Long-term Policy Institute prediction in early 1994 of a 40% reduction in tobacco quotas in Kentucky, but resourceful Kentuckians adapted, responded and achieved a 2% increase (Childress, 1995).

A recent article in Science makes the same point more sweepingly:

> "Verification and validation of numerical models of natural systems is impossible. This is because natural systems are never closed and . . . [models have] incomplete access to natural phenomena. Models can only be evaluated in relative terms, and their predictive value is always open to question." (Oreskes et al., 1994, p. 641.)

Oreskes and her colleagues go on to urge: stick with real systems This sentiment (that no model can achieve generality and realistic description as well as mathematical precision) is also widespread in the ecological literature. Ecosystem modeling is

widely seen as a vain hope (Sagoff, 1988). Worster (1977) made the most well-known case against the non-holistic systems approaches in ecology.

Crop modeling had a field day during the 70s and still employs a fair number of researchers, but most LGU administrators are much less sanguine about its prospects today. This issue is discussed more thoroughly in Chapter 3, but the basic problem is: any model is prisoner of its assumptions (inevitably wrong to some degree), data (always limited) and the extrapolations based on these wrong assumptions and limited data.

Even the best models are no better than the experts who build them. Models just extract quantitative algorithms from experts and gather the data required by those algorithms. So, in seeking to understand a particular system, the best sources are experts in those systems. Rather than extracting algorithms which can never be complete and matching them with limited data, an alternative approach is to go directly to the source.

Field-crop ecosystems are purposeful, self-regulating systems (Bawden and Ison in Pearson 1992). Such systems are managed. They exist only because someone wants them to. They are the product of the skills of a manager. Whether the integrity and functioning of a system is maintained then depends on the ability of a manager to respond properly when the system is disturbed and to anticipate disturbance.

Our best source of information about agroecosystems thus becomes the managers of those systems. So, to understand the constraints on farms, input of farmers as managers: university types, farmers, food system managers is crucial.

A first step away from theoretical models and toward sticking with real systems and the managers of those systems is: assemble expert panels. When Allen (1993b) accessed academic agricultural experts through workshop and survey, three key forces stood out as key influences on the future of agriculture:

1. public concern about environmental quality on agricultural production
2. vertical integration of farms
3. increasing political clout of urban and suburban consumers

But expert panels, no matter how expert, are only expert in the systems they manage. Academic experts are experts in academia. Further, extensive studies of research priority setting show that expert panels produce a very diverse collection of priorities and a very limited consensus on the relative importance of either major issues or specific research areas (P.J. Smith, 1994). The inherent problem is that priorities are properties of desires: something will only be a priority if it is seen as contributing directly to a person's or organization's goals.

Cooperative Extension in the South came one step closer to establishing priorities through direct system manager input by organizing a region-wide conference in conjunction with the early stages of the State of the South investigations. This conference did succeed in attracting a wide cross section of farmers and extension agents from the 13 Southern states to Callaway Gardens, Georgia in early 1993. A series of iterative focus groups led to the following prioritization of constraints on sustainability in the South:

% of total votes (actual votes in parentheses)	Constraint
22 (166)	economics and profitability of sustainable systems
15 (115)	lack of information on alternatives
14 (110)	government policy problems
8 (65)	conventional agricultural mindsets, inertia of system
8 (65)	lack of understanding of agriculture in general public
7 (57)	difficulty of communication about sus ag between farmers, media and environmentalists
7 (56)	international trade, competition
7 (52)	soil and water conservation: farmers know better, but don't
5 (42)	loss of knowledgeable older farmers, few young coming in.
5 (38)	definition of sustainability: confusion

The Callaway results can be summarized in four categories:

1. need for profitable, environmentally sound technologies
2. farmer-researcher information systems
3. policy constraints
4. public education and farmer-press-environmentalist communication.

Such conclusions from expert panels and region-wide conferences are valuable, but they cannot give a complete picture. Only an approach which goes to the grassroots and directly seeks the viewpoint of farmers and their neighbors will give on-the-ground validity to efforts to understand agricultural systems.

This is the context in which a unique effort occurred over the last three years to determine the best opportunities for moving toward a more economically and environmentally sound food and fiber system.

Thousands of people from every part of the South took part in the unprecedented assessment and planning effort reported in the following chapters. Once we had identified the areas of the South where we should focus (through the quantitative analysis shown above), we recruited every non-governmental agency we could identify in those areas to become part of process.

These groups were asked to undertake a process of rapid rural appraisal to identify the key stakeholders in agriculture in their community and to identify people with demonstrated expertise in sustainable agriculture as defined by the 1990 farm bill. Then these farmers and agribusinessmen met in a facilitated focus group. These groups followed a constructivist group process (see Chapter 4) whose goals were to determine a community consensus on the constraints and solutions to sustainable agriculture in that area and the interrelationships between constraints and solutions. This was accomplished through the process shown in Figure 1.

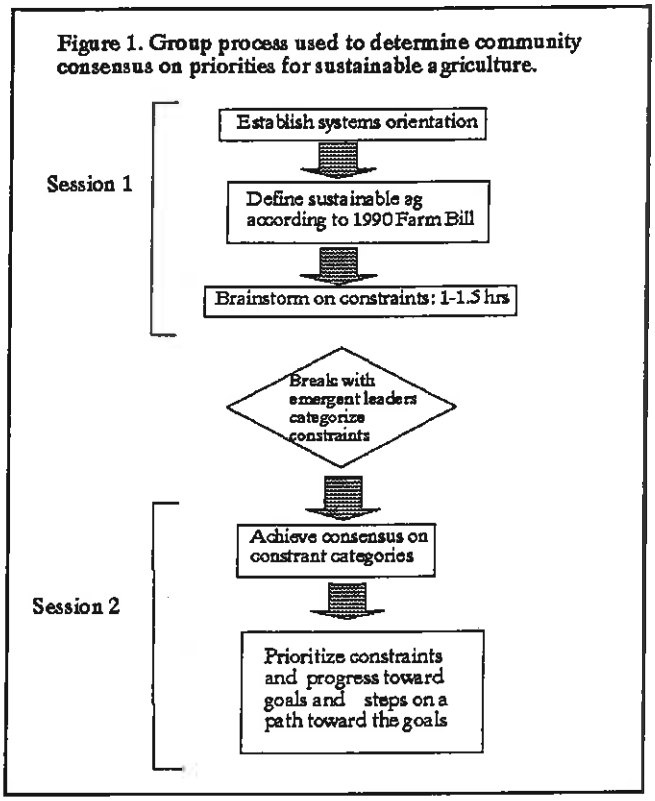


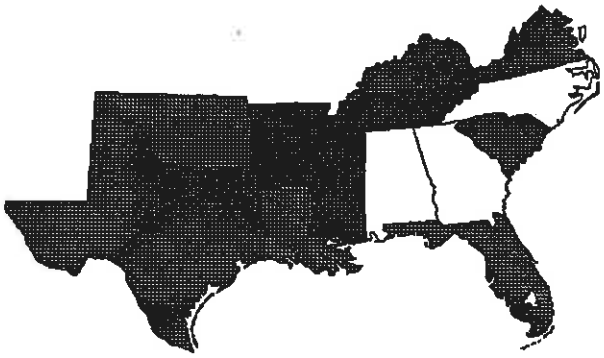
Figure 1. Group process used to determine community consensus on priorities for sustainable agriculture.

Over a thousand people (including more than 700 farmers) participated in 55 focus groups, then 500 more including 350 farmers in 10 opportunity workshops.

Finally, to provide quantitative data to complement the focus groups, a survey was conducted of county-level practices, perceptions and needs in sustainable agriculture. Eighty-nine per cent of counties in the South (1189 counties in all) responded to a survey (Appendix 1) sent to Extension and National Resource Conservation Service agents. (Huston and Rhoades, 1993; Huston, 1995). To provide a comparative view of opinions, four other agricultural stakeholder groups were sampled using the same questionnaire. The groups were "conventional" farmers (county Farm Bureau Presidents), "alternative" farmers (New Farm subscribers), environmentalists (Sierra Club members), and Southern Sustainable Agriculture Working Group (SSAWG) members.

Conclusion. The South is the birthplace of agriculture, Extension, soil conservation and vertical integration in the United States. What sustainable agricultural systems could be in the future of Southern agriculture? Thousands of Southerners have clear and remarkably consistent ideas about where the answers lie. Exploring these ideas, and the Southern futures they make possible, is the purpose of the following chapters.

Chapter 2. Overcoming the clash of paradigms



Communication across the revolutionary divide is inevitably partial. ***Thomas Kuhn***

Persons whose thinking is embedded in a given paradigm cannot perceive the reality that is seen by those whose thinking is embedded in another paradigm--it is like the blind talking to the deaf. ***Milbrath, 1994.***

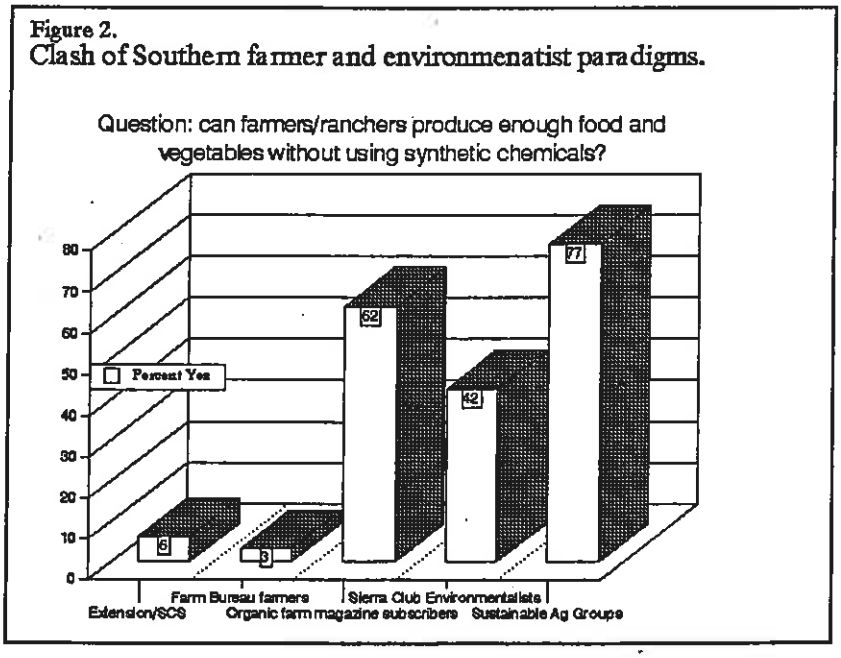
Southern farmers and environmentalists hardly seem to live in the same world. When asked: can farmers produce enough food and fiber without using synthetic chemicals? Only three percent of farmers and six per cent of extension staff agreed[1]. But environmental groups overwhelmingly agreed: from 62 to 77%. Most farmers (87%) see profitability (especially of low input practices) as crucial to sustainability while few Sierra Club members (34%) give even limited priority to such considerations.

Do lack of markets keep farmers from implementing sustainable practices Extension agreed (72%), as did most farmers (58%), but only 35% of environmentalists said yes.

Do negative farmer attitudes keep farmers from implementing sus ag practices? Responding yes: farmers, 37; environmentalists, 63.

Are producers in your county practicing sustainable agriculture? Answering yes: extension, 62; farmers, 51; environmentalists 16.

Figure 2.
Clash of Southern farmer and environmenatist paradigms.



[1] Survey details are given in Appendix 1 and Chapter 5.

One basic difference in views of sustainable agriculture centers on the fact that most farmers and extension staff don't yet believe it is possible. When asked whether sustainable agriculture is economical, less than a third of farmers agreed, while 70% of environmentalists did. Only 38% of extension agents feel sustainable agriculture is economical (Map 5). Large portions of important agricultural areas lack agents who believe sustainability is economical--including large portions of Texas, Oklahoma and Louisiana. On a state by state basis, some interesting trends emerge. In the mountains of northwest Virginia, most feel sustainability is economically feasible. But in more agriculturally intensive areas of Virginia, sustainability is viewed less positively (Map 6). In Mississippi, on the other hand, the very important agricultural counties along the Mississippi River feel sustainability is economical, while extension in less agriculturally important counties responded more negatively (Map 7). However, though the intra-state dynamics are crucial to local change, the fact remains that Southern extension agents, farmers' key advisors, remain skeptical of sustainability. This remains a big hurdle for those working toward sustainable rural development.

Extremes (nozzleheads, some in Farm Bureau, and chemophobes, some environmentalists) hold back progress and must move back to the center.

However the bigger hurdle may be the dichotomy between farmer and environmentalist viewpoints. The Delta workshop consensus said it most clearly:

> Extremes (nozzleheads, some in Farm Bureau, and chemophobes, some environmentalists) hold back progress and must move back to the center.

The Lubbock group viewed traditional attitudes as closely related to information/education systems. Their consensus was:

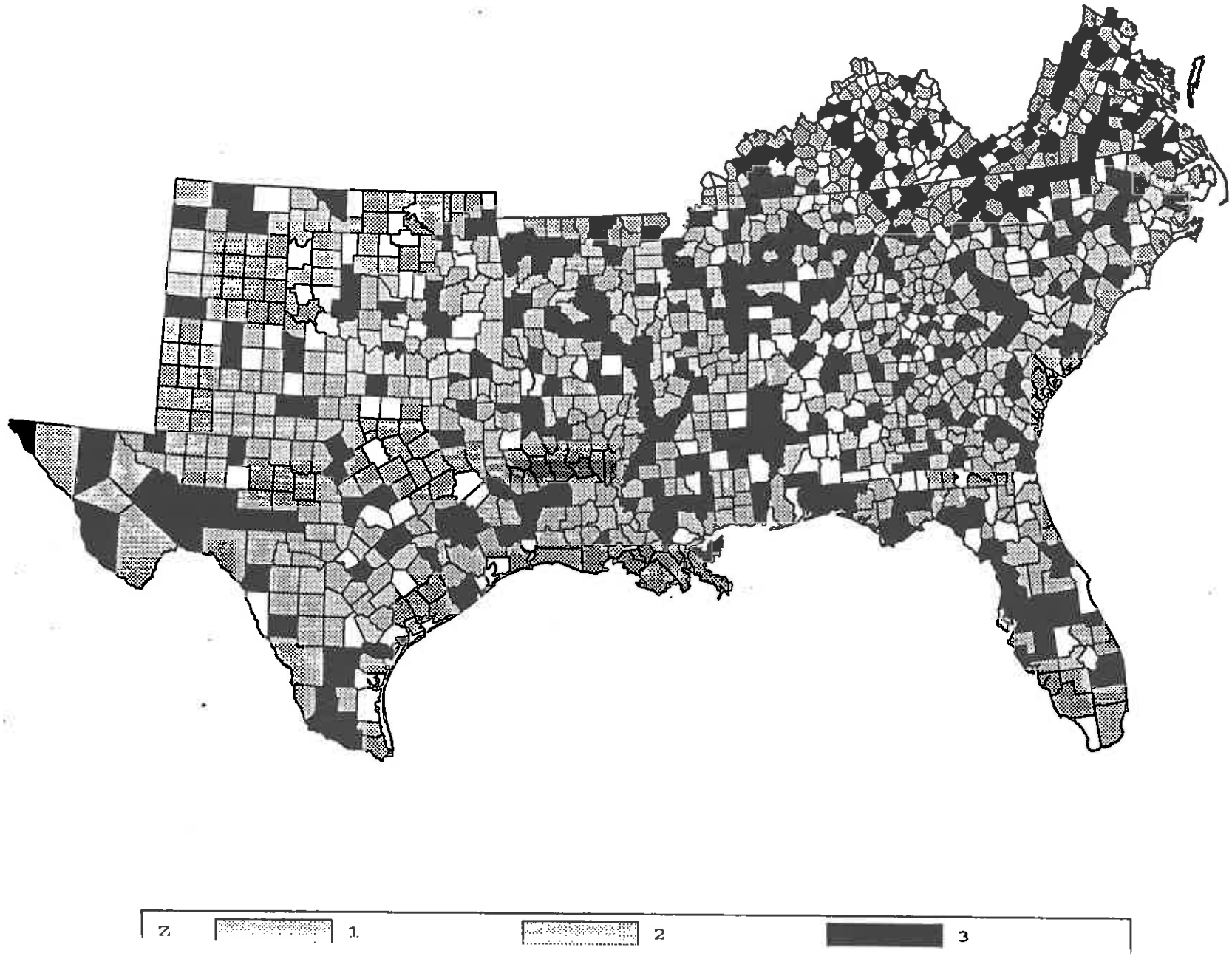
> 1. Problem: traditional farmers are in the habit of planting cotton after cotton.
> 2. Problem: extension is equally set in their ways--has a hard time swallowing organic approaches.
> 3. Much of the problem with extension is that the head honchos are so anti-organic. Often the county agents are great.
> 4. Bankers insist on cotton after cotton since they feel it is the only way farmers can pay off their loans.
> 5. Many people don't want to think about new ways of doing things.
> 6. We must overcome the fact that we are creatures of habit.

The solution, according to the Delta opportunity workshop consensus:

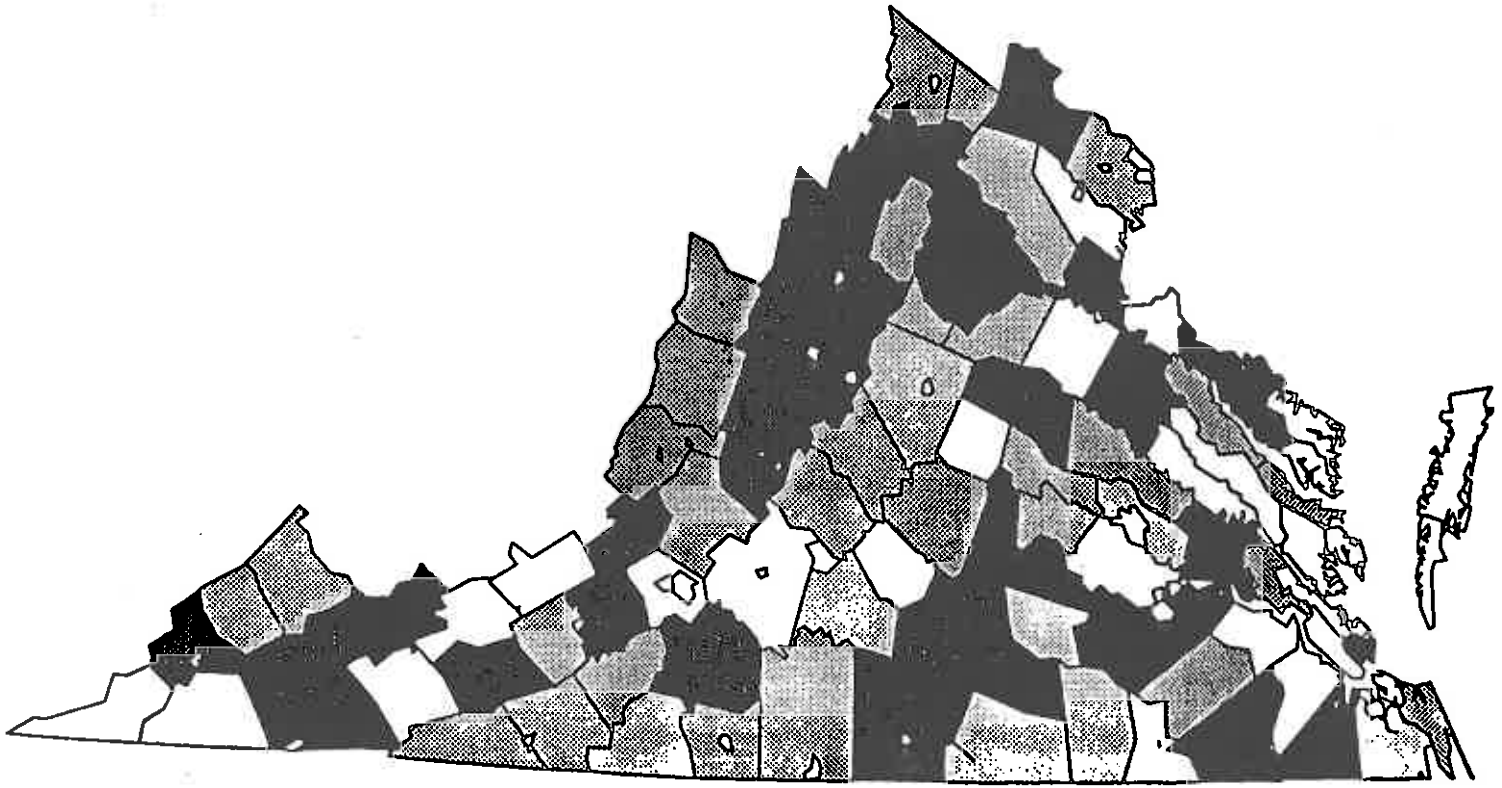
> **Basic problem and potential solution: sustainable farmers and environmentalists have not joined in coalition to control research funding and priorities.**

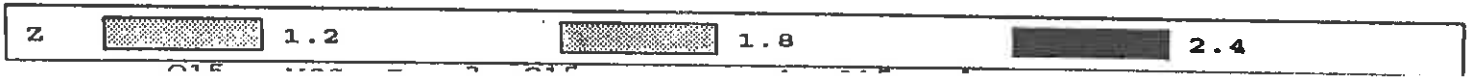
-Farmers have gradually been pushed out of the driver's seat when we went to

Map 5. Is sustainable agriculture economical? Counties filled in with black returned survey from Extension and/or SCS said yes to this question. Thirty-five per cent of 1189 Southern counties had positive responses.

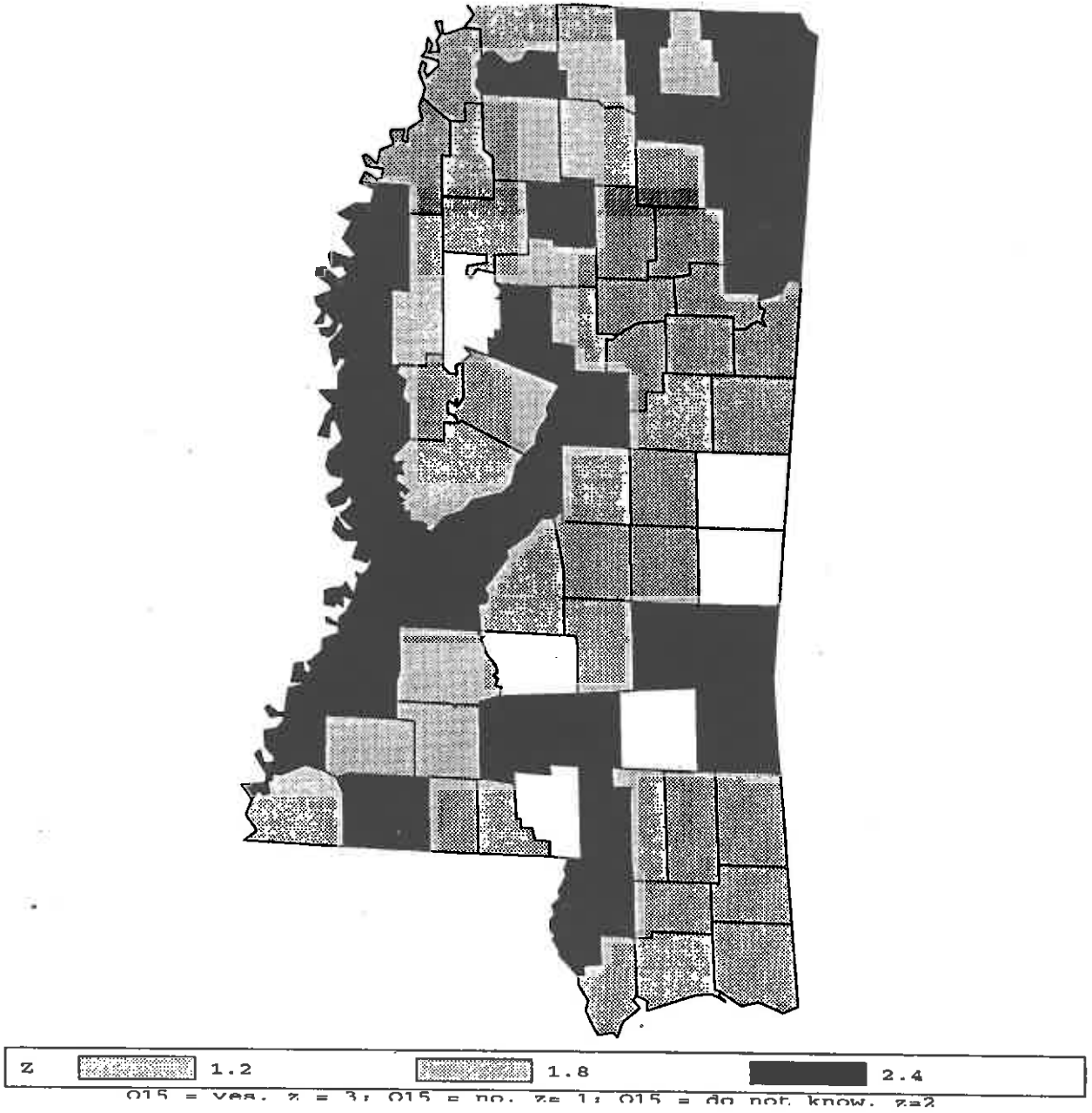


Map 6. Virginia counties filled in with black returned survey from Extension and/or SCS said yes to the question: Is sustainable agriculture economical? Forty-seven per cent of Virginia counties had positive responses.





Map 7. Mississippi counties filled in with black returned survey from Extension and/or SCS said yes to the question: Is sustainable agriculture economical? Forty per cent of Mississippi counties had positive responses.



industrialized agriculture.
-Some of these extremists have induced an atmosphere of fear among county agents and land grant researchers for looking at new, less chemically-intensive, alternative practices.

Creation of unity between farmers and environmentalist is blocked by the differing assumptions and mindsets of "chemophobes and nozzleheads." Beus and Dunlap (1990) see sustainable agriculture debates in terms of a clash of paradigms. Beus and Dunlap cite the telling example of Earl Butz debating with Wendell Berry where Butz noted in his concluding comments: "I've got a feeling that Dr. Berry and I haven't met here tonight. Perhaps we won't." The same differing mindsets appear in the interpretation of academic research. The key problem is differing assumptions.

An example from the heart of ecology, diversity, illustrates how such polarization occurs in interpretation of scientific literature. Environmentalists like diversity and assume monocrops are bad. Productionists like to defend monocrops.

The environmentalist preference for diversity has roots in the "balance of nature" concepts of competing populations keeping each other in check. Diversity is assumed to lend stability to ecosystems. Supporting research is illustrated by examples such as Hendrix et al. (1989) showing grass strips in soybean fields leading to less pest damage by increasing predators of pest species. Tonhasca and Byrne (1994) contend through meta-analysis that the average difference in insect density due to diversification is over 60%.

Productionists note that stable, climax ecosystems invariably have fewer species present than systems in flux. This position is supported by recent ecological studies. Reice (1994) provides several examples including his own long-term work in North Carolina. New Hope Creek, disturbed frequently by flooding has 10 times as many different macroinvertebrate species as the nearby, but stable Botany Pond. Allen Savory (1988) even asserts that a lack of physical disturbance for some years not only results in simpler, less diversified communities but communities which are less resilient when disturbed.

Productionists can then write books with titles such as Crop Ecology which defend monocropping by citing the low species diversity of many climax communities such as the Coast Redwood (Sequoia sempervirens) association of California, brigalow (Acacia harpophylla) shrublands of Queensland Australia, salt marshes and many others in a variety of climatic conditions (Loomis and Conner, 1992). Ecologists, in fact, now see stability as associated with lack of diversity in ecosystems as different as sage scrub lands and oak-pine forest (Westman, 1985). The mechanisms behind the decrease in diversity in stable ecosystems are now being uncovered. A fast growing area in plant ecology is "positive feedback switches" where plant species change their environment to make it more suitable for themselves (see e.g., Wilson and Agnew, 1992) thus decreasing diversity, but increasing their own species abundance. Often these mechanisms involve the release of chemicals, enabling conventional farmers and researchers to argue herbicides are natural (as happened at the Blacklands Opportunity Workshop of the State of the South project).

Ecologists respond that, under stable environmental conditions, systems can evolve where a few species are very dominant and diversity declines. However, when

stress hits, it is systems with high diversity which weather the storm best (see, e.g., Stevens, 1994).

Polarization inhibits synthesis. This sort of argument goes back and forth with neither side convincing the other and not likely to. The environmentalist sees the redwood forest as a complex community of species interacting synergistically to create a highly productive ecosystem. The productionist see one highly dominant species with many similarities to monocultured crops.

> ***Environmentalism is a religion for some, just as the conventional paradigm of chemically-based production agriculture is an article of faith for others.***

This controversy illustrates how each side is wedded to a set of beliefs and practices. Clarity of information will not alter their ability to interpret information according to their paradigm. Environmentalism is a religion for some, just as the conventional paradigm of chemically-based production agriculture is an article of faith for others. Extension agents, being well integrated in their communities and knowing the high productivity permitted by conventional farming practices have been justifiably reluctant to recommend new ideas not scientifically verified (even knowing that many scientists are locked into a rigid paradigm). Even when a new idea appears to work in other areas, farm advisors, in many rural communities, often "know" that other farmers would never even consider it.

Many extension agents and farmers have perhaps become too comfortable in a world of like-minded folks. Likewise, environmental regulators can remain most comfortable with people who think just as they do. However, increasingly farmers, extension agents, and agricultural researchers find it necessary to work with environmentalists, environmental regulators and consumers with entirely different perspectives, paradigms, problem definitions. When they do so, they often step into entirely different worlds.

The need and opportunity is to provide systematic tools to enable all farm advisors to create this merger or synthesis of paradigms. Chapter 4 explores this in more detail.

But the paradigm clash is not just between farmers and environmentalists. Consumers, wildlife advocates, rural development specialists and "wise use" folks all see Southern food and fiber systems through different lenses.

The need for a synthesis of perspectives becomes clear when environmentalists despair at getting sustainable agriculture policies from Republican administrations, while a Democratic Secretary of Agriculture notes that support for agriculture is hard to come by in a Democratic administration because "Farmers all vote Republican" (Espy, 1994).

Some think sustainability as a concept is the answer. Sustainability as a concept has the potential to bridge the divide between farmers and environmentalists because it assumes productivity, profitability and environmental quality are all valued goals (Murdoch, 1993). Or, as de Queiroz (1994) put it: sustainability is way of uniting ecology, systems and environmental concerns.

Unfortunately, sustainability has connotations of "manure and sunshine" to many as participants in the Lubbock focus group noted. However, to many environmentalists, sustainability is a concept owned by the production-oriented.

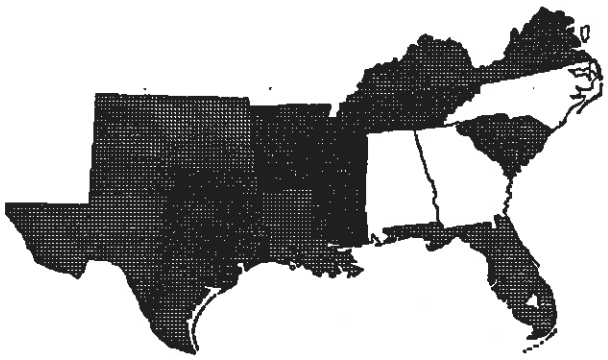
The problem with putting our hopes on sustainability as a concept is that any particular term will have to fit into a particular paradigm, if it is very strictly defined. Many within the sustainable agriculture movement are calling for a new term. But the same problems will arise with any new term.

Norgaard (1991) proposes a different approach: keep several perspectives in mind at once. If the ability of a system to last means resilience, ability to come up with right response in right situation, then we need a variety of approaches--which means being able to take multiple perspectives. Such an approach is consistent with an ecological systems approach since it stresses multiple, overlapping strategies rather than silver bullets (Cate and Hinkle, 1994).

No farmer wants to waste time debating the definition of sustainable agriculture. Not once in any of the 55 focus groups did any of the over 1000 participants argue with the vision of sustainable agriculture expressed in the 1990 farm bill: enhancing renewable resources, productivity, profitability, more efficient use of nonrenewable resources and a higher quality of life.

But many of these groups came up with a basic conclusion which may help overcome the clash of paradigms: taking a systems perspective.

Chapter 3. Farmers, systems theory and managing chaos



What is the basic change needed in our approach to Southern agriculture?

"Every aspect of education system needs to come from a systems perspective." **Delta Opportunity Workshop**

"We need systems approach to all research."
Lubbock focus group

These sorts of statements are common at gatherings of farmers interested in sustainable agriculture and they are usually accompanied by many heads nodding in agreement. The need is expressed in various ways: need for a systems approach, systems thinking, a systems perspective. But in agricultural academia "systems analysis" means crop modeling and has largely fallen out of favor as administrators and researchers become disenchanted due to the lack of progress (e.g. MacRae, et al., 1989). Cate and Hinkle (1994) note the universal lack of success of systems analysis in IPM.

It is crucial to, for a moment, dwell on the distinction between what farmers mean by a systems approach and what academicians typically mean. Since two groups are using the same phrase to mean entirely different things, they can and do often talk completely past each other, even while thinking they are communicating.

Jan Christian Smuts in South Africa in the 1920s began systems theory when he created the term holism. Smuts' approach continues with the practical systems work of Holistic Resource Management (Savory, 1988). But, as von Bertalanffy (1968) makes clear in the classic General Systems Theory, much of work which has occurred under the label "systems" has little in common with Smuts and Savory's work.

Smuts (1926 , 1971) coined the phrase: "the whole is greater than the sum of the parts." This is the sense in which farmers in our focus groups have used the term "systems approach". But many researchers today do not understand the wholes farmers are dealing with. They know individual components--often, even, understanding the components as systems--but lack an understanding of the larger systems which determine the worth of the component their research and discipline is devoted to. As one Midwestern independent crop consultant put it:

"We need real systems research, not what they do at West Lafayette. Researchers typically look at single components and examine them in unrealistic, experiment station conditions."

Academically-oriented researchers and extension staff are often reflexively reductionist[2]. When confronted with a system, they try to break it down into components to explain the system. Within this tradition, overly mechanistic academics adopted systems language and created something called "systems analysis." The agricultural colleges did not invent this approach to systems. It was at the august Institute for Advanced Study in Princeton, New Jersey, that systems theory met reductionism and was almost consumed. World War II was the impetus for development of quantitative approaches for making decisions regarding allocation of scarce resources. The tool of linear programming and the field of operations research (OR) resulted. In the euphoria after the war, OR evolved into systems analysis with headquarters at Princeton.

Systems analysis is defined largely in terms of quantification of components, simulation and optimization of mathematical models (Hesketh and Alm, 1992). John von Neuman is described as the father of computers and systems analysis. He contended:

"The sciences do not try to explain, they hardly even try to interpret, they mainly make models. By a model is meant a mathematical construct which, with the addition of certain verbal interpretations, describes observed phenomena. The justification of such a mathematical construct is solely and precisely that it is expected to work." (quoted in Gleich,1987).

One of von Neumann's principal claims was that **systems analysis would be able to not just predict, but control any complex phenomenon (such as the weather)** if only enough computing power was arrayed to fully describe each component and enough information about initial conditions was available. During the heyday of this belief, in the 50s and 60s, the biggest and fastest Cray supercomputers were supplied with data pouring in hourly from every nation on the globe. The weather was one area where von Neumann explicitly predicted control would result. Scientists who share this assumption still argue for ever greater computing capacity and for sending airplanes up to lay down smoke screens or seed clouds to push weather into the desired mode.

The results have been somewhat less than overpowering. Weather forecasts have become statistically better than chance, but are only speculative beyond 2-3 days and virtually worthless beyond that. Faster computers often just make the wrong predictions earlier than slow computers (Macrae, 1992:274). von Neumann himself

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[2] For example, when the Southern Association of Agricultural Experiment Station Directors (SAAESD) undertook the task of examining how sustainable their research projects are, a "systems" project was defined as one meeting four or more of seven criteria. "Component" projects met less than 4 criteria (Yeiser, 1995). In this usage, if a project just addresses enough criteria, it becomes a systems project. Adding another component to a project then becomes a way of making it fit this definition. However, a system is not defined by the components in it, but by the relationship between components. A bucket, a tree limb and a rope make a system only in their relationship. Study of the components isolated from the system tells nothing about how they interact to create a system or the emergent properties of the system.

began to realize this. Just as he early to appreciate the potential power of computers, so was he early to question his formerly steadfast faith in quantitative, algorithmic understandings of Nature.

> "Just as Greek and Sanscrit are historical fact and not absolute logical necessities, it is only reasonable to assume that logics and mathematics are similarly historically accidental forms of expression. . . [W]hen we talk mathematics we may be discussing a secondary language built on the prime language used by [Nature]." (quoted in Macrae, 1992:370)

Unfortunately, von Neumann's untimely death prevented him from developing these insights as fully as he had developed the systems analysis approach. This enabled his mature epiphany to be ignored by systems analysts with a vested interest in algorithmic understandings of natural systems.

In agriculture, the systems analysis approach to systems led to various crop modeling efforts, with the less than enchanting results noted above. However, a series of symposia at the 1994 American Society of Agronomy meetings illustrated how devoted agricultural scientists still are to modeling, even while admitting that models cannot be validated (Addiscott et al., 1994; Sinclair and Seligman, 1994; Passioura, 1994). The consensus of these symposia was that models can be useful heuristic devices but cannot be used to predict reality--though a few diehards with big modeling grants disagree. The temptation to modelers is that policy makers continue to ask for such predictions.

In international agricultural development, systems analysis also spawned **Farming Systems Research and Extension (FSRE)**. Grand and complicated flow charts attempted to break farms across the world into components and then pull them back together to come up with research directions. After lavish support for many years, the CGIAR has largely given up on FSRE, though a comeback with a more holistic approach is predicted by some.

Why has systems analysis not met up to its expectations? Systems analysis has made great strides in developing useful closed systems such as computers. But in biological systems, the models of systems analysis don't satisfy the one criterion of von Neumann, they don't work. Observers of systems analysis have come to echo the Latin poet Ennis' attitude toward forecasters "who don't know the path for themselves yet show the way for others" (McCloskey, 1994:107).

The reason systems analysis has not predicted natural phenomena well is the failure to deal adequately with open systems, the class to which all living systems belong.

Open systems and chaos. The reason systems analysis has not predicted natural phenomena well, according to von Bertalanffy (1968) is the failure to "deal adequately with open systems, the class to which all living systems belong." Two fields of inquiry, chaos theory and "self-organization" theory are felt by some in landscape ecology (Naveh and Lieberman, 1994) and policy theory (Daneke, 1990) to hold the keys to more useful application of holistic systems to biology.

Systems analysts, following von Neumann's early lead, believe that enough

data and computing power would enable scientists to isolate the few variables which are points of instability. But this overlooks the possibility of instability and reorganization at every point in natural systems. Meteorologist Edward Lorenz published the seminal papers in this area, which came to be called chaos theory As he explained later,

> "The average person, seeing that we can predict tides pretty well a few months ahead would say, why can't we do the same thing with the atmosphere, it's just a different fluid system, the laws are about as complicated. But I realized that any physical system that behaved nonperiodically would be unpredictable" (quoted in Gleich, 1987: 18).

Beyond being aperiodic, chaotic phenomena have an extreme sensitivity to initial conditions--leading to the quip about a butterfly flapping its wings in Denver leading to a thunderstorm in New York. Though unpredictable, chaotic phenomena trace regular patterns (called strange attractors). Such attractors have been observed throughout physics and in many areas of physiology. Chaotic dynamics underlie even those physiological processes that were once thought to be strictly periodic (Logan and Allen, 1992). Chaotic phenomena have even proven to be manageable--resulting in stabilization of the erratic beat of unhealthy animal hearts, increasing the power of lasers and controlling oscillations in chemical reactions among other potentially invaluable results (Ditto and Pecora, 1993). More recently, Ditto (a Southern researcher) has found evidence that excessive order, not chaos, may be the cause of nonfunctional behavior in some systems (e.g. epilepsy). Ditto and his colleagues are reported to have developed "anti-control" algorithms to detect and maintain chaos in biological systems (Regalado, 1995).

Recently, the complex, nonlinear dynamics of various agricultural phenomena have been shown to lend themselves to chaos theory. The aperiodicity in growth of broilers was recently shown to exhibit a strange attractor (Roush et al., 1994). Two Southern agricultural researchers go so far as to say:

> "In our opinion, complex nonlinear dynamics holds the potential for a true paradigm shift in insect ecology. We support this view by observing that if chaotic dynamics play an important role in the structure of insect population dynamics, then long-term prediction is simply not possible. . . Finally, the potential for chaos underlies the fragility of the natural world and its sensitivity to simplistic or insensitive attempts at management" (Logan and Allen, 1992).

Chaos theory in the last decade has spread throughout ecology, largely in response to inadequacies notions of equilibrium. Robert MacArthur, a dean of the field of ecology in the 50s and 60s posited a "balance of nature." His models supposed that an ideal climax community would eventually arise to fit any set of physical and climactic condition. This community of plant and animal populations would vary around the "equilibrium" which represented the most efficient use of food resources. In the 70s, however, ecologists began to question how often equilibrium is actually observed. What was actually observed was variation with superficial resemblance to oscillation, but the equilibrium itself never actually occurred.

All environments in all ecosystems are patchy in space and variable in time. Any equilibrium is only an average that never actually exists (Reice, 1994). A modification of equilibrium theory arose (dynamic equilibrium: Huston, 1979) to deal with these realizations, but many ecologists are rapidly abandoning the equilibrium approach because it doesn't describe or predict natural systems. Reice (1994) summarizes this perspective:

> In some systems the return frequency of disturbance is so long that the impression of equilibrium conditions develops. This is what underlies the traditional idea of climax communities. However, careful observation reveals that disturbance is ubiquitous and frequent relative to the life spans of the dominant taxa.

MacArthur's last student, William Schaffer, has led the movement to abandon the equilibrium approach in ecology and bring in chaos theory. Every organism in an ecosystem is a unique point of unpredictability (Schaffer, 1986) striving to manage its environment to make it more comfortable for its self and its offspring. Populations do balance each other by their competition. Wolves numbers will decline when they eat too many caribou. But the populations are not striving for equilibrium, but to expand their influence.

In agriculture, range management workers are joining this movement because rangelands often do not follow typical patterns of succession but have sudden, discontinuous, unpredictable changes in vegetation (Lockwood and Lockwood, 1993).

Social scientists are beginning to adopt chaos theory to understand the unpredictability of social behavior (Gregersen and Sailer, 1993). Due to the negative connotations of the term chaos, some social scientists prefer the term **transformation systems** to stress the key feature of chaotic systems: the ability to dynamically transform themselves (Loye and Eisler, 1987:58).

Systems analysis is tattered, but systems theory remains.

Two pioneers in chaos theory sound like systems theorists when they introduce chaos theory:

> "[T]he collective behavior of the whole is qualitatively different from that of the sum of the individual parts . . . is precisely the definition of nonlinear."
>
> Farmer and Packard (1985)

This is precisely the point of the concept of emergent properties: properties which are revealed at a particular level of organization and which are not possessed by their constituent subsystems (Bawden and Ison, 1992).

The destruction wrought by nonlinear, unpredictable dynamics on systems analysis has led to a chorus of "systems bashing." But systems analysis went astray because its proponents could not abandon reductionism, and so transformed systems theory into its opposite. Reductionism holds that "complicated phenomena can be understood ultimately in terms of regular relationships among simple phenomena" Randall, 1986). Systems theory says you often overlook key qualities of complicated

phenomena if you are always looking at relationships between simple phenomena.

The resounding success of agricultural sciences in increasing agricultural production, leads many academically-oriented research and extension staff to the conclusion that reductionism works. Believing in Leibig's law of the minimum enabled soil scientists to determine the components of fertilizer needed to create high yields of commodities. But, State of the South farmer participants point out, for example, the "unknown growth factors" reductionistic scientists need to explain increased hog growth rates on pasture. Or how organic crop production methods lead to reduced insect pressure and enable a farmer to help his eight children continue farming in an otherwise conventional manner.

Researchers are usually convinced that their assumptions are correct and that the answers lie in understanding the components. Supported in their stance by members of their discipline, they often ignore such farmers' observations. Sooner or later, some academic researchers do come around to investigating such observations of farmers, as shown by recent Ohio State confirmation of the effect of organic fertility practices on reducing insect damage (Stinner, unpublished).

Practitioners express concern that researchers rarely look at the system as a whole to determine emergent properties which occur only when components work together.

> The sense of unease about the inadequacy of reductionistic science in agriculture (as well as in many other areas of human endeavor) comes precisely because of increasing evidence that in dealing with complexity by simplifying it to "manageable bits", we fail to come to terms with the "real issues" facing humankind
>
> Richard Bawden (1991)
> Keynote at 1990 American Dairy Science meetings

Unfortunately all too many people in agricultural disciplines equate systems theory with the search for mathematical models of agricultural systems. Administrators then sour on systems work as such models are shown not to be sufficiently predictive--just as were models of the weather--and incapable of ever being verified or validated (Oreskes et al., 1994).

Luckily, the original holistic emphasis of systems theory was maintained, largely outside the U.S., under a variety of names such as soft systems (Bawden, 1991) and landscape ecology (Naveh and Lieberman, 1994). This original approach to systems is being rediscovered in the South by many researchers and extension workers, as they recounted during workshops of the State of the South project. Savory (1988) has been one catalyst for much of this change of thinking among farmers in Texas and Oklahoma, but many farmers and land grant staff from other corners of the South are becoming converts from a variety of experiences--probably most prominently through rapid rural appraisal (e.g., van Willingen and Absher, 1986).

The general **revival of holistic systems approaches** is being heralded expectantly in various disciplines because of the successes of mathematical chaos and advances in understanding self-organization. Naveh and Lieberman (1994), in the latest edition of Landscape Ecology, and policy theorist Gregory Daneke (1991) cite

the Nobel Prize winning work of Prigogine (e.g., Prigogine and Stengers, 1984) and Jantsch (1980) in exploring the self-organizing "dissipative structures" which organize a chaotic mass of units into a more complex whole. These authors feel such work is laying the foundation for a fundamental new understanding of biological organizational change.

Due to the work of Prigogine and Jantsch, Anatol Rapaport (1986) holds out the hope that a dynamic approach to systems is arriving which may finally provide a way out of the dead end of systems analysis. Details of these developments are beyond the scope of this book, but one key point makes them extremely relevant to agroecosystems. A new organization of existing components is what makes an agroecosystem more than an ecosystem. The farmer or other manager accomplishes any reorganization of the farm or other system he manages. Rapaport begins his General Systems Theory by contrasting analytic and holistic approaches to cognition in a manner that rings true to farmers faced with reductionistic academic researchers:

> The analytic method is supposed to provide an understanding of some object, phenomenon, or process by examining its constituent parts. Note that the term 'method' already implicitly designated the analytic approach, since a 'method' is usually defined in terms of procedures, in fact, well defined sequences of procedures, which in their totality are expected to lead to the goal--acquisition of knowledge. In other words, the description of a method is tantamount to an analysis of knowledge-acquiring processes. For this reason, it seems appropriate to speak of a `holistic method'. The holistic approach to knowledge is based not on analyzing but on grasping the `whole'.

Making this "systems thinking" even more relevant to farmers and agricultural researchers is the dynamism of natural systems combined with the emergent properties of farmer decision-making. To Bryan Norton (1991) of Georgia Institute of Technology, the whole is the large, autonomous system "which, more or less mysteriously to us", maintains the integrity and productivity of itself. The farm can be seen as such a whole if we also recognize, with the landscape ecologists, that every whole is dependent on other systems both "above and below" it. The concept of hierarchy does not implies domination of the smaller systems by the larger, but the interdependence of both (cf. the adage: "For lack of a nail . . .the kingdom was lost").

But the "systems thinking" farmer gives her agroecosystems a completely unique character. In natural ecosystems, ecologists generally view two processes as determining ecosystem community structure: environmental processes impinging on the species and equilibrium between species (Reice, 1994). In agroecosystems a third process is dominant: decision-making of systems managers. The farmer's management decisions control much of the structure of his agroecosystem. Whether the integrity and functioning of a system is maintained depends on the ability of a manager to respond properly when the system is disturbed, to anticipate disturbance. One crop ecologist even goes so far as to make the definition:

> "Sustainability is a measure of the difficulty which management encounters in maintaining biological and economic resources" (Pearson, 1992).

A field with a good cover crop has little difficulty controlling erosion of soil resource. A fall-plowed field erodes. A field with an abundance of the spider Lycosa pseudoannulata will have few green rice leafhoppers. A rice field wiped clean of L. pseudoannulata by insecticide used to control the leafhopper is much more likely to suffer devastation via leafhopper.

The spider-leafhopper-rice system is open. The borders of the system are defined only by where action can be taken to control subsystems (Bawden and Ison, 1992). However, in agroecosystems the goals and purposes at one level may conflict and even be totally alien with those at another level. Tennessee tobacco farmers could virtually eliminate erosion, produce with maximum efficiency and make a good profit in the mid 1990s. But if managers of marketing systems find more profit in vertically integrated production in Argentina or Malawi and/or the policy system pursues elimination of tobacco's supply management commodity program, conflicting goals could overnight turn a profit into a huge loss.

All natural ecosystems seem to have two key "goals": to accumulate nutrients and to last (Woodmansee, 1984). All subsystems within any natural ecosystem seem to share these goals. These goals can be accomplished because natural systems are open. As Odum (1989) summarized:

> In Nature, closed systems with complete isolation are rare and temporary. A state far from equilibrium is maintained through the open flow of energy and matter across the system boundaries. The ecosystem is organized to capture and concentrate energy and nutrients.

The flow of solar energy (in various forms) into natural systems makes self-organization possible (Prigogine and Stengers, 1984).

Likewise, in agroecosystems, each subsystem has the two goals to accumulate (nutrients or their equivalent--often capital) and to last. In an ecological examination of the economics of agroecosystems, the inputs are not land, labor and capital, but flow of materials, energy and information and the technology and workers organized to process materials, energy and information. Technological change is nondeterministic and possesses emergent properties (Christensen, 1992). Or alternately, technology is a chaotic stimulus to self-organization. Innovation is the organizing of technology and other inputs to accumulate and last.

A "basic observation of landscape ecology is that modern agricultural landscapes are in a constant flux of change" (Bunce and Jongman, 1993). And the farmer (or other system manager) is the organizer who turns the flux into production and profit. Specifically, "the farm is at the smallest scale where biological, economic and social considerations are integrated, where decisions are made, where systems are organized" (Greenland et al., 1994).

Resilience is the ecological indicator of the ability of a system to bounce back from the flux (Westman, 1985). "Brittleness" is another ecological term modified by some to describe agricultural landscapes which require proper management to maintain resilience

If we recognize that the future is unknown and technology change makes it unknowable, then flexibility is key.

(Savory, 1988). Resilience requires flexibility (Gray, 1991). If we recognize that the future is unknown and technology change makes it unknowable, then flexibility is key. The question for sustainable agriculture then becomes, how to help farmers be more flexible. Huge amounts of readily available capital and/or vertical integration of production and markets helps accomplish this for some agroecosystem managers, but can our publicly supported research and education system create the tools needed for agroecological resilience by the rest of us?

Farmers are notoriously independent and, by necessity, systems-minded. Farmers can usually ignore the true-believer researcher or environmentalist who doesn't see the myriad of variables which must be optimized in agricultural production and ignores the context (especially market, policy and input supply systems) in which a practice must occur.

Farmers trust those who understand their situation and share their view of the world, not "experts" sitting behind a desk, much less to true-believers touting a particular nostrum. This is especially true for those farmers interested in sustainable agriculture since they know it "is a goal, not a fixed technology, but an ever-evolving approach to farming that changes as the body of knowledge grows about eco-systems and agriculture" (Strange, 1991).

Conclusion. Holistic systems theory is one of the many areas of science where mathematics does not reach (Rapaport, 1986). It studies the many phenomena which are "noncomputable" (Penrose, 1989:216ff). This makes it unattractive to many scientific disciplines--founded as they were on the notion that quantitative mathematics should eventually be able to solve every problem. But farmers and other agriculture professionals with demonstrated expertise in sustainable agriculture are convinced a holistic systems approach is crucial to creation of sustainable agricultural systems.

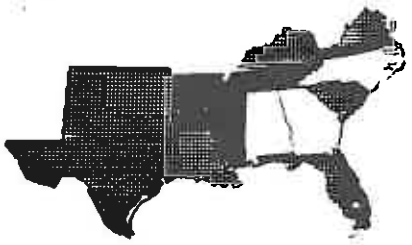
The persons most likely to have a realistic systems perspective in agriculture are those who are actively managing agroecosystems. So, as State of the South focus groups and opportunity workshop participants pointed out in so many different ways, to understand the constraints on farms, agribusinesses, food markets, extension and agricultural research systems, input from the appropriate systems managers is crucial. Doob (1991) argued we need sustainable people to achieve sustainability. Perhaps we need systems thinkers who value more than the narrow prosperity of the systems they manage.

Will agricultural researchers awake from their slumber in narrow reductionism? Nearly all agricultural researchers now advocate sustainability. Sustainability, if viewed as a property of whole systems and not of particular practices, is an emergent property which requires a holistic approach to systems. Recent work in chaos and holistic systems in entomology, dairy science, range management, poultry science and, especially, agronomy--with the American Society of Agronomy establishing the Integrated Agricultural Systems division--are all hope-inducing signs. But our best cause for optimism may be the strength of "pragmatism, which is the official methodology and ideology of the land-grant system" (Randall,

Strong farmer/environmentalist organizations can take heart from one fact: Pragmatism is the official methodology and ideology of the land-grant system.

1986).

Chapter 4. Generating knowledge out of research: transforming farmer-researcher relationships



The biggest priority is to create an entirely transformed research/education system in the Delta, not just do a few particular research projects.
Delta workshop consensus

Just funding a few good projects will not move the South toward more sustainable agricultural systems, according to State of the South results. The needed change is in the basic characteristics of the research and education system, not the superficial changes of adding a few research projects. According to the Delta Opportunity Workshop, the following are the biggest constraints to achieving a transformed system:

1. There is no prescription for a revamped research system.
2. Time lag: By the time research completed, replicated and in print, farmers are on to new things and research is not useful.
3. Consumers are not educated about the hidden costs in cheap food.
4. Researchers don't ask farmers enough questions.
    4.1 Research methods don't use enough of farmers' day to day knowledge of agricultural systems.
5. Every aspect of education system needs to come from a systems perspective.
6. Extension agents lack time and money to interact with both farmers and researchers enough.
7. Researchers have severe time constraints:
    7.1 Need to teach
    7.2 Help quits early and doesn't work on weekends.
8. Neither farmers or researchers recognize their different objectives.

The Athens focus group stated the priority need as: Farmer-researcher networks. This group labeled such networks as their overall priority in research-education and as the top priority in education. Such farmer-researcher networks would solve problems in both research and education:

Farmer-researcher networks

Researchers and farmers need to be tied more tightly together, both to insure researchers are not out of touch with farmers and that information gets quickly to farmers.

Research constraints:

1. Most research doesn't benefit farmers or get to farmers.
2. USDA has cut down on the number of field days they have.
3. Policy: USDA should put more dollars into sustainable agriculture demonstration programs.
4. Research is insufficiently regionalized. South has unique, difficult problems.
5. Researchers often are not aware of others research and duplicate efforts.
6. Before research begins, the first question should be: What is the benefit to farmers?
7. Farmers doing research should be eligible for grants.

Education constraints:

1. Problem: information on sustainable agriculture is just not available.
2. Farmers need specialized information which local agents often can't supply, but regional agents are often hard to contact.
3. Insect and disease problems in vegetables are especially hard to get help with.
4. A mechanism is needed to obtain immediately available information from extension--especially on minor industries--e.g. vegetables.
5. Solution: 800 # for contact directly with information and researchers.

AGCARES in the High Plains. The Lubbock focus group stated the opportunity very succinctly, perhaps because a very popular farmer controlled research/extension effort (AGCARES) has been established near Lubbock. The highest priority for the Lubbock group was: establishing new research/ demonstration systems where researchers and extension are combined in research on a large enough scale to meet farmers' needs: specifically the AGCARES approach. This general statement was supported by the following statements of consensus:

1. Need systems approach to all research
2. Publish or perish system only benefits professors trying to get tenure
3. Research must have the grower's perspective, e.g. profit is always an important issue. To the researcher it is often secondary.
4. Needed: Extension and research in real farming conditions.
5. Needed: research and extension together in one research program which uses an integrated systems approach.

specifics:

6. More work is needed to perfect LEPA type irrigation systems
7. use organic farms for work on beneficial insects
8. parasites to Russian wheat aphid
9. predators on cotton pests

The Blacklands group echoed the commonly felt constraint, but stated the problem as one of policy and philosophy. A revitalized research/extension system

would require:

Overall philosophy/policy change: increase the dollars to on-farm and applied research. Get the funds out to research away from the research station.

-Biggest problem in research: lack of applied research.
-Farmers want big plots, researchers want little ones--county agents can collect the data on big plots if they have a little labor to help.
-De-emphasize research with complex computer models which need a 486 to run. They aren't useful in the field.
-Emphasize applied research done with extension specialists and county agents.

In summary, information/communication/feedback systems between producers and researchers was a priority constraint for all groups. The few bright spots, such as the AGCARES farm in the High Plains underscore the general lack of productive farmer/researcher/extension interaction. Farmers and extension agents believe land grant universities are asking the wrong questions because they are out of touch with farmers.

> ***"The formulation of a problem is far more often essential than its solution, which may be merely a matter of mathematical or experimental skill."***
>
> ***Albert Einstein***

The circumscribed mindset in agricultural institutions

We need the right questions, not good answers to inadequate questions. All paradigms exhibit very strong exclusion effects. That is, "The paradigm tells us what to look for and what questions to ask; it determines the fields of inquiry . . ." (Manning and Rejeski, 1993). Most Southern agricultural scientists adhere to a research model which relies primarily on quantitative, controlled manipulation and measurement. Landscape ecology has a different approach: the controlled experiment "may be difficult or impossible at the landscape scale" (Gardner and Turner, 1991).

Agricultural science is almost reflexively reductionist. Problems are divided into discrete, manageable components. This approach has been useful in solving narrow production problems, but it is impossible to study the emergent properties of wholes by studying the components of the whole. If an agricultural scientist looks for solutions in components, then the solutions will be discrete technologies that can be applied universally to specific, economically valuable commodities. Many behave as if it is their role to develop solutions that the market place can disseminate (MacRae et al, 1989). Many prominent agricultural scientists assert: patents are today more valuable to a scientist's advancement than scientific papers. Farmers in State of the

South focus groups often wondered why our tax money goes to create products we'll have to buy in order to stay competitive.

Ecological and economic studies of systems sustainability indicate a key characteristic of sustainable systems is resilience and flexibility resulting from robust feedback systems (e.g. Hansen et al., 1992; Harrington, 1992; Gray, 1991). Agriculture is getting feedback from a variety of sources that something is amiss. However, this evidence is largely ignored. Researchers receive their rewards by satisfying their peers: other researchers. Agricultural information systems need to access a variety of perspectives so that farmers and agricultural scientists can be more adaptive and resilient. This is not easy given the hold certain perspectives have on their adherents. Unless traditional research/extension perspectives change they will be overwhelmed from the outside: the recent successes of holistic resource management (Savory, 1988), biodynamic agriculture, permaculture (Mollison, 1988) are portents; the success of independent crop consultants is a challenging reality.

To many farmers, the original Morrill Act of 1862 appears to have evolved into an agricultural research establishment with only glancing contact with farmers and other agricultural system managers. As the organizers of agroecosystems, these managers are at the heart of any systems approach to agricultural research. Understanding of general systems theory would require a significant portion of agricultural research be conducted with America's farmers and other food and natural resource system managers.

To many farmers, the original Morrill Act of 1862 appears to have evolved into an agricultural research establishment with only glancing contact with farmers and other agricultural system managers.

The organizational structures of today's land grant universities may not be flexible enough to meet the new challenges (Andrew, Hildebrand and Fajardo, 1993). Mainstream agricultural thinking may be too reluctant to challenge basic assumptions, too dogmatic, and too quick to become immersed in technical minutiae even though fundamental questions remain unaddressed (Lockeretz, 1988). As late as 1986, when a symposium was held to address the criticism that "the land-grant system is out of touch and out of date" environmental issues were not even addressed (Lennon, 1986). Even LGU faculty often feel: "The majority of land grant colleges of agriculture are becoming redundant and out of date . . ." (Cambell, 1991).

Some top land grant administrators, being locked in the paradigm, genuinely cannot see out of it. Some Southern Deans have reacted by claiming that all the research we've done since 1900 (or 1920) has been sustainable. Usually the sentiments which reach print are less extreme:

> Land grant universities (LGUs) "have indeed been conducting useful research and education programs on many LISA issues for decades" (Holt, 1989).

However, a recent internal analysis by the Southern Association of Agricultural Experiment Station Directors reveals each university to believe only about a tiny percentage of their projects are not compatible with sustainable agriculture research (Clarke, 1995). Of 120 Arkansas Agricultural Experiment Station (AAES) projects, for example, only one project (herbicide screening) was found by AAES to be

incompatible with sustainability (Yeiser, 1995).

Many feel LGUs attempt to appropriate the positive images associated with sustainable agriculture, while gutting the concept of any useful meaning (Beus and Dunlap, 1990). Indeed some argue that all existing agriculture is sustainable because it still exists, indeed agriculture arose as a means of increasing sustainability of society "even out environmental and economic risk and maintain the productive base of agriculture over time" (Altieri, 1987). Claiming that an agricultural system is sustainable because it has lasted so far is to ignore the many formerly powerful civilizations now lying under the dust from their eroded fields.

Some leading agricultural administrators are calling for change. James Meyer (1993), Chancellor Emeritus of the University of California-Davis noted recently in Science, A "circumscribed mind-set" of land grant colleges of agriculture (LGCAs) has led to a stalemate. He contends LGCAs are still caught up in "the interplay between the agrarian tradition and modernization." Their identification with the agrarian tradition and devotion to modernization causes "difficulty adjusting to changing social conditions, to modern urban and consumer interests, and to the increasing interdependence of rural, urban and global communities."

Soon after Meyer published this, a controversy in his own backyard confirmed his statement. University of California-Berkeley agricultural scientists decided to break down disciplinary lines, combine four departments and form a new department to focus on environmentally sound agriculture. Administrators responded by transferring $7.3 million and 55 faculty positions to other campuses. In explaining the decision, administrators explicitly distinguished applied agricultural research from ecological research (Barinaga, 1994) as if useful agricultural research and ecological concerns were antagonistic.

The reluctance of most agricultural administrators to break out of the "productionist paradigm" stands out most strikingly when **even the most conventional farm leaders are calling for unity between farmers and environmentalists.** As the top commodity program administrator in the Bush Administration said in April 1994 in Top Producer: Moderate environmentalists and educated consumers are natural partners for progressive, market-oriented agriculture interests (Campbell, 1994). Other farm leaders, such as Farm Bureau leaders recently informally interviewed (Perkins, 1994) are increasingly seeing the need for farmers and farm advisors to be able understand and join forces with moderate environmentalists. Leaders of environmental organizations are now saying "Environmentalists and farmers are natural allies" Sierra Club activist Bill Wenzel quoted in Rauber (1994).

Extension and building farmer-environmentalist coalitions

Traditional education efforts will not likely be enough to establish these coalitions. Many extension agents, influential farmers, environmental regulators and environmentalists and agricultural administrators need radical perspective shifts. They are often locked into environmentalist or "productionist" mindsets. Both sides need to see things in entirely different ways. The best way to get that is by being "facsipulated" into confronting the inadequacies of your current perspective. Since extension and environmentalists often come from opposing places, putting them together with farmers to keep extension honest and non-profit types to facilitate will be just the trick

for forcing each to face the dilemma we are in--the tug of war between productionism and environmentalism which helps neither the environment or farmers.

Southern extension began making unique strides to begin coalition-building within the farm community with the Callaway Gardens meeting sponsored by SARE in March, 1993. Many formerly skeptical farmers, researchers and extension agents left with a new vision of what Southern food and fiber systems could be. A follow-up meeting in Mississippi was the stimulus for a positive Farm Bureau video on sustainable agriculture. However, the consensus of State of the South farmer-extension-researcher workshops is that the powerful challenges to Southern agriculture and extension can be met only with long-lasting coalitions beyond production agriculture. Clashing paradigms are interfering with movement toward sustainability, but that change is possible.

The challenge to extension is strong. When groups of farmers gather and no land grant representatives are present, the consensus often times revolves around the need for change. The Hereford, Texas focus group, for instance concluded:

> **# 1 priority on extension/demonstrations: encouragement of farmer to farmer spread of innovations**
>
> 1. We get more information from Ralph Diller and Dennis Schilling (local organic grain producers) than we do from extension agents
> 2. Those paper pushers at College Station just eat up resources.
> 3. The researchers who are doing the most useful research are those who are farmers themselves--e.g. Bill Lyle, irrigation and production engineer at Lubbock Experiment Station of Texas A&M.
> 4. Gathering sustainable practitioners together on a local basis would be the most helpful.

A similar consensus was expressed by the Blacklands focus session:

> Current technology transfer programs are not meeting the information and technology needs of Blackland producers. Research need: Develop participatory, on-farm research and education programs which increase interaction among producers and agents of technology transfer (extension agents and consultants) under the site-specific constraints of Blackland production systems. Develop electronic and multimedia technologies which enhance producer access to information and networks of producers and specialists that are needed for decision-making.

Several groups specified one gap in existing information systems as the lack of systematic farmer to farmer information sharing. The Tuscaloosa group cited the #1 short term priority as: **Better farmer-to-farmer information networks.** Some groups suggested extension agents could fill this gap by serving as facilitators of information flow.

The Austin Opportunity Workshop, convened to consider "above the farm" systems, concludes that a key opportunity for moving toward more sustainable

systems was:

Creation of effective farmer-to-farmer education methods.

Their consensus conceptualization of this problem area was:

1. Extension has a row crop-feedlot approach.
2. Extension has often adopted the "medical model" of an expert prescribing solutions. This model breeds passivity.
    - 2.1 We need to redesign extensions role from sole source to facilitator
    - 2.2 Farmers have no incentive to take responsibility.
3. Adoption of a new paradigm is essential
    - 3.1 A first problem is that farmers don't even realize there is a paradigm.
    - 3.2 A top-down emphasis in USDA on sustainable agriculture is needed for quick change.
        - 3.2.1 A related change would be to focus extension priorities on local needs locally determined.
4. Changing extension: possible alternatives
    - 4.1 Extension agents need broad training in sustainability.
    - 4.2 Extension internships on farms should be required before one becomes an agent.
        - 4.2.1 Require 15 years as a farmer before can be an agent.
    - 4.3 The functions of extension should be identified and contracted out.
    - 4.4 Education efforts should concentrate on the 85% of farmers outside this paradigm and not go head-to-head with large companies.
    - 4.5 On-farm demonstrations by extension agents with statistically valid plots are the foundation for more effective extension education.
    - 4.6 Every state should set aside on research farm as a sustainable agriculture center with each having a farmer-environmentalist advisory committee.
5. Progress toward more sustainable systems will likely come from farmers, not extension agents.
6. There is a lack of any institutional structure to encourage farmer to farmer exchange.
    - 6.1 A simple start would be publicizing farmer success stories.
    - 6.2 Needed: paraprofessional programs where farmers are hired to work with other farmers and trained in it.
7. Strong local sustainable agriculture organizations facilitate farmer to farmer exchange.
    - 7.1 Strong individualism of farmers means they won't work together.
8. Community linkages and diagnosis/education will be important in maintaining a farmer to farmer system.
9. Indicators of success of farmer to farmer networks will include:
    - 9.1 increased access to info

9.2 ability to use info to make decisions
9.3 changed attitudes
9.4 increased cooperation/collaboration
9.5 increased use of sustainable practices.

Though the Austin group contended that progress toward more sustainable systems will likely come from farmers, not extension agents, they did endorse work on empowerment where local agents work to empower farmers and establish farmer to farmer relations. Their recommendations are summarized in the series of diagrams in Figure 3. They noted that interested extension agents can help facilitate the process. Raby (1991) expressed it this way: farmers sometimes need a coach (to develop skills in team work, leadership, problem solving) and sometimes a referee (between farmer and other levels). One of the participants in the Austin workshop, John Ikerd, has

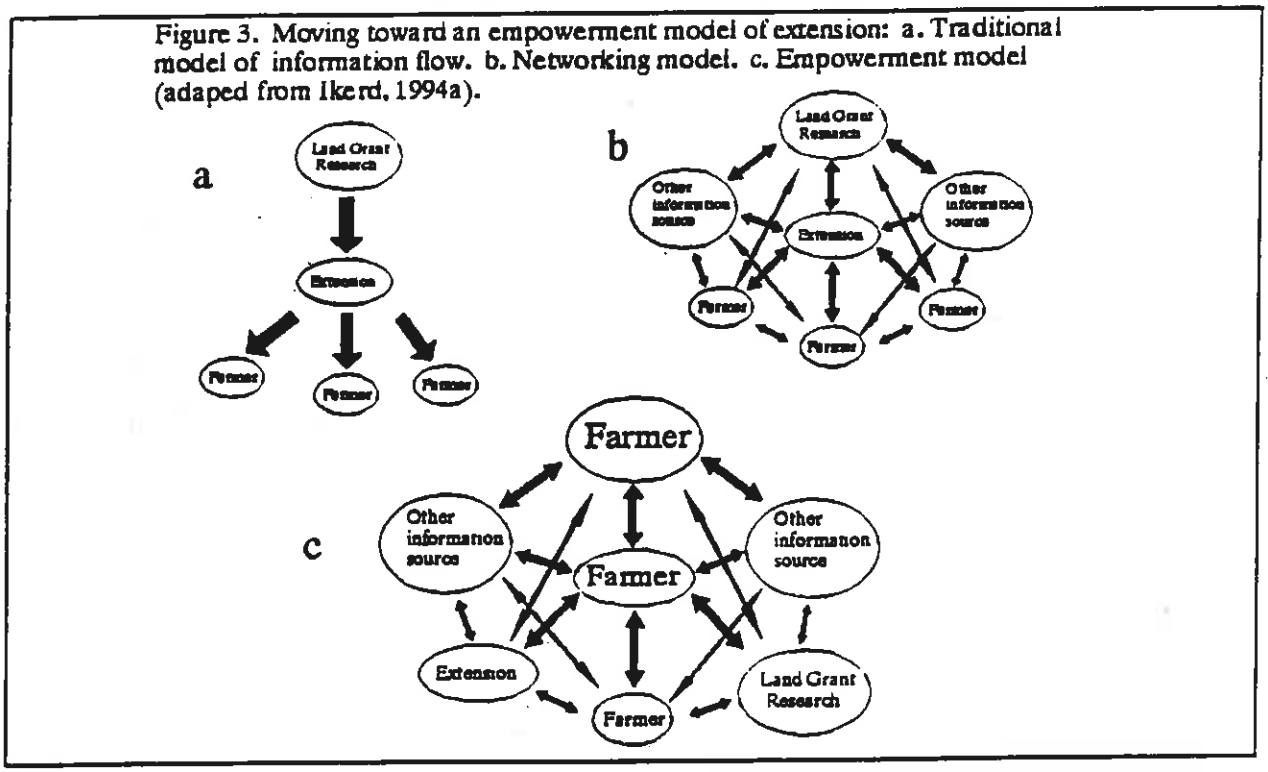


Figure 3. Moving toward an empowerment model of extension: a. Traditional model of information flow. b. Networking model. c. Empowerment model (adaped from Ikerd, 1994a).

developed this empowerment approach for extension work in detail. The approach has now been adopted nationally by extension (Ikerd, 1994a).

Southern extension systems.

In many ways, the South is the birthplace of extension. Tuskegee Institute's Jesup wagon was the first extension vehicle. Seaman A. Knapp's demonstrations with farmers in Louisiana and Texas were the inspiration for the 1914 Smith-Lever Act. This legislation provided the basis for a large-scale, federally sponsored extension program with farm and home demonstration agents in every county.

More recently, the South has also been the site of some of the most successful

educational efforts related to sustainable agriculture. Pesticide use is declining in most crops in the South through the use of IPM. The largest decline has been in the quintessential Southern crop: cotton. Insecticide use in cotton in 1964 accounted for over half the 65 million kg sold in the US. Since then, cotton usage of insecticides has dropped from 3 times that of corn to half that of corn, though acreage has only dropped slightly. Cotton insecticide use fell in Texas from 8.6 to 0.9 million kg. (Hearn and Fitt, 1992).

The successes of education on IPM in cotton have been repeated in a number of other areas. But in so many places, farmers aren't using the technology and knowledge which exists. Technology which could save them money and protect the environment is not being used. As Willie Lockeretz (1990) wrote regarding adoption of soil erosion control practices:

> "The problem is not primarily technical. Available techniques continue to advance, but that does not mean that farmers necessarily use them.

A response to Lockeretz' article, coming from outside the research community, was that the increase in no-till can be explained largely by the presence of an aggressive equipment dealer, chemical dealer or SCS board who sold the idea. Adoption of no-till had little to do with traditional explanatory variables used by extension researchers. This Farm Bureau official continues,

> "It is time for the U.S.Department of Agriculture and other grant makers to start asked for better research, not simply more of what hasn't worked. It is time to find out who calls the shots on conservation decisions." (Porterfield, 1990).

Who calls the shots? Who makes the decisions? Understanding how these managers organize the system is key to understanding the system. Porterfield echoed the sentiments of the focus groups noted above. Another farm leader put it this way:

> It is a fact that most farmers learn about new things from their neighbors. It is also important to recognize that there are certain farm leaders in a community who have a profound impact on how any type of new technology is viewed by the majority in that community. Without their support, and indeed willingness to take an advocacy position, failure is assured (Bertrand et al., 1994).

Where IPM has been widely adopted, it is where independent consultants, scouts and extension staff understood the decision-making underlying use of each particular chemical. Where IPM has not been successful, it is because sufficient effort has not been "put into understanding the farmers' decision process and information needs" (Teng, 1994). If we don't pay attention to decision-making by farmers, then, Teng contends, we have to ask the question, "Do we really want IPM to work?" as did a now classic paper by Goodell (1984).

Similarly, we have to ask, "Do we really want sustainable agriculture to work?" Assuming you do because you have read this far, then we must make the shift from recommending specific technologies and technology packages to understanding the decision-making processes of farmers and other system managers. The nature of

IPM, and sustainable agriculture generally, is such that "decisions have to be tailored to the prevailing conditions, in contrast with a 'technology package,' which removes apparent uncertainty from the decision process" (Teng, 1994).

Efforts to promote technology packages invariably meet failure when they are not adapted to farmers' conditions. Adaptation, not adoption seems to be the most productive focus of local agents working with farmers. Consultants working one on one with farmers know that they must understand how a farmer makes decisions, whether an innovation will overcome existing problems and how to move the innovation into the farmer's decision-making. Where extension is strongest in the U.S. is where it has not skimped on one on one contact with farmers (Swanson, 1994). Support for extension is highest in states such as Kentucky which emphasize one-on-one service of farmers. State legislators in 1994 drastically reduced funding to extension in some Southern states, but allocated new money for 50 agricultural agent positions in Kentucky. The State of the South focus groups made clear that where extension agents have become removed from the day-to-day decision-making of farmers, others have become the catalysts of progress. Consultants get their paychecks from farmers and have to satisfy the farmer to get paid. A recent survey of Delta farmers showed consultants advice was considered far more valuable than extension agents. Only 3% ranked extension as the best source of information (Delta Farm Press, 1995).

One consultant to 120 grain farmers contends that agriculture in America is industry-driven because industry views farmers as the key peers in technology development, whereas in academia, the only peers are other scientists (Swaim, 1994).

Where extension--and other local change--agents answer to farmers and not to research, agriculture progresses. Researchers understandably want to promote their innovations. But all too often, disciplinary control of the research agenda, divorced from farmer decision processes, creates at best innovations which lead to the technology treadmill and not to the flexibility necessary for resilience. At worst, it leads to white elephants or no technology at all. Agricultural research had its glory days when most researchers grew up on farms and knew the basic problems of farmers. Today, you would be hard-pressed to find a single farm-raised researcher in most departments.

Sustainable innovations are adapted, not adopted. Any technological aspect of an innovation has non-technological implications. Separating technical from non-technical barriers is, therefore, impossible.

Innovations which provide more options for farmers are always welcome. The question is whether an innovation provides a viable option or not. The lack of adoption of many innovations has little to do with technical validity and most to do with lack of fit to the farmer's system. Whenever researchers are out of touch with farmers, such examples will be legion (though rarely publicized since they are negative results).

How can we productively look at those "non-technical barriers to adoption"? First, the phrase, "non-technical barriers" makes a crucial assumption: that the technology is worthy of adoption. But, if adaptation, not adoption, is the foundation for incorporation of an innovation into a farm system, then we cannot really separate

technical from non-technical barriers.

Both, however, can be addressed if a holistic systems approach is used. Long experience in IPM led Teng (1994) to contend that "farmer group learning appears to be the most effective way towards IPM adoption." Farmers are always part of social systems which influence and may even control their behavior. A holistic approach would postulate that not understanding the emergent properties of whole social systems would lead to failures to catalyze farmer innovation.

In recent chaos and self-organization work lie some hints for more effective work with these systems. Chaos workers refer to recursive algorithms as foundations for the strange attractors which control non-linear phenomena. An algorithm is simply a procedure by which we get things done. A recursive algorithm is one which uses feedback from its past effects to change itself and adapt to new conditions[3].

In farming we all have procedures by which we plow, scout for alfalfa weevils, decide when to spray, decide how much to sidedress our corn. These become recursive when we change them based on feedback instead of blindly following "standard operating procedure."

Some of these algorithms operate mainly at a level where they influence a broad range of other patterns. If you really believe that "organic agriculture will not work," this belief is more than a set of words you endorse in casual conversation. It is a way of thinking which influences all sorts of activities on your farm. Another pattern at this level involves not trying anything new till it works for your neighbors. This level of "social algorithm" acts to insure that all sorts of systems under its control (soil biota, beneficial insect habitat, new ideas of all sorts) evolve in ways consistent with itself.

According to this perspective, local leadership--the managers of social systems--can then insure conventional, traditional approaches or catalyze innovation. Local change agents will not be successful if they do not recognize the influence of social systems and their leadership.

Local leadership is usually a part of broader social systems which operate to influence the local social systems. The algorithms at this level could almost be called paradigms. One example is: "free market, rugged individualist, accept no charity, word hard, produce and act right, distrust government." Another is: "nature is good, men are greedy, government programs are needed to control man."

And at all these levels there are all sorts of ways of thinking and ways of doing things which have never been put into words but nonetheless structure the farmer's existence such that an innovation must fit into them before it can be adopted.

Appropriate technology and recursive algorithms

A new practice or piece of equipment, technology or marketing technique, is created to work within a certain way of farming--a certain set of algorithms. If it is created on a well-equipped and funded experimental farm by people who live in

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[3] Note that this usage here is that popularized by Gleich (1987). This usage differs from that of most mathematicians (see Penrose, 1989) where algorithmic and recursive are synonyms for a quantitative, reductionistic approach antithetical to that described here. Recursive algorithm is used here in the sense popularized by Gleich to designate noncomputable, but understandable, system-specific processes which lead to transformation of systems.

suburbia, spend most of their time in offices and get promoted by writing papers approved by other people like them, then the innovation will likely be adapted to and adopted by only a certain type of farmer.

If the profitable, environmentally sound innovation is created by a farmer to fit his own needs, it is more likely to be widely adopted. The history of tobacco harvesting technology is one illustrative example from the South. University of Kentucky researchers developed a huge apparatus to completely mechanize tobacco harvest. The effort was lavishly supported by the tobacco industry, but not tested with farmers during development. When the machine was unveiled, farmers took the basic idea home and created much simpler, more flexible prototypes better suited to typical Kentucky farms. These prototypes were then refined by UK agricultural engineers and are now being widely manufactured and used, whereas the original machine has been labeled a "white elephant" by researchers within the University of Kentucky (personal conversations with George Duncan and Scott Smith, 1992). The literature in appropriate technology is replete with such examples.

In systems work, the way around these problems is termed "systems requirements engineering" and has begun to be applied in agriculture (Mayhew and Alessi, 1994). The basic idea is to always keep the end-users' needs foremost. This is done by "rapid prototyping." Researchers produce a prototype, get reactions from end-users, and modify the prototype in an iterative process.

Researchers can keep the end-users' needs foremost through "rapid prototyping."

A foundation for successful rapid prototyping is the relationship of farmer and researcher. This relationship is most productive when there is no expert, no student, no we, no them; where "we can all learn something from each other"; and where the ways of thinking which are most crucial to understand are those of the managers of the systems: the farmers, the foresters, the market managers.

Examples of common "interpersonal stances' in agriculture research/education:

"I'm the expert, you listen."

"You can learn something from everyone."

"You're going to have to prove to me that pesticides are a problem."

"We're all in this together."

"It's us versus them."

"If you can't measure it, it doesn't exist."

Researchers and local agents can create these more productive relationships if they pay attention to "stance." Whenever farmers learn about an innovation, they are simultaneously exposed to a specific attitude or stance toward relationships. Likewise when city-bred environmentalists talk with extension agents from rural counties both parties encounter a stance toward relationships. Some well-known example can be expressed in single statements such as those in the accompanying box.

The stance through which information is delivered has a far greater impact on the sustainability of agriculture than

factsheets, videos, on-farm demonstrations, lectures and teleconferences. These valuable communication tools are determined (either limited or enhanced) by the stance of those who create them.

If sustainable agriculture were a specific set of practices, stance would not be so important. However, sustainable agriculture, by its nature, requires increased flexibility of farmers, not adoption of specific practices. Some well-intentioned environmentalists and researchers have made the error of focusing on practices instead of on system. Cover crops, ridge tilling, no-till, rotational grazing, farrowing on pasture, organic cotton, agroforestry and many other specific practices have been touted as always more sustainable than some "conventional" or "chemical" practice. Whether a given practice is technically "better" or not begs the basic question. The crucial question is how to increase the resilience of farmers by increasing their options and their flexibility in adapting/adopting innovations.

Farmer-environmentalist unity through changes in stance.

Extension could be a region-wide catalyst for a merging of perspectives between farmers and environmentalists. The problem is that environmentalists, farmers and researchers of all stripes often appear convinced of the complete logical and empirical justification of their activities. In social interaction (including public policy creation), such naive realism serves to polarize rather than achieve the consensus.

Given these basic different assumptions, even when coalitions are achieved to a accomplish common objective, they fall apart. The underlying problem is that coalitions quickly fall apart unless the disparate parts can be unified around a new perspective, a new way of defining problems, a new paradigm. Simply bringing people together to talk--the "better communication will solve our problems" stance--achieves little of lasting value unless a new way of defining common problems emerges from the interaction.

Methods are becoming widespread for integrating conflicting perspectives. Early work relevant to this method includes various Midwestern "participative research" efforts (Dennis Keeney in Iowa and Chuck Francis in Nebraska) and, internationally and in Florida and Kentucky, agroecosystems analysis and RRA (Conway et al., 1987; van Willigen and Absher, 1987; Worstell, 1991). The method also draws from more recent work at Washington State with long-term focus groups (Murray and Butler, 1993), at Oregon State with Farmer/Scientist Focus Sessions (McGrath et al., 1992), in Kentucky with conflict resolution, in Minnesota with responsive constructivism (Mayhew and Alessi, 1994) and with Rodale study circles and Norwegian "searching circles."

Results of using such methods in the South include:

- Nationally innovative water quality legislation passed the Kentucky legislature in 1994 where farmers, researchers, Extension, SCS and environmental interests are jointly responsible for developing BMPs.
- A strategic plan for Agriculture for a Sustainable Florida developed with representative of major commodities (organic and conventional), extension, research and university administration (Swisher, 1994).

-Multi-state agroecoregion strategic priorities for research and extension priorities [High Plains (Hake, 1994), Coastal Plains (Kvien, 1994) and the Karst region (Worstell, 1994a)].
-A regional conference to unite rural development and sustainable agriculture perspectives in July 1994 (Worstell, 1994c).
-A joint Kentucky Department of Agriculture/Cooperative Extension agriculture planning process with 30 focus groups throughout Kentucky (Worstell, 1995).

Lev et al. (1994) describe the method succinctly:

> Farmer/scientist focus sessions (FSFS) use collaborative problem solving to take advantage of the creativity and synergism that occurs when farmers and scientists listen carefully to each other and learn as a team. Use of the method in a number of agricultural industries (e.g. onions and snap beans) has resulted not only in innovative solutions and research directions, but, more importantly in new working relationships between practicing farmers and academic scientists. Key characteristics of successful FSFS are: a philosophy of co-learning, team facilitation, separation of the creative process from the decision-making process and recording the discussion through non-linear methods.

The objective of such groups is to achieve a creative synthesis of ideas and build consensus on priorities for action. Following is a detailed discussion of a specific use of the approach.

The construct group method

The foundation of the method is an "open stance" on the part of the facilitator. The open stance is the exact opposite of trying to be the expert with the "one right solution." Instead, the focus is on creating information networks to get the broadest array of ideas related to environment and rural development, as well as technical agricultural ideas, to farmers and research-farmer networks.

Getting this process right is the key to success in creative synthesis of seemingly opposite viewpoints. The process is the key product. If the process is right, then all other products will be right. In addition, the quality of the product will continue to improve as the process becomes develops a more and more robust feedback process enabled by understanding other perspectives.

The "open stance" approach can be expressed with a football analogy. If have a closed stance with feet together, you are easy to knock over. Likewise, if an extension agent approaches all environmentalists with suspicion, progress will be much more difficult and he will be closed to new information, new ideas. However, being open to new information does not mean abandoning your purpose. The purposes of sustainable agriculture (1990 farm bill definition) can, in fact, be more readily achieved through openness to new perspectives.

Learning this "open stance" can't be done through a lecture format. Many people can talk the talk without being able to walk the walk. Participants must learn by doing, so they can step outside their behavior and learn to recognize when have

taken a closed stance, a we-them approach or an expert-student attitude.

Group methods. Local agents can use the open stance in almost any interaction. To be most efficient, it is used in group settings. In groups, the local agent acts as **integrating facilitator**, not as expert during these session. Anecdotal evidence from all parts of the South indicates that extension agents often feel pressed to be the expert in every field. The focus team approach provides another professional role for agents. By acting as a facilitator, the agent can take a more neutral stance between differing perspectives and different sources of information. The focus team process sets up a co-learning environment where everyone recognizes they can learn something from everyone else. The farmer has much to offer, as do the researcher and the businessman and environmental regulator.

But the focus teams will go far beyond sharing information and perspectives. The facilitator in this approach does not just ease the flow of information between differing perspectives. Rather, as an integrating facilitator, the local agent [4] uses the raw data of differing information and perspectives to create a consensus conceptualization of a particular problem space. In group meetings this is done by separating brainstorming from priority setting and between the two sessions recruiting group "leaders" (who emerge as adept at integrating in the brainstorming session) to help group and summarize the ideas, information and perspectives which emerged. The second, priority-setting session begins with refinement of the consensus conceptualization. Next, these concept categories are prioritized by the group and refined into goals.

At this point, the process diverges depending on the goals of the focus team and the time available, since this interaction typically takes 2.5 hours. If the team was brought together to examine a problem area and give advice on needed extension bulletins and demonstrations, then the group may have finished its initial task and given the agent the information he needs to revise or create new materials and activities. The agent continues the process by writing up the group conclusions and sending these written conclusions for review to all group participants. The agent also solicits elaboration and collaboration from the participants in activities designed to achieve the goals set at the meeting.

Teams and strategic planning. If strategic planning is the goal of the group, however, another session follows the priority-setting session. This session follows the principles of the logical framework (PCI, 1979). This involves generating antecedents for all the goals and then antecedents for the antecedents. A typical facilitator question is: What is required to accomplish this? The linkages between these antecedents and the consensus goals then becomes a map or flow chart for the achievement of the goals.

As this map/flow chart is being developed, people and groups will be mentioned who can accomplish specific parts of the chart. These can be used to begin a Gantt chart. As the flow chart becomes complete, attention can move to the Gantt chart to begin scheduling activities. As activities are scheduled they can be related back to the map/flow chart to create a PERT Chart (note: A discussion of Gantt and PERT charts

[4] "Local agent" is any farm advisor or farmer who is trying to catalyze a change in perspective.

can be found in Craig, 1978). When the group reaches consensus that the activities necessary to accomplish the goals have been delineated, persons capable of accomplishing them identified and a logical sequencing of activities determined, the strategic planning session has accomplished its objectives. The facilitator then writes up the conclusions of the group and solicits comments from participants and key players not present during the planning session. When these responses have been adequately incorporated, a strategic plan is accomplished.

The key to planning with construct or focus groups is definition of the problem area. One key problem with our land grant system is: **we have too many solutions in search of problems.** The constructivist approach begins with searching for the right questions. This requires first defining the boundaries of real systems. For anything to be a system, there must be strong boundaries around what is being called a system.

Second, the facilitator looks for feedback loops--both inside the system and between the system and other systems outside it. For example, we have a distinct commercial vegetable marketing system in the South. If you want to see big quantities of vegetables right now, you'll just about have to deliver tractor trailer loads through established channels. CSA's and other direct marketing efforts are fairly minor systems outside this vegetable marketing structure.

However, this system does respond to feedback from outside--witness the increased variety of "lettuces" on the shelf. And direct marketers have established relationships with buyers and captured some of this market (though usually the big boys find ways of producing the same stuff and take over eventually). At some point in the process of planning, a conceptualization of the existing system must be created.

Maintain conceptual pluralism. Keeping several perspectives in mind at once is required in order to help people shift to a new perspective.

However, in creating this conceptualization, the facilitator must maintain the open stance. Too rigid a conceptualization insures that only one solution is appropriate. Norgaard (1991) is among many advocating the value in being able to keep several conflicting perspectives, i.e. "maintain conceptual pluralism." Keeping several perspectives in mind at once is required in order to help people shift to a new perspective.

Measurement of results. The basic goal of the above method is a qualitative one--achieving synthesis of paradigms. We are under no illusions that it is easy to measure paradigm synthesis. We can take solace in the idea that:

> "Most of the things you can measure aren't interesting and most of what's interesting you can't measure" Marcia Angell, executive editor of the New England Journal of Medicine, (quoted by Taubes, 1993).

But success can be inferred from the establishment of state, agroecoregion and local teams across ideological boundaries devoted to creation of Southern agricultural systems which are productive, supportive of rural communities, profitable for farmers and environmentally sound.

General Conclusion. Farmers are faced with a vast number of contradictory and often antagonistic sources of information. Local agents can help remove the us-them mentality, realizing all have something to offer. The time is right for a merger of farm and environmental paradigms to create a new perspective. The hundreds of bulletins, factsheets, video conferences and demonstrations developed every year across the 13 Southern states could serve, not just to pass on information, but to build a new way of looking at agricultural systems and a coalition beyond production agriculture to address the powerful challenges facing agriculture and extension. **We need farmer-environmentalist perspective synthesis and tools exist to accomplish it.**

Specific education systems and sustainable agricultures.

Education methods which accomplish farmer-environmentalist perspective synthesis can also create the farmer-to-farmer exchange and farmer empowerment which were explored in the Austin workshop and Lubbock workshops and illustrated in action with the AGCARES farm in the High Plains of Texas. The Memphis workshop created an analysis of existing technical assistance systems which shows the key characteristics such an education system should have. Though addressing one aspect of sustainable agriculture (locally- owned value-added enterprises or LOVAs), the conclusions are broadly applicable to sustainable agriculture generally. The conclusion was the need for **creation of accessible, flexible technical assistance systems integrating public and private sources with farmers directing.** They summarized this need as follows:

> No existing technical assistance source is adequate to provide the flexible, accessible and system-specific training and information required to facilitate LOVAs. Models for technical assistance to LOVAs and a multi-dimensional matrix for comparing TA systems were developed. A system integrating public and private sources and providing a 1-800 number, "high touch" personal response and email features, along with access through local nodes (extension agents, non-profit staff, SCS RC&D, etc.) would provide the ideal system. An initial step will be a database of existing LOVAs in the South which includes their present top constraints.

This Memphis group developed the new system based on the following consensus observations:

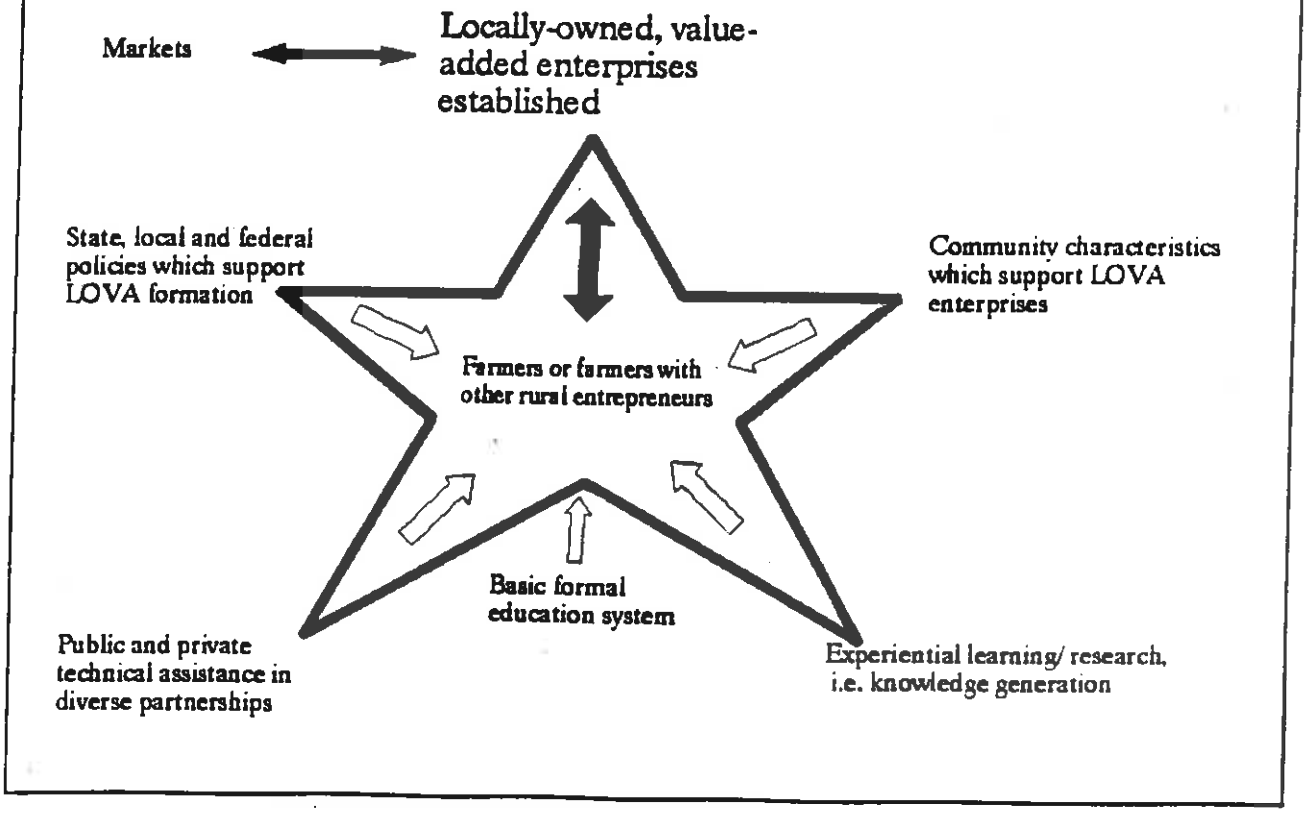
> 1. The old model of technical assistance/knowledge adoption is the bell-shaped curve relating percent adopting to time: innovators and early adopters followed by the majority as the hump of the curve, followed by the laggards.
>
> 1.1 In many respects, LOVA can be viewed in this framework. In some ways, LOVA-ers are most certainly farmers in the first two categories, perhaps in only the innovators category. However, to facilitate LOVAs, a paradigm shift is necessary from traditional TA dogma.
>
> 1.2 For example, there is not one adoption curve per individual. LOVA-ers may be innovators on production but laggards in business

management

2. Many of the technical and other advances do not come from traditional research, but from creative melding of ideas from many sources.
3. Traditional TA is not flexible enough to deal with the infinite variety of systems specific TA needs to help generate LOVAs.
    3.1 Timing is everything in LOVAs.
4. Community acceptance and local encouragement (including the role of grassroots activities) may be crucial to acceptance of innovations related to LOVAs.
5. TA for LOVAs and SARE support for such TA should probably be focused on only the innovators and early adopters instead of to the majority.
6. Finally, SARE funding should be designed to share the cost of development with innovators and early adopters.

TA and LOVA: a model. This group developed a triangular and then a more complete star model to represent the realities of TA and LOVAs. The initial model was a triangular model with technical assistance/transfer in the middle with banks, community and policy being outside influences and the points of the triangle being private enterprise (LOVA) at the top and the two bottom points being public assistance (extension, SCS, SBA) and private assistance [non-profits, for profits (including consultants)]. A line called barriers keeps private and private TA from reaching LOVAs. Policy, Financial institutions and community can help or hinder breaching these barriers.

Figure 4. Star model of relationship between technical assistance and creation of locally-owned, value-added (LOVA) enterprises developed by Memphis workshop.



The five pointed star model elaborates on the triangle. The basic goal of TA was to prepare people to be entrepreneurs instead of just working for a living. The five points of the star represent key interconnected elements--all of which are crucial. The foundation points are technical assistance (both public and private assistance combined as one force) and research/experiential learning (knowledge generation). The top point, as in the triangular model is LOVA (private enterprise) with an arrow (representing feedback) going off to market and an arrow coming in from education (representing new entrepreneurs). The two middle points are policy and community. This model is depicted in Figure 4.

Designing the new system. Finally, the Memphis group summarized the key characteristics of technical assistance to LOVAs. These characteristics of the TA process could become criteria on which to judge proposed and existing systems. If we can get the criteria right, then we can tackle the organization of a technical assistance system.

Characteristics of technical assistance systems. The following continua could be refined into criteria for LOVA TA systems using the pole on the left as the desirable end of the each continuum.

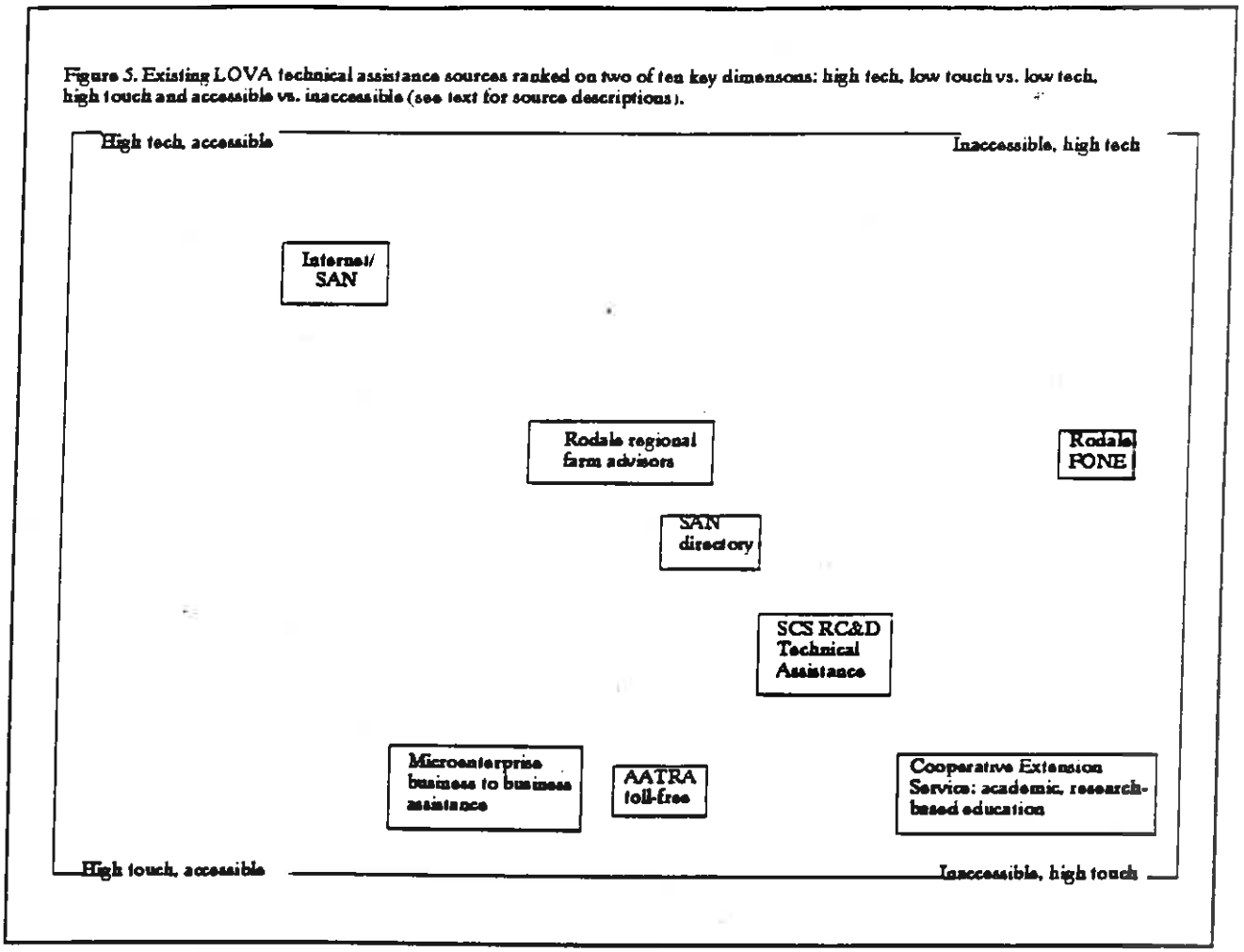
1. accessible-inaccessible
2. flexible---inflexible
3. nontraditional---traditional
4. accountable---non-accountable
5. loose structure---rigid structure
6. low maintenance---high maintenance
7. experiential---based on academic research
8. unfocused---center focused
9. relevant---irrelevant
10. current---out-of-date

All the prominent existing TA systems were then located on a 2 dimensional grid. One dimension was high tech versus high touch, a second dimension was accessible versus inaccessible. This demonstrates on two dimensions how an n-dimensional system could analyze possible and existing systems on the most relevant criteria. See Figure 5.

The TA systems located on the two dimensions of Figure 5 are described in more detail below:

1. Micro-enterprise model is of businesses helping businesses: e.g. the "Good Faith Fund." Key characteristics include a loan group, a peer match, heavy on business management and financial training. A few firms--similar or dissimilar--meet regularly to discuss/solve problems and learn from each other (probably need to be firms at similar level of development and fairly new?).
2. Rodale FONE book model: a directory which is farmers own network for education.

3. AERO in Montana, Idaho, and Western Washington, funded by SARE West region: "Farmer Improvement Clubs."



4. ATTRA model: toll-free information source. Staff to research the question. Answer as unique to the individual asking the question as possible.
5. Sustainable Agriculture Network, through internet, forum "discussion group" model: has a current directory, toll-free access could be added.
6. Non-profit sector model: Zero-based budgeting, highly flexible and responsive.
7. SCS model: RC&D.
8. Extension model: relatively inflexible except within traditional crops-livestock; not accountable outside land-grant system (some exceptions: see demand-based systems described by group 5); locked into maintaining a particular infrastructure and organization:

Farmer<--->Agent<--->Specialist<--->Researcher

A more perfect system will probably combine parts of many of the existing models. For example, Cooperative Extension Service could be reorganized as a non-profit with a zero-based budget system and high levels of accountability. (Or CES

could successfully implement the empowerment model now adopted as national policy.)

Based on this analysis of educational systems, this group developed a series of recommendations on needed research and education projects in the South.

RESEARCH/EDUCATION PROJECTS

1. **LOVA database.** A key short-term research/development project would be to establish a database with names and addresses of LOVA folks in South, what they are producing, what they have excess to sell, what threatens most their survivability and figure out how can deliver what first.

    1.1 An evolving institution. This could evolve into a long-term project which would be an evolving institution to knock down barriers to LOVAs.

        1.1.1 Such and "institution," however, to be most effective, will concentrate on specific systems and not be so broad to become too diffuse and general and so ineffective.

2. **A network with no center.** ATTRA and extension can and often do both function as intermediaries (gatekeepers), albeit in very different ways. Research question: How can a network with no gatekeepers still provide the personal touch desired and needed for system-specific LOVA catalysis?

    2.1 A variety of sources of information equals a network. There will always be some nodes in a network. These can become service-oriented LOVAs, but should not be out-of-touch, though professional, advice givers.

    2.1.1 Other farmers become clients, contractees, or just look up to these nodes for advice.

Research/education priorities in chaotic systems. The behavior of a chaotic system is a collection of many orderly behaviors none of which dominates in ordinary circumstances (Ditto and Pecora, 1993). The behavior of agricultural system managers may seem irrational from the perspective of optimizing any particular outcome. However, given the infinite number of factors which farmers manage, a set of completely logical responses to these factors, may, in toto, result in a system which has the unpreditability of a chaotic system.

If agricultural systems are chaotic systems, then unpredictability is a unavoidable characteristic. The scientific goals of prediction and control cannot, then, be achieved. If sustainability is the goal, however, predictability of system behavior is not required, only that the effects of the system move toward sustainability. In fact, an agricultural system which is predictable and controllable will likely be controlled by those with the most capital--which is antithetical to most definitions of sustainability.

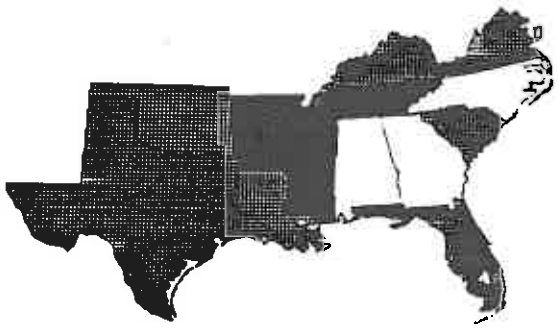
Accepting the unpredictability of agricultural systems means a radical change in agricultural marketing research. Production agriculture research has seen its share of modelling research seeking to predict and control, but by far the most priority has been given to increasing production information and tools available to farmers--for farmers to employ as they see fit. Mechanistic computer models, however, have been the mainstay of agricultural marketing research. Information on alternative marketing approaches and tools for creating new value-added marketing alternatives (see further

elaboration in Chapter 10) are priorities much more consistent with the current knowledge of systems behavior. Moving in this direction may even enable agricultural marketing research to duplicate the success of agricultural production research.

Conclusion. Land grant universities (LGUs) enjoy support which is wide but not very deep. LGUs are filled with farm management experts who have never managed a farm, rural development specialists who have never started a business, economists who have never invested a cent in agriculture. Farmers' respect for LGU research and extension has drastically declined in many parts of the country. This has translated into reduced legislative support, decreased funding and a vicious cycle which permits escape only by bold action.

However, this trend has not taken root everywhere. Some state extension services have increased their popularity and funding in recent years. The director of one of the most popular and well-funded state extension programs in the country recently employed the construct group method in a state-wide strategic planning process. After these sessions, he found that previously obstructionist farmers and left-out community members were singing the praises of extension in public meetings and in print (Absher, 1995). Absher contends that agricultural systems are in a state of transition where networks, collaboration, access and empowerment are the tools which will enable public research/education systems to be the chosen sources of information for farmers and rural people.

Section II. Specific Research Priorities.



Chapter 5. How extension and SCS agents would reorder existing priorities

Up to this point we have focused on the assumptions underlying agricultural research and education. Questioning these assumptions will require a basic shift in the way research and extension is done in the South. Eventually, entirely new areas of emphasis will arise.

In the short run, research and extension activities can be expected to fall within traditional categories--it is only the prioritization of these activities which is likely to change. However, one basic change is required to move agricultural systems toward sustainability: they must be the priorities of systems managers, especially farmers.

The State of the South project, due to the participation of highly respected Extension leaders such as Joe Waldrum, Curtis Absher, Roger Crickenberger and Dixon Hubbard was able to obtain priorities from the county level from 1189 counties in the South.

The survey instrument is provided in Appendix 1. In brief, surveys were filled out by county extension staff and SCS staff to represent the conditions and needs in each county. These results represent the first and only county-level database on sustainable agriculture priorities ever assembled. The survey reports responses to questions regarding current conditions in each county as well as future needs.

Following is a summary for each State. Tables 1-10 in Appendix 2 summarize the results. Only means are provided in these tables in order to conserve space. For a complete statistical analysis, contact survey coordinators Virgil Huston or Dr. Robert Rhoades at the Department of Anthropology, University of Georgia, Athens, GA 30602 or Dr. Jim Worstell, State of the South Coordinator, Route 1, Box 57A, Almyra, AR 72003.

ALABAMA

How can Alabama agricultural research and extension be improved?

With 66% of Alabama counties returning usable surveys, following is a brief summary of results. Of the 13 Southern States, Alabama had the lowest response rate. Tables 1-10 present the data in more depth.

What is the state of Alabama in sustainable agriculture?

The survey results show the extent of various sustainable agriculture practices, current education programs and current research programs in each county.

Current participation in sustainable practices (Table 1): Alabama agents report farmers much more involved in forest-related practices and IPM than the regional average or adjacent states. Regarding the 31 other practices listed, Alabama is not significantly different from the regional averages where highest current participation in sustainable activities is concentrated in IPM, rotation and erosion control.

Current educational programs. Educational programs in reforestation and forest stewardship were reported in more counties in Alabama than in any adjacent state or than the regional average (Table 2). The only other program area where Alabama is different from regional averages is composting. In composting, Alabama agents report much more educational effort than any other state.

Current problems. Table 3 shows current problems. No significant differences in Alabama from the regional averages where the top five current problems of farmers and ranchers are: profitability, susceptibility to pests and disease, adequacy of markets, soil erosion and labor.

Current research program. Table 4 shows percentages of Alabama counties reporting current research programs in various research areas. In IPM, Alabama counties ranked higher than regional average and all adjacent states. Forestry programs also rank significantly above the regional averages. Crop rotation, various waste management programs and conservation tillage comprise the remaining most prevalent research programs.

Why are farmers not adopting more sustainable practices? Table 6 shows that Alabama agents felt adequate markets was the top constraint. The need for adequate markets was the top constraint region-wide, but Alabama was higher than any adjacent state.

What research is needed in the future in Alabama? Table 7 shows that alternative marketing research again ranked at the top (along with general category of profitability). Biological pest control, IPM and related research areas along with waste management and water management comprised the top ranked research areas. Alabama needs are very consistent with regional averages. Alabama was significantly

lower than other states regarding the perceived need for controlled grazing research.

What education programs will be needed in the future? Education needs in Alabama are very similar to research needs (Table 8). Alternative markets, IPM and waste management all rank near the top. Biological pest control is ranked high in education as it was in research and significantly higher than the regional average and most adjacent states.

Comparing relative rankings of current conditions to needs, alternative markets is ranked as a much higher need than the attention devoted to it in education or research. Alternative market research and education is also see as a top future need. But several other topics gain more attention in present research and education efforts.

Professional problems. Finally, the key professional problems for Alabama agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, inadequate funds and lack of time. Alabama agents are somewhat less concerned about definitional problems than other states, but they see the same top four problems.

Finally, looking at general enthusiasm for sustainable agriculture (Table 10) Alabama agents overwhelming agreed that agriculture can be profitable and environmentally and economically sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. In contrast to agents in other states, the majority of Alabama agents feels sustainable agriculture is economical. Alabama agents almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals.

This last item is where Alabama agents, and farmers and agents across the South, differ most with environmentalists, as Table 10 shows. Three percent of farmers and seven percent of Alabama agents feel synthetic chemicals are not necessary while up to 77% of environmentalists feel such chemicals are unneeded.

Conclusion:

The picture of current conditions in Alabama which emerges from these four tables is: **the need for work on alternative markets** is not matched by either educational or research effort. IPM work, on the other hand, is needed and present at high levels in both education and research. Higher than average investment in education and research on forestry has resulted in significant adoption of such practices though such work does not appear to be the most important need for Alabama farmers.

ARKANSAS

How can Arkansas agricultural research and extension be improved?

With 100% of Arkansas counties returning usable surveys, following is a brief summary of results.

What is the state of Arkansas in sustainable agriculture?

The survey results show the extent of various sustainable agriculture practices, current education programs and current research programs in each county.

Current participation in sustainable practices. Arkansas agents report farmers to be using manure as fertilizer significantly more than the regional average (Table 1) and more than any other state in the region except North Carolina .

Arkansas averages ranked significantly lower than the regional averages on various measures related to erosion control and conservation tillage and to measures of crop diversification.

Current educational programs. Educational programs in various aspects of waste management were reported in more counties than any other state (Tables 2). Various forestry education programs also were reported at higher levels than the regional average.

Lower reports of alternative marketing and diversification education programs were reported by Arkansas agents. Arkansas ranked lower than any adjacent state on education in alternative marketing.

Current problems. Arkansas farmers' current problems are largely the same as those of other farmers in the region. The top four problems in Arkansas are the same as the regional averages: profitability, adequacy of markets, susceptibility to pests and disease and farm labor (Table 3). However, the latter two are ranked much lower than the regional averages.

The only other difference from regional means is that soil erosion is not seen as much a problem. Of all Southern states, only Florida ranked soil erosion as less of a problem than Arkansas.

Current research programs. Research in various waste management topics, water management and reforestation was reported at significantly higher levels than the regional average (Table 4). On waste management, especially, reported research was far above other Southern states.

What organizations are promoting sustainable agriculture? Results were largely consistent with other states, except that Farm Bureau was reported to be active in more counties and the state department of agriculture less active than the regional

average (Table 5). Reported activity of the state department of agriculture was lower than in any other state in the South .

Why are farmers not adopting more sustainable practices? Table 6 shows that Arkansas agents felt adequate markets was the top constraint. Need for adequate markets was the top constraint region-wide, but Arkansas agents ranked lack of markets significantly higher than other Delta states and higher than any other state in the South (Table 6).

What research is needed in the future in Arkansas? Table 7 shows that alternative marketing research again ranked at the top (along with general category of profitability). Arkansas agents ranked alternative marketing research as a greater need than any other state. Various research areas related to waste management were also ranked significantly higher than the regional average and any other state in the region.

Consumer behavior was ranked in the top six needs--higher by Arkansas agents than by any other state. Though not in the top needs, controlled grazing, water management and forest stewardship all ranked in significantly higher in Arkansas than in other states, on average.

What education programs will be needed in the future? Education needs (Table 8) are very similar to research needs. Alternative markets, waste management and IPM all rank near the top. Alternative marketing and waste management programs are significantly higher than the region average and higher than in nearly all states in the South.

Consumer behavior education programs again ranked as a higher need than in any other state.

Comparing rankings of current conditions to needs. Arkansas appears to need more research and education programs in alternative marketing. Agents rank alternative marketing as a top need of farmers and as a top need for research and education programs. The unique need expressed for consumer behavior programs could be incorporated in alternative marketing projects.

The need for waste management programs appears to be met by high levels of research and education programs.

Key professional problems. The key professional problems for Arkansas agents in helping farmers implement sustainable practices (Table 9) are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time.

More Arkansas agents reported professional problems than the regional average in nearly every category.

Enthusiasm for sustainable agriculture. Finally, looking at general enthusiasm for sustainable agriculture (Table 10) Arkansas agents overwhelming agreed that agriculture can be profitable and environmentally and economically sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture.

However, a much lower percentage of Arkansas agents felt farmers were actually practicing sustainable agriculture compared to other states.

Consistent with other states, only about a third Arkansas agents feel sustainable agriculture is economical. Also consistent with the regional trend, that Arkansas agents almost universally disagreed that farmers and ranchers can produce enough food and fiber without using synthetic chemicals.

This last items is where Arkansas agents, and farmers and agents across the South, differ most with environmentalists, as Table 10 shows. Three percent of farmers and five percent of Arkansas agents feel synthetic chemicals are not necessary while up to 77% of environmentalists feel such chemicals are unneeded.

Conclusion:

The picture of current conditions in Arkansas which emerges from these four tables is: the need for work on alternative markets is not matched by either educational or research effort. Arkansas agents feel both more research and more education is needed on alternative markets. Waste management work is getting the high level of attention required.

Florida

How can Florida agricultural research and extension be improved?

With 94% of Florida counties returning usable surveys, following is a brief summary of results.

What is the state of Florida in sustainable agriculture?

The survey results show the extent of various sustainable agriculture practices, current education programs and current research programs in each county.

Current participation in sustainable practices. Florida agents report farmers to be much less diversified than in other states (Table 1). Crop and livestock diversification is significantly more prevalent on farms in other Southern states. The Florida ranking was lower than any other state. Consistently, crop rotation is also ranked lower in Florida than in adjacent state.

As expected from Florida's topography, conservation tillage and other erosion control practices ranked significantly lower than other Southern states.

No sustainable practices were ranked significantly higher in Florida than the regional average.

Current educational programs. Eighty-four percent of responding Florida counties have IPM programs, making this area the highest of all sustainable agriculture areas (Table 2). A related area, biological pest control, was rated significantly higher than the regional average. Composting, various aspects of waste management and mulching education programs were likewise reported at significantly higher rates. Various forestry education programs also were reported at higher levels than the regional average.

Programs related to profitability were reported significantly less frequently than the regional average as were programs in crop rotation, diversification and conservation tillage. In fact, programs in these three areas were less prevalent in Florida than in any other state in the South.

Lower reports of alternative marketing and diversification education programs were reported by Florida agents. Florida ranked lower than any adjacent state on education in alternative marketing education.

Current problems. Florida farmers' current problems are largely the same as those of other farmers in the region. The top four problems in Florida are the same as the regional averages: profitability, adequacy of markets, susceptibility to pests and disease and farm labor (Table 3). However, the latter two are ranked much lower than the regional averages.

The only other difference from regional means is that soil erosion is not seen as much a problem. Consistent with physiographic conditions, Florida ranked soil erosion as less of a problem than any other Southern state.

Current research programs in Florida counties. IPM research is reported in more counties than any other sustainable agriculture research area (Table 4). Improved water management, reduced synthetic fertilizers, reduced synthetic pesticides, biological pest control and cultural pest control, to round out the top six Florida research areas, were all reported at significantly higher levels than the regional averages. Consumer behavior was being researched in 32% of reporting counties, highest in the Southern region.

Research in various waste management topics, water management and reforestation was reported at significantly higher levels than the regional average (Table 4). On waste management, especially, reported research was far above other Southern states.

Research programs occurring below the regional averages were conservation tillage and erosion reduction.

What organizations are promoting sustainable agriculture? Results were largely consistent with other states, except that Farm Bureau was reported to be active in more counties and the state department of agriculture less active than the regional average (Table 5). Reported activity of the state department of agriculture was lower than in any other state in the South.

The question, "What needs to be done in Florida?," is addressed by Tables 6 through 8.

Table 6. Why are farmers not adopting more sustainable practices? Unlike the rest of the region, adequacy of markets was not noted as the top constraint on implementation of sustainable practices. Instead, in Florida, inadequate knowledge of sustainable practices ranked highest. Lack of appropriate technology, though not as highly ranked, was higher than in any other state.

What research is needed in the future? Table 7 shows that farm profitability was ranked highest and alternative marketing ranked very high just as they were in all other states. However, several research areas ranked much higher in Florida than in other states. These included: total sustainable systems, biological pest control, reduced synthetic pesticide and fertilizer use and improved water management. IPM also ranked in the top research areas, as it did in other states.

What education programs will be needed in the future? Education needs (Table 8) are very similar to research needs. Alternative markets, IPM and profitability all rank near the top, as do related pest control topics and water management.

Comparing relative rankings of current conditions to needs. Needs for programs related to alternative marketing and profitability are needs which are not sufficiently addressed. Pest control research and education were seen as continuing

needs and were the focus of present programs.

Key professional problems for Florida agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time (Table 9).

However, a number of professional problems ranked higher in Florida than other states. These included: lack of training opportunities, lack of organizational priority on sustainable agriculture and lack of support in both state and national policies.

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) Florida agents overwhelming agreed that agriculture can be profitable and environmentally and economically sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Forty-two percent believed sustainable agriculture was economically viable. Significantly less than the regional average was the percent who felt farmers in his county were practicing sustainable agriculture. However, this figure was still double the percent estimated by environmentalists.

Florida agents almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals. These last three items are where Florida agents differ most with environmentalists, as Table 10 shows.

Georgia

How can Georgia agricultural research and extension be improved?

With 97% of Georgia counties returning usable surveys, following is a brief summary of results.

Current participation in Georgia in sustainable practices (Table 1).Crop rotation and reforestation were the sustainable practices most reported in use in Georgia. Reforestation along with forest stewardship was ranked significantly higher than the regional average. Diversification and landforming to reduce erosion were highly ranked in Georgia as they were in other Southern states.

Table 2. Current educational programs. In contrast to other Southern states, forest stewardship and reforestation were the top reported education programs with 89 and 87 per cent of counties reporting such programs. Diversification and alternative markets were ranked significantly lower than in other states, as were controlled grazing and IPM.

Table 3. Current problems. Consistent with the regional results, the top current problems were listed as farm profitability, susceptibility to plant pests and diseases, farm labor, adequacy of markets and negative public opinion about farm chemical usage. There were no significant differences from regional averages.

Table 4. Current research programs in your county. Reforestation was listed as a top research area and significantly higher than in the region as a whole. IPM and conservation tillage also were reported as highly prevalent research areas, as they were region wide.

Reported at significantly less frequency than regional averages were alternative marketing, profitability and diversification research.

The picture of current conditions in Georgia which emerges from these four tables is that Georgia is not conducting as much research or education as is needed in alternative marketing and profitability in general.

Why are farmers not adopting more sustainable practices?

As throughout the region, adequacy of markets was listed as the top reason farmers do not implement sustainable practices (Table 6). Inadequate knowledge of sustainable practices, and costs and difficulty of implementation were also highly ranked in Georgia as they were in the region. The only significant difference from regional results was a lower number of counties ranking pressure to increase productivity as a constraint.

What research is needed in the future?

Alternative markets and profitability were the top needs in Georgia as they are

throughout the region (Table 7). IPM, biological pest control and total sustainable systems research rounded out the top five as they did for the rest of the region. Improved animal waste management, conservation tillage and manure use as a fertilizer were ranked next highest and each was significantly higher than the regional average.

What education programs will be needed in the future?

Education needs (Table 8) are very similar to research needs. Alternative markets, profitability, IPM and total sustainable systems rank at the top. Improved animal waste management, however, entered the top 5 and was significantly more highly ranked than in the region as a whole.

Comparing relative rankings of current conditions to needs, alternative marketing, profitability and total sustainable systems are the areas which are missing attention currently and seen as having the highest needs in the future.

Groups promoting sustainable agriculture. The State Department of Agriculture was ranked significantly lower in promoting agriculture than in other states in the region.

Key professional problems for Georgia agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time (Table 9).

Looking at **general enthusiasm for sustainable agriculture** (Table 10) Georgia agents overwhelming agreed that agriculture can be profitable and environmentally and economically sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Georgia agents almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 3% agreed with the statement compared with up to 77% of environmentalists. The vast majority of Georgia agents also feel sustainable agriculture is not economical. These last two items are where Georgia agents differ most with environmentalists, as Table 10 shows.

Conclusion:

Georgia agents feel more effort should be focused on alternative markets and profitability than is presently the case.

Kentucky

How can Kentucky agricultural research and extension be improved?

With 70% of Kentucky counties returning usable surveys, following is a brief summary of results.

Current participation in Kentucky in sustainable practices (Table 1). Crop rotation, conservation tillage and cover cropping were the sustainable practices most reported in use in Kentucky. All of these were reported at higher levels than the regional averages. Diversification and manure use as fertilizer completed the top five practices reported. Reforestation and IPM, ranked in the top five in most Southern states, didn't even reach the top 15 in Kentucky.

Table 2. Current educational programs. Educational programs related to crop rotation, profitability and conservation tillage were ranked as the three most prevalent. Alternative marketing was reported in 77% of counties--equal to its usual high rank across the region. Diversification and animal waste management were ranked significantly higher than the regional average.

Table 3. Current problems. Consistent with the regional results, the top current problems were listed as farm profitability, adequacy of markets, farm labor and susceptibility to plant pests. There were no significant differences from regional averages.

Table 4. Current research programs in your county. Significantly higher than in other states, controlled grazing research was reported in the most counties. Farm profitability and alternative market research was also reported at high levels, consistent with other states. Conservation tillage, crop rotation and IPM also were reported as highly prevalent research areas, as they were region wide. Animal waste management was reported at higher levels than in the region as a whole.

The picture of current conditions in Kentucky which emerges from these four tables is that Kentucky is conducting a relatively high amount of research or education in the needed areas of alternative marketing and profitability, but putting less emphasis than needed on pest control and farm labor.

Why are farmers not adopting more sustainable practices?

As throughout the region, adequacy of markets and costs and difficulty of implementation were listed as the top reason farmers do not implement sustainable practices (Table 6). Inadequate knowledge of sustainable practices was, however, seen as significantly less a problem than in other Southern states, though it still was ranked fourth. Lack of appropriate technology was also ranked as a problem is significantly fewer counties than the regional average.

What research is needed in the future?

Alternative markets and farm profitability were the top needs in Kentucky as they are throughout the region (Table 7). IPM, total sustainable systems research and diversification were the other top needs reported, with not significant differences with the region.

What education programs will be needed in the future?

Education needs (Table 8) have exactly the same ranking as research needs. Alternative markets, profitability, IPM, total sustainable systems and diversification rank at the top. Controlled grazing was significantly higher than the regional average.

Comparing relative rankings of current conditions to needs, alternative marketing, profitability are receiving attention and need to receive continued attention. IPM, diversification and total sustainable systems are the areas which are missing attention currently and seen as being extremely important for the future.

The groups active in promoting sustainable agriculture in Kentucky are similar to other states reports with the exception that commodity groups were reported as being significantly more active than in other states (Table 5).

The top two professional problems for Kentucky agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest and lack of a clear definition of sustainable agriculture. However, lack of adequate funds and lack of time were reported to be problems less often than in other states. In addition national and state agricultural policy were felt to be problems by significantly fewer agents in Kentucky.

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) Kentucky agents overwhelming agreed that agriculture can be profitable and environmentally and economically sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Kentucky agents almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 4% agreed with the statement while up to 77% of environmentalists agreed. The majority of Kentucky agents also feel sustainable agriculture is not economical. These last two items are where Kentucky agents differ most with environmentalists, as Table 10 shows.

Conclusion:

Kentucky agents feel more effort should be focused on diversification, pest control and total sustainable systems. Emphasis should continue on alternative markets and profitability.

Louisiana

How can Louisiana agricultural research and extension be improved?

With 100% of Louisiana counties returning usable surveys, following is a brief summary of results.

Current participation in Louisiana in sustainable practices (Table 1). Cover cropping was the sustainable practices most reported in use in Louisiana. It was reported at significantly higher levels than in other states. Sprayer calibration, water management, IPM and reforestation rounded out the top five at levels consistent with regional trends. Crop rotation, on average the highest ranked in the South, was ranked significantly lower by Louisiana agents. Diversification, in the top five regionally, was also significantly lower in Louisiana.

Table 2. Current educational programs. Educational programs related to profitability, alternative markets, sprayer calibration and IPM were ranked in the top five as they were region-wide. Improved water management was ranked significantly higher than in other states to complete the most prevalent programs. Controlled grazing was reported significantly less often than in other states, ranking only 13th while it occurred in the top five regionally.

Table 3. Current problems. Consistent with the regional results, farm profitability, adequacy of markets, farm labor and susceptibility to plant pests and negative public opinion about farm chemical usage comprised to top five problems. The only significant differences from regional averages was a higher score for waterlogging.

Table 4. Current research programs in your county. Significantly higher than the regional average, sprayer calibration was the research program reported in the most Louisiana counties. Farm profitability, conservation tillage and IPM also were reported as highly prevalent research areas, as they were region wide. Reduced synthetic pesticide use and cultural pest control were the often reported and at higher rates than regionally. Due to the high levels of research reported in these areas, alternative marketing research ranked lower in Louisiana than in other states.

The picture of current conditions in Louisiana which emerges from these four tables is that Louisiana is conducting a relatively high amount of research and education in the needed areas of alternative marketing, profitability, and IPM but putting less emphasis than needed on farm labor and negative public opinion about farm chemical use.

Why are farmers not adopting more sustainable practices? As throughout the region, adequacy of markets, inadequate knowledge of sustainable practices and costs and difficulty of implementation were ranked in the top five reasons farmers do not implement sustainable practices (Table 6). In contrast to the regional average, however, pressure to raise productivity jumped to the number 4 rank as a farmer constraint in Louisiana.

What research is needed in the future? Alternative markets and farm profitability were the top needs in Louisiana as they are throughout the region (Table 7). However, alternative markets cited significantly less often than the regional average. IPM, total sustainable systems research, improved water management, biological pest control and cultural pest control were the next most often cited. The latter was cited significantly more than the regional average.

What education programs will be needed in the future? Education needs (Table 8) cited were led by profitability, alternative markets, total sustainable systems, IPM, conservation tillage and improved water management. There were no significant differences between the regional and Louisiana's expressed needs for education programs.

Comparing relative rankings of current conditions to needs, alternative marketing and profitability and pest control are receiving attention and need to receive continued attention. A few areas, such as sprayer calibration are reported as receiving more education and research attention than the need warrants. Total sustainable systems research needs more emphasis.

Some groups were reported more active in promoting sustainable agriculture in Louisiana than in other states in the regional. ASCS, Farm Bureau, State Department of Agriculture and commodity groups were all reported as being significantly more active than in other states (Table 5).

The key professional problems for Louisiana agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time.

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) Louisiana agents overwhelming agreed that agriculture can be profitable and environmentally and economically sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Louisiana agents almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 3% agreed with the statement. The vast majority of Louisiana agents also feel sustainable agriculture is not economical--significantly fewer than the already low regional average and the lowest among all Southern states (19%).

These last two items are where Louisiana agents differ most with environmentalists, as Table 10 shows.

Conclusion:

Louisiana agents feel more effort should be focused on labor and total sustainable systems. Emphasis should continue on alternative markets and profitability.

Mississippi

How can Mississippi agricultural research and extension be improved?

With 94% of Mississippi counties returning usable surveys, following is a brief summary of results.

Current participation in Mississippi in sustainable practices (Table 1). Land forming to reduce erosion and reforestation were the sustainable practices most reported in use in Mississippi. Both were reported at significantly higher levels than in other states. Sprayer calibration, conservation tillage, crop rotation, diversification and forest stewardship were the other most prevalent practices. Other states did not rank forest stewardship as high, but the ranking of other practices was largely consistent with regional averages.

Table 2. Current educational programs differed significantly in Mississippi compared to the region as a whole. Four of the five education programs reported most often (conservation tillage, forest stewardship, crop rotation and reforestation) were all reported at higher levels than the regional levels. Alternative markets was ranked fourth, consistent with its high rank in other states. Items related to erosion were reported significantly more often in Mississippi and items related to pest control were usually ranked lower.

Table 3. Current problems. Consistent with the regional results, farm profitability, adequacy of markets, farm labor and susceptibility to plant pests were all among the top problems. However, the fifth ranked problem in Mississippi, soil erosion, was ranked significantly higher than in the region. Deforestation, ranked eighth in the region, was also ranked higher in Mississippi than the regional average.

Table 4. Current research programs. The same topics reported as the most prevalent education programs were also the most common research programs and with the same rankings: conservation tillage, forest stewardship, crop rotation, alternative markets and reforestation. All except alternative markets were reported at significantly higher levels than the regional average. Land forming to reduce erosion was ranked sixth and also reported at significantly higher levels than the regional average. Research in reducing synthetic pesticide and fertilizer use were both reported at significantly lower levels than regionally.

The picture of current conditions in Mississippi which emerges from these four tables is that Mississippi is conducting a relatively high amount of research and education in the needed areas of alternative marketing, forest research and soil erosion, but neglecting pest control and labor.

Why are farmers not adopting more sustainable practices? Costs of implementation was cited most often, and at a significantly higher level than regionally, as the reason farmers don't adopt sustainable practices in Mississippi (Table 6). Consistent with regional trends, adequacy of markets, inadequate knowledge of sustainable practices

and perceived difficulty of implementation completed the top four farmer constraints.

What research is needed in the future? Alternative markets and farm profitability, total sustainable systems and IPM techniques were four of the five top needs in Mississippi as they were throughout the region (Table 7). However, biological control was not in the top five as it was regionally and conservation tillage, forest stewardship and crop rotation were ranked significantly higher in Mississippi than regionally.

What education programs will be needed in the future? Education needs (Table 8) were led by profitability, alternative markets, total sustainable systems, IPM, conservation tillage and IPM techniques. There were no significant differences between the regional and Mississippi's expressed needs for education programs except that conservation tillage was ranked significantly higher. Forest stewardship and reforestation, while not among the top ranked needs, were ranked higher than the regional mean.

Comparing relative rankings of current conditions to needs, alternative marketing and profitability are receiving attention and need to receive continued attention. Pest control, especially IPM, and farm labor need increased emphasis.

The **key professional problems** for Mississippi agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time. The latter was cited more often in Mississippi than in other states.

Though not the highest ranked, state, organizational and federal policies were cited as professional problems significantly more often by Mississippi agents than regionally.

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) Mississippi agents overwhelming agreed that agriculture can be profitable and environmentally sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Mississippi agents almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 1% agreed with the statement. The majority of Mississippi agents also feel sustainable agriculture is not economical. These last two items are where Mississippi agents differ most with environmentalists, as Table 10 shows.

Conclusion:

Mississippi agents feel more effort should be focused on pest control, labor and total sustainable systems. Emphasis should continue on alternative markets and profitability.

North Carolina

How can North Carolina agricultural research and extension be improved?

With 75% of North Carolina counties returning usable surveys, following is a brief summary of results.

Current participation in North Carolina in sustainable practices (Table 1). Crop rotation, manure as fertilizer and improved animal waste management were all significantly more prevalent in North Carolina than the regional averages. Reforestation and diversification, consistent with regional trends, completed the top five sustainable practices in use in North Carolina. Though not as often used as the most prevalent practices, cover cropping was the other practice cited as more prevalent in North Carolina than regionally.

Table 2. Current educational programs. North Carolina reported significantly more counties with educational programs in 16 areas, compared to regional averages. The rankings of relative frequency was consistent with regional trends, however. Farm profitability, conservation tillage, forest stewardship, improved animal waste management and sprayer calibration were the five cited most frequently. Crop rotation and IPM were close behind.

Table 3. Current problems. Consistent with the regional results, farm profitability, adequacy of markets, farm labor and susceptibility to plant pests were all among the top problems. However, the fifth ranked problem in North Carolina, population/ development pressures, was ranked significantly higher than in the region.

Table 4. Current research programs. Conservation tillage, improved animal waste management, composting and manure distribution as fertilizer were 4 of the 6 research programs present most often and at significantly higher rates than regionally. IPM and crop rotation, consistent with regional trends completed the top six.

The picture of current conditions in North Carolina which emerges from these four tables is that North Carolina is neglecting alternative market research and education in favor of less important areas. Farm labor could also use increased attention. Pest control is receiving high levels of needed work.

Why are farmers not adopting more sustainable practices?

Inadequate markets for alternative products is the top reason, consistent with regional results as Table 6 shows. Costs and difficulty of implementation, along with inadequate knowledge of sustainable practices and negative farmer attitudes toward sustainable agriculture completed the top farmer constraints, as they did regionally, on average.

What research is needed in the future?

Alternative markets and farm profitability, total sustainable systems and pest control (biological control, reduced synthetic pesticide usage and IPM techniques) were the top needs in North Carolina as they were throughout the region (Table 7).

What education programs will be needed in the future?

Education program needs (Table 8) were led by the areas of farm profitability, alternative markets, total sustainable systems and IPM techniques.

Comparing relative rankings of current conditions to needs, alternative marketing is the area which will need most attention in both research and education. IPM and related pest control areas are also not receiving enough attention.

The **key professional problems** for North Carolina agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time (Table 9). Lack of a clear definition was cited less often in North Carolina than in other states.

Many groups were deemed less active in North Carolina promoting sustainable agriculture than in other states. SCS, ASCS, Farm Bureau and State Department of Agriculture were all seen as significantly less active than in other states (Table 5).

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) North Carolina agents overwhelming agreed that agriculture can be profitable and environmentally sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Farmers in North Carolina counties were seen as being significantly more apt to be practicing sustainable agriculture. Significantly more North Carolina respondents agreed that sustainable agriculture is economical. North Carolina staff almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 5% agreed with the statement while up to 77% of environmentalists agreed. This last items is where North Carolina staff differ most with environmentalists, as Table 10 shows.

Conclusion:

North Carolina staff feel more effort should be focused especially on alternative markets and farm profitability with more effort also devoted to sustainable pest control systems.

Oklahoma

How can Oklahoma agricultural research and extension be improved?

With 86% of Oklahoma counties returning usable surveys, following is a brief summary of results.

Current participation in Oklahoma in sustainable practices (Table 1.) Current practices related to sustainable agriculture show a very different picture in Oklahoma compared to the rest of the South. Land forming to reduce erosion and integration of crops and livestock are both among the top three and significantly higher than the regional average. Crop rotation ranks significantly lower than the regional average. Diversification and IPM are also not as highly ranked.

Table 2. Current educational programs. Current educational programs in Oklahoma are virtually identical to the regional averages. Top programs reported are: farm profitability, controlled grazing, sprayer calibration, alternative markets and IPM. Integration of crops of livestock is reported significantly more often than the regional average as is ranked seventh.

Table 3. Current problems. Consistent with the regional results, farm profitability, adequacy of markets and susceptibility to plant pests were all among the top problems. However, overgrazing was ranked fourth and much higher than the regional average while farm labor was reported as a problem significantly less than in the region, though still ranked sixth.

Table 4. Current research programs. Controlled grazing was the top research program reported and at significantly higher levels than in other states. Alternative market research was reported significantly less than regionally. IPM and farm profitability research were reported at high levels as they typically were in the region.

The picture of current conditions in Oklahoma which emerges from these four tables is that Oklahoma is neglecting alternative market research, while devoting justified effort to sustainable pest control and grazing research.

Why are farmers not adopting more sustainable practices?

Inadequate markets for alternative products is the top reason, consistent with regional results. Costs and difficulty of implementation, along with inadequate knowledge of sustainable practices and negative farmer attitudes toward sustainable agriculture completed the top farmer constraints, as they did regionally, on average.

The only significant difference comparing Oklahoma responses to regional averages was that Oklahoma staff were less likely to see pressure to increase productivity as a constraint to farmer implementation of sustainable practices.

What research is needed in the future?

Alternative markets, farm profitability and diversification, along with IPM were the top research needs in Oklahoma. Controlled grazing was also cited more often than in other states, though not at the top level.

What education programs will be needed in the future?

Education program needs (Table 8) were led by the areas of farm profitability, alternative markets and IPM with total sustainable systems and integration of crop and livestock rounding out the top five. The latter was cited significantly more often than the regional average.

Comparing relative rankings of current conditions to needs, alternative marketing/profitability research is the area which needs the biggest increase in attention. IPM and related pest control areas warrant continued high levels of research and education effort.

The **key professional problems** for Oklahoma agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time (Table 9). Lack of a clear definition was cited less often in Oklahoma than in other states.

Farm Bureau was deemed less active in Oklahoma promoting sustainable agriculture than in other states (Table 5).

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) Oklahoma agents overwhelming agreed that agriculture can be profitable and environmentally sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Oklahoma staff almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 7% agreed with the statement. The vast majority of Oklahoma agents also feel sustainable agriculture is not economical.

The last two items are where Oklahoma agents differ most with environmentalists, as Table 10 shows.

Conclusion:

Oklahoma staff feel more effort should be focused especially on alternative markets and farm profitability with a continued strong effort devoted to sustainable pest control systems.

South Carolina

How can South Carolina agricultural research and extension be improved?

With 100% of South Carolina counties returning usable surveys, following is a brief summary of results.

Current participation in South Carolina in sustainable practices (Table 1). Crop rotation and reforestation were the sustainable practices with most participation in South Carolina. Both occurred at levels significantly higher than the regional average. No other practices was significantly different from regional means. Land forming to reduce erosion, sprayer calibration and improved water management complete the top five practices in South Carolina.

Table 2. Current educational programs. Reforestation and forest stewardship were the most common educational programs in South Carolina and occurred at levels significantly higher than in the regional as a whole. Sprayer calibration, crop rotation, conservation tillage and IPM techniques completed the top group. Reported by only a few less agents were programs on farm profitability, diversification and alternative markets.

Table 3. Current problems. Consistent with the regional results, farm profitability, adequacy of markets, farm labor and susceptibility to plant pests were all among the top problems. Contrary to most other states, population/development pressure was rated in the top five current problems, while negative public opinion regarding farm chemicals and soil erosion were slightly less important problems than in other states.

Table 4. Current research programs. Forest stewardship was the research area reported by the most South Carolina counties and at significantly higher levels than in other states. Reforestation, IPM, conservation tillage and improved water management completed the top five reported research programs. Farm profitability and alternative market research were each reported significantly less than regionally.

The picture of current conditions in South Carolina which emerges from these four tables is that South Carolina is neglecting alternative market, farm profitability, farm labor and population pressure research, while devoting justified effort to sustainable pest control and grazing research.

Why are farmers not adopting more sustainable practices?

Table 6 shows that inadequate knowledge of sustainable practices is the most prominent reason why farmers don't use such practices in South Carolina. Seventy-seven per cent of agents agreed, significantly higher for South Carolina than for the nation as a whole. Perceived difficulty and cost of implementation, inadequate markets, and pressure to increase productivity completed the top five farmer constraints.

What research is needed in the future?

Consistent with regional results, alternative markets and farm profitability headed the list of future research needs in South Carolina (Table 7). Research into total sustainable systems, reduced synthetic pesticide use and IPM techniques were the other most highly ranked research needs.

What education programs will be needed in the future?

Education program needs (Table 8) were also by the areas of farm profitability, alternative markets. With total sustainable systems, IPM and diversification completing the top five education needs.

Comparing relative rankings of current conditions to needs, alternative marketing/profitability/diversification is the area which needs the biggest increase in attention both in research and education. IPM and related pest control areas warrant continued high levels of research and education effort. Forestry programs seem overemphasized given the vast needs in other areas.

The **key professional problems** for South Carolina agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time. Lack of opportunities for training in sustainable agriculture was ranked fifth in South Carolina, somewhat higher than the regional average.

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) South Carolina agents overwhelming agreed that agriculture can be profitable and environmentally sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Significantly fewer South Carolina agents felt young people in their counties were willing to take up farming. South Carolina staff almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 7% agreed with the statement. The vast majority of South Carolina agents also feel sustainable agriculture is not economical.

The last two items are where South Carolina agents differ most with environmentalists, as Table 10 shows.

Conclusion:

South Carolina staff feel more effort should be focused especially on alternative markets, farm profitability and diversification with a continued strong effort devoted to sustainable pest control systems.

Tennessee

How can Tennessee agricultural research and extension be improved?

With 94% of Tennessee counties returning usable surveys, following is a brief summary of results.

Current participation in Tennessee in sustainable practices (Table 1). Crop rotation and conservation tillage were the sustainable practices with most participation in Tennessee. Conservation tillage was ranked significantly higher than the regional average. Diversification, cover cropping (also significantly higher than regional means) and sprayer calibration complete the top five practices in Tennessee. Some practices ranked highly in other states were ranked significantly lower in Tennessee. These included: IPM, reforestation, forest stewardship, land forming to reduce erosion and water management.

Table 2. Current educational programs. In general, Tennessee agents reported more educational programs related to sustainable agriculture than the regional average. Of the top seven--farm profitability, conservation tillage, crop rotation, controlled grazing, improved animal waste management, cover cropping and forest stewardship--all except profitability were reported at higher rates than regionally. IPM education was reported at lower levels than the regional average.

Table 3. Current problems. Consistent with the regional results, farm profitability, adequacy of markets, farm labor, susceptibility to plant pests and soil erosion were the top problems. There were no significant differences with regional averages regarding current problems.

Table 4. Current research programs. Conservation tillage and alternative markets were the top two research areas reported by the most Tennessee counties and both at significantly higher levels than in other states. Farm profitability, controlled grazing and forest stewardship (with the latter significantly different from the region) completed the top five reported current research programs. IPM research programs were reported in significantly fewer counties in Tennessee than the regional average.

The picture of current conditions in Tennessee which emerges from these four tables is that Tennessee is not addressing needs for IPM research and education. Low levels of use of IPM reflects the low numbers of research and education programs and indicate the huge problem of sustainable pest control is not being adequately addressed. Alternative marketing education programs could also be increased to meet the most often cited problems. Emphasis on conservation tillage appears highly warranted to reduce reported soil erosion problems.

Why are farmers not adopting more sustainable practices?

Table 6 shows that inadequate markets is the most prominent reason why farmers don't use such practices in Tennessee. Perceived difficulty and cost of

implementation, inadequate knowledge of sustainable practices and pressure to increase productivity completed the top five farmer constraints. No farmer constraint was reported at levels significantly different from regional averages.

What research is needed in the future? Consistent with regional results, alternative markets and farm profitability far outstripped other future research needs in Tennessee (Table 7). Research into total sustainable systems, IPM techniques and improved animal waste management were the other most highly ranked research needs.

What education programs will be needed in the future? Tennessee sustainable agriculture education program needs (Table 8) were also led by the areas of farm profitability and alternative markets, with total sustainable systems, IPM and improved animal waste management completing the top five education needs.

Comparing relative rankings of current conditions to needs, IPM and alternative marketing/profitability are the area which needs the biggest increase in attention. Tennessee agents also called for increased animal waste management work. The high levels of present effort in conservation tillage mean additional emphasis is not required.

In a contrast with other states, Tennessee agents felt Soil and Water Conservation Districts were less active and Farm Bureau and the state department of agriculture more active than regional averages (Table 5).

The key professional problems for Tennessee agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time (Table 9). Lack of opportunities for training in sustainable agriculture was ranked fifth in Tennessee.

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) Tennessee agents overwhelming agreed that agriculture can be profitable and environmentally sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Significantly more Tennessee agents felt young people in their counties were willing to take up farming. Tennessee staff almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 6% agreed with the statement. The majority of Tennessee agents also feel sustainable agriculture is not economical.

The last two items are where Tennessee agents differ most with environmentalists, as Table 10 shows.

Conclusion:

Tennessee staff feel more effort should be focused especially on alternative markets, farm profitability and IPM.

Texas

How can Texas agricultural research and extension be improved?

With 93% of Texas counties returning usable surveys, following is a brief summary of results.

Table 1. Current participation in sustainable practices. Crop diversification and rotation were the practices with most participation. Diversification and IPM use also ranked higher than any adjacent state and regional averages. Though lower than the average in use of cover crops, cover crop use was higher than adjacent states

Table 2. Current educational programs. Texas agents reported more educational programs than the regional average and any adjacent state in diversification, IPM and alternative markets and various grazing-related programs. Texas counties were lower than regional average and adjacent states in cover-cropping, composting and manure as fertilizer and animal waste management, conservation tillage and forest related activities.

Table 3 Current problems. Texas responses were very similar to regional averages: significantly higher only in areas were Texas is geographically or ecologically dissimilar to region: overgrazing, soil alkalinity and population pressure.

Table 4. Current research programs. Texas counties reported more research than the regional average and all adjacent states in IPM, diversification, controlled grazing and other grazing improvement programs, expert systems
Less research activity than other states was reported in composting and other waste management items and in cover cropping

The picture of current conditions in Texas which emerges from these four tables is:

Higher than average investment in education and research on IPM and diversification and grazing improvement is in response to current problems with adequacy of markets, overgrazing and susceptibility to pests and disease has resulted in significant adoption of practices IPM and diversification by Texas farmers.

In general, conservation tillage and waste management have not received as much attention as in adjacent states, nor have they been as widely adopted by Texas farmers.

What needs to be done?

Why are farmers not adopting more sustainable practices?

As throughout the region, adequacy of markets was the top reason (Table 6), though the Texas average was lower than in adjacent states. This may be due to the higher

reported emphasis on diversification in Texas than in the other states. The only difference with regional averages and adjacent states was in lack of knowledge about sustainable practices. Texas agents felt Texas farmers know more about such practices.

What research is needed in the future?

Alternative markets and profitability were the top needs in Texas as they are throughout the region (Table 7). Texas agents ranked research into diversification much higher than other states, especially adjacent states. Though IPM ranked high as a research need, biological pest control and research into reduced synthetic pesticide use ranked lower than other states. Various measures related to waste management also ranked lower in priority for research as did consumer behavior.

What education programs will be needed in the future?

Education needs (Table 8) are very similar to research needs. Alternative markets, diversification, IPM all rank near the top. Again, though IPM is ranked near the top, biological pest control and reduced synthetic pesticide use are ranked lower in adjacent states and the regional average. Various waste management research areas and consumer education also ranked lower than in adjacent states and the regional average--just as seen in the research results.

Comparing relative rankings of current conditions to needs, alternative markets is ranked much higher need in both education and research than it is in current practices. It's a top need for farmers and a top research and education need. But several other topics gain more attention in present research and education efforts.

The related topic of diversification, however, ranks high as both a need and current activity in both research and education.

Key professional problems for Texas agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time.

In contrast to other states, Texas agents feel lack of opportunities for training in sustainable agriculture are not as limiting.

Finally, looking at general enthusiasm for sustainable agriculture (Table 10) Texas agents overwhelming agreed that agriculture can be profitable and environmentally and economically sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Texas agents almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals. The vast majority of Texas agents also feel sustainable agriculture is not economical. Though this opinion is consistent with the regional trend, the difference was more extreme in Texas than in the region.

These last two items are where Texas agents differ most with environmentalists, as Table 10 shows.

Conclusion:

Texas agents feel more effort should be focused on alternative markets than is presently the case. Texas agents advocate continuing the present high level of research and education activity in diversification, IPM and various grazing programs. Texas agents are satisfied that a lower level of activity on waste management than reported in other states is warranted by both research and extension.

Virginia

How can Virginia agricultural research and extension be improved?

With 89% of Virginia counties returning usable surveys, following is a brief summary of results.

Current participation in Virginia in sustainable practices (Table 1). Crop rotation and conservation tillage were the sustainable practices with most participation in Virginia. Both ranked significantly higher than the regional average. Reforestation and sprayer calibration completed the group of most common practices. The next most common practices included: diversification, improved animal waste management, manure as fertilizer, cover cropping and forest stewardship. The latter three were all significantly higher than regional averages. Through ranked at lower levels of participation, both reduced synthetic pesticide and fertilizer use were practices significantly more common in Virginia than regionally.

Table 2. Current educational programs. Virginia agents reported most education programs in farm profitability, IPM and crop rotation (with the latter two at significantly higher levels than the regional average). Sprayer calibration, alternative markets and conservation tillage were also highly ranked. Numerous educational programs were reported at significantly higher levels in Virginia than regionally. These included: reduced synthetic pesticide and fertilizer usage, forest stewardship, cover cropping, biological pest control and improved animal waste management.

Table 3. Current problems. Consistent with the regional results, farm profitability, adequacy of markets, farm labor, susceptibility to plant pests and negative public opinion about farm chemical usage were the top problems. There were no significant differences with regional averages regarding current problems.

Table 4. Current research programs. Research in IPM and reduced synthetic fertilizer use were reported at the highest levels in Virginia counties. The latter was significantly higher than the regional average. Controlled grazing, reduced synthetic pesticide use and alternative markets complete the top five reported current research programs. Of all research areas, only reforestation was reported at lower rates than the regional average.

The picture of current conditions in Virginia which emerges from these four tables is that Virginia should increase effort on alternative markets and farm profitability. High levels of effort on reducing synthetic pesticide and fertilizer use appear to be bearing fruit.

Why are farmers not adopting more sustainable practices? Table 6 shows that inadequate markets is the most prominent reason why farmers don't use such practices in Virginia. Perceived difficulty and cost of implementation, inadequate knowledge of sustainable practices and pressure to increase productivity completed the top five farmer constraints as they did regionally. Cost of implementation was

seen as significantly less a constraint than regionally, but 52% of counties still felt it was a constraint.

What research is needed in the future? Consistent with regional results, alternative markets and farm profitability far outstripped other future research needs in Virginia (Table 7). Also consistent with regional averages, total sustainable systems, IPM techniques and biological pest control were the other most highly ranked research needs.

What education programs will be needed in the future? Virginia sustainable agriculture education program needs (Table 8) were also led by the areas of farm profitability and alternative markets, with IPM total sustainable systems following closely behind. In contrast to the regional average, controlled grazing was among the highest ranked educational programs needed. At the same level of need were consumer education and reduced synthetic pesticide usage programs.

Comparing relative rankings of current conditions to needs, alternative marketing, especially education programs is by far the area in need of most attention in Virginia. Effort in sustainable pest control appears to be having the desired effects in changing practices.

The **key professional problems** for Virginia agents in helping farmers implement sustainable practices are the same as for other states in the region: lack of farmer interest, lack of a clear definition of sustainable agriculture, lack of adequate funds and lack of time. Lack of opportunities for training in sustainable agriculture was ranked fifth in Virginia.

County level effort by agencies working in sustainable agriculture in Virginia counties were significantly lower than regional averages for Soil and Water Conservation Districts, Soil Conservation Service and ASCS, but all were reported working in at least 60% of counties.

Finally, looking at **general enthusiasm for sustainable agriculture** (Table 10) Virginia agents overwhelming agreed that agriculture can be profitable and environmentally sound and that farmers and ranchers in their counties were capable of practicing sustainable agriculture. Significantly more Virginia agents farmers in their counties were practicing sustainable agriculture. Virginia staff almost universally disagreed, consistent with the regional trend, that farmers and ranchers can produce enough food and fiber without using synthetic chemicals--only 7% agreed with the statement. The majority of Virginia agents also feel sustainable agriculture is not economical.

The last two items are where Virginia agents differ most with environmentalists, as Table 10 shows.

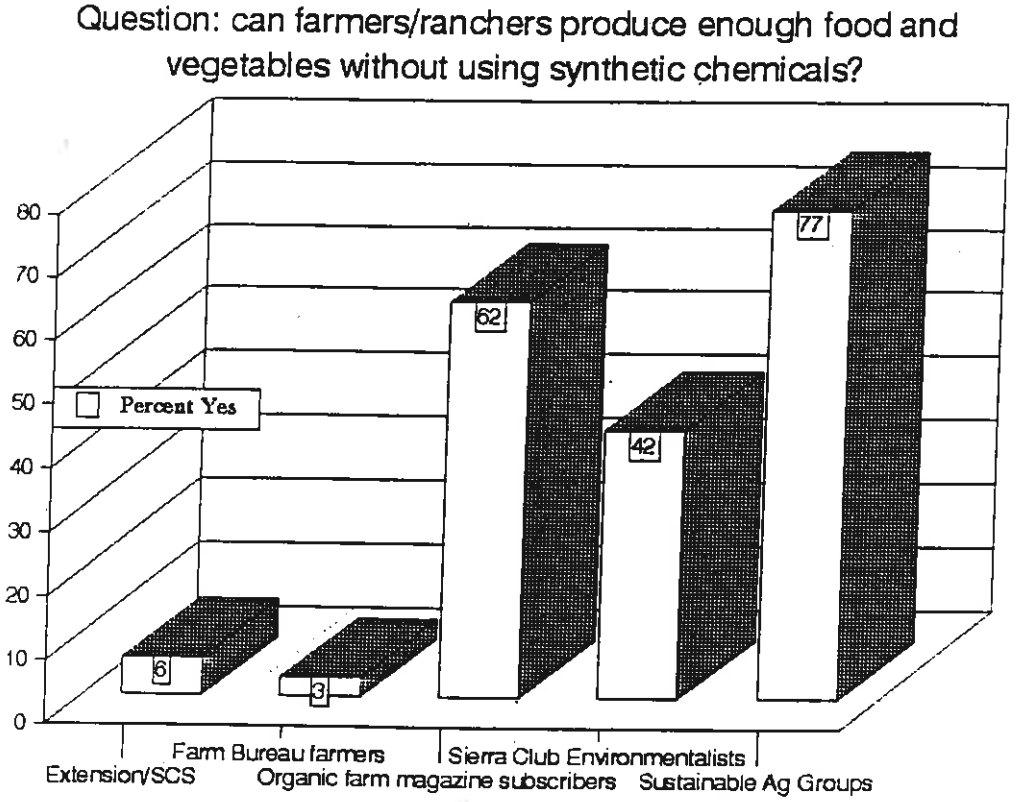
Conclusion:

Virginia staff feel inadequate attention is being given to alternative markets, especially in education programs.

Survey sidelights

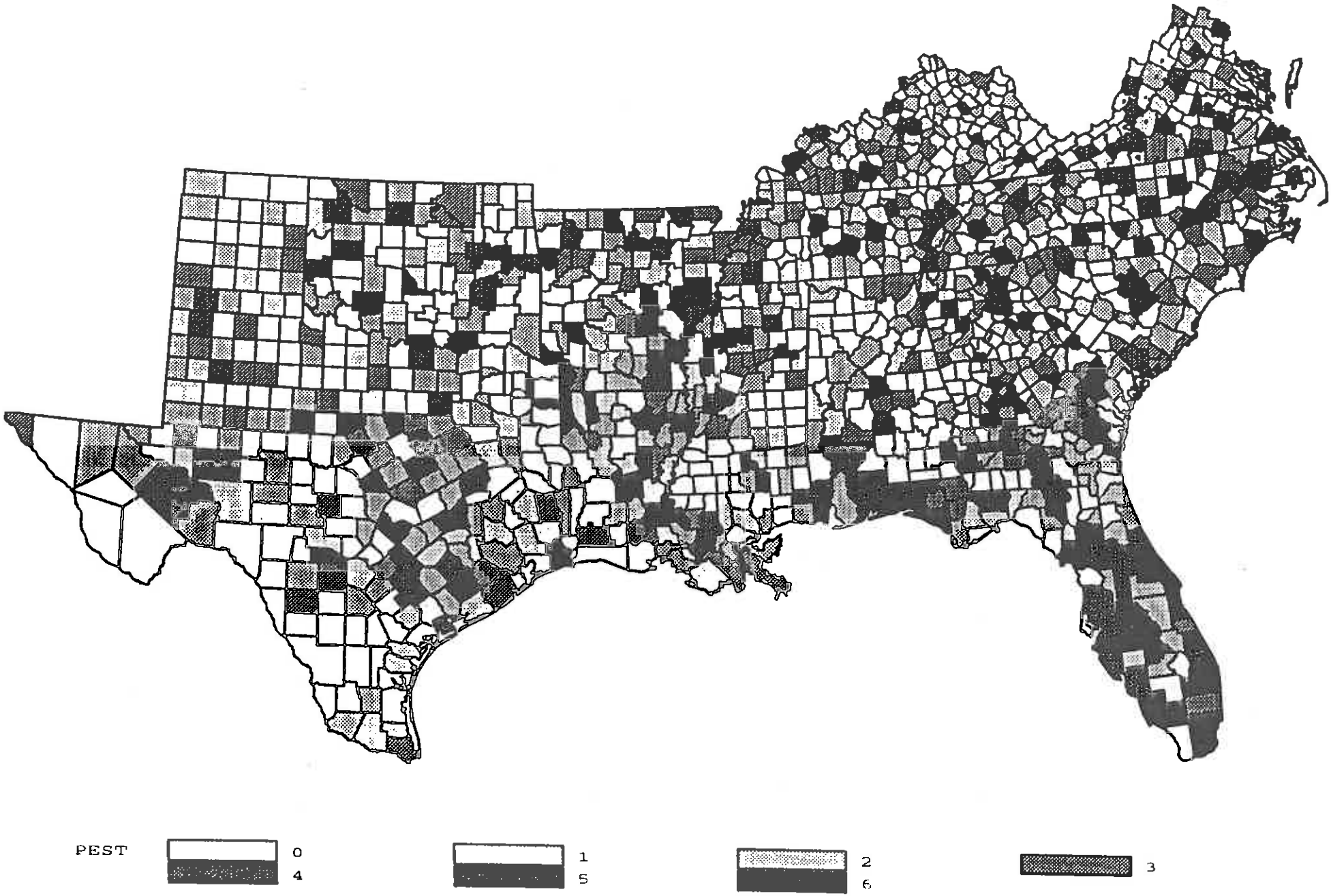
The widest variation between environmentalists and Extension/SCS (as noted in Table 10 and the discussion of each state's results above) came when considering the use of synthetic chemicals. A graphic summary of region-wide responses to one such question is presented in Figure 6. This topic is discussed more fully in Chapter 2.

Figure 6. Extension/NRCS, farmers and environmentalists share a belief that Southern agriculture can be environmentally and economically sound, but have differences on how this will be achieved.

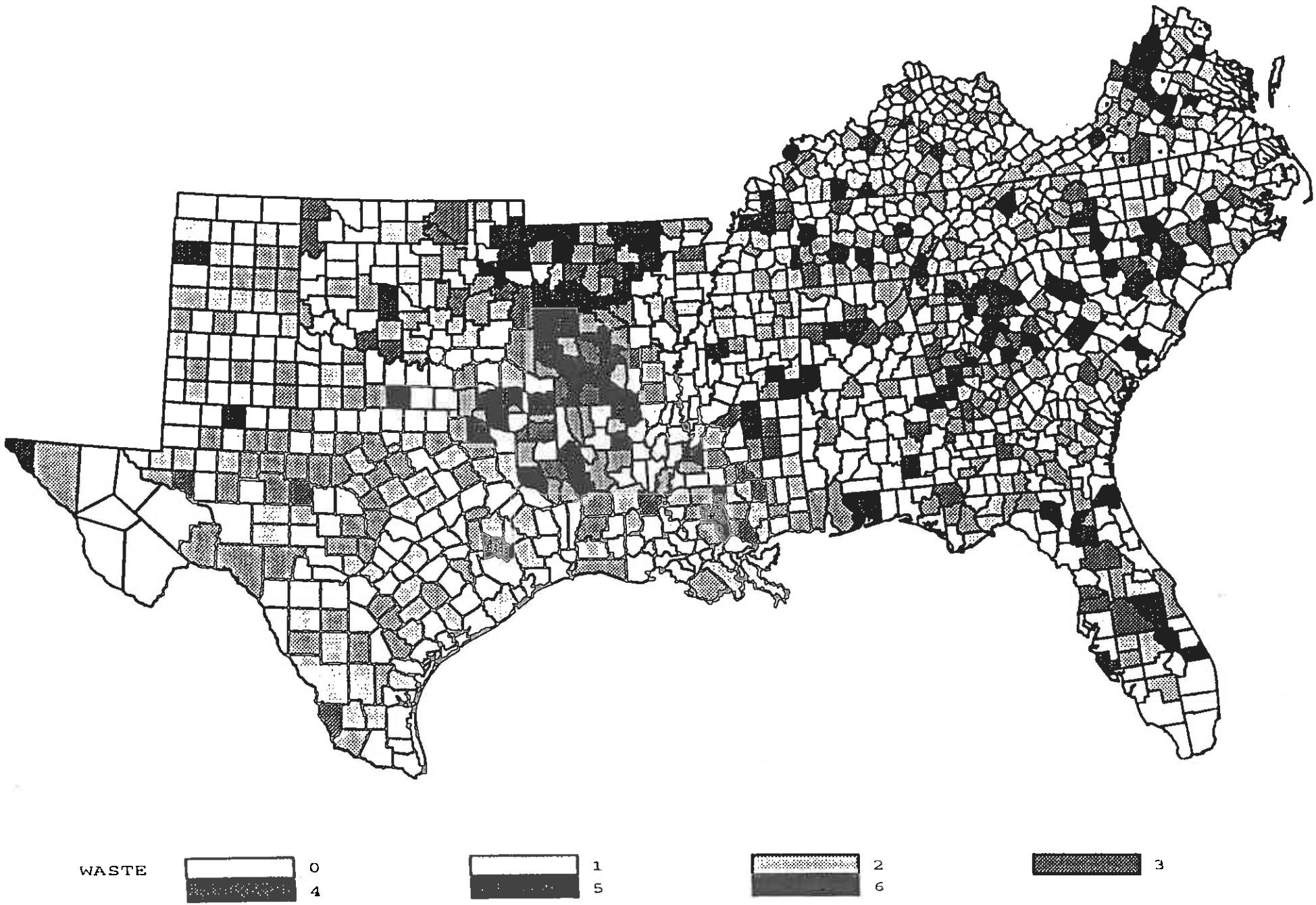


Overall need for pest control work and animal waste work. When the various questions related to pest control research and education are combined into an index to obtain a quantitative variation in overall level of need, certain parts of the region such as Florida and the Gulf Coast emerge as making strong calls for more work in pest control (Map 8). A similar index, created for animal waste research and education needs (Map 9), shows western Arkansas and northern Alabama as showing significantly high levels than other regions of those states--consistent with patterns of animal concentration. These maps show the regional and intrastate variation much more clearly than the state means can.

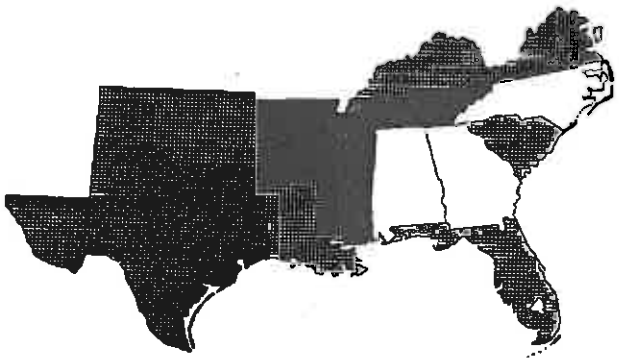
Map 8. Pest control needs index. Darker counties express more need for sustainable pest control research and education. Survey questions related to pest control were summarized in an index: 0=no need for increased sustainable pest control research and education; 6=maximum need for sustainable pest control work (see legend below).



Map 9. Animal waste needs index. Darker counties express more need for sustainable animal waste control research and education. Survey questions related to waste control were summarized in an index: 0= no need for increased sustainable animal waste research and education; 6=maximum needs for sustainable animal waste work.



Chapter 6. Melding survey and focus group priorities



The results of the county-level survey presented in the last chapter challenge the sometimes overwhelming tendency in SARE circles of looking at specific production practices. Whether a given practice is technically "better" or not begs the basic question. The general need is for practices which consider profitability. The state by state survey of extension agents ranked profitability at the top of research needs.

Expressed as a specific research need: finding profitable markets for sustainably produced products is an overwhelming need expressed by both farmers and extension in every state.

Some researchers contend that profitability should not be considered in determining sustainability. For example, Crews et al. (1991) contend that profitability may be determined by factors biased against ecological sustainability. From a systems perspective, that is exactly why the emergent social factors which determine profitability are key to sustainability. If the decisions of the agroecosystem manager are key to the sustainability of the system and if profitability is a prime mover of the manager's decisions, then profitability is a key component of sustainability.

Further, the survey results and a holistic systems perspective are consistent: production research should be integrated with alternative marketing research in order to increase profitability. To separate production agriculture from the system which creates it is to foster the perpetuation of that system. Production agriculture exists as a field of study in order to focus on the particular technical problems associated with the presence of a defined set of available inputs, equipment and market channels.

Profitability was the number one constraint in nearly all focus groups. As expressed by the Blacklands group:

> Unfavorable economic constraints (low commodity prices, inadequate deficiency payments, high and increasing input costs, diminishing opportunities for realizing improved efficiencies, eroding assets, and tax structures which discourage liquidation) are the key problems in the Blacklands.
> --Research need: Develop analytical tools which quantitatively integrate crop responses to environment and management, economic costs and returns, new technology, and policy constraints in predicting short and long-term profitability of cropping systems in the Blacklands.

The West Memphis group stated the problem a bit more succinctly:

> **Overall priority #1. As long as farmers as depleting equity like mad and going under by the droves, the key research and policy criterion for sustainability must be profitability.**

Distinguishing productivity from profitability and giving more emphasis to profitability was an alternate way many groups used to voice a similar priority. The consensus statement from Glasgow for the #1 short-term priority was:

> **All research and research reporting should be refocused to sustainable profitability--not just productivity.**
>
> -Federal policy: a directive from the highest levels of USDA should decree that research reports should detail how much profit per acre this research will produce for farmers.
>
> -This research on profitability should take into account what types of farming are most sustainable when real costs of production are taken into account.
>
> -Most research now only looks to increase production, not to the real costs of that production.
>
> -Research on global competitiveness should take into account whether it is really cheaper to produce and ship.
>
> -Research must take into account the real costs, long-term costs.
>
> -Thinking must be transformed to look at real costs beyond the market.
>
> -State policy: the push to increase agricultural income should be changed to increase agricultural profit.
>
> -If farming was more profitable, we could fix the environmental problems.
>
> -If profit were higher, it would be easier for young to enter farming.
>
> -No young people are staying on the farm.
>
> -Children don't want to stay on the farm.
>
> -Problem: true farmers keeps farming until he dies or is run out--he overlooks profitability.

The lack of young people coming into farming, linked to profitability by the Glasgow group and others, was a priority constraint for many groups.

In Athens, the second highest long-term priority was: helping young farmers get started. Their consensus statement was:

> **Average age of farmers is increasing. This is a sure indicator of lack of sustainability of the agricultural system.**
>
> **-Increasing profitability will do the most to young onto farms.**
>
> **-Reduced capital costs are one good way to help young get started.**
>
> **-When the young can't get in, land ownership declines and so does sustainability since renters take less care of land.**

Markets/profitability must be the top research/education priority.

Profitability was by far the top priority in the agent survey. Adequacy of markets almost invariably second. Southern farmers have tried every way they can to put together the inputs, climate and markets available to him and he barely makes a living--with about 2% every year not making a living and quitting farming. The only ones for whom it works are those who support the farm with outside income, those who have the capital and expertise to vertically integrate, and those who find ways to avoid environmental regulations.

"Technology treadmill" and "commodification squeeze" are terms used to describe how research on specific technological fixes results in an almost inexorable push toward adoption of the latest technology by the few who can afford it. An alternative approach, consistent with the work of E. P. Odum and Shijun Ma, does not separate production agriculture. Such separation, according to Wang and Zhiyun (1994) results in a focus on maximizing economic output (GNP), exploiting non-renewable resources, and then attempting to block pollutant emissions are incompatible with sustainable development. Wang and Zhiyun argue that every product in the world will inevitably become a waste; yet every "waste" is bound to be a "resource" useful elsewhere in the biosphere. Too many or too few "wastes" will cause various ecological problems.

> "Building a healthy ecological order means turning control of pollutant emissions into control of resource consumption, turning a mono-economic profit orientation into a multi-ecological benefit orientation, and turning the strategy of environmental protection into a strategy of ecological development."

Both productionists and environmentalists are guilty of separating production from the larger system of which it is a part.

> "Throughout its history the environmental movement has been mainly reactive, usually defining its positions in negative terms, opposing dams on free-flowing rivers, urban sprawl, fighting wasteful use of renewable but fragile resources, and generally trying with varied success to stall some of the more distasteful effects of human industrial progress" (Norton, 1991).

Environmentalists could go beyond their opposition and propose positive plans for development in harmony with landscapes.

Similarly, agricultural professionals, as noted above, often take on a defensive circle-the-wagons, defend-production-agriculture mentality. Proposing an agriculture in harmony with landscapes has certainly met with vast support for agriculture in many parts of Europe (Naveh and Lieberman, 1994) and has succeeded in the South in getting previously antagonistic farmers and

Neither environmental quality nor profitability are improved by continuing isolated research on technology and then wondering why it is not adopted.

environmentalists to agree to major policy reform (e.g., Kentucky Agricultural Water Quality Authority--Tonning, 1994).

Profitability and technology development. The question of profitability cannot be addressed by continuing with isolated research on technology and then wondering why it is not adopted. A systems approach such as the one outlined in Chapter 3 is needed. Such an approach would necessarily look at our food and fiber system as a dynamic whole comprised of managed systems which are seeking to maintain and expand their influence.

Agricultural researchers, like farmers, are faced with a particular system in which they must make progress. At worst, this is a laboratory system of importance only to the researchers' peers who review their papers for publication. Working, risk-taking farms are seldom the topic of research. Only by understanding such systems can profitability be understood. Farmers, closer to this system than anyone, have a remarkable consensus on research priorities. Farmers begin their lists with alternative marketing. These are discussed in Chapters 9-12. Following is the consensus across focus groups on other research priorities.

Specific research priorities from focus group explorations

Soil quality, rotations--especially as related to pest control and soil quality--**and cover crops** were the most often cited by the focus groups.

The West Memphis group felt that:

The #1 research priority is soil quality.

-Key research topics:
- -What are the effects of muriate of potash, anhydrous ammonia, triple super phosphate and dolomitic lime on friability/flocculation of soil, microorganisms, biological systems in the soil and general soil structure?
- -Evaluation of pH as sole indicator of need for calcium
  - -Look at plant extraction tests for calcium: e.g. plant derived acetic acid tests.
  - -The method of measurement is the problem. The right question is: is it available, not is it there. Clay soils can have all the calcium in the world, but it isn't available.
- -Reorient approaches to building organic matter, conventional, chemical system advocates say you can't build organic matter and you can't with a chemical system.
- -Even if you can't increase organic matter (as measured by standard burning methods) by improving biological activity of soils, you can sure help yields. Why is this occurring on our farms?
- -We need tests for the key components of humus, not just carbon

as most organic matter tests measure.

-Need to determine which organisms do the most to create vitamins and other nutrients (complexes of NPK with simple COH's) which benefit plants.

-Perfect a colorimeter tests for humus.

-Research on buffering capacity of humus and correlation with various humic fractions.

-How much of increasing recommendations for P and K over the last 30 years on the same soils are due to depletion of humus?

-How does improving soil biological activity reduce need for fungicides?

-Is their any significant research anywhere in USDA on building up soil health?

-We need an index of soil health which includes microflora and could use electrical conductivity as a correlate of biological activity.

The West Memphis group also felt soil quality was a policy/philosophy issue. Their consensus statement was:

Needed is a change overall research orientation: Soil is a living entity. Treat it like that to get improvement. With conventional ag practices, we're killing it.

-This is a subset of a larger problem which will only be solved with an **overall change in research policy/philosophy:** we must change from a linear approach investigating one input at a time with all others controlled. **We must look at systems as having circular feedback mechanisms.**

-Extension/research paradigm must change: Now we are treating the symptoms of diseases and insects. We need to get to the causes. The real problem goes to the health of the soil.

-Today we have "recipe" farming. Farmers don't pay attention to the particular life of their soils.

-Extension/research just determines what chemical components you need--with no attention to living component of soil which controls most of those chemicals.

The concern of Southern farmers regarding soil biology and ecology are also a concern of researchers. For example, an applied goal of some Southern researchers is to make organic fertilizers as predictable and manageable as synthetic fertilizers (e.g. Hendrix et al., 1992). This would certainly meet some of the priorities expressed by the Lubbock and Hereford group. However, a number of more basic needs are not being addressed.

Conservation tillage in the South lags behind other regions. In the Delta states, for example, only 15% of planted acreage was conservation tillage versus 28% nationwide. This is largely due to the slow pace of adoption/adaptation in cotton (Gerik, 1994). The situation is even worse in peanut production areas where virtually no adequate no-till technology exists (Hartzog, 1993).

Federal acreage reduction programs and management improvements have led some to conclude the 1980s saw a 12% decline in sheet and rill erosion (e.g., Lee, 1990). But others contend one fifth of US cropland is subject to serious erosion damage (NRC, 1989). If we continue to erode our topsoil at present rates for another 50 years, declines in crop yield from erosion alone may equal the loss of 23 million acres of cropland (Kirschenman, 1994). The lower levels of implementation of conservation tillage in the South indicate the South will bear the brunt of erosion.

Related to maintaining soil quality, rotation was felt by farmers to merit a separate category. Along with the West Memphis group, the Lubbock group put research on rotations as their second short-term priority:

The number 2 short term priority is work related to rotations.

-Especially related to maintaining and increasing organic matter. 0.6 is high organic matter, but some using sustainable practices and high residue crops have reached 1.3

-Monetary incentives to rotate are simply not there. ASCS says monocrop, SCS says need rotations.

-FLEX program helps, but no monetary incentive.

-All farmers are so marginal these days, they are scared to diversify.

-You lose your base if you rotate.

-We need good research on how best to rotate to high residue crops.

-Need research on how residues build "balanced" soils.

-Need research on trap crops and habitat crops.

-Study how cotton bollworms flock to corn, where you can then knock them down.

-Look at how to get a minor, harvestable crop from the habitat or trap crop.

-Research: corn and wheat as cover crops, especially how well cotton does after them.

-The most important research area within rotations is strip-cropping.

-Research: how to get high residues

-how to use strips as insectaries

-how to increase N-fixation

-research how best to use manure on high residue crops.

-Research on "allelopathic" strip crops: e.g. how milo sucks moisture from cotton and leaves blow in to decrease cotton quality.

-Research need: cattle in rotations, e.g. millet for summer grazing, wheat into cotton stubble for winter grazing.

-Research the separate and complementary demands on fertility, herbicides and water of wheat and cotton.

Other groups were similarly very specific in establishing a detailed consensus on production research needs in cover crops and rotations. For example, the Hereford group reached consensus that:

The top need in production research was for local research on cover

crops, green manures and multiple cropping and their relationships to fertility, weed and insect control with the following specific ideas:

1. find any rotations anywhere in the world with similar effective climate (taking latitude, altitude and rainfall into account)
2. black medic in dryland behind winter wheat
3. focus on perennial weeds and cover crops to control them: especially
   - -bindweed (need demos in Adrian County)
   - -Canadian thistle
4. research on cover crops to control the following insects:
   - -corn borers
   - -spider mites
   - -replacements for Azadrin
   - -work on beneficials
   - -work around fact that sulfur kills beneficials
   - -Russian aphid in wheat
   - -continued support for breeding work and the annual conference with New Mexico, OK

The latter recommendation--consistent with the holistic, systems perspective of farmers--links pest control to covercropping to improve soils. Many focus groups also ranked **pest and disease susceptibility** highly, consistent with results from the survey. Glasgow, for instance, ranked it as the foremost long-term priority. When specific priority research areas were listed, specific pests and diseases were usually highest.

However, farmers do not want to micromanage researchers' work in these areas. Once a given technical area is identified as being of high priority, farmers are eager to turn researchers loose to define specific problem areas. No focus group was interested in designing specific research programs for IPM, for example. The work of experienced, holistic researchers (such as Cate and Hinkle, 1994, in IPM) was supported by these farmer groups.

The important criteria is a holistic approach. Such an approach to pests and diseases would look at rotations and covercrops as they influenced not only pests but soil quality and water quality.

The **interaction of policy and research** is crucial in this area. Research into rotations, strip-cropping and habitat for beneficial organisms could result in the biggest bang for the Southern research buck. But only if policy encourages movement away from monocropping. Bill Yearian (1994) of the University of Arkansas Center for Alternative Pest Control, for instance, sees such research not likely to be used by the producers the major Arkansas commodities rice, cotton and soybeans. He predicts that these farmers will continue monocrops unless policy changes induce them to change.

Policy change may be the best way to increase use of rotations. Then, a huge need will exist for research in these areas. In all of pest control, policy is likely to be the main determinant of the payoff of any given research area to sustainability

Pesticide policy, according to those active in Federal policy debates such as John Adams (1994), CEO of Natural Resources Defense Council, will continue to be the chief concern of environmentalists in farm policy. In 1993, total U.S. pesticide use

reached an estimated 2.23 billion pounds, up from 2.15 billion pounds in 1990, according to the EPA (Aspelin, 1994). U.S. pesticide user purchases account for one-third of the total world market in dollar terms, and one-fourth of the total volume of active ingredient. Pesticides were used on more than 900,000 farms and in about 69 million households in the U.S. Annual pesticide user expenditures totaled approximately $8.5 billion in 1993. Farmers' expenditures on pesticides equal about 4.2% of total farm production expenditures, up from 3.9% in 1991. More pesticides and pesticide uses were registered in 1993 than in any year since 1975. In 1993, EPA registered 21 new uses and 20 new chemicals. In 1990, 8 uses and 8 chemicals were registered.

The most conservative approach to pest control research programs in weed science, plant pathology and entomology is to convert them into biocontrol and habitat/population management programs.

Pesticide research needs are so policy-dependent and policy is so fast moving, that the long-term crucial research needs are hard to assess. The October 12, 1994 decision by EPA to outlaw uses of 36 pesticides and begin eliminating uses of 49 others (Curtis, 1994), for example, unleashed a host of new research needs.

Clearly the most conservative approach would be to convert pest control research programs in weed science, plant pathology and entomology into biocontrol and habitat/population management programs.

Research in such areas is widespread, such as Barrett's (1992) demonstration of the advantages of strip cropping with grass corridors leading to reduced soybean damage from potato leafhopper to increased infection of green cloverworms by fungal pathogens. Yet land grant faculty locked in the old paradigm can still have a book titled **Crop Ecology** published as late as 1992 (Loomis and Connor, 1992) which supports monocrops and the high chemical use needed to maintain them. Such land grant researcher need to give up trying to find support for monocropping and begin to support such research areas as biological control. According to the farmers and extension agents participating in this study: the sooner, the better.

Biological control is the priority research area in pest control among farmers in our workshops and shows surprising priority among research needs expressed by county agents (see Chapter 5). Biological control is the use of natural processes to influence interaction of populations of various species to suppress pest populations and enhance productivity of desired species. Biological controls usually are much more host specific than chemical controls and often have the capacity to coevolve with the pest to provide long term control (Cate and Maddox, 1994).

Some Southern land-grant researchers such as Yearian (1994) believe in the long-run biocontrol will probably be the best answer to pest control problems. Biocontrol by living organisms has the capacity to coevolve along with pest species. Incorporating host plant resistance through traditional plant breeding or bioengineering is always met with pests evolving resistance. The typical resistance gene lasts only 4 to 7 years before being overcome by pest evolution. Though this can sometimes be offset by incorporating multiple resistance gene, pests are usually creative enough to eventually get around the barriers.

Encouraging parasites and diseases of pests however, enables the farmer to use the evolution of resistance to his advantage, rather than having to fight against it

continually.

Biological control is gaining increased support in research policy circles. Benbrook (1994) notes that:

> A decade's worth of policy studies and attempts at reform have demonstrated pretty clearly that it will be a long, slow process getting to environmentally sustainable production systems if farmers, and researchers work at the margins of conventional systems, incorporating, for example, integrated pesticide management practices, as opposed to biologically based pest management systems that start with the goal of controlling pests largely with cultural, genetic, and biological practices and technologies.

The National Research Initiative underscored this recognition in 1994 by establishing a biological control grant panel (Cate and Hinkle, 1994).

Biopesticides (Deutsch, 1994) is an active area of research resulting from biocontrol work. Biopesticides are substance derived from living organisms, but do not involve direct manipulation of populations in the field. They are characterized as formulations or preparations in which the active ingredient is based on or derived from a living microorganism. The purpose of the product is to control or eradicate disease, weeds or pests. For example, in commercially available biopesticides on the market now, 104 were derived from bacteria; 44 from nematodes; 12 from fungi; eight from viruses; six from protozoa; and 107 from various insects. World sales of biopesticides were estimated between $45 and $60 million in 1992.

Given the level of environmentalist interest in pesticides, pest control researchers should hedge their bets. Just as ARS has eliminated publicly funded tobacco research in 1994 in response to popular pressure, public outcry may similarly lead to elimination publicly funded pesticide research. Southern research institution should prepare for this eventuality rather than being confronted with drastic reductions in research funding as encountered by tobacco states in 1994.

Specific opportunities abound. For example, one prediction is that biocontrol research, if properly funded for five years, would result in elimination of the need for use of chemicals for seedling diseases in cotton (Bird, 1993).

Water quality is an indicator of progress in pesticide, erosion and animal waste research and education.

Water quality is where the effects of pesticides, erosion and animal wastes are felt by the non-farm community. Water quality was noted as a priority for a number of focus groups with the common emphasis (at Hayesville, Athens and others) on the **need for more site-specific waste/nutrient management systems.**

The water quality research/extension needs expressed by these groups all included:

> Examine the effect of best management practices (BMPs) on water quality-especially:
>
> -where a beneficial practices such an no-till is alleged to lead to groundwater contamination,

-where information is needed for imminent policy changes: e.g., vegetative filters along streams may be best place for new CRP land.
-where research advances promise direct economic as well as environmental benefits, as in reducing nitrogen applications through pre-side dress nitrate test.

The West Memphis row crop producers likewise listed water quality as the a priority constraint, but put the emphasis on education:

Water quality is the #1 Education priority

-Most NPS pollution and erosion can be stopped with education
-Change policy on education: put more dollars into SCS for education and demonstrations and make sure it goes to field men. Let SCS return to role of being of assistance and not enforcers

The Hayesville, NC, focus group stressed the interaction of policy with research and education in water quality due to their successful experience with a local SCS demonstration project:

Policy: need more water quality improvement programs.

The Hiawassee River Water Quality program should be replicated by adopting the following key characteristics needed for successful water quality programs.

1. Local control by local board tailored to individual farm-specific conditions.
2. Local committees prioritize with the biggest polluters handled first--especially dairies dumping directly into creeks.
3. Need cost share.
4. Key technical features:
    Field borders (buffer zones), fencing for livestock exclusion from streams, stream crossings, waste-handling systems, filter cloth and gravel on stock trails, grass waterways, stock tanks.
5. Cooperation among all agencies: Extension, ASCS, Fish and Wildlife, Forestry, SCS, SWCD.
6. Every water quality program should be site specific.
7. Cities get millions to clean up sewage systems, farmers get regulations.
8. Incentives, not regulation, work best with farmers.
9. Research needed on livestock waste use as nutrient: chief problems in this area are trout, dairies, poultry.
    9.1 Research topics would include collection, handling and treatment of wastes and education in best techniques.
10. Education on reducing overloading of phosphate into streams.

Just as with pest control, the usefulness of water quality research is partly dependent on the policy climate. Low water quality is an external cost in most farm operations. Research to make wastes a resource will always be useful. Innovation marketing approaches and technology improvement to facilitate market possibilities,

such as those being supported by the Southern SARE program in Arkansas (Busby, 1994).

Water quantity. Industrial agriculture is often very irrigation dependent. As a result we have been draining our groundwater supplies at a rate exceeding nature's capacity to recharge them. We are currently draining the Ogalala aquifer (which underlies part of Texas and Oklahoma in addition to several Midwestern states) at a rate of 130% to 160% faster than it is being recharged. Irrigation is causing groundwater over a 15 million-acre area to decline between 6 inches and 6 feet every year. The best work to build on in the Southern region appears to be that of Bill Lyle with the LEPA system in the Texas High Plains (supported by the Southern SARE program).

Conclusion. Specific research areas recommended by farmers and extension agents are overwhelmingly consistent. Alternative marketing and integrated approaches to soil quality and pest control are the two areas needed the most.

The biggest need within each of these areas is for researchers and extension staff to take an integrated, holistic approach. Taking policy trends into account while integrating marketing and production is the approach which rings true with those who manage agriculture on a daily basis.

Section III: Giving priority to systems above the farm level: marketing and policy

"Educating members of Congress that agriculture doesn't begin or end on the farm" is the goal of a coalition established in 1995 by Cargill, the National Grain Trade Council and eighty other companies and lobbying groups not normally associated with sustainable agriculture. Sustainable agriculture research and extension programs would do well to embrace the same fact.

This sentiment leads to the most common conclusion of the survey, focus groups and workshops:

research and education efforts must
integrate production research with research on marketing and policy.

In hindsight this conclusion seems obvious, but it was unexpected. When we began the State of the South work, we expected to generate a number of specific production research priorities. This is not the need expressed by farmers and extension agents. The data from the survey presented in Chapter 5 provides unequivocal quantitative support for this assertion.

The results summarized in Chapters 2, 3 and 4 make clear farmers know sustainability is a property of systems, agricultural systems are notoriously open to outside influences and all farms are part of larger systems such as credit systems, marketing systems, training-information systems and input supply systems.

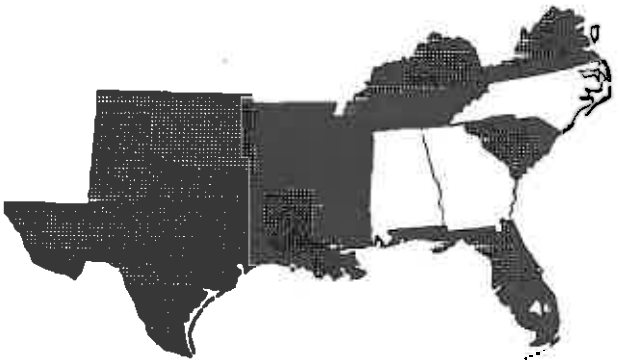
These observations seem to inexorably lead to the overwhelming conclusion from all the focus groups is that the biggest barriers to more sustainable agricultural systems are above and beyond the farm level.

Key statements from the 55 focus groups regarding this conclusion can be summarized as:

-the key constraint right now to sustainability is price at the farm gate, until it goes up, farmers will continue to go under.
-researcher-farmer linkages need to be tighter
-deficiency payments and disaster payments are too closely tied to production and do not engender environmentally sound systems.
-farmer-to-farmer systems of education are needed
-strong local sustainable agriculture farmer organizations are lacking.
-local, farmer-controlled value-added industries are needed.
-local food systems are needed with more direct farmer-consumer interaction
-methods for encouraging cooperative local marketing need to be developed.

These seven summary statements were the foundation for an opportunity workshop titled **Marketing, Policy, Communities** and held in Austin, Texas January 20-23, 1994.

Chapter 7. Research policy: getting the questions right



> I believe that over-dependence on peer review is one reason that research is in financial difficulties and USDA/ARS is looking at staff and budget cuts. I think that some of the people footing the bill are saying that the researchers are answering their researchable questions rather than addressing the questions of interest to the people. Meyer (1995)

> "Those paper pushers in College Station just eat up resources."
> Farmer from Hereford, Texas, Spring 1994

The group of farmers, researchers and agency staff gathered for the Austin workshop concluded that to increase sustainability of Southern agricultural systems one policy area posed special constraints and strong opportunities: developing systems to make research priorities more responsive to farmer and environmental concerns.

When the survey results were examined, the opposite results seem to obtain (Map 10). Only in a very few areas of the South did extension and SCS agents admit the belief the federal, state and organizational policies are important constraints to sustainability. However, in the Delta and around the Everglades are a number of counties recognizing the importance of policy. When extension agents participated in focus groups for in depth discussion of constraints to sustainability, however, policy does come to the fore as crucial (as in the Callaway gardens groups reported in Chapter 1).

Comments about policy recur throughout the focus groups' consensus statements. The conclusion is inescapable that there is a huge need for research into policies which would improve agricultural sustainability.

One area is mentioned repeatedly: agricultural research policy, transdisciplinary research and peer review. The Delta opportunity workshop dealt specifically with this issue and described how a revitalized research/education system could be created in the Delta (Figure 7).

A key conclusion of the Delta workshop is that a nongovernmental organization which unites farmers and environmentalists will be required to accomplish the needed changes. Stevenson and Klemme (1992) show that historically large institutions do not change unless there is some outward impetus to change. Folks inside the

Map 10. Public policy and sustainable agriculture. Darker counties expressed more agreement that public policy does not support sustainable agriculture. Survey responses related to public policy of Extension/SCS were combined in an index: 0=no agreement that public policy is not a constraint to sustainable agriculture; 3=maximum agreement that public policy is a constraint to sustainable agriculture.

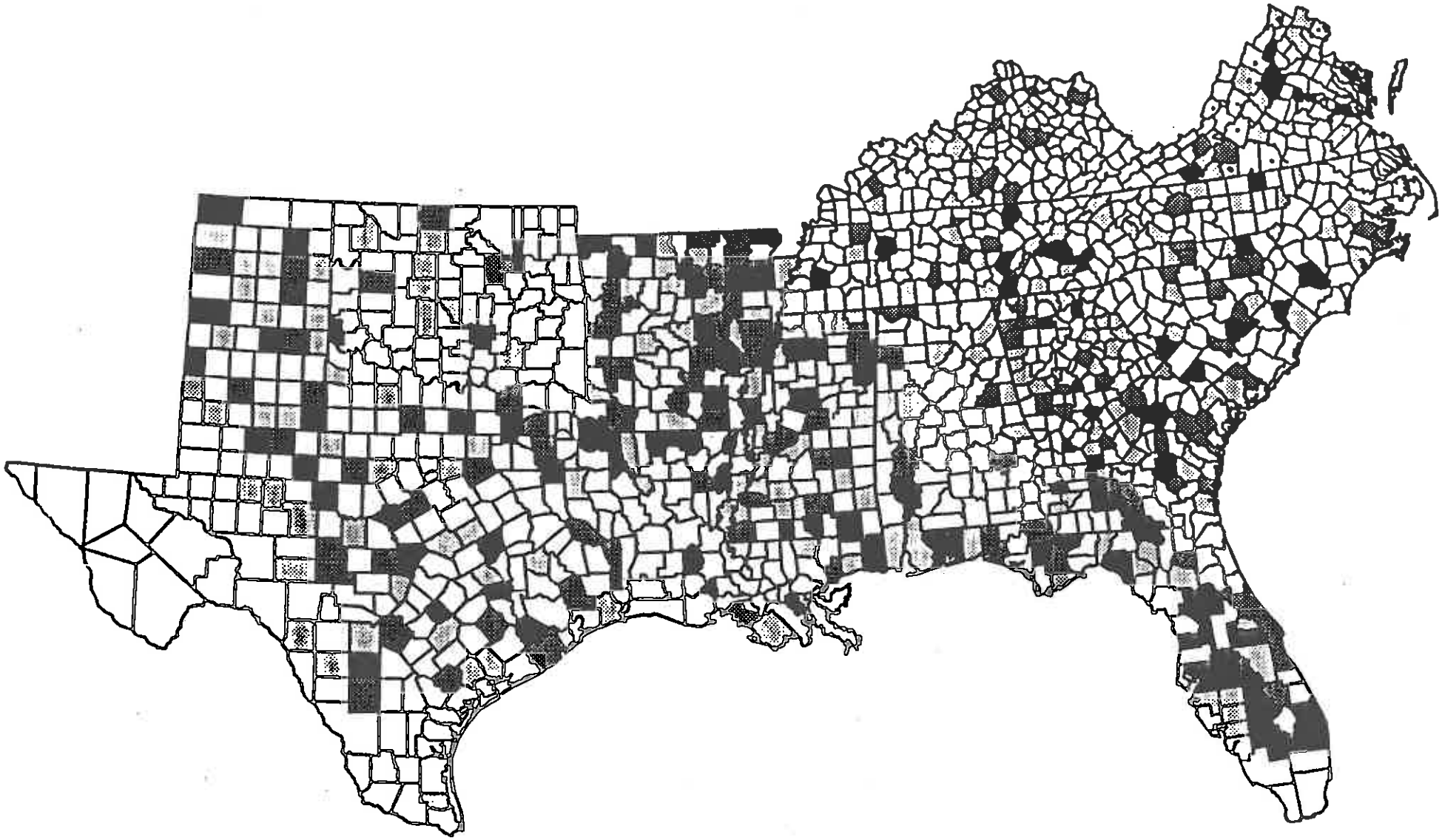
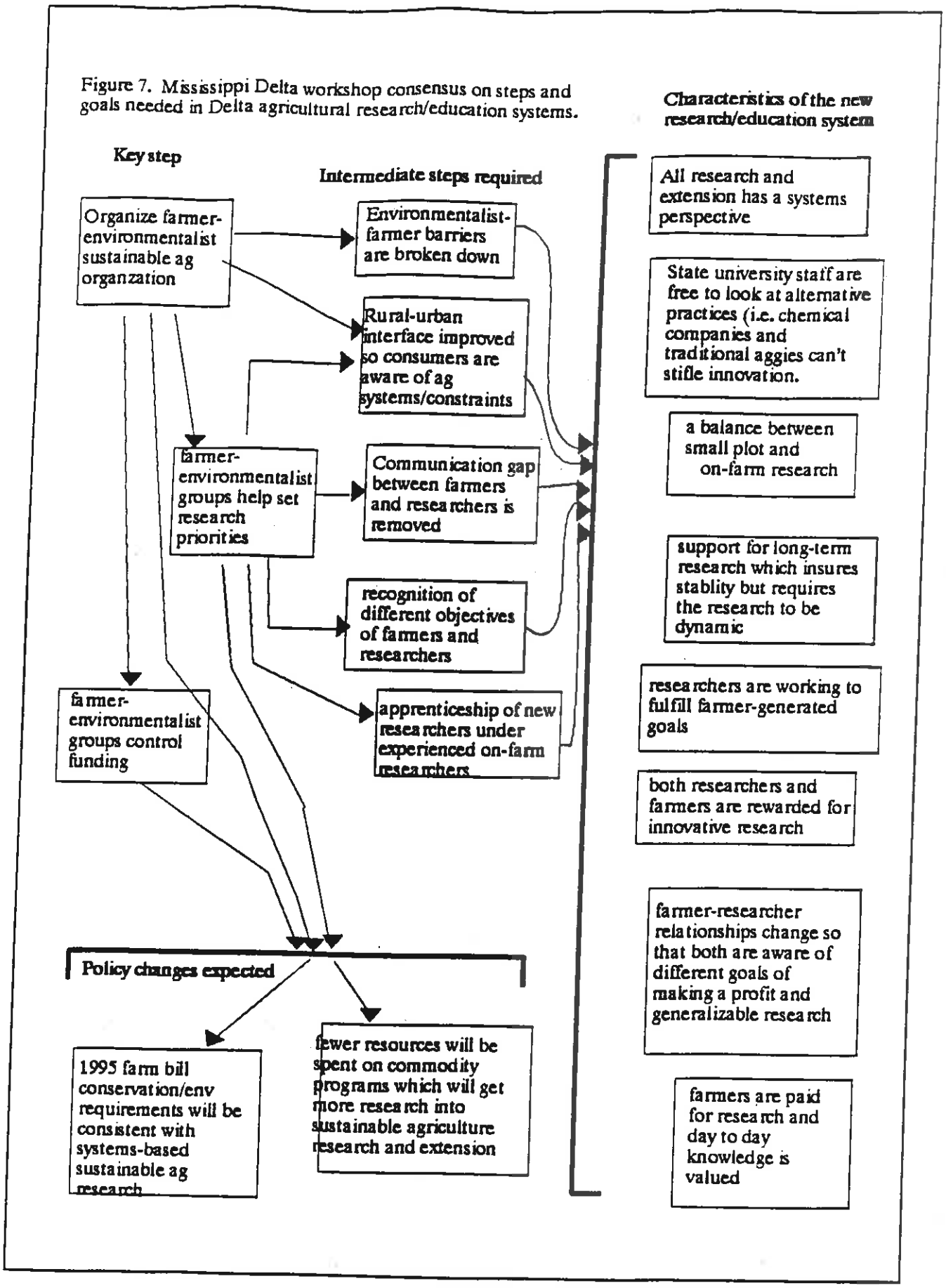


Figure 7. Mississippi Delta workshop consensus on steps and goals needed in Delta agricultural research/education systems.



institution are needed to act on that impetus, of course.

The Austin workshop echoed the Delta conclusion. They summarized the need as: changing research priorities to meet needs of farmers and environment. Their conclusion were organized by a subgroup into a set of 11 problem areas in research policy:

1. Research doesn't take multiple viewpoints.
   - 1.1 Research is too narrow.
   - 1.2 Researchers don't know farmers problems.
   - 1.3 Research does not represent all farmers.
   - 1.4 Research concentrates of biggest farmers: the 15% which account for 85% of farm output; so 85% of farmers are ignored.

2 Wall between research and extension doesn't permit 2-way communication flow.
   - 2.1 No 2-way information flow.
   - 2.2 Research findings are not easy to access.
   - 2.3 Research is not readily available to farmers, especially since its not comparable to his conditions.

3 Research is secretive--you don't know what it is until its finished.
   - 3.1 Researchers are arrogant.
   - 3.2 Research is done in a vacuum.
   - 3.3 Establishing a collaborative, cooperative inquiry process is the basic need of land grant research systems.

4 Research doesn't take the whole picture.
   - 4.1 Research is focused on single factors (i.e. production).
   - 4.2 Food is only 10% of family expenses--lowest in the world--so research can quit trying to create cheaper food and instead focus on environmental issue as a new agenda for agriculture.
   - 4.3 Research is not done on the "bottom-line."
   - 4.4 Research doesn't account for external costs (i.e. erosion, decline of rural communities).

5 Ag research leadership lacks vision.
   - 5.1 Ag research leaders have no training in leadership and management.

6 Turf wars between researchers and institutions.

7 An industrial, concentrated, non-diversified, commodity-oriented paradigm dominates agricultural systems in the South.
   - 7.1 Big government perpetuates this system.
   - 7.2 Change is crucial for the widespread philosophical system emphasizing cheap food, and everything quick and easy.

8 Distrust of research
   - 8.1 Research is irrelevant or misdirected.

9 Current research only meets short term problems.
   - 9.1 Current research ignores soil health.
   - 9.2 Research does not address long-term soil productivity.

10 No integrative, product and problem solving development environment exists in agriculture.

10.1 No research has been done on how to integrate research results.
10.2 No teamwork model exists among ag. researchers.
10.3 Research does not build upon itself.
10.4 Theoretical models between disciplines are not compatible.
10.4.1 Promotional system breeds individualism and competition.
11 Many farmers don't want to get involved in formal research.
11.1 Farmers fear new things.
11.2 Farmers fear scientists.

Common agricultural research policies are also under increasing attack from inside agricultural research institutions.

> "It is essential to move away from the discredited image of the white-coated scientist with all the answers; to find out how resources are really used and why; to learn what specific problems most need to be researched; and to determine what existing research on resource management has real value. . . [E]ffective management systems do not have to be invented only by modern science. They exist and have been continuously developed by the world's farmers. The ultimate aim is to seek out these systems, research them, and provide options for the better management of land and resources . . ." (Brookfield and Padoch, 1994:41ff).

Scientists often foolishly and unthinkingly claim they have exclusive rights to priority-setting in scientific research. Scientists know best, according to such influential scientists as Daniel Koshland, Jr. Editor-in-Chief of Science. Koshland (1994) cites the need for scientists to control research priorities by citing the discoveries from basic research on electricity by Faraday and DNA structure by Watson and Crick as showing that we need basic research which only scientists can understand. That we do, but neither Faraday's or Watson and Crick's projects were helped by peer-reviewed competitive grants. In fact, novel ideas such as those would likely not get past any conventional peer review panel. Another line of argument supports scientists' exclusive control of research priorities by taking the opposite tack and decrying any emphasis on "results oriented criteria" in rewarding grants as limiting exploration of new areas of research (past AAAS President Philip Abelson, (1995a: 435). Scientists should control priorities because they have achieved results, but they should not have to achieve results in order to control priorities, so the argument goes.

Sen. Barbara Mikulski (D-MD) ranking member of the Appropriations subcommittee which oversees funding for NSF as well as space and environmental research $88 billion in research funding., calls attitudes such as Koshland and Abelson's: a "sense of entitlement: that it is the job of the United States of America to fund every Ph.D. to pursue any area of intellectual curiosity" (Mikulski, 1994).

Sen. Mikulski specifically recommends that 60% of budget should be spent on 'strategic' research aimed at meeting national needs. What does strategic research mean? It means research focused on key problems facing the U.S. and the world. As Sen. Mikulski advised NSF during a forum held at the National Academy of Sciences organized by M.R.C. Greenwood, chief scientist in the White House Office of

Science and Technology Policy (OSTP), The foundation's top officials should consider an internal realignment to emphasize the link between what it funds and the national need being addressed. Mikulski has said, "Maybe it's time to reorganize into a series of institutes on manufacturing, global change, high-performance computing, and other strategic areas" (Mervis, 1994). Some would contend USDA is already organized around the key commodities and that the problems of the major commodities are the key strategic problems of agriculture.

If the traditional agriculture community listens only to itself, this answer will be affirmed. But a resilient system always listens to feedback and adapts. Other communities, growing more powerful than the traditional agriculture community, are saying the problems of the commodities are not the problems of agriculture. To be "strategic" in Mikulski's sense, agriculture must ask what society feels are the most important problems. If society is asking agriculture to produce healthy food and a clean environment, then these are the strategic areas around which to focus research and education. live problems in society.

How can we put our agricultural research system to work on these strategic problems?

Overcoming doubts within agricultural academe. There is doubt among some agricultural researchers, even in alternative agriculture circles, that we should put our agricultural research system to work on these "mission-oriented" "strategic" areas. Though recognizing the importance of practical, applied work, Lockeretz (1995) titled a recent article: "Removing applied agricultural research from the academy." He contends, as do many academics, that basic research is something to be kept pure--untainted by applied research. The research priorities of farmers, extension agents and policy-makers are likely to be dismissed by such basic science purists. If agricultural research is to be only "basic" research then basic researchers can more easily make the case that only they have the knowledge to choose research priorities. Ignored is the fact that agriculture is an applied endeavor--in contrast to such fields as biology, chemistry and physics which are basic to a number of fields. Perhaps all agricultural research should be applied research.

During the glory years of agricultural research--when progress was fast and furious, farmers had no reason to object to the direction of agricultural research. But the successes of agricultural research in increasing yield have not been followed by sufficient success in social and environmental aspects of agriculture. If basic research is achieving a deepening understanding of these phenomenon, farmers, extension agents and policy-makers are not seeing the practical results of this basic, pure research. As one State Director of USDA's CFSA said during a State of the South meeting, "Long-term research is like money down a rat-hole."

The State of the South results indicate we must first recognize one fact: **we have excellent researchers who do a good job of solving problems, but they often don't pick the right questions.**

As Norman Brown, President and CEO of W. K. Kellogg Foundation put it:

"Our biggest concern is that the land-grant institutions seem to be struggling.

> Many are too busy competing to be research institutions. Too many professors are reviewing professors and many faculty members don't seem interested in dealing with people's problems. That's the land grant mission, to help people solve problems." Lehnert (1992)

Why do agricultural scientists not pick the most practical, strategic problems? Ikerd (1993b) provides one answer:

> "Tenure and promotion require publications in scientific journals that generally are refereed and read by other scientists, not by farmers or other information users."

Some administrators echo these ideas:

> "Scientists and other professionals seek the answers to questions which are professionally satisfying within the norms of their professions and disciplines[--]the science-led paradigm . . ." (Grove and Edwards, 1993).

The needs and interests of other scientists, largely working in a research environment unlike that of any farmer or extension agent, determines research agendas. "Science has narrowed itself so thoroughly that it doesn't look at very interesting issues anymore," according to a former head of National Science Foundaiton (Mervis, 1995).

The need to break down disciplinary barriers has echoed through the halls of academia for at least the last quarter century. Many academicians realize that the most striking research advances are occurring at the interface of multiple fields Barrett (1992). Many agricultural researchers realize that in a spatial hierarchy of possible sustainability research areas (Lowrance, 1992), too much effort is spent on field-scale research and not enough on interdisciplinary watershed, microeconomic (what types of farms are sustainable), and macroeconomic (relation to market forces) research. In short many conclude with Murdoch (1993):

> "[T]he implications of breaking down disciplinary boundaries are far-reaching but necessary to any meaningful research on sustainability."

Some, however, contend that interdisciplinary work or changing the level of investigation will not be enough. Instead, they argue for a new paradigm:

> "The socio-ecological paradigm is founded on an assumption that human development must be adaptive. Development processes and components can be successful only if they are compatible with local biophysical and sociocultural environments. . . The role of science in this paradigm is to enhance the rate of adaptation. Delegation to a supportive role is often unsatisfying to scientists who believe that science should provide leadership in development" (Grove and Edwards, 1993).

Chambers endorses this view in his recent book: Challenging the Professions (1993). He contends that the various disciplines are basically sets of solutions agreed

to be people who have similar jobs. They received their positions because these solutions worked in some arena in the past. These solutions have no necessary link to any crucial current problems of agriculture. Dedication to these solutions means members of disciplines redefine any problem so that their solutions can solve it. Farmers lack of profitability is defined as a need for higher yield, instead of a need for marketing alternatives. Chambers advocates a paradigm shift to a dynamic, action-oriented approach based on farmer initiatives.

A third approach recognizes the value of such new perspectives or paradigm, but advocates not adopting a new paradigm but entertaining multiple perspectives. With Grove and Edwards, Norgaard (1991) characterizes agricultural scientists as having a common vision of progress and a common faith in how Western science and technology could accelerate development. According to this approach, "knowledge consists of universal laws with universal applicability" or conceptual monism. Norgaard contends that agricultural scientists would benefit from conceptual pluralism which recognizes that systems and their relationships are continually in flux, any one particular conception is necessarily incomplete and can be improved if multiple other approaches are simultaneously.

Norgaard (1992) expanded his explication of this approach by noting:

> "Discipline boundaries have impeded true implementation of interdisciplinary methodologies . . . because the assumptions, cultures, and paradigms within the disciplines have not been overcome."

He contends that each discipline's way of thinking is, by itself, incomplete. Each pattern of thinking makes assumptions about the nature of the world which cannot be proven objectively. Thus each way of thinking about the world is based on a set of ideas which ultimately must be accepted on faith. Narrowly disciplined scholars then have a tendency to develop a certain confidence, founded or unfounded, by mastering a culture. This is "a sort of disciplinary tribalism [emphasis added]: the belief that one's own way of knowing and doing is the right and only way of knowing." Norgaard outlines a program for creating adoption of a multiple-perspective approach would help create a sufficiently diverse menu of options needed in the face of change to create the resilience necessary for sustainability.

A multiple-perspective approach would be focused on providing multiple locally appropriate options which mesh with the decision-making needs of the managers of the ag systems: farmers, input suppliers, bankers and grain, livestock and vegetable dealers.

Discipliary tribalism and peer review. "Disciplinary tribalism" results in situations where all members of a discipline concur that "any rational person knows this is a better way to do things" even though farmers are extremely slow to adopt the practice, despite huge efforts on research and extension (McDonald and Glynn, 1994). The fact that disciplinary departments are the base units of management and funding agricultural research then makes disciplines the "immediate obstacle" in reforming agricultural institutions (Fischer and Zuiches, 1994:7).

The system of peer review through which academic research must travel these days is a qualitative process. Papers are rejected or accepted based on how well

they meet the needs and assumptions of reviewers. Ideas which do not fit the mindset of the reviewers are unlikely to pass peer review, even though many editors try to search out the innovative. As the Executive Editor of a prestigious biological journal says,

> "Most of the things you can measure aren't interesting and most of what's interesting you can't measure. . . [The] study of peer review is like the study of art: quality is more easily recognized than quantified" (Marcia Angell, quoted in Taubes, 1993).

A number of changes in peer review systems are being tried in other countries. The council which allocates research funding in Britain will no longer use total publication counts as a measure of relative strength of research departments. Instead the top four recent papers will determine rankings. Number of publications is "not considered necessarily to be an indicator of research quality." the council recently announced (O'Brien, 1994).

A Dutch government research agency has included systems managers in its peer review of technology development research proposals. A study of the first round of grants awarded 10 years ago shows that commercial success was very accurately predicted by the evaluation panels. The lesson, to get the best research on particular systems, let systems managers in on the decision-making process. The Science report on the study says that unless agencies using traditional peer review can show they are doing a better job, the systems manager approach is best (Aldhous, 1993).

The approach of the Dutch program is being more widely advocated in Europe. Funtowicz and Ravetz (1991) contend that such "extended peer communities" may be required for insuring quality of research results given the lack of certainty regarding the route to solutions to agriculture's environmental problems. They continue:

> "We have now reached the point where a narrow scientific tradition is no longer appropriate to our needs. Unless we find a way of enriching our science to include practice, we will fail to create methods for coping with the environmental challenges in all their complexity, variability and uncertainty."

Extended peer communities or "end-user review" may be required to break down disciplinary barriers to solution of the critical problems facing agriculture today. Peer review is being overhauled in some U.S. agencies (see, e.g., "NIH tunes up Peer Review," Marshall, 1994),

One team at the Austin workshop felt that an initial step toward merging the perspectives of farmers and researchers would be to establish a projects following this basic prototype:

Getting the questions right: a managed farmer-researcher teamwork process.

Objective:

1. Study goal-oriented management of teams of farmers and researchers in relation to:

a conformance to proposed cost and schedule estimates.
b. quality of the resulting research product
    i. relevancy, correctness, reliability, efficiency, integrity, usability, survivability, maintainability, reusability, interoperability and expandability.
c. long term sustainability of the proposed teamwork process.
    i. team satisfaction, financially sound, potential for manipulation and power struggles, captures multiple viewpoints.

One research group has developed a project along the lines of this prototype. RESTORE (Lightfoot et al., 1993 and Lightfoot and Noble, 1993) is a participatory research tool for natural resource management monitoring and evaluation. The tool comprises a set of participatory research procedures and computer based analysis for sustainability indicators:

> The procedure works as follows:
> 1) Indigenous categories of natural resource types on the farm are identified and mapped. How these resources are used and who has access to them are determined. The flows of biological resources within the farm are then modeled.
> 2) These outputs provide a vehicle for farmer-researcher brainstorming on experiments to rehabilitate water resources, increase the number of utilized species, and recycling of by-products and wastes.
> 3) Participatory monitoring and evaluation tells which way the farm is changing in terms of four sustainability indicators. Results are "taken back" to the farmers using sustainability kite and bar graphs which enhance the farmer-researcher brainstorming. This process sets in motion further changes and thus the continuing transformation of the farming system. RESTORE software captures all the data to enable comparisons of sustainability indicators both across farms and in time series.

Experiences with RESTORE in Malawi, Ghana and the Philippines suggests that impacts at the farm level can be impressive - net incomes reportedly rose by more than 50% except in Malawi where drought and devaluation held increases down to a still impressive 15%.

Another approach to breaking down disciplinary barriers is to create new disciplines instead of just advocating interdisciplinary work. The creation of the new Integrated Agricultural Systems division of the American Society of Agronomy is a step in this direction.

Some farming system development projects take a research and development approach rather than a research and publish approach. These projects will have the most practical and immediate impact on agriculture.

The most radical approach, perhaps, is just to forget about traditional scientific examination of sustainable agriculture. Admit that each system is unique and that to

understand a system you must be managing it. Creation of more sustainable agricultural systems may actually be inhibited by the procedures of traditional agricultural science. The leader of Washington State's preeminent sustainable agricultural project (STEEP) goes even further:

> "[S]cientific inquiry on the farm may actually impede the farmer's inventive progress. Some farming system development projects take a research and development approach rather than a research and publish approach. In my opinion, these projects will have the most practical and immediate impact on agriculture" (Wuest, 1993).

An Australian approach to agricultural research policy may bear examination in the U.S. This approach assumes that viewing problems from multiple perspectives is increasingly required in agriculture. Agricultural research must take both a "professional" and a "scientific" perspective (Holt and Schoorl, 1993:79ff). Holt and Schoorl contend that the professional perspective (application of values and standards to enable scientific findings to address real-world problems) is often overwhelmed in agricultural research and education institutions by the quantitative, laboratory-oriented "scientific" perspective. In fact, Holt and Schoorl note that this latter perspective has come to dominate most agricultural institutions--leading to avoidance of real-world problems "because they do not lead to quantifiable analysis" (Holt and Schoorl, 1993:89).

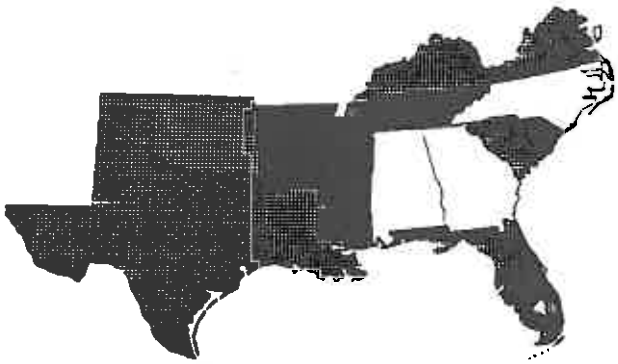
The avoidance of alternative marketing and LOVA research because there is "virtually no data" (Jones, 1995) is probably the most egregious example of this avoidance of real-world problems, given the extremely high priority given by farmers and extension agents to this area (see Chapters 5 and 6).

The methodological challenges may run even deeper. Ikerd (1993b) contends that:

> The efforts of science to tease apart causality through the logical concepts of "necessity and sufficiency fails to explicitly recognize the unique dynamics of managed ecosystems . . .[I]n dynamic systems the concept of causality becomes tenuous."

The nonlinear approaches which have swept a number of fields are beginning to be felt in agriculture. Especially in the unique challenges of creating new marketing systems, dynamic, participatory, holistic research may become the best route to sustainability.

Chapter 8. Commodity policy for flexibility and innovation



> "The important question now is not which . . . practices . . . are sustainable, but rather which conditions cause people to conserve their resources, and which conditions favor destruction, or over-exploitation of local resources."
>
> Schmink et al. (1992: 8)

Changes in agricultural research policy recommended in the preceding chapter could make sustainable agriculture innovations more available for farmers to adapt to their farmers. But, federal commodity policies can have an more immediate effect on sustainability. Policy research, however, is fraught with difficulty since every policy situation is unique and cannot rely on replicated, controlled experiments for guidance. No matter how policy research is conducted, farmers' vast experience with past agricultural policies provides the raw data.

Farmers' reactions to past agricultural policy

The most consistently highly ranked policy priority in the State of the South focus groups was elimination of direct payments to farmers. No group felt that direct payments to farmers increased sustainability. A number of groups advocated redirecting those funds to subsidize cost-share for ponds, dams, cover crops and other productive investments. The Memphis group stated the priority the most broadly:

> **Government should weed out all subsidies and other programs which do not encourage farmers to be good, environmentally conscious, sustainable farmers.**
>
> -Cut out subsidies which lead to reduction in productivity.
>
> -Eliminate farming for disaster payments and "farming the program" instead of the land.
>
> -Eliminate all subsidies to large farmers.
>
> -In general deregulation should be the goal and focus should be on increasing education/demonstration to build awareness of policy changes.
>
> -If any subsidies remain as incentives for sustainable farming, they should be fair and focused on small farmers, and always support education/demonstration projects.

The near universal emphasis on eliminating subsidies suggests a focus for

agricultural policy research. Are farmers from all these groups correct that direct payments contribute to less sustainable systems?

The most common specific policy constraint cited was hindrances on using rotations and cover crops. The Hereford group expressed it best. They cited as a

#1 policy priority: rotations and cover crops should be encouraged, not discouraged by federal policy.

-Bases should be tied to each farm's need to conserve residue.
-Need to modify "Flex" program so that bigger acreages can be put into cover crops.
-Uncertainty about CRP acres makes it hard to make long-term plans.
-There is little continuity in farm policy, which means you can't believe any long term assurances. Farmers were told in the 80's that they couldn't lose base by taking certain conservation-oriented actions, then they lost base. This lack of continuity is due both to Farm Bill changes every 5 years and a new president every four years.
-Every big "layout" program has led to losing base and not being able to get it back--so farmers are less and less likely to participate.
-Change the fact that: if you rotate, you lose base.

Taking the policy statements generated by the focus groups, the Austin Opportunity Workshop participants generated the following consensus:

Conceptualization of current commodity policy constraints:

1. Cheap food policy is a big barrier.
2. GATT threatens to undermine efforts.
    2.1 GATT will phase out supply management and sustainable programs.
3. Tax dollars are used to send wheat overseas and import wheat from Canada.
4. Deficiency payments and disaster payments promote environmentally unsound agriculture.
5. Education programs are needed to train farmers out of disaster-prone farmers.
    5.1 Could be similar to required training for DUI convictions.
6. FmHA loans only to delinquent rewards failure.
7. FmHA lacks information on sustainable production.
8. Programs must be defined which fund system conversion, not just a set of "right practices."
    8.1 If based on practices, determining which practices to pay for ignores uniqueness of each system.
    8.2 Trick is in designing a better incentive system.
9. Diversified, small and local systems are excluded by their nature from present commodity programs.
10. Government deficiency payment program shield farmers from market.
11. Deficiency payments penalize better producers, since based on county means.

12. Decouple farm income from commodity programs.
13. Production regulations should be the same for imported food as for local food.

According to the Austin group, <u>the solution is commodity programs which reward environmentally sound production systems.</u> This group developed prototypes in each of three key research areas:

1. Research studies to determine the full costs of production;
2. Comparison of cost-effectiveness and adoption rate with incentives versus regulations;
3. An RFP for multidisciplinary analysis of the effect of the following policy options: Income stabilization; Expanded cost-share, IPM and ICM; CRP continuation.

The Lubbock group created an innovative policy option which tied encouragement of alternative marketing to reform of commodity programs:

-The two top policy priorities should be alternative market developing and eliminating "disaster farming" ("farming the program") while still providing a rare safety net--e.g. when an early freeze hits the cotton.
  -Solve both problems by: shift from disaster payments to price supports on alternative crops so a farmer is encouraged to plant something else rather than just make sure his cotton is declared a disaster.
  -This could insure that any disaster payments do not encourage cutting down on rotations, hurting the soil
  -This would tie conservation practices closer to the disaster programs.
-We need good federal crop insurance or just do away with it and get a program such as above.

In several parts of the South, producers receive payments under grain and cotton programs that amount to a significant portion of their gross cash farm income--20% on average (Dobbs, 1993). A rice grower participating in the Delta Opportunity Workshop labeled his payments as "welfare payments." The average rice grower received $142 per acre in government payments in 1994 (Phillips, 1995). Farm programs add value to farmland. One estimate is that farm programs have added $85-100 billion to the value of the nation's farms. Others prophesy massive depression in land prices should commodity programs be eliminated. An important agricultural policy research area is how to reduce deficiency payments while avoiding loss of land value.

Lessons from other natural resource policy areas.

Policies for sustainable agriculture should examine related natural resource fields where policy has long attempted to achieve sustainability. Fisheries policy is the venue in which attempts to achieve sustainability have been around the longest. Based on this experience some contend that sustainability will never be achieved

through policy change (Ludwig et al., 1993) Others examine the same history and don't go quite so far, but do contend that open access is a key constraint to sustainability (Rosenberg et al., 1993). Fisheries policy has led to sustainability only if access to a system is limited. Working out the implications for agricultural research presents an important research opportunity.

Limiting access to the system is also a theme from sustainable development work in the developing world. Benbrook (1994) notes:

> "In the developing world context, sustainable agriculture that relies heavily on local inputs, is ecologically sensitive, and which spreads the benefits of progress widely in order to reduce poverty and hopelessness is fundamentally different from specialized, export-crop dominated, chemical intensive farmers systems that have been the principle subject of most 'development' investment in the last several decades."

As noted in Chapter 1, the President's Council on Sustainable Development was consumed early on by whether sustainability could be achieved while striving to be the low cost provider of export commodities. Research and education related to this topic is sorely needed, given the various antagonistic options with in the agricultural community.

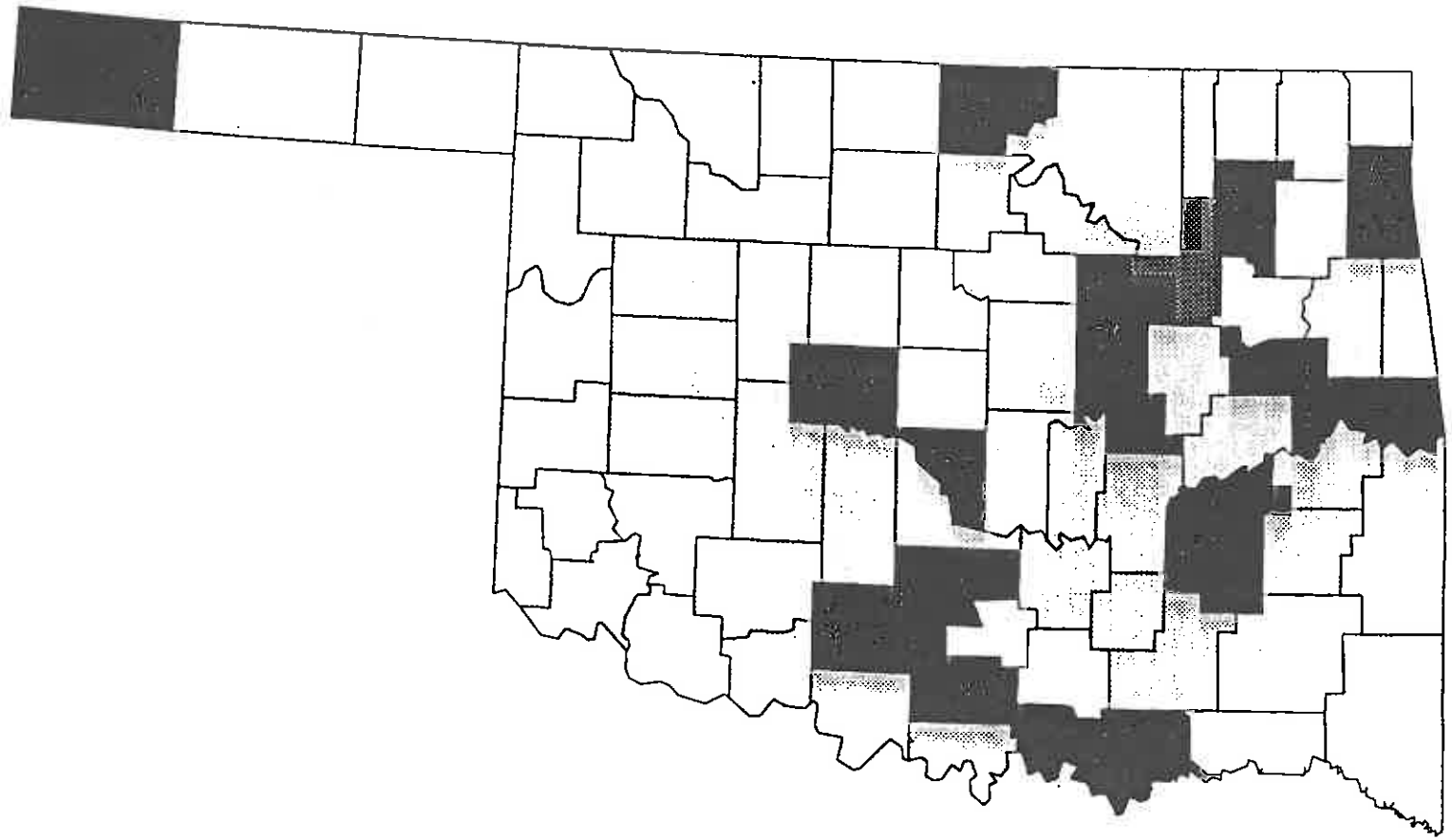
Ecological vs. environmental approaches to policy.

Mercier (1994) contrasts two approaches to environmental policy. One he labels the environmental approach: it focuses on cleaning up the effects. The approach he labels ecological looks to changing the institutions which cause the effects. The ecological approach is grassroots, connected, incremental and decentralized.

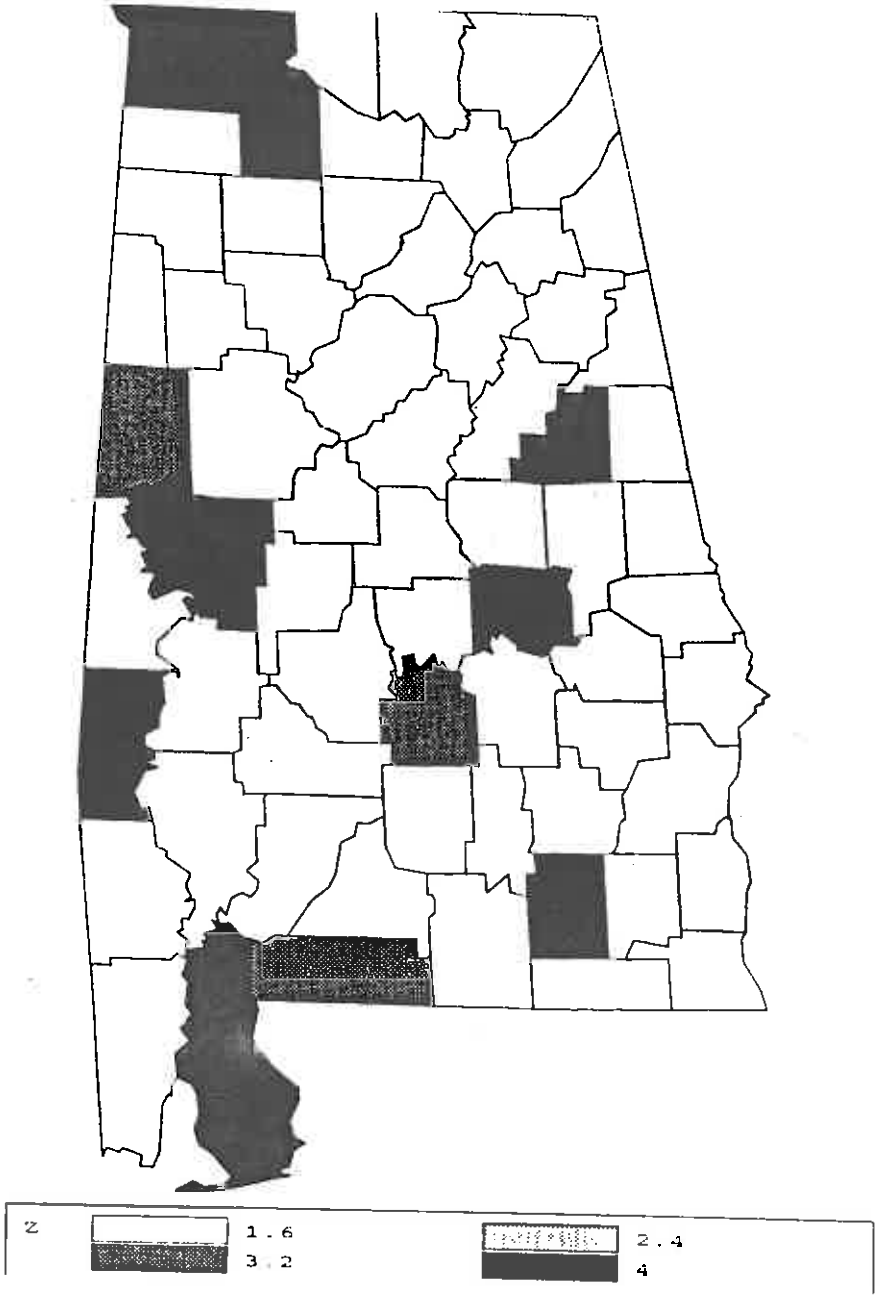
The ecological approach to policy is closest to farmers' opinions as expressed in the State of the South groups. One quality of the ecological approach according to Mercier is subsidiarity. This is a devolution of responsibility to the most basic level of decision-making. This concept resonates very well with the policy consensus of the focus groups.

Focus groups cited a number of situations where government intervention with regulations led to a reduction in sustainability. For example, several groups mentioned that labor is a problem only when government intervened to require farm wages be reported. Several also noted that strict regulations may backfire since they may lead farmers to abandon farm programs or may result in complying farmers being less competitive with farmers who lie about compliance. Farmers see regulation, given the lack of ability to monitor compliance, as only hurting the law-abiding farmer. This fact led a study in the North Carolina coastal plain to conclude that the best means of reducing water pollution from agriculture is to subsidize farmers who reduce their use of nitrogen and pesticides (Painter and Young, 1993). Then the incentive is to not use instead of trying to find ways to get around restrictions on use. Only when pesticides

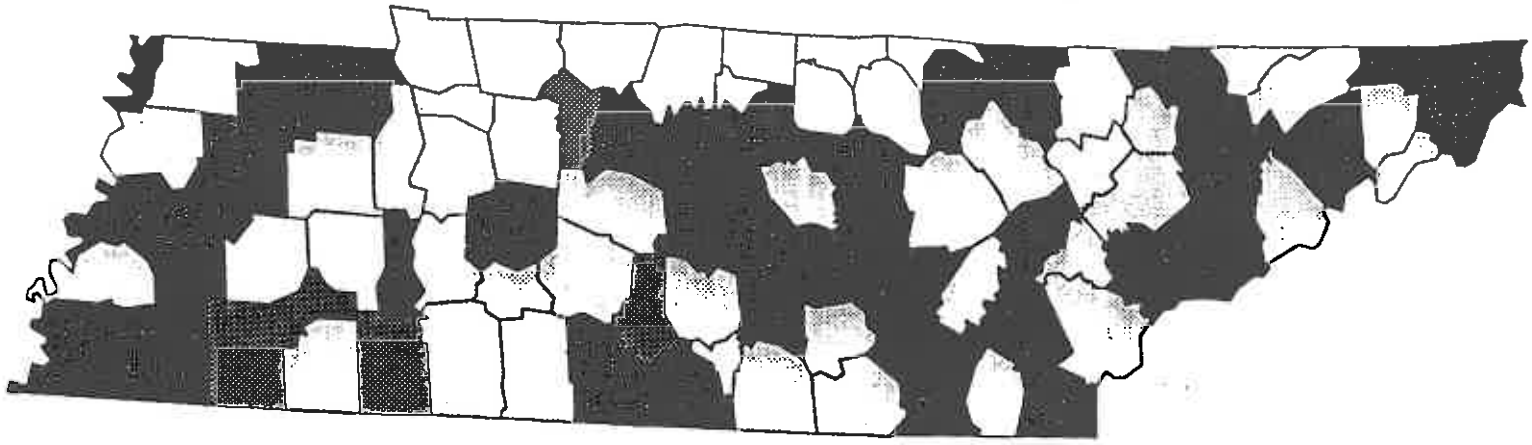
Map 12. Oklahoma need for sustainable agriculture research and education into alternative markets. Darker counties express more need for alternative market research and education. 4=need for both more research and more education in alternative markets; 1.6=no need for increased research or education in alternative markets (see legend below).



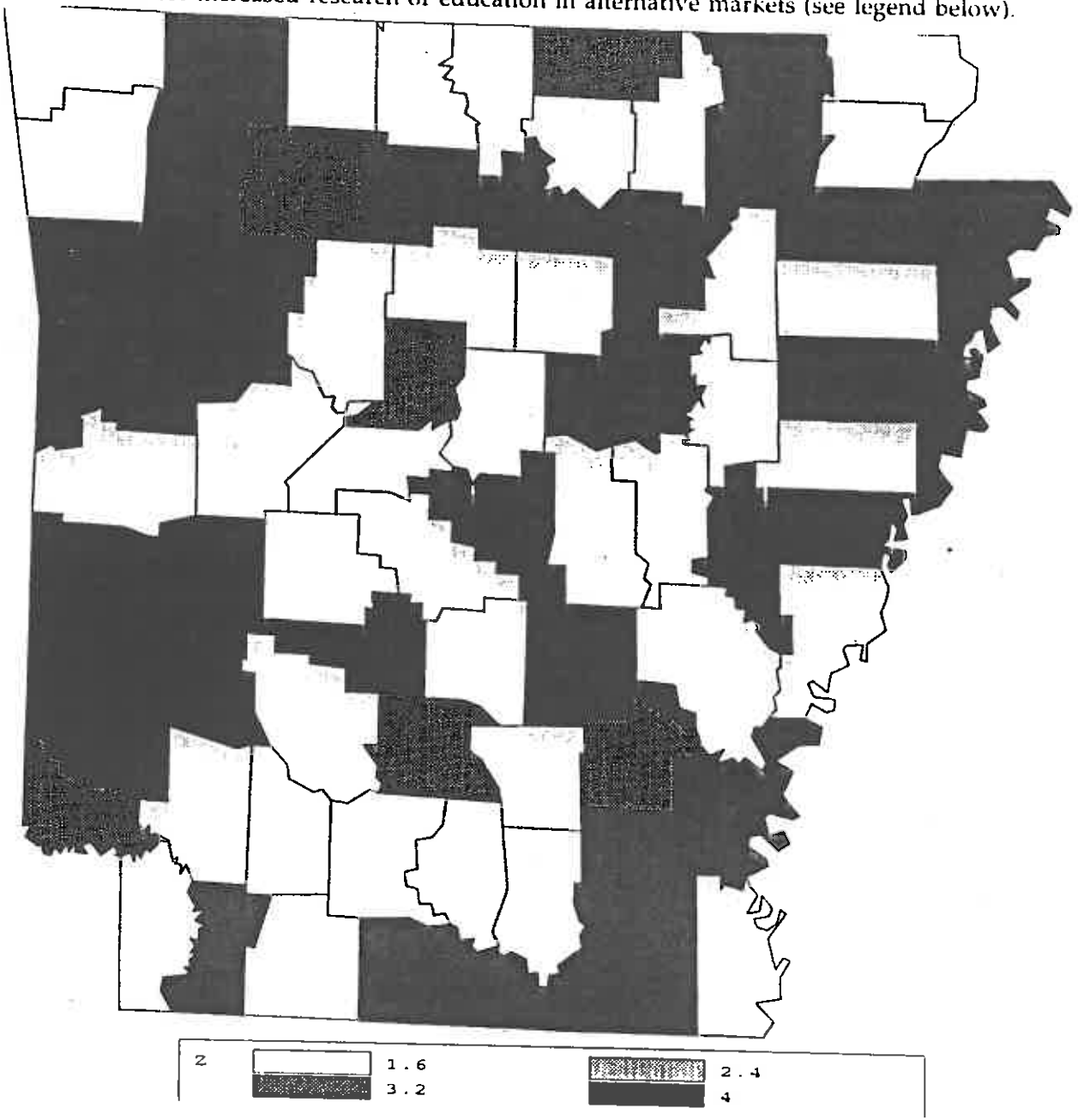
Map 13. Alabama need for sustainable agriculture research and education into alternative markets. Darker counties express more need for alternative market research and education. 4=need for both more research and more education in alternative markets; 1.6=no need for increased research or education in alternative markets (see legend below).



Map 14. Tennessee need for sustainable agriculture research and education into alternative markets. Darker counties express more need for alternative market research and education. 4=need for both more research and more education in alternative markets; 1.6=no need for increased research or education in alternative markets (see legend below).



Map 15. Arkansas need for sustainable agriculture research and education into alternative markets. Darker counties express more need for alternative market research and education. 4=need for both more research and more education in alternative markets; 1.6=no need for increased research or education in alternative markets (see legend below).



are totally banned are law-abiding farmers not hurt by regulations of pesticide use.

But the ecological approach to policy goes farther to

> "abandon the linear model of growth where resources are combined to produce goods and wastes and the process is supplied from, and wastes disposed of, outside the model. Instead, [it advocates] a multi-circular model where the wastes from one production process are used as resources in another and where renewable inputs are substituted for non-renewable" (Murdoch, 1993).

EPA in the 80s assumed the linear model and began priority setting by looking at the risk to humans of various waste products. This process, known as comparative risk assessment, attempts to put a dollar value on various risks to human health and then to prioritize expenditures accordingly (Stone, 1994). Now, within EPA, the ecological approach is also being considered (Manning and Rejeski, 1993). As part of the Future Studies Unit of EPA's OPPE, studies are now being attempted in Oregon, Minnesota and Kentucky to contrast with comparative risk assessment an approach which first establish a vision for the future and then target expenditures according to what will get us there quickest and with least cost (Childress, 1994).

Policy and the multi-perspective systems approach.

Too many environmental regulators are afflicted with the conceptual monism widespread in agricultural scientists. Thus, too often they cannot avoid the old trap of top-down authoritarians: we "know the answers and need only communicate them to the passive public" (Norton, 1991).

Echoing the farmers' refrain that we must take a systems perspective, how can systems research contribute to public policy making? All too often, Dery (1990) contends, the very fact that some rules of observation and inference has been followed in producing a given set of data and interpretations supposed to have guaranteed "policy knowledge," an authoritative guide to action. Dery contends that policy situations are so complex and unique that policy knowledge is only known in retrospect. But on a regional and ecosystem basis, different policies can be tried to see whether they work and expanded if they do.

Policies are experiments. Approaching policy as if we know the all the answers is to stick our heads in the sand.

In any case, policy is always experiment: we will never have enough science to be sure of the effect of a particular policy due to the "lack of controls and replicates, so that each new problem involves learning about a new system" Ludwig et al., (1993). In federal policy, the system is the whole country, so research has to look at the whole country. The wisest advice, then, seems to be: "Policies are experiments; learn from them." (Kai Lee, 1993). If policies are viewed as experiments, then the key to successful policies is structuring them so that useful information can be gleaned from them. Rather than acting as if we have all the answers, we must design policies assuming we do not have the answers.

The history of "Southern commodities" (cotton, rice, peanuts, tobacco) shows how little we have learned and how poorly designed the programs were, if the goal is

to obtain "policy knowledge." All four of these Southern crops were subject to rigid supply controls during 1950s and 1960s and modified due to factors extraneous to the policy's actual benefits.

When policy change works, how can we learn from it? Early settlers describe dust-storms which blackened the sky and required them to stay in door trying to seal out the blowing dust. These storms were a function of soil type, climate and the removal of the native parry grass cover. It was the attempt to bring this area under row-crop agriculture with little understanding of erosive process which caused the dust-storms. The storms themselves spanned the period until the adoption of anti-erosive land use practices as part of the SCS effort of the New Deal (Lord, 1938). The dustbowl was ended by government intervention through the promotion of soil conservation techniques. Yet wind erosion remains a problem in the Plains due to the increased access to the Ogalla aquifer since the 40's. The policy of support of DDT by land grant scientists led to discrediting of the agricultural establishment. But this experience did not hinder land grant opposition to sustainable agriculture, which has now also been largely reversed.

Some farmers call for increased flexibility so they can rotate from cotton to other crops. A systems perspective to sustainable agricultural policy would stress that multiple options leads to flexibility which leads to resilience which is the foundation of sustainability. Flexibility among a diversity of options is a key to resilience. Yet Doering and Ervin (1990) predict maximum planting flexibility would lead to increased erosion in Delta. After FLEX provisions were passed in the 1990 farm bill, Doering (1992) contended that flexibility provisions, though highly touted by those interested in sustainability, have had little effect is changing farmers' crop mix. For some farmers the FLEX provision have enabled them to become less diversfied and convert to continuous cotton, as detailed at a 1995 farm bill hearing called by U.S. Representatives from Arkansas, Tennessee and Missouri (Parker, 1995).

Increasing flexibility alone will not increase sustainability if farmers pursue the option of increasing environmentally unsustainable practices such as continuous cotton. Gray (1991) outlines some ideas about how policy could encourage flexibility from a systems perspective. A flexible production system would produce less when prices are low and produce more when prices are high. Present government programs often work against the flexibility by putting a floor under commodity prices by deficiency payments and other agricultural income support programs. Sustainable policies would enhance the elasticity of supply. The 50 year experiment with supply management in tobacco did remarkably well in sustaining small family farms in Kentucky, for instance, until the recent influx of foreign tobacco.

van Kooten (1991) and Faeth (1993) also cite evidence that deficiency payments and loan support programs contribute to overproduction, destruction of wildlife habitat and a general decline in sustainability of agriculture.

This policy experiment has been done. Direct income support programs don't work and farmers and researchers experienced in sustainable agriculture know it. Our data from farmer focus groups and all the research available indicates that

> . . . the basic incentive structure of the U.S. farm program works against sound resource management because farmers are paid according to how much of the defined "program crops" they produce. Farmers who plant nonprogram crops

to control pests and manage soil fertility receive less government support than do farmers who follow the program and ignore environmental impacts.

Faeth (1994)

Why are such programs in existence if nearly all farmers and research militate against them? One answer lays the blame at Congress' fealty to strident interest group pressure. The former head of EPA, William K. Reilly stated in early 1994:

> "Throughout the 1970s and 1980s, Congress constructed an arsenal of laws, typically in response to an episode of media attention and public alarm . . . Many of these laws addressed serious problems but they were typically conceived in isolation, and constructed without reference to other environmental problems or laws . . . No law ever directed that we seek out the best opportunities to reduce environmental risks, in toto; nor that we employ the most efficient, cost-effective means of addressing them."

Of course, this analysis begs the question of why Reilly's EPA needed a Congressional mandate to do something as obvious as be efficient, cost-effective and seek out the best opportunities for reducing environmental problems.

An alternative analysis sees the problem from the opposite pole. Charles Benbrook, organizer of the 1989 NRC review Alternative Agriculture, wrote in July 1994:

> [T]he institutions and constituencies that generally make up the "conventional" agricultural community have solidified their control over the policy process and fiscal priorities, and used a host of public laws/regulations/ processes to raise the cost and difficulty of change. Action recently completed on the FY 1995 budget is yet the latest confirmation that the "more things change the more they stay the same". Why? It has something to do with the structure of power, which in turn reflects, indeed is fueled by, the flow and access to money -- both income from the sale of food, inputs, services, and public benefits in the form of direct subsidies and tax benefits. Conventional ag inputs generate over $15 billion in annual income, a percentage of which is diverted to political activity and promotion of industry interests.

The State of the South group conclusions represent a synthesis between these two seemingly polar positions:

Farmers organized with environmentalists in sustainable agriculture groups are the key to better commodity policy.

A key conclusion of the Delta workshop was that a nongovernmental organization which unites farmers and environmentalists will be required to accomplish the needed changes. Stevenson and Klemme (1992) show that historically large institutions do not change unless there is some outward impetus to change. Sympathetic folks inside

the institution are needed to act on that impetus, of course. But even if such insiders do not exist, the outside agency can begin the slow social learning process which Lee (1993) contends will be required for long-term improvement of large ecosystems anyway. And while that process is occurring, farmers who are members of sustainable agriculture organizations typically have higher yields and lower costs than similar non-members (Bird, Bultena and Gardner, 1995).

Rees (1988) identifies four basic types of intervention to achieve policy objectives: economic incentives, direct regulation, persuasion/information and community action. The latter two are the ones which our focus groups would support. The best available example of a combination of those approaches with the formation of local non-governmental institutions is from Australia.

Down-under, a political union of environmentalists and farmers has resulted in "a grassroots revolution called landcare." Over 3000 farmer organizations--with membership of 28% of all Australian farmers--have been established under a 10 year government program (Douglas-Hill, 1995) and achieved notable successes in nearly every area of sustainable agriculture, according to Campbell (1994). The creativity of farmers have been mobilized to solve environmental problems. As a fifth generation wool farmer stated:

> "The goal of sustainability at any given time will always be a social construction, not something to be defined and decreed behind a veneer of intellectual 'scientific' authority by either economists or ecologists."

In the United States, a now vast farmer organization is an example of the mutually beneficial relationship possible between NGOs, extension and land grant universities. Farm Bureau was created with the active assistance of Cooperative Extension (McConnell, 1953) to promote progress among farm families and forestall more radical groups. The active support of such an independent agency was extremely helpful in garnering resources for the land grant system.

The processes underlying development of Farm Bureau are consistent with those of successful farmer organizations world-wide. According to Bray (1991), farmer groups usually start with a small active group which enlarges and maintains membership through establishment of commercial activities. In the case of Farm Bureau, this activity was insurance. Regular meetings and social activities solidified the county organizations which are the heart of Farm Bureau.

In the developing world, Bray notes the more usual commercial activities focus on areas such as: joint marketing, establishment of consumer stores, encouraging diversification and creating and managing their own agroindustries.

The similarities between Australian landcare groups and American Farm Bureau dissolve when considering some aspects of sustainable agriculture such as advocacy of low external input use. One opportunity for research is whether the most effective means of creating local, farmer groups focused on sustainability is through existing groups or by creating new groups. Anecdotal evidence seems to indicate that new groups are the strongest force for change, but no formal research is available.

Policy and indicators. A number of national and international efforts (e.g. SANREM and UNDP) are seeking to determine indicators of sustainable development.

Some of the impetus appears to be influencing policies which move toward sustainability by focusing on the right indicators. The multi-perspective, flexible holistic systems approach offers one caution to these efforts: do not inflexibly settle on any particular indicator. As MacRae et al. (1989) have shown, monitoring chosen indicators produces new information that enables reexamination of the problem definition which may lead to a refined conceptualization and thus a different choice of indicators for the next set of research events.

Policy research is unfortunately replete with examples of calcified focus on indicators which turned out to be inconsistent with the goals of the project since they were prematurely accepted as complete measures of a phenomenon. The control of car emissions of carbon monoxide and unburned hydrocarbons, for example, led manufacturers to raise engine flame temperature in such a way that more oxides of nitrogen were emitted. Air pollution was not fully measured by the former indicators and worsened by adherence to those indicators.

The attention to feedback in a multi-perspective systems approach insures that choice of indicators is part of an iterative loop to revisit indicators according to their effect--knowing that no indicator will fully capture the essence of sustainability.

Conclusion. Policy is a continual experimentation process, always acting without sufficient data. The experience of farmers is a crucial ingredient in policy deliberations. This only happens when farmers are an organized presence. The best opportunity for farmer organizations in sustainable agriculture is with moderate environmentalists. Then farmers will be able to achieve the almost unanimous goals of weeding out subsidies and creating farm policy which encourages flexibility and multiple options.

Section IV Marketing and rural development

Regulation and marketing. Though many environmental and sustainable agriculture advocates distrust the market to incorporate environmental externalities, farmers typically see it differently. In our State of the South groups, farmers saw the route to sustainability much more in increasing marketing alternatives than in "command and control" regulation. Government policy is welcomed which helps create new markets for sustainably produced commodities and products.

Quality of life and increasing options. In SARE research, marketing is often placed under the rubric: quality of life.

> "Congress has mandated that SARE research should increase the quality of life in rural areas with quality of life defined as including protecting small family farms and increasing self-employment opportunities in rural areas . . . Funding for QOL programs by every regional SARE program has been minuscule to non-existent despite the Congressional mandate" (Ikerd, 1993c).

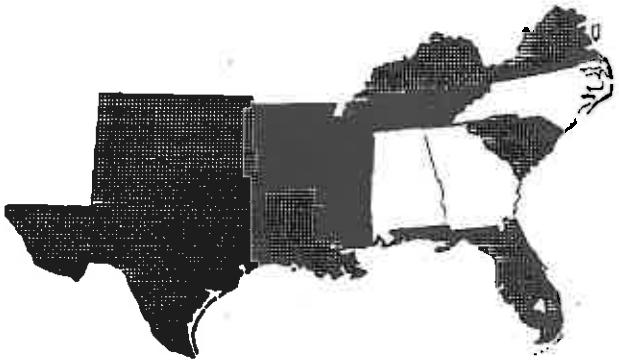
Quality of life was presented in State of the South focus groups and surveys as one of the five key components of sustainable agriculture. In focus groups, passing reference was made to the fact that farming is not attractive as a way of life to children. But quality of life was not included in any consensus statements of any focus group. However, given the inclusion by Congressional resolution of maintaining small and moderate sized farms and rural employment opportunities definition in the definition of quality of life, the major conclusions of the focus groups would be included.

One way of summarizing our findings regarding quality of life is that farmers want more options and more control over their lives. Specifically, nearly every focus group was searching for marketing alternatives. If a farmer has choice among enough options he can design a quality of life which suits him. If a farmer is constrained by debt, landlords, or markets to a very limited set of options, his quality of life will likely be poor. On most U.S. farms today, a basic contributor to quality of life is the lack of profitability. Young people don't see farming as a good option if their parents are working their fingers to the bone and still not making ends meet.

In exploring opportunities for increasing profitability, alternative markets was the consistent theme. Locally-owned, value-added marketing alternatives were the favored solution within that theme.

Is there a means of externalities being internalized in private markets to insure that markets will get the right price signals and evolve toward sustainability? A combination of consumer education and policy support for locally-owned value-added enterprises could provide the needed tools. The next chapter looks at opportunities within marketing and rural development for sustainability.

Chapter 9. Marketing research within sustainable agriculture



> Four companies control over 70% of beef, hog, sheep, and soybean processing. Poultry and processed vegetables are rapidly reaching the same level.
>
> Heffernan (1994)

> The big commodity producers don't support extension any more--they don't need us.
>
> Assistant Dean for Extension, Southern land grant university, June 1995

Sustainable agricultural research, and agricultural systems research more broadly, has largely relegated marketing issues to the nether regions where methodologically difficult topics lie. Farming systems researchers are beginning to realize that farming systems don't stop at the farm gate. Fleming and Hardaker (1993) advocate a marketing systems research (MSR) approach "as a counterweight to the bias toward production research". However, Fleming and Hardaker define MSR as separate from farming systems research. They follow the usual tendency of farming systems researchers to break systems into components instead of looking at emergent qualities of systems.

The holistic systems approach advocated in State of the South groups would be more consistent with an integration of marketing and production concerns. Many farmers are interested in doing marketing research themselves--realizing that markets are relationships between producers and consumers and that to understand how to create those relationships requires direct farmer involvement.

A clue to possible methodologies for making this happen comes in the "active researching systems" preferred by soft systems researchers such as Bawden (1991), where farmers and researchers actively interact to change such phenomena as markets. Soft systems is criticized for not pinning down these methods quantitatively to make them more accessible to researchers. Soft systems theorists say the flexibility of having no rigid methods is the key to soft systems.

Diversification and alternative markets: the top priority. State of the South farmers and extension agents were not concerned with methodology but with results. The emphasis on profitability expressed throughout the focus groups and surveys was much less on reducing inputs and much more on market development. Both the Memphis and Athens groups stressed policy change as the first need for market development with research and education meshing as components of policy changes.

The Athens group (representing a wide diversity of Piedmont farming systems) reached consensus on top priorities:

#1 Long-term priority: market development policies.
-Overall priorities:
-Policy: USDA should encourage cooperative marketing
-Research into marking more markets open to vegetable producers.
-Education: open communication between small farmers and local markets.
-Policy: encourage more local food production to bring people back to farms.
-Consumer education: encourage consumers to consider organic produce and educate on sustainable agriculture to get their support.
-Policy: better labeling of vegetables and meat regarding pesticide use.
-Policy: facilitate better markets for organic produce.
-Research: How can direct marketing and CSA's be encouraged?

The Lubbock group also viewed marketing alternative crops as the most important policy issue:

#1 policy initiative should be marketing of alternative crops.

The Hereford group likewise stated the need for changes in rural economic development and marketing as a policy priority, and linked it, as did others, to beginning farmers:

-Needed: a complete overhaul of rural development efforts and farm financing with a focus on value-added industries and assistance to young farmers.
-Young farmer programs set criteria so that few can qualify. E.g. in the Texas beginning farmer program, you must buy land or you are not eligible.
-Policies are not adapted to different crops, different areas and different practices.
-Bankers and government financing for younger farmers do not recognize the financial viability of low-input, sustainable or organic farming.
-Bankers are still lost in the belief that shooting for the big yields and big dollars in gross income even when they don't really cash flow.
-Base price is lower than production costs.
-Government policy is forcing farmers not to use sustainable ag. practices.
-The big need is to keep young people in rural communities. People are leaving small communities due to larger farms and no local employment opportunities.
-Value-added, agriculturally-based rural development should be focused on rural areas.
-The most important agricultural development efforts (in value-added industries) are focused on **urban areas**. This must change to put value-added industries in rural areas.

-West Texas especially needs value-added plants.
-Social problems mainly derive from the lack of profitability of farming.

Other groups saw diversification as less a policy issue than a research and education issue. The Glasgow group ranked diversification as the #2 long-term priority. Their consensus statement on diversification was:

-Encourage diversification by developing alternative business models (stressing added-value) and crops which help farmers to stay on the land.
-Need marketing windows research on truck crops.
-Research: breed crops which are suited just to this area to give local farmers a market niche.
-Policy: support value-added facilities: farmers can produce, but can't take care of it after harvest.
-Policy: invest in marketing expertise to avoid surplus crops.
-Extension: show that diversified farms are more profitable.
-Research should focus on determining what local farmers can produce most cost-effectively.

The most striking focus group results came from a set of 30 focus groups conducted in 5 locations throughout Kentucky in March 1995. The consensus from each location was that assistance in creating marketing alternatives was the key need if sustainable agricultural systems are to be created. (See Figure 8 for details.)

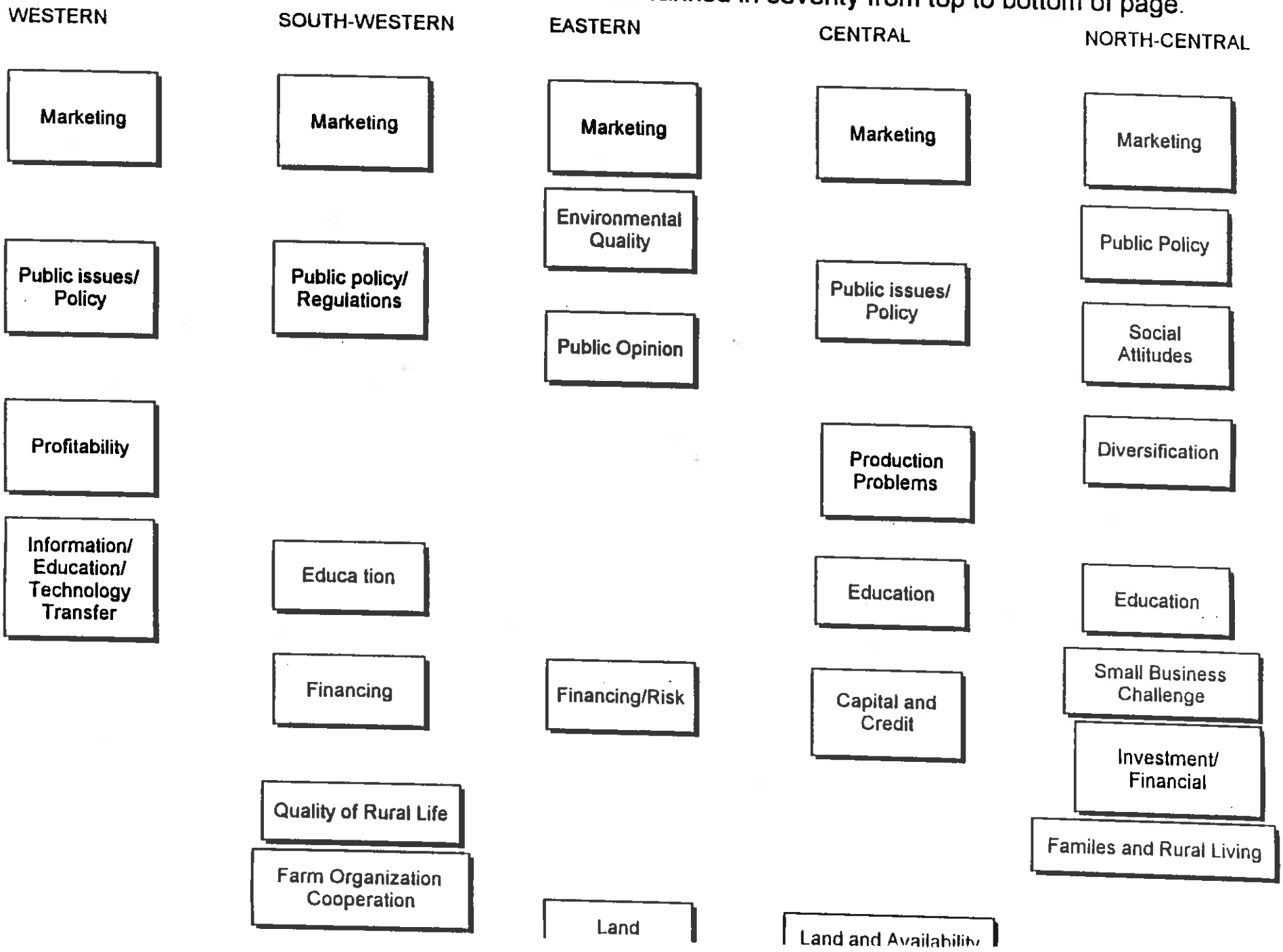
No matter whether it was seen as primarily a policy, research or education issue, **the need for diversification, value-added enterprises and alternative markets was a top priority for nearly every group as a means of improving profitability.**

Farmer groups and marketing. This overwhelming emphasis on alternative markets provides partial confirmation for Bray's (1991) developing world observations that farmer groups grow when a small active group creates a joint marketing venture, encourages diversification or creates new agroindustries. Southern agricultural development workers have long realized that farmers

> greatest potential for establishing commercial production lies in developing markets through some sort of mutual agreement--joint partnership, cooperative, market coalition.
>
> Goodwin (1987)

Efforts to promote large scale wholesale/retail farmers markets have been extremely successful in some states and not successful in others, even successful in parts of some states and not in other parts (Farrington and Reese, 1987). Similarly, the success of packing sheds has been extremely variable. Focus group participants in Georgia talked of the many successful and abandoned packing sheds in adjoining areas in the Coastal Plain. Cooperatives in the South have fewer success stories. Most farmers know of a cooperative which failed and cost the farmer members too

Figure 8. Results of 30 Kentucky focus groups (6 in each of 5 regions) on barriers to sustainability of Kentucky agricultural systems conducted in March 1995. Barriers are ranked in severity from top to bottom of page.



much money. But successful cooperatives in Southern towns such as Stuttgart, AR, Monticello, KY, and Hopkinsville, KY, do exist and seem to have transformed the farming country around them.

However, little research has been focused on understanding the successes and failures of these various alternative marketing efforts. Flora (1990) and Flora and Flora (1993) report that communities displaying high levels of local initiative for entrepreneurial activity have certain defined characteristics including: flexibility, continual learning, encouraging debate on multiple perspectives, saving and investment. They call this entrepreneurial social infrastructure.

Certainly community attitudes which keep multiple perspectives and flexibility strong are consistent with the holistic systems approach emerging from State of the South results. The task for sustainable agriculture research and education is to explore the generation of these attitudes and how tightly linked they are to development and success of alternative marketing efforts.

How can markets deal with externalities? Markets do not assign values to those things which are not owned and not priced. So how can environmental improvement occur through markets and rural development? Some argue that since markets need the right price signals to work properly, externalities must be internalized (Fri, 1990). Others agree: markets should be used as tools. President Clinton, for example, created the President's Council on Sustainable Development to find "more market-oriented mechanisms and less command and control" (Goldman, 1993).

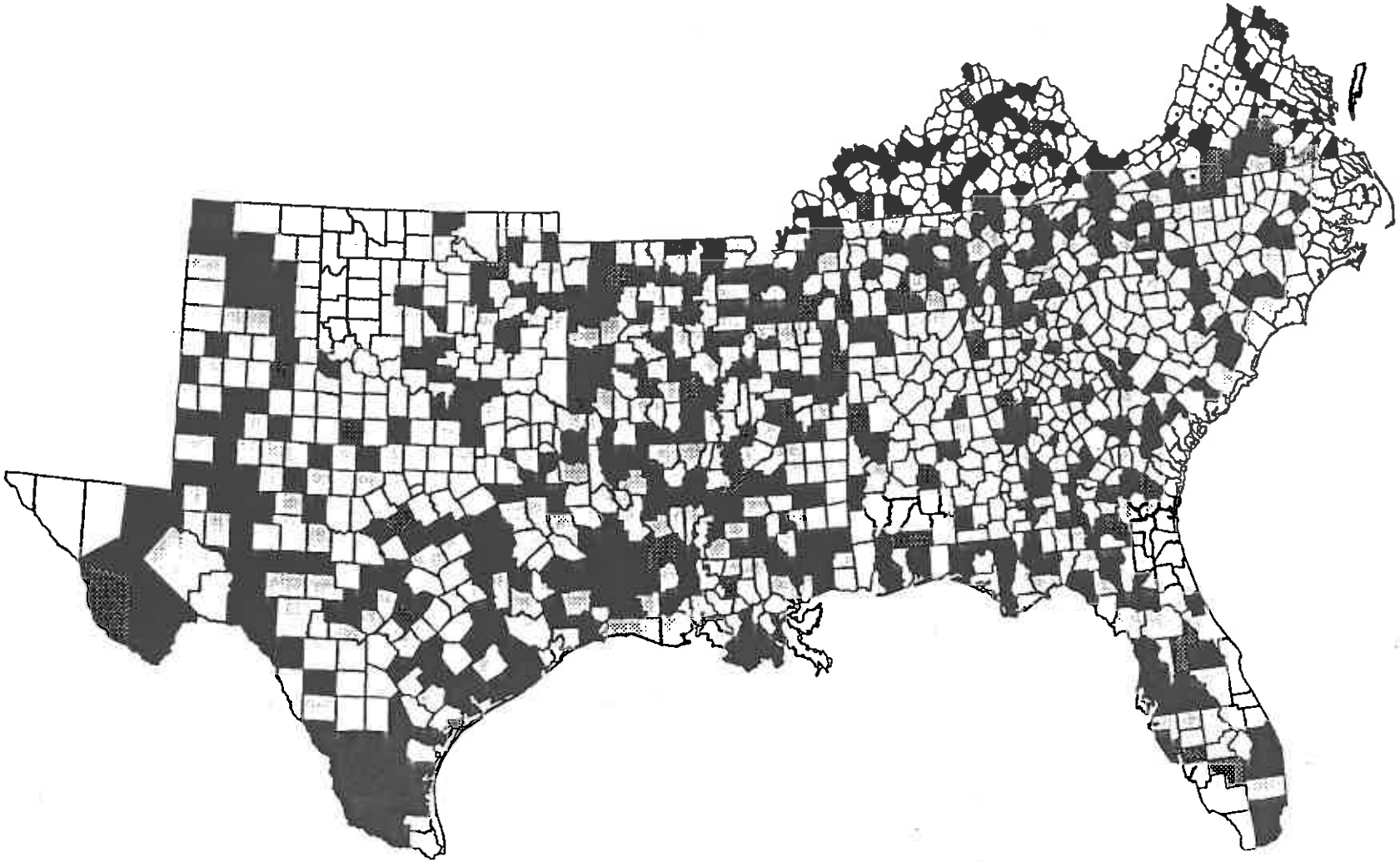
State of the South group results certainly agree with this approach and advocate the research and education on markets to make it happen. For example, according to the Hayesville, NC, focus group:

> **Long-term priority: Increasing profitability through market strategy education.**
>
> -Replicate a local example: group marketing of calves with uniform grading, standard weaning and vaccination, strict weeding out poorer calves. Buyers benefit by getting better calves.
>
> - Also focus on marketing local produce emphasizing it's taste and quality.
>
> - Research needed on how to move away from the cheap food policy.
>
> - Key problem is lack of connection between buyers and growers.

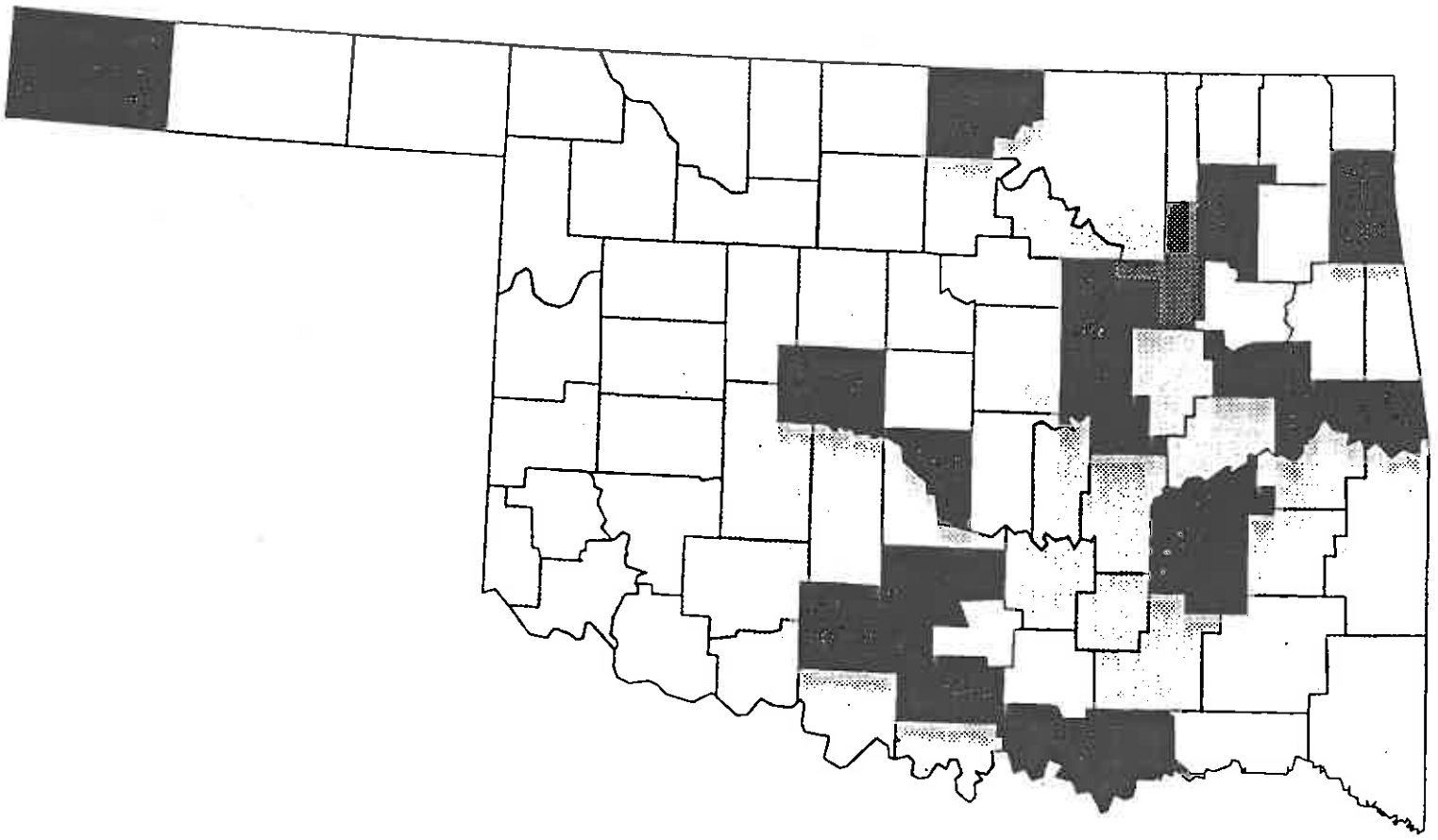
One problem is how to get researchers to involve farmers in marketing studies. In the most prominent agricultural marketing research in the South, such as the coordinated study of vegetable supply across three states by Clemson, North Carolina State and the University of Georgia (Bauer, 1988), farmers play little if any role. Some studies have taken multidisciplinary approaches involving both production and marketing (e.g., Zilverberg and Coughenour, 1987), but typically researchers interview farmers and buyers separately, code the responses into categories and look for linkages. But no reported study puts farmers in contact with buyers to actually do the research.

Marketing researchers know the key to marketing is the relationship between buyer and seller: creating a relationship where the buyer trusts the seller to deliver

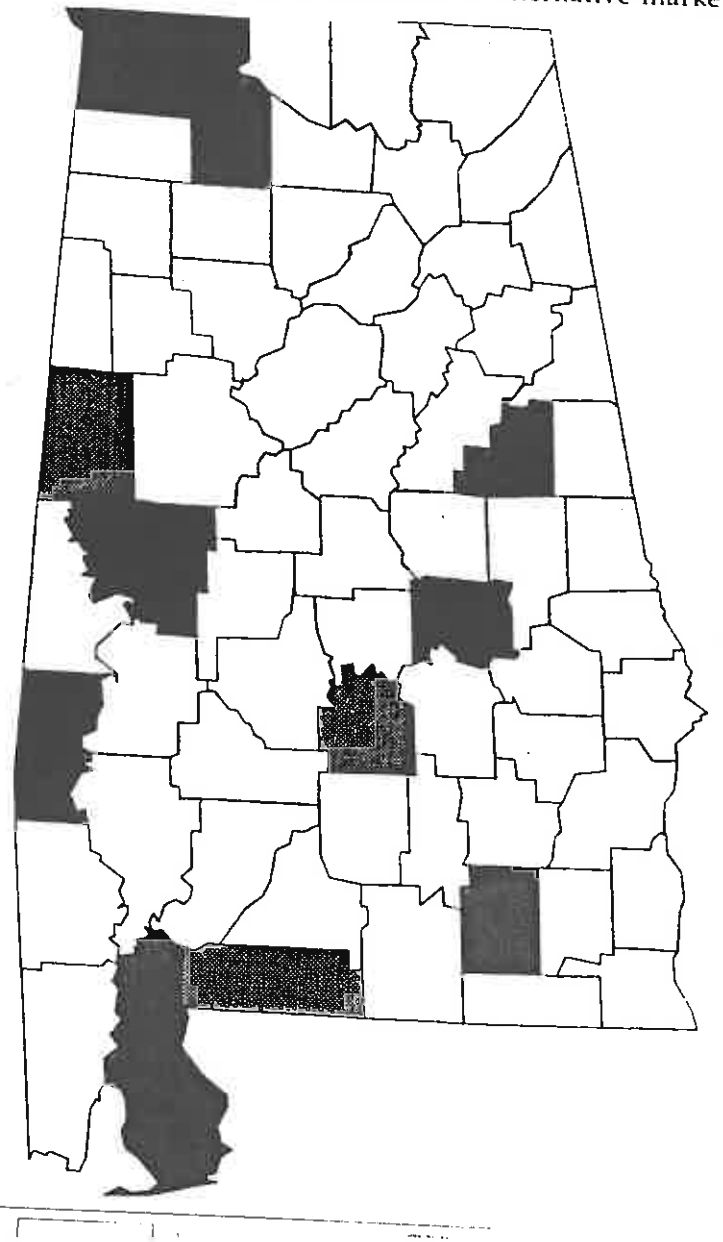
Map 11. Need for sustainable agriculture research and education into alternative markets. Darker counties express more need for alternative market research and education. 4=need for both more research and more education in alternative markets; 1.6=no need for increased research or education in alternative markets (see legend below).



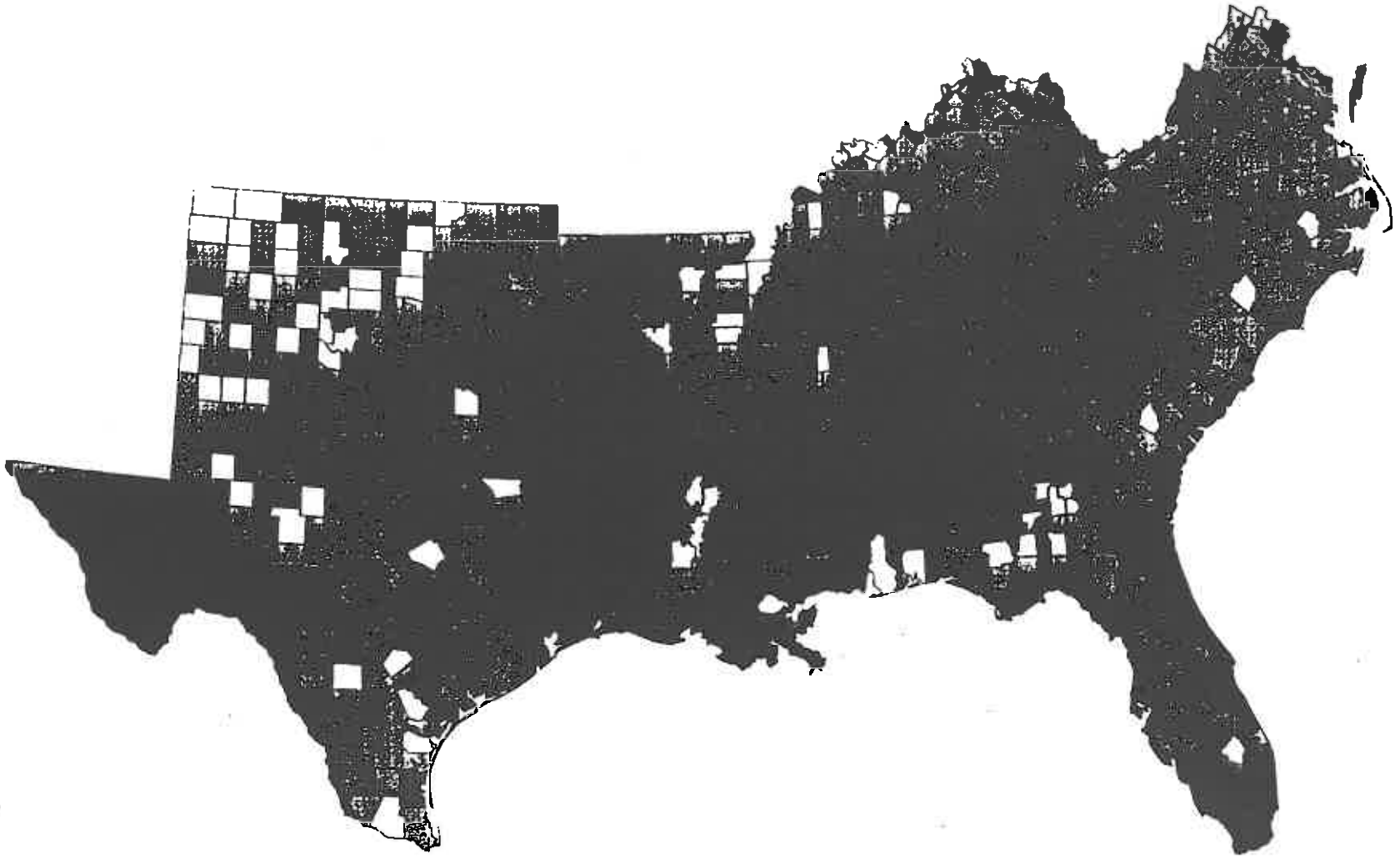
Map 12. Oklahoma need for sustainable agriculture research and education into alternative markets. Darker co[illegible] express more need for alternative market research and education. 4=need for both more research and more education i[illegible] alternative markets; 1.6=no need for increased research or education in alternative markets (see legend below).



Map 13. Alabama need for sustainable agriculture research and education into alternative markets. Darker counties express more need for alternative market research and education. 4=need for both more research and more education in alternative markets; 1.6=no need for increased research or education in alternative markets (see legend below).



Map 16. Rural Development Readiness Index: Where are sustainable agriculture/rural development programs most likely to be successful. Index created by combining responses to rural development questions with environmental problems index (Map 1).



3.1 consumer behavior research is needed.
3.2 consumer education needed on what good food is
3.2.1 goal should be consumer education to the point they will pay the complete cost.
3.2.1.1 Need increased awareness of complete cost of degradation of US and foreign land through present production practices: non-market costs, externalities.
3.2.2 getting the right farmer image portrayed will be key
3.3 consumers are more aware of environmental problems than ever before
3.3.1 now 20% will pay more for environmentally sound food.
3.3.2 consumer awareness must increase of on-farm constraints to sustainable production
4. An infrastructure doesn't exist to foster farmer-consumer relationships
5. Pricing and quality: we need to get decisions closer to people--e.g. in deciding quality standards.
5.1 Needed: new institutions for quality standards: cooperative marketing and growing standards.
5.1.1 Promote sustainable labels: especially local, within states: generate wealth in state.
6. The present marketing system is the biggest enemy.
6.1 Concentration in ever fewer hands.
6.1.1 Control by big integrators through contract farming.
6.1.2 Solution is coops but farmers are too independent.
6.1.3 Local vertical integration based on quality and consumer focus could overcome it too.
6.2 Chain stores won't buy from multiple sources.
6.2.1 Needed cultivate relationships. Overcome present system: invite strategic partners to a meeting and see what is needed to put together farmers and buyers.
6.2.2 related solution: local groups connected by computers across states
7. Farmers must own the capacity to add value to commodities locally.
8. Research criteria: all research should be assessed on contribution to profitability, not to productivity.

Beyond just marketing, this conceptualization stresses increasing value-added enterprises and increasing local ownership. What is the state of the South regarding efforts in all three of these areas of rural development? We developed one such picture by creating an index including all questions on the survey related to rural development and then uniting this index with the index of environmental problems shown in Map 1. The resulting index is a measure of which counties in the South have most potential for sustainable agriculture/rural development activities (Map 16). Though results show no clear regions of concentration, a group of counties in the High Plains and near the Florida panhandle do emerge. Other counties with high scores on the index are scattered throughout the region. These data are one indication of where sustainable rural development has attracted the most interest in the South. But, what

sorts of research and education activities will result in sustainable rural development?

Conclusions of focus groups and the Austin workshop are that research and education should focus on how to achieve improvement in three key areas:

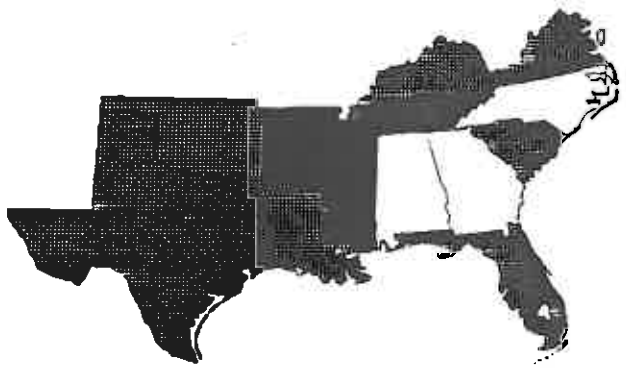
1. more local value-added processing;
2. increased local ownership;

and, near urban areas,

3. increased purchase of locally-produced food.

The final two workshops conducted by the State of the South project dealt with these topics under the headings of **increasing locally-owned, value-added enterprises** and **local food systems.**

Chapter 10. Sustainable rural development means locally-owned, value-added enterprises



> Twenty years of integrated rural development and ten years of farming systems research "are nearly unanimous in declaring that rural development . . . requires interdisciplinary examination and an approach which is able to consider many factors simultaneously in a continually changing environment."
>
> Francis, Araujo and Alcantara (1994:367)

After 55 focus groups with farmers throughout the 13 Southern states, the creation of locally-owned, value-added enterprises (LOVAs) emerged as a key to sustainable agricultural systems. But why have the rural development efforts of the last 50 years not created more LOVAs. One answer emerged from our dialogue of farmers and researchers: community-based rural development efforts leave out entrepreneurs--who are the engine of development.

Entrepreneurs have a bad reputation in some rural development circles. They are seen as taking advantage of cheap labor and "often responsible for driving farms out of business" (Bartlett, 1993). But many farmers see rural development programs teaching dependency and not leading to sustainable development. Third world rural development programs increasingly see successful relationships between entrepreneurs and community groups as crucial to success of community-based cooperatives (Kirsten, 1993). Tempering the common tendency of entrepreneurs to optimize short-term profits to the detriment of non-financial assets (including soil, water and wildlife habitat) is the key change required.

Others contend that optimizing profit is not the dominant force in agricultural systems and that abandoning the common economics assumption of optimizing behavior is the key to developing resilient, sustainable systems (Chavas, 1993). A focus on understanding emergent self-organization (as discussed in Chapter 3) warrants attention. Still others contend that the innovations of entrepreneurs are the source of the sustainability in highly developed economies.

> "According to chaos theory, in such a developed economy there must be a continuous process of innovation in order to prevent a collapse . . .[I]f sustainability is to be achieved, a constant stream of innovations is needed to prevent the collapse of the most highly developed section of the economy. Thus growth and innovation do not run counter to sustainability" (van den Noort, 1993:1).

Unifying sustainable agriculture and rural development (SARD) requires

reconciling these conflicting perspectives by creating a new synthesis. This was the purpose of a workshop co-sponsored by Karl Stauber, USDA Undersecretary for Research, Education and Economics, and the State of the South project in Memphis in July 1994. The thirty-six participants included equal numbers of farmer-entrepreneurs, rural development researchers, USDA rural development officials and non-profit SARD agencies staff.

The specific topic of the workshop was the consensus which emerged from 3 years of State of the South work: how to catalyze the locally owned value added enterprises that are the key to sustainable rural development. The results of the workshop are a thorough examination of and a consensus on how rural development programs could be modified to catalyze locally-owned value-added enterprises.

The participants identified the need for research, education and policy efforts in six areas in order to catalyze LOVAs:

1. Creation of accessible, flexible LOVA technical assistance systems integrating public and private sources with LOVA farmers directing.
2. Enhancing markets for sustainable products at the retail level, starting with education of retail buyers on consumer trends and labeling research.
3. Transition from present commodity programs to catalysis of LOVAs: first by challenging the myth that ever-bigger farms producing least cost raw commodities is the only future for Southern agriculture.
4. Understanding and changing local power structures to encourage LOVA creation and resilience.
5. Short-term public policy education: make LOVAs central to the farm bill.
6. ESOPs, partnerships, public/private linkages, and cooperatives each fit certain entrepreneurial and marketing systems; design a successor to Agricultural Cooperative Service to create easy access to pros and cons of various organizational structures.

The complete recommendations of the Memphis workshop total hundreds of specific research and education projects. The report is available from the State of the South office in Almyra, Arkansas. Following are short elaborations of the above consensus statements regarding the most important questions and conclusions regarding the catalysis of locally-owned, value-added (LOVA) enterprises as a key link in the relationships of sustainable agriculture and rural development:

1. Local power structures can make or break LOVAs, but **local power structures change when faced with an organized, informed group of local citizens.** Collaboration and confrontation are both more successful when undertaken from such a position of grassroots power. Research and education projects to alter local power structures must, therefore, be focused on how to create these groups.

2. A widespread, but inaccurate, conviction is that bigger farms producing low-cost raw commodities is the only and complete future for Southern agriculture. The overwhelming need is for extension/education programs to remove this self-fulfilling conviction which has controlled policy toward Southern agriculture for decades. Such an education program would lay the groundwork for movement away from high cost

commodity programs which result in overproduction to programs to facilitate resilient LOVAs which revitalize rural communities.

3. Retail grocery decision-makers and institutional buyers are largely unaware of consumer trends toward and availability of high quality, locally-produced, organic, natural or sustainable food products. This could be changed through an education campaign which is flexible enough to support specific local labels. Research at the retail level would be coupled with this education program to answer a host of questions related to price elasticity, consumer attitudes, labeling, maintenance of niches. Finally, the advantage of larger non-local producers in transportation and distribution could be addressed through assistance for joint ventures among LOVAs.

4. No existing technical assistance source is adequate to provide the flexible, accessible and system-specific training and information required to facilitate LOVAs. Models for technical assistance to LOVAs and a multi-dimensional matrix for comparing TA systems were developed. A system integrating public and private sources and providing a 1-800 number, "high touch" personal response and email features, along with access through local nodes (extension agents, non-profit staff, SCS RC&D, etc.) would provide the ideal system. An initial step will be a database of existing LOVAs in the South which includes their present top constraints.

5. One vehicle for short-term public policy education in LOVA catalysis is the Campaign for Sustainable Agriculture s consensus of 200 organizations regarding priorities for the 1995 farm bill. This consensus includes the statement: Funds available through various rural development programs and agencies, including the proposed Rural Development Services, should be targeted to owner-operated farms and locally controlled community organizations which add value to locally produced crops and other agricultural products.

6. The attributes of successful LOVA entrepreneurs are a key determinant of appropriate organizational structures. Examination of the literature and the database proposed in #4 above will test a number of hypotheses generated by the group.

A second set of recommended activities would create (1) a set of materials on pros and cons, strengths and weaknesses of alternative structures: coops, partnerships, ESOPs as they interact with LOVA entrepreneur attributes and (2) a set of business and management materials for entrepreneurs in LOVAs for developing business plans, financing, etc. Incorporated in both these sets of materials would be results of (3) a research program to estimate the cost-benefits of investments in LOVAs to determine payback, success rates, probability of success and (4) strategies for scale-up as LOVAs expand in size and markets. A general conclusion was that the USDA Agricultural Cooperative Service should be more of an **"Agricultural Institution Services"** which could recommend and assist in forming structures other than cooperatives where appropriate[5].

[5] The recent USDA reorganization has made a step in the direction of this recommendation by changing the name of the Agricultural Cooperative Service to the Rural Business and Cooperative Development Service.

A final recommendation of this group was to explore the trapdoor which could make any LOVA antithetical to sustainable agriculture. This research would be a comparative analysis of import substitution and export models of development and their relationship to environmental and input reduction aspects of sustainable agriculture.

Marketing research methodology is not keeping pace with farmer progress.

No Department of Agricultural Economics (DAE) anywhere in the country has a program designed to address the research and extension questions emphasized by the Memphis participants. Few even have single individuals assigned such responsibilities. This is a glaring example of the failure of agricultural academia to examine the key problems in U.S. agriculture. Many DAE Chairmen are very much aware that alternative marketing (especially LOVA development) is the primary need of farmers (Jones, 1995). The reason economists don't work in the area is: "Virtually no data." Economists have developed a preferred methodology which does not permit them to study the key problem facing farmers.

Yet the phenomena of locally-owned value added enterprises is growing increasingly widespread, especially in the Midwest. Mainstream farm publications [such as The Furrow (March-April, 1995)] regularly chronicle this trend. In fact the July 4, 1994, issue of the business magazine Forbes introduced some such successes with the headline:

> **A new wave of Midwest farmers' co-ops**
> **is challenging processors.**

According to a variety of reports on this new wave, the experiences of farmers involved in these LOVAs are very consistent with the conclusions of the Memphis workshop.

According to H. Smith (1994), these LOVAs are not traditional cooperatives. The new processing cooperatives are owned and operated by active farmers and ranchers who become members of these new cooperatives by purchasing shares in the operation and supplying additional up-front purchasing capital to fund new equipment, research and marketing costs. Memberships and stock transfers are usually be reviewed by a board of directors who ensure that new members are actively engaged in farming. Tight membership monitoring, sincere commitments from farmers and adequate capital have enabled many farmer-run processing cooperatives to attain higher prices for members and to successfully compete with similar corporate-owned facilities for market share.

The Midwestern states where LOVAs are springing up are providing marketing research dollars which require involvement of local farmers and communities. North Dakota makes almost $1 million available each year to fund feasibility studies and market research, as well as legal fees and other start-up costs associated with the establishment of new crop or livestock-based businesses. Sarah Vogel, North Dakota Commissioner of Agriculture, says this research and development support has enabled the creation of dozens of projects to facilitate farmer-owned crop and livestock value-added ventures. Vogel says she and other Agriculture Commissioners

from around the nation are developing a proposal for the 1995 farm bill that will make block grants for similar rural development initiatives available to each state from the federal government. "The federal government should help emulate and foster this kind of state-supported rural economic development," Vogel says, because it has been successful at adding value to farmers' income and the rural economies they support. "People are beginning to see opportunities that could run to $10 to $20 million," according to Duaine Flanders of the Agriculture Utilization and Research Institute (AURI) of Minnesota.

The farmer-directed marketing research has enabled farmers to focus on: retail and consumer demands for quality products, capturing newly- emerging markets for unique products, and diversifying risk by establishing a strategic relationship with other processors in the market.

"Let's face it," says John Gardner with the North Dakota State Research and Extension Center, "if you're going to process mainline commodities, the only way to compete with ADM and Cargill is to make your product or your operation unique."

The research and development funding has enabled farmers to obtain "a whole new set of skills that you generally don't learn on the farm," says Ralph Hilgendorf of Whole Grain Milling Co. who processes and markets his own grains.

One of the most successful examples of North Dakota's farmer-operated cooperatives is the Dakota Growers Pasta Cooperative in Carrington, North Dakota. The cooperative was formed in 1993 by more than 1,000 farmers who were unhappy with cash market durum prices. "Pasta demand and prices were going up while durum prices were going down ... farmers in North Dakota knew they could do better," says Gardner.

Cooperative members now receive approximately $7.00 per bushel for their wheat in the form of cash grain payments and processing dividends. Dakota Growers Pasta Cooperative has displaced many of its corporate competitors by supplying retailers across the country with pasta processed from the highest grade durum wheat. Pasta sales have already been booked with quality-conscious retailers into 1996[6].

Meanwhile, in the South a few farmers are making LOVAs work on their own. Memphis workshop participants Laura Freeman of Laura's Lean Beef and Hunt Wilson, producing free-range chickens, are two who recounted the problems and successes of their efforts at the Memphis workshop. But these farmers successes pale against the backdrop of continuing expansion of huge corporations establishing integrated poultry and swine operations throughout the South. The success of these corporations shows the opportunities for farmer groups if farmer-directed research programs assist as they have in the Midwest. Food processing companies expect a return of 18-20% yearly on their investment (Heffernan et al., 1994)--making their sector the most profitable in the nation except for health-related companies. Food processors can make these kind of profits partially because farmers typically receive a maximum of 2-3% return on investment--with much of that coming from government program payments.

Farmers today only receive an average of 26 cents, compared to 37 cents in 1980, for every dollar spent on food at the store. Many farmers do much worse, wheat farmers only get 6 cents of the bread dollar and only 2-3 cents of the packaged

[6] Quotes on this page are from H. Smith (1994) unless otherwise referenced.

cereal dollar goes to farmers. The ability of farmers to stay in business will be continually weakened unless they can capture more of that 74% which goes to processing and marketing--the value added after production.

Mark Drabenstott of the Federal Reserve Bank of Kansas City says industrialization of agriculture is speeding up due to two powerful new forces: a new consumer and a new producer. The consumer is highly discriminating and demands customized food products to meet changes in lifestyle and eating habits. The new producer is armed with the capital and technology and production capacity to meet consumers changing demands (see Hewitt, 1994).

According to the surveys and focus groups of the State of the South project, the role of sustainable agriculture research and education is to help smaller producers gain the skills to become these new producers who integrate production and marketing. The flexibility of vertically integration could be a key to their success. If LOVAs are a key to sustainable agriculture as State of the South results suggest, then SARE must find ways to getting this flexibility to those interested in establishing LOVAs.

Innovation in the economics literature. Though economics and business research is not widely consulted in sustainable agriculture circles, the literature on entrepreneurship will be required reading if LOVAs are to be catalyzed in the South. The guru of entrepreneurship is Joseph Schumpeter (1947). He defines innovation as the key to economic change. Innovation is defined as setting up a new production function.--distinguished from science and technology which are not necessarily involved. He applauded the decline of older noninnovating firms as creative destruction and key to a capitalist market economy.

> "This process of creative destruction is the essential fact about capitalism . . .It is not [price] competition which counts but the . . . competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their very foundations and their very lives."

Innovation predicts small business success, while use of technology does not according to recent research by Young et al. (1993).

How can extension help farmers become innovators, quit competing on cost alone, and begin creating the new production systems which anticipate consumer demand. The business literature is clear and consistent with the holistic, multi-perspective, systems approach advocated in earlier chapters. Innovation being distinct from technology, research and education which integrates production and marketing must focus on decision-making and not on introduction of new technology.

As Delaney (1993) shows, a key characteristic of successful small firms is seeking multiple sources of information in order to put together the industry-transforming innovations. Sustainable agriculture research and education can help make those sources of production/marketing integration information available to farmer entrepreneurs.

The quality differentiation ideas of W. Edwards Deming and others who advocate continual change toward quality differentiation to maintain market share are

second nature in business circles. But this is a far cry from the commodity mentality and strategies which have historically driven agribusiness operations (Peterson and Swinton, 1992).

In rural areas of the South, rates of entrepreneurship, according to Reid (1988), are a function of knowledge and skill within the local labor force, quality of communication and information flow, level of vitality of small business sector, and current pattern of self-employment. Expanding research in these areas to determine how farmers can best access these key factors is one tack SARE could take.

Another would be to research and educate regarding the presence of the key factors promoting entrepreneurship. Helping communities achieve these characteristics and publicizing communities which do. The State of the South rural development readiness index discussed earlier (Map 15) was one attempt to use the local agent survey to accomplish the latter objective on a county basis.

An emphasis on making entrepreneurs the center of efforts for rural development is very consistent with the "constitutent empowerment model" endorsed by the USDA Cooperative Extension Service Strategic Plan released July 7, 1994. However, planning is one thing, implementation is another. How do we move toward an entrepreneur-centered approach to technical assistance where those farmer-entrepreneurs with experience in creating new value-added enterprises are at the heart of rural development programs. To move from the present system where salaried bureaucrats are at the heart of rural development programs will require major policy change, almost a paradigm shift. Farmers throughout the South will rejoice if the shift embodied in the CES Strategic Plan becomes reality.

But there are strong impediments to this effort to put farmer-entrepreneurs at the center of rural development efforts.

Bureaucracies and entrepreneurs mix about like oil and water. Total Quality Management (TQM) is often mentioned as a path to reinventing government. But one of the early contributors to the TQM movement was Schumpeter, whose theories we reviewed above as the cornerstone of modern entrepreneurship research (Delany, 1993; and Young et al., 1993). Schumpeter and his followers established the principle that creative destruction is the key to market-based economic development. Bureaucracies seek to perpetuate themselves and insulate themselves from market signals. Gibbons and Sethi (1993) show how some conservative bureaucracies have managed to buck this trend and embrace innovation. Will Southern agricultural research and extension bureaucracies be able to encourage creative destruction and assist farmer-entrepreneurs in creating the value-added industries which can transform the rural South?

Are rural development professionals seeking to understand the decision-making processes of farmer-entrepreneurs and understand the conditions which lead to more rural entrepreneurs?

Goodell (1984) asked the IPM community, "Do we really want IPM to work?" Teng (1994) notes that Goodell had to ask this question because IPM professionals were sending out ineffective technology packages which were not tailored to specific systems and "farmers' decision processes." We might ask a similar question of rural development professionals. Are rural development professionals seeking to

understand the decision-making processes of farmer-entrepreneurs and understand the conditions which lead to more rural entrepreneurs? The rural Southerners in the State of the South applaud the few rural development professionals who abandon their role as experts and enlist with farmer-entrepreneurs to seek the opportunities for creative destruction which will shape the economy of tomorrow.

Land, labor and capital are not the basis of economic growth, innovation is. Rural people who integrate production capabilities and emerging markets are the only ones who can create the new equations for rural economic growth and development.

There is talk of rural enterprise incubators being included in farm bill reauthorization. But if these incubators are organized around rural development "experts" instead of around successful farmer-entrepreneurs, we must ask our legislators the question: Do you really want sustainable rural development to happen?

Local power structures are often one of the worst impediments to rural development, especially in the South. Putting authority for rural development in the hands of county government often just strengthens a primary roadblock to rural entrepreneurs.

The 4th conclusion from the Memphis workshop is also being contradicted by many rural development initiatives being proposed for the upcoming farm bill.

Local power structures are often one of the worst impediments to rural development, especially in the South. A rural development program which puts authority and funds in the hands of the existing power structure (such as county government) often just strengthens a primary roadblock to rural entrepreneurs. Rewarding past failure by funding the local power structure in the poor rural South will not create a social infrastructure which encourages entrepreneurs. But, according to the Memphis conclusions, facilitating creation of networks of entrepreneurs by non-governmental agencies can cut through the entrenched bureaucracy and power structure which stifle rural innovation.

Establishing networks of entrepreneurs to encourage other budding rural entrepreneurs is the best way to overcome local power structures. A number of non-profits in Southern states are experimenting with such networks. Among the most successful are networks of wood products manufacturers coordinated by the Arkansas Rural Enterprise Center and the network of entrepreneurs assisted by the Kentucky Highlands Investment Corporation (recently called "the best rural economic development organization in the country" by Bob Nash, then USDA Under Secretary for Rural Economic and Community Development).

A vast literature exists on the success of networks of rural enterprises in coordinating manufacturing and marketing to increase profitability (e.g. Levin, 1993). Prominent examples cited where such networks have transformed rural economies are the Mondragon region of Spain (Whyte and Whyte, 1991) and central-northeastern Italy (Blim, 1992). Where rural networks of small enterprises have transformed local economies, consistently present is an atmosphere encouraging the competition of ideas and innovation (Flora and Flora, 1993; and Greenfield and Strickon, 1981).

Many states are establishing structures to facilitate such networks. It's time federal rural development policy recognized the successes of entrepreneur networks

and the value of an entrepreneur centered approach to rural development technical assistance.

The research approach which has been used to assist these networks is called action research. Action research involves a mutual learning process that generates local theories through dialogue of researchers and "insiders--the problem-owners" (Levin, 1993:197). The exploration and creation of enterprise innovations is flexible and adaptive through a planned change process which sets aside old traditions, conflicts and expected patterns of behavior. Action research creates new networks by facilitating social interaction among representatives of member organizations. Though widespread in Europe and Latin America, action research has been scarce in agriculture and the U.S (see Human Relations, volume 46, special issue on action research). Action research is widely used in management research with good research output defined as a "unique, effective, self-sustaining solution to the client's problems" (P.J. Smith, 1994:464).

University and federal research institutions are also a power structure which State of the South participants felt often stifle entrepreneurship. As the SOS Delta workshop concluded:

> **"We need a whole new research and education system, not just a few different projects."**

Successful enterprises must combine production and marketing expertise. Disciplinary boundaries and reward structures separate agronomy, animal science, agricultural economics and rural sociology and often discourage the multi-disciplinary cross-fertilization necessary to the creative destruction of innovation.

Some disciplines are beginning to wake up. The American Society of Agronomy (ASA) has established a new division devoted to breaking down the barriers between disciplines. This was done for a very practical reason: to keep from going extinct, as former ASA President, and Leopold Center Director Dennis Keeney (1993) put it. As academic disciplines have progressively become disconnected with the entrepreneurial innovation continually recreating our economy, support has dwindled for academic research.

The agronomists working in the new Integrated Agricultural Systems Division of ASA are trying to reverse that trend. One effort is a symposium at the St. Louis ASA meetings in October, 1995: "Integrating production and marketing research for sustainability: new crops and new uses." Along with the push by the National Association of State Departments of Agriculture for a New Uses Title (including support for farmer-owned value-added enterprises) in the farm bill, this symposium should help create more momentum toward an entrepreneur-centered approach to rural development and land grant research.

In general, sustainable marketing research would strengthen farmer-consumer ties, as State of the South focus groups argue. Marketing system research would help farmers, as Fleming and Hardaker (1993) put it, to focus on consumers as first and last sources of contact. The processes and activities between the farm and the consumer would be the key concern.

Sustainable rural development indicators. If increasing marketing alternatives

is the best route to sustainability, then the best indicator of sustainability would be adoption of alternative marketing approaches (keeping in mind the need to avoid calcified focus on individual indicators). Researchers studying the opposite of sustainable agriculture, famine, have reached a similar conclusion and gone further. The key indicator of the early stages of famine is "the adoption of abnormal and nonsustainable survival techniques which eat into the resource and capital base which the victim would normally try to preserve" (Walker, 1989). Similarly, debt/asset ratios are a key measure of the economic sustainability of a business. A high debt to asset ratio is the best indicator of farm financial stress according to the Economic Research Service of USDA (Harrington, 1988). World Bank officials such as El Sarafy (1991) and Goodland and Daly (1992) see maintenance of "natural capital" as the essence of sustainability.

Following Barbier (1989), then, the state and trends of a community's assets--whether natural, social or financial are the key indicator of sustainable rural development. Simultaneous enhancement of natural assets (e.g. soil organic matter and biological diversity) and financial assets would be the key indicators of a successful sustainable agriculture research and education program, along with indicators of the social capital (Flora and Flora, 1993) necessary to enhance natural and financial capital through alternative marketing. When farmers are creating local ownership of value-added enterprises they are creating productive assets which will enable all their other assets to be sustained and grow in value.

Three challenges for Sustainable Rural Development in the South.

Discussion of conventional wisdom of rural development "experts" is the best way of summarizing the current relationship of sustainable agriculture and rural development in the South

1. Conventional wisdom: Rural development efforts should work only with the rural poor, agricultural development efforts should work only with farmers .

Polarization best describes social relations in much of the rural South. Black-white, liberal-conservative, farmer-environmentalist, the list of entrenched polar opposites encompasses nearly every facet of social and economic relations--including rural development. Most community and rural development specialists work only with the poor communities. Meanwhile agricultural development rests in the hands of those who benefit from least-cost production of raw commodities. The farmers and land owners who control and manage the productive natural resources of the region have been ignored or even seen as the enemy of rural development. Agricultural development in the South has historically meant producing least-cost commodities more and more efficiently. The agricultural development and rural development communities are independent and often antagonistic--reflecting the endemic polarization of the rural South.

But rural and community development efforts cannot afford to ignore the most abundant physical resources of the South--abundant raw commodities. Similarly

short-sighted is reliance on least-cost production of raw commodities, especially under the threat of deep federal farm program cuts.

New efforts are needed to break the vicious cycle of polarization and pessimism by uniting rural communities around the vast opportunities available in creation of locally-owned value-added enterprises.

Food processing enterprises typically expect an 18-20% return on investment (Heffernan, 1994), among the highest of all sectors of the U.S. economy. Return to farms for raw commodity production averages 2-3%. Adding value to raw commodities before they leave the Delta could create jobs and keep the profits in rural communities. A cooperative of a thousand North Dakota farmers now produces pasta and jobs instead of selling durum wheat to be processed elsewhere. This pasta venture is one of over 20 cooperatives recently developed in North Dakota alone with the help of the Agricultural Products Utilization Commission. These limited equity coops produce and sell everything from buffalo to corn oil to organic grains.

This approach is working for rural areas in other parts of the country as well. Soybean and corn are processed by local cooperatives in Illinois and Minnesota and sold as value-added products instead of raw commodities. A community-organized buckwheat enterprise in Illinois sells direct to Japan. Wisconsin organic milk is bottled and marketed by a cooperative. Iowa and Minnesota both have state-funded agricultural value-added efforts. The list goes on and on. But the South lags behind.

2. Conventional wisdom: Rural and community development efforts should be channelled through local government authorities.

A key consensus of the Memphis workshop, refined at a subsequent Tuskegee workshop (Baharanyi and Hill, 1995) is that local power structures are often one of the worst impediments to rural development, especially in the South. A rural development program which puts authority and funds in the hands of the existing power structure (such as county government) often just strengthens a primary roadblock to rural entrepreneurs. Rewarding past failure by funding the local power structure in the poor rural South will not create a social infrastructure which encourages entrepreneurs. But, according to the Memphis and Tuskegee conclusions, facilitating creation of networks of entrepreneurs by non-governmental agencies can cut through the entrenched bureaucracy and power structure which stifle rural innovation. A key challenge identified at the Tuskegee workshop is enhancing community participation in entrepreneurial ventures.

Establishing networks of community-oriented entrepreneurs to mentor other budding rural entrepreneurs is the best way to overcome local power structures. A number of non-profit organizations in Southern states are experimenting with such networks. Among the most successful are networks of wood products manufacturers coordinated by the Arkansas Rural Enterprise Center and the network of entrepreneurs assisted by the Kentucky Highlands Investment Corporation--recently called "the best rural economic development organization in the country" by Bob Nash (1995), then USDA Undersecretary for Rural Economic and Community Development. So impressive are these accomplishments in Appalachia that Kentucky in 1994 established a legal mechanism (HB483) to facilitate such networks.

A vast literature exists on the success of networks of rural enterprises in coordinating manufacturing and marketing to increase profitability (e.g. Levin, 1993). Prominent examples where such networks have transformed rural economies are the Mondragon region of Spain (Whyte and Whyte, 1991) and central-northeastern Italy (Blim, 1992). Where rural networks of small enterprises have transformed local economies, consistently present is an atmosphere encouraging the competition of ideas and innovation (Flora and Flora, 1993; and Greenfield and Strickon, 1981).

3. Conventional wisdom: Understanding the social structure of poverty is best done through the traditional, reductionistic, quantitative methods of normal science.

Very little academic research has been done on the creation of locally-owned, value-added enterprises (LOVAs) in rural areas of the U.S. However, agricultural economists and rural sociologists are often aware of the expressed need for LOVAs and marketing alternatives in rural areas. Most justify their lack of research with variations of the statement: "There is just not enough good data.[7]"

If there is not enough quantitative data, most methods prominent in the agricultural social science disciplines do not provide solutions. Research addressing such areas is not likely to result in academic papers which pass the peer review process. As a result, economists and sociologists ignore extremely important problems in favor of problems more amenable to their methods. Prominent rural sociologists and agricultural economists are hard put to name any colleagues working to understand how locally-owned, value-added enterprises arise in rural areas, though the few exceptions are encouraging (e.g., Busch et al., 1994). We have a research system which is very good at solving problems but not adept at selecting questions.

University and federal research disciplines and institutions have become power structures which, according to State of the South participants, do more to inhibit than promote sustainable rural development. As the Delta workshop concluded:

> **"We need a whole new research and education system, not just a few different projects."**

A type of participatory research (labeled by some "action research") has been applied in hotbeds of cooperative, flexible networks such as the Mondragon region of Spain and in central north-eastern Italy. Action research involves a mutual learning process that generates local theories through dialogue of researchers and "insiders--the problem-owners" (Levin, 1993:197). The exploration and creation of enterprise innovations is flexible and adaptive through a planned change process which sets aside old traditions, conflicts and expected patterns of behavior. Action research creates new networks by facilitating social interaction between people across social and bureaucratic boundaries. Though widespread in Europe and Latin America, action research has been scarce in agriculture and the U.S. (see Human Relations, volume

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[7] Quotation was made by the Chairman of the Agricultural Economics Department of an 1862 Land Grant University in a Delta state in April, 1995.

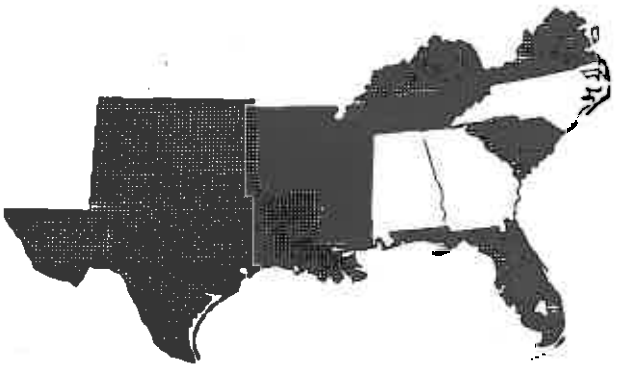
46, special issue on action research). Action research is widely used in management research with good research output defined as a "unique, effective, self-sustaining solution to the client's problems" (Smith, 1994:464).

The closest phenomenon in U.S. agricultural research is the fledgling movement toward farming systems research, which has been well-known for focusing on production rather than marketing constraints (Fleming and Hardaker, 1993)

Successful enterprises must combine production and marketing expertise. Disciplinary boundaries and reward structures separate agronomy, animal science, agricultural economics and rural sociology and often discourage the multi-disciplinary cross-fertilization necessary to the creative destruction of innovation.

The most useful rural development research efforts will be transdisciplinary action research addressing the key problem of rural development: how to create sustainable, locally-owned, value-added enterprises.

Chapter 11 Local food systems and sustainable LOVAs



"[B]uilding alliances between responsible farmers and educated consumers holds the greatest promise of supporting sustainable agriculture in the present climate." (Dale, 1994)

One particular type of locally owned value added enterprise holds perhaps the most promise for engendering sustainable agricultural systems on a local level. These are farm enterprises devoted to supplying a community with fresh, high quality food. These enterprises have been receiving national attention in the form of community supported agriculture (CSAs)[7]. The number of CSAs was over 400 in the 1994 growing season and increasing at about 20% per year (Clay, 1995).

Under the rubric of "local food systems and food policy councils," however, such LOVAs have taken on a far wider policy significance in many communities (Dahlberg, 1994).

A group of Southerners experienced in CSAs and other attempts at creating local food systems gathered for an Opportunity Workshop in Williamsburg, Virginia in February 1994 to determine the best opportunities in **Marketing and local food systems.** This group of farmers, researchers and agency staff from throughout the region concluded that increasing sustainability of semi-organic, peri-urban food systems will occur most cost-effectively through tightly targeted education efforts.

Eighteen opportunities were identified for further exploration. The common thread was a focus on non-formal education including: farmer-to-farmer, farmer-consumer and farmer-public policy efforts.

Three prototype projects were developed from these 18 opportunities. Both implementation considerations and outcomes/measurable indicators were developed for each prototype project. Below are a sampling of the opportunities and all three prototype projects.

Opportunity 3 Revamp extension communication.

Extension publications should become two-way means of communication.

[7]CSAs, also known as subscription farming, are groups of consumers who provide up-front capital to farmers in return for a weekly supply of food, herbs and flowers during the growing season. CSAs represent a type of LOVA.

Opportunity 4 Educate/Empower conventional farmers.

1 Remove 'depression' in farmers: feeling they can't effect larger systems and must just work ever harder on their ground and if they fail it is their fault alone.

2 Change values of some farmers so they are not just motivated by profit.

3 Investigate means of motivating "legacy" farmers: who inherit farms and work them, but just don't care.

Opportunity 6 Research/education related to regulatory process

1 Research/education is needed to inform the regulatory process with the goal of creating a system consistent with increasing consumer demand for a more healthy food supply.

1.1 especially look at meat, milk, eggs

1.2 Tyson gets rules set for poultry to their benefit, not small producer

3 Focus on the 85% of farmers who are not big-time operators.

4 Investigate possibility of waivers for smaller farmers--up to a certain level of production.

4.1 In VA, a small farmer can't sell raw milk or any milk off the farm unless he has a $30,000 'cow-equipped' grade A dairy, even if milking goats.

4.2 In poultry, must sell less than 20,000 birds a year to avoid regs.

4.3 Joel Salatin's recent problems are illustrative.

5 Part of the problem is that many consumers are scared of small farm production.

6 Research project: determine the actual cost of regulations to the consumer and include it in farm enterprise budgets.

6.1 Ask for funding when we next have Republican administration.

7 Research: study states whose regulations are not so prohibitive (see opportunity 17).

7.1 Education: make this comparative research into an education project.

Opportunity 8 Small farms as rural development.

1 Goal: educate county, regional and state officials to back coupons with local government funds--since they are a means of local rural development.

2 Research project on multiplier effects peculiar to local small farm production.

2.1 How dollars circulate and expand in the local economy from coupons/farmers markets/local value-added/local buying.

3 Document economic effect of extension working with small farmers.

3.1 Extension is good at lying with statistics.

4 Investigate unique advantages to older farms as a second job.

4.1 If solid marketing opportunities exist, the second job gives person just the extra leverage needed to stay in the rural community instead of moving to the city or having to commute to the city.

5 Research: Extent to which coupon/farmers market and similar programs help keep people from needing state benefits (e.g. welfare).

Opportunity 9 Change the reward system in the land grants.

1 if land grants are to look less like dinosaurs on the way to extinction, administrator-education is needed.

2 The reward system must be changed to insure that administrators reward qualitatively good research, not just lots of papers.

2.1 The disciplines control all too much, so a joint effort by a group of strong administrators will be needed to counter them.

2.2 This assumes that we have enough administrators in power who can tell good research when they see it.

2.2.1 May have to just get farmers/enviros/consumers controlling tenure/promotion decisions.

Opportunity 11 Research on how to start small processing/value added, local enterprises with profit-sharing to farmers.

1 This research would be designed to result in education materials for county-judge executives, chamber of commerce, boards of supervisors, small business development centers

Opportunity 14 Local food for local schools.

1 School systems sell lousy food and can't bring fresh, local in.

2 Everyone who thinks about it knows how bad school cafeteria food tastes and can imagine how lacking in nutrients it is.

2.1 It's so obviously silly and wrong to permit this situation to perpetuate itself that it is a great opportunity for action.

3 The potential market for local producers is immense.

Opportunity 18 Revamp curriculum of ag schools

1 Ag schools should produce people who really want to farm.

1.1 Farming must be a valued life-choice.

1.2 More hand work in the fields would help separate wheat from chaff.

2 Ag schools should not focus so tightly on processing and serving big agribusiness.

2.1 A lot more attention should be given to curriculum development and learning experiences to stress the value of farming--especially practical, small-scale value added and direct marketing.

PROTOTYPES

PROTOTYPE I Public education on local, biological farming.

Within parts of Opportunities 1, 15, 8, 2, 9, 10, 11, 12, 13, 17 were components to synthesized in a multi-faceted education project.

Implementation considerations

1 Consumers: changing the value people place on agriculture.
- 1.1 WIC coupons (turn into CSA)
- 1.2 CSAs
- 1.3 Grocery store shoppers
- 1.4 Coalitions, environmentalists, animal rights folks, medical

2 Is it a change in lifestyle or just gradually buying more of a different label?
- 2.1 A roundtable conference (supported by planning grant?) with farmers joined by all stakeholders (making sure land, animals, consumers, processors are represented in addition to farmers).
  - 2.1.1 Develop criteria for "sustainable" label. Explore: What do sustainable food systems look like?

3 How do we connect consumers to the farm?
- 3.1 Farm tours

4 What is the linkage between education and economics?
- 4.1 How do coupon dollars expand in local economy (multiplier effect)?
- 4.2 Supplemental income for retirees so they don't need state supplements.
- 4.3 Economic effect on prevention in
  - 4.3.1 health care
  - 4.3.2 environmental cleanup

Measures and Outcomes:

1 Consumer education:
- 1.1 **Overall goal:** change in behavior
  - 1.1.1 actual buying patterns: increase in sale of local farmers at local health food stores
  - 1.1.2 consumer surveys: reported behavior
- 1.2 change in value people place on agriculture.
  - 1.2.1 enrichment of society.
  - 1.2.2 How do we measure this?
    - 1.2.2.1 More people want to go into ag
    - 1.2.2.2 survey kids
- 1.3 increase economic health of local economies
  - 1.3.1 enrichment of society

2 Education: schools
- 2.1 will have classrooms on the farm/in the greenhouse
- 2.2 more farm tours being held
- 2.3 local schools have more local food served
- 2.4 urban-rural connections will be strengthened
  - 2.4.1 advantages of rural lifestyle seen
  - 2.4.2 abandoned land in local cities being used for food production

3 Education: administrators/officials
- 3.1 who are we focusing on?:
  - 3.1.1 local school system administrators
    - 3.1.1.1 sustainable ag taught in classroom
    - 3.1.1.2 more farm tours as part of curriculum
    - 3.1.1.3 schools buying local, sustainably produced food
    - 3.1.1.4 farming will be shown in curriculum to be a viable career choice
      - 3.1.1.4.1 career days will include farmers
    - 3.1.1.5 farmers use schools for meetings
    - 3.1.1.6 school cafeterias used as canneries in summer
    - 3.1.1.7 school libraries have an agriculture section
    - 3.1.1.8 local farmers will be teachers and consultants to local school system
  - 3.1.2 non-local school administrators/officials
    - 3.1.2.1 who?: bankers, realtors, lawyers, legislators, county judges, local chamber of commerce officials, rural development officials
    - 3.1.2.2 what outcomes?
      - 3.1.2.2.1 small farms are included in economic planning
      - 3.1.2.2.2 small and sustainable farmers included on "Board of Regents" of big universities
      - 3.1.2.2.3 leaders will switch from thinking bigger is better to smaller is smarter
      - 3.1.2.2.4 bankers will give loans to small, sustainable growers at same rate as big guys
      - 3.1.2.2.5 policies and decisions of bank and government officials incorporate farm practices of sustainable farmers in criteria used to get loans or rural dev assistance.
      - 3.1.2.2.6 Land grant universities are responsive to needs of sustainable farmers.
  - 3.1.3 small processors

PROTOTYPE II Educate/Empower conventional farmers.
Implementation:

9. The final conclusion is not nearly as specific as the above but will facilitate nearly all of the above recommendations. Agriculture needs a new research methodology or, even, discipline. The vast changes occurring in Southern agriculture, especially toward vertical integration, are viewed as a threat to be stopped by some. But these changes are powerful innovations in the unending creative destruction of the global agricultural system. And, to increasing numbers of Southern farmers, vertical integration is an innovation to be learned. The problem of turning these threats into opportunities through research and education is that no standard methods have yet emerged in agriculture for examining such emerging innovative systems holistically. Part of the answer may lie in the method of decision cases, long accepted in business and law is beginning to achieve inroads in agriculture. It may represent both an educational tool and a potential research method for examining such systems (Crookston, 1994).

All these innovations have involved integration of production and marketing. All are transforming agricultural systems and rural economies. Understanding these transformations is the key to the future of agriculture. Within all chaos lies the seed of creative, powerful new systems.

Flexible research and education systems willing to explore new and multiple perspectives are essential to creating and taking advantage of evolving opportunities. In particular, our analysis indicates the need for holistic systems approach to innovation in alternative marketing. The dynamic, chaotic nature of marketing innovations may have caused the inability of standard agricultural research methods to make progress in this area. If marketing innovations follow the rules of deterministic chaos, as the weather seems to, we may not be able to control or even predict very well the arrival of marketing innovations. Whether or not prediction and control result, the first step is careful observation. Just as information on weather condiitions is crucial to farmers, so is data on alternative market trends to enable farmers to adjust and take advantage of them.

Concepts from chaos theory, increasingly being applied in other areas of agriculture, will likely be dominant in this new agricultural research methodology. Researchers interested in this area will rely much less on controlled experiments and computer models. Emphasis will switch to participant observation and action research with existing successful entrepreneurs. Research and education priorities will revolve around the decision-making needs of farmers attempting to create locally-owned, value-added enterprises.

The marketing tools now available to most farmers (e.g. futures contracts) are based on a system of low cost production of undifferentiated commodities--consistent with the overwhelming emphasis of most agricultural research. Given world commodity prices below the cost of production and government payments decreasing, such a research emphasis may increase the sustainability of farmers who have the capital to produce enough. But the benefits accrue most to the biggest farms--making every farmer at risk of any farmer bigger than him.

The future, however, never lies in just more of the same. The future comes from the edges--from the innovation which transforms. Fifty years ago, when John Tyson and others began taking advantage of poultry market cycles to efficiently

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      - 3.1.2.2.6 Land grant universities are responsive to needs of sustainable farmers.
  - 3.1.3 small processors

PROTOTYPE II Educate/Empower conventional farmers.
Implementation:

1 Goal: Not just telling farmers what the most recent high value crop is.
1.1 Goal is to help farmer learn to continually diversify and transition into "sustainable"
2 Direct and continuous link with consumers will be key.
3 Farmer to farmer exchange will be crucial.
3.1 what are the character traits of both farmers and consumers that are the basis of success in certain markets?

Outcomes and Measurable indicators:

1 Farmers
1.1 Change in farm practices for more farmers.
1.2 Conventional growers attend sustainable ag workshop/conference.
1.3 Sustainable ag education is available through extension.
1.4 Farmers know about SARE and SAWG.
1.5 Education leads to an increase in profits
1.6 Farmers use computers more.

PROTOTYPE III Getting beginning farmers started growing for local systems.

A Mentor project (focused on Opportunity 5)

Implementation:

1 Involve mentors who are good at both growing and marketing.
2 Markets: look at successful examples: Fresh Fields, Whole Foods, and farmer-owned groceries.
2.1 Do pilots based on information gathered.
2.2 Value-added: how to start local canneries, use school cafeterias, start in home ec class.
2.3 Must address financing.
3 Farmers:
3.1 Team up older with younger
3.2 Sustainable with non-sustainable.

Outcomes and Measurable indicators:

1 Mentors:
1.1 identify successful examples
1.1.1 how and why
1.1.2 group types of successes
1.2 Disseminate information: video, e-mail.
1.3 Establish an advisory board of farmers and businessmen that makes itself available as consultants.

1.3.1 Use this board to educate community leaders.
1.3.2 Use with bankers.
1.4 Make sure the farmer mentors are as local as possible.
2 Develop criteria for new mentors: composition and distribution.

Conclusions on local food systems:

The above summary represent a thorough research-education agenda for local food systems. The keystone for building local food systems is education by mentors--those successful and experienced in creating more direct links between farmer and consumer. Local food systems will not be created by more research papers by researchers. Rather we need more education by mentors. Identifying successful creators and managers of local food systems and pairing them will others who want to learn is the best way to engender sustainable local food systems. Supporting this keystone are efforts to educate consumers.

Efforts to create food policy councils are a recent means of accomplishing this goal. Dahlberg (1994) has been promoting this effort, most recently with W.K. Kellogg Foundation support, to make local food systems a health and environment as well as an agricultural issue. One early efforts was in the South in Knoxville, but new initiatives are beginning throughout the country. In some places, city health departments have taken the lead. Insuring a high quality food supply, according to this approach, is a "sound social investment in contrast to the costly, curative approach of our `sick care' system" (Schiller, 1993).

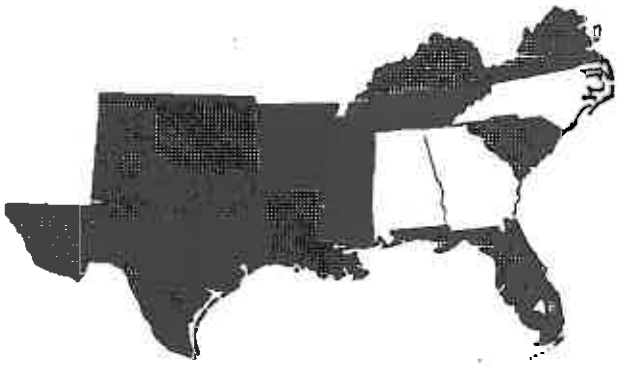
Some visionaries are so bold as to suggest that health policy and agricultural policy will someday be integrated. The Director of the Food and Drug Administration's Center for Food Safety and Applied Nutrition, Dr. Sanford Miller predicted in 1985 that within the next decade such an integration will occur in the next decade (Clancy, 1986).

Even the mainstream agricultural press is coming to see local food systems as a wave of the future. An editorial in the Kentucky-based Farmer's Pride said it this way:

> "Years ago, people produced food for themselves and for others in the community. Soon, however, came the wonders of major transportation and markets opened. From there, we became part of a "global market." A global market is fine if you don't mind competing with people who make $1 an hour and live in mud huts.
>
> So, today, when people talk about alternative agriculture they usually mean . . . a specialty product that has a unique market, or a person produces something that is marketed directly within the community or region" (Burton, 1994).

Such support from the mainstream agricultural press indicates the movement to sustainable local food systems just may be getting up a head of steam.

Chapter 12. Synthesis: uniting innovation, networks and sustainability



This process of creative destruction is the essential fact about capitalism . . .It is not [price] competition which counts but the . . . competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their very foundations and their very lives. ***Joseph Schumpeter***

The State of the South project aims to determine the key constraints and best opportunities for increasing sustainability of Southern agricultural systems. Based on the contributions of thousands of Southerners, six key constraint areas have emerged:

1. Profitable and environmentally sound production practices--especially related to pests/habitat management and soil fertility-biology.
2. Sustainable marketing alternatives focusing on locally-owned value-added enterprises.
3. Information/communication/feedback systems between producers and researchers stressing whole farm systems and farmer to farmer exchange.
4. Policy research to define policies which will increase sustainability at all levels of the agricultural system--concentrating on marketing policies, env. sound commodity programs, changing research/education paradigms.
5. Farmer/environmentalist/consumer interaction and communication.
6. Water quality--especially focusing on animal waste management.

From December 1993 to March 1995, the State of the South project sponsored workshops to uncover the opportunities in agricultural research and education which would most move Southern agricultural systems toward more sustainability.

Summarizing all these workshops: Integration of production and marketing research and unity of farmer-environmentalist attitudes are the two accomplishments which would contribute most to sustainability of Southern agricultural systems. **Sustainable production is increasingly impossible without marketing alternatives--especially locally-owned, value-added enterprises. Progress toward a cleaner environment is held up by the polar attitudes of farmers and environmentalists.**

Success has been achieved on both these fronts, but often with non-traditional agricultural research and education methods. Progress in marketing will requires changing from a commodity to a product focus. Southern agricultural research and education staff can best assist by applying methods from entrepreneurship research

for innovating production/marketing systems to anticipate and respond to consumer needs. County-level staff can assist by taking a professional stance of empowerment of their farmer clients and examining the use of decision cases as an educational tool.

Innovations at the intersection of production and marketing seem to be chaotic, transformational phenomena which will be immune to traditional controlled experimentation. Instead the "action research" methods popular in managerial research should be employed.

Progress toward the second goal, farmer-environmentalist unity, could be hastened by borrowing from social science methods of responsive constructivism and conceptual pluralism. County-level staff can become facilitators of such processes by abandoning "circle-the-wagons" tendencies and learning methods of creative synthesis of ideas.

A third conclusion common to these workshops is: Southern farmers organize hugely complicated systems and increasingly need research/education efforts which take a holistic systems approach. The key for researchers is not to focus on components so narrowly that the emerging properties of the whole farm or enterprise become ignored. Soil biology certainly is a top specific agronomic priority, especially when integrated with work on cover crops and pest control. But a narrow focus on improving soil quality can easily miss the target. Part of the problem is looking for "the key" rather than looking to increase the overall resilience of the system by generating multiple options and thereby flexibility for farmers. Changing the reward system for researchers, especially expanding peer review panels to include farmers and other systems managers, will be crucial to accomplishing this objective.

Fourth, to increase sustainability, we must increase farmer resilience. To increase resilience, we must increase flexibility. To increase flexibility, we need to increase options available to farmers. **The key options desired by farmers in the South are marketing alternatives--especially locally-owned, value-added (LOVA) enterprises.** Focus groups, workshops and the survey were unanimous in advocating more research and education into alternative markets.

5. The indicator of sustainability most important to Southern farmers is the condition of their assets. If new options lead to increasing assets (including soil, equipment, financial, biodiversity and new joint business ventures), they will be likely lead to increased sustainability of Southern farmers. The best indicator of sustainability, therefore, are farmers' assets (from soil to cash in the bank).

6. The best route to increasing marketing options for sustainable products lies through strengthened ties between farmers and consumers. Efforts to create more local food systems are one part of this effort, as are efforts to achieve farmer-environmentalist unity on policy issues, and efforts to integrate production and marketing to achieve continual innovation toward consumer satisfaction.

7. The key for educators is to adopt an empowerment model where the goal is to help farmers and other clients become the hubs of multiple information sources. One aspect is encouraging farmer to farmer information exchange. Another is facilitating farmer-researcher networks.

8. In marketing, engendering LOVAs means building technical assistance to farmers around the experienced LOVA entrepreneurs. Direct farmer involvement is crucial in any research, especially marketing research, undertaken to support such a technical assistance program.

9. The final conclusion is not nearly as specific as the above but will facilitate nearly all of the above recommendations. Agriculture needs a new research methodology or, even, discipline. The vast changes occurring in Southern agriculture, especially toward vertical integration, are viewed as a threat to be stopped by some. But these changes are powerful innovations in the unending creative destruction of the global agricultural system. And, to increasing numbers of Southern farmers, vertical integration is an innovation to be learned. The problem of turning these threats into opportunities through research and education is that no standard methods have yet emerged in agriculture for examining such emerging innovative systems holistically. Part of the answer may lie in the method of decision cases, long accepted in business and law is beginning to achieve inroads in agriculture. It may represent both an educational tool and a potential research method for examining such systems (Crookston, 1994).

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The future, however, never lies in just more of the same. The future comes from the edges--from the innovation which transforms. Fifty years ago, when John Tyson and others began taking advantage of poultry market cycles to efficiently

integrate egg, feed and processing needs in Arkansas, no similar innovation had ever been seen in agriculture (Stewart, 1995b). Oklahoma has never been known for hogs, yet hog production doubled in 1994 in Oklahoma and agriculture officials expect a quadrupling in the next two years (Stewart, 1995a). Wheat growers have never before owned a pasta plant, but this and thirty other value-added farmer-owned enterprises have arisen in the past few years in North Dakota.

> ***"Value-added processing . . . may be the only way a farmer can market his commodities at a fair price come the year 2000."***
>
> ***Lee Estenson, Vice-President***
> ***St. Paul Bank of Cooperatives***
> ***(in Pates, 1995)***

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However, the creative destruction of innovation often spirals out of control, as the abandoned cities at the birthplace of agriculture attest. Land is not just grist for industry's mills. Good soil, clean water and wildlife habitat are easy to destroy and hard to replace. The food and fiber we all need can be a part of that destruction or contribute to the renewal of these resources. Farmer-consumer-environmentalist coalitions focused on locally-owned, value-added innovations can provide the impetus for research, education and policy change. Then sustainable agriculture research and education can help farmers create both a sound rural economy and a clean environment in the South.

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integrate egg, feed and processing needs in Arkansas, no similar innovation had ever been seen in agriculture (Stewart, 1995b). Oklahoma has never been known for hogs, yet hog production doubled in 1994 in Oklahoma and agriculture officials expect a quadrupling in the next two years (Stewart, 1995a). Wheat growers have never before owned a pasta plant, but this and thirty other value-added farmer-owned enterprises have arisen in the past few years in North Dakota.

> ***"Value-added processing . . . may be the only way a farmer can market his commodities at a fair price come the year 2000."***
>
> ***Lee Estenson, Vice-President***
> ***St. Paul Bank of Cooperatives***
> ***(in Pates, 1995)***

All these innovations have involved integration of production and marketing. All are transforming agricultural systems and rural economies. Understanding these transformations is the key to the future of agriculture. Within all chaos lies the seed of creative, powerful new systems.

However, the creative destruction of innovation often spirals out of control, as the abandoned cities at the birthplace of agriculture attest. Land is not just grist for industry's mills. Good soil, clean water and wildlife habitat are easy to destroy and hard to replace. The food and fiber we all need can be a part of that destruction or contribute to the renewal of these resources. Farmer-consumer-environmentalist coalitions focused on locally-owned, value-added innovations can provide the impetus for research, education and policy change. Then sustainable agriculture research and education can help farmers create both a sound rural economy and a clean environment in the South.

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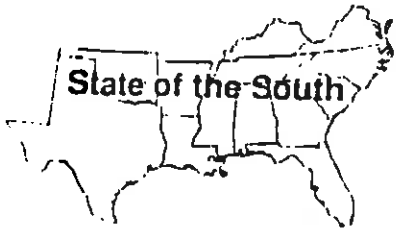
Appendix 1: Survey questions.

SUSTAINABLE AGRICULTURE SURVEY

MARCH, 1993



DEPARTMENT OF ANTHROPOLOGY
THE UNIVERSITY OF GEORGIA

SUSTAINABLE AGRICULTURE SURVEY

Please take a moment of your time to answer the following questions. Your answers will help us better understand sustainable agriculture in your state. Thank you.

Below is a definition of sustainable agriculture as defined by the Food Agriculture, Conservation and Trade Act of 1990.

> Sustainable agriculture is an integrated system of plant and animal production practices having a site-specific application that will, over the long term,
>
> 1. satisfy human food and fiber needs;
> 2. enhance environmental quality and the natural resource base upon which the agricultural economy depends;
> 3. make the most efficient use of nonrenewable resources and on-farm/ranch resources and integrate, where appropriate, natural biological cycles and controls;
> 4. sustain the economic viability of farm/ranch operations;
> 5. and enhance the quality of life for farmers/ranchers and society as a whole

Please answer the survey questions with this definition in mind. You are encouraged to seek out others in your county to provide the most accurate answers.

Q1 For the following activities please indicate the extent of participation by farmers/ranchers in your county. Circle the appropriate number for each. The Not Applicable category should be circled only if no agricultural land in your county is suitable for the activity (for example, conservation tillage would not be applicable in a county without cropping systems). Responses for No, Minimal, Moderate, and Widespread Participation should be based on the extent of use on land suitable for the activity (for example, conservation tillage in relation to total cropland).

1 Not Applicable to My County
2 No Participation
3 Minimal Participation
4 Moderate Participation
5 Widespread Participation

1	1 2 3 4 5	total sustainable farming system
2	1 2 3 4 5	conservation tillage in cropping systems
3	1 2 3 4 5	reduced synthetic pesticide usage
4	1 2 3 4 5	reduced synthetic fertilizer usage
5	1 2 3 4 5	cover cropping or green manuring
6	1 2 3 4 5	crop rotation
7	1 2 3 4 5	integrated pest management techniques
8	1 2 3 4 5	improved animal waste management techniques
9	1 2 3 4 5	crop and livestock diversification
10	1 2 3 4 5	land forming to reduce erosion (terracing, contour planting, grade stabilization, etc.)
11	1 2 3 4 5	improved water management techniques (drainage and irrigation)
12	1 2 3 4 5	biological pest control
13	1 2 3 4 5	cultural pest control
14	1 2 3 4 5	controlled grazing (rotational, intensive, etc.)
15	1 2 3 4 5	farm machinery adaptations to promote erosion control
16	1 2 3 4 5	composting
17	1 2 3 4 5	manure distribution as fertilizer
18	1 2 3 4 5	ridge till
19	1 2 3 4 5	expert computer systems for farm management
20	1 2 3 4 5	fallow management systems
21	1 2 3 4 5	mulching
22	1 2 3 4 5	complete organic operation
23	1 2 3 4 5	sprayer calibration and application accuracy
24	1 2 3 4 5	alley cropping (crops grown in alleys formed between trees or shrubs)
25	1 2 3 4 5	forest stewardship
26	1 2 3 4 5	windbreaks and/or shelterbelts
27	1 2 3 4 5	integration of crop and livestock production systems
28	1 2 3 4 5	variety mixtures of single crops
29	1 2 3 4 5	native or "local" crops
30	1 2 3 4 5	polyculture farming (more than one crop grown in a field at the same time)
31	1 2 3 4 5	use of animals to control or eliminate brush for land reclamation
32	1 2 3 4 5	multiple-species grazing
33	1 2 3 4 5	reforestation
34	1 2 3 4 5	increasing biological diversity
35	1 2 3 4 5	other (please list) _____
36	1 2 3 4 5	other (please list) _____
37	1 2 3 4 5	other (please list) _____
38	1 2 3 4 5	other (please list) _____

Q2 What educational programs are currently being conducted in your county (by your organization or others) to address the issue of sustainable agriculture? Check all that apply.

1	___ farm profitability
2	___ alternative markets
3	___ total sustainable farming systems
4	___ conservation tillage in cropping systems
5	___ reduced synthetic pesticide usage
6	___ reduced synthetic fertilizer usage
7	___ cover cropping or green manuring
8	___ crop rotation
9	___ integrated pest management techniques
10	___ improved animal waste management techniques
11	___ crop and livestock diversification

12 ___ land forming to reduce erosion (terracing, contour planting, grade stabilization, etc.)
13 ___ improved water management techniques (drainage and irrigation)
14 ___ biological pest control
15 ___ cultural pest control
16 ___ controlled grazing (rotational, intensive, etc.)
17 ___ farm machinery adaptations to promote erosion control
18 ___ composting
19 ___ manure distribution as fertilizer
20 ___ ridge till
21 ___ expert computer systems for farm management
22 ___ fallow management systems
23 ___ mulching
24 ___ complete organic operation
25 ___ sprayer calibration and application accuracy
26 ___ alley cropping (crops grown in alleys formed between trees or shrubs)
27 ___ forest stewardship
28 ___ windbreaks and/or shelterbelts
29 ___ integration of crop and livestock production systems
30 ___ variety mixtures of single crops
31 ___ native or "local" crops
32 ___ polyculture farming (more than one crop grown in a field at the same time)
33 ___ use of animals to control or eliminate brush for land reclamation
34 ___ multiple-species grazing
35 ___ reforestation
36 ___ increasing biological diversity
37 ___ consumer education
38 ___ other (please list)

_____

Q3 What are the problems facing farmers/ranchers in your county? For each item that applies please indicate the extent of the problem in your county by circling the appropriate number

1 - minor problem
2 - moderate problem
3 - serious problem

1 1 2 3 waterlogging
2 1 2 3 soil salinity
3 1 2 3 soil alkalinity
4 1 2 3 susceptibility to plant pests and diseases
5 1 2 3 farm labor
6 1 2 3 worker health and safety
7 1 2 3 lack of quality assurance programs
8 1 2 3 depletion of ground water resources
9 1 2 3 excessive synthetic pesticide usage
10 1 2 3 excessive synthetic fertilizer usage
11 1 2 3 environmental problems from chemical usage
12 1 2 3 public health problems from chemical usage
13 1 2 3 inefficiency of water usage and on-farm water management
14 1 2 3 soil erosion
15 1 2 3 reduced biological diversity
16 1 2 3 overgrazing
17 1 2 3 deforestation
18 1 2 3 fisheries depletion
19 1 2 3 population/development pressure
20 1 2 3 farm profitability
21 1 2 3 adequacy of markets
22. 1 2 3 negative public opinion about farm chemical usage
23 1 2 3 excess use of organic waste (for example excessive manure application)
24 1 2 3 other (please list) _____
25 1 2 3 other (please list) _____
26 1 2 3 other (please list) _____
27 1 2 3 other (please list) _____

Q4 What research on sustainable agriculture is currently being conducted in your county by your organization or others? Check all that apply

1 ___ farm profitability
2 ___ alternative markets
3 ___ total sustainable farming systems
4 ___ conservation tillage in cropping systems
5 ___ reduced synthetic pesticide usage
6 ___ reduced synthetic fertilizer usage
7 ___ cover cropping or green manuring
8 ___ crop rotation
9 ___ integrated pest management techniques
10 ___ improved animal waste management techniques
11 ___ crop and livestock diversification
12 ___ land forming to reduce erosion (terracing, contour planting, grade stabilization, etc.)
13 ___ improved water management techniques (drainage and irrigation)
14 ___ biological pest control
15 ___ cultural pest control
16 ___ controlled grazing (rotational, intensive, etc.)
17 ___ farm machinery adaptations to promote erosion control
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20 ___ ridge till
21 ___ expert computer systems for farm management
22 ___ fallow management systems
23 ___ mulching
24 ___ complete organic operation
25 ___ sprayer calibration and application accuracy
26 ___ alley cropping (crops grown in alleys formed between trees or shrubs)
27 ___ forest stewardship
28 ___ windbreaks and/or shelterbelts
29 ___ integration of crop and livestock production systems
30 ___ variety mixtures of single crops
31 ___ native or "local" crops
32 ___ polyculture farming (more than one crop grown in a field at the same time)
33 ___ use of animals to control or eliminate brush for land reclamation
34 ___ multiple species grazing
35 ___ reforestation
36 ___ increasing biological diversity
37 ___ consumer attitudes and/or behavior
38 ___ other (please list)

_____

Q5 What groups are active in your county promoting sustainable agriculture? Check all that apply

1 ___ Rodale Institute
2 ___ Appropriate Technology Transfer for Rural Areas (ATTRA)
3 ___ Soil and Water Conservation District
4 ___ Farm Bureau
5 ___ Agricultural Stabilization and Conservation Service
6 ___ Cooperative Extension Service
7 ___ Soil Conservation Service
8 ___ State Departments of Agriculture
9 ___ commodity groups (please list)

_____

10 ___ other (please list)

_____

11 ___ none in my county

Q6 What are the factors keeping farmers/ranchers in your county from implementing sustainable agricultural practices? Check all that apply

1 ___ inadequate knowledge of sustainable agriculture practices
2 ___ perceived costs of implementation
3 ___ perceived difficulty of implementation
4 ___ pressure to increase crop/livestock productivity
5 ___ lack of adequate markets for alternative products
6 ___ lack of consumer acceptance for alternative products
7 ___ negative farmer/rancher attitudes about sustainable agriculture
8 ___ lack of appropriate technology
9 ___ other (please list)

_____

Q7 Please check the five most important areas where additional research efforts are needed to address the sustainable agriculture issue. Add your own at the end if your top five choices are not on the list.

1 ___ farm profitability
2 ___ alternative markets
3 ___ total sustainable farming systems
4 ___ conservation tillage in cropping systems
5 ___ reduced synthetic pesticide usage
6 ___ reduced synthetic fertilizer usage
7 ___ cover cropping or green manuring
8 ___ crop rotation
9 ___ integrated pest management
10 ___ improved animal waste management techniques
11 ___ crop and livestock diversification
12 ___ land forming to reduce erosion (terracing, contour planting, grade stabilization, etc.)
13 ___ improved water management techniques (drainage and irrigation)
14 ___ biological pest control
15 ___ cultural pest control
16 ___ controlled grazing (rotational, intensive, etc.)
17 ___ farm machinery adaptations to promote erosion control
18 ___ composting
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23 ___ mulching
24 ___ complete organic operation
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26 ___ alley cropping (crops grown in alleys formed between trees or shrubs)
27 ___ forest stewardship
28 ___ windbreaks and/or shelterbelts
29 ___ integration of crop and livestock production systems
30 ___ variety mixtures of single crops
31 ___ native or "local" crops
32 ___ polyculture farming (more than one crop grown in a field at the same time)
33. ___ use of animals to control or eliminate brush for land reclamation
34 ___ multiple species grazing
35. ___ reforestation
36. ___ increasing biological diversity.
37 ___ consumer attitudes and/or behavior
38 ___ other (please list) _____
39 ___ other (please list) _____
40 ___ other (please list) _____
41 ___ other (please list) _____

Q8 Please check the five most important areas where additional educational efforts are needed to address the issue of sustainable agriculture. Add your own at the end if your top five choices are not on the list.

1 ___ farm profitability
2 ___ alternative markets
3 ___ total sustainable farming systems
4 ___ conservation tillage in cropping systems
5 ___ reduced synthetic pesticide usage
6 ___ reduced synthetic fertilizer usage
7 ___ cover cropping or green manuring
8 ___ crop rotation
9 ___ integrated pest management
10 ___ improved animal waste management techniques
11 ___ crop and livestock diversification
12 ___ land forming to reduce erosion (terracing, contour planting, grade stabilization, etc.)
13 ___ improved water management techniques (drainage and irrigation)
14 ___ biological pest control
15 ___ cultural pest control
16 ___ controlled grazing (rotational, intensive, etc.)
17 ___ farm machinery adaptations to promote erosion control
18 ___ composting
19 ___ manure distribution as fertilizer
20 ___ ridge till
21 ___ expert computer systems for farm management
22 ___ fallow management systems
23 ___ mulching
24 ___ complete organic operation
25 ___ sprayer calibration and application accuracy
26 ___ alley cropping (crops grown in alleys formed between trees or shrubs)
27 ___ forest stewardship
28 ___ windbreaks and/or shelterbelts
29 ___ integration of crop and livestock production systems
30 ___ variety mixtures of single crops
31 ___ native or "local" crops
32 ___ polyculture farming (more than one crop grown in a field at the same time)
33 ___ use of animals to control or eliminate brush for land reclamation
34 ___ multiple-species grazing
35 ___ reforestation
36 ___ increasing biological diversity
37 ___ consumer education
38 ___ other (please list)

Q9 What problems do you face, in your professional capacity, helping farmers/ranchers in your county implement sustainable agriculture practices? Check all that apply.

1 ___ lack of a clear definition of sustainable agriculture
2 ___ national agriculture policy does not stress sustainable agriculture
3 ___ state agriculture policy does not stress sustainable agriculture
4 ___ lack of farmer/rancher interest
5 ___ organizational priorities do not stress sustainable agriculture
6 ___ lack of time to work on sustainable agriculture projects
7 ___ lack of adequate funds for sustainable agriculture projects
8 ___ lack of opportunities for you to attend training in sustainable agriculture practices
9 ___ your lack of knowledge/experience in sustainable agriculture
10 ___ your lack of interest or disagreement with the sustainable agriculture concept
11 ___ other (please list)

Q10 Do you think agriculture can be profitable and environmentally sound?

1 ___ yes
2. ___ no
3 ___ don't know

Q11 Do you think farmers/ranchers in your county are capable of practicing sustainable agriculture?

1 ___ yes
2 ___ no
3 ___ don't know

Q12 Do you think farmers/ranchers in your county are practicing sustainable agriculture?

1 ___ yes
2 ___ no
3 ___ don't know

Q13 Are there young people in your county willing to take up farm life and practice sustainable agriculture?

1 ___ yes
2 ___ no
3 ___ don't know

Q14 Can farmers/ranchers produce enough food and fiber without using synthetic chemicals?

1 ___ yes
2 ___ no
3 ___ don't know

Q15 Do you think sustainable agriculture is economical?

1 ___ yes
2 ___ no
3 ___ don't know

Appendix 2:

Tables of mean responses by state, region and respondent group to State of South survey.

Table 1 - Extent of Current Participation in Sustainable Practices - Extension/SCS Responses By States

2 = no participation
3 = minimal participation
4 = moderate participation
5 = widespread participation
Responses of 'not applicable to my county' are not included in the calculations

Sustainable Practice	AL	AR	FL	GA	KY	LA	MS	NC	OK	TN	SC	TN	TX	VA
total sustainable farming systems	3.69	3.18	3.16	3.27	3.32	3.37	3.47	3.35	3.36	3.66	3.23	3.41	3.37	3.17
conservation tillage	3.62	3.36	3.12	3.62	4.30	3.34	3.98	4.01	3.81	3.49	3.84	4.07	3.48	4.46
reduced synthetic pesticide usage	3.36	3.24	3.30	3.44	3.41	3.27	3.10	3.49	3.29	3.31	3.39	3.27	3.40	3.65
reduced synthetic fertilizer usage	3.21	3.08	3.16	3.21	3.22	2.90	2.91	3.34	2.97	3.15	3.15	3.12	3.11	3.54
cover cropping or green manuring	3.64	3.10	3.55	3.55	4.25	3.08	3.24	3.85	3.05	3.10	3.24	3.90	3.17	3.93
crop rotation	4.00	3.99	3.72	4.22	4.46	3.72	3.97	4.55	3.72	3.64	4.56	4.24	4.12	4.47
IPM techniques	4.21	3.38	3.65	3.84	3.35	3.89	3.60	3.83	3.67	3.23	3.72	3.29	3.96	3.83
improved animal waste management	3.93	3.84	3.33	3.73	3.74	3.43	3.54	4.06	3.51	3.90	3.81	3.68	3.62	4.00
crop and livestock diversification	3.95	3.58	3.41	3.89	4.11	3.46	3.97	4.08	3.79	3.83	3.90	4.05	4.13	4.01
land forming to reduce erosion	4.26	3.48	3.35	3.96	3.71	3.75	4.31	3.99	4.29	3.75	4.12	3.51	3.93	3.79
improved water management	3.63	3.69	3.91	3.86	3.66	4.00	3.79	3.87	3.92	3.50	3.97	3.30	3.88	3.64
biological pest cont	2.90	2.73	3.12	2.93	2.81	3.00	2.91	3.05	2.99	2.67	3.11	2.85	3.10	3.10
cultural pest control	3.51	3.21	3.43	3.34	3.53	3.55	3.27	3.66	3.34	3.18	3.55	3.39	3.55	3.43
controlled grazing	3.54	3.45	3.62	3.66	3.49	3.55	3.68	3.50	3.59	3.51	3.41	3.36	3.85	3.51
farm machinery adaptations for erosion control	3.46	3.09	3.02	3.48	3.71	3.16	3.73	3.50	3.52	3.18	3.50	3.57	3.49	3.70
composting	3.17	3.41	2.93	3.04	2.94	2.93	2.90	3.18	2.91	2.86	2.98	2.95	2.97	2.89
manure distribution as fertilizer	3.69	3.99	3.24	3.68	3.85	3.18	3.23	4.12	3.39	3.43	3.67	3.56	3.30	3.97
ridge till	2.78	2.47	2.62	2.70	2.70	2.89	2.86	2.74	2.72	3.12	2.53	2.47	2.60	2.55
expert computer sys for farm management	3.07	2.92	3.01	2.87	3.00	3.07	2.92	2.91	3.15	2.53	2.92	2.90	3.06	2.90
fallow management systems	3.16	2.86	3.06	3.02	2.75	3.58	3.07	2.94	3.18	3.09	2.93	2.75	3.27	2.90
mulching	3.02	2.72	3.06	2.99	3.00	3.20	2.74	3.15	3.16	2.69	2.90	2.94	2.93	3.10
complete organic operation	2.39	2.43	2.50	2.35	2.41	2.25	2.33	2.51	2.54	2.47	2.29	2.44	2.52	2.60
sprayer calibration & application accuracy	4.14	4.03	4.04	4.07	3.85	4.19	4.07	4.05	4.08	3.37	4.01	3.89	4.06	4.12
alley cropping	2.48	2.35	2.38	2.49	2.31	2.33	2.42	2.44	2.49	2.89	2.37	2.33	2.47	2.34
forest stewardship	4.21	3.46	3.36	4.00	3.39	3.46	3.93	3.52	3.00	2.85	3.83	3.26	3.33	3.92
windbreaks/shelterbelt	2.89	2.59	3.10	3.01	2.87	2.63	2.89	3.12	3.53	3.03	3.22	2.64	2.98	2.81
integration of crops and livestock	3.76	3.04	3.24	3.63	3.68	3.38	3.51	3.80	3.96	3.37	3.50	3.51	3.71	3.65
variety mixtures of single crops	3.56	3.32	3.05	3.38	3.53	3.74	3.45	3.54	3.37	3.61	3.50	3.27	3.41	3.35
native or local crops	3.32	2.85	3.06	3.12	3.28	3.16	3.08	3.27	3.37	3.98	2.96	3.01	3.30	3.18
polyculture farming	2.80	2.46	2.61	2.75	2.75	2.36	2.79	2.72	2.74	3.95	2.77	2.61	2.76	2.63
use of animals to control brush	3.05	2.73	2.57	2.88	3.07	2.65	2.66	3.00	2.98	3.13	2.69	2.89	3.13	3.00
multiple species grazing	2.98	3.05	2.65	2.98	3.15	2.68	2.98	2.97	2.93	3.18	2.89	2.96	3.19	3.16
reforestation	4.40	3.80	3.81	4.22	3.38	3.89	4.27	4.09	2.74	3.51	4.48	3.40	3.24	4.18
increasing biological diversity	3.21	2.72	2.89	3.05	2.85	2.98	3.08	3.08	2.74	3.05	3.12	2.93	2.93	3.09

Table 2 - Current Educational Programs - Extension/SCS Responses By State - Percent Answering Yes

Program	AL	AR	FL	GA	KY	LA	MS	NC	OK	PR	SC	TN	TX	VA
farm profitability	84	83	71	81	95	90	82	96	92	65	75	92	97	95
alternative markets	75	67	76	63	77	79	84	80	84	67	75	78	86	85
total sustainable farming systems	45	35	14	26	20	35	36	47	31	10	30	38	27	29
conservation tillage	84	65	42	76	84	68	92	93	67	58	82	92	57	84
reduced synthetic pesticide usage	57	64	68	57	63	70	49	72	54	41	55	66	67	80
reduced synthetic fertilizer usage	50	51	65	47	52	54	31	73	44	65	48	51	42	79
cover cropping or green manuring	64	51	45	55	69	63	60	72	21	33	43	87	28	71
crop rotation	84	65	53	75	94	71	88	88	56	77	86	91	69	87
IPM techniques	86	63	84	69	69	76	74	88	74	79	82	65	86	92
improved animal waste management	73	80	56	73	78	46	56	92	62	84	68	88	42	80
crop and livestock diversification	75	67	50	64	85	63	74	67	70	70	75	78	89	72
land forming to reduce erosion	75	58	35	68	64	68	82	63	67	77	66	55	54	41
improved water management	75	73	77	75	65	83	75	69	61	65	73	63	69	61
biological pest control	50	49	65	39	35	59	34	68	34	35	39	47	56	68
cultural pest control	59	61	73	56	75	63	53	77	44	51	61	61	67	69
controlled grazing	77	77	73	70	85	67	78	84	87	60	70	90	84	80
farm machiner adaptations for erosion control	43	40	16	47	47	48	64	37	36	10	50	55	29	44
composting	84	72	66	66	52	63	42	73	34	33	52	46	33	41
manure distribution as fertilizer	64	88	53	66	69	51	45	80	48	32	66	72	39	80
ridge till	14	20	11	13	12	35	19	20	15	16	9	9	12	9
expert computer sys for farm management	64	52	47	36	40	59	38	56	59	33	41	51	62	43
fallow management systems	32	16	21	22	14	52	25	13	23	23	14	19	27	15
mulching	48	43	58	50	38	35	30	47	34	14	34	39	32	27
complete organic operation	9	13	15	6	6	6	9	11	3	12	9	4	11	17
sprayer calibration & application accuracy	89	89	82	83	86	89	81	92	87	63	89	85	85	87
alley cropping	7	7	10	7	11	6	1	5	2	16	2	2	2	4
forest stewardship	95	80	76	89	67	67	91	91	28	21	95	87	17	77
windbreaks/shelterbelts	9	19	29	18	15	10	9	19	36	28	18	4	21	7
integration of crops and livestock	52	41	45	52	67	54	49	65	69	56	52	65	58	55
variety mixtures of single crops	43	35	24	24	46	54	36	47	18	37	39	30	35	33
native or local crops	23	28	44	24	35	37	27	36	36	47	18	27	33	19
polyculture farming	14	13	13	17	25	13	23	19	11	44	14	10	17	8
use of animals to control brush	32	37	21	24	31	17	17	40	38	23	14	18	47	25
multiple species grazing	25	40	18	23	36	17	25	36	31	12	23	21	42	41
reforestation	95	81	73	87	58	68	83	83	21	88	98	74	17	75
increasing biological diversity	34	25	29	18	21	35	23	29	8	23	25	26	25	23
consumer education	77	79	71	69	75	76	68	80	54	63	57	64	63	71

Table 3 - Current Problems - Extension/SCS Responses By State

0 = no problem
1 = minor problem
2 = moderate problem
3 = serious problem

Current Problem	AL	AR	FL	GA	KY	LA	MS	NC	OK	PR	SC	TN	TX	VA
waterlogging	1.07	1.31	1.31	1.13	1.38	1.87	1.51	1.20	1.34	1.28	1.33	1.04	1.15	1.01
soil salinity	0.84	1.10	1.13	0.92	1.05	1.06	0.95	1.13	1.44	0.98	1.90	0.85	1.31	0.80
soil alkalinity	1.25	0.98	0.93	1.02	1.15	1.00	1.23	1.04	1.46	1.07	1.01	0.97	1.56	0.84
susceptibility to plant pests/diseases	2.36	1.88	2.45	2.27	2.17	2.59	2.29	2.33	2.14	2.21	2.26	2.19	2.30	2.12
farm labor	1.93	1.90	2.14	2.22	2.44	2.19	2.38	2.50	1.78	2.67	2.41	2.46	2.05	2.37
worker health/safety	1.57	1.45	1.72	1.59	1.81	1.75	1.85	1.71	1.43	1.53	1.65	1.53	1.56	1.57
lack of quality assurance programs	1.36	1.10	1.30	1.30	1.51	1.41	1.51	1.35	1.39	1.88	1.22	1.34	1.28	1.24
depletion of ground water resources	1.09	1.27	1.62	1.01	1.01	1.08	1.19	0.97	1.10	1.53	1.06	0.91	1.47	1.05
excessive synthetic, pesticide usage	1.07	0.99	1.41	1.13	1.21	1.70	1.32	1.27	1.11	2.14	1.22	1.17	1.18	1.19
excessive synthetic fertilizer usage	1.09	0.98	1.41	1.10	1.33	1.19	1.21	1.27	1.07	2.09	1.21	1.16	1.09	1.32
environmental problems from chemical usage	1.09	0.99	1.40	1.08	1.11	1.27	1.23	1.16	1.13	1.93	1.17	1.07	1.08	1.03
public health problems from chemical usage	0.91	0.85	1.11	0.90	0.96	1.44	1.02	0.97	1.10	1.33	1.01	0.91	0.94	0.91
inefficiency of water usage and on-farm water management	1.16	1.27	1.47	1.12	1.06	1.22	1.16	1.15	1.08	1.93	1.20	0.99	1.35	0.95
soil erosion	2.02	1.50	1.22	1.75	1.98	1.59	2.18	1.78	1.89	2.40	1.66	2.06	1.80	1.71
reduced biological diversity	1.07	0.86	1.13	1.11	1.16	1.05	1.10	1.17	1.08	1.51	1.17	1.12	1.13	1.04
overgrazing	1.39	1.44	1.35	1.37	1.47	1.32	1.59	1.40	2.03	1.95	1.48	1.62	1.81	1.59
deforestation	1.41	1.07	1.09	1.44	1.26	1.25	1.60	1.28	0.98	2.09	1.49	1.38	0.86	1.11
population/development pressure	1.34	1.22	1.77	1.70	1.35	1.54	1.44	2.03	1.17	2.09	1.73	1.64	1.25	1.87
farm profitability	2.39	2.38	2.21	2.51	2.62	2.59	2.66	2.51	2.59	2.16	2.57	2.58	2.65	2.45
adequacy of markets	2.20	1.91	1.81	2.20	2.53	2.32	2.37	2.17	2.15	2.49	2.20	2.26	2.31	2.15
negative public opinion about farm chemical usage	1.80	1.60	1.94	1.77	1.70	1.94	1.92	2.00	1.65	1.70	1.69	1.95	1.85	1.93
excess use of organic waste	1.18	1.16	1.06	1.19	1.10	1.02	1.07	1.18	1.06	1.14	1.10	1.08	0.94	1.12

Table 4 - Current Research - Extension/SCS Responses By State - Percent Answering Yes

Research Program	AL	AR	FL	GA	KY	LA	MS	NC	OK	SC	TN	TX	VA
farm profitability	42	44	37	33	53	52	43	35	41	37	30	49	63	39
alternative markets	31	51	47	32	52	41	51	11	28	40	19	53	46	44
total sustainable farming systems	20	23	21	14	10	24	25	12	23	9	14	22	18	13
conservation tillage	40	40	19	46	52	51	66	57	33	30	35	58	34	39
reduced synthetic pesticide usage	29	35	55	28	37	51	17	37	34	44	28	30	41	45
reduced synthetic fertilizer usage	27	28	56	27	37	44	12	36	28	37	26	38	34	49
cover cropping or green manuring	27	15	26	26	30	40	24	35	13	12	14	40	14	21
crop rotation	44	39	35	41	52	38	54	48	26	37	33	42	41	39
IPM techniques	64	39	61	44	43	54	43	52	56	47	37	35	58	55
improved animal waste management	44	51	37	34	48	30	41	53	30	53	33	40	20	37
crop and livestock diversification	31	23	35	23	35	29	29	28	30	23	19	29	51	25
land forming to reduce erosion	29	37	18	32	25	35	45	21	31	35	28	21	25	12
improved water management	27	45	58	28	26	41	24	20	30	35	35	21	42	16
biological pest control	24	25	48	24	21	27	25	35	23	30	19	27	34	36
cultural pest control	18	28	48	20	32	49	22	37	25	33	21	26	37	27
controlled grazing	29	44	48	24	58	40	38	43	57	30	33	49	51	48
farm machiner adaptations for erosion control	11	20	8	18	20	25	32	9	11	12	12	21	14	15
composting	36	43	47	39	22	41	21	48	15	21	14	25	17	19
manure distribution as fertilizer	18	39	14	18	31	42	24	47	21	40	40	40	17	35
ridge till	9	5	2	5	6	17	13	7	10	16	5	8	7	5
expert computer sys for farm management	13	24	23	20	25	35	26	13	23	33	7	26	30	16
fallow management systems	16	3	16	9	10	32	8	3	16	14	2	8	12	4
mulching	18	20	37	22	20	17	12	21	15	14	5	15	15	11
complete organic operation	4	9	6	5	4	2	4	4	7	7	2	3	6	7
sprayer calibration & application accuracy	27	59	48	31	32	57	36	28	38	26	30	43	38	29
alley cropping	4	3	2	2	6	2	3	1	2	7	0	2	3	1
forest stewardship	53	40	40	37	28	32	58	41	13	19	47	49	9	21
windbreaks/shelterbelts	4	5	15	5	6	0	5	5	10	12	7	1	9	1
integration of crops and livestock	20	19	26	15	15	22	14	23	23	16	14	17	27	13
variety mixtures of single crops	13	19	16	14	19	17	18	13	23	14	12	18	14	9
native or local crops	9	11	27	12	15	19	16	20	25	26	12	12	20	5
polyculture farming	11	11	13	11	11	5	11	9	8	26	5	7	8	7
use of animals to control brush	9	20	8	9	12	3	8	16	21	16	5	4	28	11
multiple species grazing	0	20	11	8	17	10	5	16	15	12	7	10	25	12
reforestation	47	43	39	44	19	38	50	40	7	51	40	37	10	20
increasing biological diversity	9	11	18	6	10	13	8	4	8	12	14	9	11	3
consumer behavior	7	21	12	16	10	29	13	12	16	26	14	18	18	11

Table 5 - Active Groups Promoting Sustainable Agriculture - Extension/SCS Responses By State - Percent Answering Yes

Active Group	AL	AR	FL	GA	KY	LA	MS	NC	OK	OR	SC	TN	TX	VA
Rodale Institute	0	12	0	0	0	0	0	0	1	0	0	1	0	1
Appropriate Technology Transfer for Rural Areas (ATTRA)	0	17	2	0	1	0	0	1	7	0	2	1	0	1
Soil and Water Conservation District	96	92	90	88	86	92	97	91	95	72	88	79	90	76
Farm Bureau	58	77	65	68	72	86	80	49	44	5	56	79	58	61
Agricultural Stabilization and Conservation Service	91	85	81	85	75	95	92	67	84	84	79	84	89	61
Cooperative Extension Service	98	95	89	94	93	98	96	96	97	98	95	99	91	92
Soil Conservation Service	98	93	92	94	91	97	97	84	92	93	95	93	92	76
State Depts of AG	62	12	44	30	43	63	46	31	46	81	44	69	40	40
Commodity Groups	29	12	23	17	28	38	16	15	21	12	7	12	17	12
Other Groups	18	12	10	7	5	8	11	9	7	7	2	3	6	9
None in My County	2	4	0	2	2	0	1	1	0	0	2	0	4	5

Table 6 - Farmer Constraints To Increased Implementation of Sustainable Practices - Extension/SCS Responses By State - Percent Answering Yes

Constraint	AL	AR	FL	GA	KY	LA	MS	NC	OK	SR	SC	TN	TX	VA
inadequate knowledge of sustainable ag practices	51	76	68	61	48	63	68	59	56	63	77	69	49	56
perceived costs of implementation	76	72	66	61	57	57	82	57	56	65	65	71	61	52
perceived difficulty of implementation	60	67	68	57	52	51	68	63	51	49	70	55	56	56
pressure to increase crop/livestock productivity	24	49	50	32	46	54	43	37	20	33	47	44	44	37
lack of adequate markets for alternative products	78	83	61	74	72	68	72	69	82	79	70	76	67	65
lack of consumer acceptance for alternative products	38	33	34	28	16	22	24	32	23	23	30	20	25	25
negative farmer attitudes about sustainable ag	44	69	52	42	47	40	46	48	52	63	40	44	42	52
lack of appropriate technology	24	47	55	47	23	41	46	40	33	47	35	42	34	44

Table 7 - Future Research Needs - Extension/SCS Responses By State - Percent Answering Yes

Research Need	AL	AR	FL	GA	KY	LA	MS	NC	OK	PR	SC	TN	TX	VA
farm profitability	67	83	74	79	81	81	76	67	79	26	84	81	72	81
alternative markets	53	77	56	66	63	46	68	53	62	60	53	55	63	61
total sustainable farming systems	24	40	58	30	27	30	38	39	26	47	33	42	34	29
conservation tillage	16	16	5	28	9	22	36	20	10	2	21	18	13	7
reduced synthetic pesticide usage	16	27	50	24	19	17	14	31	18	40	33	27	18	24
reduced synthetic fertilizer usage	13	19	48	13	12	11	9	8	8	16	26	18	12	15
cover cropping or green manuring	2	8	3	9	6	10	9	11	3	2	9	10	3	8
crop rotation	2	5	5	13	9	3	22	8	7	9	14	4	9	7
IPM techniques	27	28	44	34	31	44	26	31	43	33	33	38	34	28
improved animal waste management	13	48	18	30	17	14	16	23	15	26	12	30	8	15
crop and livestock diversification	18	16	29	19	27	16	20	15	28	26	23	20	35	25
land forming to reduce erosion	4	4	0	6	2	6	14	7	3	23	5	1	4	0
improved water management	22	25	40	9	7	25	17	5	5	21	12	9	21	11
biological pest control	38	35	53	34	20	25	18	33	15	35	28	25	18	28
cultural pest control	9	15	19	12	10	24	11	13	11	14	12	4	9	19
controlled grazing	4	24	18	11	15	11	11	11	25	5	9	15	19	23
farm machiner adaptations for erosion control	2	4	0	10	4	2	9	3	7	12	2	6	3	4
composting	11	15	6	14	5	13	5	7	3	7	5	7	5	4
manure distribution as fertilizer	22	40	21	27	10	13	20	15	11	7	23	13	9	11
ridge till	0	0	2	1	2	3	4	1	0	2	2	0	3	1
expert computer sys for farm management	22	13	13	16	7	16	16	7	15	14	19	12	17	13
fallow management systems	4	3	3	2	1	10	1	0	3	5	2	0	2	0
mulching	4	0	2	1	0	0	1	3	0	7	2	2	1	1
complete organic operation	11	13	16	4	7	6	4	12	3	23	2	8	5	9
sprayer calibration & application accuracy	7	7	10	5	4	2	5	8	8	5	9	7	4	3
alley cropping	0	1	2	0	1	0	0	1	0	5	5	1	1	0
forest stewardship	13	19	6	13	16	6	26	5	3	5	14	18	4	3
windbreaks/shelterbelts	0	0	0	1	0	0	0	0	0	5	0	0	1	0
integration of crops and livestock	20	11	19	13	19	13	17	11	25	9	14	10	23	17
variety mixtures of single crops	0	4	2	3	2	2	1	3	2	2	5	0	3	3
native or local crops	4	8	16	5	4	3	3	8	8	7	9	4	7	7
polyculture farming	11	9	8	6	4	2	5	7	2	19	7	2	4	7
use of animals to control brush	2	7	5	1	5	2	3	4	8	7	7	0	11	1
multiple species grazing	4	11	0	2	0	0	3	1	7	2	5	4	7	5
reforestation	7	7	5	13	4	3	13	1	3	21	9	11	3	4
increasing biological diversity	7	9	6	9	4	3	4	9	7	9	7	3	4	7
consumer behavior	13	35	27	22	20	13	13	25	26	33	16	21	12	17

Table 8 - Future Education Requirements - Extension/SCS Responses By State - Percent Answering Yes

Education Requirement	AL	AR	FL	GA	KY	LA	MS	NC	OK	SR	[illegible]	TN	TX	VA
farm profitability	59	83	71	70	72	79	73	59	69	42	82	78	71	75
alternative markets	52	67	50	57	53	52	58	41	57	51	48	49	57	56
total sustainable farming systems	27	37	58	42	28	43	40	43	33	42	43	44	38	33
conservation tillage	18	17	5	24	7	24	36	23	8	14	23	26	17	7
reduced synthetic pesticide usage	16	29	53	27	27	22	17	21	16	37	23	30	15	27
reduced synthetic fertilizer usage	7	20	45	16	21	19	12	13	7	23	18	22	12	23
cover cropping or green manuring	2	16	8	7	5	11	9	9	2	0	5	13	3	7
crop rotation	11	7	6	16	9	6	17	11	8	14	7	11	7	9
IPM techniques	27	13	48	35	36	41	30	37	48	42	30	39	34	19
improved animal waste management	25	45	18	28	22	17	19	24	15	5	16	13	10	12
crop and livestock diversification	18	16	18	22	28	19	27	16	25	23	30	22	38	17
land forming to reduce erosion	2	7	3	5	4	6	14	5	5	19	2	4	3	4
improved water management	16	23	44	16	11	24	18	5	8	26	11	10	24	7
biological pest control	36	24	53	26	15	22	16	24	13	33	16	13	13	23
cultural pest control	9	17	24	13	16	14	13	21	18	12	9	3	10	16
controlled grazing	5	24	15	9	26	13	12	7	23	2	14	20	21	28
farm machiner adaptations for erosion control	5	8	2	7	1	6	13	3	7	14	0	8	4	0
composting	9	17	10	18	4	11	5	11	5	9	2	8	2	7
manure distribution as fertilizer	18	47	21	23	9	16	17	16	10	12	25	13	9	12
ridge till	2	3	0	1	4	1	3	1	0	3	0	1	2	0
expert computer sys for farm management	27	16	13	26	15	22	25	12	18	21	27	17	21	7
fallow management systems	0	0	2	2	1	6	1	0	2	2	2	1	3	0
mulching	2	1	5	3	0	0	3	3	2	2	0	1	1	0
complete organic operation	9	11	10	4	4	0	4	7	2	7	2	3	2	4
sprayer calibration & application accuracy	18	15	8	11	10	8	5	11	7	2	14	11	5	7
alley cropping	0	1	2	0	0	0	0	4	2	2	2	1	1	0
forest stewardship	11	19	6	12	12	6	18	7	2	2	25	21	3	1
windbreaks/shelterbelts	0	0	0	1	0	0	0	0	0	0	0	0	0	0
integration of crops and livestock	18	11	18	16	16	6	13	8	26	9	16	4	14	11
variety mixtures of single crops	2	1	2	1	1	2	3	0	2	0	5	0	3	0
native or local crops	5	4	6	4	2	2	5	5	3	5	5	2	5	0
polyculture farming	11	3	2	3	1	2	3	7	0	7	2	2	2	3
use of animals to control brush	0	7	0	1	2	0	3	4	5	0	5	0	8	3
multiple species grazing	5	7	3	2	2	0	1	0	5	0	0	2	7	4
reforestation	5	11	3	13	2	5	18	5	2	16	7	9	2	1
increasing biological diversity	5	8	8	6	2	2	6	9	5	5	5	0	3	12
consumer education	11	13	29	24	22	14	12	27	21	23	18	16	14	28

Table 9 -Professional Problems In Helping Producers Implement Sustainable Practices By State - Extension/SCS Responses - Percent Answering Yes

Problem	AL	AR	FL	GA	KY	LA	MS	NC	OK	PR	SC	TN	TX	VA
lack of a clear definition of sustainable ag	52	81	79	74	64	78	74	56	61	47	70	75	67	61
national ag policy does not support sustainable ag	14	49	44	30	15	19	38	20	20	28	23	21	26	21
state ag policy does not support sustainable ag	14	33	39	26	11	14	34	15	11	65	20	12	19	16
lack of farmer/ rancher interest	55	77	71	63	65	68	69	67	75	35	68	63	69	57
organizational priorities do not stress sustainable ag	23	35	45	26	16	21	40	17	13	35	23	17	19	17
lack of time to work on sustainable ag projects	52	72	55	60	42	54	71	51	66	23	52	60	71	49
lack of adequate funds for sustainable ag projects	50	65	73	59	48	65	68	67	69	56	64	58	62	64
lack of opportunities for you to attend training in sustainable ag	14	51	47	36	26	35	44	21	13	44	45	37	27	28
your lack of knowledge/ experience in sustainable ag	9	25	16	14	17	3	13	5	21	2	9	13	9	17
your lack of interest or disagreement with the sustainable ag concept	2	8	18	7	6	10	8	9	10	5	5	6	6	15

Table 10 Other Questions - Extension/SCS Responses By State - Percent Answering Yes

Question	AL	AR	FL	GA	KY	LA	MS	NC	OK	PR	SC	TN	TX	VA
Do you think ag can profitable and environmentally sound?	98	96	92	88	93	97	94	96	93	95	93	96	92	93
Do you think farmers/ ranchers in your county are capable of practicing sustainable ag?	93	87	89	80	79	83	82	89	92	91	84	96	81	93
Do you think farmers/ ranchers in your county are practicing sustainable ag?	73	36	34	45	63	54	48	76	56	33	57	71	60	81
Are there young people in your county willing to take up farm life and practice sustainable ag?	68	53	55	38	49	52	52	48	52	74	34	69	52	53
Can Farmers/ranchers produce enough food and fiber without using synthetic chemicals?	7	5	6	3	4	3	1	5	7	19	7	6	6	7
Do you think sustainable ag is economical?	57	36	42	28	40	19	40	49	20	58	32	45	22	47

Question	Region Ext/SCS	Region Farm Bur	Region New Frm	Region SSAWG	Region Sierra Club
Do you think ag can profitable and environmentally sound?	93	92	95	96	94
Do you think farmers/ ranchers in your county are capable of practicing sustainable ag?	85	77	72	92	79
Do you think farmers/ ranchers in your county are practicing sustainable ag?	57	49	19	15	15
Are there young people in your county willing to take up farm life and practice sustainable ag?	52	44	16	62	40
Do you think sustainable ag is economical?	35	32	59	88	70
Can Farmers/ranchers produce enough food and fiber without using synthetic chemicals?	6	3	42	77	60