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MINNESOTA  
STATE GOVERNMENT  
**ISSUES**

STATE AGRICULTURE POLICY--  
PROVIDING FOR THE NEXT GENERATION

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**DRAFT**

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## I. INTRODUCTION

Issue Title: State Agriculture Policy

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### SUMMARY

This issue report addresses the development of a coherent long-range state agriculture policy. The study is future oriented and follows the theme of "providing for the next generation". The first steps to the future, however, begin with today. Therefore, the current farm financial crisis is a major focus of this report.

The project work includes defining the current situation, including the magnitude of the family farm financial crisis, and preparing policy recommendations and specific action proposals.

Section II describes the background and study process of the policy project. Section III presents the main findings from three supporting reports that form the basis for much of this study. The section concludes that Minnesota agriculture is in a deep financial crisis needing immediate action. Longer range issues are also identified.

Sections IV, V and VI identify three agricultural issues that are related and need to be considered at the same time. These are: (1) Family Farm Financial Crisis--Helping Farmers Stay on the Farm; (2) Agricultural Resource Stewardship--Protecting Farmland, Farm Family and Community; and (3) Information-Intensive Agriculture--Improving the Mix of Agricultural Inputs. The first issue is the immediate farm financial crisis which deals with farm financial survival for the next two years and beyond. The next issue concerns protecting the productive resource base so as to insure the long-run survival of agriculture. The final issue identifies some opportunities for improving the input mix so as to strengthen the long run financial base for agriculture.

Section VII presents a preliminary assessment of the potential budget implications of the the action proposals identified in the three issue chapters. Fuller definition of these budget implications will be developed on the basis of the public and agency review process to further define the action proposals.

## II. BACKGROUND

### Issue Background

This report was prepared as part of the 1984-85 Executive Branch Policy Development Program initiated by Governor Perpich. The purpose of this Program is to identify major policy issues affecting state government and to provide the Governor with policy options and recommendations for dealing with those issues.

State government has historically played a significant role as a builder and regulator of agriculture. Our state has actively supported export promotion, has provided marketing research, and has played a key role in agriculture education. It has encouraged health and safety standards for food processing and agriculture production, and has fostered land and water conservation. The state has provided financing for beginning farmers and acted to restrict corporate and foreign ownership of Minnesota farmland. Our farm management education system and our agriculture extension service have provided a variety of hands-on services to many farmers for many years.

But agriculture is changing in Minnesota, and state government must change its role in response to these changes.

The changes now occurring in agriculture in Minnesota and, for that matter throughout this country, are structural in nature. They emanate from a combination of stable or decreasing prices for farmers' products, increasing costs for production inputs, a continuing overproduction, and the inability or unwillingness of the federal government to assume a leadership role in setting an adequate agricultural policy.

These causes, and others, have combined to pose the most serious threat to Minnesota agriculture, and Minnesota farmers, that the state has seen in many decades. Many of our farmers are facing the imminent demise of their operations. According to the survey results discussed later in this report, over half of our farmers may be facing liquidation in the next ten years.

This extraordinary situation demands an extraordinary response from state government. However, government's ability to respond is limited. As will be noted below, many of the causes of our current farm crisis are beyond our control, and fiscal limitations prohibit us from doing everything we might like.

In addition, if these changes in agriculture are truly structural, and if they are nationwide in scope, it is necessary to recognize that Minnesota's agriculture must develop the ability to cope with the new realities of agriculture. Minnesota state government and Minnesota farmers must seek ways to deal with a future that includes high interest rates, production outpacing demands, low commodity prices, dependence on volatile export markets, and rising production costs.

Therefore, our task must be to define viable options for change which the state can implement and which are consistent with anticipated long-term fundamental changes in agriculture. And, we must do so in a way that recognizes the needs of the individual--the Minnesota farmer who has contributed so much to our state's society in the past, and who will be called on to continue to keep agriculture as our state's number one industry.

## Issue Charge

The issue charge established by the Governor's Energy/Environment/Resources Sub-Cabinet was the following:

"Charge to the Team: The project team is to develop the basis for a coherent long-range state agriculture policy. The principal focus of the project is to be on enhancing the fundamental economic and social viability of Minnesota agriculture for the long-range future by Minnesota initiatives, including assessment of the implications for Minnesota of proposed 1985 federal farm bills.

The central theme is "providing for the next generation". Included in this is concern for the next generation of farmers and their communities, the next generation of agriprocessing and the multiple benefits that are now just potentials, the next generation of people--here and abroad--that will need our agricultural products; and, sufficient farm income for the next generation of Minnesota agriculture."

The study team addressed the following specific issue areas:

1. Situation Assessment--Where have we been? Where are we going?
2. Agricultural Innovation--Seeds of the Future;
3. Land, Farmers and Community--Agricultural Stewardship;
4. Agriprocessing--Value-Added Strategy;
5. Export Agriculture--The Future of an Important Market; and
6. Federal Policy--Help or Hindrance?

## Study Process

The study process followed by the team included the following:

1. Individual and small group consultations with a variety of knowledgeable experts, interests, farmers and farm organizations;
2. Tours of the Waseca, Morris, Crookston and Grand Rapids agricultural experiment stations of the University of Minnesota. Tour of the Rodale Research Center, a private agricultural research station;
3. Farm visits to meet innovative farmers and see their farm operations;
4. Visits to the Crookston and Waseca Technical Colleges to discuss their role in agricultural education;
5. Visits with adult farm management instructors to learn how they work with farmers; and
6. Preparation of three supplementary reports to support policy considerations.

### III. REPORTS ON THE CRISIS OF AGRICULTURE

The recommendations of this study are based substantially on the three reports that were prepared to help define the issue. This section summarizes the central findings of these reports.

The first report, PROFILE OF MINNESOTA AGRICULTURE, is a compilation of statistics on the condition and structure of agriculture in Minnesota.

The second report, FAMILY FARM FINANCIAL SURVEY, documents the financial condition of Minnesota farmers and was conducted by Mid-Continent Research in July, 1984.

The third report, STATE INNOVATIONS IN AGRICULTURAL POLICYMAKING, was prepared by the Council of State Planning Agencies. It surveys several states for new policy approaches and specific actions that might be useful in Minnesota.

#### REPORT ONE: PROFILE OF MINNESOTA AGRICULTURE

##### Farm Size and Numbers

There have been dramatic structural changes in Minnesota agriculture:

The number of farms hit a historical low of 94,385 in 1982.

Mid-sized farms represent 69 percent of all farms but are on the endangered list. Since 1974 all decreases in the number of farms have occurred among medium-sized farms (50-499 acres). Minnesota lost about 1,500 medium-sized farms each year--15 percent of its 1974 base. The loss of medium-sized farms is accelerating--twice as many mid-sized farms were lost between 1978-82 than in the previous four years. Virtually every major farm county lost at least 10 percent of its mid-sized farms in 1978-82.

Growth in farms has occurred in two areas: hobby farming (under 10 acres) and large farms (500 plus acres). While mid-sized farms were decreasing, large farms increased in size (from 792 to 918 acres) and in numbers (15.9% between 1974-78).

##### Farm Ownership and Management

Family ownership and management is the strength of Minnesota agriculture. This strength is being challenged by the loss of record numbers of owner-operators and an aging farm population:

About two-third of Minnesota's farmland is farmed by its owner, about one-third is rented; 31 percent of Minnesota's farmland is owned by non-farmers.

As the size of farms increases, the proportion of fully-owned farms decreases dramatically. Only 31 percent of family farms having sales of \$100,000 or more were full owner operated.

Of Minnesota's 94,585 farms in 1982, 28 percent were operated by persons with a principal occupation other than farming. Between 1970-80, the farm population declined by 21 percent.

A substantially greater percentage of the farm population is between the ages of 40 and 64, compared to statewide averages.

In 1980, 26 percent of farm owners/managers were 60 years or over compared to 10 percent in the non-farm work place.

### Soil and Water Conservation

In 1982, soil loss in Minnesota was 6.4 tons per acre. Acceptable soil loss rates for Minnesota are 3-5 tons per acre per year. Eight million acres of Minnesota cropland and pasture land need some special protection from soil loss by erosion.

According to the USDA Soil Conservation Service, to achieve the desired level of water quality in certain problem areas, soil erosion may have to be reduced to a rate below that considered to be acceptable from a soil productivity standpoint. This could involve additional soil and water conservation practices for 4.2 million acres of land in Minnesota.

### Crops and Livestock

Forty percent of Minnesota's land area is crop production with 70 percent of those acres in corn, soybeans and wheat. Dairying continues to be the single largest sector of Minnesota agriculture accounting for 10-20 percent of all direct cash farm receipts. Most dairy farms tend to be mid-sized, the type of farm that is the bellwether of the rural community economic system.

Productivity increases have continued to increase production yields significantly since the early 70's:

Corn increased 19.8 percent when 1972-73 averages are compared with 1981-82 averages.

Soybeans increased 10.1 percent; wheat by 11.1 percent.

Dairy output per cow increased about 20 percent between 1970-83.

Structural changes have encouraged specialization within Minnesota agriculture:

The number of farms with livestock have declined since 1965, especially among farms having milk cows and hogs.

The percentage of cash crop farms increased as measured by increases in acreage for these crops.

### Farm Marketing and Income

While net farm income has increased 126 percent between 1960-82, inflation has climbed 226 percent.

Minnesota's net farm income has been very erratic during the 1970's and 1980's.

### Farm Finances

Debt service in 1982 accounted for 23 percent of total production costs. In total, interest expenses for Minnesota farmers totaled \$1.1 billion in 1982.

FmHA delinquency rates increased dramatically between 1976 and 1982, from 15.6 percent to 33.6 percent. A Norwest bank economist predicts that 4,500 farmers could go out of business during the next few years.

### Farmland Values

During the 1970's, Minnesota had the highest increase in land values in the nation. Average Minnesota farmland values escalated from \$248 per acre in 1972, to a high of \$1,310 per acre in 1981. In the early 1980's, export demand slackened, surplus supplies developed, and land prices fell dramatically. The average value of farmland on a per acre basis was \$1,310 in 1981, \$1,179 in 1982, and \$1,065 in 1983, which is an average 10 percent drop in both 1981-1983. A recent 9th District Federal Reserve System survey predicted a further drop in the coming year.

For the first time since the Great Depression, the U.S. has recorded three straight yearly declines in the value of farmland. Falling land values have eroded the farmers borrowing power while loss of potential capital gains is another concern. Average equity per Minnesota farm has dropped by more than \$55,000 between 1981-1983.

Many Minnesota farmers are now in financial peril because of farmland investments they made at inflated asset values, a situation made more precarious by lower farm prices and higher farm costs.

### Farm Related Employment

Farm and farm-related employment accounts for 9.0 percent of total state employment, but 21 percent of employment in rural areas. A minimum of 173,635 persons are employed directly in agriculture.

The Minnesota Department of Revenue estimates that each \$100 million in sales of agricultural products will have the effect of increasing employment by between 1,150 to 1,650 jobs, depending upon type of sale (dairy products, grain, etc.).

## Export Sales

In 1960, approximately 12 percent of U.S. farm income was derived from exports. Today, between 20 and 30 percent of total U.S. farm income is derived from exports.

Minnesota ranks 5th among states in agricultural exports. In terms of dollars, Minnesota exports about \$2 billion (\$1.8 to \$2.0 billion) worth of products each year. About 80 percent of Minnesota exports are concentrated in sales of corn, soybeans, and wheat.

Exports peaked in 1981 at \$2.4 billion; in 1985 they had fallen to \$1.8 billion--a decrease of 25 percent.

## Farm Production Costs

While realized gross farm income grew by about 88 percent between 1975 and 1982, total net income remained unchanged.

Between 1975-1982, interest paid by Minnesota farmers on farm mortgage debts increased by more than 300 percent - from \$160 million to \$526 million. Interest expenses, as a share of total farm expenses, doubled from 1977 to 1982, from 11 to 23 percent.

In 1982, approximately 95 percent of Minnesota's total cash farm receipts went to pay farm expenses.

## REPORT TWO: FAMILY FARM FINANCIAL SURVEY

In July, 1984, the Minnesota Department of Agriculture commissioned Mid-Continent Research to conduct a statewide survey on farm financial conditions. Surveys were sent to 1,500 farmers--41 percent responded indicating a very high interest by farmers.

### Key findings:

Thirty-six percent of Minnesota farmers face liquidation within two to five years;

Over 50 percent of Minnesota farm borrowers have debt/asset ratios over 40 percent. Half of them are above 70 percent;

In every major category--debt/asset ratio, net worth, farmers expectations about their ability to remain in farming--the financial situation of family farmers has worsened significantly.

### Debt to Asset Ratio

A majority of Minnesota farmers have a debt to asset ratio over 40 percent. Farmers with a debt to asset ratio over 70 percent will have great difficulty surviving over the next two years. Farmers with a debt to asset ratio below 40 percent have better chances of survival. Coupled with high interest rates, this deteriorating debt-to-asset ratio will make it almost impossible for many farmers to borrow needed operating credit, thus forcing them out of business.

<u>DEBT/ASSET RATIO</u>	<u>PERCENTAGE OF BORROWER</u>
70.1% - 100%	25%
40.1% - 70%	26%
10.1% - 40%	30%
under 10%	13%

### Net Worth

Farmers indicated that their net worth has decreased significantly during the last three years. Decreased net worth has been a major factor in blocking access to credit for farmers.

<u>YEAR</u>	<u>REPORTED NET WORTH DECREASED</u>	<u>REPORTED NET WORTH INCREASED</u>
1981-1982	35%	25%
1982-1983	50%	22%

### Farmers' Expectations About Their Ability to Remain in Farming

Over 54 percent of Minnesota farm borrowers believe they will be out of business within five years. This corresponds closely with those farmers in the 40 percent and above debt-to-asset ratio. Only 36 percent of farm borrowers believed they could make it until retirement. Over 35 percent of all Minnesota farmers believe they would be forced out within five years, meaning a loss of about 35,000 farmers before the turn of the decade.

The implications for employment, small businesses, agribusiness and rural community survival are enormous. For example, USDA estimates for each farm eliminated, about three jobs are lost, which would mean a loss of 75,000 to 100,000 Minnesota jobs. It is estimated that for every ten farms lost, one farm-related business will fold, meaning the loss of up to 2,500 to 3,500 businesses before 1990. Nebraska estimates that at current rates of farm liquidations, all their towns under the population of 900 will disappear before 1995.

## Impact on the Rural Economy

Farmers are coping with financial strain by the following:

Using less fertilizer	31%
Reducing their use of herbicides, insecticides	23%
Selling livestock	15%
Taking off-farm employment	14%
Adopting minimum tillage methods	12%
Selling equipment	6%
Selling land	3%

Farmers are also coping by borrowing more. Forty-five percent say that their borrowing has increased while only 9 percent have decreased. Because of low farm prices and high costs, farmers have had to substitute borrowed money for income.

Independent bankers, the Federal Land Bank, Production Credit Association, Farmers Home Administration, and individuals owning contracts for deed are highly exposed. Machinery and supply dealers have become lenders of last resort--17 percent of all farmers are not current on those accounts. The farmers with the highest debt-to-asset ratio hold about one-third of the \$12 billion farm debt. That means that about \$4 billion of that debt may be liquidated in the next two years.

### REPORT THREE: STATE INNOVATIONS IN AGRICULTURAL POLICYMAKING

This report was prepared by the Council of State Planning Agencies. The purpose was to survey the new policy approaches and specific actions other states have developed which might be useful to Minnesota. The report also provides an assessment of the current crisis in agriculture. The full report is available for review. The major conclusion that can be drawn from the report is that many of the most innovative state policy initiatives have already been implemented by Minnesota. This means that Minnesota needs to both make existing policies work better and to search for new solutions. This is what the following sections of this report address.

### CONCLUSIONS

To be blunt, the results of the Family Farm Financial Survey were worse than expected. The survey shows that Minnesota may lose 13,000 farmers in the next two years. Minnesota may lose an additional 14,000 within the next two to five years. The Profile of Minnesota Agriculture shows that this situation is caused by: low farm prices; high production expenses, especially interest costs; declining land values; and resultant erosion of borrowing capacity.

The central fundamental fact that Minnesota must face is that the farm economy is at the edge of a financial collapse unprecedented since the 1930's. To put it in current terms: if present conditions continue, the state will lose as many farmers in 1985 as it lost Iron Range miners in 1982. The loss of farmers is only the beginning. Main Street, small town businesses, banks, and urban areas are also going to pay the price.

Finally, the report on State Innovations in Agricultural Policymaking shows that Minnesota must look for new solutions. It is possible to learn from and work with other agricultural states, but ready made solutions from these states are not available. Agricultural states need to work together to develop innovative state agriculture policy and specific action proposals.

#### IV. FAMILY FARM FINANCIAL CRISIS--HELPING FARMERS STAY ON THE FARM

##### Definition of the Issue

The major cause of today's farm financial crisis is low net farm income. Combined with high farm debt loads, imbalance in supply over demand, increasing dependency on the unstable export market, under-developed domestic consumption, ineffective supply management, high interest rates and the strong dollar associated with federal budget deficits--all this adds up to a disastrous situation for Minnesota farmers.

The farm financial crisis also poses serious problems for Minnesota banks and rural communities for both the short and long-term future. Not since the lowest point of the 1930's have the rural people of Minnesota faced a greater threat to their economic survival.

The underlying cause of this crisis is simple economics. Farm prices have been kept too low to cover rising costs, especially interest rates. These inadequate farm prices have been the result of federal government policies aimed at maintaining relatively low consumer food costs, at boosting overseas sales by U.S. based grain companies, and at managing the national economy at the expense of overpricing the U.S. dollar in international trade. Unfortunately, these low commodity price policies have eroded the financial well being of Minnesota farmers, threatening rural banks and small town merchants as well.

The fact of agriculture's importance in Minnesota's economy makes this crisis serious for the entire state. It will severely affect our overall economy through the next decade, seriously reducing sales tax, property tax, and income tax revenues. These reductions in tax revenues will come at precisely the time when demands for governmental assistance to farm families will be the greatest.

##### Guiding Principles

Given the severity of the crisis, the seriousness of its overall impact on the state, and the importance of external forces, the following guiding principles of state agriculture policy should be used to develop specific action recommendations:

- A. The state must play a major role in solving agricultural problems at the state, regional and federal level. It must aggressively act on the problems of farm price, interest rates, farm debt and credit, export policy and development, land and water conservation, and hunger through effective lobbying of Congress and by innovative state programs. The state should also provide leadership in forming regional consortiums of neighboring states to maximize its impact on these issues.

State agriculture policy and action should recognize that the problems of agriculture must be addressed at the state, regional and federal levels. Individual states, multi-state regional cooperation, and the federal government all have different roles to play. The differing capacities of each level of government must be considered in defining the proper mix of state, regional and federal responsibility for action.

- B. Net farm income needs to be increased and the capital requirements of farming need to be reduced. State agriculture policy should work to improve net farm income by seeking to raise prices for farm products and to reduce the costs of production. The high interest costs and severe financial risks of highly leveraged farming need to be reduced.

In addition to seeking lower interest rates, state agriculture policy should help farmers reduce the capital requirements of farming. Top priority must be given to stabilizing the number of medium-size family farms by assisting farmers in financial distress.

- C. Supply management must be an important part of any solution to the problems of agriculture. State agriculture policy should recognize that for both the immediate term and the long run there is a serious potential for the supply of farm commodities to outpace the demand for these products. Weak farm prices now and in the future could result unless some form of direct or indirect supply management is practiced.

The state should promote a sound combination of supply management through federal commodity programs and supply management by developing major new markets to supplement the market demand from the traditional domestic food and fiber markets and the export market. Innovative agriprocessing to convert farm commodities into high-value products for the energy, chemicals and materials markets should be promoted as an indirect supply management practice.

- D. State agriculture policy should continue to promote export market development, but the risks associated with high dependence on the export market should be recognized. The risks of high dependency on the export market include increased instability of export sales and uncertain revenues from these foreign sales because of changes in the international exchange rate for the U.S. dollar. The state should promote market diversification and other risk hedging strategies to minimize the risk to farmers that are inherent in the export market.

The state should develop new uses for existing commodities, should expand the variety of crops produced in the state, and should promote more profitable ways to market state products, including Minnesota consumption of Minnesota grown and processed products.

### Specific Action Proposals

The following action proposals build off these Guiding Principles and are intended to help resolve the immediate farm financial crisis. Although state action can significantly shape agriculture policy at the state level, federal government policy will play a much more significant role during this crisis.

## FEDERAL ACTION

- A. Influence Federal Action In 1985--The major federal farm legislation will be amended in 1985 and the state should attempt to influence this legislation. State government must provide a lobbying team and commit resources so the state can play an effective lobbying role. The main objective should be to deal with fundamental structural improvements. The 1985 Farm Bill will require a major effort by the Governor and the Congressional delegation as well as by the Department of Agriculture and farm organizations. The areas of federal policy the state should attempt to influence are:
- 1) Farm debt restructuring and adequate operating credit at affordable interest rates should be provided through the Farmers Home Administration. In addition, the Federal Land Bank and Production Credit Associations should also take actions to restructure debt.
  - 2) Federal commodity program benefits should be targeted to small and medium-size full-time farmers, and be designed to insure maximum supply management program by all sizes of farmers.
  - 3) Federal commodity price programs should be redesigned to achieve fair prices. To achieve this goal, non-recourse loan levels on storable commodities should be raised to cover full production costs. This would eliminate the need for any expensive deficiency payments, and it would provide the floor under prices needed to restore stability to the farm economy. This approach must be in conjunction with effective supply management to prevent the build-up of unnecessary reserves;
  - 4) Direct assistance for soil and water conservation efforts is a legitimate use of public funds and should be targeted at protecting our most fragile resources and at rewarding proper management techniques. Resource conservation should be closely tied with farm commodity programs;
  - 5) Stabilizing commodity price fluctuations should be made a primary goal of commodity programs;
  - 6) Renewable energy and materials from agricultural biomass should be supported in the form of business tax credits, a ban on leaded gasoline, research and other means;
  - 7) Federal tax laws and policies that distort the economics of agriculture, disadvantage the family farm, and separate ownership from operation should be opposed; and
  - 8) Federal management of the economy to reduce the budget deficit, lower interest rates and reduce the excessively "strong dollar" exchange rate should be insisted upon. High federal deficits and interest rates over-price the U.S. dollar relative to foreign currencies, depressing commodity prices. High interest rates alone are a major cause of financial crisis for farmers.

- 9) Expanded federal food programs to help farmers and the hungry are needed. Food Stamps, school food programs and others need to be expanded.

#### STATE ACTION

- B. Farm Family Economic Crisis Assistance--The state should provide direct assistance to farmers and rural residents in financial crisis through a variety of existing and new programs including:
  - 1) Continuation and expansion of the Family Farm Advocate Program to maximize the availability of federal loan dollars to Minnesota farmers. Creation of a Family Farm Legal Advocacy program to provide class action protection training of private attorneys in protecting farm assets in bankruptcies and foreclosures, and provide legal advocacy for farmers in financial stress;
  - 2) Health insurance assistance for families who have been forced to drop all medical insurance due to economic conditions;
  - 3) The state should dedicate funds into a Special Farmers Retraining Fund to retrain farmers to work in other industries;
  - 4) Relocation assistance should be provided to farm families unable to keep farming.
- C. Monitor Farm Crisis and Bank Stability--The Minnesota Department of Agriculture and the Department of Commerce should develop a monitoring and data collection program that tracks closely the financial conditions of farmers and the relationship to the stability of banks and other financial institutions in Minnesota. Banks should be encouraged to be as accommodating as possible to those farmers considered to be good credit risks even though farmland equity has decreased. Particular attention should be given to the amount of farmland put on the market, because a flood of farmland for sale has the potential of creating a downward spiral of farmland prices, farm equity, and farm foreclosure.
- D. Control Outside Equity Investment--The state should close loopholes in the Minnesota Corporate Farm Ownership Act to prevent land speculation by non-farm limited partnerships. Investments in farmland by outside non-farm investors through a variety of arrangements should be carefully monitored. Any form of outside equity investment that seems to separate long-term farm ownership from operation should be discouraged. Consideration should be given to approaches which limit the sale of farmland from non-farm investors only back to the original farmer-operator or to beginning farmers qualified under the Family Farm Security Program. Eliminating the capital gains tax benefits from the sale of farmland by non-farm investors should be considered, alone or in combination with the above approaches.

- E. Ethanol Market Development--Additional measures should be considered to promote market development for ethanol produced from agricultural products. Specifically, the state should tax leaded gasoline as a way to promote the acceleration of the phase-out of lead in the environment to meet public health protection needs and to stimulate the ethanol market. Farm organizations and cooperatives that supply fuels to farmers should launch major market development programs to promote ethanol made from farm products.
- F. Regional Value-Added Plan--Minnesota should work to establish a multi-state regional task force to promote the development of high value-added fuels, chemicals and materials from agricultural products. A regional promotion plan should be prepared to encourage and promote this new agricultural market development. All states in the region can benefit from accelerating the development of this new market sector because it does not compete with existing agriprocessing, and successful market development can help cope with the expected excess of commodities for the future.
- G. Midwest Agricultural Consortium--The state should form a Midwest Agricultural Consortium of midwest states to develop regional cooperation in solving agricultural problems. The Consortium should cooperate on matters of price, agricultural credit, market development, exports, transportation, crop diversification, and agricultural research.
- H. Minnesota Department of Agriculture--The policy analysis, planning and implementation capabilities of the Department of Agriculture should be augmented to enable the Department to play an expanded leadership role in agricultural policy development. The number and importance of agricultural issues affecting the State of Minnesota has expanded. At the same time the federal government is not adequately dealing with these issues. This makes state leadership more important, requiring adequate resources for the Department of Agriculture to respond effectively.

## V. AGRICULTURAL RESOURCE STEWARDSHIP--PROTECTING FARMLAND, FARM FAMILY AND COMMUNITY

### Definition of the Issue

Actions to cope with the current farm financial crisis need to support and be supported by actions to promote agricultural stewardship to conserve and care for the productive resources of agriculture. Broadly defined, this agricultural resource stewardship includes: conserving and building a sustainable agricultural resource base; protecting the quality of life and health of farm families, rural residents, consumers and the Minnesota environment; promoting a new generation of beginning farmers and increasing the viability of medium-size farms; and stimulating rural development and rural communities based upon agriculture as a major source of economic and social growth.

Agricultural resource stewardship in the form of soil and water conservation legislation dates to 1937 in Minnesota. During the 1970's an extensive body of state legislation was passed to protect family farms, promote rural development, preserve farmland and protect the environment. Legislation to keep farm ownership and operation together was also passed. In the 1980's the Legislature passed further legislation to conserve the soil, preserve farmland, support family farmers and promote conservation tillage practices.

### Guiding Principles

The following Guiding Principles for promoting agricultural resource stewardship are aimed at conserving the productive resources of farming in the broad sense. Economic stresses have forced farmers to mine soil and water resources in an attempt to stay alive financially.

- A. Conserving and building the long-run sustainability and productive capacity of the natural resource base of agriculture must begin with strong state programs promoting soil and water conservation. The estimated average combined wind and water erosion in Minnesota amounts to 6.4 tons of soil loss per acre of farmland. This exceeds the acceptable 3 to 5 tons per acre annual erosion rate which soil scientists consider the long-term sustainable level for one acre of farmland.

This eroding soil takes agricultural chemicals and nutrients with it and impacts Minnesota's water resources. A range of state action is required to protect agricultural soil and related water resources. In addition to regulatory, cost-sharing and incentive programs, the state needs to promote farming technologies that help farmers make a profit and conserve natural resources at the same time. Particular attention must be paid to the effects on ground water supplies by agriculture chemicals and other products.

- B. Protecting the quality of life and health associated with farming must be an important concern for farmers and other Minnesotans. There are serious chronic health effects of modern farming practices. These range from farm accidents to the effects of agricultural chemicals and fertilizers. The state needs to monitor the results of the current \$1.4 million National Cancer Institute study of Minnesota farmers, due in mid-1985, and to evaluate other investigations to determine what the causes are and what the state should do to protect the health of Minnesota farmers and the general public.

Chemical usage needs careful monitoring. For example, nitrates and other chemicals associated with farming have been found in levels exceeding health standards in groundwater.

- C. Beginning farmers and owner/operators of medium-size farms need special attention because of their social and economic contribution. They are needed to keep the farming system healthy for the long-run. The state needs to continue its commitment to these farmers and medium-size farms (50 to 500 acres in size) which are the base of the farming population for rural areas.

Between 1978 and 1982, Minnesota lost 10% of the medium-size farms, while the number of farms larger than 1,000 acres increased by 16%. This shift means fewer people in the farming regions of rural Minnesota. It also means fewer school children, less main street business and weaker economies for small rural communities in farming areas.

- D. State agriculture policy must recognize the critical interrelationship of farms and rural communities. Small communities in agricultural regions are not participating in the general economic growth of Minnesota, most of which is occurring in urban centers. Past trends and the current farm crisis work against small farming communities. Various recent studies show the direct correlation between the decline in the number of farms and the decline in the health of farm communities.

To limit the decline of rural communities, the state must specifically include agriculture in the state economic development strategy to support rural community development. Rural communities should not have to depend on spin-off economic activity from the more urban regions of the state for their development. Both rural and urban communities will benefit from a strong agriculture-based economy.

### Specific Action Proposals

The following action proposals will promote agricultural stewardship to conserve and care for the productive resources of agriculture. In this issue area the state has a substantial ability to act on agricultural policy.

- A. Image of Agriculture--The state should take an active role in fostering a positive "image of agriculture" as a way to engender public empathy with and support for the agriculture initiatives discussed in this study. Urban Minnesotans should have the opportunity to gain a positive understanding of the current reality and future potential of farming. Agricultural education, such as the new "Agriculture in the Classroom" program, should be incorporated in urban as well as rural school education. Metro-area schools should be encouraged to use existing or planned interpretative opportunities such as FarmAmerica, the Agriculture Campus of the University of Minnesota, and the Wilder farm near Stillwater. Multi-state promotion campaigns should also be supported to develop a positive understanding and image of agriculture.
- B. Family Farm Security Program--This program for beginning farmers should be carefully reviewed for possible improvements. Since this program requires applicants to participate in adult farm management education, the pilot projects to expand and improve the scope of farm management education could focus attention on the needs of beginning farmers who need every possible advantage.
- C. Resource Stewardship Technology--Substantial attention should be given to the development of technologies that can promote farm prosperity and protect agricultural resources at the same time. Innovative conservation tillage and integrated pest management practices are examples of such agricultural resource stewardship technologies.
- D. Review Implications of Biotechnology--The implications of the new biotechnologies on farming and agriprocessing should be reviewed by a special board or the Pollution Control Agency.
- E. Resource Conservation and Protection--Programs to protect the land base and water resources upon which agriculture is dependent should receive increased support. A key to the success of these programs will be local planning and implementation within broad state guidelines and with state financial assistance. The Agricultural Land Preservation Program authorized by the 1984 Legislature would accomplish this and ought to receive priority attention for funding.
- F. State Tax Policy--State tax policy should be used to encourage sound environmental practices, discourage land speculation, and encourage preservation of medium-size farms. Taxation should be based on land valuation that is consistent with production valuation. If the current Tax Study Commission does not deal with these issues, then a special agricultural tax policy task force should be created.

- G. Indicators of the Health of Farmers, Farmland and Rural Communities--  
The state should build off of existing data indicator activities in order to better measure the health of farmers, farmland and rural communities. Physical and economic health should both be addressed. This may require epidemiological studies of the health of Minnesota farmers to track the health risks that some studies have indicated are a special problem for farmers. Monitoring the economic health of farms and rural communities should involve tracking indicators of the agricultural and dollar flows of farming to determine if these flows are draining resources or building them up within the system.
- H. Agriprocessing Support Program--Substantial resources for the promotion of agriprocessing projects that have a large positive effect on farmers and rural communities should be advocated. Both on-farm and off-farm projects and technologies should be promoted.
- I. Agriculture-Based Economic Development--The Department of Energy and Economic Development should develop a comprehensive agriculture-based rural community development program that employs all of the currently available development tools of the Department. This program must include coordination with the work of the Governors' Council on Rural Development, community development block grants, small business assistance, financing authorities and energy programs.
- J. Interagency Coordination--The Commissioner of Agriculture should chair an interagency task force composed of the Commissioners of Energy and Economic Development, Commerce, and Economic Security to coordinate the development and delivery of programs to the agricultural community.

## VI. INFORMATION-INTENSIVE AGRICULTURE--IMPROVING THE MIX OF AGRICULTURAL INPUTS

### Definition of the Issue

The issue of information-intensive agriculture is more of an opportunity than a problem. As the costs of energy and capital inputs to agriculture increase, the relative advantage of information as an agricultural input increases, since the cost of information inputs is not closely related to the cost of energy and capital. The information-intensive agriculture issue is finding the best ways to develop and to make available to farmers highly cost-effective information inputs as supplements or substitutes for more costly energy and capital inputs. This involves: supporting the current and emerging rural information infrastructure; rejuvenating and redirecting the development of agricultural scientific knowledge; relying upon innovative farmers and farm organizations to develop and demonstrate information-intensive farming practices; and recycling farm inputs and rural dollars by displacing some imported inputs with home-grown ones.

### Guiding Principles

- A. State agriculture policy should support the renewal and further development of a high quality, accessible and diverse information infrastructure for rural Minnesota. High technology agriculture is coming to mean information-intensive agriculture. The greater the access to information, the more cost-efficient the farming operation. Therefore, state agricultural policy must include support for mechanisms to convey information to farmers.

Important forms of agricultural information include data computation and transmission, farm management assistance, genetic information in seeds, high information content embodied in high technology farming hardware, computer automated dairy cow feeders, highly educated and skilled farmers, integrated pest management, ridge-till planting and the high genetic information diversity of multiple cropping and rotation practices. Other examples of information-intensive agriculture are included in the Appendix.

- B. State agriculture policy should refocus agricultural research to better meet the needs of Minnesota farmers. The mission of the land grant research and extension system has long been the development and dissemination of new knowledge and information to improve agriculture. The land grant system and all other sources of an information-intensive agriculture now appear more important than ever.

More detailed findings regarding university-based agricultural research are presented in the Appendix. The essential conclusion from these findings is that agricultural science is extremely important and that substantial efforts should be made to redirect it to best serve the future of Minnesota agriculture and farmers.

- C. State agricultural policy must develop means for the state's many innovative farmers to share their ideas with others. Farmers have been major sources of innovation in the past and can be expected to be an important source of agricultural innovation in the future. Many new products or even entire companies have grown out of the innovative work of farmers trying to solve real world farming problems. The new breed of farmers is sufficiently confident, educated and skilled to carry this innovative farmer tradition on to the new challenges of information-intensive agriculture.
- D. State agriculture policy should encourage and facilitate information-intensive practices for recycling the flow of agricultural inputs on the farm and of agricultural dollars in rural Minnesota. Recycling agricultural inputs on the farm should be promoted to make more efficient use of or reduce the need for off-farm energy and capital-intensive inputs that are imported to the farm and the state. To do this, large inputs of high quality information are necessary. The information is in the form of increased management knowledge and skill and higher levels of knowledge about cropping patterns and crop pests. Improved marketing practices and further processing of products before they leave the farm are also possible applications.

Rural Minnesota agribusiness services, that are both information and people-intensive, should be promoted to provide agricultural inputs to farmers that originate in Minnesota. The purpose should be to reduce the export of Minnesota's agricultural dollars out of the state for purchases of imported energy and capital-intensive inputs. Recycling of a larger share of agricultural input dollars within the state should be an important part of state economic development.

### Specific Action Proposals

Action proposals presented in this section are aimed at promoting information-intensive agriculture to improve the mix of agricultural inputs used in farming, processing and marketing. Some of these action proposals can be effective in the short-term; however, most are long-range proposals. The investment of leadership and financial resources should begin now to provide a better future for Minnesota agriculture.

- A. Farm Management Instructors--Adult farm management instructors and other vocational agriculture teachers associated with the AVTI system are an excellent example of information-intensive agriculture that should be expanded. More instructors are needed to work with high risk clients of the Farmers Home Administration and other financial institutions to improve farmers' survival chances and reduce loan risks. Pilot projects should be developed to expand the role of adult farm management instructors into farm marketing, integrated pest management and other areas where integrated whole-farm management abilities are needed.

- B. Crookston and Waseca Technical Colleges--The education roles of the Technical Colleges should be scrutinized. One possibility is to serve as centers for agriculture teachers who can serve several high schools on a shared time basis. Adult education for local agribusinesses and for agricultural cooperative management could be emphasized.
- C. Curriculum Development and In-Service Training--Funds for innovative curriculum development and in-service training should be provided by redirecting existing funding from those research and extension programs which are not meeting the future needs of Minnesota farmers. These funds would be used to establish new pilot programs to build the capability of teachers to play key roles in expanding the use of information as agricultural input for the future.
- D. Regional Technology Trade--Minnesota Wellspring has initiated a proposal for the development of a regional multi-state organization to promote the international trade of technologies that would be mutually beneficial to the economies of the international trading partners involved. If such a proposal is enacted, agricultural technology should be given high priority. Some of the prime trading partners currently being considered, Japan and Britain, have technological capacity but do not have extensive farmland. This provides the opportunity for Midwestern trade to acquire innovative agriprocessing technology and new biotechnologies.
- E. Model Farm Institute--The development of a Model Farm Institute is also being considered by Minnesota Wellspring. The purpose is to establish ten model farms to demonstrate agricultural technology applicable to small and medium-size farm operations to improve their income and survival chances. Technologies that have been researched in the public or private sector would be demonstrated by the proposed non-profit organization established with seed money from the Legislature. This proposal should receive careful consideration because it could be able to accelerate the development and use of innovative agricultural practices to strengthen the family farm.
- F. Policy on the Future of Agricultural Research--The Governor should consult with legislative leadership, farm groups, the business community, the University of Minnesota, Department of Agriculture, State Planning Agency, and others concerning future policy direction for agricultural research. This should include preparation of the next generation of agricultural scientists and educators for an information-intensive agriculture of the future. Consideration should also be given to legislative policy guidance for publicly supported agricultural research to meet the needs of Minnesota farmers in the future. The Guiding Principles in this report should be considered in the establishment of such a legislative policy direction for agricultural research. It is recommended that legislative policy redirect agricultural research to the primary purposes of increasing net farm income, reducing the capital requirements of farming and promoting agricultural resource stewardship. Increasing the production of agricultural commodities should be the secondary and supporting purpose.

- G. Integrated Agricultural Research--The single most important problem with agricultural research is the difficulty of conducting research activities as an integrated multifaceted program clearly aimed at agreed upon public policy goals. Consideration should be given to establishing a Center for Integrated Family Farm Research at the Institute of Agriculture, Forestry and Home Economics. The Center's responsibility should be to serve as a focal point within the Institute for integrated research pilot projects. It should also prepare integrated research program assessments of the Institute's agricultural research activities. Legislation defining the content of these assessments and the public review process should be established to enhance legislative oversight.
- H. Biotechnology Research and Development--Consideration should be given to the establishment of an inter-disciplinary center for plant molecular biology work. The Institute and the College of Biological Sciences could form a joint center funded for this work. Basic research for plant breeding and the development of alternative plant crops would be the focus. Support for the existing center for biotechnology process development should also be expanded. Work should specifically include the enabling research necessary to support on-farm and rural community value-added bioprocessing of agricultural products.
- I. Innovative Farmer Networks--Networks of innovative farmers should be created so that the innovations of farmers can be promoted and shared. Information-intensive farming innovations which can reduce off-farm costs and increase on-farm value-added should be particularly emphasized. A variety of pilot programs should be established to find the best ways to promote, share and evaluate this farmer-based innovation. The advantage farmers have of inherently being required to manage their operations as whole farms without artificial barriers should be developed. Such networks can serve to inform agribusiness and research institutions of farmers' needs as well. The Department of Agriculture should take the lead, working closely with the AVTI's and the University of Minnesota, to promote these networks of innovative farmers.
- J. Farmer and Rural Community Telecommunications--State policy and action should assure that farmers and rural communities have high priority in receiving access to new telecommunications services. The development of the new telecommunications information infrastructure should specifically focus on the opportunity of information-intensive agriculture. The Telecommunications Policy Council should address these opportunities and make recommendations on the telecommunications infrastructure necessary for development.

- K. Agricultural Innovation and Demonstration--A broad agricultural innovation and demonstration effort should be conducted by a variety of state institutions. In particular, the Legislative Commission on Minnesota Resources should consider establishing a major program of agricultural innovation and demonstration to stimulate information-intensive agriculture that is compatible with the Commission's natural resource goals, such as water quality and quantity goals. The Governors' Council on Rural Development should continue and expand its innovative work related to agriculture. The Department of Energy and Economic Development should give more attention to energy issues related to agriculture and should promote innovative information-intensive agriculture projects as a central strategy for state economic development.
- L. Agricultural Development Grants--The program of agricultural development grants recently established a means of funding market promotion activities by grants to farm organizations and agriculture related businesses. This program provides the opportunity for the Minnesota Department of Agriculture to establish public-private partnerships as a way of doing innovative marketing of Minnesota agricultural products. Consideration should be given to expanding the funding from non-government sources and the purposes of this program to make it a major means to stimulate innovation throughout the farming, processing and marketing system. This is an important way of enabling farm organizations and agriculture related businesses to actively and directly build the future of Minnesota agriculture.
- M. Foundations' Role In Agricultural Innovations--The Governor and the state's agriculture leaders should exercise leadership to bring the attention of Minnesota foundations to the need for their creative abilities at this turning point for Minnesota agriculture. Some agricultural innovations needed in the development of information-intensive agriculture will be too undefined and speculative for the state to be very helpful in promoting at first. Foundations could provide a great public service by nurturing and developing these early stage ideas until they are sufficiently developed for state and private sector considerations.

## VII. BUDGET IMPLICATIONS

The implication for the state budget are generally identified in this preliminary assesment. These will be made more detailed as the action proposals are further defined during the public and agency review process.

The main categories of budget impacts are the following:

(Budget details still being developed.)

## APPENDIX: INFORMATION-INTENSIVE AGRICULTURE

### Examples of Information-Intensive Agriculture

The pattern of high information use as a substitute for energy and other materials is often not recognized as information-intensive agriculture, but rather as just efficient agricultural practice. However, it is important to recognize the importance of information as an agricultural input with unique characteristics and potentials.

Some examples that fit the emerging pattern of information-intensive agriculture are the following:

1. Highly-Skilled and Well-Educated Farmers--Farmers today are generally very well educated. The major commitment to public education in Minnesota has helped our farmers prepare to meet an information-intensive age in agriculture. Successful farmers have the capacity to work with complex financial information as well as with crops and livestock. There seems to be a new breed of farmers who are highly innovative and capable of working with more information based agricultural practice. Some of these farmers are even ahead of the formal institutions of agricultural innovation.
2. Farm Management Instructors--Many farmers in Minnesota work with adult farm management instructors on an on-going basis. These instructors advise farmers on establishing financial and resource accounting systems and how to use them in making farm management decisions. The unique advantage adult farm management instructors provide is that they help farmers see their farm operations as integrated whole-farm systems in which every practice, action and decision has an impact on the bottom line viability of the farm. This whole-farm knowledge is the most needed type of agricultural information today.
3. Computerized Dairy Cow Feeder--Some farmers have computerized dairy feeders that feed custom rations to a large number of dairy cows. The cows wear electronic identification badges which the computer recognizes to serve up the right amount of feed, for the right time, and for the right interval between feeding. The result is an increase in milk yield and feed efficiency from custom feeding, which is impossible with manual labor and which avoids the necessity of one non-computerized feed station for each cow, an example of information substituting for capital. Also the accumulated feed records can be used to improve herd management decisions. The computerized dairy feeders are designed and manufactured in Holland, but there is no reason why they cannot be produced by a Minnesota company.

4. Innovative Feed Storage Systems--Some farmers use plastic silo bags for air tight silage fermentation and storage. A patented machine from Germany loads silage into the large plastic bags that look like very big white sausages laying in the field. For \$1,500 worth of custom work each year, a farmer can have the equivalent of a 300 ton high quality silo that would cost about \$60,000 to buy and have a fixed debt service charge of around \$9,000 annually. The innovative feed storage system is six times more capital efficient. The difference is in the quality and quantity of information contained in the \$30,000 patented German machine, the chemistry of the plastic bags and the innovative ability to act on that knowledge to provide a low cost, high efficiency alternative to long-existing agricultural practice.
5. Ridge-Till Planting--More farmers are beginning to use ridge-till planting for row crops such as corn and soybeans. While this practice requires modifications to an existing planter or purchase of a new planter, the cost of equipment is not the determining factor. Compared to the conventional moldboard plow method of tillage, ridge-till requires less equipment, less energy, less labor, less horsepower, fewer field trips, and less erosion and nutrient runoff. Yields are comparable and there are other advantages to planting every year on the same ridge. The main ingredient that makes this practice work is information in the form of knowledge of crop response and soil behavior to a tillage practice that builds ridges rather than turns over the earth.
6. Crop Rotation and Nutrient Recycling--Some farmers use crop rotations and nutrient recycling to reduce their use of energy and other materials. Reasonable crop yields and low costs can be obtained as information inputs, such as higher levels of farm management, are added to the system. Fertility can be obtained from recycling nutrients either from animal operations or from nitrogen-fixing legume rotations. The project team toured farms which ranged from 200 to 1100 acres using these practices. Research from the Waseca Experiment Station on corn and soybean rotations shows that the addition of genetic diversity (an increase in field information) by rotation can avoid toxins resulting from straight corn planting year after year. The Crookston Experiment station is working with rye crop rotations sequences that can suppress broad leaf weeds without off-farm energy-intensive inputs.
7. Integrated Pest Management--Some farmers rely on information in the form of integrated pest management to increase their efficiency in the cost of controlling crop pests. Such information can be provided either by a skilled farmer, if prepared and educated in the practice, or by a rural agribusiness service company. Centrol, affiliated with Cenex, is one such agribusiness service that provides information to farmers to reduce their costs by making more efficient use of purchased pest control products.

8. Market and Weather Information--A variety of marketing practices are available to help farmers protect themselves against uncertainty and improve their price. Existing futures markets are now being supplemented by options markets, which can serve to provide a farmer with an assured price floor. While there are financial costs associated with these marketing techniques, the most important requirement is the management ability and capacity to use market information. There is also the potential for using computer-based weather information to improve irrigation, grain drying and cattle feeding efficiency. Many of these information services can be provided by new telecommunications technologies. A television station in Appleton, Minnesota, has been a pioneer in agricultural telecommunications development.
9. Farm-Based Fuel and Feed Processing--A small commercial corn-to-ethanol processing plant is operating very successfully in Watertown, Minnesota. It uses the advanced technology of a molecular sieve unit to produce anhydrous alcohol on a relatively small scale. The plant produces 400,000 gallons of ethanol annually and provides enough wet distillers grains to feed 1400 cows daily for forty neighboring farmers. The equipment is German but it is nothing that could not be produced by Minnesota companies. The important resource is the information-intensive content of the operation, particularly the knowledge necessary to put together a multi-product processing and marketing operation. Information in the form of animal feeding trials of livestock weight gain on wet distillers grain, developed by the Morris Experiment Station, is also very important in the success of this operation.
10. Integrated Hog Management--Dr. Stolba at Edinburgh University, School of Agriculture, has developed an innovative integrated hog management system that is based on information-intensive and stewardship agriculture concepts. In the course of six years, Dr. Stolba has developed a hog confinement system that imitates the natural habitat of wild hogs. He has achieved a space-efficient confinement system in which there is very little aggression and stress for the animals. The result is high productivity of 2.3 litters/sow/year and 9 market hogs per litter. The key to this productivity is knowledge of how hogs behave in natural family groups and designing a facility to accommodate this behavior.
11. Dairy Net--Agri Data Network is establishing an on-line information and communications system for the National Dairy Herd Improvement Association. Dairy Net will provide 66,000 dairy farmers with electronic access to a variety of news, market information and summary data developed by the National Dairy Herd Improvement Association, USDA and other dairy record processing centers. This is an example of information-intensive agriculture which is being undertaken by a farm organization for the benefit of its members.

12. Perennial Polyculture--Plant genetic researcher Wes Jackson has founded the Land Institute in Kansas to develop perennial polyculture as a way of substituting information for energy and capital used in the current annual monoculture farming practices. This is a long term basic research effort. If it is successful, it would permit farmers to grow grains without annual plowing and planting, and to minimize the energy and chemicals farmers need to purchase. It would also sharply reduce soil losses and other conservation problems.

### Findings on Agricultural Research

Publicly supported agricultural scientific research is especially important to the future of Minnesota agriculture and the viability of family farms in Minnesota. Agricultural research has a long and productive history. The founding purpose of the land grant college research and extension system was to develop and disseminate new knowledge to make agriculture more productive--this is the original information-intensive agriculture.

However, a substantial public debate has developed in recent years over the current capacity and future direction of this land grant college based agricultural research and extension system. The project team has reviewed policy reports associated with this debate, visited with Dr. Sauer and several faculty members and administrators of the Institute, toured the Waseca, Grand Rapids, Morris and Crookston agricultural research experiment stations of the University of Minnesota, attended a seminar on agricultural research organized by Dr. Vernon Ruttan, participated in a conference on agricultural innovation sponsored by the National Governors Association, and organized a seminar for a delegation of Minnesota government and farm group officials at the Rodale Research Center, a private agricultural research station.

The team's findings concerning agricultural research are the following:

1. There is considerable substance to the debate over the current capacity and future direction of agricultural research and related extension activities. The agenda of issues is a serious one deserving a serious response.
2. The age structure of current agricultural researchers and the narrowing farm population suggest that for the next decade there will be a substantial turnover of experienced farm-bred agricultural researchers, and there will be difficulty finding quality replacements with farm backgrounds and a hands-on experience in agriculture.
3. The focus of agricultural research has been primarily on production maximizing research goals. Some of this research results in increased yields which require large energy and capital inputs and which tend to undercut commodity prices. Increasing net farm income, reducing capital requirements and promoting agricultural resource stewardship need to receive first priority, and production research should support these goals.

The expected future increases in crop yields, as estimated by the USDA, are the following:

U.S. Average Yield Projections for  
Major Crops by 2000 and 2030

Crops	Percent Increase For The:			
	"Most Probable"		"Optimistic"	
	2000	2030	2000	2030
Feed grains and silage	40	100	100	200
Alfalfa	20	50	60	150
Wheat	50	100	100	200
Cotton	20	60	100	200
Rice	100	150	200	250
Soybeans	60	120	150	300

Source: Felix Spinelli, ERS-USDA--Presented on March 8, 1984, at USDA Conference on the 1985 Farm Bill.

4. Knowledge of agricultural systems on an integrated basis receives insufficient attention resulting in lost opportunities because of over specialization and departmental isolation.
5. Agricultural science, like many other sciences, has overly emphasized the manipulation, modification and control of nature. It has often overlooked the opportunities for intelligently cooperating with the inherent wisdom and capacities of nature. This is especially important for agricultural science, because the subject matter is the biological life process of nature.
6. There is inadequate scientific communication between the agricultural science community and other fields of science. More openness, communication and interaction are needed so agricultural science can benefit from developments in other fields. Collaborative interdisciplinary research across scientific fields and institutions is needed.
7. There is a lack of a clearly focused mission, supported by highly integrated research programs, to serve the public interest.

8. Funding by state and county governments has increased relative to federal funding in recent years. Budget support currently is \$61 million annually for research and extension, with the following allocation:

<u>Source of Funds</u>	<u>Research--\$35 Million</u>	<u>Extension--\$26 Million</u>
State Government	60%	42%
County Government	-	21%
Federal Government	12%	31%
Grants & Contracts	20%	-
Retained Income	8%	-
Other	-	6%
	<u>100%</u>	<u>100%</u>

Source: Richard Sauer, University of Minnesota--Presented on April 12, 1984, at the annual University of Minnesota seminar on Agricultural Research Policy.

9. The research and extension system has a long history of evolving and responding to changing needs when it has received sufficiently clear signals as guides to follow;
10. Publicly supported agricultural science may be even more important now than in the past because much of the research investment in new information-intensive agricultural practice cannot be captured by manufacturers of proprietary products. Therefore, the private sector is unlikely to make the needed investments in many areas of information-intensive agriculture. This means missed opportunities for farmers unless public investment does the job; and
11. Both public and private agricultural research have important roles to play in agriculture. Public and private research can be complementary and can learn from each other.

The scientific issues raised in the public debate on agricultural research have been carefully reviewed by researchers Bush and Lacy of the University of Kentucky. Bush and Lacy based their review in the opinions of 1400 land grant scientists nationwide. The findings in the concluding chapter of their book, Science, Agriculture and the Politics of Research, can serve as a guide and agenda for rejuvenation of publicly supported agricultural research.

The findings apply to the average institution and not necessarily to the University of Minnesota, which is already making progress in many areas. There are signs of integrated systems research developing at the Institute. Dr. Sauer is fully aware of the importance of such knowledge to the future of agriculture. Dr. Sundquist has prepared an integrated technology assessment of corn production, a rare accomplishment in a world of specialization. An innovative faculty group has been reviewing and preparing to implement various farming systems research initiatives.

There is a very high quality, but relatively small, effort in integrated pest management. Experiment station supervisors often mentioned to the team the need to do more integrated research work that can relate cropping patterns, tillage practice and other factors into a systems approach to farming research. Finally, there is a growing interest in computers and telecommunications as opportunities to serve farmers.