

SPECIFIC PROBLEMS IN AGRICULTURE MOST IN NEED OF
RESEARCH SOLUTIONS AS PERCEIVED BY WEST VIRGINIA
VOCATIONAL AGRICULTURE TEACHERS AND
COUNTY EXTENSION AGENTS

THESIS

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by

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Chapter 1

INTRODUCTION

Agricultural production in the United States is a modern-day miracle. The increase in productivity of farmers allows the people of this country not only to be the best fed nation in the world at a low cost for each family, but one of the leading nations in the export of food and fiber in the world. Agricultural products rank first among the U.S. exports. Over 25 percent of the acreage harvested in the United States produces commodities for export (Committee of Science and Technology, 1975:131). In addition, agriculture has released vast amounts of resources to permit an unprecedented industrial expansion making the United States a giant industrial nation. One of the institutions which has been responsible for this miracle of food production is the agricultural research system operated by the land-grant universities* which has provided farmers and agribusinessmen with a steady stream of new knowledge and technologies needed to increase agricultural production.

Agricultural research by its definition is research whose objective is to apply a wide variety of scientific disciplines to the development of new approaches to agricultural production and to the solution of problems besetting the farmer (Arnon, 1968:102). Thus, one of the ultimate goals of agricultural research is to increase

* Agricultural institutions established by the Morrill Act in 1862.

agricultural production. This is achieved by reducing costs; increasing output; reducing losses of products throughout the food and fiber chain; improving product quality; introduction of new products and improved processes; and by reducing vulnerability forces which are beyond the control of the producers, processors and marketing firms.

Agricultural research in the United States is supported by both the public and private sectors. Publicly supported agricultural research began in 1862 with the establishment of the Department of Agriculture (the Act of Establishment) and the land-grant colleges (Morril Act). The purpose of the new Department of Agriculture was "to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate and distribute among the people new and valuable seed and plants" (Wiest, 1975:28). Federal support in university agricultural research, however, started with the Hatch Act of 1887 which created the State Agricultural Experiment Stations (U.S. Department of Agriculture, 1962:219). It provided:

. . . that in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experimentation respecting the principles and application of agricultural science, there shall be established, under the direction of the college or colleges or agricultural department of colleges in each state or territory established, or which may hereafter be established. . . . a department to be known as an agriculture experiment station.

Land-grant colleges were thus established to perform three major functions: (1) resident instruction to produce well trained and qualified people in the field of agriculture; (2) research; and (3) extension service which was formally started by the Smith-Lever Act of May 8, 1914, as amended.

Since 1862, research programs supported financially and technically by Federal and State governments and other agencies have been broadened to cover a wide range of disciplines in order to meet different needs and interests of farmers. This United States public policy in support of research and education in technology and organization of farming has been termed as the single most effective policy element responsible for technical and economic development in agriculture during this century. Public investment in this research has been substantial, but the returns have far exceeded the costs (Committee of Science and Technology, 1975:139).

Another important aspect of public agricultural research policy is the research cooperation between federal and state governments and other agencies (public and private). Non-land grant universities, commercial concerns, and USDA agencies* have made important contributions to solving agricultural problems, especially in basic research and technological development. Research participants in the private sector include foundations, industry and industrial

*USDA research agencies include the Agricultural Research Service, Forestry Service, Farmer Cooperative Service, Economic Research Service, Statistical Reporting Service, etc.

associations. In some areas of activity, their financial investments exceed those of the public sector (OTA, 1981:83).

The nationwide cooperative USDA-State Agricultural Experiment Stations research program has served broad objectives of agricultural research (Committee of Science and Technology, 1976:41):

1. To solve local, regional and national problems affecting agriculture, forestry and other renewable natural resources. This includes work toward an adequate and safe food supply for all consumers; protection of environmental quality; and quality of life.
2. To provide a continuing flow of scientific knowledge essential to the solution of future problems.
3. To provide scientific competence for teaching, including graduate student research, to train future generations of scientists.
4. To provide scientific expertise to (a) local, state and federal agencies, (b) private organizations and individuals, and (c) program of overseas agricultural development.

The great accomplishment of this cooperative program has been the establishment of the national network of experimental stations and research centers where practical solutions to problems can be developed. Overall, the research programs are designed to enable agriculture to attain the following goals (Committee of Science and Technology, 1975:14):

1. To assure adequate supplies of food (from crops and animals) and fibers.
2. To improve human nutrition and food safety.
3. To improve food and fiber marketing efficiency and processing.
4. To improve protection, management and utilization of forest resources.
5. To protect quality of environment, conserve natural resources and improve natural beauty.

6. To preserve and strengthen the farm income and hence improve rural levels of living.

From the foregoing analysis it can be noted that agricultural research is an activity which no country can afford to neglect.

While it is undoubtedly true that agricultural research has contributed greatly to the food 'miracle' in this country, it is presently not only at a 'crisis' but in a 'crunch'. The agricultural industry and all its segments is passing through a period of extremely rapid change--the most rapid and significant in all its history. Most of these changes have been brought about by technological advances, varying economic and social patterns, and other factors. As a result of these changes, the most important problem facing all segments of the agricultural industry is that of making prompt and reasonable adjustments.

It is the magnitude of these changes, diversity of problems facing agriculture, and the amount of financial and human resources currently being invested in agricultural research and the type of research being undertaken that has created much public concern. As can be noted in the review of literature, farmers, vocational agriculture teachers, extension agents, policy makers and even scientists complain that the present research programs do not meet the needs of the continually changing agricultural industry. They charge that many of the programs are not mission-oriented or targeted to solving the immediate and pressing problems of the farmers and society; that most of the research is being done for its 'own sake' or for academic purposes. In some quarters, the complaint is made that too much emphasis

has been placed on 'basic' research, which, although useful in the long run, is presently not helping them. They argue that basic research should be left to the Agricultural Research Service (one of the USDA research agencies) which has pioneering research laboratories, staffed with selected scientists who devote themselves solely to advancing the frontier of knowledge with no immediate concern for solutions of practical problems. Today there are many pressing issues that should receive increased research attention.

The need for conducting 'appropriate' or 'useful' research in agriculture is of critical importance. In this regard the Kansas City Conference on Research (1975:113) reports:

. . . Future agricultural research, adequately analyzed and pinpointed for its relevance to present and future needs, can provide one of the critical bulwarks against scarce and costly food supplies for the American people . . . and one of the major defenses against starvation and malnutrition in the world. The challenge is to insure that appropriate research is stressed and to obtain the support necessary to conduct the work.

Emphasizing the importance of 'useful' research, the U.S. Board of Agriculture and Renewable Resources (1975:115) comments:

Technological changes are causing the obsolescence of certain agricultural techniques . . . This is a challenge to agricultural research. It should facilitate adjustments so as to minimize the negative impact of technological change for the farmer and the society.

While trying to remind agricultural scientists of their 'noble' duty, Young (1976:8) wrote:

In the future our agricultural experiment stations must exercise more vision and foresight than ever so that answers to emerging problems will be available when they are most needed. The policy, too long a custom, of waiting until an emergency is upon us before doing anything about it is an

expensive luxury, one that our states can ill afford. Research must keep well ahead of the need for it.

Due to widespread belief that the present agricultural research programs carried out by publicly supported research institutions are not as effective in meeting the needs and interests of the American agricultural community as they might be, there is a great need to undertake a study to ascertain these assertions. This study was, therefore, conducted to obtain a comprehensive analysis of those specific agricultural problems in West Virginia most in need of research solutions to enable agricultural scientists to evaluate present programs and prepare more appropriate future research programs. As the nation faces a future increase in demand in its agricultural resources, it is essential to ensure that the research system functions as effectively as possible.

Objective of the Study

The purpose of this study was to identify specific problems in agriculture most in need of research solutions as perceived by West Virginia vocational agriculture teachers and county agricultural extension agents. Specifically the study had the following objectives:

1. To identify specific agricultural problems most in need of research solutions in West Virginia.
2. To rank the specific problems according to their perceived importance and, thus, provide criteria for evaluating and/or developing research programs.

Research Methods and Procedures

Method - Data for this study were obtained by use of the Delphi technique. Due to the vastness of the state and limited resources and time, the survey could not be conducted by personal interviews. The Delphi technique overcame this problem by communication through use of mailed survey forms. In addition, the technique had the advantage of removing the biasing effect which might have occurred during face-to-face interaction (Dalkey, 1969).

The data and information were secured from the study population consisting of vocational agriculture teachers and county extension agents of West Virginia. These professional agriculturalists, through their strategic positions and experience in rural communities throughout the state were in an appropriate position to perceive problems pertaining to agriculture which may need immediate solutions through research undertakings.

Administration of Instruments - The data and information pertaining to this study were collected by means of two types of questionnaires specifically designed to meet the objectives of the study.

The first survey instruments (Appendix II) were administered by mail to 106 vocational agriculture teachers and 48 county extension agents in West Virginia on February 18, 1982. A letter of introduction (Appendix I) signed by the writer and the Chairman of the Study Committee accompanied the questionnaire sent to each participant by name and title; also a self-addressed stamped reply envelope was enclosed for ease and convenience of feedback. Each envelope

was numbered against a corresponding file number for identification on return. Follow-up letters were sent after two weeks to those who did not respond (Appendix III).

Each participant was asked to list five major problems in agriculture which in his/her opinion most seriously needed research attention. Specifically participants answered the following question:

In your opinion, what are the specific problems in agriculture most in need of research solutions in your community?

After receiving the responses, a Q-sort committee* scrutinized and combined the opinions and wherever necessary modified the statements without altering the intended meaning. A list of the 136 edited statements was assembled to form the second phase instrument (Appendix V).

The second phase questionnaire was mailed on March 19, 1982 to the same population with enclosures of self-addressed stamped envelopes. A cover letter, again signed by the writer and the Chairman of the Study Committee, which acknowledged and thanked each participant for responding to the initial request, accompanied the questionnaire (Appendix IV).

Statements in the second questionnaire were divided into eleven major components of the field of agriculture: field crop production; livestock production; horticulture; farm management; plant pests/diseases; pasture management; agricultural marketing and processing;

*Q-sort committee: a panel of two or three people appointed outside the respondents of the Delphi investigation to scrutinize and refine information elicited from participants.

farm machinery and structures; soil/water conservation; agricultural energy; and rural development and extension/education. Each statement was weighted (ranked) numerically:

- 1 = not important
- 2 = somewhat important
- 3 = important
- 4 = very important

Participants were asked to circle one number for each statement corresponding to their perception regarding the importance of the research problem.

A date was set for the participant to return the instruments. A follow-up letter was mailed to all those who did not respond as of April 2, 1982 (Appendix VI).

Treatment of Data - Data from the questionnaires were organized and summarized for the appropriate statistical analysis using the West Virginia University Computer Center facilities. Overall means and standard deviations were derived for each item (problem). Means and standard deviations were also determined according to positions, regions and category variables. The results were then presented in tabular and narrative form.

Extension Regions (Areas)

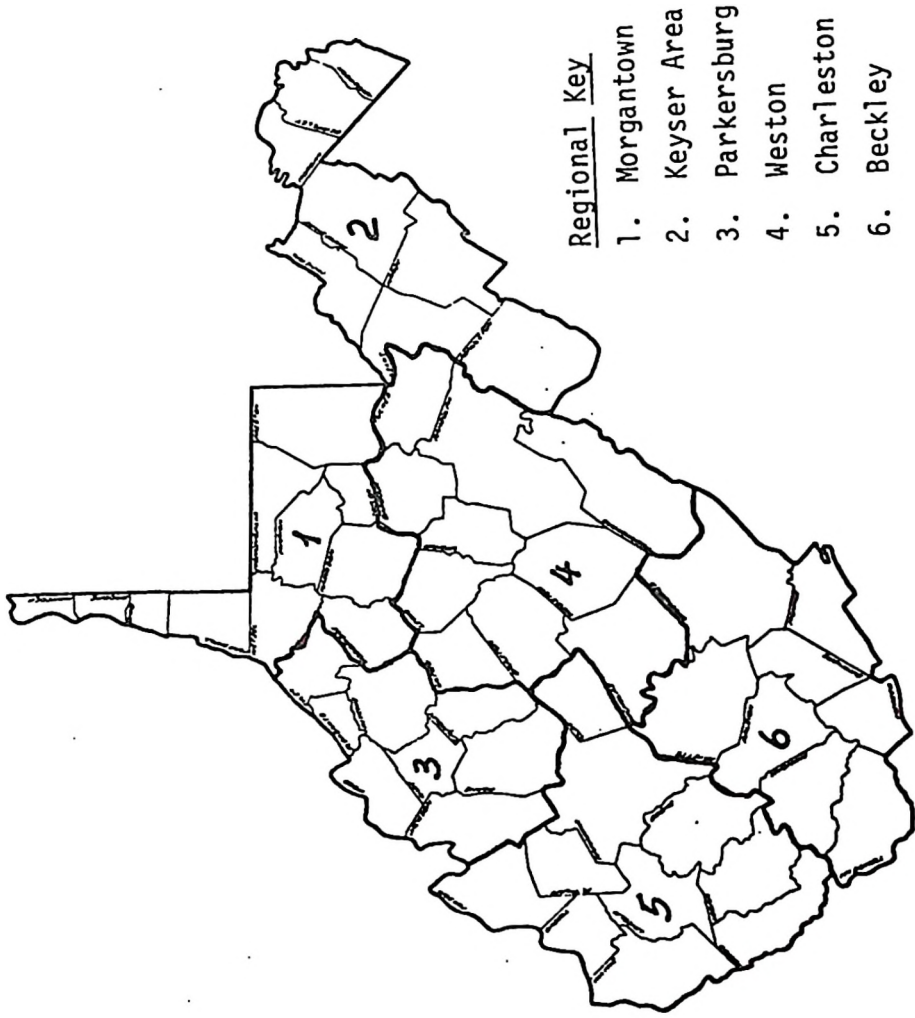
Analysis of data by regions was based on the existing administrative areas of the West Virginia Cooperative Extension Service as indicated in the Figure. Extension regions (or areas) and counties included in the study are shown in Table 1.

Table 1

Extension Regions (Areas) and Counties Included in the Study

1. Morgantown	2. Keyser Area	3. Parkersburg	4. Weston	5. Charleston	6. Beckley
Hancock Brooke Ohio Marshall Wetzel Monongalia Preston Marion Taylor Harrison- Doddridge	Grant Mineral Hampshire Hardy Pendleton Morgan Berkeley Jefferson	Tyler Pleasant Ritchie Wood Calhoun Roane Jackson Wirt	Tucker Barbour Randolph Upshur Lewis Gilmer Braxton Webster Nicholas Pocahontas	Mason Putnam Kanawha Cabell Lincoln Boone Logan Mingo Wayne	Fayette Raleigh Wyoming Summers Greenbrier Monroe Mercer McDowell

Source: Cooperative Extension Service, WVU



Schematic Map of West Virginia Showing Extension Regions (Areas) and Counties

Limitation of the Study

The study was limited to (1) vocational agriculture teachers in high schools, and (2) county extension agents in West Virginia employed during the study period of January-June, 1982. A total of 79 vocational agriculture teachers and 37 county extension agents participated in the study as shown in Table 2.

Table 2

Returns of Completed Instruments by Respondent Group and Extension Regions
Phase I and II of the Delphi Technique

1.1 Phase I

REGIONS (AREA)	VO-AG TEACHERS		EXTENSION AGENTS		OVER ALL TOTAL					
	Number of Participants	Number of Percent Returns	Number of Participants	Number of Percent Returns	Number of Participants	Number of Percent Returns				
1. Morgantown	26	14	54	9	9	100	35	23	66	
2. Keyser Area	24	11	46	8	6	75	32	17	53	
3. Parkersburg	20	8	40	7	5	71	27	13	48	
4. Weston	12	5	42	10	7	70	22	12	54.5	
5. Charleston	12	9	75	7	6	86	19	15	79	
6. Beckley	14	7	50	7	5	71	21	12	57	
TOTAL	106	54	51	48	38	79	154	92	60	
1:2 PHASE II										
1. Morgantown	26	18	69	9	5	56	35	23	66	
2. Keyser Area	24	16	67	8	6	75	32	22	69	
3. Parkersburg	20	17	85	7	6	86	27	23	85	
4. Weston	12	10	83	10	8	80	22	18	82	
5. Charleston	12	8	67	7	6	86	19	13	68	
6. Beckley	14	11	79	7	6	86	21	17	81	
TOTAL	106	79	75	48	37	77	154	116	75	

Chapter 2

REVIEW OF THE LITERATURE

The literature reviewed in this section shows the role of agricultural research in agricultural development and the national economy. It also evaluates strengths and weaknesses of the American research system as perceived by different writers.

Research in any field, including agriculture, is a systematic process of acquiring new facts as a step toward solution of a recognized problem or to add to the store of knowledge which has long range usefulness--often unanticipated. Kolpsley (1945:569-575) gives the following more comprehensive definition:

Research is the original and intellectual activity carried out in the laboratory, the library, or the field, which endeavors to discover new facts and to appraise and interpret them properly in the light of the previous knowledge. With constantly increasing understanding it revised previously accepted conclusions, theories and laws and makes new applications of its findings. Whether it seeks to extend knowledge for its own sake or to achieve results with specific economic or social values its *raison d'etre* is its contribution to human welfare.

Hertz (1957:45-59) is more succinct in defining research as "the application of human intelligence in a systematic manner to a problem whose solution is not immediately available."

The National Science Foundation of the U.S.A. (1959:102-103) and the Office of Technology Assessment (OTA, 1981:101-102) distinguish three kinds of research--basic (fundamental), applied (adaptive) and developmental research:

1. Basic or fundamental research is that which is motivated primarily or exclusively by intellectual curiosity and an interest in the study of the laws of nature for their own sake without regard for the immediate applicability of any finds he may reach. It is an uncommitted research aimed primarily at the extension of the boundaries of knowledge, by deepening insights and understanding into biological and physical forces or economic and social conditions.
2. Applied research is research which represents investigation directed to discovery of new scientific knowledge and which has specific commercial objectives with respect to either products or processes. It is essentially the direction or application of such basic and background knowledge to specific environments or problems and hence to practical end uses. It is, therefore, committed to the search of a solution to a specific problem as opposed to basic research. Research which involves further adjustments, modifications or changes, of the applied results is called adaptive research.
3. Developmental research is the systematic use of scientific knowledge and understanding gained from research directed toward the production of useful materials, devices, systems, or methods including design and development of prototypes and processes.

Agricultural research may, therefore, be defined as "research whose objective is to apply a wide variety of scientific disciplines (e.g., biological sciences, chemistry, physics, geology, meteorology, etc.) to the development of new approaches to agricultural production and marketing and to the solution of the problems besetting the farmer" and is, therefore, essentially applied/developmental research in the wide sense. Arnon (1968), however, distinguishes between basic and applied/developmental research in agriculture by whether or not it is more immediately addressed to a better understanding of phenomena or the achievement of a specific practical goal. It is the nature of the problem and not motivations of researchers that determines whether

basic research, applied or developmental research is necessary or preferable for the solution of a specified problem.

All these arguments signify that in agricultural research, the primary consideration of the research organization should be to ensure that the work carried out under its auspices should at least potentially be of benefit to the farming community in particular and the society in general. Efforts should be directed toward 'objective' or 'mission-oriented research' whether basic, applied or developmental. Besides, all types of research are complementary and interdependent and are thus essential for a well planned mission-oriented research.

This mission of agricultural research has been defined by Aldrich (1966:50-53) as:

1. To apply all possible sources of scientific discovery to solutions of technical and practical problems of agriculture.
2. To engage in basic research where the lack of fundamental knowledge may impede progress, and
3. To solve specific problems with which agriculture is faced.

The agricultural research in the United States has the tradition and the present responsibility of carrying out this kind of research. According to Arnon (1968:88) the primary objectives of agricultural research are:

1. To increase productivity by increasing production per unit area (or animal) or in irrigation agriculture per unit of water, if water is the limiting factor.
2. To increase efficiency by reducing the input of labor in relation to production or by making the work less onerous.
3. To increase stability of production by breeding varieties of crops and breeds of animals that are more resistant to

diseases or immune to unfavorable environmental conditions, by improving methods of crop protection against diseases, pests and weeds.

4. To improve quality by breeding varieties with inherent higher nutritive value, improved flavor or eye appeal; improving production techniques that affect quality improving; improving post-harvest techniques.
5. To produce the type of products required for consumption, industries and export. This frequently involves the introduction of new crops or methods of production with the attendant required research, increased control of environmental factors, investigating new uses for established crops, etc.

A number of studies have stressed the importance of agricultural research in meeting the challenge of food and agriculture in the United States and the world in general. Discussing this issue, the Agricultural Research Policy Advisory Committee (1975:13) noted:

The most powerful single force for increasing the amount and quantity of food for people anywhere is agricultural research, which is literally, a key to progress. It is through agricultural research that scientists and technicians produce the vast body of knowledge and technology needed to increase the productivity of agriculture.

The National Research Council (1972:5) confirms this by saying:

One of the greatest and most conspicuous benefits, flowing from agricultural research has been the abundant supply of high quality food and fiber both at home and abroad at a relatively low cost. No country in all of history has met the food and fiber needs of its people at the cost of such a low proportion of its total labor resources as does the United States . . . returns to investments in agriculture research and extension have been highly favorable and in the order of two or three times greater than returns to other agricultural investments. Annual internal rates of returns estimates . . . compare favorably to investments in other industries.

However, during the past decade or so, many events have taken place which are threatening the agricultural industry. Such events

(concerns) which have appeared in most studies include:

1. Increased population growth.
2. Rapid world-wide economic growth.
3. Poor weather conditions in key producing areas.
4. Steady increases in demand for food and feed grains in the world market.
5. The oil price jump and embargo and increased prices of various agricultural inputs especially those associated with high yielding varieties such as energy, fertilizers, pesticides, equipment, etc.
6. Increased environmental concern over pesticides use and run-off.
7. Technological obsolescence.

Several studies have been conducted in response to these 'warning signals' and the public demand for more useful research in the publicly supported agricultural research systems. Most of these studies were done in an effort to find ways to improve the system and thus address such areas as organization, structure, coordination, funding system, review and evaluation processes, quality of work and image. Many studies were critical of one or more aspects of research and recommended change and/or improvement.

The host of such studies in recent years provide very useful documentation of perceptions of a wide range of people as to the strengths and weaknesses of the agricultural research and development system and research needs. The frequency with which certain points surface provides good indicators of the consensus in many instances.

Most of the studies, however, point out that agricultural research has not adequately addressed itself to the specific problems of farmers in the country. The U.S. Department of Agriculture (1978: 14) provides useful insights on critical problems and issues facing agricultural research in the United States. The following are among the most prevalent concerns (weaknesses) reported:

- absence of national/state research policy, goals and defined priorities.
- absence of integrated system of both basic and applied research.
- absence of a lead agency role for research in support of food and agriculture.
- fragmentation or lack of concentration of efforts.
- research system is 'too closed' in terms of its policy making and priority setting activities.

Clarifying the last point one Congressman (Committee of Science and Technology, 1976:69) once remarked:

. . . USDA does its research in a vacuum. They (researchers) seldom discuss research with any other interested parties. They spend money, many hundreds of millions of dollars on research, but unfortunately nobody from the outside world advises them or tells them what the priorities really are in the United States.

The report that is most critical to the agricultural research system and one of those most frequently quoted in recent years is the 'Pound Report' (National Research Council, 1972:11) which concludes that:

The Committee has looked at a number of program areas and organizational structures of agricultural research in both the U.S. Department of Agriculture and the State Agricultural Experiment Stations. It has found many programs of excellence both in terms of scientific quality and of

mission. It has found that agriculture has a large cadre of well trained, highly motivated scientists many of whom are up to date and out front in their research leadership . . . But to acknowledge these findings is not in itself adequate. Acknowledgement must also be made of findings that indicate that much of agricultural research is out-moded, pedestrian and inefficient . . . and that bold moves are called for in reshaping administrative philosophies and organizations, establishing goals and missions . . . and allocating resources. The research itself is an unwarranted duplication of efforts in some areas and thus a wastage of resources; that far too much research is of low scientific quality, indicating poor project selection ability of some researchers or poor administrative management of the researcher.

In the past, the public supported any technological advance that would increase production efficiently. Recently, however, this support has faltered. According to studies carried out recently, this decline in support for and even antipathy toward agricultural research has been enhanced and compounded partly by the increased awareness of the environmental and health aspects of certain agricultural practices, partly by over-reaction to past food surpluses, but mainly to the lack of real understanding and appreciation for the direction, appropriateness, and effectiveness of the present agricultural research programs (Committee of Science and Technology, 1975).

Regarding the need for 'appropriate' or 'useful' research in agriculture in solving the food problems, the U.S. Department of Agriculture (1978:61) noted:

The most likely means of assuring food adequate to meet the needs of expanding population and increased effective food demand and still maintain reasonable domestic food prices, is more rapid development and adaptation of new technology. This in turn depends on the level of research adequate to provide the basis for the required new technology.

This indicates that greatly increased levels of appropriate agricultural research and technology development and transfer are likely to lead to:

1. sharp increases in productivity of crops and livestock in the country.
2. increased capability of the country to meet its domestic needs and have surpluses for export.
3. relatively stable food prices.

At the other end of the spectrum, maintenance of existing levels of agricultural research and technology development and transfer or continued erosion of these levels, are likely to lead to:

1. a leveling off or even a decrease in productivity of crops and livestock.
2. a widening gap between food supplies and food needs with, at best, increased hunger in the country and other countries dependent on food imports, and at worst, massive famine and starvation.
3. sharply increasing food prices as demand exceeds supply.

In response to criticisms and recommendations regarding the present research system, several studies have been done in an attempt to identify those research program areas, or problems (priorities), judged to be most pertinent in enabling the United States and the world agricultural research community to develop a broader, more comprehensive and more directly relevant program of research to meet the present and future food and fiber needs. Among these studies, three which merit special mention are reviewed in this section.

One of such studies is "The Kansas City Conference on Research to Meet U.S. and World Food Needs," (Agricultural Research Policy

Advisory Committee, 1975). A total of 89 research need areas were identified, evaluated and rated by delegates and other conference participants representing a wide range of agricultural research areas in the United States. The "top 10" research need areas by priority were identified as follows:

<u>Research Problem Area</u>	<u>Average Rating</u>
Energy	4.73
Soybean: production	4.58
Water	4.53
Basic problems in plant growth and reproduction	4.51
Nutrient requirements	4.45
Production inputs and services	4.43
International Development: Food production technology and resource management	4.43
Land	4.42
Corn: production	4.35
Wheat: production	4.32

The second notable study was conducted by the Joint Council on Food and Agricultural Sciences (1980). This study identifies five broad areas of emphasis in food and agricultural sciences that need increased attention in the early 1980's. The need areas (or initiatives) are: productivity; energy; natural resources; families and communities; and structure of agriculture and policy considerations (Appendix X).

In order to give life to these general proposals the report also summarizes projections of research needs/priorities for the same period. The projections were made by both the National Agricultural Research and Extension Users Advisory Boards and research administrators

representing the USDA - State Agricultural Experiment Stations research system.

The following is a summary of the national priority listing of topical areas of concern:

a. Natural Resources

- water
- land and soil
- germ plasm
- forestry

b. Energy and Agriculture

- increased energy research and extension funding
- agricultural energy investment priorities

c. Agricultural Economics

- protection of family farms
- research on a post-harvest industry concentration

d. Human Nutrition

- nutrition education
- research on nutrition information dissemination

e. Commodity Production

- post harvest
- integrated pest management
- organic farming methods
- aquaculture

f. Marketing and Distribution

- increased extension marketing work
- intercity food distribution
- regional markets and distribution

g. Rural Development and Sociology

- rural development programs
- agricultural production centers

h. Administrative Concerns

- use of private funds in public organizations

The regional projections are summarized in Appendix X. West Virginia is located in the Northeastern Region.

Another very important study is "Animal Agriculture: Research to Meet Human Needs in the 21st Century." This study was conducted by the Conference on Animal Agriculture in May, 1980, and its main goal was "to explore how research can best help animal agriculture to efficiently and effectively meet human needs now and in the future," (Bond, et al., 1980). The conference was organized to address the critical challenges facing the animal industry in the United States. They sought to define constraints on--and more important opportunities in--animal agriculture; to identify essential and innovative research; and to outline support for that research. Ten areas of emphasis were identified: Human Nutrition; Food Processing and Acceptability; Food Safety; Animal Nutrition; Animal Genetics and Reproduction; Animal Health; Feed Production; Production, Marketing and Distribution; Resources and Environment; and Public Policy.

In West Virginia, too, agricultural scientists did attempt to identify those problem areas in agriculture which, if unified action (research and extension services) were to be concentrated on them, could enable the agricultural industry to continue to make its contribution to the economy of the State. One of such notable attempts was the Jackson Mill Conference on the "Establishment of Logical Directions for the Future Evolvment of Agriculture in West Virginia," (Cooperative Extension Service, 1963). This was a three-phase endeavor, but for reasons unknown to the writer, the attempt did not get further than the first phase--i.e., "get acquainted, unearthen

some areas of interest and produce the first draft." So no 'logical directions' were actually established.

From the literature reviewed, it can be noted that identification of specific research problems in agriculture is very important in making prompt and reasonable adjustments required to meet the rapidly changing agricultural needs. Since many of such studies have been done on either a regional or national basis, and very little has been done statewide, it is believed that this particular study will provide useful guidelines for evaluating the present programs and developing more appropriate and innovative future research programs for the State of West Virginia, and for carrying out similar studies in other states.

Chapter 3

DATA PRESENTATION AND INTERPRETATION

Food and agricultural research has contributed markedly to agricultural development in West Virginia and in the United States in general. It is through research that new knowledge and better technologies have been and are being discovered and which enable farmers and agribusinessmen to improve production, processing and marketing. In addition, agricultural research is solving problems in environmental quality, food quality and safety, and human nutrition. The United States is recognized throughout the world as a leader in agricultural research.

Despite its notable achievements, the U.S. research system is facing criticisms from all walks of life--the policy makers, scientists and the public. It has been accused of not being effective in meeting the needs and interests of the agricultural community. This study has been designed to identify various (specific) problems besetting the agricultural industry in West Virginia which require immediate research attention as perceived by agricultural educators--the vocational agriculture teachers and county extension agents. It is anticipated that the findings of this study will assist policy makers and research scientists in evaluating present research programs and in preparing/developing more effective future programs.

Data for the study were obtained from the study population consisting of 106 vocational agriculture teachers and 48 county extension

agents in West Virginia by use of the Delphi technique employing two types of questionnaires. The first phase instrument asked participants to identify the five major agricultural problems in their communities which, in their opinion, seriously needed research attention. It was mailed to each individual together with a cover letter explaining the purpose of the survey on February 18, 1982. A total of 92 (60 percent) completed questionnaires were returned.

After receiving the responses, a Q-sort committee scrutinized and combined the opinions into 136 rateable statements (or problems) divided into eleven categories (problem areas) -- field crop production, horticulture, plant pests/diseases, pasture management, livestock production, agricultural marketing, farm management, farm machinery and structures, soil/water conservation, agricultural energy, and rural development, extension and education. These statements formed the second phase instrument. To prevent bias which might occur from a single yes or no answer, each item allowed a choice of four answers: 1. Not Important, 2. Somewhat Important, 3. Important, and 4. Very Important.

The questionnaire was then mailed to each of the 154 participants, who were asked to rate each problem identified as to its importance in their communities. Follow-up letters were sent to those who did not respond in the time allotted. A total of 116 (75 percent) participants responded.

Data from the survey were organized and recorded on 80-column IBM cards, and then analyzed with the aid of the West Virginia University Computer facilities. Mean ratings and standard deviations

were determined for each statement by position and region. The results are presented in tabular and narrative form.

For the purpose of analysis and interpretation of the study data mean values were grouped as follows:

- (i) Mean values of 1.24 and below were considered to indicate that the problem was Not Important.
- (ii) Mean values between 1.25 and 2.24 were considered to indicate that the problem was Somewhat (slightly) Important.
- (iii) Mean values between 2.25 and 3.24 were considered to indicate that the problem was Important, and
- (iv) Mean values of 3.25 and above were considered to indicate that the problem was Very Important.

Specific Problems in Agriculture Most in Need of Research Solutions,
Ranked with Mean Ratings of 3.25 and Above.

Agriculture is an important industry in West Virginia. It contributed substantially to the economy of the State and employs an appreciable percent of its population. It is, therefore, imperative that the research institutions play an increasingly supportive role in order to sustain and expand this industry and thus accelerate social and economic growth of West Virginia's farmers.

Data in Table 3 gives an overall view of the perceptions of vocational agriculture teachers and county extension agents regarding the relative importance of the problems identified. Nineteen statements have been earmarked as very important (mean ratings of 3.25 or above). The following were perceived to be particularly serious problems:

"Multiflora rose eradication" (3.63)

Table 3

Specific Problems in Agriculture Most in Need of Research Solutions,
Ranked With Mean Ratings of 3.25 and Above

Problem and Overall Rank	Overall Mean (N = 116)	S.D.
1. Multiflora rose eradication	3.63	0.70
2. Coping with high production costs and interest rates	3.55	0.69
3. Improving State level funding for extension and vo-ag programs	3.52	0.74
4. Protection of farmland from oil, gas and coal companies	3.48	0.72
5. Chemical weed and brush control in pastures	3.40	0.76
6. Increasing weaning weights of feeder calves through breeding and nutrition	3.39	0.79
7. Control of pink eye	3.38	0.76
8. Budgeting for machinery, buildings, equipment and livestock	3.37	0.72
9. Economic sources of N, P, and K	3.35	0.70
10. Liming and fertilization methods for pasture	3.35	0.65
11. Farmland preservation and retention	3.34	0.75
12. Control of face fly	3.31	0.76
13. Haymaking with limited labor	3.30	0.79
14. Farm estate planning	3.30	0.71
15. Efficient methods of lime and fertilizer application for small farmers	3.28	0.76
16. Effects of laws and regulations on the farm community	3.26	0.72
17. Land owner rights in strip mines and oil field reclamation	3.26	0.96
18. Pasture renovation methods	3.25	0.69
19. Development of better quality pasture grasses	3.25	0.71

Rating Scale: 1 = Not Important; 2 = Somewhat Important; 3 = Important; 4 = Very Important

"Coping with high production costs and interest rates" (3.55)

"Improving State level funding for extension and vo-ag programs"
(3.52)

Statements rated by participants were divided into eleven problem areas. Of the 19 statements which received overall mean ratings of 3.25 and above, five were related to rural development and extension/education; four were in the field of pasture management; three in field crop production; two in livestock production; three in farm management and two in plant pest/disease management.

Specific Problems in Agriculture, with Mean Ratings of 3.25 and Above, Most in Need of Research Solutions as Perceived by Vocational Agricultural Teachers and County Extension Agents.

Data for the study were secured from vocational agricultural teachers in high schools and county extension agents in West Virginia. These professional agriculturalists, through their strategic positions and experience in rural communities were thought to be in appropriate positions to perceive problems pertaining to agriculture. However, because of differences in their day-to-day activities, their perceptions of the problems identified may also be different.

Data in Table 4 reveal the major problems in agriculture, with mean ratings of 3.25 and above, as perceived by each of the two groups. Although 10 problems were rated as "Very Important" by both groups, data indicate that there was considerable disagreement on the importance of several problem areas both by degree of rating and by type of problems identified. Vocational agriculture teachers rated the following as the top four problems:

Table 4

Specific Problems in Agriculture with Mean Ratings of 3.25 and Above
as Perceived by Vocational Agriculture Teachers and County Extension Agents

Problem and Rank	Mean (n = 79)	Problem and Rank	Mean (n = 37)
Vo-Ag Teachers (VATS)			
1. Coping with high production costs and interest rates	3.61	1. Multiflora rose eradication	3.73
2. Multiflora rose eradication	3.58	2. Chemical weed and brush control in pastures	3.59
3. Protection of farm land from oil, gas and coal fields	3.56	3. Improvement of state level funding for extension and vo-ag programs	3.51
4. Improvement of state level funding for extension and vo-ag programs	3.52	4. Control of face fly	3.47
5. Budgeting for machinery, buildings, equipment and livestock	3.46	5. Coping with high production costs and interest rates	3.45
6. Increasing weaning weights of feeder calves through breeding and nutrition	3.43	6. Economic sources of N, P, and K	3.41
7. Job satisfaction of vo-ag teachers	3.43	7. Farmland preservation and retention	3.38
8. Control of pink eye	3.39	8. Development of grasses for acid soil	3.36
9. Hay making with limited labor	3.37	9. Liming and fertilization methods for pastures	3.33
10. Farm estate planning	3.37	10. Protection of farmland from oil, gas and coal companies	3.32
11. Liming and fertilization methods for pasture	3.35	11. Efficient methods of lime and fertilizer application for small farmers	3.32
12. Economic sources of N, P, and K	3.33	12. Increasing weaning weights of feeder calves through breeding and nutrition	3.30
13. Farmland preservation and retention	3.33	13. Pasture renovation methods	3.28
14. Chemical weed and brush control in pastures	3.30	14. Development of better quality pasture grasses	3.28
15. Land owner rights in strip mine and oil field reclamation	3.30		
16. Means of getting started in farming	3.29		
17. Agricultural safety	3.29		
18. Development of better quality pasture grasses	3.28		
19. Efficient methods of lime and fertilizer application	3.25		
County Extension Agents (CEA)			

Rating Scale: 1 = Not Important; 2 = Somewhat Important; 3 = Important; 4 = Very Important.

"Coping with high production costs and interest rates"
(mean of 3.61)

"Multiflora rose eradication" (3.58)

"Protection of farm land from oil, gas and coal companies"
(mean of 3.56)

"Improvement of state level funding for extension and vo-
ag program" (mean of 3.52)

On the other hand, county extension agents rated the following
as the top four problems:

"Multiflora rose eradication" (3.73)

"Chemical weed and brush control" (3.59)

"Improvement of state level funding for extension and vo-
ag programs" (3.51)

"Control of face fly" (3.47)

In general, vocational agricultural teachers perceived more prob-
lems to be of a serious nature (19 problems) than did county extension
agents (14 problems).

Specific Problems in Agriculture, with Mean Ratings of 3.25 and
Above, As Perceived by Vocational Agriculture Teachers and
County Extension Agents, by Regions.

There are many problems which affect agricultural production in
West Virginia. Most of them are common across the state but some are
not--they are found only in certain regions. This difference is in-
evitable because of varying geophysical and climatic conditions which
influence agricultural enterprises.

Table 5 presents data that summarize the perceptions of respon-
dents when categorized by regions. The data show that:

-- some problems are common in all regions

Table 5

Specific Problems in Agriculture, With Mean Ratings of 3.25 and Above
Most in Need of Research Solutions as Perceived by Vocational
Agriculture Teachers and County Extension Agents by Region

Region 1		Region 2	
Problem and Rank	Mean (n = 23)	Problem and Rank	Mean (n = 22)
1. Chemical weed and brush control in pasture	3.56	1. Coping with high production cost and interest rates	3.73
2. Protection of farm land from oil, gas and coal companies	3.56	2. Farm estate planning	3.68
3. Economic lime usage	3.52	3. Multiflora rose eradication	3.64
4. Liming and fertilization methods for pasture	3.48	4. Farm land preservation and retention	3.64
5. Multiflora rose eradication	3.43	5. Improvement of state level funding for extension and vo-ag programs	3.64
6. Pasture renovation methods	3.43	6. Increasing weaning weights of feeder calves through breeding and nutrition	3.59
7. Application of lime on steep land	3.43	7. Budgeting for machinery, buildings, equipment and livestock	3.59
8. Landowner rights in strip mine and oil field reclamation	3.43	8. Control of Johnson grass	3.55
9. Economic sources of N, P, and K	3.39	9. Chemical weed control of crops	3.55
10. Development of better quality pasture legumes	3.39	10. Forages for shale lands in eastern West Virginia	3.50
11. Development of quality pasture grasses	3.39	11. Control of pink eye	3.50
12. Prevention of grass tetany	3.39	12. Control of gypsy moth	3.45
13. Coping with high production costs and interest rates	3.39	13. No-till corn production practices	3.41
14. Practical and inexpensive soil erosion control measures	3.39	14. Efficient methods of lime and fertilizer application for small farms	3.41
15. Improvement of state level funding for extension and vo-ag programs	3.39	15. Effective deer control methods	3.41
16. Hay making with limited labor	3.35	16. Extended grazing season methods	3.41
17. Increasing weaning weights of feeder calves through breeding and nutrition	3.30	17. Haymaking with limited labor	3.41
18. Control of pink eye	3.30	18. Effect of laws and regulations on the farm community	3.41
19. Control of foot rot (sheep)	3.30	19. Chemical weed and brush control in pastures	3.36
20. Need for improved livestock marketing systems	3.26	20. Development of better quality pasture legumes	3.36
21. Means of getting started in farming	3.26	21. Liming and fertilization methods for pastures	3.36
22. Farm land preservation and retention	3.26	22. Prevention and control of calf scours	3.36
23. Budgeting for machinery, buildings, equipment and livestock	3.26	23. Protection of farmland from oil, gas and coal companies	3.36
24. Development of grasses for acid soil	3.26	24. Economic sources of li, P and K	3.32
		25. Alfalfa stand establishment	3.32
		26. Development of better quality pasture grasses	3.32
		27. Low cost holding and handling facilities	3.32
		28. Control of face fly	3.32
		29. Need for improved livestock marketing system	3.32
		30. Reducing capital investment on the farm	3.32
		31. Development of energy efficient farm machinery	3.32
		32. Fertility and reproduction problems (in livestock)	3.27

Table 5. (Continued)

Region 3		Region 4	
Problem and Rank	Mean (n = 18)	Problem and Rank	Mean (n = 18)
1. Protection of farmland from oil, gas and coal companies	3.83	1. Need for improved livestock marketing systems	3.78
2. Multiflora rose eradication	3.78	2. Control of foot rot (sheep)	3.50
3. Coping with high production costs and interest rates	3.78	3. Control of face fly	3.50
4. Improvement of state level funding for extension and vo-ag programs	3.70	4. Multiflora rose eradication	3.50
5. Control of pink eye	3.61	5. Protection of farmland from oil, gas and coal companies	3.44
6. Landowner rights in strip mine and oil field reclamation	3.61	6. Application of lime on steep ground	3.39
7. Increasing weaning weights of feeder calves through breeding and nutrition	3.52	7. Hay making with limited labor	3.39
8. Control of face fly	3.48	8. Landowner rights in strip mining and oil field reclamation	3.33
9. Means of getting started in farming	3.48	9. Prevention and control of early blight (beans, tomatoes, etc.)	3.33
10. Economics of pick-your-own fruit and vegetable farming	3.39	10. Increasing weaning weights of feeder calves through breeding and nutrition	3.33
11. Direct marketing--farmer to retailer or consumer	3.39	11. Prevention and control of calf scours	3.33
12. Chemical weed and brush control in pastures	3.35	12. Coping with high production costs and interest rates	3.33
13. Economic sources of N, P and K	3.35	13. Farm estate planning	3.33
14. Liming and fertilization methods for pasture	3.35	14. Chemical weed and brush control in pastures	3.28
15. No-till pasture and meadow reseeding	3.35	15. Farm land preservation and retention	3.28
16. Potential for commercial vegetable production, marketing and processing	3.30		
17. Effective deer control methods	3.30		
18. Development of grasses for acid soils	3.30		
19. Hay making with limited labor	3.30		
20. Need for improved livestock marketing	3.30		
21. Budgeting for machinery, buildings, equipment and livestock	3.30		
22. Farm management for small scale family or part-time farm operators	3.30		
23. Farm land preservation and retention	3.30		
24. Cultural practices in vegetable production	3.26		
25. Development of better quality pasture legumes	3.26		
26. Pasture renovation methods	3.26		
27. Effect of laws and regulations on the farm community	3.26		

Table 5. (Continued)

Region 5		Region 6	
Problem and Rank	Mean (n = 13)	Problem and Rank	Mean (n = 17)
1. Tobacco production and marketing	3.77	1. Multiflora rose eradication	3.76
2. Multiflora rose eradication	3.77	2. Improving state level funding for extension and vo-ag programs	3.71
3. Prevention and control of tobacco diseases	3.62	3. Economic sources of N, P and K	3.65
4. Chemical weed and brush control in pastures	3.62	4. Control of pink eye	3.63
5. Budgeting for machinery, building, equipment and livestock	3.54	5. Coping with high production costs and interest rates	3.54
6. Potential for commercial vegetable production	3.46	6. Development of better quality pasture grasses	3.56
7. Coping with high production costs & interest rates	3.38	7. Liming and fertilization methods for pasture	3.56
8. Practical and inexpensive soil erosion control measures	3.38	8. Pasture renovation methods	3.56
9. Protection of farmland from oil, gas and coal companies	3.38	9. Increasing weaning weights of feeder calves through breeding and nutrition	3.50
10. Improvement of state level funding for extension work and vo-ag programs	3.38	10. Control of face fly	3.50
11. Efficient methods of lime and fertilizer application for small farmers	3.31	11. Control of foot rot (sheep)	3.44
12. Economic sources of N, P and K	3.31	12. Alfalfa stand establishment	3.41
13. Control of Johnson grass	3.31	13. Efficient methods of lime and fertilizer application for small farmers	3.41
14. Roadside marketing	3.31	14. Chemical weed and brush control in pastures	3.41
15. Agricultural safety	3.31	15. Prevention of grass tetany	3.38
16. Landowner rights in strip mine and oil field reclamation	3.31	16. Development of quality pasture legumes	3.36
		17. Cultural practices in vegetable production	3.35
		18. Direct marketing--farmer to retailer or consumer	3.35
		19. Budgeting for machinery, buildings, equipment and livestock	3.35
		20. Farm estate planning	3.35
		21. Ways of getting farmers organized to solve their own problems	3.35
		22. Hay making with limited labor	3.31
		23. No-till corn production practices	3.29
		24. Maintaining quality in field stored large round bales	3.29
		25. Chemical weed control in crops	3.29
		26. Farm land preservation and retention	3.29
		27. Effect of laws and regulations on the farm community	3.29
		28. Development of grasses for acid soils	3.25
		29. Prevention of calf scours	3.25

Rating Scale: 1 = Not important; 2 = Somewhat important; 3 = Important; 4 = Very important.

-- there was disagreement on the importance of some of the problems as indicated by the rating levels

-- some regions perceived more problems than others.

Problems which are perceived to be serious in at least five of the six regions include:

"Multiflora rose eradication"

"Coping with high production costs and interest rates"

"Improving state level funding for extension and vo-ag programs"

"Protection of farmland from oil, gas and coal companies"

"Increasing weaning weights of feeder calves through breeding and nutrition"

"Farm land retention and preservation"

These problems, considered very important, also appeared in Table 3 (i.e., by overall response).

Disparity in perceived importance of the problems was also noted.

The three most important problems by rank in each region were as follows:

Region 1:

1. "Chemical weed and brush control in pasture"
2. "Protection of farmland from oil, gas and coal companies"
3. "Economic lime usage"

Region 2:

1. "Coping with high production costs and interest rates"
2. "Farm estate planning"
3. "Multiflora rose eradication"

Region 3:

1. "Protection of farmland from oil, gas and coal companies"
2. "Multiflora rose eradication"
3. "Coping with high production costs and interest rates"

Region 4:

1. "Need for improved livestock market systems"
2. "Control of foot rot (sheep)"
3. "Control of face fly"

Region 5:

1. "Tobacco production and marketing"
2. "Multiflora rose eradication"
3. "Prevention and control of tobacco diseases"

Region 6:

1. "Multiflora rose eradication"
2. "Improving state level funding for extension and vo-ag programs"
3. "Economic sources of N, P and K"

Highest mean ratings, indicating exceptional importance in their respective regions, were given the following statements:

"Protection of farmland from oil, gas and coal companies"
(3.83 in Region 3)

"Multiflora rose eradication" (3.78 in Region 3)

"Coping with high production costs and interest rates"
(3.78 in Region 3)

"Need for improved livestock marketing systems" (3.78
in Region 4)

Further observation of the data reveals that respondents in Regions 2 and 6 perceived more problems to be of a serious nature (32 and 29 problems, respectively) than did those in other regions. Region 4 participants rated the least number of problems (15 problems) with means of 3.25 or above.

Specific Problems in Field Crop Production Most in Need of Research Solutions

As already noted, West Virginia is an agricultural state producing a wide variety of high quality field crops for both domestic and distant markets. Among the most important crops grown are corn, wheat, barley, oats, tobacco and hay. Since crop production is becoming increasingly expensive, it must be performed as efficiently as possible by growers if it is to be successful. Major problems in field crop production most in need of research solutions are presented in Table 6. "Economic Sources of N, P, and K (3.35) and "Efficient Methods of Lime and Fertilization Application for Small Farmers" (3.28) were considered "very important" problems whereas the following statements were perceived to be of "little importance" overall:

"Effect of fertilizer on heavy metal uptake" (mean of 2.22)

"Sewage sludge use on farms" (mean of 2.03)

"Oat and barley yield and nutritional value listing" (mean of 1.92)

"Tobacco production and marketing" (mean of 1.74)

The remaining 12 items were considered "important". Vocational agriculture teachers and county extension agents had similar perceptions of the problems identified in this category.

Table 6

Specific Problems in Field Crop Production Most in Need of Research Solutions

Problem and Rank	POSITION			REGIONS						Overall	
	VAT n=79	CEA n=37		1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17	Mean n=116	SD
1. Economic sources of N, P, and K	3.33	3.41		3.39	3.32	3.35	3.11	3.31	3.65	3.35	0.70
2. Efficient methods of lime and fertilization application for small farmers	3.25	3.32		3.22	3.41	3.22	3.11	3.31	3.41	3.28	0.76
3. Economic lime usage	3.09	3.22		3.52	3.00	3.09	3.00	2.92	3.12	3.13	0.69
4. Application of lime on steep land	3.06	3.16		3.43	2.82	3.09	3.39	2.69	3.00	3.09	0.86
5. Alfalfa stand establishment	3.01	3.19		3.13	3.32	2.91	2.50	3.15	3.41	3.07	0.81
6. Maintaining quality in field stored	3.06	2.89		2.91	3.14	3.13	2.94	2.46	3.29	3.01	0.96
7. No-till corn production practices	2.91	2.86		2.96	3.41	2.52	2.50	2.62	3.29	2.90	0.95
8. Soil fertility improvement without use of commercial fertilizer and lime	2.77	2.81		2.74	2.77	2.70	2.72	3.00	2.88	2.78	0.97
9. Development of 'deer resistant' crop varieties	2.76	2.73		2.61	3.18	2.96	2.94	2.15	2.35	2.75	1.10
10. Silage production vs haymaking (economic comparison)	2.82	2.49		2.52	2.95	2.70	2.89	2.15	2.94	2.72	0.90
11. Potential multicropping systems	2.66	2.65		2.74	3.09	2.39	2.28	2.54	2.82	2.66	0.81
12. Corn variety yield and nutrition	2.70	2.54		2.61	2.91	2.39	2.67	2.69	2.65	2.65	0.93
13. Optimum organic matter levels for specific crops	2.54	2.65		2.48	2.50	2.61	2.28	3.15	2.65	2.58	0.83
14. Development of seed for cool weather germination	2.54	2.49		2.65	2.50	2.22	2.78	2.23	2.76	2.53	0.93
15. Effect of fertilizer on heavy metal uptake	2.11	2.43		2.30	2.14	2.17	2.06	2.54	2.18	2.22	0.91
16. Sewage sludge use on farms	1.87	2.35		2.26	2.05	1.87	1.89	2.15	1.94	2.03	1.00
17. Oat and barley yield & nutritional value testing	1.94	1.89		2.09	2.40	1.57	1.94	1.38	1.94	1.92	0.88
18. Tobacco production and marketing	1.72	1.78		1.09	1.23	2.35	1.22	3.77	1.47	1.74	1.17

Rating Scale:

1=Not Important

2=Somewhat Important

3=Important

4=Very Important

However, disparity in perception occurred in ratings by respondents when categorized by regions. Statements with variations in mean ratings exceeding 0.50 include: "Economic source of N, P and K" rated high (3.65) in Region 6 and low (3.11) in Region 4; "Economic lime usage" was given a high rating (3.52) in Region 1 but a low rating (2.92) in Region 5; "Application of lime on steep land" rated high in Regions 1 and 4 but low in Region 5 (2.69); and "No-till corn production practices" rated high in Regions 2 and 6 but low in other regions.

A very interesting variation occurred in the perception of need for research in "Tobacco production and marketing." Respondents in all regions except those in Region 5 gave this problem very low ratings. Respondents in Region 5 gave it the highest rating in the category (3.77). This is undoubtedly due to the fact that tobacco is an important crop only in this particular region.

Specific Problems in Horticulture Most in Need of Research Solutions

The production of horticultural crops is also important to the economy of West Virginia. Different types of fruits* and vegetables are produced for both local and distant markets. There appears to be great potential for expansion.

Table 7 presents information concerning problem areas in the horticultural industry which need research attention. On examination of the data, it seems that none of the problems identified were

*West Virginia is one of the top ten states in the production of apples and peaches in the United States.

Table 7
Specific Problems in Horticulture Most in Need of Research Solutions

Problem and rank	POSITION		REGIONS						Overall Mean N=116 SD	
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17		
1. Potential for commercial vegetable production and processing	3.10	2.95	3.13	3.05	3.30	2.33	3.46	3.06	3.05	0.83
2. Cultural practices in small fruit production	3.00	2.92	2.91	3.05	3.13	2.50	3.08	3.18	2.97	0.76
3. Potential for commercial small fruit production	2.92	2.86	2.87	3.09	2.96	2.61	2.92	2.94	2.91	0.83
4. Cultural practices in fruit production	2.76	2.78	2.52	3.00	2.74	2.50	2.96	3.00	2.77	0.77
5. Potential for greenhouse production of bedding and ornamental plants	2.76	2.59	2.65	2.86	2.70	2.39	2.77	2.88	2.71	0.83
6. Potential for grape production (fresh fruit & wine)	2.73	2.54	2.83	2.74	2.57	2.50	3.00	2.59	2.60	0.94
7. Cultural practices in greenhouse plant production	2.64	2.57	2.57	2.73	2.61	2.11	3.00	2.82	2.62	0.86
8. Potential for commercial fruit production, marketing and processing	2.64	2.54	2.30	2.77	2.87	2.06	2.92	2.80	2.61	0.90
9. Grape variety testing	2.26	2.35	2.26	2.36	2.17	2.22	2.54	2.29	2.29	0.94
10. The potential for specialized agriculture (mushrooms, garlic, etc.) in low income counties	2.28	2.16	2.30	2.18	2.35	2.00	2.23	2.35	2.24	1.03

Rating Scale:

- 1=Not Important
- 2=Somewhat Important
- 3=Important
- 4=Very Important

considered crucial. However, overall ratings of all items were in the "important" category.

In all statements there was considerable agreement between vocational agriculture teachers and county extension agents. Both groups of respondents rated all statements to be important (2.25-3.24) except for Statement 10, which was given a mean rating of 2.16 by county extension agents. The top rating for importance given by both groups was for "Potential for commercial vegetable production and processing." In general, vocational agriculture teachers indicated greater concern for horticultural problems than did county extension agents.

There was very little variation in perceptions of horticultural problems by region. However, "Potential for commercial vegetable production and marketing" was given somewhat higher ratings by participants from Region 3 and 5. Respondents in Region 4 gave lower mean ratings on nearly all the statements in this category.

Specific Problems in Plant Pest/Disease Management Most in Need of Research Solutions

Pest and disease control in plants is one of the major problems affecting agricultural production today. Although a great deal of research work has been done in this field, problems continue to threaten the industry.

Table 8 shows the major problems in need of research solutions in plant pest/disease management as perceived by the respondent groups. Data indicate that multiflora rose eradication and chemical weed and brush control in pastures are the most serious problems (means of 3.63 and 3.40) in this category. All problems were considered

Table 8

Specific Problems in Pest/Disease Management Most in Need of Research Solutions

Problem and Rank	POSITIONS		REGIONS						Overall Mean N = 116	SD
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17		
1. Multiflora rose eradication	3.58	3.73	3.43	3.64	3.78	3.44	3.77	3.76	3.63	0.70
2. Chemical weed and brush control in pastures	3.30	3.59	3.43	3.36	3.35	3.28	3.62	3.41	3.40	0.76
3. Chemical weed control in crops	3.22	3.22	3.17	3.55	3.13	2.89	3.23	3.29	3.22	0.80
4. Prevention and control of early blight (beans, tomatoes, etc.)	3.20	2.97	2.96	3.05	3.09	3.33	3.23	3.24	3.13	0.75
5. Economic pest control techniques for small farmers	3.04	3.05	3.09	3.09	3.04	2.89	2.92	3.18	3.04	0.68
6. Control of gypsy moth	2.95	3.14	2.83	3.45	3.17	2.83	2.31	3.18	3.01	0.93
7. Effective deer control methods	2.92	3.05	2.91	3.41	3.30	3.22	2.31	2.24	2.97	1.09
8. Prevention and control of brown root rot in beans	2.81	3.03	2.78	2.55	3.00	2.83	3.15	3.12	2.88	0.85
9. Control of Johnson grass	2.84	2.95	2.13	3.55	3.04	2.56	3.31	2.76	2.87	0.99
10. Integrated pest management techniques	2.92	2.70	2.96	3.05	2.91	2.51	2.60	2.76	2.86	0.70
11. Control of army work (corn) in wet weather	2.82	2.86	2.87	3.09	2.57	2.56	2.92	3.06	2.84	0.80
12. Chemical weed control for family gardens	2.82	2.67	2.70	3.05	2.91	2.61	2.62	2.65	2.78	0.85
13. Control of Japanese beetle	2.80	2.70	2.83	2.91	2.52	2.72	2.46	3.12	2.77	0.78
14. Prevention and control of ground moles in lawns	2.34	2.92	2.74	2.27	2.74	2.33	2.54	2.47	2.53	1.00
15. Control of autumn olive	2.38	2.73	2.57	2.68	2.70	2.56	1.92	2.24	2.49	1.07
16. Control soil borne diseases in intensively used soils	2.46	2.54	2.30	2.73	2.52	2.22	2.54	2.59	2.48	0.91
17. Nematodes control in gardens	2.47	2.19	2.39	2.55	2.35	2.17	2.08	2.65	2.38	0.73
18. Prevention and control of potato scab	2.41	2.19	2.48	2.18	2.30	2.28	2.31	2.47	2.34	0.72
19. Prevention and control of tobacco diseases	1.72	1.62	1.13	1.32	2.09	1.28	3.62	1.35	1.69	1.07

Rating Scale: 1 = Not Important; 2 = Somewhat Important; 3 = Important; 4 = Very Important.

"important" except for "Prevention and control of tobacco diseases," which was given the lowest rating (1.69) overall.

There was close agreement between vocational agriculture teachers and county extension agents on the importance of problems identified. Both groups ranked "Multiflora rose eradication" as the number one problem, followed by "Chemical weed and brush control in pastures." However, county extension agents gave higher ratings for these problems than did vocational agriculture teachers. Both groups also considered "Prevention and control of tobacco diseases" the least important problem in this category.

Although respondents in all regions considered "Multiflora rose eradication" as a very serious problem, there was considerable variation in perception with respect to other statements. Notable among these include statements concerned with control of weeds, Johnson grass, gypsy moth and deer which were perceived "very important" in Region 2 but only "important" in other regions. However, the major variation was observed in the perception of the item: "Prevention and control of tobacco diseases." This statement was rated "very important" in Region 5, but of much less importance in other regions.

In general, respondents in Region 2 considered problems in this category to be more serious than did those in other regions.

Specific Problems in Pasture Management Most in Need of Research Solutions

Pasture management is the science and art of managing forage resources in order to produce livestock/dairy products at a reasonable price for consumers and an acceptable net profit to the producers.

Table 9 presents the major problems in pasture management as perceived by the two respondent groups. All statements received overall mean ratings above 3.00 except statement 9, rated very low (2.05) which dealt with a problem specific to the eastern panhandle area of the state. The top ratings for importance were for:

"Liming and fertilization methods for pasture" (3.25)

"Hay making with limited labor" (3.30)

"Development of quality pasture grasses" and "Pasture renovation methods" (3.25)

Variations in perceptions between vocational agriculture teachers and county extension agents were noted in certain statements. Disagreement was especially noticed with regard to importance of the following two items: "Hay making with limited labor" was rated somewhat more important by vocational agriculture teachers (3.37) than by county extension agents (3.17); and "Development of grasses for acid soils" was perceived to be more important by county extension agents (3.36) than by vocational agriculture teachers (3.00).

Regional differences in perception were also evident in several statements. The regional top ratings were for:

"Liming and fertilization methods for pasture" in Regions 1, 3 and 6

"Hay making with limited labor" in Region 4

"Pasture renovation methods" in Regions 5 and 6

"Development of quality pasture grasses" in Region 6

"Forage for shale lands in eastern West Virginia" in Region 2

Table 9
Specific Problems in Pasture Management Most in Need of Research Solutions

Problem and Rank	POSITIONS		REGIONS						Overall Mean N=116 SD	
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17		
1. Liming and fertilization methods for pasture	3.35	3.33	3.48	3.35	3.35	3.11	3.15	3.56	3.35	0.65
2. Hay making with limited labor	3.37	3.17	3.35	3.41	3.30	3.39	2.92	3.31	3.30	0.79
3. Development of quality pasture grasses	3.24	3.28	3.39	3.32	2.17	3.00	3.00	3.56	3.25	0.71
4. Pasture renovation methods	3.24	3.28	3.43	3.05	3.26	3.00	3.23	3.56	3.25	0.69
5. Development of quality pasture legumes	3.28	3.14	3.39	3.35	3.26	2.89	3.00	3.38	3.23	0.68
6. Development of grasses for acid soils	3.00	3.36	3.26	2.73	3.30	3.22	2.85	3.25	3.11	0.80
7. Extended grazing season methods	3.14	3.06	3.17	3.41	3.22	3.06	2.46	3.06	3.11	0.78
8. No-till pasture and meadow reseeding	3.10	2.97	3.13	3.14	3.35	2.78	2.62	3.13	3.06	0.84
9. Forage for shale lands in eastern West Virginia	2.13	1.89	1.48	3.50	1.56	2.06	1.31	2.19	2.05	1.17

Rating Scale:
1=Not Important
2=Somewhat Important
3=Important
4=Very Important

In general, respondents in Region 6 perceived items in this category to be greater problems than did those in other regions.

Specific Problems in Livestock Production Most in Need of Research Solutions

Livestock, dairy, and poultry production are major agricultural enterprises in West Virginia. Among the most important animals found in the state are cattle (beef and dairy), hogs, chickens, and sheep/lambs. The potential for increased production exists throughout the state. Problems relating to livestock production and which were noted to require research attention are presented in Table 10. More problems were identified in livestock production than in any other category. However, no specific problems were noted in poultry production.

The following were considered "very important" problems by respondents:

"Increasing weaning weights of feeder calves through breeding and nutrition" (3.39)

"Control of pink eye" (3.38)

"Control of face fly" (3.31)

Except for "Dairy goat management and milk processing," the remaining problems were all considered "important" (2.25-3.34).

With regard to group perception, data show that there was strong agreement between vocational agriculture teachers and county extension agents. The greatest difference of opinion occurred with regard to the item, "Production of feeder pigs," which vocational teachers perceived to be of greater importance than did extension agents (means of 2.94 and 2.58, respectively).

Table 10

Specific Problems in Livestock Production Most in Need of Research Solutions

Problem and Rank	POSITIONS		REGIONS						Overall Mean N = 116	SD
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17		
1. Increasing weaning weights of feeder calves through breeding and nutrition	3.43	3.31	3.30	3.59	3.52	3.33	2.92	3.50	3.39	0.79
2. Control of pink eye	3.39	3.36	3.30	3.50	3.60	3.22	2.85	3.63	3.38	0.76
3. Control of face fly	3.24	3.47	3.17	3.32	3.48	3.50	2.77	3.50	3.31	0.76
4. Low cost hndling and handling facilities	3.16	3.14	3.17	3.32	3.22	3.17	2.69	3.19	3.16	0.81
5. Prevention and control of calf scours	3.13	3.11	3.09	3.36	2.91	3.33	2.69	3.25	3.12	0.80
6. Prevention of grass tetany	3.22	2.92	3.39	3.22	3.04	3.00	2.46	3.38	3.12	0.87
7. Control of foot rot (sheep)	3.06	3.06	3.30	3.00	2.91	3.50	1.92	3.44	3.06	1.01
8. Prevention of leptospirosis	3.08	3.03	3.04	3.14	3.22	3.00	2.85	3.00	3.06	0.85
9. Fertility and reproduction problems	3.00	3.00	3.13	3.27	2.91	2.78	2.77	3.00	3.00	0.82
10. Economics of using beef cattle production testing (BCPT) programs	2.85	2.89	3.00	2.95	2.70	2.83	2.54	3.06	2.85	0.85
11. Estrus synchronization and heat detection in artificial insemination (sheep and cattle)	2.91	2.71	2.78	2.91	2.61	3.06	2.77	3.06	2.85	0.85
12. Prevention of sheep fever in nursing calves	2.89	2.75	2.78	2.95	2.65	3.00	2.54	3.13	2.85	0.85
13. Production of feeder pigs	2.94	2.58	2.52	3.18	2.96	2.50	2.92	2.88	2.89	0.89
14. Control of internal parasites in nursing calves	2.80	2.81	2.87	2.77	2.57	3.11	2.38	3.06	2.80	0.84
15. Mastitis prevention	2.72	2.69	2.87	3.05	2.35	2.61	2.46	2.88	2.77	1.00
16. Small scale (backyard) livestock production	2.68	2.97	2.74	3.00	2.91	2.61	2.85	2.44	2.71	0.95
17. Cost effective production of small livestock (poultry, rabbit, etc.) management, marketing, etc.	2.65	2.72	2.87	2.68	2.87	2.44	2.62	2.38	2.67	0.94
18. Development of pour-on insecticide for sheep	2.53	2.86	2.61	2.59	2.87	3.00	1.92	2.63	2.63	0.88
19. Prevention and control of lamb scours	2.51	2.69	2.57	2.73	2.48	2.89	1.77	2.75	2.57	0.87
20. Control of respiratory diseases (sheep)	2.49	2.56	2.43	2.73	2.48	2.72	1.85	2.69	2.51	0.85
21. Increasing dairy production and profits through breeding and nutrition	2.48	2.25	2.57	2.77	2.00	2.17	2.08	2.81	2.41	1.14
22. Swine production testing	2.48	2.19	2.17	2.73	2.43	2.22	2.46	2.31	2.39	1.00
23. Dairy goat management and milk processing	1.95	2.22	2.13	1.95	2.09	1.83	2.62	1.69	2.03	0.92

Rating Scale: 1 = Not Important; 2 = Somewhat Important; 3 = Important; 4 = Very Important.

However, there was disagreement regarding the importance of certain problems by respondents in various regions. Major disagreements occurred in the ranking of the following statements:

"Increasing weaning weights of feeder calves through breeding and nutrition," considered the number one item in Regions 2 and 5

"Control of pink eye," the most serious problem identified in Regions 3 and 6

"Control of face fly," a very important problem in Region 4

"Prevention of grass tetany," rated very high in Region 1

Further observation of the data reveals an interesting feature. Respondents in Region 5 were somewhat less concerned with nearly all problems identified in the category than were those from other regions.

Specific Problems in Agricultural Marketing Most in Need of Research Solutions

Today, marketing of farm products is part and parcel of the total productive process and is thus an essential element in a well organized agricultural industry. Table 11 presents data that summarize the perceptions of vocational agriculture teachers and county extension agents regarding the importance of problems in marketing. All problems in this category were considered important with mean ratings between 2.25-3.24. The statement, "Need for improved livestock marketing systems" was ranked highest.

Data in the same table indicate that perceptions of the two groups of respondents were similar. All statements were rated "important" except "Use of future contracts in marketing," which was considered only "somewhat important" (2.19) by county extension agents.

Table 11
Specific Problems in Agricultural Marketing and Processing Most in Need of
Research Solutions

Problem and Rank	POSITION		REGIONS						Overall	
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17	Mean n=116	SD
1. Need for improved livestock marketing systems	3.20	3.24	3.26	3.32	3.30	3.28	2.77	3.18	3.22	0.82
2. Direct marketing-farmer to retailer or consumer	3.22	3.05	2.91	3.09	3.39	3.17	3.08	3.35	3.16	0.70
3. Economics of pick-your-own fruit and vegetables	3.14	3.05	3.04	3.23	3.39	2.61	3.23	3.12	3.11	0.86
4. Roadside marketing	2.95	2.81	2.87	2.86	3.04	2.61	3.31	2.82	2.91	0.86
5. Effects on sheep production if processing plants were located in West Virginia	2.73	3.08	2.74	3.23	2.91	2.78	2.15	3.00	2.84	1.02
6. Improvement of farm to market road system	2.82	2.70	2.78	2.77	3.00	2.56	3.08	2.53	2.78	0.89
7. Need for lamb slaughtering facilities	2.62	2.81	2.57	3.09	2.51	2.67	1.92	3.00	2.68	1.06
8. Need for small-scale food processing plants	2.70	2.49	2.65	2.64	2.70	2.28	2.77	2.82	2.64	1.04
9. Economics of 'bulk grain shipment' (pooling of resources)	2.65	2.30	2.83	2.59	2.61	2.22	2.31	2.48	2.53	1.01
10. Electronic marketing	2.43	2.54	2.35	2.77	2.43	2.44	2.31	2.41	2.47	0.89
11. Use of future contracts in marketing	2.33	2.19	2.43	2.45	2.30	1.94	2.31	2.18	2.28	0.95

Rating Scale:
1=Not Important
2=Somewhat Important
3=Important
4=Very Important

Respondents in various regions differed somewhat in their perceptions of problems in this category. The greatest variations occurred in the following items (mean rating differences > 0.60): "Economics of pick-your-own fruit and vegetables," with mean ratings of 3.34 in Region 3 and 2.61 in Region 4; "Effects on sheep production if processing plants were located in West Virginia," with means of 3.25 in Region 2 and 2.15 in Region 5; "Need for lamb slaughtering facilities," with means of 3.09 in Region 2 and 1.92 in Region 5; and "Economics of bulk grain shipment (pooling of resources)," with means of 2.83 in Region 1 and 2.22 in Region 4.

The item considered most important in each region was:

"Need for improved livestock marketing systems" in Regions 1, 2 and 4

"Direct marketing--farmer to retailer or/and consumer" in Regions 3 and 6

"Roadside marketing" in Region 5

Specific Problems in Farm Management Most in Need of Research Solutions

A good farmer knows what to do

He knows when to do it

He knows how to do it

He knows why to do it

And he does it.

(James E. Hamilton)

Conditions in farming are changing rapidly throughout the United States. Farming today is a much more complex and highly capitalized job than it has been in the past. Farmers must practice sound

business management if they are to succeed or even survive in the years ahead. Data in Table 12 shows 13 problems in farm management which, according to vocational agriculture teachers and county extension agents, need research solutions. The following were rated the most important items in the category (with overall mean ratings above 3.25):

"Coping with high production costs and interest rates"

"Budgeting for machinery, buildings, equipment and livestock"

"Farm estate planning"

All remaining items were considered important with mean ratings ranging from 2.61 to 3.21.

Further observation of data shows that close agreement existed between perceptions of vocational agriculture teachers and county extension agents concerning the problems identified. However, vocational agriculture teachers tended to consider the problems more severe than did county extension agents.

When analyzed by regions, some disagreement appears. Statements with variations of mean ratings exceeding 0.50 include: "Budgeting for machinery, buildings, equipment and livestock," with mean ratings above 3.25 in all regions except Region 4 (2.22); "Farm estate planning," is given a very high rating (3.68) in Region 2 but a low rating (2.85) in Region 5; and "Means of getting started in farming," rated much higher in Region 3 (3.48) than in Region 4 (2.94).

Except for those in Region 5, participants in all other regions considered "Coping with high production costs and interest rates" the major problem in the category. Participants in Region 5 considered

Table 12
Specific Problems in Farm Management Most in Need of Research Solutions

Problem and Rank	POSITION		REGIONS						Overall Mean n=116 SD
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=17	6 n=13	
1. Coping with high production costs and interest rates	3.61	3.43	3.39	3.73	3.78	3.33	3.38	3.58	3.55 0.69
2. Budgeting for machinery, buildings, equipment and livestock	3.46	3.18	3.26	3.59	3.30	2.22	3.54	3.35	3.37 0.72
3. Farm estate planning	3.37	3.16	3.22	3.68	3.22	3.33	2.85	3.35	3.30 0.71
4. Means of getting started in farming	3.29	3.03	3.26	3.14	3.48	2.94	3.23	3.12	3.21 0.84
5. Reducing capital investment on the farm	3.14	3.24	3.04	3.32	3.22	3.22	3.08	3.12	3.17 0.81
6. Farm management for small scale family or part-time farm operations	3.16	3.16	3.09	3.00	3.30	3.22	3.23	3.18	3.16 0.73
7. Cost/profit analysis of recommended practices	3.00	3.08	3.04	3.05	3.22	2.83	3.23	2.76	3.03 0.82
8. Farm business agreements (renting and leasing)	3.00	2.70	2.70	3.14	2.78	2.83	2.77	3.24	2.91 0.86
9. Influences on increased population on farmland	2.90	2.86	2.78	2.86	2.70	2.50	2.77	2.94	2.76 0.87
10. Economics of alternative crops and livestock systems	2.80	2.68	2.78	2.86	2.70	2.50	2.77	2.94	2.76 0.88
11. The need for new and different agribusiness programs	2.71	2.59	2.26	2.91	2.96	2.39	2.77	2.76	2.67 0.86
12. Control of commodity prices by producers	2.63	2.65	2.65	2.91	2.39	2.44	2.60	2.76	2.64 0.88
13. Application of home computers and development of programs for agriculture	2.64	2.49	2.57	2.91	2.48	2.56	2.31	2.76	2.61 1.02

Rating Scale:

- 1=Not Important
- 2=Somewhat Important
- 3=Important
- 4=Very Important

"Budgeting for machinery, buildings, equipment and livestock" their most important farm management problem.

Specific Problems in Farm Machinery and Structures Most in Need of Research Solutions.

Farm machinery includes all items on the farm which help make farm work easier to perform. Modern farming necessitates the use of expensive machinery as well as structures designed for specific uses. Data relating to problems in farm machinery and structures are recorded in Table 13. The overall mean ratings indicate that all the statements were perceived to be important (2.25-3.24). However, "Agricultural safety" was given the highest rating (3.16) in the category.

Vocational agriculture teachers considered "Agricultural safety" a very important problem (3.29) while county extension agents rated it much lower (2.89). To county extension agents, "Development of energy efficient machinery" was considered the major problem (3.03) in the category.

Observation of mean ratings on a regional basis shows only slight variations in perceptions of participants. Disagreements were noted in the following statements:

"Development of energy efficient machinery" rated somewhat lower in Region 3 than in other regions

"Economic methods of storing corn" rated somewhat less important in Region 4 than in other regions

"Economic methods of storing grass silage" considered somewhat less important in Region 5 than in other regions.

"Agricultural safety" was perceived as the major problem in the

Table 13
 Specific Problems in Farm Machinery and Structures Most in Need of Research Solutions

Problem and Rank	POSITION		REGIONS						Overall	
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17	Mean N=116	SD
1. Agricultural safety	3.29	2.89	3.13	3.23	2.13	3.05	3.31	3.18	3.16	0.77
2. Fences: building, repairing, maintenance	3.14	3.00	3.09	3.23	2.96	3.17	3.15	3.00	3.09	0.72
3. Development of energy efficient machinery	3.10	3.03	3.00	3.32	2.87	3.00	3.15	3.18	3.08	0.71
4. Farm machinery selection and economics	2.97	2.94	2.91	3.09	2.87	2.94	2.92	3.06	2.97	0.77
5. Economic methods of machinery storage	2.90	2.54	2.83	3.00	2.65	2.94	2.54	2.76	2.80	0.82
6. Economic methods of storing corn	2.61	2.35	2.35	2.95	2.48	2.22	2.60	2.47	2.53	0.84
7. Economic methods of storing grass silage	2.58	2.32	2.61	2.81	2.30	2.39	2.23	2.53	2.50	0.93
8. Need for farm machinery dealership and service centers	2.63	2.16	2.52	2.45	2.52	2.50	2.62	2.29	2.48	0.97

Rating Scale:
 1=Not Important
 2=Somewhat Important
 3=Important
 4=Very Important

category in all regions except in Region 2, where "Development of energy efficient machinery" was rated as the leading problem.

Specific Problems in Soil and Water Conservation Most in Need of Research Solutions.

Data in Table 14 show the four problems in soil/water conservation which, according to participants in this study, need research attention. Overall mean ratings indicate that respondents considered three items as "important" (means above 2.25) and one item only "somewhat important" (1.91). The item, "Practical and inexpensive soil erosion control measures," was perceived to be of considerably greater importance than the others.

Although there was considerable agreement between vocational agriculture teachers and county extension agents, there were divergencies of opinions in the regional responses, especially with respect to statements perceived least important overall. "Water management systems" was perceived much more important in Regions 2 and 5 than in other regions, and "Mine subsidence problems" was rated much more important by participants in Region 1 than by those in other regions.

Specific Problems in Agricultural Energy Most in Need of Research Solutions.

American agriculture is highly sophisticated and depends heavily on fossil energy--energy derived from coal, petroleum and natural gas. Most farm operations, e.g., tillage, planting, fertilizer and pesticide application, harvesting, transportation and production of livestock are highly mechanized and require large quantities of gasoline/diesel

Table 14
Specific Problems in Soil and Water Conservation Most in Need of Research Solutions

Problem and Rank	POSITION		REGION					Overall		
	VAT n=79	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17	Mean N=116	SD
1. Practical and inexpensive soil erosion and control measures	3.23	3.14	3.39	2.14	3.17	3.00	3.38	3.12	3.20	0.70
2. Land classification techniques (i.e., what is land good for - pastures, crops, trees, game)	2.80	2.38	2.91	2.64	2.61	2.61	2.62	2.53	2.66	0.84
3. Water management systems, e.g., supplementary irrigation to increase agricultural production	2.42	2.24	2.17	2.95	2.04	2.00	2.92	2.24	2.36	0.90
4. Mine subsidence problems	1.89	1.95	2.52	1.50	1.47	2.11	1.85	2.00	1.91	1.05
Rating Scale: 1=Not Important 2=Somewhat Important 3=Important 4=Very Important										

fuels. Agricultural chemicals including pesticides, herbicides and some fertilizers, all have their source in fossil fuels (petroleum and natural gas). Crop drying also employs large quantities of LP gas, natural gas and fuel oil. The entire United States food system (production, processing, distribution, and preparation) uses 16.5 percent of the total energy consumed nationally (Joint Council on Food and Agricultural Sciences, 1981:12). Success in today's highly sophisticated agricultural methods has been achieved partly due to the availability of inexpensive petroleum and other energy supplies. However, recent developments in the energy markets are reversing the trend--energy is no longer "cheap" and readily available. This means higher production costs and lower profits to farmers. The energy issue has tremendous implications to research scientists.

Data in Table 15 deals with problems associated with agricultural energy identified by vocational agriculture teachers and county extension agents, which need research solutions in West Virginia. Although "Farm energy conservation methods" was perceived to be, by far, the most important item in the category (mean rating of 2.99), need for research in solar energy, fuel alcohol and methane production was also considered important.

Vocational agriculture teachers considered each of the items dealing with agricultural energy to be considerably greater in importance than did extension agents. However, both groups agreed that research in "Farm energy conservation methods" was most important.

Table 15
Specific Problems in Agricultural Energy Most in Need of Research Solutions

TABLE 15
SPECIFIC PROBLEMS IN AGRICULTURAL ENERGY MOST IN NEED OF RESEARCH SOLUTIONS

Problem and Rank	VAT n=78	CEA n=37	1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17	Overall	
									Mean N=116	SD
1. Farm energy conservation methods	3.04	2.89	3.00	3.23	2.78	3.00	3.08	2.88	2.99	0.73
2. Development of alternative energy sources	3.01	2.73	3.00	3.23	2.70	2.94	2.77	2.82	2.66	0.72
3. Potential for solar energy and other alternatives in greenhouse heating	2.71	2.49	2.52	2.95	2.39	2.33	2.60	3.00	2.64	1.03
4. Fuel alcohol production	2.54	2.16	2.48	2.73	2.22	2.33	2.38	2.35	2.42	0.88
5. Methane production from manure, etc.	2.52	2.14	2.17	3.00	2.09	2.33	2.46	2.35	2.40	0.96
6. Underground passive solar livestock buildings	2.30	1.95	2.17	2.55	1.74	2.11	2.31	2.35	2.19	0.93

Rating Scale:
1=Not Important
2=Somewhat Important
3=Important
4=Very Important

Some disparities in perception among respondents in the regions can be noted. Statements with differences in mean ratings exceeding 0.50 include:

"Development of alternative energy sources" rated high (3.23) in Region 2 and low (2.70) in Region 3

"Potential for solar energy and other alternatives in greenhouse heating" rated high (3.00) in Region 6 and low (2.33) in Region 4

"Methane production from manure, etc." and

"Underground passive solar livestock buildings" rated high in Region 2 and very low in Region 3

"Farm energy conservation methods" was given the top rating for importance except in Region 6, where participants considered "Fuel alcohol production" a more important problem.

Specific Problems in Rural Development, Extension and Education Most in Need of Research Solutions.

Agriculture is a basic industry in West Virginia. It requires both technical skills and managerial abilities of those engaged in it. Vocational agriculture teachers and county extension agents help provide farmers with these basic skills. It is imperative that research institutions continue to develop new technologies that agricultural educators can take to farmers. Close links between the two groups are also essential if agriculture is to continue to make its important contribution to the economy of the State.

Table 16 presents data regarding the degree of importance of problems relating to rural development, extension and education as perceived by vocational agriculture teachers and county extension

Table 16

Specific Problems in Rural Development, Extension and Education Most in Need of Research Solutions

Problem and Rank	POSITION			REGIONS						Overall Mean N=116 SD	
	VAT n=79	CEA n=37		1 n=23	2 n=22	3 n=23	4 n=18	5 n=13	6 n=17		
1. Improvement of state level funding for extension and vo-ag programs	3.52	3.51		3.39	3.64	3.69	3.22	3.38	3.71	3.52	0.74
2. Protection of farm land from oil, gas and coal companies	3.56	3.32		3.57	3.36	3.82	3.44	3.38	3.18	3.48	0.72
3. Farm land preservation and retention	3.33	3.38		3.26	3.64	3.30	3.28	3.23	3.29	3.34	0.75
4. Effect of laws and regulations on the farm community	3.24	3.30		3.22	3.41	3.26	3.11	3.23	3.29	3.26	0.72
5. Land owner rights in strip mine and oil fields reclamation	3.30	3.16		3.43	2.77	3.61	3.39	3.31	3.00	3.26	0.96
6. Means of changing farmers' attitudes toward adoption of new ideas and practices	2.99	3.03		3.00	3.18	2.96	2.72	3.08	3.06	3.00	0.83
7. Job satisfaction of vo-ag teachers	3.43	2.05		3.13	2.82	3.17	2.89	2.77	3.06	2.99	1.18
8. Ways of getting farmers to organize to solve their own problems	3.01	2.92		2.87	3.18	2.91	2.62	3.00	3.35	2.98	0.89
9. Effective use of media in imparting agricultural information	3.04	2.86		3.00	3.00	2.96	2.83	3.00	3.12	2.98	0.75
10. Accountability of vo-ag programs	3.25	2.35		3.00	2.95	3.17	2.67	2.92	3.00	2.96	1.11
11. Determining areas suitable for agricultural development	2.87	2.62		2.87	2.91	3.09	2.55	2.54	2.59	2.79	0.91
12. Adapting vo-ag to decreasing funding levels	3.20	1.92		3.09	2.68	3.13	2.16	2.69	2.82	2.79	1.21
13. Identification of rural development opportunities	2.78	2.78		2.65	2.68	3.04	2.78	2.77	2.76	2.78	0.83
14. Impact of tourism on the local community	2.30	2.43		2.22	2.73	3.00	2.75	1.92	2.59	2.34	0.97

Rating Scale:
 1=Not Important
 2=Somewhat Important
 3=Important
 4=Very Important

agents. "Improvement of state level funding for extension and vo-ag programs" was given the highest rating (3.52) in the category. Four other items concerning protection and preservation of farm land and effect of laws and regulations on the farm community were also considered "very important". All remaining statements were regarded as "important" by participants.

Further analysis of data reveals disagreements between vocational agriculture teachers and county extension agents particularly with respect to the following statements:

"Job satisfaction of vo-ag techers"

"Accountability of vo-ag programs"

"Adapting vo-ag to decreasing funding levels"

As might be expected, these statements were given higher importance ratings by vocational agriculture teachers than by county extension agents.

Disparity in opinion was also noted among the regional responses. Major divergencies, with differences in mean ratings of 0.50 or greater, appeared in the rating of the following statements:

"Protection of farm land from oil, gas and coal companies" and "Land owner rights in strip mine and oil field reclamation" were rated high in Region 3 and lower by participants in Regions 2 and 6

"Ways of getting farmers to organize to solve their own problems," considered very important in Region 6 but much lower in Region 4

"Accountability of vo-ag programs" and "Adapting vo-ag to decreasing funding levels," rated somewhat less important in Region 4 than in other regions

"Impact of tourism on the local community," rated much more important by participants in Region 3 than by others.

However, the regional top ratings for importance were for:

"Improvement of state level funding for extension and vo-ag programs in Regions 2, 5 and 6

"Protection of farm land from oil, gas and coal companies" in Regions 1, 3, 4 and 5.

Chapter 4

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Agriculture in the United States is a dynamic, growing, changing industry. It is the nation's largest and perhaps most essential industry. In continuing their efficient production of food and fiber, farmers must practice sound business management and use of the latest developments in science and technology produced by research institutions. However, the research system has been criticized for not keeping pace with the continually changing needs of the agricultural industry. The objectives of this study, therefore, were:

- (1) To identify specific problems in agriculture most in need of research solutions as perceived by vocational agriculture teachers and county extension agents in West Virginia.
- (2) To rank the specific problems so identified according to their perceived importance and thus provide criteria for evaluating and/or developing future research programs.

The study was limited to the 106 vocational agriculture teachers and 48 county extension agents in West Virginia employed during the study period of January-June, 1982. Of the 154 individuals, 116 (75 percent) responded and were included in the study.

Data were collected through use of the Delphi technique which involved the administration of two types of questionnaires. The first questionnaire asked the participants to list the five major

agricultural problems in their communities which, in their opinion, were most in need of immediate research attention. The second questionnaire was made up of 136 statements derived from responses to the first questionnaire. Participants were asked to rate each problem with regard to its importance in their communities.

Data were processed with the aid of West Virginia University computer facilities. Mean responses and standard deviations were determined for each statement by category, position and region.

Findings of the study are summarized as follows:

Problems Identified by Overall Rating

- (1) Of the 136 problems identified by respondents, 19 were considered very important in the State, overall. However, the following three problems were considered particularly serious: Multiflora rose eradication; coping with high production costs and interest rates; and improving state level funding for extension and vocational agriculture programs.
- (2) With regard to group perception, the data show that 10 problems were rated very important by both the vocational agriculture teachers and extension agents.
- (3) With respect to regional perception, data reveal that there were some problems which were common to all regions; some regions perceived more problems than others; and that there was disagreement on the level of importance of many of the problems identified. However, multiflora rose eradication, coping with high production costs and interest rates, improving state level funding for extension and vocational agriculture programs, farm land protection and preservation and increasing weaning weights of feeder calves were serious problems common to all the six regions.

Problems in Field Crop Production

- (1) Economic sources of N, P and K and efficient methods of lime and fertilizer application for small farmers were considered the outstanding problems in field crop production.
- (2) Vocational agriculture teachers and county extension agents had similar perceptions of the importance of problems identified in this category.

- (3) Regional variation in perceptions were observed in almost all the statements. Economic sources of N, P and K was considered a very important problem by respondents in Region 6; application of lime in steep land by those in Region 1; no-till corn production by those in Regions 2 and 6; and tobacco production and marketing by respondents in Region 5.

Problems in Horticulture

- (1) In general, all statements in this category were considered important by the respondents. The following statement was given the highest overall rating of importance: "Potential for commercial vegetable production and processing."
- (2) There was considerable agreement between vocational agriculture teachers and extension agents. The top rating for importance given by both groups was again for "Potential for commercial vegetable production and marketing." However, vocational agriculture teachers indicated greater concern for horticultural problems than did extension agents.
- (3) There was very little variation in the perception of horticultural problems by regions. However, "Potential for commercial vegetable production and marketing" was given somewhat higher ratings by participants in Regions 3 and 5. Respondents in Region 4 gave lower ratings to nearly all the statements in the category.

Problems in Plant Pests/Diseases

- (1) Multiflora rose eradication and chemical weed and brush control in pastures were found to be the most serious problems in this category. All other problems were considered important except "Prevention and control of tobacco diseases."
- (2) Vocational agriculture teachers and extension agents closely agreed on the importance of the problems identified. Both groups ranked multiflora rose eradication and chemical weed and brush control in pastures as very serious problems. Prevention and control of tobacco diseases was considered the least important problem by both groups.
- (3) Respondents in all regions considered "Multiflora rose eradication" as a very serious problem. However, there were differences in perception of other problems. The major variation was observed in the perception of the item: "Prevention and control of tobacco diseases" which was rated "very important" in Region 5 but of much less importance in all other regions. Other notable variations include problems connected with control of weeds, Johnson

grass, gypsy moth and deer, which were perceived "very important" in Region 2 but only "important" in other regions.

Problems in Pasture Management

- (1) Liming and fertilization methods for pasture, hay making with limited labor, pasture renovation methods and development of quality pasture legumes were considered by participants to be the most serious problems in this category. Other problems were rated important except the item: "Forage for shale land in eastern West Virginia," which was rated very low.
- (2) Disagreement between vocational agriculture teachers and extension agents were noted in the perception of certain statements, particularly with regard to the importance of the following: "Hay making with limited labor," considered somewhat more important by vocational agriculture teachers than by county extension agents, and "Development of grasses for acid soils," perceived to be more important by county extension agents than by vocational agriculture teachers.
- (3) Regional differences in perception were also evident in several statements. However, the following statements were considered very important in the respective regions: liming and fertilization methods in pasture in Regions 1, 2 and 6; hay making with limited labor in Regions 4 and 6; pasture renovation methods in Regions 5 and 6; development of quality pasture grasses in Region 6; and forage for shale lands in eastern West Virginia in Region 2.

Problems in Livestock Production

- (1) More problems were identified in livestock production than in any other category listed. However, "Increasing weaning weights of feeder calves through breeding and nutrition," and "Control of pink eye and face fly" were considered as outstanding problems by respondents. Except for dairy goat management and milk processing, the remaining problems were all considered important.
- (2) Vocational agriculture teachers and extension agents strongly agreed on most statements in this category. The major disagreement occurred with respect to the item, "Production of feeder pigs," which vocational agriculture teachers perceived to be of greater importance than did extension agents.
- (3) Regional differences in perceptions were noted in several livestock problems. Notable ones include: "Increasing weaning weights of feeder calves through breeding and nutrition," perceived very important in Regions 2 and 5; "Control of pink eye," a very serious problem in Regions 3 and 6; "Control of face fly,"

rated very important in Region 4; and "Prevention of grass tetany," a very serious problem in Region 1. Respondents in Region 5 were somewhat less concerned with nearly all problems identified in this category than were those from other regions.

Problems in Agricultural Marketing and Processing

- (1) All problems in marketing and processing were considered important with the item, "Need for improved livestock marketing systems," having the highest mean rating.
- (2) Vocational agriculture teachers and extension agents had similar perceptions of the problems identified. All statements were rated serious except "Use of future contracts in marketing," which was considered less important.
- (3) Respondents in the regions differed somewhat in their perceptions of the problems in this category. Items considered most important by region were: "Need for improved livestock marketing systems" in Regions 1, 2 and 4; "Directing marketing--i.e., farmer to retailer or/and consumer" in Regions 3 and 6; and "Roadside marketing" in Region 5.

Problems in Farm Management

- (1) Coping with high production costs and interest rates; budgeting for machinery, buildings, equipment and livestock; and farm estate planning were considered by participants as the most serious problems connected with farm management. All the remaining items were considered "important".
- (2) Close agreement existed between vocational agriculture teachers and extension agents concerning the problems identified. However, vocational agriculture teachers tended to consider the problems more severe than did extension agents.
- (3) Regional variations were observed in several statements and particularly in the following items: "Coping with high production costs and interest rates," considered as the major problem in all regions except in Region 5, and "Budgeting for machinery, buildings, equipment and livestock," considered the most important farm management problem in Region 5. Other statements which showed variations included "Farm estate planning," considered somewhat more important in Region 2 than in Region 5; and "Means of getting started in farming" rated much higher in Region 3 than in Region 4.

Problems in Farm Machinery and Structures

- (1) All the statements in this category were perceived to be important by the respondent groups. However, "Agricultural safety" was given the highest mean rating.
- (2) No major variations were noted between perceptions of vocational agriculture teachers and extension agents. However, vocational agriculture teachers considered "Agricultural safety" a very serious problem while "Development of energy efficient machinery" was considered the major problem by extension agents.
- (3) Slight variations were noted with regard to regional perceptions. Participants in five of the six regions considered "Agricultural safety" as the major problem in the category, while those in Region 2 rated "Development of energy efficient machinery" as their leading problem.

Problems in Soil and Water Conservation

- (1) The item, "Practical and inexpensive soil erosion control measures," was singled out to be of greater importance than other problems in soil and water conservation. Land classification techniques and water management systems were also considered important.
- (2) There was considerable agreement between vocational agriculture teachers and extension agents. All the statements were rated important except "Mine subsidence," which was considered less important by both groups.
- (3) There were divergencies of opinions in the regional responses, especially with respect to the statement, "Water management systems," which was perceived to be much more important in Regions 2 and 5 than in other regions.

Problems in Agricultural Energy

- (1) Farm energy conservation methods were perceived to be by far the most important item relating to agricultural energy. Need for research in solar energy, fuel alcohol, and methane production was also considered important.
- (2) Vocational agriculture teachers perceived all the items dealing with agricultural energy to be of much more importance than did extension agents. However, both groups agreed that research in farm energy conservation methods was most important.
- (3) Disparities in perception among participants in the regions were noted. "Potential for solar energy and other alternatives in

greenhouse heating" was rated high in Region 6 and low in Region 4. Research in methane production and underground passive solar livestock buildings were considered more important in Region 2 than in Region 3. "Farm energy conservation methods" was rated highest in all regions except in Region 6 where fuel alcohol production was viewed as more important.

Problems in Rural Development, Extension and Education

- (1) Improvement of state level funding for extension and vocational agriculture programs was considered the most important problem in this category. Items concerning protection and preservation of farmland and effect of laws and regulations in the farm community were also considered very important.
- (2) Disagreement between vocational agriculture teachers and extension agents were noticed. Vocational agriculture teachers tended to give higher mean ratings to problems connected with job satisfaction of vocational agriculture teachers, accountability of vocational agricultural programs and adapting vocational agricultural programs to decreasing funding levels than did extension agents.
- (3) Some disparity in opinion was noted among the regional responses. However, the regional top ratings for importance were for "Improvement of state level funding for extension and vo-ag programs" in Regions 2, 5 and 6; and "Protection of farmland from oil, gas and coal companies" in Regions 1, 3, 4 and 5.

Conclusions

From the analysis of data obtained from vocational agriculture teachers and county extension agents, the following conclusions were drawn:

- (1) Research in field crop production is important for the development of agriculture in West Virginia. Problems connected with economic sources of N, P and K, efficient methods of lime and fertilizer application for small farmers, alfalfa establishment, no-till corn production practices and tobacco production and marketing are areas which need immediate research attention.
- (2) Although there are several important problems affecting the horticultural industry, potential for commercial vegetable production and processing is the most important.

- (3) Multiflora rose eradication and weed and brush control in pastures are the most outstanding problems in pests and disease management that need immediate research solutions. Other serious problems in this category include those relating to chemical weed control in crops and prevention and control of tobacco diseases.
- (4) There are several problems in pasture management which need research solutions. However, liming and fertilization methods, hay making with limited labor and development of pasture legumes and grasses are considered to be the most serious in West Virginia. Problems associated with pasture renovation and forages for shale lands in the eastern part of the State also need research attention.
- (5) The livestock industry in West Virginia is facing many problems. The most outstanding ones are those connected with increasing weaning weights of feeder calves, control of face fly, pink eye and foot rot (particularly in sheep), and prevention of grass tetany.
- (6) Need for improved livestock marketing systems, the economic feasibility of direct marketing--i.e., from farmer to retailer or/and consumer, and the economics of pick-your-own fruit and vegetables are the most important areas in agricultural marketing in need of study. Other areas included roadside marketing, effects on sheep production if processing plants were located in West Virginia, improvement of farm to market road system and need for lamb slaughtering facilities.
- (7) Farm management problems seriously need research attention. Coping with high production costs and interest rates and budgeting for machinery, buildings, equipment and livestock are the most important problems in farm management. Farm estate planning, means of getting started in farming, reducing capital investment on the farm and farm management for small scale family or part-time farm operations are also serious problems in this category.
- (8) Agricultural safety is the most important area in farm machinery and structures in need of research. Other outstanding research areas include those connected with fences (building, repairing, maintenance), and development of energy efficient machinery.
- (9) Practical and inexpensive soil erosion control measures are seriously needed by farmers in West Virginia. Other areas of importance include land classification techniques and water management systems, particularly those which can enhance agricultural production.

- (10) Problems in agricultural energy most in need of research solutions include those connected with energy conservation and development of alternative energy sources. Research in solar energy, fuel alcohol, and methane production is urgently needed.
- (11) Improvement of state level funding for extension and vocational agriculture programs, protection and preservation of farm land, and effects of laws and regulations on a farm community are the major areas which seriously need research attention in rural development and extension/education.

Recommendations

This study was designed to identify specific problems in agriculture most in need of research solutions as perceived by West Virginia vocational agriculture teachers and county extension agents.

Analysis of responses of the study population reveals some suggestions for improvement/adjustments in the present research programs at West Virginia University and other affiliated institutions. Based on the findings and conclusions emanating from this study, plus the review of literature and related studies, the following recommendations are made:

- (1) The study has identified several agricultural problems which need research solutions, indicating that the research system has not adequately addressed itself to many of these problems. There is, therefore, a need for a clear dynamic process of (i) evaluating the existing research activities; (ii) identifying potential research opportunities; and (iii) developing of mission-oriented research priorities. This may necessitate the establishment of an Advisory Council with "outside groups" (particularly agricultural educators at the grass roots level and consumers of research results) having a voice in the Council in determining research priorities and emphasis.
- (2) Funding for publicly supported agricultural research has been one of the major limiting factors in expanding its scope. There is great need for such funding to be significantly increased so that research and agriculture as a whole can effectively contribute toward expansion of the economy of the State.

- (3) The agricultural community in West Virginia is composed of small, (full-time or part-time), intermediate and large scale farmers and agribusinessmen. It is recommended that steps be taken to ensure that research policy and programs adequately reflect the needs and concerns of all these groups and make effective use of available resources.
- (4) The Cooperative Extension Service is a major component of the agricultural research delivery system. It is the vehicle of a "broad spectrum" which carries the research findings to the clientele--the farmer and agribusinessman. Results of the study suggest that vocational agriculture teachers and county extension agents are unaware of much of the available research information. Steps should be taken to ensure that research findings are communicated to educators and farmers as soon as they are obtained and ascertained. This necessitates close links and mutual understanding between research and extension/education.
- (5) The study has identified many problems besetting the agricultural industry in West Virginia and which need immediate research attention. It is important that those concerned with research become aware of problems identified in this study and take them into consideration when evaluating present programs or/and developing future research programs. Problems unique to various regions should also be given consideration.

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APPENDICES

APPENDIX I

COVER LETTER TO RESPONDENTS FOR THE
FIRST PHASE QUESTIONNAIRE

February 18, 1982

This is not just another questionnaire to fill out so that someone can complete a Masters Thesis (although it will do that). We are offering you a unique opportunity to assist in the development of a more viable agricultural research program at West Virginia University.

Because of your contacts with large numbers of farmers and your experience in agriculture, you are in a favorable position to assess both development and problems of farmers. We are asking you to identify the five specific problems in agriculture which, in your opinion, are most in need of research solutions in your community. When these are received, your statements will be combined with those of vocational agriculture teachers and county extension agents across the state of West Virginia. The state list will then be sent to you for your evaluation and rating of each problem mentioned.

Completion of the form may require some serious thought. Please give it your most earnest consideration. Specific problems (research needs) in livestock production, crops production, horticulture, energy, machinery, structures, processing, farm management, economics, rural development, and others, may be identified.

This study was suggested by the West Virginia Vocational Agriculture Teachers Association and carries the approval and encouragement of College of Agriculture and Forestry administrators. We urge you to complete the survey form and return it to us in the enclosed self-addressed, stamped envelope by March 5, 1982. To be of greatest value, participation of every vo-ag teacher and county agricultural agent is imperative.

Your cooperation and promptness will be greatly appreciated.

Sincerely,

L. R. Chalamira
Graduate Student

L. D. Lawrence
Professor

APPENDIX II

FIRST PHASE QUESTIONNAIRE

SPECIFIC PROBLEMS IN AGRICULTURE MOST IN NEED OF RESEARCH SOLUTIONS
AS PERCEIVED BY WEST VIRGINIA VOCATIONAL AGRICULTURE TEACHERS
AND COUNTY AGRICULTURAL EXTENSION AGENTS

Please list below the five specific problems in agriculture which, in your opinion, are most in need of research solutions in your community.

1.

2.

3.

4.

5.

Please return this form in the enclosed self-addressed postage-paid envelope so as to reach us by March 8, 1982.

Thank you for your cooperation.

APPENDIX III

FOLLOW-UP MEMORANDUM TO RESPONDENTS FOR
FIRST PHASE QUESTIONNAIRE

Agricultural Education
304 293-3431

Division of Resource Management
College of Agriculture and Forestry
Morgantown, West Virginia
26506



West Virginia
University

March 3, 1982

MEMORANDUM:

TO: Vocational Agriculture Teachers
County Extension Agents

FROM: L. R. Chalamira
Graduate Student

L. D. Lawrence
Professor

SUBJECT: Research needs survey

Several days ago, we sent you a letter and a form requesting you to identify the five specific problems in agriculture which, in your opinion, are most in need of research solutions in your community.

If you have not already done so, we urge you to complete the form and return it at your earliest convenience.

Thanks once again for your cooperation.

APPENDIX IV

COVER LETTER TO RESPONDENTS FOR THE
SECOND PHASE QUESTIONNAIRE



West Virginia
University

March 19, 1982

M E M O R A N D U M

TO: County Extension Agents
Vocational Agriculture Teachers

FROM: C. R. Chalamira
Graduate Student

Layle D. Lawrence, Professor
Agricultural Education

RE: Identification of research needs.

Several weeks ago, vocational agriculture teachers and county extension agents of West Virginia were requested to identify specific problems in agriculture which, in their opinions, are most in need of research solutions in their communities. Response to the request was outstanding.

Items listed in the original request have been combined and condensed into statements appearing in the enclosed survey form. Please evaluate and rate each statement as it pertains to your community. Responses will be analyzed and will provide information that may be useful in planning agricultural research programs at West Virginia University. Your response will be treated with complete confidence.

Thanks so much for your participation. If possible please return the completed form by April 2, 1982.

CRC/LDL/hcm

ENCLOSURE

APPENDIX V

SECOND PHASE QUESTIONNAIRE

PROBLEMS IN AGRICULTURE MOST IN NEED OF
RESEARCH SOLUTIONS (WEST VIRGINIA)

Instructions: Please read each statement carefully. Circle the number that most nearly corresponds to your opinion regarding the importance of the problem to your community.

	Not Important	Somewhat Important	Important	Very Important
A. <u>FIELD CROP PRODUCTION</u>				
1. Corn variety yield and nutritional value testing.	1	2	3	4
2. No-till corn production practices.	1	2	3	4
3. Oat and barley yield and nutritional value testing.	1	2	3	4
4. Tobacco production and marketing.	1	2	3	4
5. Efficient methods of lime and fertilizer application for small farmers.	1	2	3	4
6. Soil fertility improvement without use of commercial fertilizer and lime.	1	2	3	4
7. Optimum organic matter levels for specific crops.	1	2	3	4
8. Sewage sludge use on farms.	1	2	3	4
9. Application of lime on steep land.	1	2	3	4
10. Effect of fertilizer on heavy metal uptake.	1	2	3	4
11. Economic sources of N, P, and K.	1	2	3	4
12. Potential multiple cropping systems.	1	2	3	4
13. Development of seeds for cool weather germination.	1	2	3	4
14. Economic lime usage.	1	2	3	4
15. Development of 'deer resistant' crop varieties.	1	2	3	4
16. Silage production vs. hay making (economic comparison).	1	2	3	4
17. Maintaining quality in field stored large round bales.	1	2	3	4
18. Alfalfa stand establishment.	1	2	3	4
B. <u>HORTICULTURE</u>				
19. Potential for commercial vegetable production, marketing and processing.	1	2	3	4
20. Potential for commercial fruit production, marketing and processing.	1	2	3	4

	Not Important	Somewhat Important	Important	Very Important
21. Potential for greenhouse production of bedding and ornamental plants.	1	2	3	4
22. Potential for commercial small fruit production, marketing and processing	1	2	3	4
23. Potential for grape production (fresh fruit and wine).	1	2	3	4
24. Grape variety testing.	1	2	3	4
25. Cultural practices in vegetable production.	1	2	3	4
26. Cultural practices in fruit production.	1	2	3	4
27. Cultural practices in small fruit production.	1	2	3	4
28. Cultural practices in greenhouse plant production.	1	2	3	4
29. The potential for specialized agriculture (mushrooms, garlic, etc.) in low income counties.	1	2	3	4
C. <u>PLANT PESTS AND DISEASES</u>				
30. Control of Japanese beetle.	1	2	3	4
31. Control of gypsy moth.	1	2	3	4
32. Control of army worm (corn) in wet weather.	1	2	3	4
33. Prevention and control of potato scab.	1	2	3	4
34. Prevention and control of tobacco diseases.	1	2	3	4
35. Prevention and control of brown root rot in beans.	1	2	3	4
36. Prevention and control of early blight (beans, tomatoes, etc.)	1	2	3	4
37. Control of Johnson grass.	1	2	3	4
38. Effective deer control methods.	1	2	3	4
39. Chemical weed control in crops.	1	2	3	4
40. Chemical weed and brush control in pastures.	1	2	3	4
41. Control of autumn olive.	1	2	3	4
42. Multiflora rose eradication.	1	2	3	4
43. Chemical weed control for family gardens.	1	2	3	4
44. Economic pest control techniques for small farmers	1	2	3	4
45. Integrated pest management techniques.	1	2	3	4
46. Nematode control in gardens.	1	2	3	4

	Not Important	Somewhat Important	Important	Very Important
47. Prevention and control of gourd moles in lawns.	1	2	3	4
48. Control of soil borne diseases in intensively used soils	1	2	3	4
D. <u>PASTURE MANAGEMENT</u>				
49. Development of better quality pasture legumes.	1	2	3	4
50. Development of better quality pasture grasses.	1	2	3	4
51. Liming and fertilization methods for pasture.	1	2	3	4
52. Pasture renovation methods.	1	2	3	4
53. Development of grasses for acid soils.	1	2	3	4
54. Forages for shale lands in eastern West Virginia	1	2	3	4
55. No-till pasture and meadow reseeding.	1	2	3	4
56. Extended grazing season methods.	1	2	3	4
57. Hay making with limited labor.	1	2	3	4
E. <u>LIVESTOCK PRODUCTION</u>				
58. Increasing weaning weights of feeder calves through breeding and nutrition.	1	2	3	4
59. Low cost holding and handling facilities.	1	2	3	4
60. Increasing dairy production and profits through breeding and nutrition.	1	2	3	4
61. Production of feeder pigs.	1	2	3	4
62. Swine production testing.	1	2	3	4
63. Small-scale (backyard) livestock production.	1	2	3	4
64. Dairy goat management and milk processing.	1	2	3	4
65. Cost-effective production of small livestock (poultry, rabbit, etc.)--management, marketing, etc.	1	2	3	4
66. Development of pour-on insecticide for sheep.	1	2	3	4
67. Economics of using beef cattle production testing (BCPT) programs.	1	2	3	4
68. Control of pink-eye.	1	2	3	4
69. Mastitis prevention.	1	2	3	4
70. Control of foot-rot (sheep).	1	2	3	4

	Not Important	Somewhat Important	Important	Very Important
71. Control of respiratory diseases (sheep).	1	2	3	4
72. Prevention and control of lamb scours.	1	2	3	4
73. Prevention and control of calf scours.	1	2	3	4
74. Prevention of grass tetany.	1	2	3	4
75. Prevention of leptospirosis.	1	2	3	4
76. Prevention of shipping fever in nursing calves.	1	2	3	4
77. Control of face-fly	1	2	3	4
78. Control of internal parasites in nursing calves.	1	2	3	4
79. Fertility and reproduction problems.	1	2	3	4
80. Estrus synchronization and heat detection in artificial insemination (sheep and cattle).	1	2	3	4
F. <u>AG-MARKETING AND PROCESSING</u>				
81. Effects on sheep production if processing plants were located in West Virginia.	1	2	3	4
82. Need for lamb slaughtering facilities.	1	2	3	4
83. Need for improved livestock marketing systems.	1	2	3	4
84. Roadside marketing.	1	2	3	4
85. Economics of pick-your-own fruit and vegetable operations.	1	2	3	4
86. Direct marketing, farmer to retailer or consumer	1	2	3	4
87. Need for small-scale food processing plants.	1	2	3	4
88. Economics of 'bulk grain shipment' (pooling of resources).	1	2	3	4
89. Use of futures contracts in marketing.	1	2	3	4
90. Electronic marketing.	1	2	3	4
91. Improvement of farm to market road system.	1	2	3	4
G. <u>FARM MANAGEMENT</u>				
92. Means of getting started in farming.	1	2	3	4
93. Coping with high production costs and interest rates.	1	2	3	4
94. Budgeting for machinery, buildings, equipment and livestock.	1	2	3	4

	Not Important	Somewhat Important	Important	Very Important
95. Application of home computers and development of programs for agriculture.	1	2	3	4
96. Economics of alternative crops and livestock systems.	1	2	3	4
97. The need for new and different agribusiness programs.	1	2	3	4
98. Farm management for small scale family or part-time farm operations.	1	2	3	4
99. Cost/profit analyses of recommended practices.	1	2	3	4
100. Reducing capital investment on the farm.	1	2	3	4
101. Influences of increased population on farmland.	1	2	3	4
102. Control of commodity prices by producers.	1	2	3	4
103. Farm business agreements (renting and leasing).	1	2	3	4
104. Farm estate planning.	1	2	3	4
H. <u>FARM MACHINERY AND STRUCTURES</u>				
105. Development of energy efficient farm machinery.	1	2	3	4
106. Agricultural safety.	1	2	3	4
107. Fences: building, repairing and maintenance.	1	2	3	4
108. Farm machinery selection and economics.	1	2	3	4
109. Economic methods of machinery storage.	1	2	3	4
110. Need for farm machinery dealerships and service centers	1	2	3	4
111. Economical methods of storing corn.	1	2	3	4
112. Economic methods of storing grass silage.	1	2	3	4
I. <u>SOIL AND WATER CONSERVATION</u>				
113. Practical and inexpensive soil erosion control measures.	1	2	3	4
114. Water management systems, e.g., supplementary irrigation, to increase agricultural production.	1	2	3	4
115. Land classification techniques (i.e., what is land good for--pasture, crops, trees and game, etc.).	1	2	3	4
116. Mine subsidence problems.	1	2	3	4

	Not Important	Somewhat Important	Important	Very Important
J. <u>AGRICULTURAL ENERGY</u>				
117. Development of alternative farm energy sources.	1	2	3	4
118. Farm energy conservation methods.	1	2	3	4
119. Potential for solar energy and other alternatives in greenhouse heating.	1	2	3	4
120. Underground passive solar livestock buildings.	1	2	3	4
121. Methane production from manure, etc.	1	2	3	4
122. Fuel alcohol production.	1	2	3	4
K. <u>RURAL DEVELOPMENT, EXTENSION AND EDUCATION</u>				
123. Farm land preservation and retention.	1	2	3	4
124. Effect of laws and regulations on the farm community.	1	2	3	4
125. Protection of farm land from oil, gas, and coal companies.	1	2	3	4
126. Landowner rights in strip mine and oilfield reclamation.	1	2	3	4
127. Determination of areas suitable for agricultural development.	1	2	3	4
128. Identification of rural development opportunities.	1	2	3	4
129. Impact of tourism on local community.	1	2	3	4
130. Ways of getting farmers to organize to solve their own problems.	1	2	3	4
131. Means of changing farmers' attitudes toward adoption of new ideas and practices.	1	2	3	4
132. Effective use of media in imparting agricultural information.	1	2	3	4
133. Improvement of state level funding for extension and vo-ag programs.	1	2	3	4
134. Adapting vo-ag to decreased funding levels.	1	2	3	4
135. Job satisfaction of vo-ag teachers.	1	2	3	4
136. Accountability of vo-ag programs.	1	2	3	4

APPENDIX VI

FOLLOW-UP MEMORANDUM FOR THE
SECOND PHASE QUESTIONNAIRE

April 13, 1982



West Virginia
University

M E M O R A N D U M

TO: Vocational Agricultural Teachers
County Extension Agents

FROM: L. R. Chalamira
Graduate Student

L. D. Lawrence, Professor
Agricultural Education

SUBJECT: Identification of Research Needs

Several days ago, we sent you a letter and a questionnaire regarding agricultural research needs requesting you to evaluate and rate the statements appearing in it as they pertain to your community.

If you have not already done so, we urge you to complete the form and return it at your earliest convenience.

Thanks once again for your cooperation.

LRC/LDL/hcm

APPENDIX VII

LETTER FROM THE PRESIDENT OF WEST VIRGINIA
VOCATIONAL AGRICULTURE TEACHERS' ASSOCIATION

GRAFTON HIGH SCHOOL

97

Riverside Drive
Grafton, West Virginia 26354
304/265-3046

MARGORY H. CARTWRIGHT
Principal

THOMAS A. TALERICO
Assistant Principal

September 29, 1981

Dr. Layle D. Lawrence
2052 Agricultural Sciences Building
West Virginia University
Morgantown, WV 26506

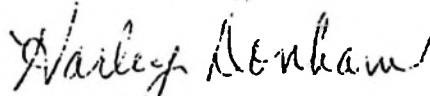
Dear Dr. Lawrence:

At our recent executive committee meeting of the West Virginia Vocational Agriculture Teachers Association, the committee agreed to contact you and request that you design a study which would determine specific agricultural research projects vocational agriculture teachers feel are needed to solve major agricultural problems in their communities.

We believe that such a study would be of service to the College of Agriculture and Forestry and to the farmers and agribusiness establishments of West Virginia.

Please give this idea your serious consideration. The Association will be glad to assist in any way possible.

Sincerely,



Harley Donham, President
WVWATA

HD:ED

APPENDIX VIII

TABLE FOR OVERALL AGRICULTURAL PROBLEMS MOST IN
NEED OF RESEARCH SOLUTIONS

Specific Problems in Agriculture, Listed by Rank, Most in Need of Research Solutions as Perceived by Vocational Agriculture Teachers and County Extension Agents

Statement and Overall Rank	Mean (N = 116)	SD
1. Multiflora rose eradication	3.63	0.70
2. Coping with high production costs and interest rates	3.55	0.69
3. Improving state level funding for extension and vo-ag programs	3.52	0.74
4. Protection of farm land from oil, gas and coal companies	3.48	0.72
5. Chemical weed and brush control in pastures	3.40	0.76
6. Increasing weaning weights of feeder calves through breeding and nutrition	3.39	0.79
7. Control of pink eye	3.38	0.76
8. Budgeting for machinery, buildings, equipment, and livestock	3.37	0.72
9. Economic sources of N, P, and K	3.35	0.70
10. Liming and fertilization methods for pasture	3.35	0.65
11. Farmland preservation and retention	3.34	0.75
12. Control of face fly	3.31	0.76
13. Farm estate planning	3.30	0.71
14. Hay making with limited labor	3.30	0.79
15. Efficient methods of lime and fertilizer application for small farmers	3.28	0.76
16. Effects of laws and regulations on the farm community	3.26	0.72
17. Land owner rights in strip mine and oil field reclamation	3.26	0.96
18. Pasture renovation methods	3.25	0.69
19. Development of better quality pasture grasses	3.25	0.71
20. Development of better quality pasture legumes	3.23	0.68
21. Chemical weed control in crops	3.22	0.80
22. Need for improved livestock marketing systems	3.21	0.82
23. Means of getting started in farming	3.20	0.84

Appendix IX (Continued)

Statement and Overall Rank	Mean (N = 116)	SD
24. Practical and inexpensive soil erosion control measures	3.20	0.70
25. Reducing capital investment on the farm	3.16	0.81
26. Low cost holding and handling facilities	3.16	0.78
27. Direct marketing--farmer to retailer or consumer	3.16	0.70
28. Farm management for small scale family or part-time farm operations	3.16	0.73
29. Agricultural safety	3.16	0.77
30. Economic lime usage	3.13	0.69
31. Prevention and control of early blight (in beans, tomatoes, etc.)	3.13	0.75
32. Prevention and control of calf scours	3.12	0.80
33. Prevention of grass tetany	3.12	0.87
34. Development of greases from acid soils	3.11	0.80
35. Extended grazing season methods	3.11	0.86
36. Economics of pick-your-own fruit and vegetables operations	3.11	0.86
37. Application of lime on steep land	3.09	0.86
38. Fences: building, repairing and maintenance	3.09	0.72
39. Development of energy efficient farm machinery	3.09	0.71
40. Alfalfa stand establishment	3.07	0.81
41. Cultural practices in vegetable production	3.06	0.71
42. No-till pasture and meadow reseeding	3.06	0.84
43. Control of foot rot (sheep)	3.06	1.01
44. Prevention of leptospirosis	3.06	0.85
45. Potential for commercial vegetable production, marketing and processing	3.05	0.83
46. Economic pest control techniques for small farmers	3.04	0.68
47. Cost/profit analyses of recommended practices	3.03	0.82
48. Maintaining quality in field stored large round bales	3.01	0.96
49. Control of gypsy moth	3.01	0.93

Appendix IX (Continued)

Statement and Overall Rank	Mean (N = 116)	SD
50. Fertility and reproduction problems	3.00	0.82
51. Means of changing farmer's attitudes toward adoption of new ideas and practices	3.00	0.83
52. Farm energy conservation methods	2.99	0.73
53. Job satisfaction of vo-ag teachers	2.99	1.18
54. Ways getting farmers to organize to solve their own problems	2.98	0.89
55. Effective use of media in imparting agricultural information	2.98	0.75
56. Cultural practices in small fruit production	2.97	0.76
57. Effective deer control methods	2.96	1.09
58. Farm machinery selection and economics	2.96	0.77
59. Accountability of vo-ag programs	2.96	1.11
60. Development of alternative farm energy sources	2.92	0.72
61. Potential for commercial small fruit production, marketing and processing	2.91	0.83
62. No-till corn production practices	2.90	0.95
63. Roadside marketing	2.90	0.86
64. Farm business agreements (renting and leasing)	2.90	0.86
65. Influences of increased population on farm land	2.89	0.87
66. Prevention and control of brown root rot in beans	2.88	0.85
67. Control of Johnson grass	2.87	0.99
68. Economics of using beef cattle production testing (BCPT) programs	2.86	0.86
69. Integrated pest management techniques	2.85	0.70
70. Estrus synchronization and heat detection in artificial insemination (sheep and cattle)	2.85	0.85
71. Control of army worm (corn) in wet weather	2.84	0.80
72. Prevention of shipping fever in nursing calves	2.84	0.85
73. Effects on sheep production if processing plants were located in West Virginia	2.84	1.02
74. Production of feeder pigs	2.83	0.89

Appendix IX (Continued)

Statement and Overall Rank	Mean (N = 116)	SD
75. Control of internal parasites in nursing calves	2.80	0.84
76. Economic methods of machinery storage	2.80	0.82
77. Determination of areas suitable for agricultural development	2.79	0.90
78. Adapting vo-ag programs to decreasing funding levels	2.79	1.21
79. Soil fertility improvement without use of commercial fertilizers and lime	2.78	0.97
80. Improvement of farm to market road system	2.78	0.89
81. Identification of rural development opportunities	2.78	0.83
82. Cultural practices in fruit production	2.77	0.77
83. Control of Japanese beetle	2.77	0.78
84. Chemical weed control for family gardens	2.77	0.85
85. Small-scale (backyard) livestock production	2.77	0.95
86. Economics of alternative crops and livestock	2.76	0.88
87. Development of 'deer resistant' crop varieties	2.75	1.10
88. Silage production vs. hay making (economic comparison)	2.73	0.90
89. Potential for greenhouse production of bedding and ornamental plants	2.71	0.83
90. Mastitis prevention	2.71	1.00
91. Potential for grape production (fresh fruit and wine)	2.69	0.94
92. Need for lamb slaughtering facilities	2.68	1.06
93. Cost-effective production of small livestock (poultry, rabbit, etc.)--management, marketing, etc.	2.67	0.94
94. The need for new and different agribusiness programs	2.67	0.86
95. Potential for multiple cropping systems	2.66	0.81
96. Land classification techniques	2.66	0.84
97. Corn variety yield and nutrition value testing	2.65	0.93
98. Need for small scale food processing plants	2.64	1.04

Appendix IX (Continued)

Statement and Overall Rank	Mean (N = 116)	SD
99. Control of commodity prices by producers	2.64	0.88
100. Potential for solar energy and other alternatives in greenhouse heating	2.64	1.03
101. Development of pour-on insecticides for sheep	2.63	0.88
102. Cultural practices in greenhouse plant production	2.62	0.86
103. Potential for commercial fruit production, marketing and processing	2.61	0.90
104. Application of home computers and development of programs for agriculture	2.61	1.02
105. Optimum organic matter levels for specific crops	2.58	0.83
106. Prevention and control of lamb scours	2.56	0.87
107. Development of seeds for cool weather germination	2.53	0.93
108. Prevention and control of ground moles in lawns	2.53	1.00
109. Economics of 'bulk grain shipment' (pooling of resources)	2.53	1.01
110. Economical methods of storing corn	2.52	0.84
111. Control of respiratory diseases (sheep)	2.51	0.85
112. Economic methods of storing grass silage	2.50	0.93
113. Control of autumn olive	2.49	1.07
114. Control of soil borne diseases in intensively used soils	2.48	0.91
115. Need for machinery dealership and service centers	2.48	0.97
116. Electronic marketing	2.46	0.89
117. Fuel alcohol production	2.42	0.89
118. Increasing dairy production and profits through breeding and nutrition	2.41	1.14
119. Methane production from manure	2.40	0.96
120. Smine production testing	2.39	1.00
121. Nematode control in gardens	2.38	0.73
122. Water management systems (e.g., supplementary irrigation, to increase agricultural production	2.36	0.90
123. Prevention and control of potato scab	2.34	0.72

Appendix IX (Continued)

Statement and Overall Rank	Mean (N = 116)	SD
124. Impact of tourism on local community	2.34	0.97
125. Grape variety testing	2.29	0.94
126. Use of future contracts in marketing	2.28	0.95
127. The potential for specialized agriculture (mush-rooms, garlic, etc.) in low income counties	2.24	1.03
128. Effect of fertilizer on heavy metal uptake	2.22	0.91
129. Landowner rights in strip mine and oil field reclamation	2.19	0.96
130. Forages for shale lands in eastern West Virginia	2.05	1.17
131. Sewage sludge use on farms	2.03	1.00
132. Dairy goat management and milk processing	2.03	0.92
133. Oat and barley yield and nutrition value testing	1.92	0.88
134. Mine subsidence problems	1.90	1.05
135. Tobacco production and marketing	1.74	1.17
136. Prevention and control of tobacco diseases	1.69	1.07

Rating Scale: 1 = Not Important; 2 = Somewhat Important; 3 = Important;
4 = Very Important.

APPENDIX IX

MAJOR ISSUES IN FOOD AND AGRICULTURAL SCIENCES
IN THE UNITED STATES THAT NEED INCREASED ATTENTION
IN THE EARLY 1980's
(SUMMARY)

Source: Joint Council on Food and Agricultural
Sciences, 1981

1. Productivity: Improved productivity in terms of land, labor, capital, water and energy inputs will reduce inflationary pressures, contribute to social and political stability, and help us maintain an effective and efficient agricultural system. Increased effort is needed in:

- Basic research to unlock nature's secrets.
- Improved integrated management systems for crop, range and forest land in both protection of these lands and production on them.
- Innovations in animal health, protection, and reproduction.
- More efficient ways to process and market food, fiber, and wood; developed in cooperation with the private sector.
- Improved data and analysis for decision makers.

2. Energy: Uncertainties about future supplies of crude oil and prices of petroleum based products have important implications for the U.S. food and agricultural system. Insufficient supplies of energy at critical stages within the production-processing-distribution system could result in domestic food shortages as well as disruptions in agricultural exports. Implementing the following initiatives could lessen agriculture's dependence on unstable supplies and contribute to the nation's energy supply.

- Updated inventory, assessment, and evaluation of energy use patterns and potential supplies on the nation's farms and forests.
- Identification of opportunities for energy conservation in production, processing, and marketing.
- Use of alternative energy sources (solar, wind, agricultural crops and residue, wood, fuel plantations).

3. Natural Resources: Our farmlands and forests, water and soil, wildlife and fisheries, and renewable energy sources are the basis of this nation's present and future material well being. Emerging problems are the increased pressures for limited water supplies in the West, serious soil erosion and water pollution, multiple-use conflicts in forest use, and deteriorating range conditions. Increased emphasis is needed on:

- Water use efficiency and water pollution prevention.
- Role of soil erosion as it affects productivity.
- Reversing desertification process on western ranges.
- Increasing commercial production from U.S. forests while maintaining their environmental potential.
- Statistical and economic data for the nation's resource managers.

4. Families and Rural Communities: Families and communities have a major impact on agriculture through their consumption and non-market production practices, their provision of human capital, and their contribution to preserving the quality of the natural environment. To assure continued and improved well being of families and communities requires expanded efforts in:

- All phases of human nutrition.
- Programs to enhance family and consumer ability to cope with inflation, income stability, and other current living stresses.
- Improving socioeconomic aspects of rural community living.

5. Structure of Agriculture and Policy Considerations: The linchpin for the nation's food and agriculture economy (20 percent of

the Gross National Product (GNP) is the farm subsector, which directly produces about 2.5 percent of the GNP and contains 5-6 percent of the nation's tangible wealth. Initiatives are needed on:

- Potential consequences to stability and vitality of farm subsector of trends toward fewer and larger farms, increased capital needs, tighter profit margins, increased regulations, and a more concentrated food industry.
- Analysis of new technologies before adoption.
- Improving our ability to understand the world food and fiber supply picture.

These proposed directions provide the framework for the more specific initiatives needed over the next 5 years. No priorities or ratings are attached to these; all are important for future consideration in our very complex food and agricultural system. All are considered to have research, extension, and higher education components but in varying degrees.

The importance of maintaining a strong, continuing base of ongoing programs is emphasized and is especially significant in the light of recent studies indicating the very high rates of return to investments in agricultural and forestry research and education.

APPENDIX X

MAJOR PROBLEM AREAS IN FOOD AND AGRICULTURE IN THE
UNITED STATES (IN PRIORITY ORDER) MOST IN NEED OF
RESEARCH ATTENTION - 1981-86 BY REGION
(SUMMARY)

Source: Pond, et al., 1980

WesternPriority

1. Improve use and conservation of water, including soil erosion concerns.
2. Develop new techniques for improving forest and range productivity --multiple-use conflicts are also increasing and these urgently need solutions.
3. Improve management methods for increasing productivity and reproductive efficiency of livestock.
4. Develop integrated and systematic control for plant and animal pests--especially for horticulture crops.
5. Improve safety and nutritional quality of processed food.
6. Develop ways to improve the quality of rural living; there are significant growth-related problems associated with energy development and recreation use.
7. Expand efforts in supply-demand analysis and marketing studies and distribute this information to farm operators.

SouthernPriority

1. Energy - includes conservation, more efficient use, and production; especially interested in improving minimum tillage systems.
2. Improve pest management techniques for plants and animals.
3. Develop the means for improving water and soil resource management.
4. Improve knowledge about plant growth control mechanisms.
5. Expand animal research, including disease concerns, livestock-forage production systems, nutrition, and reproduction.
6. Plant stress research - especially on fruits and vegetables.
7. Forest management concerns - lumber, paper, water, grazing, and recreation.
8. New marketing techniques--research on transportation systems; costs, losses, and alternatives.
9. Human nutrition--including concerns about food safety.

10. Develop germ plasm collections for new crops.
11. Find ways to reduce losses in the food system.
12. Expand research for meeting needs of small farmers.
13. Find ways to control dust better in mills, gins, and elevators.
14. Examine the consequences of acid rain and other environmental contaminants on agriculture, forestry, and natural resources.

Northeast

Priority

1. Pest management - including research on insects, weeds, and diseases that affect plants and animals.
2. Basic research - both physical and biological.
3. Energy - both conservation and production for agriculture and forestry.
4. Forage-ruminants interaction.
5. Impact of climate on agriculture and forestry - including plant stress and acid rain.
6. Human nutrition - includes research on food safety and areas of interface with food security.
7. Marketing - including economics, transportation, and quality maintenance.
8. Land use policy.
9. Improve management and utilization of eastern hardwoods.
10. Fertility and erosion concerns in soils.
11. Examine ways to meet small farm needs better.
12. Irrigation and drainage concerns of water management.

North Central

Priority

1. Energy
 - impact of rising energy prices on costs of producing crops and livestock, transportation, and location of processing and marketing firms.
 - Use of biomass; alternate energy sources.
2. Improving reproductive efficiency and health of red meat and dairy animals.
3. Improving soil and water use and conservation practices.
4. Transportation Systems.
5. Human Nutrition
 - Long-term effects of diet on human health and aging.
 - Developing eating patterns to promote optimum health.
6. Field Crop Production and Protection
 - Systems approaches to identification, control, and loss determination including economic thresholds.
 - Bionomics of plant disease development in changing cropping and tillage systems.
 - Genetic engineering of plants, their pests, and pest hosts or enemies.
 - Molecular and cellular biology and physiology of field crop species.
7. Food Safety and Conservation
 - Increasing safety
 - Reducing losses
 - Strengthening current food science research
8. Animal production and health - strengthening current programs and special initiatives.
9. Forestry - strengthening current programs and special initiatives.

ABSTRACT

Objective

The primary objective of the study was to identify specific problems in agriculture which are most in need of research solutions as perceived by West Virginia vocational agriculture teachers and county extension agents.

Methods and Procedures

Data for the study were obtained from the study population consisting of 106 vocational agriculture teachers and 48 county extension agents. The Delphi technique consisting of two types of questionnaires was used. The first phase questionnaires asked participants to list five specific agricultural problems in their communities which, in their opinion, were most in need of research solutions. Responses were then used by the Q-sort committee to formulate 136 rateable statements which formed the second phase questionnaire. The questionnaires were sent to the same study population. The response was 75 percent. Data were analyzed using West Virginia University computer facilities. Means and standard deviation were determined for each statement by category, position and region.

Findings

Information derived from the study reveals that there are many agricultural problems in West Virginia which seriously need research attention. Problems identified by the respondent groups cut across all the major areas of the agricultural industry: field crop production; livestock production; horticulture; farm management; plant pests/

diseases; pasture management; agricultural marketing and processing; farm machinery and structures; soil/water conservation; agricultural energy; and rural development and extension/education.

Of the 136 problems identified by participants, 19 were rated as "very important". Considered particularly serious were: multiflora rose eradication; coping with high production costs and interest rates; and improving state level funding for extension and vocational agriculture programs.

The study also showed that vocational agriculture teachers and county extension agents had similar perceptions of many of the problems identified. However, problems connected with vocational agriculture programs were rated higher by vocational agriculture teachers than by county extension agents.

The degree of importance of the problems varied from region to region. These regional variations may be due to the fact that different parts of the state have different geophysical and climatic conditions. However, problems associated with livestock (and particularly beef/dairy) and pasture production were similar in all the six regions of the state.

It was recommended that research institutions in West Virginia study the problems identified and take them into consideration when evaluating/developing research programs. Regional variations should also be taken into account.

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