REPORT BY THE U.S.

General Accounting Office

Agriculture Weather Information Is Not Effectively Communicated To Users

The Agricultural Weather Service Program is not being communicated effectively to users and potential users; and the Departments of Commerce and Agriculture program roles, responsibilities, and goals for providing this service are not clear.

GAO believes Commerce and Agriculture should reassess their respective program roles. This should include (1) improving the methods and procedures for publicizing and communicating weather information to users and potential users and (2) providing program coordination by updating the Federal Plan for a National Agricultural Weather Service.

CED-79-110
AUGUST 7, 1979

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

:OMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION

B-133202

The Honorable Juanita M. Kreps
The Secretary of Commerce

Dear Madam Secretary:

Our review of certain aspects of the Agricultural Weather Service Program shows that weather service information is not being effectively communicated to users and potential users in the agricultural community. We believe the Departments of Commerce and Agriculture need to clarify their respective roles, responsibilities, and goals in order to establish an effectively coordinated program. This clarification should include the weather-related functions of the National Oceanic and Atmospheric Administration and Agriculture's Extension Service and Agricultural Research Service.

Much of the information we obtained during our review was gathered through a questionnaire we sent to the agricultural community. Although the response rate from farmers and ranchers was low and the response rate on some specific questions from all those responding was low, the information obtained does show a need for strengthening the program.

SCOPE OF REVIEW

We performed our review at the Departments of Agriculture and Commerce in Washington, D.C., and regional offices in Kansas City, Missouri; Fort Worth, Texas; and Salt Lake City, Utah. We developed and sent questionnaires to agricultural weather service users, such as farmers and ranchers, agricultural businesses, county agents, and radio and TV stations. We sent questionnaires to 1,000 farmers and ranchers randomly selected from the mailing list of a major agricultural periodical and 300 county agents randomly selected from a list of all county agents nationwide. We had a response rate of 52 percent from the farmers and ranchers and 93 percent from the county agents. We sent the questionnaire to 150 agricultural businesses, such as food processors, nurserymen, and agricultural equipment dealers randomly selected by us and representing agricultural businesses in National Weather Service (NWS) central,

southern, and western regions. We also sent the questionnaire to 150 radio and TV stations randomly selected from the annual broadcasters yearbook of stations. Over 69 percent of the agricultural businesses and about 65 percent of the radio and TV stations responded.

For your information and assistance in managing the Agricultural Weather Service Program, we are including a statistical summary of the questionnaire responses as appendixes I through V. The information presented is for this study only and should not be projected as a universe of agricultural weather service users.

BACKGROUND

The Agricultural Weather Service Program's objective is to provide users--farmers, ranchers, and agriculture-related businesses--with information that will help them benefit from favorable weather conditions and minimize their losses from adverse conditions.

The effects of adverse weather on agriculture and related activities causing reduced yields cost the Nation as much as $9 billion annually. Direct crop losses alone from unfavorable weather have been estimated at $1.6 billion a year. The Department of Commerce, through its National Oceanic and Atmospheric Administration's (NOAA's) NWS, and the Department of Agriculture, through its Extension Service and other related groups, are responsible for providing weather observations, forecasts, advisories, and related information to the agricultural community.

The current agricultural weather program was started in Mississippi's delta area in 1958. It began as a result of congressional interest expressed in a July 1955 Senate resolution calling on the Secretaries of Agriculture and Commerce to cooperate in identifying the agricultural community's weather information needs and jointly develop a comprehensive program to meet those needs.

In a January 1956 joint report to the Congress, the Departments of Agriculture and Commerce stated that the following were needed:

--More cooperation and collaboration between NWS weather forecasting and Agriculture's identification of agricultural weather information needs.

--An improved and expanded program of agricultural weather research to improve the accuracy of agricultural weather forecasting.

--Significant improvements in communicating NWS weather information to program users and potential users.

NWS spends an estimated $3 million each year on the program and the Department of Agriculture has allocated approximately $1,000,000 annually for this program.

PREVIOUS GAO REPORT

In a March 29, 1978, report to the Chairman, House Committee on Science and Technology, entitled "The Congress Should Clearly Define The National Weather Service's Role To Provide Specialized Weather Services" (CED-78-77), we pointed out that the Congress had not specifically mandated the extent to which NWS should provide specialized weather services for users, such as those in agriculture, aviation, marine, forestry and environmental air quality.

Office of Management and Budget Circular A-62, dated November 13, 1963, addressed policies and procedures for coordinating Federal meteorological services with the weather information needs of the general public and "user" agencies. While not specifically addressing Commerce's role in providing specialized services, the Office did state that Commerce "will, to the extent consistent with effective and economical use of resources, conduct the specialized services that support the mission requirements of user agencies." The circular also designates Commerce as responsible for preparing plans for establishing basic and specialized weather services.

We recommended that the Congress (1) clearly define NWS's role and responsibilities in providing specialized weather service to user agencies and (2) assure that NWS has adequate resources to fulfill its responsibilities.

In recognition of the need to define NWS's role and responsibilities, a bill was introduced in the House of Representatives during the 95th Congress requiring the Secretary of Commerce to develop a coordinated interagency plan to provide specialized weather services to other Federal agencies. However, the Congress took no action on this bill.

AGRICULTURAL WEATHER INFORMATION HAS NOT BEEN EFFECTIVELY COMMUNICATED

The agricultural weather program and specific weather information have not been effectively communicated to program users and potential users. The Federal Plan for a National Agricultural Weather Service states that benefits from the Agricultural Weather Service Program cannot be fully realized unless a "direct link" with the user is available by which weather information can be effectively distributed.

The two basic program products are forecasts and advisories. Agricultural forecasts are intended to provide guidance in managing farm operations and include such elements as expected cloudiness, the geographical area that will have rain, the wind speed and direction, dew duration and intensity, and the range of high and low temperatures. Agricultural advisories, on the other hand, are intended to evaluate the effects of past, present, and expected weather factors and relate them to day-to-day operations; for example, advising farmers that immediate fertilization of pastures may be appropriate because a light rain with a minimum runoff is anticipated. This information is to be provided to users in various ways, including the NOAA Weather Wire Service, NOAA Weather Radio, and the Department of Agriculture's county agents in areas covered by the program.

About one-third of the farmers and ranchers responding to our questionnaire from areas covered by the agricultural weather program could not recall ever hearing of agricultural forecasts and about one-half could not recall hearing of the advisories. Likewise, about 40 percent of the agricultural businesses responding said they could not recall ever hearing of agricultural forecasts and advisories. Sixteen percent of county agents could not recall hearing of agricultural forecasts and 25 percent responded similarly regarding advisories. (See app. II.)

An earlier survey in one State, made by the State Extension Service and various farmer/agribusiness groups, disclosed that 30 percent of the above groups which responded were not aware of the Agricultural Weather Service Program. These results were considered disappointing because the program had been in effect in that State for over 10 years.

Most farmers and ranchers responding to our questionnaire said their operations were 500 acres or less and their major products were grain, feed, livestock, dairy, and poultry. These farmers and ranchers, as well as county agents, said accurate weather information is mostly needed for planting, harvesting, and livestock protection. Agricultural businesses said they need accurate weather information for marketing, processing, and other operations, such as aerial application of chemicals. (See app. III.)

Users of weather information said the amount and chance of precipitation, air temperature, and drying conditions are most important or essential to their agricultural operations. Immediate and up to 48-hour forecasts are also considered most essential to their operations. Although agricultural businesses considered the long-range forecasts (3 to 90 days and seasonal) "very important," farmers and ranchers considered only the 3- to 5-day forecasts "very important" while considering the long-range forecasts "somewhat important" to their operations. (See app. III.)

Most agricultural users of weather program information feel the general weather forecasts are at least "marginally" meeting their needs. Their major complaint is that the forecasts are not accurate. They added that they prefer agricultural weather forecasts because they are more accurate and because they contain more statistics relating to agricultural operations. Of those users who are aware of agricultural weather advisories, farmers and ranchers perferred them over the agricultural forecasts whereas few agricultural businesses did. County extension agents preferred advisories by more than 5 to 1 over forecasts mainly because they converted "facts" into "farming actions." (See app. IV.)

The primary source of weather information for farmers, ranchers, and agricultural businesses throughout the country is commercial radio and TV. Only about 1 percent said they received any weather information from county agents. In areas of the country covered by the agricultural weather program, NOAA Weather Radio is not a widely used source. About half of the farmers and ranchers, 38 percent of agricultural businesses, and 24 percent of the county agents said they did not recall ever hearing of NOAA Weather Radio. (See app. II.) Forty-two percent of the farmers and ranchers and 65 percent of the agricultural businesses said they would invest $10 to $20 for a radio that would provide NOAA weather information. More than half of the

farmers and ranchers and agricultural businesses thought it would be beneficial enough to agricultural production in their area to warrant public or commercial investment in a toll-free telephone number that would provide agricultural weather information on a 24-hour basis. (See app. III.)

Most radio and TV stations which have heard of agricultural forecasts and advisories said they do broadcast them. Of the few stations that responded as to why they did not, the following reasons were cited:

--There are not enough farmers in the audience.

--The general public forecast is adequate for most users.

Radio and TV stations responding to our questionnaires from States with agricultural weather service coverage estimated that their audience had a higher proportion of farmers and ranchers than States without the service. (See app. I.) Also, as indicated earlier, users of agricultural weather forecasts and advisories said the general public forecast is not adequate due to inaccurate forecasts and failure to relate to specific farming actions. (See app. V.)

Radio and TV stations do not always broadcast or want to broadcast agricultural weather information when the users want it. Farmers, ranchers, and agricultural businesses most frequently said they would like to have weather information broadcast from 5:00 to 7:00 a.m. and from 6:00 to 11:30 p.m. Radio and TV stations said that the most desirable time for them to broadcast this information is 5:00 to 7:00 a.m., but few favored the 6:00 to 11:30 p.m. broadcasts. (See app. III.)

AGENCY ROLES NEED TO BE CLARIFIED

The Federal Plan for a National Agricultural Weather Service is one of several weather plans the Department of Commerce is required to prepare. The plan, issued in 1971, does not describe the specific program roles, responsibilities, or goals of Commerce's NWS and Agriculture's Extension Service, Agricultural Research Service, and State Experiment Stations or how they are to assist each other in managing an effective program.

The need for program cooperation has been recognized by the Secretaries of Agriculture and Commerce. For example, on April 5, 1977, the Secretary of Agriculture in a letter to the Secretary of Commerce highlighted the need for improved meteorological and climatological support:

> "However, more data and information are needed on a meso (localized) scale that is directed to the specific short run, information needs of farmers as well as probability analyses to provide a basis for making judgements. This information is essential in our field programs now underway and planned to help farmers in drought areas adjust cropping patterns, seeding rates, fertilizer applications, irrigation practices, stocking rates, tillage and pest control practices to varying drought conditions. It will provide improved technical information for staff of this Department working with farmers to vastly improve decisions on water utilization and tailor production practices to minimize the effects of drought. Over the longer run, improved climatological data forecasts provide tremendous potential for increasing the efficiency of agricultural production and reducing risks associated with weather."

Past agreements between the two Departments, however, have not addressed total program needs or the specific responsibilities and goals of each agency. For example, under one agreement an NWS advisory group was located in Agriculture and was to (1) contribute to the publication of the "Weekly Weather and Crop Bulletin," (2) provide a central source of up-to-date weather information and interpret related weather efforts, and (3) assist in computing probability estimates for production planning and in policy decisions in areas such as acreage allotments, managing stocks on hand, and supplying feed and food to meet foreign obligations. We found that there was some cooperation in publishing the "Weekly Weather and Crop Bulletin" but little communication and cooperation in carrying out the other functions and in meeting the agreement's basic objectives.

A recent agreement between NWS and the Extension Service does explain the responsibilities of the two

agencies more specifically than does the Federal plan. The agreement calls for cooperation between NWS and the Extension Service in (1) developing agricultural weather services, (2) determining the program's future requirements, and (3) providing the necessary expertise for training their respective staffs in agriculture and meteorology. The agreement also requires the Extension Service to keep NWS informed of current farm operations and weather elements affecting them. However, the agreement does not cover other NOAA or Agriculture programs and activities, such as the National Environmental Satellite Service or the Agricultural Research Service, and the role they should play in providing a coordinated weather service program.

SUPPORTING RESEARCH NEEDS TO BE COORDINATED

Improved cooperation is also needed in the research performed by Agriculture, NWS, and other NOAA organizations. The Federal Plan for a National Agricultural Weather Service provides for Agriculture to carry out research to determine the specific effects of weather elements on all facets of agricultural production. The plan provides that NOAA, in addition to furnishing weather services for general public interest, must conduct research to meet Agriculture's forecasting and climatological needs. The plan, however, does not define and delineate the research responsibilities of NOAA and Agriculture or how such research is to be coordinated.

CONCLUSIONS

Agricultural weather service information is not being communicated effectively to users and potential users. The need for certain improvements in the program has been noted by the Departments of Agriculture and Commerce. As a result, the Departments have reached some agreements to improve cooperation; however, much more remains to be done.

Our March 29, 1978, report (CED-78-77) pointed out that the Congress has never specifically mandated the extent to which NWS should provide specialized weather services for users, such as agricultural weather information, and recommended that the Congress clearly define NWS's role and responsibilities for providing such services. Since the Congress has not yet acted on this recommendation, the Departments of Commerce and Agriculture could do much to improve one of these specialized services by

clarifying their roles, responsibilities, and goals in the Agricultural Weather Service Program. They could also improve the methods used to communicate agricultural weather information to users and potential users.

We discussed the information presented in this report with officials of the National Oceanic and Atmospheric Administration and the Department of Agriculture involved in the agricultural weather program. These officials concurred with our views and recommendations.

RECOMMENDATIONS

We recommend that you, in cooperation with the Secretary of Agriculture, clarify and strengthen the roles of your Departments in the Agricultural Weather Service Program. This should include:

--Improving the methods for publicizing and communicating weather information to users and potential users.

--Providing program coordination by updating the Federal Plan for a National Agricultural Weather Service.

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As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Chairmen, Senate Committee on Governmental Affairs; House Committee on Government Operations; and House and Senate Committees on Appropriations; House Committee on Agriculture; Senate Committee on Commerce, Science and Transportation; Subcommittees on Agriculture and Related Agencies, and on State, Justice, Commerce and the Judiciary, Senate Committee on Appropriations. Copies are being sent as requested

to Senator Walter D. Huddleston and Congressman David R. Obey. We are also sending copies to the Secretary of Agriculture; the Director, Office of Management and Budget; and the Administrator, National Oceanic and Atmospheric Administration.

Sincerely yours,

Henry Eschwege

Henry Eschwege
Director

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INTRODUCTION TO APPENDIXES

Questionnaires were sent to approximately 1,600 agricultural weather information users or disseminators. They were sent to 17 States with full agricultural weather service coverage and 31 States with limited or no agricultural weather service. The table below shows the breakout of the sampling plan and responses.

Group Sampled	Type of Sample	Total Number Sampled	% of usable Responses
Farmers/ Ranchers	Random statistical sample of a major farm journal subscription list	1,000	52%
County Agents	Random statistical sample of all county agents	300	93%
Agri-businesses	Judgment sample of selected agribusinesses	150	69%
TV and Radio Stations	Judgment sample of selected stations	150	65%
Total		1,600	

In the tables that follow, the responses given by the farmers/ranchers, agribusinesses, county agents, or radio and TV stations are summarized. Responses from the 17 States with full agricultural weather services are labelled as "areas covered." Responses from the 31 States with limited or no coverage are labelled as "areas not covered." (See question 5, app. I.) Most of the tables in appendixes I, II, and III, however, are not labeled and give combined results for both areas. (See questions 1, 2, 3, and 4 in app. I.) Tables in appendixes IV and V are for covered areas, unless noted.

Care must be used in making generalizations from the data given in these appendixes. For example, the response rate for farmers/ranchers was low and we have no assurance that nonrespondents would answer in exactly the same way.

Since the county agent information came from a statistical sample with a high response rate, it should be more reliable. The data from agribusinesses and radio and TV stations should not be used for interpretive purposes since it is from a judgment sample, plus the response rates are low.

Also, the response rate is particularly low on some specific questions. This is because the respondent chose not to answer and/or responses were solicited from only a subgroup of those sampled. For example, only those familiar with the agricultural forecast were supposed to answer question 3 on page 20.

The results in the tables are all reported in percentages. But the total number of people in the sample or in the subsample are shown in parenthesis by each table or section of a table.

In some cases, percentages do not add up to 100 because of rounding.

DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

1. SIZE OF FARM OR RANCH

The majority of farmers/ranchers responding indicated that the size of their farm/ranch operation is 500 acres or less.

Size Of Farm	Farmer/Rancher (524)
Less than 250 acres	54%
250 to under 500 acres	22
500 to under 750 acres	7
750 to under 1,000 acres	5
1,000 or more acres	11
No Response	1
	100%

2. PRINCIPAL AGRICULTURE BUSINESS

Processing was the principal business of 24 percent of the respondents. Nurserymen and equipment dealers accounted for about 12 and 11 percent, respectively. Twenty-five percent of the agribusiness respondents indicated their business was something other than that listed. Generally, this included wholesale operations, such as groves, orchards, egg firms, or farm cooperatives.

Type Of Business	Agribusiness (104)
Processor	24%
Storage and warehousing	3
Shipper	3
Fertilizing	4
Insecticide and other chemicals	0
Nurserymen	12
Equipment dealer	11
Aerial applicator	5
Custom operations (combining, bailing, etc.)	1
Other	25
No response	12
	100%

APPENDIX I

3. MAJOR AGRICULTURAL PRODUCT

Farmers/ranchers and county agents identified grain and feed, livestock, dairy, and poultry as being the "major" products the farmers produced. As shown in the chart below, county agents mentioned the other products as being "important" more frequently than did the farmers.

Types Of Products	Farmers And Ranchers (524)		County Agents (278) (note a)	
	Major Product	Other Important Product	Major Product	Other Important Product
Grain and feed	50%	17%	30%	33%
Cotton	3	1	4	8
Sugar	1	0	0	3
Tobacco	4	1	5	6
Livestock, dairy, poultry	38	18	35	38
Fruit and tree nuts	2	2	1	18
Vegetables	4	3	3	23
Pasture and hay	22	24	4	55
Other	6	3	6	12

a/Percentages add to more than 100%--some respondents felt more than one product was "major."

4. USE OF IRRIGATION SYSTEMS

Fourteen percent of the farmers and ranchers reported having irrigation systems on their farms or ranches.

Use Irrigation Systems	Farmers and Ranchers (524)
Yes	14%
No	76
No response	10

5. TYPE OF BROADCASTING MEDIA

The major type of broadcasting medium responding to our survey is AM radio stations.

Type Of Broadcasting Medium	Radio And TV	
	Areas Covered (52)	Areas Not Covered (45)
AM Radio	42%	40%
FM Radio	10	4
Television	15	36
AM/FM Radio	27	13
Comb. of above	6	4
No response	0	2
	100%	100%

6. AVERAGE SIZE OF AUDIENCE

The average size TV or radio audience most frequently mentioned (29%) was between 20,000 and 49,999 people.

Size of Audience	Radio and TV (97)
Less than 20,000 people	16%
Between 20,000 and 49,000	29
Between 50,000 and 99,999	19
Between 100,000 and 499,999	24
500,000 and over	10
No Answer	2
	100%

7. ESTIMATED PROPORTION OF AUDIENCE AS FARMERS/ RANCHERS OR OTHER AGRICULTURE PRODUCERS

While the States with agricultural weather service more frequently estimated that their audience had a higher proportion of farmers than the States without agricultural weather service, the majority of the respondents estimated the proportion of farmers/ranchers to be less than 20 percent.

APPENDIX I

Proportion of Audience As Farmers/Ranchers	Radio And TV	
	Areas Covered (52)	Areas Not Covered (45)
Less than 10%	23%	33%
Between 10% and 19.9%	23	27
Between 20% and 29.9%	15	4
Between 30% and 39.9%	12	11
Between 40% and 49.9%	10	20
50% and over	17	4
	100%	100%

AWARENESS OF WEATHER INFORMATION SOURCES

This section concerns those questions addressing the agricultural weather service users' awareness and familiarity with the services available to them.

1. USUAL SOURCE OF WEATHER INFORMATION

Both farmers and ranchers and agribusinesses reported using commercial radio and television as their most common source of weather information.

Source of Weather Information	Percent of Those Responding			
	Areas covered		Areas not covered	
	farmers/ ranchers (247)	agri-busi-nesses (37)	farmers/ ranchers (277)	agri-busi-nesses (67)
Commercial radio	75%	68%	85%	73%
TV	80	92	85	64
Telephone (if general weather)	7	19	6	16
Newspaper	22	19	21	24
NOAA weather radio	5	11	4	10
County agent	1	0	1	2
Private meteorologist	1	3	1	18
Other	3	3	2	9

2. FAMILIARITY WITH NOAA WEATHER RADIO

Almost half of the farmers/ranchers, one-third of the agribusinesses, and one-fourth of the county agents indicated they had never heard of NOAA radio or were not sure they had heard of it. As shown in the table below, this relationship holds whether the respondent was in a covered or a noncovered area.

APPENDIX II

Familiarity With NOAA Weather Radio	Percent Of Those Responding					
	Areas Covered			Areas Not Covered		
	farmers/ ranchers (247)	agri-busi-nesses (37)	county agents (140)	farmers/ ranchers (277)	agri-busi-nesses (67)	county agents (138)
Can't recall ever hearing about it	49%	38%	24%	50%	33%	26%
Believe I have heard about it	27	22	30	34	25	43
Listened to it once	4	3	8	2	5	8
Listened to it several times	7	19	29	8	18	17
Frequently listened to it	8	19	9	5	18	7
No response	5	0	0	1	1	0

3. FAMILIARITY WITH AGRICULTURAL WEATHER FORECAST

Each of the four respondent groups was asked about their familiarity with the agricultural weather forecast. Notice that some respondents in the area not covered by the Agricultural Weather Service indicated they used the service. This does not seem possible. Although respondents did not have the official NOAA agricultural forecast available in these areas, other types of agricultural forecasts may be available. These respondents probably mistook them for the official NOAA agricultural forecast. This also brings into question whether as many in the area covered used the official NOAA agricultural forecast as indicated by the responses.

Familiarity With Agricultural Forecast	Percent Of Those Responding							
	Area covered				Area not covered			
	farmers/ ranchers (247)	agri-busi-nesses (37)	county agents (140)	radio TV (52)	farmers/ ranchers (277)	agri-busi-nesses (67)	county agents (138)	radio/ TV (45)
Can't recall ever hearing forecast	34%	43%	16%	No 12%	54%	37%	35%	No 38%
Remember as part of gen. forecast	41	32	43	Yes 88%	33	31	44	Yes 60%
Remember as a separate forecast	17	14	30		10	18	15	
No response	8	11	11		3	14	6	2%

4. FAMILIARITY WITH AGRICULTURAL WEATHER ADVISORIES

Each of the four respondent groups was asked about their familiarity with the agricultural weather advisory. Notice that some respondents in the area not covered by the Agricultural Weather Service indicated they used the service. This does not seem possible. Although respondents did not have the official NOAA agricultural advisory available in these areas, other types of agricultural advisories may be available. These respondents probably mistook them for the official NOAA agricultural advisory. This also brings into question whether as many in the area covered used the official NOAA agricultural advisory as indicated by the responses.

Familiarity With Agricultural Advisory	Percent Of Those Responding							
	Area covered				Area not covered			
	farmers/ ranchers (247)	agri-busi-nesses (37)	county agents (140)	radio/ TV (52)	farmers/ ranchers (277)	agri-busi-nesses (67)	county agents (138)	radio/ TV (45)
Can't recall ever hearing advisory	49%	38%	25%	No 15%	63%	49%	46%	No 36%
Remember as part of ag. forecast	33	35	41	Yes 83%	23	30	32	Yes 60%
Remember as a distinct advisory	12	22	26		8	12	15	
No response	6	5	8	2%	6	9	7	4%

WEATHER INFORMATION NEEDS

This section discusses the user's weather information needs, such as the importance of different types of weather information and the critical periods and operations requiring accurate weather information. Also discussed is the medium and timing of weather information dissemination.

Unless otherwise noted, all tables in this section are for all respondents combined.

1. AGRICULTURAL OPERATIONS FOR WHICH FARMERS AND RANCHERS NEED ACCURATE WEATHER INFORMATION

Farmers/ranchers and county agents identified planting, transplanting, harvesting, and livestock protection among those operations in which accurate weather information is needed. As shown in the chart below, county agent percentages for accurate weather information were higher than farmer/rancher percentages.

Operations Needing Accurate Weather Information	Farmers/ Ranchers (524)	County Agents (278)
CROPS		
Planting, transplanting, etc.	68%	84%
Frost protection	24	50
Harvesting	73	84
Irrigation	9	19
Spraying or dusting	35	60
Plowing, harrowing, etc.	30	29
Fertilizing	28	28
Pruning	1	3
Crop storage and protection	17	21
Other	2	6
LIVESTOCK, DAIRY & POULTRY		
Feeding	10	33
Livestock protection	23	41
Grazing	15	30
Farrowing, calving, lambing, etc.	17	42
Heading or droving	0	2
Breeding	4	5
Other	0	3

2. AGRIBUSINESS AGRICULTURAL OPERATIONS NEEDING ACCURATE WEATHER INFORMATION

For the agricultural operations of agribusiness, over 40 percent said accurate weather information is most frequently needed in "other" operations, which generally included aerial applications, custom operations, or wholesale operations.

Operations Needing Accurate Weather Information	Agribusiness (104)
Weighing and measuring	3%
Receiving	22
Shipping	23
Storing	16
Processing	24
Handling	17
Marketing application	38
Other	42

3. IMPORTANCE OF VARIOUS TYPES OF WEATHER INFORMATION FOR AGRICULTURAL OPERATIONS

The three respondent groups below indicated amount and probability of precipitation as the most important type of weather information.

Types of Weather Information	Farmers/Ranchers (524)				Agribusinesses (104)				County Agents (278)			
	Little or Somewhat Imp.	Moderately Imp.	Very Imp. or Essential	No Response	Little or Somewhat Imp.	Moderately Imp.	Very Impt. or Essential	No Response	Little or Somewhat Impt.	Moderately Impt.	Very Impt. or Essential	No Response
Chance of Precipitation	11%	13%	62%	14%	6%	16%	74%	4%	5%	10%	82%	3%
Amount of Precipitation	15	18	44	24	11	20	64	5	13	28	55	4
Air Temperatures	25	19	20	37	27	18	44	11	21	27	40	12
Wind (direction and speed)	33	14	16	37	44	18	22	15	40	25	22	13
Humidity	36	13	13	38	49	19	21	11	42	24	18	17
Wind Chill Factor	34	14	15	37	52	19	14	14	31	23	32	14
Drying or Curing Conditions	17	14	43	27	41	14	36	9	16	21	57	7
Dew Amount	39	13	9	39	63	15	10	12	54	23	11	13
Dew Points	44	10	4	43	63	16	7	14	64	14	7	15
Sunshine (number of hours)	24	17	24	35	39	23	24	14	25	31	30	14
Soil Temperature	24	16	27	33	40	16	32	12	14	31	49	5
Soil Moisture	19	16	32	33	39	14	33	14	14	27	50	10
Other	1	0	1	99	2	0	7	92	1	0	1	98

APPENDIX III

4. TOLL-FREE TELEPHONE WEATHER INFORMATION: A BENEFICAL INVESTMENT

Fifty-five percent of the farmers/ranchers thought it would be sufficiently beneficial to the agricultural production in their area to warrent public or commercial investment in a toll-free telephone number that would provide agricultural weather information for their area on a 24-hour basis. Sixty-eight percent of agribusinesses also agreed with this concept.

Is 24-Hour Telephone Weather Information A Good Investment?	Farmers/ Ranchers (524)	Agribusinesses (104)
Yes or probably Yes	55%	68%
Undecided	15	9
No or probably No	27	20
No response	3	3

5. WILLINGNESS TO INVEST IN COMMERCIAL RADIO BROADCASTING NOAA WEATHER INFORMATION

Forty-two percent of the farmers/ranchers indicated a willingness to invest $10 to $20 for a small commercial radio that would provide continuous NOAA weather information at certain hours throughout the day. Sixty-five percent of agribusinesses said they would probably be willing to buy such a radio.

Willing To Buy A Radio For NOAA Weather Information	Farmers/ Ranchers (524)	Agribusinesses (104)
Yes or probably Yes	42%	65%
Undecided	17	7
No or probably No	39	27
No response	2	1

6. EFFECT OF WEATHER INFORMATION ON AGRICULTURAL PRODUCTION

Seventy percent of farmers/ranchers said that accurate and reliable weather information would improve their agricultural business at least to some extent. Seventy-five percent of agribusinesses gave similar responses.

Effect Of Weather Information On Agricultural Production	Farmers/ Ranchers (524)	Agribusinesses (104)
Little if any improvement	20%	15%
Some improvement	30	19
Moderate improvement	19	20
Substantial improvement	14	17
Very great improvement	8	19
No response	10	9

7. IMPORTANCE OF FORECASTS DURING CRITICAL OPERATION PERIODS

The farmers/ranchers, county agents, and agribusinesses responding to the questionnaire generally felt the immediate or up-to-48-hour forecasts are the most important during critical agricultural operations.

Forecast Periods	Farmers/Ranchers (524)				Agribusinesses (104)				County Agents (278)			
	Little or Somewhat Impt.	Moderately Impt.	Very Impt. or Essential	No Response	Little or Somewhat Impt.	Moderately Impt.	Very Impt. or Essential	No Response	Little or Somewhat Impt.	Moderately Impt.	Very Impt. or Essential	No Response
Immediate or Timely	13%	12%	51%	24%	15%	11%	63%	12%	8%	8%	82%	3%
6-12 Hour Forecast	18	16	38	28	21	14	54	12	11	20	62	8
12 24 Hour Forecast	15	18	44	24	20	15	51	14	6	17	71	6
24-48 Hour Forecast	16	19	34	31	18	24	42	15	5	28	60	7
3-5 Day Forecast	17	20	37	27	22	26	41	12	12	30	55	4
30-90 Day Forecast	36	17	15	32	32	20	36	13	44	29	20	7
Seasonal	38	14	14	34	25	12	34	30	47	19	17	18

8. FARMERS' AND RANCHERS' NORMAL V. DESIRED LISTENING HOURS FOR WEATHER INFORMATION

The hours farmers/ranchers normally listen for general weather information differ only slightly from their desired listening hours.

	Farmers/Ranchers (524)	
Listening Hours	Normal Listening Hours	Desired Listening Hours
5 - 7 a.m	60%	56%
7a.m. - noon	24	26
12 - 2 p.m.	40	40
2 - 6 p.m.	8	7
6 - 11:30 p.m.	79	68
Other	2	3

9. AGRIBUSINESS NORMAL V. DESIRED LISTENING HOURS FOR WEATHER INFORMATION

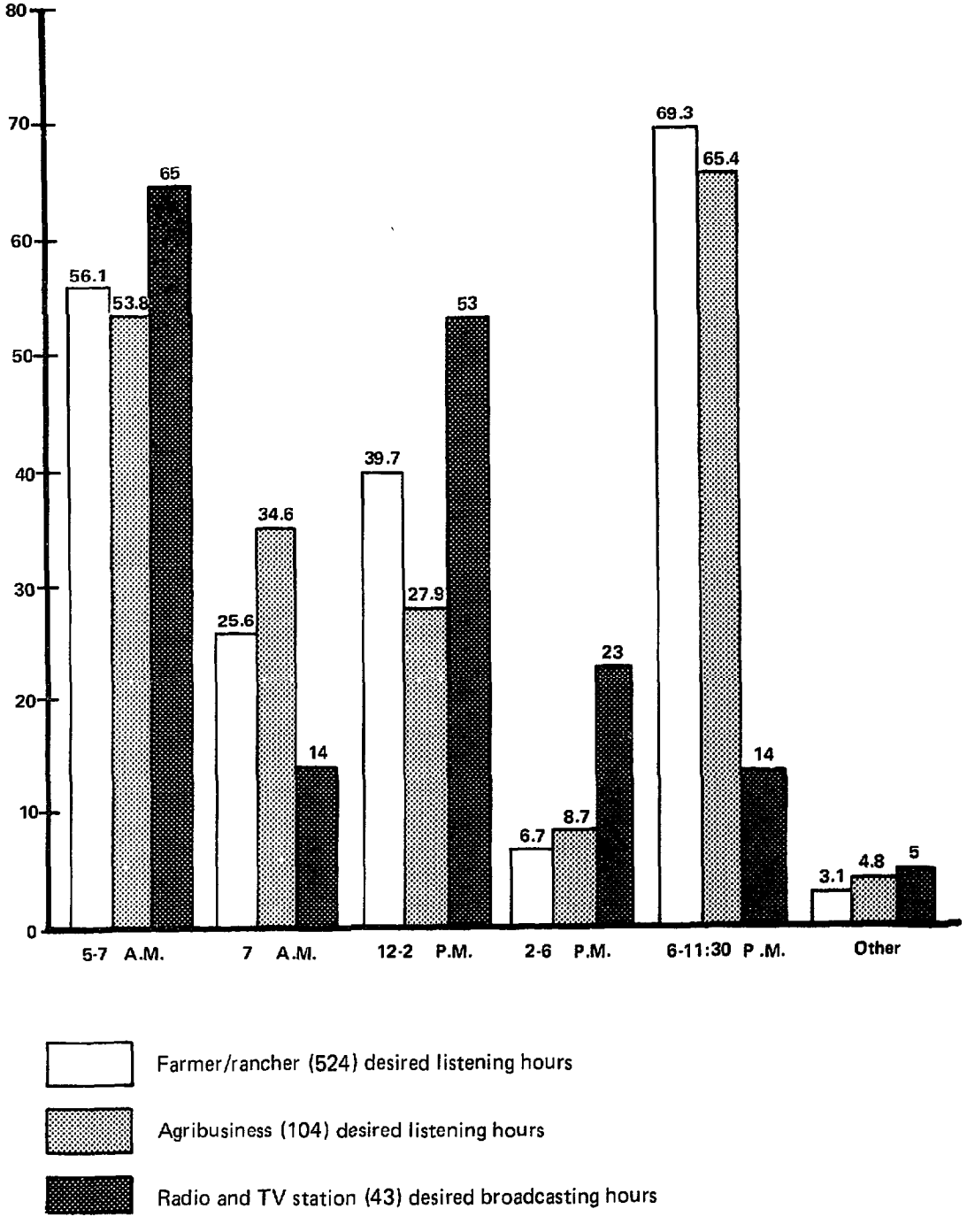
The hours agribusinesses normally listen for general weather information differ only slightly from their desired listening hours.

	Agribusiness (104)	
Listening Hours	Normal Listening Hours	Desired Listening Hours
5 - 7 a.m.	54%	54%
7 a.m. - noon	29	35
12 - 2 p.m.	25	28
2 - 6 p.m.	11	9
6 - 11:30 p.m.	73	65
Other	6	5

10. RADIO AND TV USUAL V. DESIRED BROADCASTING AND LISTENING HOURS FOR THE WEATHER INFORMATION

There is a difference between the hours radio and television stations feel are the most desirable for broadcasting agricultural weather information and the hours that farmers/ranchers and agribusinesses would like to listen for agricultural weather information.

APPENDIX III



11. UTILIZATION OF AGRICULTURAL FORECASTS

Of the farmers/ranchers and agribusinesses who are familiar with the agricultural weather forecast, the agribusinesses use the agricultural forecast more frequently than farmers/ranchers, though neither group uses the forecast much more than a few times.

Notice that some respondents in the area not covered by the agricultural weather service indicated they used the service. This does not seem possible. Although respondents did not have the official NOAA agricultural forecast available in these areas, other types of agricultural forecasts may be available. These respondents probably mistook them for the official NOAA agricultural forecast. This also brings into question whether as many in the areas covered used the official NOAA agricultural forecast as indicated by the responses.

Question: How often do you use Agricultural Weather Forecast?	Area Covered		Area Not Covered	
	farmers/ ranchers (162)	agri-busi-nesses (19)	farmers/ ranchers (124)	agri-busi-nesses (36)
Seldom if ever	22%	11%	30%	17%
At least a few times	27	11	28	22
A number of times	20	16	18	22
Frequently	25	47	15	31
No response	6	16	9	8

12. UTILIZATION OF AGRICULTURAL ADVISORY SERVICE

Of the farmers/ranchers and agribusinesses who are familiar with the agricultural weather advisory, none indicated using the service more than two to three times a year. Notice that some respondents in the area not covered by the agricultural weather service indicated they used the service. This does not seem possible. Although respondents did not have the official NOAA agricultural advisory available in these areas, other types of agricultural advisories may be available. These respondents probably mistook it for the official NOAA agricultural advisory. This also brings into question whether as many in the area covered used the official NOAA agricultural advisory as indicated by the responses.

	Area Covered		Area Not Covered	
Question: How often do you use the Agricultural Weather Advisory?	farmers/ ranchers (129)	agri-busi-nesses (24)	farmers/ rancher (97)	agri-busi-nesses (30)
Seldom if ever	33%	25%	42%	37%
Occasionally (2-3 times a year)	25	29	22	23
Moderately (once a month)	12	17	6	17
Fairly often (twice a month)	6	4	7	3
Frequently (1-2 times a week)	11	13	6	10
No response	13	13	16	10

ADEQUACY OF SERVICES IN COVERED AREAS

This section, dealing only with respondents living in areas covered by the agricultural weather service, addresses the adequacy of the general public weather forecast, the agricultural weather forecast, and the agriculture weather advisory from the perspective of the farmer/rancher, agribusiness, and the county extension agent. Inadequacies and preferred aspects of these services will also be discussed.

1. THE GENERAL PUBLIC WEATHER FORECAST

A slight majority of farmer/rancher respondents said that the general public weather forecast was marginal or inadequate for their agricultural operations. A greater percentage of county agents gave a similar response.

Adequacy Of General Public Forecast	Farmer/ rancher (247)	Agri-busi-ness (37)	County agent (140)
Adequate or more than adequate	44%	43%	31%
Marginal	40	41	56
Inadequate or very inadequate	11	8	11
No answer	5	0	2

2. GENERAL PUBLIC WEATHER FORECAST--INADEQUACIES

Of those farmers/ranchers, agribusinesses, and county agents who found the general public weather forecasts inadequate or very inadequate, the major objections cited were the inaccuracies of the short-term (less than 2 days) and extended (over 2 days) forecasts.

Adequacy Of General Public Forecast	Farmers/ ranchers (63)	Agri-busi-nesses (9)	County agents (36)
The regular short-range forecast (up to 2 days) is not accurate enough	52%	44%	67%
The extended forecast (over 2 days) is not accurate enough	60	44	75
Difficult to convert the forecast into farming decisions	30	11	53
Gives me too many statistics that I can't use	8	11	14
Doesn't have enough of the right statistics	11	22	17
Covers the urban centers and not my area	22	11	44
Not given at the right time of day	5	0	14
Other	6	0	0

3. IS THE AGRICULTURAL WEATHER FORECAST PREFERRED TO THE GENERAL PUBLIC WEATHER FORECAST

Those respondents familiar with the agricultural weather forecast generally thought it was better than the general forecast. An overwhelming majority of county agents indicated that the agricultural weather forecast did a better job for farmers/ranchers than the general public weather forecast.

Question: Does Agricultural Forecast do a better job than the General Public Forecast?

	farmers/ ranchers (142)	agri-busi-nesses (17)	county agents (102)
Yes	63%	59%	86%
No	37	29	12
No answer	0	12	2

4. ASPECTS OF AGRICULTURAL FORECAST PREFERRED TO GENERAL PUBLIC WEATHER FORECAST

When asked what aspects of the agricultural forecast were better than the general public weather forecast, those farmers/ranchers, agribusinesses, and county agents who thought the agricultural forecasts did a better job cited "contains more statistics" and "more accurate."

Preferred Aspect of Agricultural Forecasts	farmers/ ranchers (91)	agri-busi-nesses (10)	county agents (88)
Contains more statistics	82%	80%	89%
Relating to my agricultural operation such as:			
Hours of sunshine	62	30	56
When dew is off the ground	31	10	39
Ground temperature	42	60	61
Other	5	20	14
More accurate	36	30	38
Wording of the forecast is easier to understand	19	10	27
Comes at a better time a day	15	0	19
Covers the rural area where I operate	32	30	34
Other	3	0	1

5. DOES THE AGRICULTURAL ADVISORY DO A BETTER JOB THAN THE AGRICULTURAL FORECAST

Of those who were aware of the agricultural weather advisory, more farmers/ranchers preferred the advisory whereas few agribusinesses did. The county agents preferred the advisories by more than 5 to 1.

Question: Is the Agricultural Advisory better than the Agricultural Forecast?

	farmers/ ranchers (111)	agri-busi-nesses (21)	county agents (94)
Yes	54%	19%	86%
No	37	67	16
No response	9	14	0

5. For those respondents who indicated that the Advisory did a better job for them, the mentioned favored aspect was "the facts converted to recommended farming actions."

Preferred Aspects of The Agricultural Advisory	farmers/ ranchers (60)	agri-busi-nesses (4)	county agents (84)
I like the facts converted into recommended farming actions	13%	3%	22%
Reminds me of things that need to be done	6	3	22
Related to my specific farm products	6	8	22
Gives more historical weather data	3	3	8
Comes at a better time of day	3	0	4
Other	4	0	1

WEATHER INFORMATION DISSEMINATORS--

ROLES AND RESTRICTIONS

This section is concerned with responses of the disseminators of weather information--radio and TV broadcasters and county agents--their roles and restrictions. Unless noted, responses are restricted to geographic areas covered by weather information services.

1. BROADCASTS OF AGRICULTURAL FORECASTS AND ADVISORIES

The majority of radio-TV station respondents have heard of the agricultural forecast and advisory.

	Radio & TV	
	Heard of Agricultural Forecast	Heard of Agricultural Advisory
Yes	89%	83%
No	11	15
No response	0	2

Of those respondents who had heard of either the agricultural forecast or advisory, the majority said they also broadcast them.

		Radio & TV	
Question:	Do You Broadcast the:	Agricultural Forecast (46)	Agricultural Advisory (43)
	Yes	76%	74%
	No	24	26
	No response	0	0

2. BROADCAST SPONSORS OF THE AGRICULTURAL WEATHER FORECAST AND ADVISORY

Most radio and television stations broadcast the weather forecast or advisory as a public service, as shown below.

Broadcast Sponsors	Radio & TV			
	Areas Covered		Areas Not Covered	
	Forecast (49)	Advisory (38)	Forecast (18)	Advisory (15)
Not sponsored as a public service	39%	55%	28%	20%
Local agriculture business	20	18	28	33
Other business	23	18	17	13
Farmer cooperatives	8	3	0	0
USDA or other Gov't agencies	0	0	0	0
Other	4	3	11	20
No answer	6	3	17	13
	100%	100%	100%	100%

3. SOURCE OF WEATHER INFORMATION--RADIO AND TV

Almost 70 percent of the radio and TV stations in non-covered States and 75 percent of the stations in covered States responding to our questionnaire indicated that the primary source of weather information disseminated by their stations is the news services (AP or UPI).

Source of Weather Information	Radio & TV	
	Area Covered (52)	Area not covered (45)
NWS phone briefings	23%	40%
NOAA weather wire	69	69
Station's meteorologist	15	29
News service (AP or UPI)	75	69
NOAA weather radio	21	7
Other	17	24

4. WHY RADIO AND TV STATIONS DO NOT BROADCAST AGRICULTURAL WEATHER FORECASTS

Of those radio and TV station respondents who answered this question, the reasons they cited for not broadcasting the agricultural weather forecast were that "the regular general public forecast is adequate for farmers and ranchers" and "there are not enough farmers or ranchers in my audience."

Reasons For Not Broadcasting the Agricultural Forecasts	Radio-TV Station (note a) (6)
Not enough farmers or ranchers in my audience	33%
Don't think I could find a sponsor	0
Don't have any qualified agricultural specialist with our station	0
The regular general public forecast is adequate for farmers and ranchers	50
Concerned about the reliability of the information I might get from the National Weather Service	0
Blank or invalid	17

5. WHY RADIO AND TV STATIONS DO NOT BROADCAST AGRICULTURAL WEATHER ADVISORIES

Radio and TV stations responding indicated they do not broadcast the advisories for the same reasons the agricultural weather forecasts are not broadcast.

Reasons For Not Broadcasting the Agricultural Advisory	Radio-TV Station (note a) (6)
Not enough farmers or ranchers in my audience	33%
Don't think I could find a sponsor	0
Don't have any qualified agricultural specialist with our station	0
The regular general public forecast is adequate for farmers and ranchers	50
Concerned about the reliability of the information I might get from the National Weather Service	0
Concerned about the possible legal risk of giving advice	0
The Advisory is too long	0
The Advisory is issued too late in the day	0
Blank or invalid	17

a/There were only six respondents to this question. The results are probably not very reliable.

6. RADIO AND TV STATION INTEREST IN RECEIVING MORE AGRICULTURAL WEATHER INFORMATION

Most of the radio and TV staions surveyed are interested in receiving more information about weather services for agriculture.

Interest In Receiving More Agricultural Weather Information	Radio & TV Stations	
	Areas covered (52)	Areas not covered (45)
Yes	64%	62%
No	27	31
No response	10	7

7. COUNTY EXTENSION AGENTS--DISSEMINATION OF WEATHER INFORMATION

About two-thirds of county agents responding, in both covered and noncovered areas, do not disseminate any weather information to farmers, ranchers, or agri-businesses.

Question: Do You Disseminate Weather Information?	County Agents	
	Areas covered (140)	Areas not covered (138)
Yes	29%	36%
No	69	64
No response	2	0

8. SOURCE OF WEATHER INFORMATION DISSEMINATED--COUNTY AGENTS

The main source of weather information that county agents disseminate is the general public weather forecast in noncovered States and the agricultural weather forecast in covered States.

Source Of Weather Information	County Agents	
	Areas covered (140)	Areas not covered (138)
USDA research reports	8%	17%
General public weather forecast	12	22
Special National Weather Service Agr. Forecast	16	9
Special National Weather Service Agr. Advisory	11	3
Private meteorological services	3	4
Other	2	13

9. COUNTY EXTENSION AGENTS--FREQUENCY OF DISSEMINATING WEATHER INFORMATION

When county agents disseminate weather information, the following types of information are provided for areas covered and not covered by agricultural weather services.

Types Of Weather Information	Seldom To Occasionally		Moderately		Fairly Often To Often	
	Covered (41)	Not Covered (50)	Covered (41)	Not Covered (50)	Covered (41)	Not Covered (50)
A weather forecast only	44%	44%	2%	2%	7%	2%
A weather forecast plus recommended actions to take	44	42	5	0	17	10
No forecast, but recommended actions to take if certain weather conditions occur	24	26	12	24	22	36
Historical trends in local climate	37	42	5	14	17	22
Historical trends plus significance to agriculture	29	38	5	10	22	20
Ideal weather conditions for various agriculture operations	22	24	10	24	37	34
Other (specify)	5	10	0	2	2	6

10. COUNTY EXTENSION AGENTS--MAIN WEATHER INFORMATION DISSEMINATION MODE (COVERED AREAS)

According to county agents, weather information is disseminated mostly in response to phone calls. The farmer, on the other hand, does not indicate that this is the primary source of weather information from the county agent. (See question 1, app. II.)

Ways County Agents Disseminate Information	County Agents (140)
TV or radio	16%
Mailings to farmers	14
Response to phone calls	19
Other	7

11. FREQUENCY OF MAIL FROM COUNTY AGENTS

The farmer/rancher respondents indicated that they received mail from county agents only slightly more often than do agribusinesses.

Frequency Of Mail From County Agents	Farmer & Rancher (524)	Agri-business (104)
Seldom, if ever	17%	29%
Occasionally (2-3 times a year)	28	14
Moderate number (once a month)	30	30
Fairly often (twice a month)	18	18
Often (once or twice a week)	4	5
No response	3	4

12. COUNTY AGENT AS A SOURCE OF ANY WEATHER INFORMATION

Despite the mailings farmers/ranchers and agribusinesses receive, neither respondent group actively uses the county agent's office as a source of any weather information.

Use Of County Agents For Weather Information	Farmers & Ranchers (524)	Agri-businesses (104)
Seldom, if ever	88%	83%
Occasionally (1-2 times a month)	6	8
Moderately (once a month)	1	3
Fairly often (2 times a month)	1	3
Often (1-2 times a week	1	3
No response	3	1

13. WHY COUNTY EXTENSION AGENTS DO NOT HAVE LARGER ROLE IN DISSEMINATING WEATHER INFORMATION

In both covered and noncovered areas, the major reason given by county agents for not having a larger role in weather dissemination was that the weather information needed was not readily available.

Why County Agents Do Not Have A Larger Dissemination Role	County Agents	
	Areas Covered (140)	Areas Not Covered (138)
Higher priority work	10%	12%
The weather information I need is not readily available to me	28	24
I don't have access to the media to disseminate the information in a timely manner	7	8
Farmers have not demanded it	6	12
I don't have adequate training and experience in meteorology and climatology	16	16
Other	2	2

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