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January 2000 Las Cruces, NM
Electronic Distribution March 2002 5C

Department of Agricultural Economics and Agricultural Business

A Survey of Southern New Mexico Chile Producers

Production Practices and Problems

Agricultural Experiment Station • Bulletin 782

College of
Agriculture and Home Economics

A Survey of Southern New Mexico Chile Producers: Production Practices and Problems

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Chiles have been produced in New Mexico for at least four centuries (Bosland, Bailey, Cotter, 1998). Chile has been growing in importance as a cash crop in New Mexico since the 1970s. Data for chile acreage, production, and value first appeared in the 1974 New Mexico Agricultural Statistics publication. In 1978, the New Mexico Department of Agriculture reported that all varieties of chile pepper plantings had increased statewide from 5,550 acres in 1970 to 11,200 acres in 1978. Harvested acreage increased steadily through the 1980s and reached a peak in 1992 of 34,500. Harvested acreage decreased to 22,400 in 1995, but rebounded to 30,600 in 1997.

Chile production in New Mexico is highly variable and depends on many factors other than harvested acreage. Events of recent years demonstrate the unstable nature of chile production in the state. For instance, 1995 production was reduced due to weather and disease problems. These problems were less severe in 1996; as green chile production increased 35% and red chile production increased 20% over 1995. However, total chile production de-

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creased 22% in 1997, relative to 1996. Red chile production in 1997 was 17% higher than the previous year, but green chile production fell 37%. In terms of total nominal value of the New Mexico chile crop, the three highest years have been 1996, 1992, and 1997.

The New Mexico chile industry is very complex with the presence of several subsectors defined by different cultivars, objectives, production systems and problems, and processing and marketing structures. The commodities within the state's chile industry include cayenne, jalapeño, paprika, green chile, and red chile. The chile industry also is divided by use of fresh chile for processing (jalapeño and green chile), and dried red varieties (paprika, cayenne, and red chile). Production practices vary greatly. One notable difference is whether producers plant chile specifically for use as a dried red chile crop, or as a green chile crop with a final harvest of red chile.

Ninety-one percent of the state's chile acreage is located in seven New Mexico counties. Doña Ana County historically has been the largest chile production area. However, Luna County's production has been greater than Doña Ana's in eight of the past nine years. The other important chile producing counties are Chaves, Eddy, Hidalgo, Lea, and Sierra. In 1997, Doña Ana, Luna, and Hidalgo accounted for 65% of the state's harvested acreage. There were almost 400 chile producers in New Mexico in 1997, with the largest number located in Doña Ana County, including the Mesilla Valley and Hatch production regions (New Mexico Agricultural Statistics Service).

Chile designated for fresh market purposes represents about 20% of the annual statewide crop and accounts for virtually all of the crop produced in northern New Mexico (Mapel 1993). The majority of the crop is grown in the southern part of the state under contract for processing (freezing, canning, dehydrating, or pickling). Most of the major green and red chile processors are located in southern New Mexico or in the El Paso, Texas area.

PROBLEMS FACING NEW MEXICO CHILE PRODUCERS

The variation in chile production discussed above is related to yield differences,which are influenced by disease and weather. In recent years, the New Mexico chile industry has become increasingly affected by world market events. Imports of fresh chile from Mexico and dried products from several countries are forcing New Mexico producers to become more internationally competitive. Processors in New Mexico continue to purchase fresh and dried chile from local producers. However, New Mexico chile must be sold competitively with imports. These outside market pressures, along with some industry participants' observations that local chile disease and pest problems have worsened and average yields have decreased, have led to heightened concern about the future of commercial chile production and processing in the state. Several commercial chile producers and processors in southern New Mexico believe the local chile industry must increase yields, and/or reduce production costs in order to be viable in the future.

BACKGROUND OF THE SOUTHERN NEW MEXICO CHILE PRODUCERS' SURVEY

A meeting of New Mexico State University's College of Agriculture and Home Economics chile production specialists/researchers was held in April 1998. At this meeting, actual and perceived chile production problems experienced by New Mexico growers were discussed. The attendees posed numerous hypotheses regarding decreases in local chile yields and production in recent years. The potential explanations for reduced yields and production ranged from pests and inadequate soil fertility to overall marketing conditions, increased competition from other crops, and the structure of chile production in the state. Some attendees also questioned whether or not yields have actually decreased.

Because of a variety of opinions regarding chile production practices and problems in southern New Mexico, a survey of chile producers was initiated in June 1998. The objective of the survey was to provide an overview of production practices and identify potential causes of declining chile crop yields and production. The survey of southern New Mexico chile producers was administered during summer 1998. Telephone surveying of producers began in late June and continued through August.

SURVEY PROCEDURES

The Sample

A list of New Mexico chile producers was obtained from the U.S. Department of Agriculture (USDA). This list had been updated through 1997, and is used by the USDA in collecting annual chile production data. The list for the state included 379 producers, with 302 located in the southern part of the state (table 1).

Table 1. Two-way table of region by acres in chile for all southern New Mexico chile growers, n = 302.

	<10 acres	10 - <20 acres	20 - <50 acres	50+ acres	n	Row %
Region 1 (Doña Ana / Sierra)	50	26	43	53	172	57.0
Region 2 (Luna / Hidalgo)	4	2	11	49	66	21.8
Region 3 (Chaves / Eddy / Lea)	5	8	16	35	64	21.2
n	59	36	70	137	302	—
Column %	19.5	11.9	23.2	45.4	—	100.0

Growers with fewer than 20 acres in Region 2 and Region 3, and growers with fewer than 10 acres in Region 1 were not included in the sampling frame due to the noncommercial nature of many smaller operations. The seven counties included in the sampling frame accounted for 91% of New Mexico's harvested chile acreage in 1997. Counties in the three geographically distinct production areas were combined to reduce the number of regional strata. A random sample of producers was selected from each of the seven remaining subgroups. A minimum of five completed questionnaires from each subgroup was required.

Telephone interviewing within a strata was conducted by sequentially moving through a randomly ordered list of producers.

Repeated attempts to contact growers at the beginning of the list were made before continuing down the list.

The Questionnaire

A questionnaire (Appendix A) designed to assess chile production practices and identify potential causes of declining chile crop yields and production was developed based on recommendations of college chile researchers and specialists. The questionnaire was reviewed and approved by faculty members within the college's Agricultural Biometric Service.

RESPONSE TO THE SURVEY

Thirty-seven questionnaires were completed for producers who reported they were currently growing chile or had grown the crop in the last three years (in order to gather information from growers who may not produce chile every year as a result of crop rotations). Twenty-seven individuals contacted through the survey reported they were no longer producing chile and considered themselves to be permanently out of chile production. Multiple responses were possible to several of the survey questions posed to each group of interviewees. In the tables which follow, responses are summarized as a percentage of 37 or 27 total respondents (for growers and former growers, respectively), even though multiple responses may have been provided by some individuals. In some instances, the number of total respondents is less than 37 or 27 because of nonresponses to individual questions.

Survey Results for Growers No Longer Producing Chile (n = 27)

Eleven of the current nongrowers are located in Region 1, two in Region 2, and 14 in Region 3. Fifty-nine percent (16) of the nongrowers had previously grown 20 - <50 acres of chile, 22% (6) had grown 50 or more acres, and 18.5% (5) grew 10 - <20 acres (table 2). More than half (14) of the former chile growers contacted during the course of the telephone survey were located in Region 3.

Table 2. Two-way table of region by acres formerly in chile for interviewed growers no longer producing chile (n = 27).

	10 - <20 acres	20 - <50 acres	50+ acres	n	Row %
Region 1 (Doña Ana / Sierra)	5	3	3	11	40.7
Region 2 (Luna / Hidalgo)	—	1	1	2	7.4
Region 3 (Chaves / Eddy / Lea)	—	12	2	14	51.9
n	5	16	6	27	—
Column %	18.5	59.3	22.2	—	100.0

The 27 nongrowers were asked why they had stopped producing chile, and several provided multiple responses. Of the nongrowers, 48.2% (13) said the reason was labor-related (the high cost of field labor, difficulties finding labor, and the comment that "machine harvesting doesn't work"). Forty-four percent of the nongrowers said that there was "no money" in chile production. High costs and risks were cited by 22.2% of the former growers as reasons they no longer raise chile, while production problems were cited by almost 26%. Marketing problems were cited by 11.1% of the nongrowers, while the North American Free Trade Agreement (NAFTA) was mentioned by two former producers as the reason they stopped raising chile. All responses to the question of why these 27 individuals were no longer producing chile are presented (table 3).

Table 3. Reasons why former chile growers stopped producing chile (n = 27).

Reason	Frequency	% Respondents
Labor (too expensive, difficult to find, mechanical harvesting doesn't work)	13	48.2
"No money" in chile production	12	44.4
High costs and risks of chile production	6	22.2
Production problems (seed quality and low yields)	7	25.9
Marketing problems and buyer disputes	3	11.1
NAFTA	2	7.4
Lack of agricultural research information	1	3.7
Other reasons or don't know	5	18.5

Alfalfa and cotton were the two crops that producers most frequently used to replace chile (table 4). Multiple responses were possible; 40 responses were given by 22 respondents. Corn, lettuce, pecans, cabbage, and small grains were mentioned by a few former chile producers.

Table 4. Two-way table of crops former chile growers have switched to producing by region (n = 22).

Crop	Region 1 (Doña Ana / Sierra)	Region 2 (Luna / Hidalgo)	Region 3 (Chaves/Eddy/Lea)	Frequency	% Respondents
Alfalfa	6	1	11	18	81.8
Cotton	4	0	7	11	50.0
Pecans	2	0	1	3	13.6
Corn	1	0	1	2	9.1
Cabbage	1	0	0	1	4.6
Lettuce	1	0	0	1	4.6
Small grains	0	0	1	1	4.6
Land leased to someone else	1	1	1	3	13.6

SURVEY RESULTS FOR CURRENT CHILE PRODUCERS (N = 37)

General Information

Forty-three percent of the growers from whom production information was obtained produce chile in Region 1 (table 5). The thirty-seven growers interviewed responded to the majority of the survey questions. A few growers refused to answer or could not answer selected questions. Multiple responses were possible on several of the questions. Many of the interviewees also provided additional comments or information beyond the questions included on the questionnaire. Producers were asked to give information based on the most recent year they had produced chile. If they couldn't remember that year's crop specifically, they were asked to respond based on typical years and production practices. This portion of the report will summarize and discuss the responses of the 37 growers.

The results reported here have not been weighted by the proportion of farms in each acreage group or region. Therefore, reported percentages for questions asked in the survey do not reflect the different numbers of chile producers in each acreage category or region from which sampled growers were randomly selected. Caution should be exercised when inferring from these survey results to the entire population of southern New Mexico chile producers. Weighting by sampling fraction was not reported due to the high variability and wide range of responses for many of the survey questions. In some instances, the total percentage will not sum to 100.00 due to rounding.

Table 5. Two-way table of region by acres of chile produced for interviewed growers who grew chile in 1995, 1996, or 1997 (n = 37).

	10 - <20 acres	20 - <50 acres	50+ acres	n	Row %
Region 1 (Doña Ana / Sierra)	6	5	5	15	40.5
Region 2 (Luna / Hidalgo)	—	5	5	10	27.0
Region 3 (Chaves / Eddy / Lea)	—	5	6	12	32.4
n	6	15	16	37	—
Column %	16.2	40.5	43.3	—	100.0

Thirty-six growers reported producing in only one county, while one reported farming in two counties. The distribution of survey respondents by county and acres of chile grown is shown (table 6). None of the Region 3 growers reported Lea County as their primary county of operation.

Table 6. Two-way table of primary county of operation for chile produced by interviewed growers who grew chile in 1995, 1996, or 1997 (n = 37).

County	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Doña Ana	6	3	4	13	35.1
Chaves	—	4	5	9	24.3
Luna	—	3	5	8	21.6
Eddy	—	1	2	3	8.1
Hidalgo	—	2	—	2	5.4
Sierra	—	2	—	2	5.4
Lea	—	—	—	—	—

Survey respondents have been grouped by acres of chile produced in the tables above, although the producers provided information for actual acreages (table 7) . The 37 growers reported planting an average of 72.4 acres of chile in the last year they had produced chile. The actual acreage of chile grown most recently ranged from 5 to 300 acres. Three of the respondents were producing below the 10-acre minimum that was selected for the survey. However, the sampling frame used in the survey indicated they were producing on at least 10 acres. These three growers were all

located in Doña Ana County and reported an average of 6.3 acres of chile planted in 1997.

Table 7. Growers' chile acreages and total acres farmed (n = 37).

	Chile acreages:		Total acres farmed:	
Acres	# Respondents	% Respondents	# Respondents	% Respondents
< 10	3	8.1	2	5.4
10 - < 20	3	8.1	—	—
20 - < 30	4	10.8	—	—
30 - < 40	3	8.1	—	—
40 - < 50	8	21.6	2	5.4
50 - < 60	2	5.4	1	2.7
60 - < 70	2	5.4	—	—
70 - < 80	2	5.4	—	—
80 - < 90	2	5.4	—	—
90 - <100	—	—	1	2.7
100 - < 150	3	8.1	3	8.1
150 - < 200	—	—	3	8.1
200 - < 250	2	5.4	2	5.4
250 -< 300	2	5.4	1	2.7
300 - < 350	1	2.7	1	2.7
350 - < 400	—	—	3	8.1
400 - < 450	—	—	2	5.4
450 - < 500	—	—	3	8.1
500 - < 550	—	—	1	2.8
600 - < 650	—	—	2	5.4
800 - < 850	—	—	2	5.4
850 - < 900	—	—	1	2.7
950 - < 1000	—	—	1	2.7
> 1000	—	—	6	16.2
Mean response:	72.4 acres		473.3 acres	

The 37 chile growers currently are operating an average of 473.3 total acres of farmland (table 7). Total acres farmed (in all crops) ranged from 5 to 1,500 acres.

Ninety percent reported producing chile in 1996 or 1997 (table 8). Four growers (10.8%) indicated they had last grown chile in 1995, three of these indicated they may have permanently stopped producing chile.

Table 8. Last year grower produced chile (n = 37).

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Year:					
1995	1	2	1	4	10.8
1996	—	3	—	3	8.1
1997	5	10	15	30	81.1

The 37 producers reported having grown chile for an average of 17 years (table 9). The range of years of experience with growing chile was 3 to 70 years. The 37 respondents ranged in age from 30 to 82, with an average age of 50 years.

Table 9. Chile growers' ages and years producing chile (n = 37).

Years	Years producing chile:		Growers' ages:	
	# Respondents	% Respondents	# Respondents	% Respondents
< 5	5	13.5	—	—
6 - 10	10	27.0	—	—
11 - 15	8	21.6	—	—
16 - 20	6	16.2	—	—
21 - 30	4	10.8	2	5.4
31 - 40	1	2.7	7	18.9
41 - 50	1	2.7	11	29.7
51 - 60	1	2.7	9	24.3
> 60	1	2.7	7	18.9
Refused to answer	—	—	1	2.7
Mean response:	17 years		50 years	

Chile production records are kept by 72.2% of the producers surveyed (table 10). No information was available regarding the quality of the records kept. Only three (8.1%) respondents indicated they had off-farm employment in addition to their farming operations (table 10).

Table 10. Chile growers' personal information.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Keep written records of chile production (n = 36):					
Yes	4	9	13	26	72.2
No	2	5	3	10	27.8
Grower has off-farm employment (n = 37):					
Yes	1	1	1	3	8.1
No	5	14	15	23	91.2

Acreage Trends

Producers were asked about trends in their chile acreages over the five years preceding the survey (table 11). Forty-six percent of the growers said they had not changed their chile acreage in the past five years, 24.3% reported increasing their chile acreage, and 21.6% had decreased their chile operations. Again, three respondents said they will not produce chile in the future.

Table 11. Two-way table of chile acreage trends in past five years by chile production region and size (n = 37).

	Quit Production	Increasing	Decreasing	Unchanged	Row total
Doña Ana/Sierra					
10 - <20 acres	1 (16.7%)	2 (33.3%)	1 (16.7%)	2 (33.3%)	n = 6 (100%)
20 - <50 acres	0 (0.0%)	0 (0.0%)	1 (20.0%)	4 (80.0%)	n = 5 (100%)
50+ acres	0 (0.0%)	0 (0.0%)	1 (25.0%)	3 (75.0%)	n = 4 (100%)
Luna/Hidalgo					
20 - <50 acres	0 (0.0%)	1 (20.0%)	2 (40.0%)	2 (40.0%	n = 5 (100%)
50+ acres	0 (0.0%)	2 (40.0%)	1 (20.0%)	2 (40.0%)	n = 5 (100%)
Chaves/Eddy					
20 - <50 acres	1 (20.0%)	0 (0.0%)	1 (20.0%)	3 (60.0%)	n = 5 (100%)
50+ acres	1 (14.3%)	4 (57.1%)	1 (14.3%)	1 (14.3%)	n = 7 (100%)
Column Total (n = 37)	3 (8.1%)	9 (24.3%)	8 (21.6%)	17 (46.0%)	37 (100%)

Growers gave several reasons why their chile acreages had changed over the past five years (table 12). Multiple responses were possible, and the 17 producers who had stable acreages over the past five years did not provide any responses. "Make more money" with chile was given with greatest frequency as the reason for increasing chile acreage. Labor problems was given as the most frequent response for decreasing chile acreage.

Table 12. Two-way table of why chile growers' chile acreages have changed in the past five years (n = 20).

	Acreage:		
Reason	Increased	Decreased	Quit production
No particular reason given	1	1	
Make more money	4		
High demand for chile	1		
Entire farm expanded	2		
No money in chile			1
Chile yields decreased			1
Wanted to grow other crops			
Labor problems		4	
Rotation required	1	1	
Chile is too hard to grow		1	
Seed purity was low			1
Wanted to farm less		1	
Total	9	8	3

Almost 56% of the respondents predicted their chile acreage will be stable during the next five years, although another 35.3% said they planned to reduce their chile acreage or quit producing chile altogether within the next five years (table 13). Reasons given for predicted acreage changes varied. Labor problems was the most frequently cited reason for reducing or ending chile production (table 14).

Table 13. Two-way table of planned chile acreages in the next five years by chile production region and size (n = 34).

	Quit production	Increasing	Decreasing	Unchanged	Row total
Doña Ana/Sierra					
10 - <20 acres	1 (20.0%)	1 (20.0%)	1 (20.0%)	2 (40.0%)	n = 5 (100%)
20 - <50 acres	0 (0.0%)	0 (0.0%)	1 (25.0%)	3 (75.0%)	n = 4 (100%)
50+ acres	1 (25.0%)	0 (0.0%)	1 (25.0%)	2 (50.0%)	n = 4 (100%)
Luna/Hidalgo					
20 - <50 acres	0 (0.0%)	1 (20.0%)	1 (20.0%)	3 (60.0%)	n = 5 (100%)
50+ acres	0 (0.0%)	0 (0.0%)	1 (20.0%)	4 (80.0%)	n = 5 (100%)
Chaves/Eddy/Lea					
20 - <50 acres	4 (80.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	n = 5 (100%)
50+ acres	1 (16.7%)	0 (0.0%)	0 (0.0%)	5 (83.3%)	n = 6 (100%)
Column total (n = 34)	7 (20.6%)	3 (8.8%)	5 (14.7%)	19 (55.9%)	34 (100%)

Table 14. Two-way table of reasons why chile growers plan to increase or decrease chile acreage in the next five years (n = 15).

	Acreage Plans:		
Reason	Increase	Decrease	Quit production
Make more money	1		
High demand for chile	1		
I'm better at growing chile	1		
No money in chile			1
Labor problems		3	2
Want to change to other crops			2
NAFTA			1
Chile weevils		1	
Low seed purity			1
Too risky to grow chile		1	
Total	3	5	7

Land Preparation Practices

Survey information for the various land preparation practices employed by the farmers who currently grow chile is summarized (table 15). Not all survey participants responded to each question; the actual number of respondents is shown for each category of information obtained through the survey. The information is presented for each size category of chile acreage grown by the respondents.

Almost 46% of the growers indicated they never deep rip their chile fields, while another 42.9% reported yearly deep ripping. Thirty percent of the growers laser level their fields every year, and 45.5% never laser level. More than half (55.6%) of the growers do not test for pre-plant fertility, and almost three-fourths (72.2%) plant in furrow ridges. A few growers who reported preplant fertility testing indicated they only test some of their fields. Spacing between rows was reported between 30 and 40 inches, with 38 inches the most frequently reported row spacing. Slightly more than 69% of the producers cap their seed beds.

The growers were asked what specific preplant fertilizers they apply to their chile fields. A list of the fertilizer information given exactly as provided by the chile producers is shown (table 16). The information about preplant pesticides (table 17) also is presented exactly as it was provided by the survey respondents. Fertilizer regimes varied greatly between the growers, and this survey was not able to capture all the possible information regarding fertilizer practices. The information presented (table 16) provides some insight into preplant fertilizer practices; however, the quality of the information provided by the interviewed growers varied. For instance, some growers reported they had used "nitrogen," but could not provide additional detail regarding the application. Furadan was the most frequently reported preplant pesticide used by the growers, although the majority reported no use of preplant pesticides.

Table 15. Two-way table of chile land preparation practices.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Deep ripping (n = 35):					
Never	3	7	6	16	45.7
Yearly	2	7	6	15	42.9
2 years ago	0	1	0	1	2.9
3 years ago	0	0	1	1	2.9
Occasionally	0	0	2	2	5.7
Laser leveling (n = 33):					
Never	2	8	5	15	45.5
Yearly	2	4	4	10	30.3
Every 2 years	1	0	0	1	3.0
Every 3 years	0	1	1	2	6.0
Every 5 years	0	1	0	1	3.0
Every 9 years	0	1	1	2	6.0
Occasionally	0	0	2	2	6.0
Preplant fertility testing (n = 36):					
Yes	1	6	9	16	44.4
No	4	9	7	20	55.6
Method of planting (n = 36):					
Furrow ridges	3	12	11	26	72.2
Cantaloupe beds	2	3	4	9	25.0
Both of the above	—	—	1	1	2.8
Spacing between rows (n = 35):					
30 inches	0	1	3	4	11.4
34 inches	0	1	1	2	5.7
36 inches	0	3	0	3	8.6
38 inches	2	6	7	15	42.9
40 inches	2	4	5	11	31.4
Cap seed beds (n = 36):					
Yes	3	10	12	25	69.4
No	2	5	4	11	30.6

Table 16. Preplant fertilizers applied as reported by chile growers (n = 29).

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
One response:					
None	—	1	1	2	6.9
Don’t know	1	—	—	1	3.5
Nitrogen	—	1	1	2	6.9
Phosphate	—	—	1	1	3.5
11-52	2	1	2	5	17.2
18-46	—	1	1	2	6.9
10-34	1	—	1	1	3.5
18-48	—	1	—	1	3.5
16-20	—	—	1	1	3.5
48-54-12	—	1	—	1	3.5
Combination of responses:					
Nitrogen, phosphate	—	1	1	2	6.9
Nitrogen, 18-46	1	—	—	1	3.5
Phosphate, trace minerals	—	—	1	1	3.5
Nitrogen, 10-34	—	1	—	1	3.5
Nitrogen, 11-52	—	1	—	1	3.5
16-48, 18-46	—	—	1	1	3.5
16-20, trace minerals	—	1	—	1	3.5
Nitrogen, phosphate, potash	—	—	1	1	3.5
Nitrogen, phosphate, trace minerals	—	—	1	1	3.5
11-53, phosphate, 18-46	—	—	1	1	3.5

Table 17. Preplant pesticides applied as reported by chile growers (n = 33).

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
None	3	7	10	20	60.6
Furadan	1	4	2	7	21.2
Disyston	1	1	2	4	12.1
Admire	—	—	1	1	3.0
Other	—	1	—	1	3.0

Rotations

Several questions were asked regarding the chile producers' crop rotation practices. Ninety-seven percent of the growers indicated they plant chile in rotation with other crops (table 18). Almost 43% wait four years before planting chile again in the same field. The second most frequently reported waiting period is two years, while rotational periods of three, five, six, and eight years were reported by smaller numbers of growers. The 37 growers gave 95 responses regarding crops used in chile rotations (table 18). Cotton and alfalfa were the most frequently reported rotational crops. The grower who reported planting "small grains" in rotation with chile declined to specify the grain crop.

Table 18. Two-way table of chile rotation practices.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Chile planted in rotation (n = 37):					
Yes	6	14	16	36	97.3
No (practices fallowing)	—	1	—	1	2.7
Years before chile is in same field (n = 28):					
Two	—	3	2	5	17.9
Three	—	1	2	3	10.7
Four	1	4	7	12	42.9
Five	1	2	1	4	14.3
Six	1	2	—	3	10.7
Eight	—	1	—	1	3.6
Crops used in rotations (n = 37):					
Cotton	6	9	12	27	73.0
Alfalfa	1	9	10	20	54.1
Corn	3	5	6	14	37.8
Wheat	—	2	5	7	18.9
Milo	—	2	4	6	16.2
Oats	2	3	1	6	16.2
Onions	2	1	3	6	16.2
Other vegetables	1	—	1	2	5.4
Lettuce	1	—	1	2	5.4
Pasture	—	1	—	1	2.7
Silage	1	—	—	1	2.7
Small grains	—	1	—	1	2.7
Land left fallow	—	1	1	2	5.4

Table 19 presents the rotations exactly as they were described by the 37 chile growers. A few of the growers mentioned chile, but most reported a sequence of other crops. It may be assumed that chile would be planted at the beginning or end of the rotation. When chile was listed in the middle of a sequence of other crops, the information was recorded and presented (table 19). Only one rotation (cotton, chile) was reported more than once.

Table 19. Crop rotations reported by survey respondents (n = 37).

	10 - <20 acres	20 - <50 acres	50+ acres
Cotton, chile	2		
Cotton, onions, other vegetables	1		
Cotton, corn, lettuce, onions	1		
Cotton, corn, alfalfa, oats	1		
Corn, cotton, oats, silage	1		
Alfalfa		1	
Cotton		1	
Fallowing		1	
Cotton, alfalfa		1	
Wheat, corn		1	
Pasture, wheat		1	
Cotton, alfalfa, chile		1	
Alfalfa, cotton, chile		1	
Alfalfa, corn, chile		1	
Cotton, milo, chile		1	
Small grain, corn, cotton		1	
Alfalfa, onions, corn		1	
Chile, cotton, alfalfa, oats		1	
Cotton, alfalfa, oats, milo		1	
Cotton, corn, alfalfa, oats		1	
Milo, cotton			1
Alfalfa, cotton			1
Alfalfa, wheat			1
Cotton, fallowing			1
Oats, alfalfa			1
Cotton, alfalfa, milo			1
Alfalfa, cotton, chile			1
Wheat, onions, corn			1
Cotton, corn, alfalfa			1
Cotton, corn, alfalfa, chile			1
Chile, cotton, alfalfa, corn			1
Corn, milo, wheat, chile			1
Chile, cotton, alfalfa, other vegetables			1
Milo, wheat, chile, cotton			1
Cotton, corn, lettuce, onions			1
Onions, alfalfa, cotton, wheat			1

Growers also provided information regarding which crops typically precede chile in their rotations (table 20). Cotton and alfalfa were the most frequently reported crops planted in rotation before chile.

Table 20. Crops typically grown before chile in rotations (n = 30).

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Cotton	3	4	2	9	30.0
Alfalfa	—	3	1	4	13.3
Corn	1	—	1	2	6.7
Wheat	—	1	1	2	6.7
Land left fallow	—	1	—	1	3.3
Oats	—	—	1	1	3.3
Small grains	—	—	1	1	3.3
Cotton or lettuce	1	—	—	1	3.3
Cotton or milo	—	—	1	1	3.3
Alfalfa or corn	—	—	1	1	3.3
Alfalfa or cotton	1	1	—	2	6.7
Cotton or fallow	—	—	1	1	3.3
Cotton or oats	—	1	—	1	3.3
Alfalfa, wheat, or onions	—	—	1	1	3.3
Alfalfa, cotton, or milo	—	—	1	1	3.3
Corn, alfalfa, or cotton	—	1	—	1	3.3

Enterprises Ranked by Contribution to Farm Income

Chile is the primary contributor to total gross farm income for 36.1% of the growers interviewed (table 21). Cotton or alfalfa is the primary component of gross farm income for 50% of the growers, while a smaller number reported they derive their greatest gross farm income from onions or pecans. The dominance of cotton as a primary income generator for growers with smaller chile acreages is evident (table 21).

Table 21. Ranking of enterprises by contribution to total gross farm income.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
#1 contributor (n = 36):					
Chile	0	5	8	13	36.1
Cotton	4	3	2	9	25.0
Alfalfa	0	5	4	9	25.0
Pecans	1	1	1	3	8.3
Onions	0	1	1	2	5.6
#2 contributor (n = 35):					
Chile	3	5	3	11	31.4
Cotton	0	6	5	11	31.4
Alfalfa	1	3	4	8	22.9
Onions	1	0	4	5	14.3
#3 contributor (n = 33):					
Chile	1	4	5	10	30.3
Cotton	0	1	4	5	15.2
Corn	2	2	1	5	15.2
Alfalfa	0	3	0	3	9.1
Wheat	0	0	2	2	6.1
Small grains	0	1	1	2	6.1
Milo	0	1	0	1	3.0
Onions	1	0	0	1	3.0
Cabbage	1	0	0	1	3.0
Pecans	0	0	1	1	3.0
Livestock	0	1	0	1	3.0
Oats	0	0	1	1	3.0

Chile Varieties and Production Practices

The majority of growers provided more than one response regarding chile varieties or cultivars planted (table 22). The most frequently planted chiles reported by the surveyed growers were paprika, Sandia, and New Mexico 6-4. The information obtained from the survey participants is recorded here exactly as it was given. Most of the growers indicated that the varieties or cultivars they reported for this survey were what they typically plant.

Table 22. Two-way table of chile varieties planted.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Chile varieties or cultivars planted (n = 35):					
Paprika	—	2	9	11	31.4
Sandia	4	3	3	10	28.6
New Mexico 6-4	1	3	5	9	25.7
AZ 20	—	2	3	5	14.3
NuMex Joe E. Parker	3	1	1	5	14.3
Sonora	—	3	2	5	14.3
Cayenne	—	1	3	4	11.4
54-14	—	2	1	3	8.6
NuMex Big Jim	2	—	1	3	8.6
Jalapeño	1	—	1	2	5.7
Alpha	1	—	1	2	5.7
Pimiento	2	—	—	2	5.7
NuMex Conquistador	—	—	1	1	2.9
AZ 19	—	—	1	1	2.9
NuMex Sweet	—	—	1	1	2.9
New Mexico Long	—	1	—	1	2.9
Extra Hot	—	1	—	1	2.9
Combination of varieties	—	1	—	1	2.9
Are you currently planting varieties that you typically plant? (n = 28):					
Yes	6	12	15	33	94.3
No	—	1	1	2	5.7
If NO was the response to the above question, what varieties do you typically plant? (n = 2):					
NuMex Sweet	—	—	1	1	50.0
Depends on market	—	—	1	1	50.0
Reasons given why chile plantings in last few years have been atypical (n = 5):					
Wanted to try a new market	—	—	1	1	20.0
Sonora is better because it is cleaner	—	1	—	1	20.0
Better contracts with cayenne	—	—	1	1	20.0
Wanted higher yields	—	1	—	1	20.0
Higher demand for other varieties	—	—	1	1	20.0

Growers typically plant chile in the last two weeks of March. However, 20.6% indicated they last planted earlier in March, and five growers reported most recent planting dates in April (table 23). Only one grower using transplants was identified through the survey. Seventy-eight percent of the producers reported using certified seed (although information was not provided as to where or by whom the seed was certified), and 70.3% said they buy their seed from a chile processor. More than 79% do not use vigorized or conditioned seeds, but 82.4% plant seeds that have been treated with bleach or fungicide. A small number of growers indicated that they typically plant some of their own seeds.

The most frequently reported planting rate for seeds was four pounds/acre, although the growers reported planting rates ranging from two to seven pounds/acre. One fourth of the producers said it normally takes 8-12 days to sprout chile, another 30.1% reported 21-30 days, while 14-20 days was reported with the greatest frequency (38.9%).

Spacing after thinning varied widely from 4 to 21 inches (table 24). The most frequently reported thinned spacing was seven inches. Six producers (17.1%) practice petiole analysis during the growing season while 82.9% said they do no petiole testing (table 24).

Irrigation Practices

A few questions dealing with irrigation practices were included in the survey. More than 86% of the survey participants use furrow or flood irrigation technology (table 25). Three producers who irrigate chile with a sprinkler system were interviewed, although two also irrigate with furrow methods. Drip technology was reported by two producers; both also practice furrow irrigation.

When asked whether or not they "irrigate the crop up," the chile growers were almost evenly divided. More than three-fourths of the producers also indicated that they practice "frequent, light" irrigations as opposed to "heavy, soaking" of the fields at each irrigation. The mean amount of irrigation water applied to chile for a season was calculated to be 3.9 acre-feet. Producers provided a wide range of irrigation water amounts, from one to 10 acre-feet; the most frequently applied amount was four acre-feet.

Table 23. Two-way table of chile planting practices.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Date planted chile in the last year planted (n = 34):					
March 1 - 15	1	3	3	7	20.6
March 16 - 31	4	8	10	22	64.7
April 1 - 15	—	3	2	5	14.7
Date typically plant chile (n = 35):					
March 1 - 15	—	3	3	6	17.1
March 16 - 31	4	8	11	23	65.7
April 1 - 5	1	3	2	6	17.1
Use of seeds or transplants (n = 37):					
Seeds	6	15	15	36	97.3
Transplants (spaced at 14")	—	—	1	1	2.7
Use of certified seed (n = 32):					
Yes	6	11	8	25	78.1
No	—	1	6	7	21.9
Source of purchased seed (n = 37):					
Chile processor	1	13	12	26	70.3
Seed company	4	2	3	9	24.3
Both of the above	1	—	1	2	5.4
Use of vigorized or conditioned seed (n = 29):					
Yes	0	6	0	6	20.1
No	3	5	15	23	79.3
Seed treated with bleach or fungicide (n = 34):					
Yes	4	12	12	28	82.4
No	1	1	4	6	17.6
Seed planted (pounds / acre) (n = 33):					
2	—	—	1	1	6.1
3	1	—	1	2	6.1
4	—	4	7	11	33.3
5	1	3	4	8	24.2
6	2	5	2	9	27.3
7	2	—	—	2	6.1
Length of time for sprouting (n = 36):					
8 - 12 days	1	5	3	9	25.0
14 - 20 days	2	8	4	14	38.9
21 - 30 days	2	1	8	11	30.1
Highly variable	—	1	1	2	5.6

Table 24. Two-way table of chile thinning and petiole analysis practices.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Spacing of plants after thinning (n = 33):					
4 inches	—	—	1	1	3.0
5 inches	—	2	—	2	6.1
6 inches	—	1	1	2	6.1
7 inches	2	1	5	8	24.3
8 inches	—	3	1	4	12.1
9 inches	—	3	1	4	12.1
10 inches	1	2	1	4	12.1
11 inches	—	—	1	1	3.0
12 inches	—	1	2	3	9.1
14 inches	—	—	1	1	3.0
16 inches	1	1	—	2	6.1
21 inches	1	—	—	1	3.0
Petiole analysis done during growing season (n = 35):					
Yes	—	1	5	6	17.1
No	5	13	11	29	82.9

Table 25. Two-way table of chile irrigation practices.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Irrigation system used (n = 37):					
Single irrigation system:					
Furrow / Flood	6	14	12	32	86.5
Sprinkler	—	1	—	1	2.7
Multiple irrigation systems:					
Furrow and drip	—	—	2	2	5.4
Furrow and sprinklers	—	—	2	2	5.4
Irrigate crop up (n = 37):					
Yes	4	6	9	19	51.4
No	2	9	7	18	48.6
Nature of irrigation (n = 37):					
Heavy, soaking	1	2	—	3	8.1
Frequent, light	5	10	13	28	75.7
Combination of heavy and frequent	—	3	2	5	13.5
Varies year-to-year	—	—	1	1	2.7
Water applied between planting and harvesting (n = 23):					
1 acre feet	—	1	—	1	4.4
2 acre feet	—	—	1	1	4.4
3 acre feet	1	2	1	4	17.4
4 acre feet	2	4	6	12	52.2
5 acre feet	—	2	2	4	17.4
10 acre feet	1	—	—	1	4.4
Mean water applied = 3.9 acre feet					

Pest Problems and Pest Management

Numerous questions in the survey dealt with pest problems and pest management. Separate questions were asked for weeds, insects, nematodes, and diseases.

The most frequently reported weed problem was spurred anoda (table 26). Morningglory, pigweed, and nutsedge were listed as the next most serious weed problems for the chile growers. Almost 30% of the producers indicated they usually apply no herbicides during the growing season.

Mechanical cultivation practices varied greatly among the 37 chile producers, with 35% reporting they cultivate "after irrigating." Another 21.6% said they cultivate four or five times during the growing season. Several of the growers reported that they cultivate on a regular basis until the plants are too big. Multiple hand hoeings throughout the growing season were reported by some growers.

Leafhoppers were the most frequently reported chile insect pest, although an equal number of growers indicated they have no significant insect problems (table 27). Pepper weevils, aphids, and thrips were each reported to be important pests by 14.3% of the growers. Sixty percent of the producers said they typically do no treatments for insects during the growing season. Treatments applied by the surveyed producers also are shown (table 27); dimethoate was the treatment most frequently applied.

Soil testing for nematodes has been done by 44.4% of the growers (table 28). The testing was done "recently" or within the last one or two years by 68.7% of the 16 producers who said they tested for nematodes. More than 89% of the growers indicated they typically do not use nematicides or fumigants. Use of fumigants and alternative methods for control of nematodes was reported by a small number of producers.

Table 26. Chile growers' weed problems and weed management.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Greatest weed problems (n = 37):					
No weed problems	—	1	1	2	5.4
All kinds of weeds	—	1	1	2	5.4
Spurred anoda	2	6	8	16	43.2
Morningglory	5	7	2	14	37.8
Pigweed	1	1	6	8	21.6
Nutsedge	2	2	2	6	16.2
Johnsongrass	—	3	2	5	13.5
Kochia	—	2	2	4	10.8
Grasses	—	—	4	4	10.8
Milo mohair	—	1	—	1	2.7
Bindweed	1	—	—	1	2.7
Ground cherry	—	1	—	1	2.7
Cocklebur	—	—	1	1	2.7
Typical herbicides applied (n = 34):					
None	2	4	7	13	38.2
Treflan	—	10	7	17	50.0
Dual	3	6	1	10	29.4
Devrinol	—	—	2	2	5.9
Poast-plus	—	—	1	1	2.9
Roundup	—	1	—	1	2.9
Frequency of mechanical cultivation (n = 37):					
Don't cultivate	—	—	1	1	2.7
1x / season	—	1	—	1	2.7
2x / season	—	—	1	1	2.7
3x / season	—	1	1	2	5.4
4x / season	3	1	—	4	10.8
5x / season	—	2	2	4	10.8
6x / season	—	—	1	1	2.7
7x / season	—	—	1	1	2.7
10x or more	—	1	—	1	2.7
As needed	1	—	1	2	5.4
After irrigation	2	4	7	13	35.1
Every 2 or 3 weeks	—	3	1	4	10.8
2x between each irrigation	—	2	—	2	5.4

Table 27. Chile growers' insect problems and insect management.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Typical insect pests (n = 35):					
No insect problems	2	3	2	7	20.0
Leafhoppers	—	5	2	7	20.0
Aphids	1	1	3	5	14.3
Weevils	2	1	2	5	14.3
Thrips	—	2	3	5	14.3
Fleahoppers	—	1	3	4	11.4
Fleabeetle	—	2	2	4	11.4
Beet armyworms	—	1	1	2	5.7
Stinkbugs	—	—	1	1	2.9
Hornworms	—	1	—	1	2.9
Worms	—	—	1	1	2.9
Metallic beetles	—	—	1	1	2.9
All kinds of insects	1	—	—	1	2.9
Typical treatments applied (n = 30):					
No treatments	4	6	8	18	60.0
Dimethoate	—	—	3	3	10.0
Don't know	2	—	—	2	6.7
Disyston	—	1	1	2	6.7
Baythroid	—	—	2	2	6.7
Neemix	—	1	—	1	3.3
Ladybugs	—	1	—	1	3.3
Other	—	1	—	1	3.3

Table 28. Chile growers' nematode problems and nematode management.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Test soils for nematodes (n = 36):					
Yes	2	6	8	16	44.4
No	3	9	8	20	55.6
When soils were last tested (n = 16):					
Recently	1	2	3	6	37.5
1 year ago	—	1	1	2	12.5
2 years ago	—	1	2	3	18.7
4 years ago	—	—	1	1	6.3
10 years ago	1	1	1	3	18.7
> 10 years ago	—	1	—	1	6.3
Use of nematicides or fumigants (n = 37):					
None	4	14	15	33	89.2
Telone	1	—	1	2	5.4
Terraclor	—	1	1	2	5.4
Other methods to control nematodes (n = 3):					
Planting grain crops	—	—	2	2	66.6
Organic means	—	1	—	1	33.3

Chile wilt was the most frequently reported disease problem, although no information is available from the survey as to the specific pathogen causing the wilt (table 29). Phytophthora and curly top were the second and third most frequent disease problems according to the surveyed producers. Almost 78% of the producers indicated they apply no treatments for chile diseases, although 8.3% said they deal with diseases by reducing or eliminating irrigation.

Table 29. Chile disease problems and management.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Chile disease problems (n = 37):					
Wilt	1	9	6	16	43.2
None	2	6	2	10	27.0
Phytophthora	2	1	3	6	16.2
Curly top	1	1	2	4	10.8
Powdery mildew	—	—	2	2	5.4
Blight	1	—	1	2	5.4
Blossom end rot	—	—	1	1	2.7
Bacterial leaf spot	—	—	1	1	2.7
Rhizoctonia	—	—	1	1	2.7
Mosaic virus	—	1	—	1	2.7
All kinds of diseases	—	—	1	1	2.7
Treatment methods used (n = 36):					
None	3	13	12	28	77.8
Reduced water applied	1	1	1	3	8.3
Nova / sulfur	—	—	1	1	2.8
Organic means	—	1	—	1	2.8
Copper	1	—	—	1	2.8
Treated soil with bleach	—	—	1	1	2.8
Ripping program	1	—	—	1	2.8

Defoliant Use

Use of defoliants was reported by 47.2% of the producers (table 30). The producers assessment of when they use the defoliants varied greatly; dates from early September into December were reported. Both sodium chloride and etheral are used for defoliation.

Table 30. Chile growers' use of defoliants.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Use of defoliants (n = 36):					
Yes	1	6	10	17	47.2
No	5	8	6	19	52.8
When defoliants used (n = 14):					
At harvest	—	—	1	1	7.1
Before picking	—	1	—	1	7.1
Early in red season	—	—	1	1	7.1
When needed	—	—	1	1	7.1
Sept. - buyer decides	—	—	1	1	7.1
Sept.	—	1	—	1	7.1
Sept. 1 - 14	—	—	2	2	14.3
Late Sept. - Early Oct.	—	—	1	1	7.1
Oct. 1	1	—	1	2	14.3
Oct. 15 - 25	—	1	1	2	14.3
Dec.	—	1	—	1	7.1
Defoliant used (n = 16):					
Etheral	1	2	2	5	31.2
Sodium Chloride	—	3	1	4	25.0
Both of the above	—	1	6	7	43.8

Growers' Sources of Chemicals and Information

The growers were asked a series of questions regarding where they purchase their agricultural chemicals and their sources of production information (table 31). The distribution of chemical sources reflects the geographic distribution of the interviewed producers. Terra International, Inc. and Helena Chemical Company in Doña Ana County were the most frequently reported chemical suppliers.

Sixty-five percent of the chile growers do not use an independent crop consultant. When asked where they go for help when they have a problem with chile production, 32.4% of the growers said "chemical company." "Chile buyer" was reported as a source of information by 29.7% of the producers, as was "independent field advisor." NMSU was reported as a source of information by four growers, but it is not clear from the survey results whether there is overlap between this response and that of "independent field advisor." From anecdotal comments by some survey respondents,

it is possible that NMSU or Cooperative Extension Service personnel may have been classified as "independent field advisors" in some instances.

Table 31. Chile growers' sources of chemicals and information.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Sources of agricultural chemicals (n =37):					
Helena	4	4	6	14	37.8
Terra	2	7	4	13	35.1
Tri-State Chemicals	2	1	3	6	16.2
Porter Farm Center	2	3	1	6	16.2
Luna Cotton Coop	—	2	2	4	10.8
Western Blend	1	—	1	2	5.4
Agri-Tech	1	—	1	2	5.4
Coop	—	1	1	2	5.4
Roswell Ag Supply	—	—	1	1	2.7
EGP Services	—	—	1	1	2.7
Lea Aviation	—	1	—	1	2.7
Chemton Farm Supply (AZ)	—	1	—	1	2.7
Use independent crop consultant (n = 37):					
Yes	1	4	8	13	35.1
No	5	11	8	24	64.9
When you have a problem with your chile, where do you turn for help to solve it? (n = 37):					
Chemical company	4	3	5	12	32.4
Independent field advisor	1	4	6	11	29.7
Chile buyer	—	6	5	11	29.7
NMSU	—	3	1	4	10.8
Neighbors or family	1	1	1	3	8.1
Myself	—	1	1	2	5.4
Magazines	—	1	—	1	2.7

Overall Production Problems

The surveyed growers also were presented with a long list of production problems. This list was developed by NMSU chile researchers and uses accurate names for diseases, weeds, insects, and plant injuries. Chile disease problems rated as severe by small

numbers of producers include verticillium wilt, curly top virus, phytophthora pod rot, phytophthora root rot, blossom end rot, seedling disease/damp off, powdery mildew, and root knot nematodes (table 32). All of these disease problems were reported as severe by one or two producers, except for powdery mildew which was reported as severe by three growers. For the open-ended question regarding chile diseases, two growers indicated that powdery mildew was a primary disease problem (table 29)

Morningglory, nutsedge, pigweed, spurred anoda, barnyardgrass, bindweed, johnsongrass were each rated as severe weed problems by some growers (table 32). These results are consistent with the responses to the open-ended weed question summarized in table 26.

Insect problems reported to be severe in the question were thrips, leafhoppers, and pepper weevils (table 32). In each case, one or two producers said these insects were serious problems. Responses to the open-ended insect question show that these insects were reported with greatest frequency (table 27).

Physical injuries to the chile plants and fruit were reported to be severe by several growers (table 32).

Table 32. Chile growers' overall assessment of production problems.

Size Category:	10 - <20 acres			20 - <50 acres			50+ acres			Total
Level of Problem:	None	Some	**Severe**	None	Some	**Severe**	None	Some	**Severe**	Respondents
Diseases:										
Verticillium Wilt	3	2	**1**	8	6	**1**	8	6	**2**	36
Blossom End Rot	4	2	—	6	9	—	6	9	**1**	37
Phytophthora Pod Rot	2	4	—	10	3	**2**	8	6	**2**	37
Phytophthora Root Rot	3	3	—	10	3	**2**	10	5	**1**	37
Black Mold	6	—	—	12	2	—	14	2	—	36
Seedling Disease / Damp off	3	2	—	11	4	—	2	13	**1**	36
Bacterial Spot	5	—	—	8	7	—	6	9	—	35
Cercospora Leaf Spot	4	—	—	9	1	**1**	9	7	—	31
Curly Top Virus	2	2	**1**	5	10	—	3	13	—	36
Pepper Mottle Virus	5	—	—	13	2	—	10	4	—	34
Alfalfa Mosaic / Calico Virus	4	1	—	11	3	—	10	5	—	34
Cucumber Mosaic Virus	5	—	—	12	1	—	12	4	—	34
Tomato Spotted Wilt	5	—	—	13	2	—	13	2	—	35
Powdery Mildew	5	—	—	9	6	—	4	9	**3**	36
Root Knot Nematodes	3	2	—	10	4	—	10	4	**1**	34
Other Diseases	5	—	—	15	—	—	16	—	—	36
Weeds:										
Barnyardgrass / Watergrass	3	3	—	8	6	**1**	9	6	**1**	37
Field Bindweed	3	3	—	9	5	**1**	8	8	—	37
Johnsongrass	2	4	—	4	11	—	5	9	**2**	37

Table 32. Chile growers' overall assessment of production problems. (Cont.)

Size Category:	10 - <20 acres			20 - <50 acres			50+ acres			Total
Level of Problem:	None	Some	**Severe**	None	Some	**Severe**	None	Some	**Severe**	Respondents
Weeds:										
Lambsquarters	2	4	—	8	7	—	8	8	—	37
Morningglory	—	3	**3**	3	8	**4**	2	12	**2**	37
Nutsedge	2	1	**3**	1	10	**3**	1	13	**2**	36
Oakleaf Thornapple	4	1	—	13	1	—	14	—	—	33
Pigweed / Carelessweed	1	3	**2**	4	10	**1**	1	10	**5**	37
Spurred anoda / Cottonweed	2	3	**1**	4	8	**2**	2	6	**8**	36
Wright groundcherry	4	2	—	12	3	—	9	7	—	37
Other weeds	5	—	—	10	—	—	8	—	—	23
Insects:										
Aphids	3	3	—	6	9	—	11	5	—	37
Thrips	3	3	—	5	9	**1**	4	11	**1**	37
Leafhoppers	4	2	—	5	8	**2**	5	10	**1**	37
Whiteflies	6	—	—	13	2	—	14	2	—	37
Pepper weevils	1	4	**1**	9	5	**1**	12	4	—	37
Other insects	6	—	—	13	—	—	13	—	—	32
Physical injuries:										
Sunscald	3	2	**1**	8	7	—	5	10	**1**	37
Salt injury	4	1	—	10	5	—	5	9	**2**	36
Wind injury	1	4	—	7	6	**2**	2	10	**4**	36
Leaf sunscald	5	—	—	10	5	—	8	8	—	36
2,4-D injury	5	—	—	13	2	—	16	—	—	36

Chile Harvesting and Yields

Information obtained from the surveyed producers regarding chile harvesting practices are presented (table 33). There was great variation in harvesting practices as reported by the chile growers. The typical date of first chile harvest indicates the differences between the fresh and dried (or green and red) chile products, as harvesting was reported to begin as early as mid-July and as late as the last two weeks in December. One producer using a mechanical harvester (for jalapeño) was surveyed.

Fifty-one percent of the surveyed growers said they harvested chile only once, while two and three harvests also were reported. Two growers (both in the smallest acreage category) said they engage in continuous harvesting of their chile crop throughout the growing season.

Table 33. Chile harvesting practices reported by growers.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Typical date of 1st chile harvest (n = 37):					
Jul. 15 - 30	1	—	—	1	2.7
Aug. 1 - 14	1	3	1	5	13.5
Aug. 15 - 31	2	—	2	5	13.5
Sept. 1 - 14	1	1	2	4	10.8
Sept. 15 - 30	1	1	1	3	8.1
Oct. 1 - 14	—	2	1	3	8.1
Oct. 15 - 31	—	2	2	4	10.8
Nov. 1 - 14	—	1	2	3	8.1
Nov. 15 - 30	—	2	3	5	13.5
Dec. 1 - 14	—	—	—	—	—
Dec. 15 - 31	—	2	1	3	8.1
Highly variable	—	1	1	2	5.4
Days between planting and 1st harvest (Calculated from dates given) (n = 31):					
100 - 124 days	—	1	—	1	3.2
125 - 149 days	2	2	1	5	16.1
150 - 174 days	2	1	4	7	22.6
175 - 199 days	1	3	2	6	19.4
200 - 224 days	—	1	2	3	9.7
225 - 249 days	—	3	3	6	19.4
250 - 275 days	—	2	1	3	9.7
Typical number of chile harvests (n = 35):					
One	10	8	8	18	51.4
Two	3	—	7	11	31.4
Three	1	—	1	4	11.4
Continuous harvesting	2	—	—	2	5.7

Chile yields as reported by the surveyed growers are presented (table 34). Yields are broken out by the commodity produced and by whether green and red chile are produced from the same plants or as separate crops. Mean, unweighted, per-acre yields also are presented for each commodity. There was only one observation each for the cayenne and jalapeño yields, and two for pimientos. The average fresh yield for green chile with no red following was 8.4 tons/acre, ranging from 5 to 14 tons/acre. Green chile with a subsequent red harvest shows an average yield of 10.4 tons/acre, with a range of 7 to 16 tons per acre. When red chile is grown strictly for red harvest, the average dry weight yield is 3,080 pounds/acre. When red chile is harvested off plants from which green chile also has been harvested, the average yield was reported to be 3,008 pounds/acre. For both categories of red chile, the reported yield ranged from 1,000 to 8,000 pounds/acre. Seven growers either refused or were unable to answer this question. Growers who were unable to answer the question, reported they "sell by the acre." A total of 44 responses were recorded for the yield question, because growers could provide responses for more than one commodity.

Growers were asked to provide information about what they believe have been their chile yield trends in recent years (table 35). Of the 35 producers who responded to this question, 13 (37.1%) indicated they believe their chile yields have decreased in recent years. These 13 respondents include one pimiento producer, nine red chile producers, and three producers who grow both red and green chile.

Five producers stated their chile yields have increased in recent years, although none of them were in the largest acreage category. Individuals reporting increased yields included one red chile producer, one green producer, one producer of both red and green, and two respondents who did not specify a chile type. Twenty percent of the producers believe there has been no change in their chile yields during the past few years, and 28.6% said that chile yields vary too much between varieties and from year-to-year to identify any definitive trends.

Table 34. Chile yields reported by surveyed growers.

	10 - <20 acres	20 - <50 acres	50+ acres	Mean (not weighted by acreage)
Cayenne (lbs / acre) (n = 1):	—	—	3,000	3,000
Jalapeño (lbs / acre) (n = 1):	—	—	2,500	2,500
Pimiento (tons / acre) (n = 2):	17	—	—	19.5
	22	—	—	
Green chile, no red following (tons / acre) (n = 4):	—	5	8.5	8.4
	—	6	14	
Green chile, with red following (tons / acre) (n = 6):	7	8	13	10.4
	7.5	11	16	
Red chile, with no green harvest (lbs /acre) (n = 17):	—	2,000	1,700	3,080
	—	2,500	2,400	
	—	3,300	2,800	
	—	3,600	2,865	
	—	3,700	3,000	
	—	3,800	3,200	
	—	—	3,300	
	—	—	3,500	
	—	—	3,500	
	—	—	3,600	
	—	—	3,600	
Red chile, following green harvest (lbs / acre) (n = 6):	2,350	1,000	1,000	3,008
	8,000	3,000	2,700	
Refused or unable to answer (n = 7):	2	4	3	—

Table 35. Perceived chile yield trends reported by surveyed growers.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Perceived yield trends, not separated by type of crop grown (n = 35):					
Decreased	1	5	7	13	37.1
No change	1	1	5	7	20.0
Increased	2	3	—	5	14.3
Varies with weather	1	3	1	5	14.3
Varies year-to-year	1	1	1	3	8.6
Varies with variety	—	—	2	2	5.7
Perceived yield trends, by type of crop grown (n = 35):					
Jalapeño - no change	—	—	1	1	—
Pimiento - no change	1	—	—	1	—
Pimiento - decrease	1	—	—	1	—
Red - decrease	—	3	6	9	—
Red - no change	—	1	1	2	—
Red - increase	—	1	—	1	—
Red - varies with weather	—	1	1	2	—
Red - varies year-to-year	—	1	1	2	—
Red - varies with variety	—	—	1	1	—
Green - no change	—	—	2	2	—
Green - increase	1	—	—	1	—
Green and red - decrease	—	2	1	3	—
Green and red - increase	—	1	—	1	—
Green and red - varies year-to-year	1	—	—	1	—
Green and red - varies with weather	1	—	—	1	—
Green increase and red decrease	—	—	1	1	—
No variety specified - increase	1	1	—	2	—
No variety specified - no change	—	—	1	1	—
No variety specified - varies with weather	—	2	—	2	—

Chile Marketing Practices

Marketing practices as reported by the surveyed producers are summarized (table 36). Seventy-three percent said they sold their chile under prior contract with a buyer. Only three producers indicated they sold without a prior contract. The growers' responses with respect to who they sold their chile also is summarized (table 36). This information is presented exactly as it was provided by the growers. When growers said they sold to more than one buyer, this information was recorded and presented (table 36).

Growers also were asked how much input buyers have into their farming practices (table 36). The majority said that buyers had no or very little input into how the chile is produced on farm. A few growers reported that buyers' input was made in the areas of irrigation and fertilizer application. One grower said his chile buyer requested information regarding the chemicals which had been used on the chile field.

When asked what changes (if any) they would like to see in chile buying contracts, a few growers provided multiple responses (table 37). The most frequently reported change growers want is higher chile prices that keep up with the cost of production. However, several growers indicated they were mostly satisfied with current chile contracts. Six growers expressed the desire for buyers to be responsible for harvesting and harvest labor, while a small number of growers made comments regarding freight terms, chile quality standards, and risk sharing between growers and buyers.

Table 36. Chile marketing practices reported by surveyed growers.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Marketing of chile (n = 37):					
Sold with buyer contract	1	11	15	27	73.0
Sold without buyer contract	—	2	1	3	8.1
Family / personal use only	2	—	—	2	5.4
Sold through broker	1	—	—	1	2.7
Direct to consumer	1	—	—	1	2.7
Family use and restaurants	1	—	—	1	2.7
Family use and sold with contract	—	1	—	1	2.7
Farmers' market and sold with contract	—	—	1	1	2.7
Chile buyer (n = 37):					
Not given	1	1	2	4	10.8
People coming by the farm	2	—	—	2	5.4
Steve Smith (Georgia buyer)	1	—	—	1	2.7
Cherokee	1	—	—	1	2.7
Restaurants	1	—	—	1	2.7
Own chile plant	—	—	1	1	2.7
Gilroy Foods	—	5	2	7	18.9
Biad	—	2	2	4	10.8
Border Foods	—	2	—	2	5.4
Riggs	—	2	—	2	5.4
Bueno Foods	—	1	—	1	2.7
Lloyd Anderson Enterprises	—	—	1	1	2.7
Pecos Valley Chile	—	1	—	1	2.7
Rio Valley Foods	—	—	1	1	2.7
Stormy Adams	—	1	—	1	2.7
Biad and Jurado	—	1	1	2	5.4
Gilroy and Jurado	—	—	1	1	2.7
Jurado and Gilroy	—	—	1	1	2.7
Border, Bueno, N.M. Chile Products	—	—	1	1	2.7
Border, Anthony Foods, N.M. Chile Products, and Bueno Foods	—	—	1	1	2.7
Anthony Foods, Basic American, Bueno Foods, and Riggs	—	—	1	1	2.7
Buyers input into farming practices (n = 32):					
None	2	7	6	15	46.9
A little / some	—	7	8	15	46.9
A lot	—	1	—	1	3.1

Table 37. Growers' desired changes in chile contracts.

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Changes in contracts desired by chile growers (n = 37):					
More money paid to growers	2	6	6	14	37.8
No changes necessary	—	5	6	11	29.7
Buyer should be responsible for harvesting (hand or mechanical)	—	2	4	6	16.2
Grower prices should be adjusted to keep up with production costs	1	3	—	4	10.8
Do contracts earlier (before we start growing)	—	—	2	2	5.4
Help reduce risks taken by growers	—	1	1	2	5.4
Free on board terms - instead of me paying freight	1	—	—	1	2.7
Relax standards for "perfect" chile	—	—	1	1	2.7
Every year contracts are modified to benefit processors	—	1	—	1	2.7
Should be as binding to buyer as to the farmer	—	1	—	1	2.7
Need more timely harvest dates	—	—	1	1	2.7
Processors want chile too dry	—	—	1	1	2.7
Prices should be scaled to harvest date	—	1	1	2	5.4
Grower does not contract	4	1	1	6	16.2

Growers' Assessment of Recurring Problems in Chile Production

Growers were asked for their opinions on chronic problems which they believe the New Mexico chile industry experiences. Their multiple responses to this question are summarized (table 38).

The responses varied widely, although the most frequent responses given were labor- and weather-related. With respect to labor, growers indicated that field labor availability, cost, and quality were all chronic concerns. A few also mentioned continuing problems dealing with immigration or legal services authorities.

Table 38. Chile growers' assessment of reoccurring problems in chile production (n = 37).

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
Pests and diseases:					
Chile wilt	1	1	1	3	8.1
Phytophthora	1	—	2	3	8.1
Powdery mildew	—	—	1	1	2.7
Alfalfa mosaic	1	—	—	1	2.7
Pepper weevils	2	—	1	3	8.1
Flea beetles	—	1	—	1	2.7
Nutsedge	—	—	1	1	2.7
"Lots" of insects and diseases	—	—	2	2	5.4
Labor (Availability, cost, quality, legal services, immigration service, lack of mechanical harvesting)	1	3	5	9	24.3
Weather, wind, getting a stand in the spring	1	2	4	7	18.9
Chemicals taken off market	—	—	2	2	5.4
Too much risk	—	2	—	2	5.4
NAFTA, Mexican competition	—	1	1	2	5.4
Lack of varieties, impure varieties	1	1	—	2	5.4
Decreasing or low yields	1	—	1	2	5.4
Buyers (and inaccurate scales)	—	—	1	1	2.7
No reoccurring problems	—	6	—	6	16.2

New Inputs or Practices Used by Chile Growers

Growers were asked what actions they had taken in order to keep their chile production profitable, if they had started doing anything new, or if they had stopped any particular cultural or business practice (in the interest of profitability) (table 39). Improved fertilizer management and reduced hand labor use were reported with the greatest frequency for this multiple-response question. Several growers indicated they were using new, better fertilizer and had fine-tuned their fertilizer management. One grower indicated he was now "fertilizing the plant instead of the ground." Growers who cited changes in labor input reported that they were overall more careful with labor due to its high cost. They said they were doing more work themselves or had reduced labor input overall. One grower reported he had stopped using hand labor for weeding in an effort to reduce production costs.

Growers' Perceived Threats to the Chile Industry

The last question on the survey instrument asked growers to indicate what they perceive to be the greatest threats to their own chile crop and/or to the entire New Mexico chile industry (table 40). Multiple responses were possible. Labor-related issues were the threat cited most frequently by the growers. Labor issues were mentioned by 46% of the growers, with respondents citing labor costs, contracts, availability, quality, and related government regulations as problems.

Several of the growers (37.8%) said they were concerned about competition from chile imports. They cited competition from Mexico and the fact that chile is now produced "everywhere" as problems for the New Mexico industry. Some of the growers said that free trade, including the North American Free Trade Agreement (NAFTA) had been detrimental to New Mexico chile producers. Reduced prices as a result of Mexican chile imports were reported by some growers.

Table 39. New inputs or practices growers have started using to keep chile production profitable (n = 37).

	10 - <20 acres	20 - <50 acres	50+ acres	n	% Respondents
No changes reported	—	8	5	13	35.1
Now use new, better fertilizers and fertilizer management	2	3	1	6	16.2
More careful with labor (too expensive) (Do more work myself, reduced labor, stopped using hand labor for weeds)	2	3	1	6	16.2
Closer management overall	—	2	1	3	8.1
More careful with water management	—	1	1	2	5.4
Use better rotations	—	—	2	2	5.4
Spending more to control chile wilt	1	—	—	1	2.7
Started doing lay-by herbicide	1	—	—	1	2.7
Now spacing chile further (8 - 10")	1	—	—	1	2.7
Use hotter varieties - produce better and get higher prices because is less produced	1	—	—	1	2.7
Reduced water use until after thinning	1	—	—	1	2.7
Started planting on beds	—	1	—	1	2.7
Went more organic because of salinity	—	1	—	1	2.7
Better herbicide management	—	1	—	1	2.7
Better planting	—	1	—	1	2.7
Started capping and hand thinning	—	1	—	1	2.7
Use mechanical harvesting	—	—	1	1	2.7
Installed drip irrigation	—	—	1	1	2.7
Use better seeds	—	—	1	1	2.7
Built own chile plant	—	—	1	1	2.7
Increased overall knowledge	—	—	1	1	2.7
Getting away from liquid fertilizer, it seems to promote diseases	—	1	—	1	2.7
Started putting chile on cleaner fields	—	—	1	1	2.7
Don't thin anymore, fruit is same size	—	—	1	1	2.7
Changed from electrical to gas pumps	—	—	1	1	2.7
Many new cultural practices	—	—	1	1	2.7
Reduced middlemen	—	—	1	1	2.7

The third most frequently cited threat (four cases) dealt with environmentalists and environmental rules and regulations. The loss of pesticides for use in chile production also was mentioned. Four producers cited diseases, while one grower believed chile weevils would be a serious future threat to the state's chile industry.

Other infrequently stated threats concerned weather, false advertising of chile as coming from New Mexico, and the nature of the NMSU chile research program. Two growers said more marketing of New Mexico chile and research on mechanical harvesting and thinning are necessary.

Table 40. Growers' perceived threats to their chile crop or to the entire New Mexico chile industry (n = 37).

	10 - <20 acres	20 - <50 acres	50+ acre	n	% Respondents
Labor: Cost, contracts, government regulations, availability, quality	1	7	9	17	46.0
Competition from chile imports: Chile is grown everywhere, free trade hurts us, Mexican imports, NAFTA	3	5	6	14	37.8
Environmentalists: EPA rules and regulations, loss of pesticides	—	3	1	4	10.8
Pests and disease:					
Chile wilt	—	1	1	2	5.4
Phytophthora	—	—	2	2	5.4
Chile weevil	—	—	1	1	2.7
Overall higher costs of production: Contracts don't keep pace with costs	1	—	—	1	2.7
False advertising of chile as from New Mexico	1	—	—	1	2.7
Hail	1	—	—	1	2.7
NMSU chile research program has its own agenda	—	—	1	1	2.7
Need more marketing to increase demand	—	1	—	1	2.7
Need research on mechanical thinning and harvesting	—	1	—	1	2.7
No significant threats identified	1	1	—	2	5.4

ANALYSIS OF CHILE YIELDS

Overview of Yield Issues

As discussed earlier, many chile industry participants are concerned about the future of commercial chile production and processing in New Mexico. One of the objectives of this study was to examine factors which may be influencing chile yields as reported by the randomly selected growers who participated in the survey. This yield analysis was complicated for a number of reasons. As described in preceding sections, chile production practices in southern New Mexico vary greatly between growers. There is no single measurable "chile yield" due to the wide variety of chile cultivars, commodities produced, and production methods. For instance, yields for chile grown only as red crop are not directly comparable to red chile yields following green harvests. Furthermore, red chile yields at the farm level will vary based on drying time in the field and harvest date. Green chile also is subject to changes in moisture depending on harvest dates and environmental conditions that can affect final yield measurements.

Based on anecdotal comments provided by growers during the survey interviews, chile yield analyses may be even more complicated because in-field yields can vary significantly from yields based on weights measured with buyers' or processors' scales. Yields reported by the growers may not be comparable, because no standard protocol for yield measurements exists. Surveyed growers were asked to provide information regarding their most recent crop yields. It is unknown if the growers provided adjusted yields or at what point actual yield measurements were taken.

Chile quality standards at the processing level can result in rejection of chile due to bruising, discoloration, or other damage. It is unknown if the yields provided by the surveyed growers were adjusted for these processing-level quality rejections. Several of the interviewed growers indicated that while they believe their own in-field yields have been unchanged or actually increased in recent years, higher, processing-level quality standards may be the true reason for the perception that yields have decreased.

Analytical Procedures

Analysis of variance (ANOVA) was conducted for selected variables within the chile grower survey data set. The measurement issues discussed above, missing values and the limited number of observations in some of the subsets limited the extent of the statistical analysis that could be performed using the survey data. Although a stratified sample of chile producers (by region and chile acreage) was used in the study, data were insufficient to account or control for the stratified sampling structure. The ANOVAs, thus, consider only one factor at a time.

Several one-factor ANOVAs, adjusted for samples of unequal sizes, were performed and are discussed here. This analysis was conducted using the SAS System™ general linear model (GLM) procedure for ANOVA of unbalanced data. With unbalanced data, there are different numbers of response observations for each combination of variables being analyzed.

Chile yields provided by the growers were divided into green and red categories. The green chile yields included data for six yields with follow-up red harvests and four yields with no red following. The red chile yields included 17 observations for red chile with no preceding green harvest and six observations with an earlier green harvest. Thus, the maximum number of yield observations available for ANOVA were 10 green and 23 red. The maximum number of yield observations was not used in several of the GLM procedures, because usable information for the production factor being analyzed had not been provided by the grower who gave the yield data.

The ANOVA procedure applied to the survey data is explained in Hoshmand (1988). The null hypothesis is that mean chile yields are equal between producer subgroups. The subgroups are defined by the producers' characteristics and production practices. The alternative hypothesis is that mean yields are not equal. The *F* statistic is calculated as the treatment mean square divided by the error mean square. Reported *P* values (table 41) indicate the levels of significance for the variables analyzed. Results that were significant at the 0.05 and 0.10 levels are marked with asterisks.

Analysis of Variance (ANOVA) Results

Results show that there are no statistically significant differences between growers' reported yields for most of the one-factor analyses (table 41). Only two cases showed significant differences in yields at the 5% level. One was for green chile producers who reported having tested for nematodes. The other was between growers based on what they reported to be the primary market outlets for their chile. Significant differences in green chile yields at the 10% level were found for growers' past trends in chile acreages, irrigation systems, and total acres farmed. Significant differences (10% level) in red chile yields were found for the irrigation practices and rotational time variables. The average chile yields for the ANOVA results significant at = 0.05 and 0.10 are presented (table 42).

Sixty-two one-factor analyses were conducted, with seven statistically significant relationships identified. It should be noted that even if all null hypotheses were true, we would expect to find 5% significant at the 5% level. With the large number of comparisons made here, we could anticipate as many "significant" results as were actually obtained just due to chance error. The results reported here are exploratory in nature, and should not be viewed as providing a firm basis for inference.

Table 41. Results of One-Factor Analysis of Variance for Chile Yields Reported by Survey Respondents.

Variables reported in survey	Green chile Observed F-value	p - value	n	Red chile Observed F-value	p - value	n
Region and Chile Acreage:						
Region where chile produced (Dona Ana/Sierra, Luna/HIdalgo, Chaves/Eddy/Lea)	1.93	0.21	10	0.02	0.98	23
Acres of chile planted (10 - <20, 20 - <50, 50+)	2.02	0.19	10	0.31	0.74	23
Region * Acres planted (7 combinations of the above)	1.38	0.37	10	0.23	0.96	23
Chile Acreage and+A46 Yield Trends:						
Last year chile was grown (1995, 1996, 1997)	1.01	0.41	10	2.03	0.17	23
Trend in chile acreage over last 5 years (Increase, decrease, no change, quit)	3.54	0.08**	10	0.62	0.61	23
Plans for chile acreage for the next 5 years (Increase, decrease, no change, quit)	0.82	0.52	10	0.23	0.88	22
Growers' yield trends (No change, increase, decrease, varies)	0.49	0.70	9	0.63	0.61	23
Production Practices:						
Ripping (yes/no)	1.27	0.29	10	1.26	0.27	23
Laser leveling (yes/no)	0.05	0.83	10	1.64	0.21	22
Soil fertility testing (yes/no)	0.25	0.63	9	0	0.98	23
Preplant pesticide use (yes/no)	0.69	0.43	10	0.12	0.74	23
Petiole analysis (yes/no)	2.02	0.19	10	0.04	0.85	23
Method of planting (Beds, furrow ridges, or both)	0.02	0.89	10	1.6	0.22	23
Spacing between rows (30, 34, 36, 38, 40 inches)	0.86	0.53	10	0.57	0.68	23
Seed bed capping (yes/no)	1.11	0.32	10	0.6	0.45	23
Certified seed (yes/no)	0.7	0.43	10	0.58	0.45	21

Table 41. Results of One-Factor Analysis of Variance for Chile Yields Reported by Survey Respondents. (Cont.)

Variables reported in survey	Green chile Observed F-value	p - value	n	Red chile Observed F-value	p - value	n
Seed source (Processor, seed company, both)	0.77	0.50	10	1.8	0.19	23
Vigorized seed (yes/no)	0.3	0.87	8	0.98	0.33	19
Bleached seed (yes/no)	—	—		0.76	0.39	23
Pounds of seed planted (2 levels)	2.06	0.19	10	0.97	0.34	23
Irrigation system (Furrow, drip, sprinkler)	4.16	0.07**	10	1.65	0.22	23
Irrigated crop up (yes/no)	0.24	0.63	10	0.75	0.40	23
Irrigation practices (Soaking, light application, or varies)	1.14	0.37	10	2.93	0.06**	23
Nematode testing (yes/no)	8.79	0.02*	10	0	0.95	23
Defoliants used (yes/no)	—	—		0.04	0.84	23
Rotational time between chile plantings (4 levels)	1.13	0.33	8	2.81	0.07**	20
Producer Characteristics:						
Age (4 levels)	0.61	0.63	10	1.28	0.31	23
Experience growing chile (3 levels)	1.08	0.38	10	1.5	0.25	23
Total acres farmed (3 levels)	3.6	0.08**	10	0.36	0.83	23
Primary chile market (Family use, with contract, without contract, mixed)	5.32	0.03*	10	0.24	0.79	23
Use independent adviser or consultant (yes/no)	1.1	0.32	10	0.04	0.84	23
Keep written records of chile production (yes/no)	—	—	0.05	0.82	23	
Grower has off-farm employment (yes/no)	—	—	1.45	0.24	23	

* = significant at 0.05 level
** significant at 0.10 level

Table 42. Yields for variables with significant differences.

	Reported Green Chile Yield Mean tons / acre	Standard error of mean	n	p - value
Nematode testing:				0.02
Yes	11.75	1.29	6	
No	6.33	0.88	3.00	
Primary market:	0.03			
Family/personal use	7.25	0.25	2	
Sold without prior contract	5.50	0.50	2	
Sold with prior contract	11.75	1.29	6	
Trend in chile acreage over past 5 years:				0.08
Increase	13.50	0.50	2	
Decrease	7.50	—	1	
No change	8.79	1.41	7	
Irrigation system:				0.07
Furrow	8.25	0.93	8	
Mixed systems (Use both furrow and drip)	15.00	1.00	2	
Total acres farmed:				0.08
< 100 acres	8.38	0.90	4	
100 - 300 acres	8.00	2.52	3	
> 300 acres	12.83	2.24	3	

	Reported Red Chile Yield Mean lbs / acre	Standard error of mean	n	p - value
Irrigation practices:				0.06
Heavy / soaking	3,600	—	1	
Light applications	2,851	136	20	
Varies	1,833	833	3	
Rotational time between chile plantings:				0.07
2 years	3,216	206	4	
3 years	3,500	—	1	
4 years	2,339	291	9	
> 4 years	3,200	190	6	

Green chile yields are significantly higher for growers who reported nematode testing at some time in the past. The nematode testing result may be an indicator of overall management level, which could thus influence yields. However, a review of the survey information regarding nematode testing (table 28) indicates that some of the growers who reported testing had done so many years prior to the survey. It is thus unknown what type of relationship this ANOVA result may truly reflect or if it is spurious.

Yields are significantly higher for green chile producers who produce chile under contract with a buyer. This result probably indicates the greater commercial orientation of this producer subgroup relative to the growers who produce for personal or family use and/or without a buyer's contract. Green chile yields also are significantly higher for growers who reported increasing their chile acreage over the past five years. Under conditions of changing technologies and production difficulties, such as diseases, insects, and variable seed quality, larger growers with more managerial and financial resources would be more likely to surmount the production problems, maintain or increase yields, and expand acreages. The ANOVA results for green chile yield differences relative to total acres farmed also may reflect the greater resources available to larger farms that lead to higher crop yields.

Green chile yields for the small number of growers who reported using both furrow and drip irrigation systems in chile production also were significantly higher than the yields for growers who reported using furrow irrigation alone. Drip technology is costly and requires extensive operator learning, management, and maintenance in order to function most effectively. Again, a higher level of managerial and financial resources would be indicated by the presence of a drip irrigation system.

Red chile yields varied significantly between growers based on the type of irrigation practices they reported. Although there was only one observation in this category, the yield for "heavy/soaking" irrigation practices was higher than for growers who reported "light applications" or those who indicated that their irrigation practices are too variable to categorize. Growers who reported variable irrigation practices had the lowest mean reported red chile yield. The ANOVA for rotational time (in years) between chile plantings also found significantly different red chile yields. Rotational times were broken into four categories (two, three, four, and more than four years). Mean yields varied for the different lengths of rotation, although caution should be exercised before extending these results to the overall population of chile growers due to the small number of growers who provided information.

Overall, the results of the ANOVA were not surprising given the limitations discussed above. The high degree of variability in chile products, production practices and grower characteristics found through the survey make it unlikely that any definitive yield trends will be found through the type of analysis performed here. The data problems discussed above are severe and limit the inference that can be made using the results obtained. The small sample of growers increases the need to view the ANOVA results as exploratory or preliminary. When significant yield differences were found with only one grower in a particular category, results should be interpreted with great caution. The ANOVA results for green chile yields provided opportunities to infer about the socio-economic characteristics of the growers. The red chile results provide fewer possibilities for interpretation based on socio-economic factors. Clearly, additional research needs to be conducted to identify factors that influence chile yields. Future studies may be able to confirm or reject the relationships tentatively identified here.

CONCLUSIONS

The objective of this research was to provide an overview of production practices and problems and to identify potential causes of declining chile crop yields and production. A survey was conducted in 1998. A total of 64 former and current chile producers were interviewed. The results of the interviews provide a foundation of information regarding chile producers' production practices and problems. It is hoped this research will be of assistance to other investigators and industry participants as they seek to address the critical issues facing the New Mexico chile industry.

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APPENDIX A:

CHILE PRODUCER SURVEY

CHILE PRODUCER SURVEY

1. Have you grown chile within the last 5 years?
   No 2 (OK then I'm sorry for bothering you.)
   Yes 1
   1a. What year did you grow it?_____

   OK, please try to respond based on 199__. However, if you can't remember that year's crop specifically, respond based on typical years and production practices.

2. Which county, or counties, do you grow chile in?

3. How many acres did you plant in chile last year?
   1-10 acres 1
   11-20 acres 2
   21-50 acres 3
   More than 50 acres 4

4. Has acreage gone up or down in the last 5 years? Why?
   Increase 1
   Decrease 2
   No change 3

5. Do you plan on increasing or decreasing your chile acreage in the next 5 years? Why?
   Increase 1
   Decrease 2
   No change 3

6. How many total acres did you farm last year?

Land Preparation

7. What land preparation procedures for your chiles where used last year (or 199__)?
   Deep ripping How often?
   Laser leveling How often?

8. Was your soil tested for fertility?
   Yes 1
   No 2

9. Was a petiole analysis done on chile during the season?
   Yes 1
   No 2

10. What pre-plant fertilizers were used?

11. What pre-plant pesticides were used?

12. Did you use cantaloupe beds or the furrow ridge method of planting?
    Beds 1
    Ridge 2

13. What was the spacing between your rows?

14. Did you cap your seed beds?
    Yes 1
    No 2

Rotation

15. Do you use crop rotation?
    No 1
    Yes 2
    15a. What other crops do you rotate with chile?
    15b. How often do you rotate?
    15c. Please rank the crops that you grow on your farm by how much they typically contribute to your total gross income.

Planting and Seeds

16. What variety or cultivar of chile did you grow?

    16a. Is that the same variety you typically plant?
    Yes 1
    No 2
    16b. What variety do you typically plant?
    16c. Why did you change?

17. Do you remember what date you planted on in 199__?

18. Approximately what date do you typically plant on?

19. Did you plant from seed or transplant?
    Transplant 1-----> 27. How far were the transplants spaced? _____
    Seed 2

20. Did you use certified seed?
    Yes 1
    No 2

21. Where did you purchase the seed from?

22. Did you use specially vigorized or conditioned seed?
    Yes 1
    No 2
    22a. Was seed treated with bleach and fungicide?
        Yes 1
        No 2

23. How many pounds of seed did you use per acre?

24. How long did it take for your seed to sprout or germinate?

25. When was the field thinned?

26. What was the final spacing between plants?

Irrigation

28. What type of irrigation do you use?
    Furrow 1 _____ acres
    Drip 2 _____ acres
    Sprinkler 3 _____ acres

29. How many acre-feet of water were applied between planting and harvesting?

30. Did you irrigate the crop up?
    Yes 1
    No 2

31. Did you use heavy, soaking waterings or more frequent, lighter irrigations?

Pest Management

Weeds

32. Which weeds have you had the most problems with?

33. Which herbicides and application methods do you use in a typical year?

34. How often do you generally use mechanical cultivation for weed control in a season?

Insects

35. Which insects do you typically have the most problems with?

36. What insecticides and applications methods do you use in a typical year?

Nematodes

37. Have you tested your soil for nematodes?
    Yes 1
    No 2

38. Have you used any nematicides or fumigants?

39. Have you used any other methods for control of nematodes such as “weed-free fallow”?

Disease Management

40. Which chile diseases or viruses have you had problems with?

41. What treatment methods were used for each?

Defoliants

42. Did you use any defoliants?
    No 2
    Yes 1
    42a. When were they used?
    42b. Did you use sodium chloride or etheral?
        Sodium chloride 1
        Etheral 2

Information

43. Where do you buy your agricultural chemicals from?

44. Do you have an independent field advisor or crop consultant?
    No 2
    Yes 1

45. If you have a problem with your child, where do you turn to for help solving it?
    NMSU 1
    Field Advisor 2
    Magazines 3
    Other 4

Yes/No option

The following is a list of problems you may have encountered. Please answer each with either none, some, or severe

None = 0 Some = 1 Severe = 2

46. Problems Encountered
    _____ Verticillium Wilt
    _____ Blossom End Rot
    _____ Phytophthora Pod Rot
    _____ Phytophthora Root Rot
    _____ Sunscald
    _____ Black Mold
    _____ Seedling Disease/Damping Off
    _____ Salt Injury
    _____ Wind Injury
    _____ Root-knot Nematodes
    _____ Leaf Sunscald
    _____ Bacterial Spot
    _____ Cercospora Leaf Spot
    _____ 2, 4-D Injury
    _____ Curly top virus
    _____ Pepper Mottle Virus
    _____ Alfalfa Mosaic Virus/Calico Virus
    _____ Cucumber Mosaic Virus
    _____ Tomato Spotted Wilt
    _____ Powdery Mildew

    _____ Other Diseases _____
    _____ Barnyardgrass/Wheatgrass
    _____ Field Bindweed
    _____ Johnsongrass
    _____ Lambsquarters
    _____ Morningglory
    _____ Nutsedge
    _____ Oakleaf thornapple
    _____ Pigweed species/Carelessweed
    _____ Spurred anoda/Cottonweed
    _____ Wright groundcherry
    _____ Other Weeds _____
    _____ Aphids
    _____ Thrips
    _____ Leafhoppers
    _____ Whiteflies
    _____ Pepper weevils
    _____ Other Insects _____

Harvesting

47. How many days after planting were your chiles harvested?

48. How many harvests did you get from your fields?

49. How many [RED] pounds/ [GREEN] tons per acre did you harvest (each time)?

50. Have you noticed any changes in your average yields over the last 5 years?

Marketing

51. How did you market your chile?
    All Family/Personal Use 1
    Roadside Stand 2

Farmer's Market/Flea Market	3
Sold Without Prior Contract	4
Sold With Prior Contract to Buyer	5
Other	6

Contract

52. Who was the buyer?
    - 52a. How much input did they have into the farming procedures you used?
    - 52b. What changes would you like to see in the way chile contracts are handled?

Conclusion

53. How many years have you been growing chile?

54. Do you keep written records of your chile production?

55. In your opinion, are there any problems with chile production you have dealt with that seem to be reoccurring?

56. What (if any) inputs or practices have you had to start using to remain profitable?

57. What (if any) inputs or practices have you had to eliminate to remain profitable?

58. What is your age?

59. Do you work off the farm in a non-farm job?

Yes	1
No	2

60. What do you perceive as the biggest threat to your chile crop or the New Mexico chile industry as a whole?