Impact of Increasing Wages on New Mexico Chile Production

Agricultural Experiment Station • Research Report 714
College of Agriculture and Home Economics

ACKNOWLEDGMENTS

This work was supported by New Mexico Agricultural Experiment Project No. 1-5-27612. Special contributions of several people deserve recognition. Lawrence Salazar provided bits of data, insights, and introductions to key informants that were invaluable. Gail James patiently and competently typed and retyped numerous drafts of the manuscript. Producers, processors, border inspection officials, and custom harvest operators took time from their busy schedules to provide the data and insights on which the study is based. To all these people we owe a debt of gratitude. Deficiencies in the work are the sole responsibility of the authors.

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Chile has long been an important element in New Mexico culture and cuisine. With the increasing popularity of Mexican food in recent decades, nationwide demand for chile has increased markedly. While chile is widely grown in northern New Mexico gardens and small plots, commercial production is concentrated in the southern part of the state. Since chile harvest is labor intensive, proximity to the large labor pool in El Paso/ Juarez has been a major factor in expanding production first in Doña Ana County, and more recently, in Luna County. Scarcity of harvest labor has been a major factor inhibiting spread of chile production into the Pecos Valley.

Periodic threats to labor availability and cost, such as immigration reform and various labor laws, have prompted efforts to mechanize chile harvest. There have been many attempts to develop mechanical pepper harvesters. However, peppers, generally, and even local chiles, specifically, are very heterogeneous. Green, red, jalapeño, cayenne, and specialty chile types each have characteristics that affect harvest. Even different varieties within one type may have markedly different characteristics that affect machine harvesting. For example, pods that grow either close to the main stem or out on the branches can help or hinder mechanical harvest. Similarly, uniform ripening facilitates machine harvest, while an extended ripening period necessitates several pickings.

The purpose of this study was to estimate the impact of increasing the minimum wage on chile production in southern New Mexico. Will it spur mechanization? Will it encourage increased chile imports from Mexico? Or, are current production patterns likely to be unaffected? The focus was on red chile and jalapeños, since these types have been most amenable to mechanical harvest.

Background

U.S. pepper production ranges from sweet bell peppers, which account for some 65% of total national acreage, to tiny pungent piquins (Willhoit, et al 1990). All types have traditionally been harvested by hand with multiple pickings common. Multiple hand harvests add up to very high labor requirements. Efforts to produce a mechanical pepper harvester go back at least three decades. In New Mexico, a few varieties of red chile and jalapeños can be mechanically harvested very satisfactorily, at least under optimal field conditions. Other varieties and other types of chile present substantial problems, such as excessive damage to the fruit and/or plant, too many left in the field, or too much trash taken with the harvest. In spite of these problems, several observers anticipate a rapid spread of mechanical harvest if there's a substantial change in labor's cost or availability. The 1996 proposed hike of about 21% in the minimum wage will significantly increase hand-harvest costs.

Mechanization is a complex process requiring simultaneous manipulation of diverse elements. Many different mechanical configurations have been developed and tested (Marshall, Esch, and Dragt 1986; Willhoit, Duncan, and Wells 1990). Every machine has numerous possible adjustments of openings, speed, angles, and other variables, which must be adapted to variety and field conditions. Mechanical harvest almost invariably takes in more trash along with the peppers than hand harvest. Removing the trash somewhere along the processing line is often difficult and expensive. Varieties differ markedly in their adaptability to machine harvest and thus become an important variable in the equation. Various field conditions such as weeds also influence harvest. For mechanization to be successful, all the critical variables must be managed simultaneously.

Successful mechanization would involve a coordinated effort between plant breeder and engineer, which has not occurred. Recent chile breeding efforts have focused on disease resistance, yield, taste, and color, but not on the qualities necessary for mechanical picking. Spawned by an outcry over the adverse impact on

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farmworkers of mechanizing lettuce and tomato harvests, federal restrictions were placed on research technology that would ultimately displace labor (Schmitz and Seckler, 1970). These restrictions have effectively separated genetic research, much of which is publicly supported, and the mechanization efforts, most of which are private.

The farm labor situation is always in a state of flux. The Special Agricultural Worker provision of the Immigration Reform and Control Act of 1986 (IRCA) legalized a large surplus of unskilled workers in El Paso/ Juarez. Moreover, the labor pool is being continuously renewed by new immigrants. Migration is a well-established behavior pattern woven into the social fabric of many Mexican villages. Children in many villages now grow up expecting to migrate, because family members and friends are already in the United States. These connections provide introductions to employers and assistance with housing, and otherwise greatly reduce migration's difficulty and risk. If documents are needed, documents are obtained. The shortage of agricultural workers expected by many farmers has yet to materialize even 10 years after IRCA. However, one producer who keeps detailed records on such matters cites a 33% decline in worker productivity during this period, as measured by the pounds of chile harvested per worker per day. His explanation is that young able-bodied males have moved out of agricultural work, leaving behind less productive older males and females.

Previous studies have encountered few native-born farmworkers in New Mexico (Eastman 1991, 1992). Some, but not all, immigrants are able to move into more stable urban employment. Children of immigrants may accompany their parents to the harvest fields when they are young. However, by the time they finish school they have a command of English and other skills and are able to move out of agriculture. Much farm work is performed outdoors in hot and dirty conditions. Even those who like working in the fields find the seasonality of agriculture leaves them unemployed for substantial periods. Farmworkers chronically complain about the instability of employment. Hourly earnings may be good but annual earnings leave most families qualified for Food Stamps. It is important to emphasize that agricultural work *did not make* immigrant workers poor. These people were poor before they entered the farm labor pool and that is why they were willing to tolerate conditions native-born workers did not. For many workers, agricultural employment provides a transition while they learn English and gain skills for more desirable or stable urban employment. Numerous attempts to legislate improvements in the working and living conditions of farmworkers have been less than successful. A chronic surplus of labor fed by a continuous stream of immigrants simply overwhelms the laws designed to improve farm workers' situations and discourages mechanization.

In the past, the U.S.-Mexico boundary was a boundary between very low wages and high underemployment south of the border and better economic prospects to the north. The North American Free Trade Agreement is substantially diminishing the sharpness of the U.S.-Mexico border. To a much greater extent than in the past, immigrants who crossed the border in 1996 to harvest chile competed directly with chile harvest workers in Mexico.

DATA AND ANALYSIS

Minimum Wage

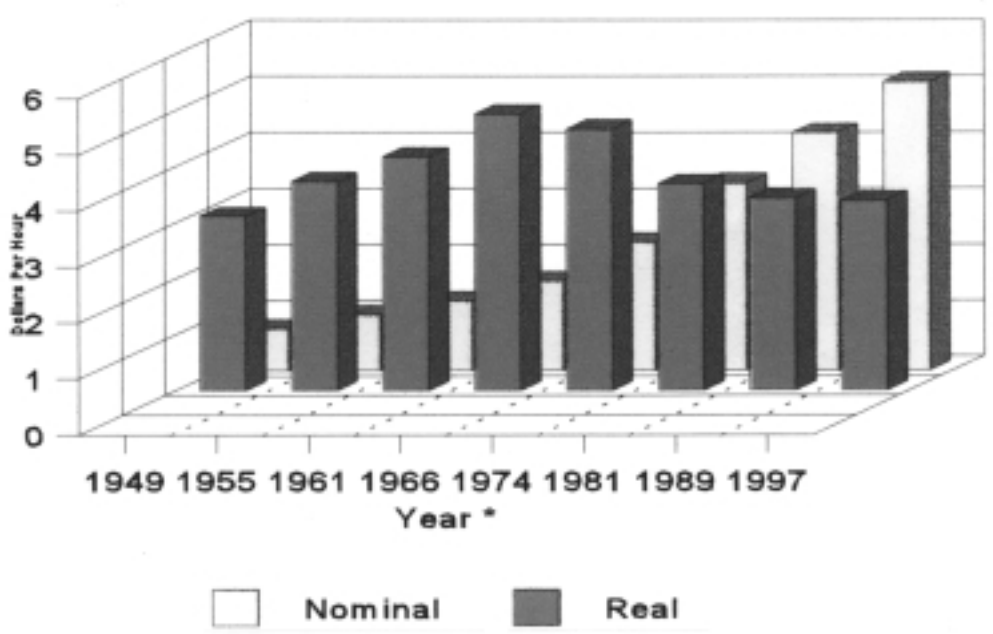
Since 1949, nominal federal minimum wages increased from 75¢ to $5.15 (fig. 1). The most recent hike was signed into law on August 20, 1996 and has two increments. A 50¢ increase took effect October 1, 1996, with the final 40¢ increase planned for September 1, 1997 (Public Law 104-188). Nominal increases have seemed dramatic. In the short-term, the recent 90¢ increase represents a 21% real increase in labor costs. A budget shock of this magnitude could result in shifts in production decisions. Producers' decisions in 1995 were made on the basis of a $4.25 wage, while 1997 production decisions will be made on a $5.15 minimum wage. Although some piece rate earnings and some workers' wages were well above the $4.25 minimum, some producers estimate (and we assume) that all chile labor costs will rise 21% from 1995 to 1997. A shock to production budgets of this magnitude could become an impetus to either mechanization or production migration.

When the minimum wage is deflated by the Consumer Price Index to real terms a very different pattern emerges. In terms of buying power, the real minimum wage peaked 30 years ago in 1966 and has declined steadily ever since. There has been a spate of federal laws to protect and improve working conditions, housing, and farmworkers' incomes (Runyan, 1992). In the agricultural sector, stagnating farmworkers' earnings reflect an over-abundance of labor, resulting from the continuing migration of workers from Mexico and Central America (Martin, p. 27, 1995). The abundance of workers has overwhelmed legislative attempts to improve working conditions and incomes of farmworkers.

Imports from Mexico

Data on chile imports through Columbus and Santa Teresa, New Mexico, provide a good indicator of trends in import competition to southern New Mexico production (table 1). In 1994, the first year of NAFTA implementation, imports were reduced because one large

Fig. 1. Nominal and real minimum wage rates by year enacted.



* In the indicated years, the federal minimum wage was increased. Real wage rates were calculated using the Consumer Price Index base year of 1982.
Source: Internet <www.dol.gov/dol/esa/public/miniwage>

cayenne processor ceased buying in Mexico due to difficulties in dealing with the government. However, in 1995, imports expanded markedly as U.S. processors and producers made connections in Mexico and took advantage of lower tariffs. Overall, the trend shows a substantial increase in imports, which corroborates reports from processors and producers.

Table 1. Annual chile imports from Mexico through New Mexico ports of entry.

Year	Kilograms
1995	22,404,433
1994	2,589,636
1993	2,850,902
1992	4,288,182
1991	1,065,592
1990	212,580
1989	65,951

Source: Personal communications from Aaron Miller and William Coppenbarger, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, September 1996.

Costs and Returns of Chile Production

These analyses are based on crop cost and return estimates developed by Libbin, et al (1996). The budgets were modified with more detailed data for both hand and machine harvest operations. Hand harvesting is labor intensive (table 2). Labor costs accounted for 42% of total production costs for jalapeños and red chile in 1995, and this is expected to increase to just under 50% in 1997. Mechanical harvesting reduced the labor fraction to less than 10% for red and 6.5% for jalapeños in 1995. In 1997, the fraction rises to 11.6% and 7.8%, respectively.

Table 2. Labor as a percent of production cost for hand and mechanical chile harvest in southern New Mexico, 1995 and 1997.*

	Hand		Mechanical	
	1995	1997	1995	1997
Red chile	41.22%	49.07%	9.71%	11.56%
Jalapeños	42.57%	47.16%	6.54%	7.79%

*Labor cost divided by total production cost.

Not much data on machine use in southern New Mexico exists, but observers generally agreed that machine harvesting declined in 1995 and 1996. On October 9, 1996, seven McClendon pepper harvesters and other equipment were sold at auction in Doña Ana, just north of Las Cruces. The newest harvester, with only 390 operating hours, sold for $36,000, which was only about one-third of the new price of about $100,000. Older machines went for as little as $14,000. These machines are the most commonly used machines and were all in field-ready condition. The substantially discounted prices indicate a very weak demand.

Mechanical harvesting gathers more trash, which must be removed in a separate cleaning operation after harvest and before processing. Cleaning requires unloading, running the peppers over cleaning rollers, and reloading onto a truck. This extra handling results in damage to the pods and decreased quality. Some processors required hand picking as a condition of their contracts in 1996.

At the outset, it should be emphasized that crop cost and return data are arithmetic means of data that in reality vary widely. Thus, while they are unlikely to correspond exactly to an individual situation, estimated budgets still provide a reasonably accurate assessment of the whole sector.

The estimated difference between machine harvesting and hand harvesting costs for red chile, before the wage increase in 1995 and after the increase in 1997, is dramatic—almost $1,000 per acre (tables 3 and 4). Figures of this magnitude are frequently cited by proponents of mechanized harvest. However, these costs only get red chile out of the field. In the case of mechanized harvest, we estimate only 85% of the crop actually gets into the bin. Furthermore, since there is often a substantial amount of trash in mechanically harvested chile, there is often an additional cleaning cost estimated at $85 in 1995 and $102 in 1997. In spite of lower gross returns due to the 15% yield loss, the estimated net operating profit is greater for machine harvest ($814 per acre) than for hand harvest ($326 per acre in 1997) (table 5). When the variety is amenable to machine harvest and field conditions are good, mechanical harvest can be more profitable.

The situation is somewhat different for jalapeños. First of all, the estimated yield is so much higher for jalapeños (28,000 lb/acre) than for red chile (4,000 lb/acre), because the former is customarily quoted on a wet basis, while the latter is customarily quoted on a dry basis (table 6). The cost advantage for using the machine with jalapeños was about $1,800 per acre in 1995 and about $2,200 per acre in 1997 (tables 6 and 7). Cleaning costs and yield losses of 15% result in reducing the differential in operating profits for machine and hand harvest in both years. The estimated advantage is $492 per acre for machine harvesting in 1995 and a $796 advantage for the machine in 1997. Thus, the increase in wage increases the estimated machine advantage by about $300 per acre (table 8).

Table 3. Estimated per-acre costs of machine harvesting red chile in Doña Ana County, New Mexico, 1995 and 1997.

	1995			1997		
Cost item	Hourly rate ($)	Hours per acre**	Cost ($)	Hourly rate ($)	Hours per acre**	Cost ($)
Labor	5.00	5.3	26.50	6.10	5.3	32.33
Fuel	1.81	5.3	9.59	1.86	5.3	9.83
Repairs	1.23	5.3	6.52	1.26	5.3	6.68
Payment*	41.93	5.3	222.23	41.93	5.3	222.23
Total cost per acre			$264.84			$271.07

* Machine costs are based on 76 days of use per year and five annual payments on the purchase price plus 10% interest.

** Based on 1.5 acres per 8-hour day.

Table 4. Estimated per-acre costs of hand harvesting red chile in Doña Ana County, New Mexico, 1995 and 1997.

	1995			1997		
Cost item	Per bucket	Buckets per acre*	Hours per acre	Per bucket	Buckets per acre*	Hours per acre
Labor	$0.78	1333.3	156.86	$0.95	1333.3	156.86
Total cost per acre			$1,039.97			$1,268.77

*Based on 4,000 lb/acre dry wt, 3 lb/bucket, 8.5 buckets per hour.

DISCUSSION AND CONCLUSIONS

If these estimates are accurate, why would producers not pick red chile with a machine? Many farmers do not like to see chile left in the field, and machines generally leave at least some. Some processors stipulate hand-picked in their contracts to avoid damaged pods. Frequently, field conditions aren't optimal. Also, otherwise desirable varieties aren't harvested well by machine. Machines are expensive to buy and aren't always reliable. Custom operators may not be available for a timely harvest, and there is always some inertia involved in changing ingrained production practices. Finally, we suggest that the specter of lower production costs in Mexico hangs over New Mexico chile fields. Many processors and producers concerned about higher labor costs are looking to move production south rather than mechanize.

Jalapeño estimates are similar to those of red chile. The major difference is that jalapeño production is much more profitable than red chile, regardless of how it is harvested. Compared to red chile, a somewhat greater percentage of jalapeños are harvested mechanically. Even more rapid mechanization could have occurred for the same reasons as mentioned for red chile. So why don't producers switch from red chile to jalapeños? For one thing, most chile is produced under contract with processors. Few producers are willing to risk the substantial production investment without an assured market. Another answer is that red chile is overripe green chile, and green chile is profitable. Much of the red is what is left over after one or two pickings of green, or perhaps, the total production of a field for which a green market couldn't be found. In that sense, the red budget is somewhat misleading. However, for comparing hand and machine costs and returns, the

Table 5. Comparison of estimated per-acre cost and returns for hand- and machine-harvested red chile in Doña Ana County, New Mexico for production years 1995 and 1997.

	Hand harvest		Machine harvest	
	1995	1997	1995	1997
Gross returns*	$2,080.00	$2,600.00	$1,768.00	$2,210.00
Expenses				
Purchased inputs	$467.05	$478.73	$467.05	$478.73
Pre-harvest operations	$317.45	$325.39	$317.45	$325.39
Harvest operations**				
Hand	$1,039.97	$1,268.77		
Machine			$264.84	$271.07
Additional cleaning[xxx]			$85.00	$102.00
Post-harvest operations	$3.83	$3.93	$3.83	$3.93
Overhead expenses	$192.48	$197.29	$192.48	$197.29
Total operating expenses	$2,020.78	$2,274.10	$1,330.65	$1,378.41
Net operating profit per acre	$59.22	$325.90	$437.35	$813.59

*Gross returns based on 4,000 lb yield at $0.52/lb price for hand harvest. For machine harvest, a 15% yield loss at 3,400 lb at $0.52/lb for 1995. For 1997, the yield is the same, but the price per lb is $0.65.

**Numbers from table 1 and table 2. 1997 numbers have been adjusted using an average CPI of 2.5%.

[xxx]Cleaning cost estimated at $0.025/lb in 1995 and $0.03/lb in 1997.

Table 6. Estimated per-acre costs of hand harvesting jalapeños in Doña Ana County, New Mexico, 1995 and 1997.

	1995			1997		
Cost item	Per bucket	Buckets per acre*	Hours per acre	Per bucket	Buckets per acre*	Hours per acre
Labor	$1.68	1,217.39	304.34	$2.05	1,217.39	304.34
Total cost per acre			$2,045.22			$2,495.16

*Based on 28,000 lb/acre, 23 lb/bucket, 4 buckets per hour.

Table 7. Estimated per-acre costs of machine harvesting jalapeños in Doña Ana County, New Mexico, 1995 and 1997*.

	1995			1997		
Cost item	Hourly rate	Hours per acre**	Cost	Hour rate	Hours per acre**	Cost
Labor	$5.00	5.3	$26.50	$6.10	5.3	$32.33
Fuel	$1.81	5.3	$9.59	$1.86	5.3	$9.86
Repairs	$1.23	5.3	$6.52	$1.26	5.3	$6.68
Payment	$41.93	5.3	$222.23	$41.93	5.3	$222.23
Total cost per acre			$264.84			$271.10

*Machine costs are based on 76 days of use per year and five annual payments on the purchase price plus 10% interest.

** Based on 3.5 acres per 8-hour day.

NMSU cost and return estimates are appropriate. Green chile is not considered in this analysis because attempts to mechanize that harvest are much less promising.

When technical and economic factors are considered together, it is difficult to be sanguine about any substantial increase in mechanical harvest adoption in the near future. The dynamic change in chile production in the mid-1990s appears to be the movement into Mexico and not to mechanization. Chile imports through Columbus and Santa Teresa, New Mexico were used because imports have and will continue to compete directly with southern New Mexico production. The import trends strongly suggest they are likely to increase. These data are consistent with anecdotal evidence of increasing processor interest in Mexico. A number of the larger, well-capitalized, more aggressive producers who would normally be leaders in mechanization are, instead, looking to Mexico.

Wage differentials are only one factor, albeit a major one, in expanding Mexican chile production and exports. The minimum wage for Mexican farm workers is $5.00 per day, less than the new hourly minimum wage on the other side of the border. Electricity is 3 cents per Kilowatt-hour, less than one-quarter of the cost in southern New Mexico. This reduces irrigation costs where ground water is used. NAFTA is lowering tariffs and facilitating chile imports into the United States. Yields tend to be higher when production first moves into a new chile-growing area due to low pathogen populations. Some production factors like machinery costs may be equal to or higher than United States' costs. Some observers predict production to initially

Table 8. Comparison of estimated per-acre cost and returns for hand- and machine-harvested jalapeños in Doña Ana County, New Mexico for production years 1995 and 1997.

	Hand harvest		Machine harvest	
	1995	1997	1995	1997
Gross returns*	$4,620.00	$4,760.00	$3,927.00	$4,046.00
Expenses:				
Purchased inputs	$467.05	$478.73	$467.05	$478.73
Preharvest operations	$317.45	$325.39	$317.45	$325.39
Harvest operations**				
Hand	$2,045.22	$2,495.16		
Machine			$264.84	$271.10
Additional cleaning[xxx]			$595.00	$714.00
Post-harvest operations	$3.83	$3.93	$3.83	$3.93
Overhead operations	$192.48	$197.29	$192.48	$197.29
Total operating expenses	$3,026.03	$3,500.50	$1,840.65	$1,990.44
Net operating profit per acre	$1,593.97	$1,259.50	$2,086.35	$2,055.56

*Gross returns based on 28,000 lb yield at $0.165/lb price for hand harvest. For machine harvest, a 15% yield loss at 23,800 lb at $0.165/lb for 1995. For 1997, the same yield, but price is $0.17.

**Numbers from table 4 and table 5. 1997 numbers adjusted by an average CPI of 2.5%.

[xxx]Cleaning cost estimated at $0.025/lb in 1995 and $0.03/lb in 1997.

move to Mexico, but then to move back to the United States once bureaucratic and other difficulties become manifest. A detailed comparison of United States and Mexican production costs is well beyond this study's scope. We rely instead on recent import trends and the judgement of key informants in chile production and processing.

In conclusion, in late 1996, it appears more likely that we'll see production move south of the border rather than an increase in mechanical harvesting. Despite all the development work that has been done on pepper harvesters, a significant breakthrough appears unlikely until there is a coordinated effort between plant breeders and engineers. That coordination has been effectively discouraged by federal restrictions on developing labor-displacing technology. As production moves south, Mexican immigrants will find less seasonal work in New Mexico fields. More would-be immigrants will be able to stay in Mexico and harvest chile under those working conditions and wages. With NAFTA, the principal competition for jobs is coming from Mexico. If it were feasible, mechanization could become the U.S. worker's ally by keeping U.S. production economically competitive. It may be coming down to a few, relatively well-paid U.S. jobs in support of a mechanized industry versus more jobs in Mexico at less desirable wage rates and working conditions. U.S. producers and processors who are able to develop relationships in Mexico stand to benefit from the new opportunities. U.S. producers and processors have technical and managerial experience. Those with access to capital and ability to work in Mexico should be able to operate on either side of the border. Smaller, less-mobile producers, in particular, are likely to feel squeezed by the competition from cheaper imports. Thus, workers in Mexico, plus some U.S. and Mexican producers and processors, should benefit from the changing situation. Farm workers already established in the U.S., plus producers and processors without access to capital or ability to work in Mexico, will lose.

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