Technical Bulletin 217

Cost of Producing Crops in the Irrigated Southwest

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N. Gene Wright, Research Associate, Department of Agricultural Economics, University of Arizona; Edmund R. Barmettler, Extension Economist and Agricultural Economist, University of Nevada; and Thomas M. Stubblefield, Agricultural Economist, University of Arizona; Daniel A. Swope, Agricultural Marketing Specialist, Agribusiness Program, Agricultural Research Service of the United States Department of Agriculture.

Department of Agricultural Experiment Station
THE UNIVERSITY OF ARIZONA
Tucson, Arizona

FOREWORD

The information developed in this project is a necessary input to achieving two basic objectives in the economic enhancement of Southwestern states:

1. To provide information needed for maximizing the agricultural base in the Southwestern states
2. To permit realistic planning of profit-making agri-businesses related to a sound agricultural base in these areas.

Some of these Southwest lands are already under irrigated cultivation and use, and additional acreages could be put under irrigation provided this would have economic advantages over other possible uses for the water and land.

The overall objective is to maximize the use of these irrigated lands as a basis for establishing and/or maintaining profit-making businesses suitable for each particular area. Such enterprises will provide living-wage jobs and assure continued prosperity in these regions.

The information in this project has been developed by the Department of Agricultural Economics of the University of Arizona under a contract with the Agri-business Program, Agricultural Research Service, United States Department of Agriculture. The procedures for determining the various yields, costs, returns, and other data have been the same for each area and each state in order that the results will afford legitimate comparisons between the various crops and types of livestock in these areas. Each of the Experiment Stations and State Universities of the four states has participated in preparing the data and final reports. Separate reports have been prepared for each participating state; the findings of each report can be compared directly with the others since each has been prepared using the same guidelines.

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GLOSSARY

Calendar of operation: A list of the different operations in sequence of their occurrence throughout the crop year. While the crop year falls within the calendar year for most crops, in some cases production overlaps into the next year. For instance, winter wheat production falls within two calendar years and there are times when final cotton harvesting operations may not be completed until early in the next calendar year.

Cost of establishing a stand: Cost of planting a perennial crop one year for harvesting several years thereafter, e.g., alfalfa.

Fixed costs: Costs that the farmer will experience whether or not a crop was planted. If the crop is not planted, the farmer will have certain costs depending upon the length of time his machinery, land, and management facilities are not used. If it is a year, then most costs except the actual operating costs of the machinery, labor, fertilizer, and part of the water costs would be incurred. A part of the water costs could be charged, depending upon the situation. If pump irrigation is used, there would be no charges for irrigation water if none was used; only the depreciation on the well and distribution system would be charged. If surface water is used, a minimum "water users" assessment is generally charged, whether water was used or not.

Machinery complement: The various machines used in the farming operation. In cases where the operations require more than one machine of a specific kind, the number of machines is stated.

Nurse crop: Usually a grain crop, such as wheat, which is used in some regions because it establishes quickly and is generally sown in advance of the alfalfa, so as to shelter the alfalfa seedlings from wind and/or water erosion of soil particles. In this report, costs of planting, growing, and harvesting the nurse crop are excluded from the production costs for alfalfa hay and alfalfa seed so that costs will be comparable among regions and also because the value of the grain and mixed hay (alfalfa and wheat straw) more than compensated for the nurse crop costs. Net returns from the sale of grain were credited to another account in the farm records. Mixed hay was generally fed to livestock on the farm.

Variable costs: Costs that are incurred only if the crop is planted, i.e., costs of inputs used directly in growing and harvesting the crop, including seed, fertilizer, water, machinery, and labor. Also included as "miscellaneous variable costs" are charges for certain items of expense that are incurred if the land is generally used for agricultural production instead of lying idle, such as charges for transportation, maintenance, office and bookkeeping expenses, management, and other expenses of running a farm.

INTRODUCTION

The purpose of this study was to determine the cost of producing crops on irrigated land in Nevada. These costs were determined in such a manner as to be comparable with similar costs in other states. Since a synthetic budgeting method was used, costs were based on the more efficient uses of agricultural inputs, at 1972 prices.[1]

Nevada has approximately 500,000 acres of irrigated crop land. Hay is the predominant crop, having been produced on about 88 percent of the irrigated crop land in 1970 and 1971. Around four percent of the crop land was used to produce alfalfa seed and about six percent to produce grain (Table 1).

Because different people desire information on costs in various amounts of detail, this report is divided into three sections: 1) a summary, 2) a detailed description of the areas and the cost of producing each crop by area, and 3) an appendix containing detailed tables of variable costs. The purpose of the latter is to make it possible to use this information as a bench-mark, or a base, and to incorporate the latest cost data in order to update the estimates of the costs of producing these crops.

TABLE 1
Acreage of Irrigated Crops in Nevada, 1970 and 1971

	1970		1971	
	Acres	Percent	Acres	Percent
All Hay	448,000	87.6	445,000	88.9
Alfalfa Seed	23,500	4.6	19,500	3.9
Cotton	2,200	.4	2,300	.5
All Grain	33,000	6.5	29,000	5.8
Corn Silage	3,000	.6	2,000	.4
Other	1,700	.3	2,700	.5
Total	511,400	100.0	500,500	100.0

[1] There are five states involved in this study — Arizona, Colorado, Nevada, New Mexico, and Utah. For comparability of the base year costs, 1972 prices were used for each state.

SUMMARY OF ESTIMATED COSTS

Estimated total costs for producing crops in the three regions of Nevada in 1972 were as follows:

Region 1		
	(Northeastern Nevada)	
	Alfalfa Hay	$33.80 per ton
	Alfalfa Seed	0.34 per pound
	Small Grains	3.05 per hundred
Region 2		
	(Western Nevada)	
	Alfalfa Hay	$31.81 per ton
	Alfalfa Seed	0.31 per pound
	Small Grains	2.61 per hundred
Region 3		
	(Southern Nevada)	
	Alfalfa Hay	$31.87 per ton
	Small Grains	2.85 per hundred
	Cotton Lint	0.27 per pound

The northeast was the highest cost area; however, this area produces hay and small grains to feed livestock through the winter. There was not enough difference in cost among areas to encourage any production shift from one area to another. Moreover, the difference was insufficient to pay transportation costs.

REGIONS

The state of Nevada was divided into three regions in which the costs of producing irrigated crops are more or less homogeneous (Figure 1). The Northeastern Region included Lincoln County, north of Pioche, all of White Pine, Elko, Eureka, Landers and Humboldt Counties, and also, the northern one-third of Washoe County. The main crop producing areas were the Reese River drainage in Landers County; Lund and Steptoe areas of White Pine County; Diamond Valley in Eureka County; Ruby-Clover Valley, Owyhee River drainage and Upper Humboldt River drainage of Elko County; and the Quinn River drainage, Kings River drainage, Paradise Valley, and Middle Humboldt River drainage in Humboldt County.

The major crops in this region were alfalfa hay, small grains, and alfalfa seed. Much of the hay grown in the area was grown by range livestock producers to feed livestock during the winter months. Average growing season ranges from 60 to 100 days. This limits the number of cuttings of hay that can be produced. If it were not necessary to feed hay in the winter to maintain the breeding livestock, it is doubtful that many of these farming operations would have been developed.

The Western Region included Nye County north of the town of Beatty, Lincoln County south of Pioche, Esmeralda, Mineral, Douglas, Lyons, Carson City, Storey, Churchill, and Pershing Counties. Also included in the Western Region was Washoe County south of a line from the north boundary of Pershing County west to the California state line. The same crops were grown in this region as in the Northeastern Region — alfalfa hay, alfalfa seed and small grains. The average growing season varies from 100 to 140 days. The main producing areas were Smokey Valley in Nye County; Pahranagat Valley of Lincoln County; Fish Lake area of Esmeralda County; Yerington and Smith Valley areas of Lyons County; Minden-Garnerville area of Douglas County; Fallen-Fernley area of Churchill County; Rye Patch Reservoir-Lovelock area of Pershing County; and Hualapai Flats-Gerlach area; and the Truckee Meadows area adjacent to Reno in Washoe County.

The Southern Region included all of Clark County and Nye County south of the town of Beatty. The principal crop producing areas were Amargosa Valley, Pahrump Valley, and Virgin River Valley and Moapa Valley in the Muddy River drainage. Cotton, grain sorghum and alfalfa hay were the principal crops in this region. This is the cotton producing area in Nevada. The growing season for this region varies from 180 to 300 days, and the areas along the Colorado River have the longest growing season. Elevation is the most important variable in crop production.

WATER RESOURCES

The production of cultivated crops in Nevada is almost entirely dependent upon irrigation. Precipitation varies from about 3 inches in the southern desert to over 20 inches at high elevations. The state average is 9 inches and much of this falls during the winter.

It is estimated that about 200,000 acres are irrigated with pumped groundwater, including about 80,000 acres irrigated with sprinkler systems. Over the last several years there has been a gradual increase in the area irrigated with groundwater. These new areas consist of land brought under production through establishment of Desert Land Entries. This increase is partly offset by abandonment in other areas. As in many areas of the West, the water table gradually declines when groundwater is used for irrigation. Thus, water costs increase as more energy is needed to lift water from greater depths.

Three major areas have a fairly stable surface water supply — Fallon-Fernley area (irrigated from the Truckee River and Lahontan Reservoir); Lovelock area (irrigated from Rye Patch Reservoir); and the Muddy River area (irrigated from large springs).

Basically, all of the surface water rights in Nevada were allotted at the time of the study. During years of plentiful surface water supplies, any additional water was used largely on wild flooded pasture land. These pastures usually received only one irrigation by stream overflow in the spring or from simple diversion systems.

Northeastern Region

The Lund area along the White River in Southern White Pine County is irrigated by surface water from the river. Water supply is dependent upon spring run-off and summer rainstorms.

Irrigation water for farming in the Steptoe Valley area of White Pine County is furnished from both pumped groundwater and surface flow from Duck Creek. Some new pump irrigation farms are being developed in this area but are being somewhat offset by abandonments of older fields.

The major irrigated area in Eureka County was the Diamond Valley which used pumped groundwater. The water table was gradually declining in this valley because of the mining of the water.

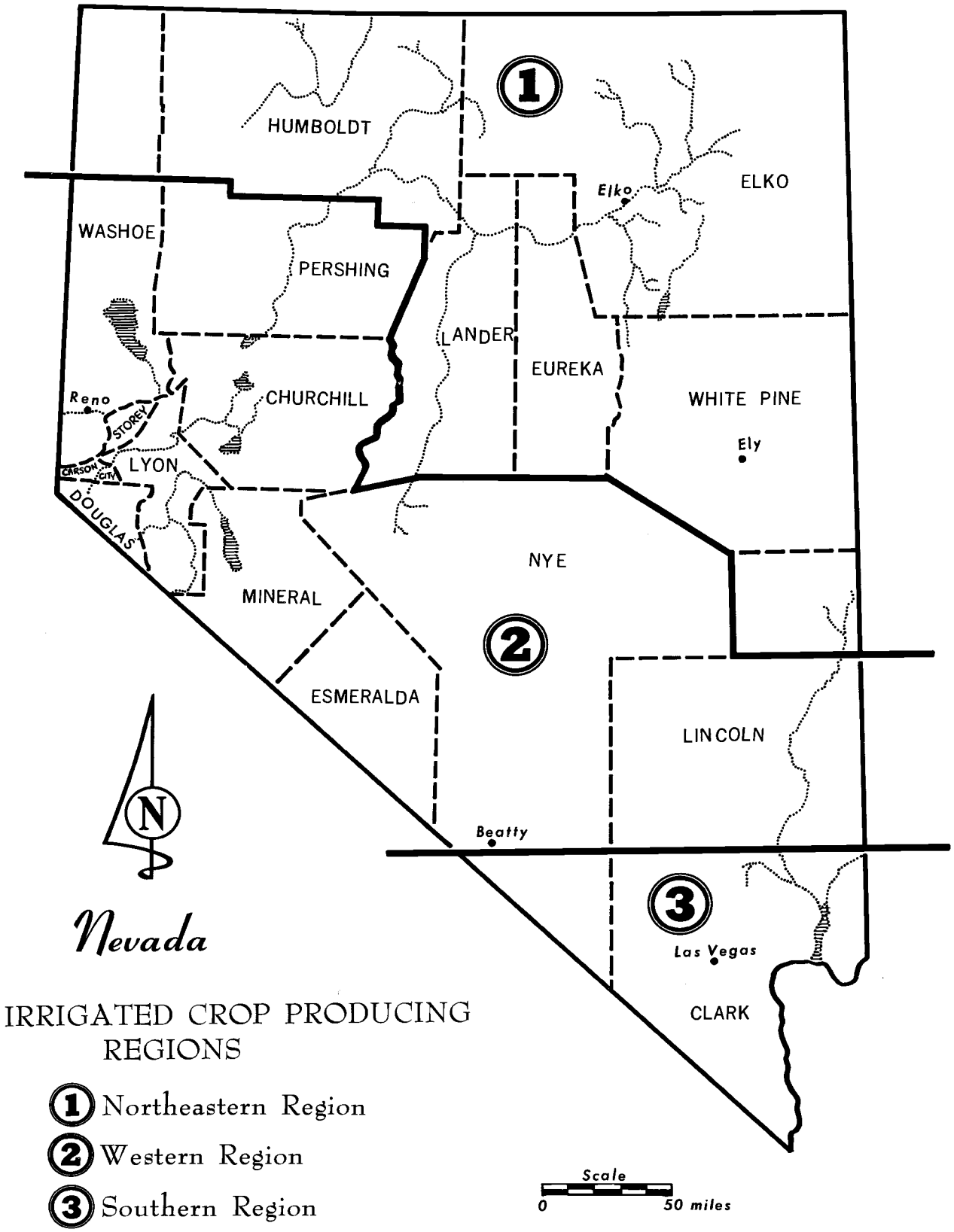
Irrigated farming was located at various spots along the entire length of the Reese River drainage of Lander County. The majority of the irrigation water used on this area was pumped from the ground. Some surface water was available for pasture and meadow land during spring runoff and summer rainstorms.

Ruby-Clover Valley area of Elko County was irrigated by surface runoff from the Ruby Mountains and East Humboldt range. Availability of water was determined by winter snowfall and the supply was often variable during the summer growing season. During periods of surplus water some additional pasture and meadow land was irrigated.

The Owyhee River farm area adjacent to Tuscarora and Jack Creek in northwest Elko County was

FIGURE 1

Irrigated Crop Regions in the State of Nevada



Prepared by Department of Agricultural Economics University of Arizona Tucson

irrigated by surface water from the Owyhee River which flows northwest into the Snake River drainage of Idaho and Oregon. This area had a surplus of water during the spring runoff and an irregular supply during the rest of the year.

Almost half of Elko County was provided surface irrigation water by the Upper Humboldt River drainage system. Again, a surplus of water was available during spring runoff but at times there was a short supply during the summer months. Much of the surface water which originated in this drainage system was allocated to users downstream in the Lovelock area.

Middle Humboldt River drainage covered the Humboldt River from Palisade in Eureka County to Rye Patch Reservoir in Pershing County. Surface water was available for irrigation along this entire distance. Water was adequate for irrigation during the spring runoff but often it was scarce during prolonged dry spells. The area below Rye Patch Dam had the first water rights from the reservoir.

Paradise Valley in Humboldt County was irrigated by surface water from the Little Humboldt River. As in many areas of Nevada, surface water was adequate in the spring but was often in short supply during the summer or during prolonged dry periods.

Irrigation water for the Quinn River Crossing and Orovada areas of central Humboldt County was mostly pumped groundwater although some surface water was available from the Quinn River. Surface water was mostly used on pasture and meadow lands adjacent to the river. Several large farming operations were using pumped groundwater to operate sprinkler systems in the Orovada area.

Along the Kings River of northern Humboldt County most of the water used for irrigation purposes was pumped groundwater. A limited amount of surface water was available from the Kings River. Several large irrigated farming operations were being developed along the Kings River using pump water.

Western Region

Pahranagat Valley in Lincoln County is irrigated by surface water from diversion dams on the White River. Water supply can be irregular during the dry season. Smokey Valley of northwest Nye County is irrigated mainly by pumped groundwater but some surface water is used. Much of the surface water is available during spring runoff from nearby mountains.

Fish Lake area of Esmeralda County is mostly irrigated from pumped groundwater. Some surface water is available from spring runoff of nearby mountains.

Smith Valley in Lyon County was irrigated by surface water from the West fork of the Walker River flowing out of the mountains of California. The Yerington area of Lyon County was irrigated by surface water from the East fork of the Walker River. During periods of surplus spring runoff a considerable acreage of native pasture was irrigated with water from the Walker River.

Minden-Gardnerville area of Douglas County was irrigated by surface water from the East fork of the Carson River. During times of ample flow, wild pasture and meadow land along the river received flood water for irrigation purposes. Reno-Truckee Meadow area of Washoe County received surface water from the Truckee River, Washoe Lake and Steamboat Creek. Much of the Truckee Meadow area adjacent to Reno was encroached by urban development. Additional meadow land and pasture were irrigated by flood water when available.

Fallon-Fernley area of Churchill County was one of the few areas of Nevada with an ample water supply from surface water. Water was stored behind Lahontan Dam on the Carson River and this area had prior water rights over upstream users.

Lovelock area of Pershing County was furnished surface irrigation water from Rye Patch Reservoir behind Rye Patch Dam on the Humboldt River. This was another of the few areas in Nevada that had an adequate supply of surface water on a year round basis. The Humboldt River ends at the Humboldt Sink several miles southwest of Lovelock.

The Hualapai Flats-Gerlach area is located in northern Pershing and central Washoe Counties. This area was irrigated mostly by pumped groundwater although some surface water from nearby mountains was available during spring runoff.

Southern Region

Amargosa Desert area of Nye County was irrigated primarily with pumped groundwater. This was a new irrigated area and as the water is mined, pumping lifts will become greater and water costs will increase.

The principal source of water for irrigation in the Pahrump Valley area of Nye County was primarily groundwater. Much of this area was being offered for sale as subdivision and other land development. Water costs were rising and profits were decreasing on many crops.

Virgin River Valley of Clark County was irrigated by surface water out of the Virgin River. The water supply was limited to runoff in the Virgin River out of Arizona and Utah. During the spring, water was usually adequate but could be irregular during the dry season.

Moapa Valley in the Muddy River drainage of Clark County had a fairly constant supply of surface water from several large springs.

MARKETING OF CROPS PRODUCED IN NEVADA

The crops produced in the Northeastern Region were used primarily to feed livestock during the winter. When there was a lack of available forage on the ranges, due to snow, it was necessary to feed. Thus a large portion of the hay produced was fed to cattle and sheep to maintain them through

the winter. Most surplus hay went to the California markets. The counties nearest to California had an advantage because the price received is the selling price in California minus transportation charges. Ranchers that normally used hay in the winter held adequate supplies for winter feeding. If they happened to have an "open" winter when less hay was fed, more hay was available for sale; however, ranchers could not be certain that they would not need the hay until late in winter. Therefore, production was not market-oriented as in southern and central California and in other areas in the irrigated West.

Alfalfa seed was contracted by seed companies for the general market. Small grains were either used locally for winter feed or were sold to markets to the west, either in Nevada or California.

In the Western Region, small grains were used locally in feedlots and dairies and the surplus went to northern and central California. Expanded cattle feeding and increased dairy production was taking a large proportion of the alfalfa hay produced around Lovelock. The surplus from Smith Valley and Yerington areas was going to northern California. It should be noted that marketing Nevada hay in California may be advantageous because interstate transportation rates are not fixed by the U. S. Government for unprocessed agricultural commodities and sellers may find back-haul opportunities. If the hay was both produced and marketed in California, truckers would have to adhere to intrastate rates set by the State of California, which may be higher than the unregulated interstate rates.

Alfalfa seed was cleaned and certified in the plant at Lovelock and was contracted to a seed company for distribution in general market channels as was the alfalfa seed from the Northeastern Region. Some alfalfa seed producers had an additional source of income from the sale of surplus alfalfa leaf-cutter bees which are needed to pollinate alfalfa for seed.[1]

The Southern Region was the only region in Nevada where cotton was grown. All cotton was ginned at Pahrump. The cotton seed went to California for crushing and in the past few years the lint has been sold to Japan. When Japan buys cotton in the United States, Nevada-produced cotton has a locational advantage. Small grains generally have been shipped to West Coast markets and alfalfa hay to Southern California and to the local Las Vegas markets, where a significant number of pleasure horses are fed alfalfa hay.

Nevada producers of hay and grain had an inducement to sell these products in California markets whenever the local Nevada prices dropped below the California prices minus trucking costs.

It is unlikely that there will be much change in the crops grown in the different Regions, although less cotton might be grown in the Southern Region. Since 1972 the price of wheat has increased relative to the price of cotton, making it as profitable, or more so, to produce wheat as cotton. The production of hay is a necessary part of the ranching enterprises in northern Nevada. Therefore, no significant decrease in the production of hay is expected.

ESTIMATES OF PRODUCTION COSTS

Method of Determining Costs

A synthetic budgeting method was used to determine cost estimates. These budgets are based on extensive use of machinery throughout most of the year, as would have been expected in a commercial farming operation in 1971 and 1972. Information on operating times and on the practical efficiency of the various machines was obtained from farm operators who used them extensively on large farms in Arizona. On the basis of this information and knowledge of prevailing practices in the production of the specified crops in Nevada, estimates of annual machine usage were developed as shown in Table 2.

The factor that limited the size of operation in this study was usually the harvesting machine. The size of operation was based on the area over which a specific harvesting machine or a combination of harvesting machines could be used most efficiently. For example, in the production of alfalfa hay, the machine that has the greatest limiting effect is the swather (harvester). It can cover only a limited number of acres in a given time. Efficient equipment is important because hay must be harvested within a given time to be of good quality. If a farmer's operation is not large enough to use his harvesting machinery efficiently, he probably would not be able to produce at unit costs as low as the estimates in this report. An alternative for overcoming this problem is to use custom harvesters.

A typical machinery complement for each specific operation was established with the objective of performing that operation at the lowest cost (Appendix A). Certain problems and variations had to be considered in estimating machinery use. Farmers located in areas with shorter growing seasons tend to make more repairs to their machinery, so as to extend its life over a longer num-

TABLE 2
Annual Use of Selected Farm Machines in Nevada Irrigated Crop Budgets

	Hours per year
90–100 HP Tractor	2000
65–75 HP Tractor	2000
Cotton Picker	500
Grain Combine	600
Swather	600
Hay Baler	500
Bale Wagon	500

[1] For information on the use of leaf-cutter bees see: Erickson, Eric H., Jr. and William T. Wilson, *Management of the Alfalfa Leaf-Cutter Bee in Colorado*, Experiment Station Bulletin 552 S, Colorado State University, Fort Collins, January 1972.

ber of hours of use than if the machine were used where the growing season is longer, i.e., 300 to 325 days per year. In the latter case, as the machine becomes worn it is impractical to replace many of the parts. In the former case, if the farmer or rancher has time when his opportunity cost is near zero, he may find it more profitable to repair the machine and extend its life rather than to replace it.

Machinery costs were calculated using 1972 costs for new machinery. Fuel and repair costs were based on the Agriculture Engineering Handbook formulas. In some instances, where experience indicated that the Agriculture Engineering Handbook formulas were underestimating costs, the costs were increased in accordance with more current information. Interest, depreciation, insurance and other fixed costs were included.

Labor rates include social security, industrial insurance, Occupational Safety and Health Act insurance, employment compensation, and vacation costs. The amount and type of materials used and the per unit costs of these materials are based on the best information available. These components should be adjusted when local conditions indicate the information included in this report is not appropriate. Understandably, there is a limit to the extent of refinement of cost estimates developed in a study of this type, if it is to serve as a more or less generalized reference. Thus, for example, allowances were not made for different rates of application of fertilizer, water, etc., by soil types and other physical aspects for each small locality.

Included under variable costs are interest charges on the variable costs in the budget. A charge has been added for management, office overhead, bookkeeping, maintenance, transportation, and other expenses of running a farm.

Since taxes vary among the different locations in the region, it is difficult to determine a representative cost figure. Furthermore, taxes vary from year to year. Thus, it was considered preferable to calculate taxes as a regional average rather than to develop estimates for each county within a region. For example, in the Northeastern Region there would be seven different tax rates due to the differences in county taxes and there could be further variation within the counties due to different school tax rates. To develop estimated costs of production for specific localities within a region, it would be necessary to recalculate the costs using the local tax rate.

Interest cost in the amount of a 6 percent charge on capital investment in land was included in the fixed costs. Although interest rates for loans on agricultural land rose sharply in 1970 and then receded in subsequent years, the rate on new loans in 1972 was still higher than 6 percent. Nevertheless, the average interest rate on outstanding loans was more likely around 6 percent than the 1972 prevailing rates of 7 percent or higher. Thus, the more conservative rate of 6 percent was selected as the interest charge on the investment in land.

Updating Cost Estimates

Because prices and charges for the various factors of production are constantly changing, it is well recognized that findings in any cost study will soon be out of date. Thus, one of the major objectives of this project was to develop a system for categorizing and presenting the findings so as to facilitate updating of the estimates by changing applicable items of cost.

The procedure for updating cost estimates appears in the Appendix, along with tables showing detailed cost information for the variable costs of producing the various crops.

Cost of Producing Crops in the Northeastern Region

The total cost of establishing an acre of alfalfa for hay production in the Northeastern region of Nevada was estimated at $95.17 (Table 3). In addition, costs of $20.93 per acre had to be incurred for a nurse crop, which was needed to establish a satisfactory stand of alfalfa in this region. Nurse

TABLE 3
Estimated Costs for Establishing One Acre of Alfalfa for Hay in the Northeastern Region of Nevada

	Alfalfa		Nurse Crop[2]
Variable Costs			
1. Land Preparation	$ 4.73		
2. Planting	10.16		$ 6.75
3. Growing			
a. Fertilization $10.90			
b. Irrigation 21.25			
c. Insect Control [1]			
d. Chemical Weed Control [1]			
	32.15		
4. Harvest			
a. Grain	—	$6.66	
b. Hay	—	7.52	
			14.18
5. Misc. Variable Costs	10.50		
6. Interest on Variable Costs (8% for 6 months)	3.14		
Total Variable Costs		$60.68	20.93
Fixed Costs			
1. Machinery	$13.79		
2. Water	6.60		
3. Taxes	2.10		
4. Interest on Land Investment ($200 @ 6%)	12.00		
Total Fixed Costs		$34.49	—
Total Establishing Costs		$95.17	$20.93[2]

[1]No costs; these controls were not customarily used.

[2]Nurse crop was used for establishing the stand. Total cost for establishing alfalfa plus nurse crop costs: $95.17 + $20.93 = $116.10. Estimated nurse crop yield per acre was 1 ton of mixed hay (alfalfa and straw) and 3,000 pounds of grain, with a return value assumed at least equal to the cost of the nurse crop.

crop costs were excluded from alfalfa establishing costs, however, because the value of grain produced from the nurse crop more than compensated for its production cost. The estimated yield of the nurse crop was 3,000 pounds of grain per acre. Also, 1 ton of mixed hay (alfalfa and straw) was produced per acre and generally was fed to livestock on the farm. Moreover, the exclusion of nurse crop costs facilitates the comparison of alfalfa costs with the other two regions in Nevada where a nurse crop was not used.

Since the estimated productive life of the stand was 5 years, establishing costs had to be distributed as an annual charge of $19.03 ($95.17 ÷ 5) to the cost of producing alfalfa hay (Table 4).

TABLE 4

Estimated Costs for Producing One Acre of Alfalfa Hay in the Northeastern Region of Nevada

Variable Costs			
1. Land Preparation		[1]	
2. Planting		[1]	
3. Growing			
a. Fertilization	$ 8.18		
b. Irrigation	23.15		
c. Insect Control	[2]		
d. Chemical Weed Control	[2]		
		$31.33	
4. Harvesting		23.42	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		2.61	
Total Variable Costs			$ 67.86
Fixed Costs			
1. Machinery		$10.70	
2. Water		6.60	
3. Taxes		2.10	
4. Interest on Land Investment ($200 @ 6%)		12.00	
5. Establishing the Stand (prorated over 5 yrs.)		19.03[3]	
Total Fixed Costs			50.43
Total Producing Costs/Acre			$118.29
Cost per ton of alfalfa hay (Estimated yield: 3.5 tons per acre):		$118.29 ÷ 3.5 = $33.80 per ton	

[1]Included in Table 3 under costs of establishing a stand.

[2]No cost; these controls are not customarily employed.

[3]Annual cost for establishing alfalfa stand, assuming a 5 year productive life (nurse crop costs are excluded because returns from nurse crop exceed its costs):

$95.17 (Table 3) ÷ 5 = $19.03

Including the prorated cost of establishing the stand, the estimated cost of producing one acre of alfalfa hay in Northeastern Nevada was $118.29. With an estimated yield of 3.5 tons per acre, the cost per ton of alfalfa hay was $33.80. This was about $2 higher than the production costs in the Western and Southern regions of Nevada.

For the production of alfalfa seed in Northeastern Nevada, the estimated cost for establishing a stand of alfalfa was $93.94 per acre (Table 5). In the first year, additional costs of $18.88 were required for planting and growing a nurse crop, but these costs were not charged to alfalfa seed production for the reasons discussed in the foregoing paragraphs, in connection with alfalfa hay production.

TABLE 5

Estimated Costs for Establishing One Acre of Alfalfa Seed Production in the Northeastern Region of Nevada

	Alfalfa		Nurse Crop[2]
Variable Costs			
1. Land Preparation	$ 7.25		
2. Planting	8.26		$ 6.75
3. Growing			
a. Fertilization	$10.90		
b. Irrigation	21.25		
c. Insect Control	[1]		
d. Chemical Weed Control	[1]		
	32.15		
4. Harvesting			12.13
5. Misc. Variable Costs	10.50		
6. Interest on Variable Costs (8% for 6 months)	3.08		
Total Variable Costs		$61.24	$18.88
Fixed Costs			
1. Machinery	12.00		
2. Water	6.60		
3. Taxes	2.10		
4. Interest on Land Investment ($200 @ 6%)	12.00		
Total Fixed Costs		$32.70	—
Total Establishing Costs		$93.94	$18.88

[1]No costs; these controls were not customarily used.

[2]Nurse crop was used for establishing the stand. Total cost for establishing alfalfa plus nurse crop costs: $93.94 + $18.88 = $112.82. Estimated nurse crop yield per acre was 1 ton of mixed hay (alfalfa and straw) and 3,000 pounds of grain, with a return value assumed at least equal to the cost of the nurse crop.

After the stand was established, the estimated cost for producing alfalfa seed from one acre was $151.70 (Table 6). Included in the variable costs of $105.31 were costs for insect control, chemical weed control, and bee pollination, totaling $36. Included with the fixed costs was a charge of $18.79 for the prorated cost of establishing a stand over a 5 year period.

With an estimated yield of 450 pounds of alfalfa seed per acre, the estimated cost per pound of seed was 34¢. This was about the same as the cost in the Western region of Nevada, 31¢.

TABLE 6

Estimated Costs for Producing One Acre of Alfalfa Seed in the Northeastern Region of Nevada

Variable Costs			
1. Land Preparation		$ 2.00	
2. Planting		[1]	
3. Growing			
a. Fertilization	$ 6.66		
b. Irrigation	20.30		
c. Insect Control	12.00		
d. Chemical Weed Control	9.00		
e. Bee Pollination	15.00		
		$62.96	
4. Harvesting		25.80	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		4.05	
Total Variable Costs			$105.31
Fixed Costs			
1. Machinery		6.90	
2. Water		6.60	
3. Taxes		2.10	
4. Interest on Land Investment ($200 @ 6%)		12.00	
5. Establishing the Stand (prorated over 5 yrs.)		18.79[2]	
Total Fixed Costs			46.39
Total Producing Costs/Acre			$151.70

Cost per pound of alfalfa seed (Estimated yield: 450 pounds per acre): $151.70 ÷ 450 lbs. = $0.337 per lb.

[1]Included in Table 5 under costs of establishing a stand.

[2]Annual cost for establishing alfalfa stand, assuming a 5 year productive life (nurse crop costs are excluded because returns from nurse crop exceed its costs):

$93.94 (Table 5) ÷ 5 = $18.79

For the production of small grains in Northeastern Nevada, the estimated total cost per acre was $91.61 (Table 7). With an estimated yield of 3,000 pounds of grain per acre, the average cost of production was $3.05 per hundredweight. This is somewhat higher than the $2.61 cost estimated for small grain production in Western Nevada.

Cost of Producing Crops in the Western Region

Alfalfa hay, alfalfa seed, and small grains were the three major crops produced on irrigated lands in the Western region of Nevada.

TABLE 7

Estimated Costs for Producing One Acre of Small Grain in the Northeastern Region of Nevada

Variable Costs			
1. Land Preparation		$ 6.31	
2. Planting		6.75	
3. Growing			
a. Fertilization	$10.90		
b. Irrigation	15.75		
c. Insect Control	[1]		
d. Chemical Weed Control	[1]		
		26.65	
4. Harvesting		9.47	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		2.39	
Total Variable Costs			$62.07
Fixed Costs			
1. Machinery		11.04	
2. Water		4.40	
3. Taxes		2.10	
4. Interest on Land Investment ($200 @ 6%)		12.00	
Total Fixed Costs			29.54
Total Producing Costs/Acre			$91.61

Cost per hundredweight of grain (Estimated yield: 3,000 pounds/acre): $91.61 ÷ 30 = $3.05 cwt.

[1]No costs; these controls were not customarily used.

Establishing a stand of alfalfa for the production of alfalfa hay or seed in the Western region of Nevada was estimated to cost $75.53 (Table 8).

TABLE 8

Estimated Costs for Establishing One Acre of Alfalfa in the Western Region of Nevada

Variable Costs			
1. Land Preparation		$ 7.69	
2. Planting		10.16	
3. Growing			
a. Fertilization	$10.90		
b. Irrigation	11.30		
c. Insect Control	[1]		
d. Chemical Weed Control	[1]		
		22.20	
4. Harvesting		[2]	
5. Misc. Variable Costs		5.25[3]	
6. Interest on Variable Costs (8% for 6 months)		1.81	
Total Variable Costs			$47.11
Fixed Costs			
1. Machinery		4.12	
2. Water		3.50	
3. Taxes		2.80	
4. Interest on Land Investment ($300 @ 6%)		18.00	
Total Fixed Costs			28.42
Total Establishing Costs			$75.53

[1]No costs; these controls were not customarily used.

[2]No nurse crop was used in this region.

[3]One-half year.

A nurse crop was not generally used in this region and thus no costs were estimated for it. The estimated productive life of a stand of alfalfa in this region was 4 years, as compared to 5 years in the Northeastern region.

The total estimated cost for producing one acre of alfalfa hay was $143.13 (Table 9). Although this was higher than the $118.29 cost in the Northeastern region, yields of alfalfa hay averaged higher in the Western region, 4.5 tons as compared with 3.5 tons in the Northeast. The average cost per ton of alfalfa hay was $31.81 per ton, which was about $2 lower than the cost in the Northeastern region and about the same as in the Southern region.

The total cost for producing alfalfa seed from a one-acre stand was $154.63 in Western Nevada (Table 10). Charges for insect and weed control and bee pollination totaled $29.50 and were included in the variable costs. An annual pro-rated cost of $18.88 for establishing a stand (with a productive life of 4 years) was included with the fixed costs. The average yield of alfalfa seed was estimated at 500 pounds per acre, which is slightly higher than the 450 pound yield in the Northeastern region. With this yield, the average cost of alfalfa seed production was 31¢ per pound, which was slightly lower than the 34¢ cost estimated for the Northeastern region.

TABLE 9

Estimated Costs for Producing One Acre of Alfalfa Hay in the Western Region of Nevada

Variable Costs			
1. Land Preparation		[1]	
2. Planting		[1]	
3. Growing			
a. Fertilization	$12.82		
b. Irrigation	26.65		
c. Insect Control	[2]		
d. Chemical Weed Control	[2]		
		$39.47	
4. Harvesting		29.10	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		3.16	
Total Variable Costs			$ 82.23
Fixed Costs			
1. Machinery		13.22	
2. Water		8.00	
3. Taxes		2.80	
4. Interest on Land Investment ($300 @ 6%)		18.00	
5. Establishing the Stand (prorated over 4 yrs.)		18.88[3]	
Total Fixed Costs			60.90
Total Producing Costs/Acre			$143.13

Cost per ton of alfalfa hay (Estimated yield: 4.5 tons per acre): $143.13 ÷ 4.5 = $31.81 per ton

[1]Included in Table 8 under costs of establishing a stand.

[2]No cost; these controls were not customarily used.

[3]Annual cost for establishing alfalfa stand, assuming a 4 year productive life (nurse crop costs are excluded because returns from nurse crop exceed its costs):

$75.53 (Table 8) ÷ 4 = $18.88

TABLE 10

Estimated Costs for Producing One Acre of Alfalfa Seed in the Western Region of Nevada

Variable Costs			
1. Land Preparation		$ 2.00	
2. Planting		[1]	
3. Growing			
a. Fertilization	$ 5.85		
b. Irrigation	20.70		
c. Insect Control	9.00		
d. Chemical Weed Control	5.50		
e. Bee Pollination	15.00		
		56.05	
4. Harvesting		30.62	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		3.97	
Total Variable Costs			$103.14
Fixed Costs			
1. Machinery		5.81	
2. Water		6.00	
3. Taxes		2.80	
4. Interest on Land Investment ($300 @ 6%)		18.00	
5. Establishing the Stand (Prorated over 4 yrs.)		18.88[2]	
Total Fixed Costs			51.49
Total Producing Costs/Acre			$154.63

Cost per pound of alfalfa seed (Estimated yield: 500 pounds per acre): $154.63 ÷ 500 lbs. = $0.309 per lb.

[1]Included in Table 8 under costs of establishing a stand.

[2]Annual cost for establishing alfalfa stand, assuming a 4 year productive life (nurse crop costs are excluded because returns from nurse crop exceed its costs):

$75.53 (Table 8) ÷ 4 = $18.88

Production of an acre of small grain in Western Nevada was estimated to cost $91.27 (Table 11). Yields averaged 500 pounds higher per acre than in the Northeast, but 500 pounds lower than in the Southern region. With the estimated yield of 3,500 pounds of grain per acre, the average cost of production was $2.61 per hundredweight. This was lower than the estimates for both the Northeast region ($3.05) and the Southern region ($2.85).

TABLE 11

Estimated Costs for Producing One Acre of Small Grain in the Western Region of Nevada

Variable Costs			
1. Land Preparation		$ 6.22	
2. Planting		6.65	
3. Growing			
a. Fertilization	$ 9.20		
b. Irrigation	13.80		
c. Insect Control	[1]		
d. Chemical Weed Control	[1]		
		23.00	
4. Harvesting		8.01	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		2.18	
Total Variable Costs			$56.56
Fixed Costs			
1. Machinery		9.91	
2. Water		4.00	
3. Taxes		2.80	
4. Interest on Land Investment ($300 @ 6%)		18.00	
Total Fixed Costs			34.71
Total Producing Costs/Acre			$91.27

Cost per hundredweight of grain (Estimated yield: 3,500 pounds/acre): $91.27 ÷ 35 = $2.61 cwt.

[1]No costs; these controls were not customarily used.

Cost of Producing Crops in the Southern Region

The major crops in the Southern region of Nevada were alfalfa hay, small grains, and cotton. In this extreme southern part of Nevada the valleys are much warmer and the growing season is longer than in the other two regions. Costs for establishing a stand of alfalfa totaled $105.02 (Table 12). This is considerably higher than the establishing costs in the other two regions. Furthermore, the estimated production cost for alfalfa hay, $223.07 per acre, was also higher in the

TABLE 12

Estimated Costs for Establishing One Acre of Alfalfa in the Southern Region of Nevada

Variable Costs			
1. Land Preparation		$11.49	
2. Planting		10.16	
3. Growing			
a. Fertilization	$15.53		
b. Irrigation	21.62		
c. Insect Control	6.82		
d. Chemical Weed Control	4.82		
		48.79	
4. Harvesting		[1]	
5. Misc. Variable Costs		5.25[2]	
6. Interest on Variable Costs (8% for 6 months)		3.03	
Total Variable Costs			$ 78.72
Fixed Costs			
1. Machinery		8.85	
2. Water		6.75	
3. Taxes		1.70[2]	
4. Interest on Land Investment (300 @ 6%)		9.00[2]	
Total Fixed Costs			26.30
Total Establishing Cost/Acre			$105.02

[1]No costs; nurse crop was not used in this region.

[2]One-half year (fall planting).

Southern region, as compared with $118.29 in the Northeast and $143.13 in the West (Table 13). In

TABLE 13

Estimated Costs for Producing One Acre of Alfalfa Hay in the Southern Region of Nevada

Variable Costs			
1. Land Preparation		[1]	
2. Planting		[1]	
3. Growing			
a. Fertilization	$10.50		
b. Irrigation	54.50		
c. Insect Control	[2]		
d. Chemical Weed Control	[2]		
		$65.00	
4. Harvesting		49.58	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		5.00	
Total Variable Costs			$130.08
Fixed Costs			
1. Machinery		27.33	
2. Water		18.00	
3. Taxes		3.40	
4. Interest on Land Investment ($300 @ 6%)		18.00	
5. Establishing the Stand (prorated over 4 yrs.)		26.26[3]	
Total Fixed Costs			92.99
Total Producing Costs/Acre			$223.07

Cost per ton of alfalfa hay (Estimated yield: 7 tons per acre): $223.07 ÷ 7 = $31.87 per ton

[1]Included in Table 12 under costs of establishing a stand.

[2]No cost; these controls were not customarily used.

[3]Annual cost for establishing alfalfa stand, assuming a 4 year productive life (nurse crop costs are excluded because returns from nurse crop exceed its costs):

$105.02 (Table 12) ÷ 4 = $26.26

spite of the higher cost, however, the yield of 7 tons of alfalfa hay per acre in the Southern region was considerably higher than the 3.5 tons in the Northeast and 4.5 tons in the West. Thus, the average cost per ton of alfalfa hay was $31.87, which was about equal to the cost in the West and about $2.00 lower than in the Northeast.

Costs for producing small grains in Southern Nevada were estimated to total $113.82 per acre (Table 14). This was about $22.00 higher than the Northeastern and Western regions, but the yields were higher, also. With an estimated yield of 4,000 pounds of grain per acre, the average production cost was $2.85 per hundred pounds of grain. This was 24¢ higher than the estimate for the Western, but 20¢ below the estimate for the Northeastern region.

Cotton was grown only in the Southern region of Nevada. Total production costs were estimated to be $306.64 per acre (Table 15). With a yield of 1,000 pounds of lint and 1,650 pounds of cotton seed per acre the average cost per pound of lint was 31¢, including the value of th eseed, and 27¢ per pound after deduction of the value of the cotton seed at $50.00 per ton.

TABLE 14

Estimated Costs for Producing One Acre of Small Grain in the Southern Region of Nevada

Variable Costs			
1. Land Preparation		$ 6.75	
2. Planting		6.65	
3. Growing			
a. Fertilization	$13.20		
b. Irrigation	19.75		
c. Insect Control	[1]		
d. Chemical Weed Control	4.54		
		37.49	
4. Harvesting		9.77	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		2.85	
Total Variable Costs			$ 74.01
Fixed Costs			
1. Machinery		12.41	
2. Water		6.00	
3. Taxes		3.40	
4. Interest on Land Investment ($300 @ 6%)		18.00	
Total Fixed Costs			39.81
Total Producing Costs/Acre			$113.82

Cost per hundredweight of grain (Estimated yield: 4,000 pounds/acre): $113.82 ÷ 40 = $2.85 cwt.

[1]No costs; these controls were not customarily used.

TABLE 15

Estimated Costs for Producing One Acre of Cotton in the Southern Region of Nevada

Variable Costs			
1. Land Preparation		$ 17.09	
2. Planting		3.76	
3. Growing			
a. Fertilization	$31.59		
b. Irrigation	34.76		
c. Insect Control	22.50		
d. Chemical Weed Control	12.82		
e. Cultivation	2.44		
		104.11	
4. Harvesting (includes defoliation)		40.76	
5. Misc. Variable Costs		10.50	
6. Interest on Variable Costs (8% for 6 months)		7.05	
7. Ginning: 1600 pounds seed cotton x $1.40/cwt. x 2 bales		44.80	
Total Variable Costs			$228.07
Fixed Costs			
1. Machinery		46.67	
2. Water		10.50	
3. Taxes		3.40	
4. Interest on Land Investment ($300 @ 6%)		18.00	
Total Fixed Costs			78.57
Total Producing Costs/Acre			$306.64

Yield: 1,000 pounds of lint per acre
1,650 pounds of cottonseed

Cost per pound of lint: $306.64 ÷ 1000 = $0.3066

Cost per pound of lint less value of cottonseed (1650# @ $50/ton = $41.25): $306.64 — $41.25 = $265.39 ÷ 1000 = $0.2654

APPENDIX A

Procedure for Updating Cost Estimates

Appendix B presents the machinery complement used in this study and the variable and fixed costs per hour for each operation, such as land preparation, irrigation preparation, growing, etc. Appendices C through O show the calendar of operations; variable costs for machines, labor, materials and water; and the number of hours required for each of the operations. These have been transferred to the respective tables in the main body of the report. For example, Table 3 includes costs for land preparation, planting, growing, and harvesting costs for establishing alfalfa, taken from Appendix C.

Variable Costs

Variable costs can be brought up-to-date by determining the present costs listed in Appendix B and transferring the variable costs to the respective appendix table. In addition, it will be necessary to obtain new costs data for labor, materials, and water.

Cost of water pumped for irrigation may be the most difficult to determine. The most popular types of energy used to pump irrigation water from underground are electricity and natural gas. If this information is not readily available, reasonable estimated costs can be derived by using the following formulas:

The annual variable costs for pumping an acre-foot of irrigation water with electricity =

$$\frac{(1.024)\ (\text{price per KWH})\ (\text{lift in ft.})}{\text{The overall efficiency of the pumping plant (See below)}} + \frac{\text{Total cost of repairs}}{(\text{No. of acre-ft. pumped})}$$

The annual fixed costs for an electrically powered well can be determined with the following equation:

Annual fixed costs per acre-foot =

$$\frac{\text{Cost of well}^1}{\text{No. of yrs. life}} \div \text{Acre-feet pumped per year}$$

These estimates should be determined by using present costs. If the costs are for an area where no new wells are being established it is suggested information be obtained from another area where new wells are being developed. The cost of wells powered with natural gas can be determined by using the following formulas:

Annual variable cost per acre-foot pumped =

$$\frac{(.00318)\ (\text{price of MCF of Gas})\ (\text{lift in ft.})}{\text{overall efficiency (See below)}} + \frac{\text{Total costs of repairs, lubrication and attendance for one year}}{\text{No. of acre-feet pumped}}$$

Annual fixed cost per acre-foot pumped =

$$\frac{\text{Cost of well}^1}{\text{No. of yrs. life}} \div \text{Acre-feet pumped per year}$$

As stated above, these estimates should be attained by using present costs.

Energy consumption is a direct function of input over time. Input may be expressed either as horsepower or in units of energy (electrical or chemical). In terms of horsepower the equation is as follows:

$$\text{Input horsepower} = \frac{\text{Water horsepower}}{\text{Overall efficiency}}$$

in which water horsepower is the energy requirement based upon lift and gallons per minute.

In terms of electrical energy the requirement to pump one acre-foot of water is:

$$\text{KWH} = \frac{1.024\ (\text{lift in ft.})}{\text{Ee}}$$

where KWH stands for kilowatt hours and Ee stands for overall efficiency of the electric motor and pump combined, expressed as a decimal.

It is suggested that .517 be used as the overall plant efficiency of electrical powered wells if this efficiency has not been determined for the well in the Region. This was the overall plant efficiency of electrical powered wells for farms in a study conducted by the Agricultural Experiment Station, The University of Arizona.[2]

For natural gas powered wells, the quantity of gas (MCF) required to pump one acre-foot of water is:

$$\text{MCF} = \frac{.00318\ (\text{lift in ft.})}{\text{Eg}}$$

where MCF stands for thousand cubic feet of natural gas and Eg stands for the overall efficiency of the natural gas engine and pump combined expressed as a decimal.

As is indicated by each equation, fuel consumption is a direct function of overall efficiency of the pumping plant. In a study conducted by the Agricultural Experiment Station, The University of Arizona, the overall plant efficiency of natural gas powered wells averaged 13.2 percent.[3] These efficiencies may be used if the efficiency of the local wells is not known.

After the new costs have been estimated the total variable costs for each of the Appendix tables can be calculated. These costs then are transferred to

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[1] Includes cost of drilling well, casing, equipment, and testing.

[2] Nelson, Aaron G. and Charles D. Busch, *Cost of Pumping Irrigation Water in Central Arizona*, Agricultural Experiment Station Technical Bulletin 182, The University of Arizona, Tucson, April 1967, pp. 21–22.

[3] Ibid.

the appropriate tables located in the main body of this publication.

The "Miscellaneous Variable Costs" need to be re-estimated for each crop, also. This can be done by increasing the present figure in the respective tables by an appropriate index number, such as the index of wholesale prices, or by making new estimates. The interest to be charged for financing the variable costs should be determined by using current interest rates for loans to finance comparable items.

Fixed Costs

Items for machinery, water, taxes, and interest on land investment must be reexamined and revised as necessary for the updating of costs. Before proceeding with these revisions, it would be helpful to review the explanation of the derivation of these items in the section on "Method of Determining Costs."

Machinery fixed costs per acre can be reestimated by updating the hourly costs in Appendix B on the basis of the proportions of variable and fixed costs indicated there. These revised hourly costs must then be applied to the operating times shown in the respective Appendices C through O.

The current cost of gravity water can be obtained from the irrigation district. Water costs for pump irrigation should be reexamined and updated when the variable water costs are recalculated, as explained earlier in this section.

Land costs can be revised by multiplying present market value of the land by the current interest rate. The price of land may be greater than its agricultural productive value. Quite often agricultural producers will continue operations even though they are not deriving a return from their land commensurate with the present price times current interest rates. Farmers can continue to operate as long as all costs except a return to land are covered, provided they own the land. Nevertheless, land is one of the necessary costs of entering into agriculture. If new land is brought into production, one should include the interest on the cost of developing the land plus the cost of interest on the raw land instead of the interest on the market value of the land.

APPENDIX B

Equipment Inventory and Costs for Machinery Used in Calculating 1972 Irrigated Crop Budget for Nevada

Operation	Machinery	Cost per Hour (dollars) Variable	Fixed
Land Preparation			
	90–110 HP Diesel Tractor	1.90	1.15
	5 Bottom 16″ Plow	1.70	1.75
	Total	3.60	2.90
	90–110 HP Diesel Tractor	1.90	1.15
	13.5′ Offset Disc	1.30	1.55
	Total	3.20	2.70
	65–75 HP Diesel Tractor	1.50	.90
	Border Disc	.25	.30
	Total	1.75	1.20
	90–110 HP Diesel Tractor	1.90	1.15
	12′ x 30′ Land Plane	.60	1.35
	Total	2.50	2.50
	120+ HP Diesel Crawler	3.85	3.30
	3 Shank HD Chisel	1.25	1.30
	Total	5.10	4.60
	90–110 HP Diesel Tractor	1.90	1.15
	4-Row Lister	.55	.65
	Total	2.45	1.80
	90–110 HP Diesel Tractor	1.90	1.15
	Roto-Mulcher	.75	1.00
	Total	2.65	2.15
	65–75 HP Diesel Tractor	1.50	.90
	Spike-Tooth Harrow	.25	.25
	Total	1.75	1.15
	65–75 HP Diesel Tractor	1.50	.90
	4-Row Stalk Cutter	.75	1.15
	Total	2.25	2.05
Irrigation Preparation			
	65–75 HP Diesel Tractor	1.50	.90
	Row-bucker	.30	.40
	Total	1.80	1.30
Cotton Harvest			
	2 Row Diesel Cotton Picker	8.20	13.60
	90–110 HP Diesel Tractor	1.90	1.15
	Ground Cotton Scrapper	2.55	6.55
	Total	4.45	7.70
Hay Harvest			
	14′ Diesel Swather (SP)	4.95	4.80
	3 Wire Baler (SP)	3.90	6.45
Hay Harvest			
	90–110 HP Diesel Tractor	1.90	1.15
	3 Wire Baler (Aux Engine)	1.80	3.50
	Total	3.70	4.65
	65–75 HP Diesel Tractor	1.50	.90
	9½′ Side Delivery Rake	.55	.60
	Total	2.05	1.50
	Automatic Bale Wagon (SP)	4.80	6.55
	90–110 HP Diesel Tractor	1.90	1.15
	Bale Wagon (PTO)	1.30	2.35
	Total	3.20	3.50
Grain Harvest			
	16′ Combine (SP)	4.85	7.50
Growing			
	65–75 HP Diesel Tractor	1.50	.90
	Dry Fertilizer Spreader	.65	.70
	Total	2.15	1.60
	12 Row Sprayer (SP)	3.50	4.00
	65–75 HP Diesel Tractor	1.50	.90
	4-Row Cultivator	.75	.65
	Total	2.25	1.55
	90–110 HP Diesel Tractor	1.90	1.15
	4-Row Cultivator and Fertilizer Attachments	3.50	3.80
	Total	5.40	4.95
Planting			
	65–75 HP Diesel Tractor	1.50	.90
	4-Row Precision Planter	1.80	2.15
	Total	3.30	3.05
	65–75 HP Diesel Tractor	1.50	.90
	12′ Grain Drill	1.50	2.10
	Total	3.00	3.00
	65–75 HP Diesel Tractor	1.50	.90
	Broadcast Seeder	.65	.70
	Total	2.15	1.60
Hauling			
	½-Ton Pickup	1.90	1.85
	Diesel Grain Truck (10 Wheels)	3.20	4.60
	½-Ton Pickup	1.90	1.85
	4-Wheel Cotton Trailer	.50	.75
	Total	2.40	2.60

APPENDIX C

Estimated Variable Costs for Establishing One Acre of Alfalfa for Hay — Northeastern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(hours)	(dollars)	(dollars)
Alfalfa:										
Plow	.30	3.60	1.08	.35	2.20	.77				1.85
Disc	.25	3.20	.80	.30	2.20	.66				1.46
Fertilize	.25	2.15	.54	.30	2.20	.66	200# (11-48-0)	$97/ton	9.70	10.90
Make Borders	.06	1.75	.10	.10	2.20	.22				.32
Harrow	.25	1.75	.44	.30	2.20	.66				1.10
Planting	.15	2.15	.32	.20	2.20	.44	20# Seed	$47/cwt	9.40	10.16
Irrigate (4X)				2.50	1.90	4.75	3 AF Water	$5.50/AF	16.50	21.25
Total, Alfalfa			3.28			8.16			35.60	47.04
Nurse Crop:										
Planting — wheat	.20	3.00	.60	.25	2.20	.55	80# Seed	$7.00/cwt	5.60	6.75
Harvest Grain: Combine	.50	4.85	2.42	.60	2.20	1.32				3.74
Harvest Grain: Haul	.50	3.20	1.60	.60	2.20	1.32				2.92
Swath (Mixed hay) (1X)	.25	4.95	1.24	.30	2.20	.66				1.90
Rake	.25	2.05	.51	.30	2.20	.66				1.17
Bale	.25	3.70	.92	.30	2.20	.66	14# Wire	$0.12/lb.	1.68	3.26
Roadside	.20	3.20	.64	.25	2.20	.55				1.19
Total, Nurse Crop			7.93			5.72			7.28	20.93

APPENDIX D

Estimated Variable Costs for Producing One Acre of Alfalfa Hay — Northeastern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Fertilize	.25	2.15	.54	.30	2.20	.66	150# (0-45-0)	$93/ton	6.98	8.18
Irrigate (5x)				3.50	1.90	6.65	3 AF Water	$5.50/AF	16.50	23.15
Swath (3x)	.75	4.95	3.71	.90	2.20	1.98				5.69
Rake (3x)	.75	2.05	1.54	.90	2.20	1.98				3.52
Bale (3x)	.75	3.70	2.78	.90	2.20	1.98	49# Wire	$0.12/lb.	5.88	10.64
Roadside (3x)	.60	3.20	1.92	.75	2.20	1.65				3.57
Total			10.49			14.90			29.36	54.75

APPENDIX E

Estimated Variable Costs for Establishing One Acre of Alfalfa Seed Production — Northeastern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Alfalfa										
Plow	.30	3.60	1.08	.35	2.20	.77				1.85
Disc	.25	3.20	.80	.30	2.20	.66				1.46
Fertilize	.25	2.15	.54	.30	2.20	.66	200# (11-48-0)	$97/ton	9.70	10.90
Harrow	.20	1.75	.35	.25	2.20	.55				.90
List	.20	2.45	.49	.25	2.20	.55				1.04
Plant	.20	3.30	.66	.25	2.20	.55	15# Seed	$47/cwt	7.05	8.26
Irrigate (4x)				2.50	1.90	4.75	3 AF Water	$5.50/AF	16.50	21.25
Field Cleanup[1]	.06	1.75	.10	1.00	1.90	1.90				2.00
Total, Alfalfa			4.02			10.39			33.25	47.66
Nurse Crop										
Drill	.20	3.00	.60	.25	2.20	.55	80# Seed	$7.00/cwt	5.60	6.75
Combine (grain)	.50	4.85	2.42	.60	2.20	1.32				3.74
Bale (straw)	.30	3.70	1.11	.35	2.20	.77	20# Wire	$0.12/lb.	2.40	4.28
Haul (grain)	.50	3.20	1.60	.60	2.20	1.32				2.92
Roadside (straw)	.20	3.20	.64	.25	2.20	.55				1.19
Total, Nurse Crop			6.37			4.51			8.00	18.88

[1] To clean out irrigation ditches.

APPENDIX F

Estimated Variable Costs for Producing One Acre of Alfalfa Seed — Northeastern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Sidedress	.25	5.40	1.35	.30	2.20	.66	100# (0-45-0)	$93/ton	4.65	6.66
Irrigate (4x)				2.00	1.90	3.80	3 AF Water	$5.50/AF	16.50	20.30
Chemical Weed Control (2x)	Custom								9.00	9.00
Insect Control (3x)	Custom								12.00	12.00
Bee Pollination							3 hives/acre	$5.00/hive	15.00	15.00
Defoliate	Custom								7.50	7.50
Swath	.30	4.95	1.48	.35	2.20	.77				2.25
Combine	.50	4.85	2.42	.60	2.20	1.32				3.74
Haul	.20	1.90	.38	.25	2.20	.55				.93
Certification & Cleaning								3.25¢/lb.	11.38	11.38
Field Cleanup	.06	1.75	.10	1.00	1.90	1.90				2.00
Total			5.73			9.00			76.03	90.76

APPENDIX G

Estimated Variable Costs for Producing One Acre of Small Grain — Northeastern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Plow	.30	3.60	1.08	.35	2.20	.77				1.85
Harrow	.25	1.75	.44	.30	2.20	.66				1.10
Make Borders	.06	1.75	.10	.10	2.20	.22				.32
Fertilize	.25	2.15	.54	.30	2.20	.66	200# (11-48-0)	$97/ton	9.70	10.90
List	.20	2.45	.49	.25	2.20	.55				1.04
Planting	.20	3.00	.60	.25	2.20	.55	80# Seed	$7.00/cwt	5.60	6.75
Irrigate (4x)				2.50	1.90	4.75	2 AF Water	$5.50/AF	11.00	15.75
Combine	.50	4.85	2.42	.60	2.20	1.32				3.74
Haul	1.00	3.20	3.20	1.15	2.20	2.53				5.73
Field Cleanup	.06	1.75	.10	1.00	1.90	1.90				2.00
Total			8.97			13.91			26.30	49.18

APPENDIX H

Estimated Variable Costs for Establishing One Acre of Alfalfa — Western Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Plow	.30	3.60	1.08	.35	2.20	.77				1.85
Disc	.25	3.20	.80	.30	2.20	.66				1.46
Fertilize	.25	2.15	.54	.30	2.20	.66	200# (11-48-0)	$97/ton	9.70	10.90
Disc	.25	3.20	.80	.30	2.20	.66				1.46
Land Plane	.30	2.50	.75	.35	2.20	.77				1.52
Make Borders	.06	1.75	.10	.10	2.20	.22				.32
Roto-Mulch	.20	2.65	.53	.25	2.20	.55				1.08
Planting	.15	2.15	.32	.20	2.20	.44	20# Seed	$47/cwt	9.40	10.16
Irrigate (3x)				2.00	1.90	3.80	1.5 AF Water	$5.00/AF	7.50	11.30
Total			4.92			8.53			26.60	40.05

APPENDIX I

Estimated Variable Costs for Producing One Acre of Alfalfa — Western Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Fertilize	.25	2.15	.54	.30	2.20	.66	250# (0-45-0)	$93/ton	11.62	12.82
Irrigate (6x)				3.50	1.90	6.65	4 AF Water	$5.00/AF	20.00	26.65
Swath (4x)	1.00	4.95	4.95	1.15	2.20	2.53				7.48
Rake (4x)	1.00	2.05	2.05	1.15	2.20	2.53				4.58
Bale (4x)	.80	3.70	2.96	.90	2.20	1.98	63# Wire	$0.12/lb.	7.56	12.50
Roadside (4x)	.80	3.20	2.56	.90	2.20	1.98				4.54
Total			13.06			16.33			39.18	68.57

APPENDIX J

Estimated Variable Costs for Producing One Acre of Alfalfa Seed — Western Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Fertilize	.25	2.15	.54	.30	2.20	.66	100# (0-45-0)	$93/ton	4.65	5.85
Chemical Weed Control	Custom								5.50	5.50
Insect Control (2x)	Custom								9.00	9.00
Bee Pollination							3 hives/acre	$5.00/hive	15.00	15.00
Irrigate (6x)				3.00	1.90	5.70	3 AF Water	$5.00/AF	15.00	20.70
Defoliate	Custom								7.50	7.50
Swath	.25	4.95	1.24	.30	2.20	.66				1.90
Combine	.50	4.85	2.42	.60	2.70	1.62				4.04
Hauling	.20	1.90	.38	.25	2.20	.55				.93
Certification Expenses							Include Cleaning	3.25¢/lb.	16.25	16.25
Field Cleanup	.06	1.75	.10	1.00	1.90	1.90				2.00
Total			4.68			11.09			72.90	88.67

APPENDIX K

Estimated Variable Costs for Producing One Acre of Small Grain — Western Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Plow	.30	3.60	1.08	.35	2.20	.77				1.85
Harrow	.25	1.75	.44	.30	2.20	.66				1.10
Fertilize	.25	2.15	.54	.30	2.20	.66	200# (16-20-0)	$80/ton	8.00	9.20
List	.25	2.45	.61	.30	2.20	.66				1.27
Planting	.20	3.00	.60	.25	2.20	.55	100# Seed	$5.50/cwt	5.50	6.65
Irrigate (4x)				2.00	1.90	3.80	2 AF Water	$5.00/AF	10.00	13.80
Combine	.50	4.85	2.42	.60	2.20	1.32				3.74
Haul	.75	3.20	2.40	.85	2.20	1.87				4.27
Field Cleanup	.06	1.75	.10	1.00	1.90	1.90				2.00
Total			8.19			12.19			23.50	43.88

APPENDIX L

Estimated Variable Costs for Establishing One Acre of Alfalfa — Southern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Subsoil	.50	5.10	2.55	.60	2.20	1.32				3.87
Disc	.25	3.20	.80	.30	2.20	.66				1.46
Fertilize	.20	2.15	.43	.25	2.20	.55	300# (11-48-0)	$97/ton	14.55	15.53
Disc	.25	3.20	.80	.30	2.20	.66				1.46
Land Plane (2x)	.66	2.50	1.65	.75	2.20	1.65				3.30
Make Borders	.06	1.75	.10	.10	2.20	.22				.32
Pre-Irrigate				1.00	1.90	1.90	.75 AF Water	$7.50/AF	5.62	7.52
Roto-Mulch	.20	2.65	.53	.25	2.20	.55				1.08
Planting	.15	2.15	.32	.20	2.20	.44	20# Seed	$47/cwt	9.40	10.16
Irrigate				.50	1.90	.95	.5 AF Water	$7.50/AF	3.75	4.70
Insect Control	.30	3.50	1.05	.35	2.20	.77			5.00	6.82
Chemical Weed Control	.30	3.50	1.05	.35	2.20	.77	2# Dactal	$1.50/lb.	3.00	4.82
Irrigate (2x)				1.00	1.90	1.90	1 AF Water	$7.50/AF	7.50	9.40
Total			9.28			12.34			48.82	70.44

APPENDIX M

Estimated Variable Costs for Producing One Acre of Alfalfa Hay — Southern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Fertilize	.25	2.15	.54	.30	2.20	.66	200# (0-45-0)	$93/ton	9.30	10.50
Irrigate (9x)				5.00	1.90	9.50	6 AF Water	$7.50/AF	45.00	54.50
Swath (7x)	1.75	4.95	8.66	2.00	2.20	4.40				13.06
Rake (7x)	1.75	2.05	3.59	2.00	2.20	4.40				7.99
Bale (7x)	1.40	3.90	5.46	1.60	2.20	3.52	98# Wire	$0.12/lb.	11.76	20.74
Roadside (7x)	1.05	4.80	5.04	1.25	2.20	2.75				7.79
Total			23.29			25.23			66.06	114.58

APPENDIX N

Estimated Variable Costs for Producing One Acre of Small Grain — Southern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Disc (2x)	.50	3.20	1.60	.60	2.20	1.32				2.92
Make Borders	.06	1.75	.10	.10	2.20	.22				.32
Fertilize	.25	2.15	.54	.30	2.20	.66	300# (16-20-0)	$80/ton	12.00	13.20
List	.30	2.45	.74	.35	2.20	.77				1.51
Planting	.20	3.00	.60	.25	2.20	.55	100# Seed	$5.50/cwt	5.50	6.65
Irrigate (5x)				2.50	1.90	4.75	2 AF Water	$7.50/AF	15.00	19.75
Chemical Weed Control	.25	3.50	.88	.30	2.20	.66	2# Dactal	$1.50/lb.	3.00	4.54
Combine	.50	4.85	2.42	.60	2.70	1.62				4.04
Haul	1.00	3.20	3.20	1.15	2.20	2.53				5.73
Field Cleanup	.06	1.75	.10	1.00	1.90	1.90				2.00
Total			10.18			14.98			35.50	60.66

APPENDIX O

Estimated Variable Costs for Producing One Acre of Cotton — Southern Region, Nevada

Operation	Hours of Machine Time (1)	Machine Cost Per Hour (2)	Total Machine Cost (1 x 2)	Hours of Labor Required (4)	Wage Rate Per Hour (5)	Total Labor Cost (4 x 5)	Amount & Type of Material (7)	Cost Per Unit (8)	Total Material Cost (7 x 8)	Sub-Total Variable Cost (1 x 2) + (4 x 5) + (7 x 8)
	(hours)	(dollars)	(dollars)	(hours)	(dollars)	(dollars)			(dollars)	(dollars)
Rip	.60	5.10	3.06	.70	2.20	1.54				4.60
Disc (2x)	.50	3.20	1.60	.60	2.20	1.32				2.92
Land Plane (2x)	.80	2.50	2.00	.90	2.20	1.98				3.98
Fertilize	.25	2.15	.54	.30	2.20	.66	500# (16-20-0)	$80/ton	20.00	21.20
List	.25	2.45	.61	.30	2.20	.66				1.27
Pre-Irrigate				1.50	1.90	2.85	1.0 AF Water	$7.50/AF	7.50	10.35
Roto-Mulch	.25	2.65	.66	.30	2.20	.66				1.32
Planting	.30	3.30	.99	.35	2.20	.77	8# Seed	$0.25/lb.	2.00	3.76
Chemical Weed Control (2x)	.50	3.50	1.75	.60	2.20	1.32	1½ pt. Treflan	$26/gal.	9.75	12.82
Irrigate (5x)				2.50	1.90	4.75	2.5 AF Water	$7.50/AF	18.75	23.50
Irrigation Preparation (4x)	.20	1.80	.36	.25	2.20	.55				.91
Cultivate (2x)	.50	2.25	1.12	.60	2.20	1.32				2.44
Sidedress	.30	5.40	1.62	.35	2.20	.77	200# NH_3	$80/ton	8.00	10.39
Insect Control (5x)	Custom								22.50	22.50
Defoliate	Custom								5.00	5.00
Pick (1st)	1.00	8.20	8.20	1.15	2.20	2.53				10.73
Haul	1.25	2.40	3.00	1.40	2.20	3.08				6.08
Pick (2nd)	.50	8.20	4.10	.60	2.20	1.32				5.42
Haul	.75	2.40	1.80	.85	2.20	1.87				3.67
Added Crew Costs				2.00	1.90	3.80				3.80
Scrap	.50	4.45	2.22	.60	2.20	1.32				3.54
Haul	.50	2.40	1.20	.60	2.20	1.32				2.52
Cut Stalks	.20	2.25	.45	.25	2.20	.55				1.00
Field Cleanup	.06	1.75	.10	1.00	1.90	1.90				2.00
Total			35.38			36.84			93.50	165.72