An Economic Analysis of Occupational Benefits Among Nevada Cattle Ranch Employees

By Don Breazeale, Rangesan Narayanan, and Rodney Torell

Abstract

The major purpose of this study was to develop an economic analysis for producers concerning the extent and use of fringe benefits for their ranch employees. Nevada ranch managers were found to be providing a sizable number of fringe benefits, the most prevalent being housing, utilities, and health insurance. Results indicated that occupational differences did not explain variations in a benefits/salary ratio, however they did constitute approximately one-third of the salary for all occupations. Furthermore, as ranch size increased, there was an increase in the value of the benefits package and number of ranch employees.

Introduction

Recruitment and retention of an agricultural labor force is of economic importance to farm and ranch managers. Instability caused by high turnover rates of employees lead to lower productivity and large transaction costs in the search and hiring process of new employees. Thus, maintaining stable worker productivity is as much of a concern to producers as the productivity of other assets utilized by the ranch (Billikopf, 1994). Managers often have the choice of providing benefit packages (often at lower costs than equivalent monetary compensation) to induce a more stable work force. The choices made in terms of compensation versus work force productivity ultimately have a direct affect on overall ranch profitability (Kay and Edwards, 1994).

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Nevada producers frequently contact University of Nevada Cooperative Extension (UNCE) educators and specialists requesting information about salaries and wages, benefits offered and their costs, and the number of full and part-time employees required by ranch size (i.e., number of cattle). There is very little published agricultural labor data related to fringe benefits that Extension is able to provide. For example, the United States Department of Agriculture (USDA) through the National Agricultural Statistics Service (NASS) only publishes agricultural worker estimates and hourly wages for Intermountain Region II that combines Nevada, Utah, and Colorado. The Nevada Department of Employment, Training, and Rehabilitation releases information, but it includes only those operations covered by unemployment insurance.

Due to the large agricultural sector in California, some information about farm workers and their compensation packages is available there. Johnston and Martin (1984) completed a rather detailed analysis of the California farm labor situation. This study reported farmers' responses to questions about year-round and seasonal employment in 1982, wages and fringe benefits offered to workers and employer satisfaction with the quality and quantity of the farm workers that they employed. More recently, Rosenberg (1998) completed a study on unauthorized workers in California. He also noted that farm workers typically receive little more than half the wage rate found in manufacturing even though farm jobs generally require judgment, manual skills, and stamina. Rosenberg, Gabbard, Alderete, and Mines (1993) also completed a demographic and employment profile of perishable crop farm workers for California.

As farm workers gain new work skills, including proficiency in English, it is less costly for them to be more mobile and find off-farm employment (Gabbard and Perloff, 1996). Bratton (1988) found that the value of fringe benefits offered to agricultural workers was frequently underestimated. However, a lack of fringe benefits is often a major reason why there is a high turnover of agricultural workers.

Scope of the Study

From an economic standpoint, there are a number of factors that affect the type and amount of benefits that employees receive. Some benefits may be negotiated between employee and employer on an individual basis. Offering certain types of benefits as opposed to an equivalent monetary compensation may provide cost advantages to employers. Examples of this are giving meat to ranch workers or free meals to restaurant workers. Another reason for the non-monetary benefit might involve improving productivity at the ranch. Examples of such benefits include paying for health insurance, making cell phones available to employees, or making reliable transportation available. Provision of certain types of benefit payments provides tax advantages to both ranch owners and employees. Types and amounts of benefits vary not only between industries but also among occupations within an industry.

Faced with today's economic realities, it is important for Nevada farm and ranch managers to become more knowledgeable about the nature of salary and benefit packages. Therefore, a survey was conducted to gather information about the current ranch labor market situation in Nevada. The major purpose or focus of the survey was to gather information that would provide guidelines for producers concerning the extent and use of fringe benefits for ranch employees.

The survey was designed with three specific study objectives in mind: (1) to gather baseline information concerning salaries, benefits offered, percentage of positions receiving benefits, and number of employees per ranch; (2) to evaluate what factors explain the variations in fringe benefits paid to employees; and (3) to determine the relationship between the number of full and part-time employees and ranch size.

Data Collection and Compilation

The survey was included as part of the University of Nevada-Reno Livestock Newsletter received by approximately 500 Nevada cattle ranch owners and managers. To increase the number of usable responses it was also distributed at the annual Cattlemen's Update programs held in various sites throughout Nevada. These were deemed to be effective methods for

increasing the number of responses as well as to elicit more complete answers to the questionnaire because of the long-standing working relationship between UNCE and the state's cattlemen. A total of sixty-nine useable responses were received. Though this constitutes a relatively small response rate, the sample size was deemed adequate to perform the relevant statistical analysis. One problem with the sample was that the responses were not completely random. Only those producers that chose to fill out the survey instrument did so, and therefore the sample would be subject to what is known as selectivity bias.

The survey instrument consisted of thirteen questions. The respondents were asked to list by position (i.e., manager, cowboy, irrigator, etc.) the salary or wage, benefits provided, and the approximate dollar value of benefits. In addition, respondents reported the number of employees and the number of cattle per ranch.

The information gathered was analyzed using Microsoft Access 97 Database software. Frequency counts and percentages were used to compile the data by position. An econometric software package called "Shazam" was used to analyze the factors that explain variations in fringe benefits and to determine the relationship between the number of full and part-time employees and ranch size (White and Whistler, 1997).

Analysis and Results

Employment Characteristics

The first section of the survey elicited information about salaries, benefits, and the associated costs of benefits that were provided to workers. The occupations covered included manager, cow boss, cowboy, mechanic, irrigator, laborer, and cook. The "cook" category was eliminated from the statistical analysis since it did not have an adequate sample size. The total number of reported positions under the various occupational categories was 151, however not all ranches provided complete data for these positions. Some ranches failed to report salary and/or benefits data. There were 105 positions with complete salary and benefit data. Table 1 lists the average monthly salary and the minimum and maximum salaries that were reported for the six remaining categories of occupations. The average monthly salaries for the positions ranged from a high of $2,040 for a ranch manager down to $1,074 for a laborer. Table 1 also indicates that with the exception of cowboy and mechanic categories, the average cost of benefits increased as salary increased. The manager and laborer occupations exhibited the widest variation among the benefits offered.

Table 1: Monthly salaries and cost of benefits by occupation.

Occupation	Average Salary	Minimum Salary	Maximum Salary	Average Benefit Cost	Benefit to Salary Ratio
Manager	$2,040	$900	$5,000	$660	0.3235
Cow boss	$1,486	$1,000	$2,350	$585	0.3936
Cowboy	$1,159	$700	$1,800	$509	0.4392
Mechanic	$1,472	$916	$2,500	$450	0.3057
Irrigator	$1,074	$750	$1,300	$427	0.3976
Laborer	$1,074	$500	$2,500	$374	0.3482

Table 2 shows the percentage of employees receiving certain benefits (i.e., housing, utilities, health insurance, vehicle, meat, retirement, vacation, and other). More than half of all positions in each occupation were receiving housing, utilities, and meat. Vacation and health benefits were offered to about the same percentage of positions in each occupation. The provision of a vehicle was highly variable between occupations. The percentage of positions receiving retirement benefits was low for all occupations.

Table 2: Percentage of positions receiving benefits.

Position	Housing	Utilities	Health	Vehicle	Meat	Retirement	Vacation	Other
Manager	81	75	47	63	63	13	50	3
Cow boss	100	94	44	50	63	13	50	19
Cowboy	90	84	42	23	65	16	48	16
Mechanic	62	54	47	23	46	0	31	15
Irrigator	89	73	36	41	50	9	32	9
Laborer	73	57	24	30	57	3	24	11

Table 3 provides a compilation of the percentage of ranches offering specific benefits by ranch size. While there are a couple of small exceptions, as a general rule, housing, utilities, and meat are provided to a higher percentage of employees as

ranch size increases. The results for the other benefit categories show a high amount of variability. Each of these benefits has a monetary value. This study focused on the total monetary value of all benefits to ranch workers as is explained later in the paper.

As can be seen from Table 4, forty-nine ranches (82%) reported having between one and four full-time employees and fifty ranches (83%) reported having between one and four part-time employees. Only eleven ranches (16%) had more than four full-time employees and ten ranches (17%) had more than four part-time employees. Respondents were asked if their part-time employees worked more or less than 150 days during the year. Thirteen ranches (24%) employed workers more than 150 days during the year and forty-two ranches (76%) employed part-time workers 149 days or less.

Respondents were also asked to list the number of head of cattle one year and older on their inventory. Table 5 shows the number of ranches and the corresponding number of cattle. Approximately sixty percent of the ranches had 600 head or less and forty percent had more than 600 head.

Explaining the Variation in Employee Benefits

In this section, an attempt was made to answer what factors explain the variation in the dollar amount of benefits offered to employees. The type of benefit offered to employees in various occupational skills was already shown in Table 2 and was discussed in the previous section. However, the variation in the monetary value of the benefits to employees needs explanation.

Benefits to the employees were measured by the ratio of the estimated monetary value of the benefits offered to the total gross monetary salary. The benefit to salary ratio (B/S) is a simple and meaningful measure of employee benefits and is easily comparable under a wide variety of situations. As pointed out earlier, there are strong apriori reasons that occupational differences may explain these variations. Another factor that may be relevant is the size or scale of the operation. The number of head of cattle was used as a variable to represent ranch size (RS). It is assumed that a unique linear relationship exists between benefit to salary ratio (B/S) and ranch size (RS). As an example in Figure 1 below, the relationship between B/S and RS for two occupations is shown.

Table 3: Percent of ranches offering benefits by ranch size.

No. of Cattle	Housing	Utilities	Health	Vehicle	Meat	Retirement	Vacation	Other
0 - 200	66.67%	50.00%	16.67%	33.33%	33.33%	8.33%	16.67%	25.00%
200 - 500	84.85%	87.88%	48.48%	54.55%	75.76%	0.00%	42.42%	27.27%
500 - 1000	84.62%	84.62%	53.85%	30.77%	46.15%	15.38%	61.54%	0.00%
1000 - 1500	96.15%	76.92%	50.00%	26.92%	80.77%	7.69%	38.46%	3.85%
1500 - 2500	100.00%	100.00%	75.00%	100.00%	100.00%	66.67%	66.67%	0.00%

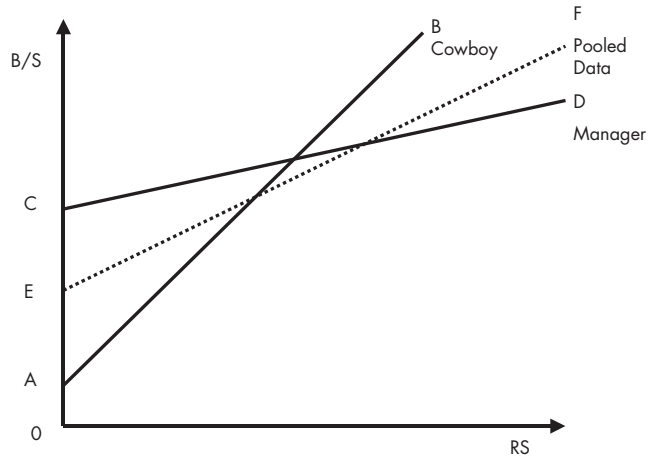
Table 4: Number of ranches by size of labor force.

Number of Employees	1 – 4	5 – 9	10 – 19	20 – 49
Full-Time	49 (82%)	7 (12%)	3 (5%)	1 (2%)
Part-Time	50 (83%)	8 (13%)	0 (0%)	2 (3%)

Table 5: Number of ranches by head of cattle one year or older.

Less than 100	101 to 300	301 to 600	601 to 1000	1001 to 2000
8 (12%)	14 (21%)	19 (28%)	9 (13%)	10 (15%)

Figure 1: Relationship between benefits/salary ratio (B/S) and ranch size (RS).



Line AB represents the relationship for cowboys and CD represents the same relationship for managers. The vertical intercept OA for cowboy is smaller than the vertical intercept OC for the manager category. However, line AB is steeper than line CD. Each occupational category may have its unique relationship. These relationships will have different vertical intercepts and slopes. These can be represented by separate single linear equations. However, these separate equations can be combined or pooled into a single equation econometric model. Formulation of such a model facilitates testing various hypotheses related to the intercept and slope parameters among or between occupations. However, such models require what are called "dummy variables." In this study, the following single equation econometric model was used:

$$B/S = a_1 + \sum_{i=2}^{6} a_i D_i + b_1 RS + \sum_{i=2}^{6} b_i (D_i * RS) + u \quad (1)$$

where D_i is a dummy variable that will take on a value of 1 for the ith occupational category otherwise has a value of 0. The occupational categories used were cowboy (D1), Irrigator (D2), laborer (D3), manager (D4), mechanic (D5), and cow boss (D6) in this order. The dummy variable D1 was left out of equation 1 to avoid multicollinearity. However, the estimated value of a_1 and b_1 would capture the intercept and slope for the relationship involving the cowboy category that is associated with the dummy variable D1. This model allows estimation of the separate relationships for each occupational category.

Since data on B/S and RS were available by occupation, multiple regression analysis could be used to estimate the parameters of the model (a_i's and b_i's). The estimated value of a_1 represents OA in Figure 1 and the estimated value of a_4 represents AC in Figure 1 so that the estimated values of $a_1 + a_4$ represent the intercept term for manager.

Similarly, the estimated value of b_1 represents the slope of AB for the cowboy's category. The estimated value of $b_1 + b_4$ represents the slope of CD for the manager category. Therefore, the estimated values of a_2 toa$_6$ and b_2 to b_6 can be respectively regarded as changes from the base value of intercept a_1 and slope b_1 for the cowboy category. If a_2 to a_6 and b_2 to b_6 were not statistically different from zero, it can be concluded that occupational differences did not explain the variations in B/S.

Equation 1 was estimated using data by ranch and occupational category. Complete salary and benefit data were available for only 105 out of the 151 reported positions. A hypothesis test was conducted to determine if there were differences in relationships among the various occupational categories. The appropriate test involved the null hypothesis H_o: a_i=0 and b_i=0, $_i$=2, 3, 4, 5, 6. Test results using the F distribution indicate that occupational differences did not explain the variations in the benefits to salary ratio. Since the occupational differences did not contribute to the explanation of variations in salary to benefit ratio in the data set, the occupational differences were ignored and a single data set was created for all occupations. In other words, the entire data set was stacked and a pooled data set was created. The reformulated model was estimated both as a linear and log-linear relationship with respect to ranch size using ordinary least squares:

$$B/S = 0.327 + .0000740\ RS \quad R^2 = .0538 \quad (2)$$
$$(8.076) \quad (2.420)$$

$$\ln (B/S) = -2.471 + 0.210 \ln RS \quad R^2 = .0922 \quad (3)$$
$$(-5.991) \ (3.401)$$

The numbers shown in parenthesis are t-values that indicate that the intercept and the slope parameters were significantly

different from zero. The estimated linear relationship was similar to EF shown by the dotted line in Figure 1. The linear relationship indicated that the base fringe benefit is 32.7% of the salaries regardless of the occupation. The model indicated that for every increase in 100 head of cattle the B/S ratio would increase by 0.74%. In terms of the log-linear model, the results showed that a 10 percent increase in ranch size would result in a B/S ratio increase of 2.1%. These results provide guidance as to the going rates for ranch benefits paid out to employees. Even though both estimated equations explain less than 10 percent of the variations in the B/S ratio for ranch employees, these results provide statistically significant guidance as to the going rates for employee benefits in relationship to ranch size.

Explaining Relationships between Number of Employees and Ranch Size

In the previous section it is shown that the benefits to salary ratio has a positive relationship to ranch or herd size. In order to explain this relationship, it is important to understand how the number of employees and the composition of labor vary in the different ranch sizes. In particular, apart from the ranch employees' occupational skills, the composition of the labor in terms of full time and part time employees will likely play a role in the explanation of the benefit structure. Since typically part time employees are not offered the same extent of benefits that the full time employees are paid, the structure of benefits is likely to vary with the number of part-time and full-time employees on the ranch.

Relative to terms of employment, full-time and part-time Nevada cattle ranch employees represent two distinct labor markets. These two markets are differentiated by skill, length of employment, and benefit structure. The survey data set was used to estimate two distinct relationships: one between the number of full-time employees and ranch size and the other between part-time employees and ranch size. In particular, the study attempted to answer the question of whether or not the number of employees in each category varied with ranch size and to what extent.

Nevada cattle ranches normally have significant haying operations in addition to their cattle enterprise. Many of the part-time employees are utilized in the haying operation as seasonal workers. They will work full-time for a period of several months during the year. Therefore, the total numbers of employees per ranch are involved with both the year-round cattle operation and the seasonal haying operation.

The survey broke down the number of employees for each ranch under categories of "full-time" and "part-time". Data on the specific number of hours worked by part time employees was not available. In this study, the number of full-time and part-time employees is assumed to have linear relationships to ranch size. However, this does not necessarily imply that these two relationships are completely independent. In reality, it is reasonable that the discrepancy (random error term) between the "true predicted" number of full-time employees to actual number of full-time employees will be negatively correlated with the discrepancy between the required "true predicted" number of part-time employees and the actual number of part time employees. In econometrics, models involving such interdependence between two equations through the error terms are called "seemingly unrelated regressions." In spite of such interdependence, it can be shown that since both relationships involve the same dependent variables, namely ranch size, the equations can be separately estimated using ordinary least squares. Based on this premise, the following estimated relationships were found:

$$\text{Full-time} = 2.1196 + .00147\ RS \quad R^2 = .1815 \qquad (4)$$
$$(3.830) \quad (3.262)$$

$$\text{Part-time} = 2.5487 + .000706\ RS \quad R^2 = .1095 \qquad (5)$$
$$(7.157) \quad (2.430)$$

Although equations (4) and (5) only explain a relatively small proportion of the variation in employee numbers, 18 and 11 percent respectively, a small but statistically significant slope coefficient (i.e., rate of change in employee numbers as ranch size changes) further illustrates that the number of employees on a ranch is somewhat fixed. One implication of the equations estimated is that the ratio of part time to full time employees decreases as the size of the ranch increases. For example, the

ratio is 1.125 for a ranch size of 200 head compared to .741 for a ranch of 2,500 head. In terms of benefit structure, the relationships indicate that the larger ranches have larger B/S ratios since they pay benefits to relatively more full time employees than smaller ranches. The results indicated that the number of base-line full-time employees on a ranch was 2.12 and part-time employees equaled 2.55. An increase of 1000 head would require an increase of 1.47 full-time employees and about 0.71 part-time employees.

Discussion and Conclusions

Due to the economic importance of finding and keeping good agricultural workers, it is necessary for farm and ranch managers to become more knowledgeable about salary and benefit requirements in their respective areas. From this study, it was possible to obtain important information about ranch employees and associated fringe benefits. Using the economic model described earlier in the paper it was possible to predict employment and benefits by ranch size. Table 6 displays five hypothetical ranches and the predicted number of employees for each ranch size. Ranch sizes ranged from a low of 200 head of cattle to a high of 2,500 and the number of employees required for each ranch size ranged from 5.1 to 10.1 respectively. In addition, the predicted cost of fringe benefits for each ranch was also displayed.

Table 6: Predicted employment and benefits by ranch size.

Ranch Size	Predicted Employees			Predicted Cost of Fringe Benefits
(Number of Cattle)	Part Time	Full Time	Total	Percent of Salary (B/S)
200	2.7	2.4	5.1	34.18%
500	2.9	2.9	5.8	36.40%
1000	3.3	3.6	6.8	40.10%
1500	3.6	4.3	7.9	43.80%
2500	4.3	5.8	10.1	51.20%

The study found that Nevada cattle ranches provide a sizable number of fringe benefits. While some benefits may be negotiated between employer and employee on an individual basis, other benefits may be offered in lieu of equivalent monetary compensation. This type of compensation may be provided because of a cost advantage to the employer or as a means of improving productivity. Test results indicated that occupational differences did not explain the variations in B/S. However, when a pooled data set was created it did show that the value of fringe benefits was approximately one-third of salary regardless of the occupation. Furthermore, as ranch size increased (i.e., per 100 head) there was an increase in the value of the B/S ratio. Finally, the study also found that ranch size did have a small but statistically significant impact on the number of both part-time and full-time ranch employees. In addition, the results indicated that the ratio of full-time to part-time employees increased as ranches became larger. This in part explains why larger ranches have higher B/S ratios.

This type of information has not previously been available to Nevada producers in this form. Ranch employers and Cooperative Extension personnel will hopefully find the information developed in this study useful for managerial decisions and educational programs.

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