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Colleen M. Brady

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A COMPARISON OF EXPENSES ON BOARDING, RIDING, AND TRAINING STABLES IN MICHIGAN

By

Colleen M. Brady

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ABSTRACT

A COMPARISON OF EXPENSES ON BOARDING, RIDING, AND TRAINING STABLES IN MICHIGAN

By

Colleen M. Brady

Data collected by the Michigan Equine Monitoring System were used to analyze the expenses reported on boarding, riding, and training stables in Michigan, in 1990. These data were analyzed to detect differences in expenses by operation type, size category, and size category within operation type. Statistical Analysis Software was used to perform this analysis.

The data indicate that there are more differences present in expenses based on operation type than on size category. In most expenses, there was the greatest annual expense per horse on training stables, and the least on boarding stables. There are more differences by size category within operation type, than by size category alone. On training stables, there is evidence of economy of scale, while boarding stables show the facilities of 3-9 horses to have the lowest annual expense. Riding stables showed very little difference based on size category.

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CHAPTER I

INTRODUCTION

The relationship between horses and humans is truly unique. For centuries, the horse provided transportation and power to conquer the land and enemies. The introduction of the horse to warfare gave men like Alexander the Great the ability to conquer new worlds, and gave people living miles apart the ability to exchange ideas and information.

Not only were horses invaluable in war, they also enabled farmers to better produce crops, and provided entertainment to rich and poor alike. Horse racing, polo, and bashkari (Afghanistan) are but three of the hundreds of games men and horses play together.

With the advent of the motorized vehicle at the turn of the century, it appeared that horses would no longer serve as a significant part of the economy. With tractors to replace them in the fields, cars to replace them on the highways, and tanks to replace them on the battlefields, horses seemed destined to go by the wayside, and the sight of the horse would become as rare as the bison.

There was one place, however, where the horse was not replaced by mechanization: pleasure. "Paradoxical as it may seem, in our automated, computer-governed age, the horse is once again becoming an important part of American life" (Alampi,1970). As the world became more mechanized, leisure hours increased. This time needed to be filled, and many

people used horses to do so. Some bought horses to race, some to show, and even a few to breed more horses. The largest portion of the horse owning population, however, owns horses just for pleasure. To go for a ride on a sunny afternoon, or to trail ride with friends. These people are the heart and soul of the horse industry, and contribute greatly to the economies where they live.

Instead of decreasing in numbers, the horse increased in population after World War II, with an estimated 7-10 million horses in the US in 1970. In 1970, it was estimated that a total of $7.5 billion was invested in the US horse industry (Bolt, 1970). It was estimated that the value of horses accounted for over $2 billion, and the remaining $5 billion was spent in the economy to maintain and support the horses. This money was spent at boarding stables, tack and feed stores, and other horse related enterprises.

A survey in 1984, conducted by the American Horse Council, reported that 750,000 Americans spent approximately $15 billion on the horse industry. This money was spent maintaining the estimated 5.2 million horses in this country, and by spectators attending or betting on horse events. The $15 billion earned by the horse industry in 1984 constituted 16% of the Gross National Product of the agriculture and fisheries section of the economy (American Horse Council, 1987). In addition to dollars spent by spectators and owners, the horse industry makes contributions to the economy

through jobs, ranging from grooms and trainers, to construction workers to build horse facilities, and maintenance crews for showgrounds and racetracks. There are also people employed working for tack and feed stores, veterinarians, and publications which interact with the horse industry.

The horse industry in Michigan contributes over 256 million dollars to the Michigan economy each year. These dollars are generated by the 28,700 owners and operators that own or care for the state's 130,000 horses. These owners and operators also realize $122,000,000 of income yearly. The largest portion of this income, 34%, is generated by 1600 riding, training and boarding operations, with a total of 42 million dollars earned.(MEMS 1991) This is consistent with a 1971 Michigan study which also reported boarding as the primary income producing facet of the horse industry.

The horse industry is unique among livestock enterprises, in that the most profitable operations are generally not animal production facilities. Although there are many owners/operators who breed horses, and sell them, the most consistently profitable industries are service oriented, such as boarding, training, or riding facilities. (Holleran, 1973)

There are many contributing factors to explain why production facilities are generally less profitable than service facilities. One is the longer generation interval for horses. Where a dairy cow calves and begins contributing to

the operation's revenue at 24 months, it is extremely common for mares not to foal before the age of four. This means the operator has an additional two years of input costs before a mare can provide any income. In addition, the foal that mare had at the age of four will likely maximize it's marketability after being started under saddle, usually between the ages of three and four. In the best case scenario, where the foal is sold as a weanling, the mare is five before she creates a salable product. It is feasible,however, that the mare could be seven years old before she provides any revenue for the operator, if the sale of the offspring is delayed until it is trained to ride.

The input costs for producing foals is also higher than for other species. The breeding fee for an outstanding dairy or beef bull is unlikely to exceed $250, while the stud fees for stallions can range from $250 to over $100,000 for an established sire of racehorses. Examination of advertised service fees in several breed publications shows the 1994 average to be between $1,000 and $2,000 for a stallion with a respectable show record. In addition, there are many rules and regulations determined by different breed registries and organizations limiting the use of technologies such as artificial insemination and embryo transfer which are common in other livestock species, and contribute to their profitability from a production standpoint. Turnover of animals in the horse industry also occurs at a slower rate

than in other livestock species. Most horses stay in the industry until they die a natural death, which can be in excess of 20 years. Therefore, the replacement rate for horses is much lower than in other species. For these reasons, traditional evaluation methods may not accurately characterize the horse industry.

For most horse owners, the horse is a leisure or recreational investment, much like a boat or a summer cottage. The horse's major purpose for these people is to provide relaxation or entertainment after a day's work (Michigan Equine Survey, 1972 & 1984). Because many of these people choose not to be intimately involved in the care of the horse, there is a demand for knowledgeable, competent people to operate facilities to care for or train these horses. It is in this service capacity where the horse industry becomes profitable, and provides a livelihood for its participants.

Boarding, riding and training stables are operated with the intention of making a profit, or at least breaking even, depending upon the mission of the operation. For these reasons, this research will concentrate on boarding, riding, and training operations.

Three hypotheses will be tested in this study:

* a difference exists in expenses based upon operation type, regardless of operation size
* a difference exists in expenses based upon operation size, regardless of operation type
* a difference exists in expenses by operation size, which varies by operation type

This study is concentrating on analysis of expenses instead of income for two reasons:

1) Profitability of a business is most affected by input costs.(Harsh, Connor & Schwab) Profitability is defined as the difference between revenue and costs. Because the facilities considered here are service instead of commodity oriented, the operator has a greater degree of flexibility than does a producer of other animal products, which are sold for a competitive price. Efficient management of costs is still imperative, as it will increase the profitability of the operation.

2) The expenses reported in the MEMS Survey, which constitutes the data base for this analysis, would appear to be more reliable than the incomes. The barter and trade system are still used commonly in the horse industry, and the value of these items is likely to be unreported, or reported inaccurately. Many income producing activities, such as lessons, are remunerated in this way.

In addition,there was a greater degree of non-reporting on the survey questionnaire in the area of income than in expenses.

There are some drawbacks intrinsic in the use of survey data, such as reliability of reporting. There are also likely to be some inaccuracies in areas such as labor hours reported. As in other livestock species, operators tend to discount their own hours of labor and report only hired labor hours.

Considering the paucity of data presently available regarding horse facilities, these analyses will be of value as a starting point for future studies.

Surveys or studies quantifying the economic impact of the horse industry are scarce, and analyses of management practices are non-existent. Most surveys concentrate more on how the horse industry affects the economy of an area, than the actual economics of owning or managing a horse operation (AHC,1987, & Economic Impact of the Virginia Horse Center, 1991). There have been studies conducted within other species (Hoyt,1955; Pickler,1947), that attempt to quantify expenses, and make management recommendations. The sheep industry and beef industry both have handbooks designed to help operators evaluate the economic and financial condition of their operations.

The dairy industry is by far the leader among large farm animal species groups in economic analysis, and the operators in this field have several references available both on a national and regional basis. Telfarm is an example of a program which assists the producer in analyzing the financial condition of the operation, and utilizing that information to make management decisions. In a search for journal articles discussing the economics of various livestock enterprises, there were 123 entries for the Dairy industry, 80 for the beef industry, 25 in swine, 17 in sheep, and 1 article on the horse industry, which was published in 1932.

At the present time, there is an inadequate supply of information available for the operator who is considering expanding or starting a profitable horse business. There are no guidelines available for identifying and quantifying operating costs.

If the horse industry is going to move forward in the business place, these operators need the methodology by which to evaluate their facilities, and benchmarks to allow them to determine what types of management decisions need to be made.

This study will report which expenses constitute the largest portion of the total expense for operators of boarding, riding, and training stables. It will also report benchmarks, the mean dollars/horse/year that operators are spending in each of the expense categories surveyed.

CHAPTER II

LITERATURE REVIEW

The key to an extended life in the horse industry is increasing profitability, just as in any other aspect of the livestock industry. Although there is limited data available on horse operations specifically, extrapolations can be made from other industries to help calculate the profitability of an operation.

The dairy industry is by far the leader in economic evaluation of an operation, and many of these concepts can be applied to the horse industry with a few changes. Profitability of dairy farms can be measured by some key farm business parameters (Galton, 1990). The number of cows per worker, pounds of milk sold per cow per year, pounds of milk sold per worker per year,cost of producing a hundredweight of milk, debt per cow and debt service per cow per year, capital investment per cow, and rate of return on equity per cow.

Telfarm is an example of a package created to help operators in the dairy industry to make these profitability calculations, and make informed management decisions. Telfarm provides a format for a producer to itemize and calculate expenses and incomes in every enterprise in the business. In addition, sectors of the dairy industry publish summaries of this information, to give operators a set of benchmarks to use for comparison. This study used these materials to assist in the decisions relative to which expenses to analyze and which

to exclude. In addition, opinions were solicited from participants in the industry to formulate a collection of expenses which were perceived to be of value.

The sheep industry has also published a handbook, Guidelines for Production and Financial performance Analysis for the Sheep Producers(1992), to measure the profitability of sheep operations. This handbook includes calculations to quantify feed and pasture expenses and reproductive criteria such as number of lambs per ewe exposed.

Studies in the swine industry have shown that there is a decrease in cost of production as operation size increased (Canadian Journal of Animal Science, 1992). This research will try to identify a similar economy of scale in the horse industry.

These parameters can all be adapted to the horse industry with a few minor changes. In a boarding or training operation, change the income unit from a cow to a housing unit, either a stall or the amount of pasture necessary to house one horse. In a breeding or riding operation, the individual horse becomes the income unit, and sale of offspring or collection of breeding or riding fees becomes the equivalent of the milk income.

Data presently available on the horse industry consists primarily of censuses, and some figures on overall economic impact of the industry in a specific area. The American Horse Council (AHC) reported 750,000 owners and spectators spent

over $15 billion in 1984 maintaining horses, or attending horse events. This $15 billion is divided amongst the farm, manufacturing, and service sectors of the economy. The horse industry in 1984 accounted for 16% of the Gross National Product from the Agricultural Sector. In Michigan, $398 million was contributed to the state's Gross National Product. (AHC, 1985)

Boarding was the number one income producing facet of the horse industry in Southern Michigan in 1971, followed by breeding and riding respectively. This was based on a survey of recreational horse facilities done in 1971 (Holleran, 1973). Michigan Equine Monitoring System(MEMS) conducted a survey in 1991 that indicated that training operations were now leading the income category and boarding had fallen to third. Breeding still ranked second.

The horse industry can be approached from two angles, either as a hobby or as a business, and many operations are a combination of the two. A survey conducted by the MSU Cooperative Extension Service in 1971 revealed that only one-third of all horse enterprises hired labor from outside the family, and many of those were only seasonal employees. For this reason, it is difficult to ascertain exact labor expenses. A 1984 study by the USDA and MDA (Michigan Equine Survey, 1984), ascertained that there were 2600 full time employees earning an average of $8100 annually, and 5200 part-time employees averaging $1800 of income annually. This

current study reflects the same difficulty with labor as those conducted previously. Most operators of livestock industries do not report their own labor or the labor of family members, skewing the labor data available. The MEMS 2nd round has tried to deal with this problem by receiving reports of unpaid labor from operators, however, that information is not yet available.

There have been many changes in the tax structure dealing with the horse industry in the last ten years, and it is not one of the objectives of this study to analyze these, only to show that improving and quantifying the profitability of the horse operation is of increasing importance. The 1993 Presumption of Profit Publication from the Internal Revenue Service states that breeding, racing, training, and showing operations must show a profit in 2 of seven years. All other operations, including boarding and riding, must show a profit in three of five years to be considered a business, not a hobby.

There is a limitless future for advancement of the horse industry, as there is a constant inflow of new participants. Nationwide 4-H programs show that there are more young people involved with horse projects(230,000) than with cattle projects(150,000)(Dyke, 1978). In 1993, there were 10,682 4-H horse projects in the state of Michigan (Michigan Conference on the Horse Industry,1994).

A survey in 1984, conducted by the American Horse

Council, reported that 750,000 Americans spent approximately $15 billion on the horse industry. This money was spent maintaining the estimated 5.2 million horses in this country, and by spectators attending or betting on horse events. In addition to dollars spent by spectators and owners, the horse industry makes contributions to the economy through jobs, ranging from grooms and trainers, to construction workers to build horse facilities, and maintenance crews for showgrounds and racetracks. There are also people employed working for tack and feed stores, veterinarians, and publications which interact with the horse industry.

Participants in the horse industry also contribute to the general economies of the areas in which they attend shows and other events. A 1991 study of the economic impact of the Virginia Horse Center, estimated that participants at shows and events hosted by the Horse Center spent $9.1 million in Virginia, with $7.7 million of that being in the Lexington-Rockbridge area immediately surrounding the Virginia Horse Center. The majority of this money was spent on food, lodging, and travel, making it apparent that the horse industry impacts not only the agricultural economy, but the broader economy as well. These figures do not include monies brought into the area through non-show events taking place at the operation.

The horse industry in Michigan contributes over 256 million dollars to the Michigan economy each year. These

dollars are generated by the 28,700 owners and operators that own or care for the state's 130,000 horses (MEMS 1991). These owners and operators also realize $122,000,000 of income yearly. The largest percent of this income (34%), is generated by the 1600 riding,training and boarding facilities, with a total of 42 million dollars earned (MEMS 1991). A 1970 study on the horse industry in Michigan reported breeding as the primary income producing facet of the horse industry (Holleran, 1973).

The survey conducted in 1972 by the Michigan State University Agricultural Experiment Station, estimated that total investment in horses and facilities exceeded $275 million, and covered over 35,000 acres in Michigan (MAES Report 323). Only one third of the operators of these facilities employed outside labor, the majority of them utilized family members as the primary labor source. This survey also projected that by 1985, the horse population in Michigan would grow from 171,000 in 1972, to exceed 400,000. The primary reasons for this growth would be an increase in available leisure time, an increase in family income,and a move toward suburban living (MAES Report 185).

The Experiment Station survey cited 3 factors which would discourage the growth of the horse industry, and as of 1994, all of these things have become factors in the horse industry, and agriculture in general. These include concerns relative to pollution of the environment by animal waste, increasing

urbanization leading to changing zoning ordinances and a lack of land available to house horses and other livestock, and changes in tax laws. The horse industry in Michigan and around the country was dealt a major blow in 1986 when the Internal Revenue Service made sweeping changes in the taxation status of horse facilities. (American Horse Council data, 1985-88) These changes included the Income Tax Reform and Economic Recovery Act, which changed the taxation status on breeding stock, making them a less appealing investment. Before these tax changes, investors could use breeding operations as tax shelters. The ability to do this was greatly reduced after 1986. This may be partially responsible for breeding falling from its 1970 position as the primary income producing operation. Records of total registrations in the American Quarter Horse and the Arabian appear to reflect this (Table 2.1).

TABLE 2.1 NUMBER OF ORIGINAL REGISTRATIONS FROM 1971-1993

Year	Quarter Horses[1]	Arabians[2]
1971	72,681	2,133
1980	137,009	6,569
1987	147,000	9,465
1988	128,000	8,750
1990	110,597	6,391
1993	104,876	1,326

[1] American Quarter Horse Association
[2] Arabian Horse Registry

A 1984 survey of the Michigan horse industry conducted by the Michigan Agricultural Reporting Service estimated that the horse industry injected over $200 million into the economy, and that revenues in the horse industry were approximately $180 million. The primary use of horses continued to be for pleasure, as it was in the earlier surveys. Total horses in Michigan in 1984 was estimated at 160,000, well below the projection of 400,000 estimated by the Agricultural Experiment Station in 1972. A tremendous drop in number of ponies in Michigan contributes to this general decrease. 1972 projections estimated that the pony population would exceed 61,000, the 1984 survey reported only 21,000 ponies, a decline of 66%.

Concerns relative to the horse industry are not confined to Michigan. The Wisconsin Agricultural Statistics Service conducted a survey in 1992 to quantify the impact of the horse industry on the Wisconsin economy. It is estimated that value of horses, land and buildings was approximately $655 million, and $125 million was spent annually to maintain the estimated 84,300 horses in Wisconsin. Once again, as in the Michigan studies, the primary use of horses was for pleasure.

Presently, most available literature on the horse industry deals more with physical management of the horse than with financial and economic management of the facilities. The literature suggests nutritional and exercise regimens, as well as housing and health care recommendations. (Johnstone, 1908)

If the horse industry is going to remain competitive and profitable into the 21st Century, operators will have to become more aware of the operating expenses on their operations. In addition, information which will assist operators in making calculations of expected costs will be of value when requesting business loans for starting an operation, or expanding one. This study will provide some benchmarks on selected expenses which may help the operators make some of these decisions.

CHAPTER III

MATERIALS AND METHODS

The data analyzed in this study were obtained through the Michigan Equine Monitoring Service (MEMS), and were collected by the Michigan Agricultural Statistics Service(MASS), in 1991. The sample was comprised of two sampling frames, a list frame and an area frame.

The list frame was created by collecting names from sources such as:

> breed associations, telephone directory listings of stables, large equine operations provided by county extension offices,large equine operations from the 1984 National Agricultural Statistics Service (NASS) list sampling frame, farms on the active NASS list frame with equine, and equine owners who attended the 1990 Stallion Show. The Michigan Department of Agriculture also provided lists of equine owners whose veterinarians performed Equine Infectious Anemia (Coggins) tests, owners with stallions for service, licensed riding stables, and racetracks. Duplication was removed, and over 13,000 names remained to comprise the list sampling frame.
>
> The list sampling frame was stratified by using size of operation,type of operation, and major breed or type of equine. Twenty strata were created and sorted by zip code, and systematic

random samples were drawn. Sampling fractions varied from 10-100 percent, and the total list frame sample was 2998 owners.

The area frame consisted of 338 segments, which are sections of land of approximately one square mile. Data from these segments which did not show up on the list frame were added to the total. Of the 338 segments, 272 had operators with horses on the facility as of June 1, 1990.(Michigan Equine Survey,1991)

The area frames were added to be sure to include smaller farms, backyard horseowners, and those who did not have a breed affiliation. The questionnaire (Appendix I) asked operators and owners to rank the level of their facilities involvement in the following activities: Boarding Farm, Breeding Farm, Other Farm, Racetrack, Riding Stable, Private Residence, and Training Stables. More detail on the actual survey technique can be found in the Michigan Equine Survey 1991. (Michigan Equine Survey, 1991)

As mentioned earlier, there are some drawbacks in the use of survey data, such as high variability in responses and differences in respondents interpretations of the questionnaire. The advantage of the technique utilized in this study was in the large number of observations obtained. Upon completion of the survey, and deletion of statistical

outliers, a database of 2040 operations remained.

This study will concentrate analysis on service-oriented facilities, specifically, boarding, riding, and training operations. Most facilities offer a combination of options, such as boarding and training, or lessons, (Holleran, 1973) but this study will concentrate on what was reported as the primary activity. Boarding stables are generally those that provide basic care, such as feed, housing, and turn out if necessary, and can range from full service facilities with all horses stalled, to an operation where the horse lives in the pasture year around. Training stables offer the same basic care, although horses are generally stalled, and in addition, the horse will be ridden or otherwise taught by the operator. Training stables cover the gamut from places where the horse lives for 30-60 days and is started under saddle, to facilities where the horses live all year around, and are shown at varying levels of competition. Riding stables are defined as those where horses can be rented at a predetermined rate for trail riding, or other equestrian activities.

The original database was also reduced to exclude any facilities where the major activity is racing either Standardbreds or Thoroughbreds. These enterprises were excluded because there is possibly a larger variation in expenses such as feed and health because of the physical stress these animals undergo. It is believed that the increased energy expended, and the more strenuous physical

exercise would create sufficient differences for racing to merit being analyzed separately. Facilities were also deleted which reported a total expense of zero or less, and those which reported a total expense of greater than $40,000 per horse per year.

Facilities were also divided into four size categories. Size category 1 had 1-2 horses (very small), size category 2 housed 3-9 horses (small), size category 3 housed 10-19 horses (medium), and size category 4 housed 20 or more horses (large). Although size category 1 represents 18% of the horse population in Michigan (MEMS 1990), these facilities were eliminated from this analysis, based on the assumption that these were not operated as income producing enterprises.

These operation sizes were arrived at based on the accumulated ideas of people with years of experience in the horse industry.

As stated earlier, the objectives of this study are to:

* identify differences in expenses based upon operation type,regardless of operation size
*identify differences in expenses based upon operation size, regardless of operation type
*identify differences in expenses by the interaction of operation size and operation type

Using Statistical Analysis Software (SAS), the condensed data set was used to calculate means and ranges on the following expenses on a $/horse/year basis:

TABLE 3.1 EXPENSES SELECTED FOR ANALYSIS

Board paid	Training fees paid
Breeding fees paid	Health costs
Feed(purchased and raised)	Insurance (equine related only)
Farrier	Travel and Lodging (equine related only
Advertisement	Utilities
Capital Improvements	Maintenance and Repair
Bedding	Tack
Rent/Lease (land and/or buildings)	Taxes (Property tax excluding residence)
Professional fees	Miscellaneous
Labor Expenditures	Other
Equipment Purchases	Total Expenses

Feed expenses were defined as the value of any feed purchased or raised for use on the operation. Labor expenditure was how much was paid for labor. This does not include value of free or bartered labor contributed by family members, or any other people. Total expenses consisted of the summation of all expenses on the questionnaire.

After the first summarization of these expenses, obvious outliers were removed from the data set. After removal of the outliers, the data were again processed to obtain the most

accurate estimates of each of these expenses as possible.

The raw data had heterogeneous variance, so all data were transformed to natural log to increase homogeneity. All analysis was conducted on the logged data. The data were also appropriately weighted based on sampling methods discussed earlier. The data were returned to normal values for reporting of means. Adjusted-log means are also reported. All analysis was done on the adjusted-log means.

The first test run was an Analysis of Variance (ANOVA). ANOVA compares actual mean squares to the value that would be expected in the situation of a null hypothesis, which states that there is no difference between the expected and the actual value. If the null hypothesis is false, and there is a difference present, the numerator increases, increasing the F value. A large F value rejects the null hypothesis.

To determine significance of any difference present, the P value is used. The P value estimates the probability of getting an even larger F value if the null hypothesis is true. The lower the P value, the greater confidence that rejection of the null hypothesis is correct.

Because this study contains unbalanced data, the ANOVA must be run with a linear model. The linear model uses a matrix which weights the number of observations meeting the specified restrictions. This is necessary with unbalanced data to avoid assigning the same importance to means containing different numbers of observations. A mean with 50

observations should be weighted differently than a mean with one observation.

The following linear model was used by this study:

$$Y_{ij} = u + T_i + S_j + TS_{ij} + E$$

with T representing type of operation, S representing operation size, TS representing the interaction of operation size and operation type, and E representing error. The significance of the model was tested for each of the expenses in Table 3.1. Any expense where the model was not significant at $P < .10$ was eliminated from further consideration because the larger the P value, the greater the probability that the null hypothesis is correct. If the model is not significant any comparisons made with that model are invalid.

The ANOVA identified which of the expenses on Table 3.1 showed differences by operation type, size category, or the interaction of operation type and size category. If $P > .10$, the relationship was considered insignificant, and the expense was excluded from further statistical analysis. If the expense was insignificant by the ANOVA, any level of significance identified by later test would be invalid.

This test was followed by calculation of adjusted-log means that would have been expected had the data been balanced. P values were then calculated from these adjusted-log means to identify significant interactions between combinations of operation type and operation size. The study

concentrated analysis on the five expenses that contributed the highest portion of the total expense on boarding, riding and training facilities. This was determined by ranking the adjusted-log mean for each expense which was significant by the interaction of operation type and size category. Miscellaneous and other expenses were eliminated from further analysis as they were judged to be too unspecific to provide valid comparisons. Any expense which was in the top five of 2 operation types is reported, as is labor. Labor was included because it was believed that this expense was important. The questionnaire asked for expenditures on labor, an area where it would be anticipated that operation type and size may have a large affect. Labor is a large expense on most businesses and farms, and would be expected to have the same influence on horse operations.

CHAPTER IV

RESULTS

SUMMARY OF RESULTS OF 1991 MICHIGAN EQUINE SURVEY

The 1991 Michigan Equine Survey, which provided the data base for this study, estimated the Michigan equine population to be approximately 130,000 head. This is a decrease of 30,000 from the 1984 inventory (Michigan Equine Survey, 1984). The 1984 Michigan Equine Survey did not use an area frame, it used only a list frame. The list frame consisted of a list of names of participants derived from veterinarians, breed associations and organizations, etc. The area frame was derived by randomly surveying 1 mile square areas in the state. This difference in methodology may have contributed to some of the population differences between the 1984 and 1991 surveys.

American Quarter Horses, Standardbreds, Arabians, and Thoroughbreds were the most populous breeds in Michigan. American Quarter Horses showed the sharpest decrease in population from 1984 to 1991, from 41,500 to 29,000. Standardbreds dropped from 19,000 in 1984 to 17,000 in 1991. Arabians and Thoroughbreds increased by 1,000 and 900 respectively. The other major decrease occurred in ponies, from a total of 21,000 in 1984 to 13,000 in 1991.

The 1991 Michigan Equine Survey used slightly different size categories than did this study.

TABLE 4.1 ESTIMATED DISTRIBUTION OF OPERATIONS IN MICHIGAN BY OPERATION SIZE[1]

OPERATION SIZE	NUMBER OF OPERATIONS
1-2 horses	14,700
3-9 horses	11,500
10-29 horses	2150
30 + horses	350

[1] MEMS, 1991

The majority of the horse population was located in urban areas, near human population. The top four counties in horse population were Oakland, Washtenaw, Livingston, and Jackson. Population estimates per county are not presently available.

Registered horses constituted approximately 60% of the total population. This number is the same as in 1984. The breeds with the highest percent registered were Thoroughbreds and Arabians at 90%, Morgans at 80%, and Standardbreds at 79%.

The Michigan Equine Survey also determined the primary use of horses to be for pleasure,42.3%. Pleasure was also the primary use of horses in the 1984 survey, 52.2%. In the 1991 survey, breeding replaced showing as the second most common use of horses. Racing, both flat and harness, was the primary occupation of 12.3% of Michigan horses in 1991.

TABLE 4.2 INCOME AND EXPENSES BY OPERATION TYPE[1]

OPERATION TYPE	NUMBER OF OPERATORS	INVENTORY JUNE 1,1991	1990 INCOME DOLLARS	1990 EXPENSES DOLLARS
Private Residences	16,500	45,000	11,000,000	61,000,000
Other Farms	9,000	30,000	7,000,000	23,000,000
Breeding Farms	1,500	23,000	22,000,000	49,000,000
Training Stables	900	11,000	26,000,000	39,000,000
Boarding Stables	500	12,000	12,000,000	17,000,000
Riding Stables	200	3,000	4,000,000	4,000,000
Other Operations	100	6,000	6,000,000	5,000,000
Owners with all Horses Boarded Elsewhere	NA	NA	34,000,000	58,000,000
TOTAL	28,700	130,000	122,000,000	256,000,000

[1] MEMS 1991

TABLE 4.3 TOTAL DOLLARS SPENT BY OPERATORS OF MICHIGAN HORSE OPERATIONS[1]

EXPENSE	TOTAL DOLLARS (millions)	AVERAGE DOLLARS PER HORSE
Feed	40.0	308
Equipment Purchases	36.0	277
Equine Purchases	35.0	269
Training Fees	17.0	131
Health	15.0	115
Capital Improvements	15.0	115
Boarding of Equine	14.0	108
Tack	11.0	85
Farrier	9.0	69
Travel & Lodging	8.5	65
Taxes	8.0	62
Labor	8.0	62
Miscellaneous	7.0	54
Maintenance/Repair	6.5	50
Breeding Fees	6.0	46
Bedding	5.5	42
Insurance	4.0	31
Utilities	4.0	31
Professional Fees	2.5	19
Advertisement	1.5	11
Rent/Lease	1.5	11
Other	1.0	8
TOTAL	256.0	1,969

[1] MEMS, 1991

TABLE 4.4 DISTRIBUTION OF OPERATIONS IN THIS STUDY

	Boarding	Riding	Training	TOTAL
3-9 horses	29	8	24	61
10-19 horses	35	11	24	70
20 + horses	36	24	34	94
TOTAL	100	43	82	225

A comparison with the estimates of operation numbers in Table 4.2 shows that twenty percent of the boarding stables, twenty-one percent of the riding stables, and nine percent of the training stables in Michigan participated in this analysis.

STATISTICAL OVERVIEW

Results of the ANOVA on the expenses in Table 3.1 are reported in Table 4.5. A $P < .10$ was required for significance. Significant values are in bold type.

Table 4.5 shows that the model for capital improvement was not significant, eliminating it from further analysis. Total expenses, insurance, advertising,bedding, tack, farrier, travel, miscellaneous, and health expenses were significantly different by operation type. Total expense, labor, tack, rent, other, and equipment purchases were significantly different by size category. Feed, total expense, insurance, advertising, utilities, maintenance, bedding, tack, taxes, farrier, miscellaneous, other, professional fees, health, and equipment purchases were significantly different by the interaction between operation type and size category.

TABLE 4.5 P VALUES OF SELECTED EXPENSES AFTER ANALYSIS OF VARIANCE
P<.10 in bold type

Variable	Model	Operation Type	Size Category	OpType * Size Cat
feed	**.0001**	.6408	.9146	**.0155**
total expense	**.0001**	**.0082**	**.0160**	**.0001**
insurance	**.0004**	**.0938**	.3111	**.0238**
advertising	**.0001**	**.0041**	.1163	**.0012**
utilities	**.0001**	.4351	.6819	**.0001**
labor	**.0459**	.8999	**.0214**	.4857
maintenance	**.0001**	.1447	.9443	**.0001**
bedding	**.0001**	**.0011**	.5664	**.0004**
tack	**.0001**	**.0093**	**.0543**	**.0001**
taxes	**.0054**	.3657	.9449	**.0785**
breeding	**.0489**	.2192	.5075	.2710
farrier	**.0001**	**.0001**	.1953	**.0001**
travel	**.0001**	**.0001**	.3943	.2623
rent	**.0018**	.5509	**.0950**	.3016
miscellaneous	**.0001**	**.0001**	.2651	**.0809**
other	**.0568**	.6541	**.0639**	**.0370**
professional fees	**.0001**	.1419	.6473	**.0592**
health	**.0001**	**.0003**	.4278	**.0001**
board	**.0132**	.2798	.2389	.4360
equipment purchases	**.0001**	.2811	**.0080**	**.0011**
training	**.0468**	.2478	.1737	.9401
capital improvements	.1419	.8380	.6224	**.0187**

TABLE 4.6A RANKING OF EXPENSES ON BOARDING STABLES[1] BY ADJUSTED-LOG MEANS

	Adjusted-log Mean (log$/horse/year)	Actual mean ($/horse/year)
Total expense	6.92	1793
Feed	5.24	254
Health	3.62	79
Bedding	3.34	66
Maintenance	3.23	85
Taxes	3.14	84
Farrier	3.14	42
Utilities	3.01	51
Tack	2.94	50
Insurance	2.67	54
Equipment Purchases	2.51	368
Professional Fees	2.07	70
Labor	1.83	97
Advertising	1.58	11

[1] n=100

TABLE 4.6B RANKING OF EXPENSES ON RIDING STABLES[1] BY ADJUSTED-LOG MEANS

	Adjusted-log Mean (log$/horse/year)	Actual mean ($/horse/year)
Total Expense	6.84	1487
Feed	5.37	276
Health	2.54	47
Utilities	2.33	47
Tack	2.32	53
Taxes	2.29	73
Maintenance	2.25	47
Farrier	2.24	43
Insurance	2.08	76
Equipment Purchases	2.04	171
Advertising	1.8	24
Labor	1.73	45
Bedding	1.46	39
Professional Fees	1.05	14

[1] n=43

TABLE 4.6C RANKING OF EXPENSES ON TRAINING STABLES[1] BY ADJUSTED-LOG MEANS

	Adjusted-log Mean (log$/horse/year)	Actual means ($/horse/year)
Total Expense	7.48	3040
Feed	5.39	283
Health	4.12	108
Farrier	3.77	84
Tack	3.64	115
Bedding	3.41	78
Maintenance	3.41	113
Equipment Purchases	3.17	930
Utilities	2.94	68
Taxes	2.78	64
Advertising	2.43	26
Labor	2.00	91
Insurance	1.93	47
Professional Fees	1.6	28

[1]n=82

Tables 4.6A-C show that feed, and health were the top two expenses for all operation types. Bedding and tack were also found in the top five on two or more operation types, qualifying them for further examination. Although taxes met this requirement, this expense was not analyzed further as it is beyond the control of the operator. Although it was not a top ranking expense in this survey, labor was added as it is a generally a major expense in most businesses.

The means reported on Tables 4.7 through 4.11 are the actual means and the adjusted-log means. All statistical analyses were performed on the adjusted-log means. Superscripts identify which comparisons are significantly different at $P < .10$.

DIFFERENCES BY OPERATION TYPE

TABLE 4.7 ACTUAL[1] AND ADJUSTED-LOG MEANS[2] OF SELECTED EXPENSES COMPARED BY OPERATION TYPE[3]

	Boarding n=100	Riding n=43	Training n=82	Means
Health	79 3.62[a]	47 2.54[c]	108 4.12[b]	Actual Adjusted-log
Tack	50 2.94[a]	53 2.32[a]	115 3.64[b]	Actual Adjusted-log
Bedding	66 3.34[a]	39 1.46[b]	78 3.41[a]	Actual Adjusted-log
Total Expense	1793 6.92[a]	1487 6.84[a]	3040 7.48[b]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Values in rows with different superscripts denote differences, $P < .10$

Table 4.7 shows that there are differences among the selected expenses based on operation type. Feed and labor are eliminated from this comparison as they were not significant by operation type when the ANOVA was performed. Comparisons of costs by operation type are based on the probability of a difference occurring between the adjusted-log means of the selected expenses.

In a comparison between boarding and training operations, training operations have higher expenses on a $/horse/year basis in both total expenses and health costs (Table 4.7) There is no difference in bedding between boarding and training stables, when all 3 size categories are considered.

When comparing boarding and riding operations, boarding has higher costs/horse/year in health and bedding expenses (Table 4.7). There is no difference in total expenses.

Training operations demonstrate a higher annual cost in total expenses, health, bedding, and tack expenses than do riding operations (Table 4.7).

When training operations are compared with either boarding or riding operations, they show a higher annual cost. Riding operations have the lowest annual costs in expenses where a difference exists.

TABLE 4.8A RANKING OF EXPENSES ON SMALL OPERATIONS[1] BY ADJUSTED-LOG MEANS

	Adjusted-log Mean	Actual Mean
Total Expenses	7.47	3573
Feed	5.38	296
Equipment Purchases	3.72	1295
Health	3.64	124
Farrier	3.29	86
Tack	3.22	111
Maintenance	3.03	129
Utilities	2.95	86
Bedding	2.93	95
Taxes	2.83	90
Insurance	1.83	46
Professional Fees	1.82	88
Advertising	1.54	23
Labor	1.02	93

[1]n=61

TABLE 4.8B RANKING OF EXPENSES ON MEDIUM OPERATIONS[1] BY ADJUSTED-LOG MEANS

	Adjusted-log Means	Actual Means
Total Expenses	6.96	1448
Feed	5.27	202
Tack	3.33	59
Health	3.30	54
Farrier	3.00	39
Maintenance	2.86	47
Bedding	2.77	47
Utilities	2.68	31
Taxes	2.66	84
Insurance	2.52	62
Advertising	2.15	13
Labor	2.15	128
Equipment Purchases	2.02	137
Professional Fees	1.4	15

[1] n=70

TABLE 4.8C RANKING OF EXPENSES ON LARGE OPERATIONS[1] BY ADJUSTED-LOG MEANS

	Adjusted-log Means	Actual Means
Total Expenses	6.83	1158
Feed	5.34	257
Health	3.35	55
Maintenance	3.02	54
Farrier	2.85	33
Taxes	5.72	37
Utilities	2.66	34
Bedding	2.53	36
Labor	2.40	66
Tack	2.36	29
Insurance	2.34	36
Advertising	2.13	15
Equipment Purchases	1.99	171
Professional Fees	1.54	19

[1] n=94

Tables 4.8A-C show that feed is the top individual expense in all size categories, just as it was in all operation types. Health, the second expense by all operation types, was in the top three expenses of all size categories.

The means reported Tables 4.9-4.12 are the actual means and adjusted-log means. All statistical analyses were performed on the adjusted-log means. Superscripts identify which comparisons are significantly different at P< .10.

DIFFERENCES BY SIZE CATEGORY

TABLE 4.9 ACTUAL[1] AND ADJUSTED[2] MEANS OF SELECTED EXPENSES COMPARED BY SIZE CATEGORY[3]

	Small 3-9 horses n=61	Medium 10-19 horses n=70	Large 20+ horses n=94	Means
Labor	93 1.01[a]	128 2.14[ab]	66 2.40[b]	Actual Adjusted-log
Tack	111 3.21[a]	59 3.32[a]	29 2.36[b]	Actual Adjusted-log
Total Expense	3573 7.47[a]	1448 6.96[b]	1158 6.82[b]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Value in rows with different superscripts denote differences, P < .10

Table 4.9 shows the differences in each selected expense by size category. Feed, health, and bedding were eliminated from this comparison because they were not significantly different by size category when the ANOVA was performed. Superscripts are used to show which comparisons showed a difference at P < .10. These differences were detected by

calculating the probabilities of differences using the adjusted-log means.

The comparison between small and medium categories shows that total expenses were higher for small operations (Table 4.9). Labor and tack showed no differences between these categories.

The comparison between small and large operations reveals differences in total expenses, labor, and tack expenses. Small operations had higher total expenses, and tack expenses, while large operations had a higher labor expense.

The comparison of medium and large operations revealed a difference in tack expenses, with the expense for medium operations being higher (Table 4.9). Total expenses and labor showed no difference between medium and large operations.

This analysis shows that although there is no difference in total expenses between medium and large operations, both medium and large operations have a lower total expense on a $/horse/year basis than do small operations.

INTERACTIONS BETWEEN OPERATION TYPE AND SIZE CATEGORY

Tables 4.10-4.12 show the differences in selected expenses between different sized operations of the same type. Tables 4.13-4.15 show the differences in selected expenses between different operation types of the same size.

The same expenses were considered that were used in the analyses by operation type and size category. Actual means

and adjusted-log means are reported, with superscripts to identify differences at P < .10. Calculations of the probability of differences existing were performed on the adjusted-log means.

TABLE 4.10 ACTUAL[1] AND ADJUSTED-LOG MEANS[2] OF SELECTED EXPENSES COMPARED BY SIZE CATEGORY WITHIN BOARDING STABLES[3]

	Small 3-9 horses n=29	Medium 10-19 horses n=35	Large 20+ horses n=36	Means
Feed	334 5.69[a]	174 4.69[b]	267 5.34[a]	Actual Adjusted-log
Health	125 4.51[a]	42 3.06[b]	50 3.29[b]	Actual Adjusted-log
Tack	60 3.48[a]	43 2.65[bc]	41 2.68[ac]	Actual Adjusted-log
Bedding	97 4.10[a]	38 2.61[bc]	59 3.32[ac]	Actual Adjusted-log
Total Expense	2518 7.50[a]	1175 6.24[b]	1465 7.02[a]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Values in rows with different superscripts denote differences, P< .10

Table 4.10 shows that there are differences in selected expenses on a $/horse/year basis among boarding stables based on size. Labor was eliminated from this comparison as it was not significant by the interaction of size category and operation type when the ANOVA was performed.

Small boarding stables had higher annual costs than did medium boarding stables in all selected expenses . Small stables were higher in total expenses, feed, health, bedding, and tack.

Health expenses were higher on small boarding operations

than on large operations (Table 4.10). There were no differences between large and small boarding operations in total expenses, feed, bedding, and tack expenses.

Large boarding stables had higher feed and total expenses than did medium boarding stables. Health, bedding, and tack expenses showed no differences between large and medium boarding stables.

Medium boarding operations had lower total expenses than either large or small operations.

TABLE 4.11 ACTUAL[1] AND ADJUSTED-LOG MEANS[2] OF SELECTED EXPENSES COMPARED BY SIZE CATEGORY WITHIN RIDING OPERATIONS[3]

	Small 3-9 horses n=8	Medium 10-19 horses n=11	Large 20+ horses n=24	Means
Feed	189 5.13[a]	365 5.63[a]	264 5.34[a]	Actual Adjusted-log
Health	28 1.55[a]	33 2.56[ab]	61 3.50[b]	Actual Adjusted-log
Tack	45 1.33[a]	57 3.03[a]	39 2.59[a]	Actual Adjusted-log
Bedding	4 .55[a]	31 1.82[a]	55 2.01[a]	Actual Adjusted-log
Total Expense	1193 6.62[a]	1694 7.00[a]	1490 6.91[a]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Values in rows with different superscripts denote differences, P <.10

Table 4.11 shows that there are very few differences among the selected expenses between riding stables of different sizes. Labor was eliminated from this analysis as it was not significantly different by the interaction of size category and operation type when the ANOVA was performed.

Comparisons of expenses are based on the probability of a difference in the adjusted-log means. The actual and adjusted-log means are reported in Table 4.11, with superscripts to identify differences significant at P < .10.

Total expenses, feed, health, bedding, and tack expenses showed no differences between small and medium riding stables.

Table 4.11 shows that there is also no difference in total expenses, feed, health, tack, and bedding between medium and large riding operations.

The only difference detected by this study on riding operations is in health expenses between large and small operations. Large operations have a higher annual health expense than do small operations.

TABLE 4.12 ACTUAL[1] AND ADJUSTED-LOG[2] MEANS OF SELECTED EXPENSES COMPARED BY SIZE CATEGORY WITHIN TRAINING OPERATIONS[3]

	Small 3-9 horses n=24	Medium 10-19 horses n=24	Large 20+ horses n=34	Means
Feed	286 5.35[a]	323 5.49[a]	254 5.32[a]	Actual Adjusted-log
Health	209 4.84[a]	129 4.25[a]	56 3.26[b]	Actual Adjusted-log
Tack	209 4.82[a]	149 4.28[a]	25 1.82[b]	Actual Adjusted-log
Bedding	127 4.11[a]	102 3.85[a]	27 2.27[b]	Actual Adjusted-log
Total Expense	6011 8.29[a]	2916 7.62[b]	1032 6.53[c]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Values in rows with different superscripts denote differences, P< .10

Table 4.12 shows that there are differences among the selected expenses on training operations of different sizes. Labor was eliminated from this comparison because it was not significant by the interaction of operation type and size category when the ANOVA was performed. Comparisons of costs were calculated by the probability of a difference being present in the adjusted-log means. Actual and adjusted-log means are reported in Table 4.12, with superscripts to identify differences significant at $P < .10$.

Table 4.12 shows that there were no differences between small and medium training stables in feed, health, tack, and bedding expenses. Total expenses were higher on small operations than on medium operations.

In a comparison of small and large training facilities, there is no difference in feed costs. There is, however, a difference in total expense, health and tack costs, with small facilities having the higher annual cost (Table 4.12).

Medium training operations had higher costs than large operations in total expenses, health, and tack. There is no difference in feed costs between medium and large training operations.

An economy of size appears to exist in the selected expenses on training operations. In the situations where a difference does exist, the expenses are lower on the larger operation.

In the analyzed expenses (total expenses, feed, health,

labor, and tack) on training operations, where a difference is present, an economy of size is seen.

TABLE 4.13 ACTUAL[1] AND ADJUSTED-LOG[2] MEANS OF SELECTED EXPENSES COMPARED BY OPERATION TYPE ON SMALL OPERATIONS[3]

	Boarding n=29	Riding n=8	Training n=24	Means
Feed	334 5.69[a]	189 5.13[b]	286 5.35[b]	Actual Adjusted-log
Health	125 4.51[a]	28 1.55[b]	209 4.84[a]	Actual Adjusted-log
Tack	60 3.48[a]	45 1.34[b]	209 4.82[c]	Actual Adjusted-log
Bedding	97 4.11[a]	4 .55[b]	127 4.11[a]	Actual Adjusted-log
Total Expense	2518 7.50[a]	1193 6.62[b]	6011 8.29[c]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Values in rows with different superscripts denote differences, P< .10

Table 4.13 shows that there are differences among all the selected expenses between small boarding and riding stables. Labor was eliminated from this comparison as it was not significant by the interaction of operation type and size category when the ANOVA was performed. Actual and adjusted-log means are both reported in Table 4.13, although all statistical analysis was performed on the adjusted-log means. A value of P<.10 was required for significance.

Boarding stables had a significantly higher cost/ horse/ year than riding stables in feed, health, tack, bedding, and total expenses.

The comparison between small boarding and small training stables showed differences in feed, tack, and total expenses. Training stables had a higher cost than boarding stables in tack and total expenses. Boarding stables had a higher feed cost than did training stables.

The comparison between small riding and small training stables (Table 4.13) showed differences in health, tack, bedding, and total expenses, with training operations having the higher costs.

On small operations, training stables tended to have the highest expenses, and riding stables tended to have the lowest expenses, if a difference was present. The only exception was in feed expenses on boarding stables, which were higher than feed expenses on riding or training stables.

TABLE 4.14 ACTUAL[1] AND ADJUSTED-LOG[2] MEANS OF SELECTED EXPENSES COMPARED BY OPERATION TYPE ON MEDIUM OPERATIONS[3]

	Boarding n=35	Riding n=11	Training n=24	Means
Feed	174 4.69[a]	365 5.63[ab]	323 5.59[b]	Actual Adjusted-log
Health	42 3.06[a]	33 2.57[a]	129 4.25[b]	Actual Adjusted-log
Tack	43 2.65[a]	57 3.04[ab]	149 4.28[b]	Actual Adjusted-log
Bedding	38 2.61[a]	31 1.82[ab]	102 3.85[b]	Actual Adjusted-log
Total Expense	1175 6.25[a]	1694 7.00[ab]	2916 7.62[b]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Values in rows with different superscripts denote differences, P< .10

Table 4.14 shows that there are differences present between medium operations of different types. Labor was eliminated from this analysis because it was not significant by the interaction of operation type and size category when the ANOVA was performed. A P value <.10 was required by this study to identify a significant difference.

Medium training stables had higher costs than medium boarding stables in feed, health tack, bedding, and total expenses.

There were no differences in costs in any of the selected expenses between medium boarding stables, and medium riding stables.

Training stables had higher health expenses than riding stables (Table 4.14). All other selected expenses showed no differences between medium riding and medium training stables.

As in small operations (Table 4.13), training stables tended to have higher expenses than did either boarding or riding stables.

TABLE 4.15 ACTUAL[1] AND ADJUSTED-LOG[2] MEANS OF SELECTED EXPENSES COMPARED BY OPERATION TYPE ON LARGE OPERATIONS[3]

	Boarding n=36	Riding n=24	Training n=34	Means
Feed	267 5.34[a]	264 5.35[a]	254 5.32[a]	Actual Adjusted-log
Health	50 3.29[a]	61 3.51[a]	56 3.26[a]	Actual Adjusted-log
Tack	41 2.69[a]	39 2.59[ab]	25 1.82[b]	Actual Adjusted-log
Bedding	59 3.32[a]	55 2.01[ab]	27 2.27[b]	Actual Adjusted-log
Total Expense	1465 7.03[a]	1490 6.91[a]	1032 6.53[a]	Actual Adjusted-log

[1] $/horse/year
[2] log$/horse/year
[3] Values in rows with different superscripts denote differences, P<.10

Table 4.15 shows that there are very few differences among the selected expenses on large operations of different types. Labor was eliminated from this analysis because it was not significant by the interaction of operation type and size category by the ANOVA. A P value of <.10 was required for significance.

Feed, health, and total expenses showed no differences between boarding, riding, and training stables of 20+ horses.

The only differences present in this comparison were in tack and bedding expenses between boarding and training stables. Training stables had the lower cost in each expense.

Contrary to the previous comparisons, on large operations training stables tended to have a lower cost/horse/year than did boarding or riding stables.

CHAPTER V

DISCUSSION

1991 MICHIGAN EQUINE SURVEY

The results of the 1991 Michigan Equine Survey show a decrease in overall population from 1984 to 1991. Both the American Quarter Horse and the Standardbred showed a marked drop in population from 1984 to 1991. This is probably in part due to the changing tax laws discussed earlier. As investing in horses becomes less profitable, fewer individuals will participate. There are also fewer horses being registered with the American Quarter Horse Association (Table 2.1). This implies that there are fewer mares being bred. The apparent decrease in breeding likely contributes to the overall decrease in the population.

There are also no "big money" shows or races in Michigan for Quarter Horses or Standardbreds. This could encourage those people interested in these horses to raise them elsewhere. Most racing breeds have races and premiums specifically for horses born in a particular state, e.g. Michigan-bred races. A State fund pays money out to both the breeder, and the owner of the horse, encouraging them to keep the horses in the state. This can have a particularly marked affect on Standardbreds, because they are almost exclusively bred for racing purposes.

Arabians and Thoroughbreds, on the other hand, have

increased in population in Michigan since 1984. The increases are relatively small, 1000 and 900 respectively, and probably do not indicate a change in the use of the horses. What makes this slight increase most impressive, is the comparison with the decrease in some other popular breeds. As indicated by Table 2.1, the Arabian Registry reports a decreasing number of foals registered nationally since 1988. Michigan, however, seems to be ahead of the nation in production as the overall population has appeared to increase over the same time period.

One reason for Arabians and Thoroughbreds maintaining their numbers in the state of Michigan could be because of a minimal affect of the tax laws which discouraged investors. Within the Arabian breed, for example, it has been suggested that most investors appeared to have horses in Arizona, California, Florida and Kentucky. Although the loss of these participants resulted in a decrease to the national population, there is probably less of an effect in states where the investor dollar was present to a smaller degree. The same would hold true in the Thoroughbred. States such as California, Kentucky, and Florida have a higher dollar market for the Thoroughbred, and would be more likely to attract investors.

The participants who were involved in the horse industry for reasons other than as an investment are likely to still be involved. In states where the investors were not a large portion of the horse owning population, their defection would

have a minimal effect on overall numbers.

As mentioned, most of the horses, 60%, in Michigan are registered. This figure has not changed since 1984 because most people still in the industry are in it for the same reasons they were in 1984. Registration is only required if the owner wishes to show at a breed sanctioned event or race. Many people enjoy pleasure riding their unregistered horses, and show them in open shows which have no breed restrictions.

In the 1991 survey, the highest number of horses lived on private residences or on other farms, meaning farms which were not primarily horse farm. This logically follows the data stating that most horses were owned for pleasure use.

Of the non-pleasure operations, breeding had the most horses. This is because most breeding farms run a large number of mares to produce the foals required to generate income. In addition to the large number of mares, they likely have a population of horses which are for sale. The average from the 1991 survey is 15 horses per operation. Breeding farms may also house horses which are there on a permanent to semi-permanent basis for absentee owners.

The remainder of the horses were housed on training, boarding, and riding stable, or on other operations. Table 4.2 indicates that boarding stables had the largest average size, and training stables had the lowest. This may be because training stables tend to be more labor intensive than do boarding stables. In addition to the feeding and cleaning

which is required on both types of operations, the operator at the training stable must exercise the horses regularly. On a boarding stable, the horses are probably turned out to self-exercise or are exercised by the horse owner, not the operator.

Feed had the highest cost per horse in the survey, followed by equipment purchases. Feed is the highest annual cost on virtually all livestock operations, so it comes as no surprise it is the highest cost on horse operations. Equipment purchases have a high cost per horse, because they are large cost items. Items such as trailers, vans, trucks, tractors, etc., cost thousands of dollars, and will increase the cost per horse per year.

Table 4.4 indicates a decrease in the number of operations in the data set after the parameters of this study were applied. This would appear to indicate that there are a large number of facilities involved in racing. The elimination of the very small (1-2 horses) operations may also account in part for this reduction in numbers of operations. The elimination of all operations reporting zero or less for total expense may have contributed to the reduction of number of boarding, riding, and training stables used in this study.

STATISTICAL OVERVIEW

The Analysis of Variance (Table 4.5) indicated that more expenses were significantly different by the interaction of operation type and size category than by operation type or size category alone. Comparisons will be discussed by operation type, size category, and size category within operation type.

THE EFFECT OF OPERATION TYPE ON SELECTED EXPENSES

Total Expense

Total expenses showed a difference by operation type (Table 4.5). Differences were detected between boarding and training stables, and between riding and training stables (Table 4.7). Feed, health, tack and bedding expenses ranked as the highest individual expenses by operation type. Expenses which had less impact individually, but contributed to the calculation of total expenses, will also be discussed in an effort to explain differences in total expenses by operation type.

Feed

Feed expenses show no difference by operation type (Table 4.5). This is somewhat surprising, as it would be expected for training or riding horses to have a higher demand for energy, resulting in higher feed expenses.

This difference may have been eliminated from riding horses because of the seasonality of their activity, and possibly the extensive use of pasture for meeting their nutritional needs. It is unlikely that value was assigned to pasture when respondents calculated their feed costs. Riding horses are also typically mature horses, which will have a lower demand for high cost nutrients such as protein than would younger horses.

Training operations would be expected to have the highest cost for feed because these horses would be expected to work hard enough to have a need for energy that is above maintenance. Training operations will also often have young horses in residence, which require higher quality feeds to maintain growth and condition. In many breeds, conditioning for showing, especially in halter, is basically fattening. These increases in energy needed would be expected to increase feed costs on training operations.

The primary reason for there not being a difference in feed expenses could be the different feeding regimens used on different operations. The use of commercially processed feeds versus bulk feeds may have more affect on overall feed cost than operation type. Also, the values assigned to feedstuffs raised on the property, such as hay, will vary, and will make it more difficult to detect differences based on operation type alone.

Health

Health costs showed a difference based on operation type (Table 4.5). Like farrier and travel costs, health costs should be assigned to the owner, and not the operation. However, as the figures indicate most people did assign health costs to the operation, explanations will be made for these differences.

As in many of the other expenses, training operations have the highest annual health costs (Table 4.7). The high health costs can be attributed to many factors which are unique to training operations. As mentioned earlier, horses at a training operation are more likely to travel than those at boarding or riding operations. This potentially exposes the animals to a greater range of pathogens. Not only is the horse that left the facility exposed, but when it returns, the pathogens are introduced to the facility. As a result, training horses are often on a more complex vaccination program, and may be vaccinated for a larger range of diseases (Evans, et.al, 1990). In addition, horses that are in training will be more likely to experience and be treated for lamenesses. There may also be a portion of the population of horses in training that are of sufficient value for breeding or performing that extreme measures may be taken medically to prolong the life of these animals.

As in most other categories, the lowest expense for health was on riding stables. These horses do not often leave

the facility, and will have a more basic vaccination program than training horses. Because they stay on the facility, and horses are not leaving and arriving with the frequency of a training stable, the exposure to pathogens is also reduced. These horses are also not subjected to the same physical demands as many training horses, therefore, a lesser occurrence and treatment of lameness would be expected. Riding stables will also have a lower number of animals whose value makes the use of extreme medical procedures appealing.

Boarding stables have higher health expenses than riding stables, although they are lower than training stables (Table 4.7). These horses are likely to experience a lower level of physical stress than either riding or training horses, because most people who board their horse cannot ride them daily. These horses may be exposed to more pathogens than riding horses because of a greater traffic flow into and out of the facility.

Tack

Tack expenses showed a difference by operation type (Table 4.5). This would be expected because the different purposes of each operation would demand different quantities of tack.

In the area of differences by operation type, boarding stables would be expected to have the lowest tack cost, as the horses are owned by clients, not by the operators. Because

there is no expectation or requirement for the boarding stable operator to train or ride the horses, these operations should have minimal tack investment in basic items such as halters and leadropes. There may also be an investment in grooming equipment, which is classified as tack by the questionnaire, but this should also be fairly small. Items such as halters and grooming supplies would not be unique to boarding operations, and would be needed at all equine operations.

There was no difference between tack expenses on riding stables and boarding stables (Table 4.7), which may be attributed to the fact that the questionnaire asked how much had been spent in a single year (1990). Although the riding stable would own more equipment such as saddles and bridles, these items have a longer life than the halters and lead ropes purchased by both boarding and riding stables, and if they were not purchased in 1990 they would not be on the survey.

Training stables had the highest annual tack expense, and showed a difference from both boarding and riding stables. This is reasonable because the greatest demand for tack is at a training stable. The trainer owns the tack he uses on a daily basis, as well as tack that is used primarily for show. Additionally, the training facility will use other equipment in the tack category, such as clippers, soaps, etc., at a greater rate than boarding or riding stables.

Also itemized in the tack category is clothing. The trainer is likely to have greater quantities of clothing, such

as show apparel, which would fit into this category. Along with show apparel, some disciplines require tack specifically for showing. This tack will tend to be more expensive than 'work' equipment, and may need to be replaced more frequently to keep up with current trends. Even the 'work' equipment may need to be replaced more often, as trainers will tend to start more horses under saddle, and untrained horses have a tendency to be harder on equipment than those which are already trained.

Lastly, as mentioned earlier, riding stables do the majority of their business in warm weather months, while a training stable can potentially operate at full capacity all year round resulting in heavier use of much of the tack. Therefore, tack may have a higher replacement rate at a training stable than at another type of operation.

Bedding

There were differences in bedding expense based on operation type (Table 4.5). As in most other areas, it would be anticipated that riding stables should have the lowest annual bedding costs because the animals may be outside a large part of the year. It would anticipated that training stables and boarding stables would have similar bedding expenses because the horses are usually stalled a similar amount of time.

The analysis of bedding expenses shows this to be true,

as there is a difference between riding and both boarding and training, but no difference between boarding and training.

Farrier

Farrier costs also show a difference among operation types (Table 4.5). This may be explained by ownership of the animals on each operation type, and by the different goals of each operation.

In an ideal reporting scenario, the boarding and training stables should report no farrier costs, as these are passed on to the owners of the horses. Any horses that are owned by the operator should not have the costs for farrier work attributed to the operation, as they are not necessary for operation of the facility. Riding stables, on the other hand, should have a farrier cost assessed to the operation as the animals are owned by the operator, and so the operator is responsible for the cost of their maintenance. As demonstrated by this survey, however, these principles do not hold true.

This may be for several reasons. The stable may pay the farrier, and then bill clients individually. This method guarantees payment for the farrier when the work is done, which makes it easier for the boarding stable to keep a quality farrier. If the client does not pay the stable, the operators have collateral in the form of the horse, an option not open to the farrier. Although this study cannot identify what portion of farrier costs reported by boarding and riding

operations is dealt with in this way, it is a possible explanation for some of the values reported.

Another possibility is the failure to separate costs for personally owned animals from those necessary to the operation. It is common for operators of boarding and training operations to have horses of their own, as well as those owned by clients. Once again, these costs should not be assessed to the operation, as they are not necessary for the running of the operation.

If farrier costs were reported by the principles stated above, riding stables should have the highest annual cost, because the operator owns the horses, and therefore is responsible for the maintenance costs of those animals. Training stables and boarding stables should have no farrier costs as those are passed on to the owner of the horse. If this were not the case, it would be expected that training horses would have the highest farrier costs, with riding horses having the lowest.

The analysis based on operation type does show that a difference is present. This could be because training horses will generally be shod at all times, and some show horses will have special shoes to improve their performance. This special shoeing is more expensive than routine shoeing that is only intended to protect the hoof. This is not to say that all training horses require special shoeing. Most horses probably do not, however, it is common enough to account for the

difference between farrier costs on training stables and those on riding or boarding operations.

Riding stables appear to have the lowest farrier costs (Table 4.6). As mentioned previously, these horses are only working for part of the year. In the off season, the horses are probably left barefoot, requiring only periodic trims to maintain hoof quality. When the horses are being ridden, they will require only routine shoeing, frequently with factory made shoes which are considerably less expensive than the handmade shoes which may be worn by a show horse.

Boarding stables would be expected to be in the middle, as they would have a combination of the types of horses found at training and riding stables. There would be horses that are always barefoot, and horses that are shown by the owners or ridden regularly enough to require shoeing. Another factor which may affect the difference between boarding and riding stables is the occurrence of physiological phenomena requiring therapeutic shoeing. An animal at a riding stable who suffered from a hoof problem which would require expensive hoof care may be culled, where a person who boarded a horse at a local stable would be more willing to spend money on their animal. This assumption is made on the basis that the riding stable operator is running a business, and therefore would be less likely to spend a lot of money on a horse which may have limited potential to return the investment. A person boarding a horse, on the other hand, may have a stronger emotional

attachment to the horse, and view it more as a pet than a potential source of income. This person would be more willing to spend more money to keep the horse functional than would the more business-minded riding stable operator.

Advertising

Advertising expenses also demonstrated a difference based on operation type (Table 4.5). Boarding stables had the lowest advertising costs (Table 4.6), which could be a result of a generally low turnover, and most advertising being by word of mouth. Once a clientele is established, a boarding stable does not need to constantly replenish the supply through advertising.

On the other hand, riding stables, which appeared to have a numerically higher annual advertising cost than boarding stables (Table 4.6), may have to advertise more aggressively to maintain a steady influx of customers. Although a percentage of customers may be returnees, new customers would always be needed.

Training stables appeared to have the highest advertising cost per horse per year (Table 4.6). The questionnaire describes advertising as "cost of ads, entertainment, pamphlets, subscriptions,etc.". It would be expected for the training operation to have higher costs than other operations for "entertainment, pamphlets, subscriptions, etc." These would includee "wining and dining" customers, and promotional

information on horses trained at the facility. Although horse promotional fees should be charged to the owner, they may have been reported in this area. There could also be reporting of certain show expenses in the advertising area, such as stall drapes displaying the stable or fliers distributed at shows. In addition, like the riding stable, the trainer may have a higher turnover than a boarding stable, therefore needing to advertise more to keep the barn full.

Insurance

Insurance expenses are highest on boarding stables and lowest on training stables in this study.

The variability of insurance expenses by operation type (Table 4.5) could largely be accounted for by the operator's liability. The operator of a riding stable would be expected to have the highest insurance cost because of liability for personal injury to the customers. In addition, the riding stable is likely to attract clientele with less experience working around horses, thereby increasing the chances of injury. Most riding stables will require the signing of a waiver, releasing them from responsibility if a person is injured. These waivers do not always stand up in court.

Boarding stables and training stables would be expected to have lower insurance costs than riding stables because of a lower traffic rate, and a tendency to have more experienced people around the horses. Although both of these operations

would be more vulnerable to property damage cases in the event of an injury to the horse, this is usually a fairly minor part of insurance costs.

The training stable would be expected to have the lowest annual insurance cost because the traffic rate through the barn would be expected to be less than on either the boarding or riding operation. It would be expected that most of the human traffic in a training stable would be the owners of the horses, or the employees of the operation. The employees at a training stable would also be expected to be more experienced than those at a riding or boarding stable, helping to reduce the cost of liability insurance.

Although horses may be insured for mortality or loss of use, this figure should not be charged to the boarding or training operation as it is the responsibility of the horse owner.

Table 4.6 shows riding stables appear to have a numerically lower insurance cost than boarding stable, contrary to the expectations mentioned earlier. One possible explanation for this difference from what was expected would be the possibility that some riding operations may be under insured.

Travel

Travel costs also demonstrated a difference by operation type (Table 4.5). This is to be expected because there is a

major difference between operation types in the amount of travel expected or required for fulfillment of the purpose of the operation. As in farrier costs, the cost of actually shipping the horse should be charged to the owner, not the operation. If this premise is followed, once again the riding stable should be the only operation type to express expenses in this area, as training and boarding stables would pass the expense on to the client.

It would be expected for training stables to have the highest travel costs because of the necessity of traveling to shows. Although this expense is usually billed back to the client, many training operations will fund the initial outlay of money. In addition, travel costs for business related activities, such as seminars, and evaluating horses, may be billed to the operation.

Riding stables would be expected to have the lowest cost, as the horse would not be expected to leave the facility. The exception would be if the horses were moved to a different facility in the off-season.

As in farrier costs, it would be expected that boarding stables would be intermediate in travel expenses. The horse owner, not the operation would most likely be responsible for travel costs.

A situation where travel costs could be billed to any of the above operations would be if the operator hauled horses as a supplement to the income of the operation. In that case,

the costs for fuel, etc. would be from the operation budget. Even in this scenario, an enterprise budget should separate the hauling portion of the operation from the boarding, riding, or training portion, although this is probably not the case on most operations.

THE EFFECT OF SIZE CATEGORY ON SELECTED EXPENSES

Total Expense

There were differences between small and large operations, and small and medium operations in total expenses (Table 4.9). As in the previous section, differences in individual expenses will be discussed to help explain the total expense differences. Economic theory relative to economies of size would lead to the expectation that as the size of the operation increases, the annual expenses per animal should decrease.

Feed

There was no difference in feed expense by size category (Table 4.5). It was expected that feed costs would be lower on larger farms, because of the economy of buying larger quantities of feedstuffs. This was, however, not demonstrated by the data. This may in part be due to storage space available being potentially a limiting factor on horse operations. As mentioned in the discussion on bedding, most

horse operations are located near urban areas, and may have a limited capacity for storage of large amounts of feedstuffs. This may not have a great effect on grain costs, but may reduce the operator's ability to purchase large quantities of hay at a single time. Even if the operator is able to purchase enough hay to last the year, it may be necessary to pay the supplier for storing that hay if the operator's facility does not have adequate storage available.

The range of feeding practices in the industry may also eliminate feed savings across size categories. Operations using a mill mix will have different costs than operations feeding a commercial sweet feed. Different operation's feeding programs may also incorporate different levels of supplementation. The feeding programs with a higher level of supplementation would be expected to have higher feed costs. The distribution of these different feeding regimens throughout all size categories may contribute to the lack of a difference between size categories. Differences in feeding regimens may account for more differences in feed costs than does operation size.

Tack

Tack showed a difference by size category (Table 4.5). Because a piece of equipment can be used by multiple horses, it is logical that there is a difference among size categories.

When analyzed by size category, tack showed a difference between small and large operations, and between medium and large operations (Table 4.9). Large operations had the lowest tack cost, as the fixed cost of the tack could be spread over a larger number of animals. Unlike items such as feed and bedding, which can only be used by one animal in a time period, tack can be used by multiple animals in a single day.

Table 4.9 shows no significant difference in tack costs between small and medium operations, indicating that larger numbers of horses, or different size breaks, are needed to see a definite change in cost per horse per year for tack.

Bedding

There was no difference in bedding expense detected based on size category (Table 4.5). A decrease in bedding expenses per horse as size category increased might be expected. The larger size categories should have a greater opportunity to purchase bedding in large quantities, thereby bedding each stall at a lower cost.

There was no evidence for this in the analysis. There may be sufficient variation present in the distribution of operation types within the size categories to make it difficult to detect differences based on size category alone. Another alternative would be that because of the proximity of most horse operations to urban areas, the capacity to store sufficient quantities of bedding to generate a volume savings

would be reduced. Variations in cost and use of different bedding materials may also eliminate differences between size categories.

Farrier

The analysis based on size category showed no difference based solely on size categories (Table 4.5). This is because farriers bill on a unit of work, and don't generally include quantity discounts. There is a set price for a trim, a shoeing or other work, that is the same across horses. The only exception might be a potentially increased fee for a horse that was particularly difficult to work with.

Health/Travel/Insurance/Advertising

Health, travel, insurance, and advertising costs did not demonstrate a difference by size category (Table 4.5). This may indicate that the operation type has a greater effect on these costs than size of the operation, and because operation types are dispersed throughout the size categories, any differences are eliminated.

THE EFFECT OF THE INTERACTION OF SIZE CATEGORY AND OPERATION TYPE ON SELECTED EXPENSES

Total Expense

Within operation types, boarding demonstrated difference is total expenses between small and medium, and medium and large operations (Table 4.10). Riding operations showed no differences in total expenses (Table 4.11), and training operations showed differences between small and medium operations, small and large operations, and medium and large operations (Table 4.12).

Within size categories, training had the highest total expense on small operations, and riding had the lowest total expense (Table 4.13). On medium operations, training had a higher total expense than boarding, and there was no difference in total expense between riding and boarding or between riding and training stables (Table 4.14). There were no differences in total expenses on large operations(Table 4.15). As in previous comparisons, expenses will be discussed on an individual basis.

Feed

Feed was the highest ranked individual expense of those surveyed. In analysis by size category within operation types, training stables (Table 4.12) and riding stables (Table 4.11) showed no difference in feed costs based on size category. Boarding stables showed a difference between small

and medium operations, and between medium and large operations. There was no difference in feed cost between small and large operations (Table 4.10).

Costs for medium boarding operations were lower than either small or large operations, a pattern which existed in many of the expenses on boarding stables. Once again, it is possible that the differences may be due in part to the location of operations near urban areas. This proximity may limit storage area for feedstuffs. Larger operations may need to purchase feed in smaller quantities, or pay for storage, because of limited storage available on the facility. The limited land base may also inhibit use of land for production of feedstuffs.

Medium sized boarding operations have the lowest feed costs (Table 4.10) and may have sufficient storage to take advantage of reduced prices when crops are in season. These operations may also have the opportunity to raise a greater percentage of the feed needed by the operation. The questionnaire does ask for the value of feed raised, but over or underestimation of this number could contribute to a difference in feed costs on operations raising much of their own feed.

Small boarding operations may have higher feed expenses than medium operations (Table 4.10) because of an increased used of commercially processed feeds, which are generally more expensive than mill mixes. These operations may tend to have

limited storage facilities for feed, and may need to purchase hay throughout the year.

Because of the level of emotional attachment, and anthropomorphism exhibited by horse owners, they are generally an "easy touch" for people selling feed supplements that will "improve the life and health" of the horse. The horse owner is frequently not as aware of their animal's true nutritional needs as a livestock or dairy farmer, and will overspend on feed. Feed manufacturers are aware of this tendency, and will occasionally charge more for a feedstuff if it is labeled for horses than they would for the identical product labeled for livestock.

In the comparison of different operation types of the same size, there were differences present between operation types on small (Table 4.13) and medium (Table 4.14) operations. There were no differences in feed cost on large operations (Table 4.15) of different types.

On small operations (Table 4.13), boarding stables had higher feed costs than training or riding stables. The difference between boarding and riding stables may in part be attributed to the use of pasture as a feed source. The riding stables may use pasture more extensively. Horses at boarding stables are generally kept in stalls, unless special arrangements are made. Also, the proximity of boarding stables to suburban areas could limit the amount of quality pasture available.

The difference between feed expenses on small boarding and small training stables is not what would be expected. It would be expected that if a difference was present, training stables would have a higher cost. Because of the higher level of physical activity of training horses, it would be expected that they would have a higher energy need, and therefore, a higher feed cost. Also, it would be expected that because of this higher level of physical activity, training horses may require more supplementation than boarding horses. This would also result in training operations having higher feed costs than boarding operations. Further study on the feeding regimens of small boarding and training stables is necessary to explain the differences shown on Table 4.13.

Boarding stables had the lowest feed cost numerically on medium operations (Table 4.14). This was not significant in the comparison with riding stables, although it was significantly different than the feed cost on training stables.

Although riding stables had the highest feed cost numerically on medium operations, it was not significantly different than either boarding or riding stables (Table 4.15). The small number of operations (n=11) in this sample may be part of the reason a difference did not exist. Also, if there was a large range in response, that, in conjunction with the small number of responses, could explain why the difference was not significant.

Medium boarding stables had a lower feed cost than did medium training stables (Table 4.15). This may be in part due to the training horse requiring more energy because of a higher level of physical activity. This higher level of physical activity may also result in use of feed supplements, which would also increase the feed cost.

Health

Boarding operations showed differences in health expenses between small and medium operations, and between small and large operations. There was no difference between medium operations and large operations (Table 4.10).

Small operations had a higher annual health expense than either medium or large operations. The larger number of horses will yield a lower annual expense for routine items such as vaccination. The operator may be able to get a "group rate" from the veterinarian for routine health maintenance and the cost of farm calls can be distributed over a larger number of animals. The larger operation will also have enough animals to possibly wait on non-emergency matters until the veterinarian can work on several animals at a time, thereby reducing the cost per horse.

Riding stables show a difference between small and large operations , with large operations reporting higher annual costs (Table 4.11). The higher costs may be a result of the larger operation having more human traffic into and out of the

facility, potentially carrying in more pathogens. Different management practices relative to the use of vaccinations and anthelmintics may also result in higher costs for larger operations. Further analysis of the individual data in this area may be required to identify why the costs appear higher on the larger operations, when for boarding and training, the inverse is true.

The values for health care for small riding operations is 25% that of small boarding or training operations. Further study is necessary to reveal why this difference appears to exist. A possible explanation is that the smaller riding operation may have a reduced vaccination and deworming program, which would decrease annual costs. These horses may also be less likely to receive extreme treatment for health problems based on their potential for producing income.

Training operations demonstrate a difference in health costs between small and large operations, and medium and large operations (Table 4.12). In both instances, large operations have the lowest annual cost. There is no difference between small and medium operations.

These differences may again be ascribed to distributing the costs over a larger number of horses. The larger number of horses may increase the opportunity for the veterinarian to work on several horses at a time, thereby reducing the cost per horse.

Lower costs on larger operations may also be a result of

the operator doing more basic care, and requiring less veterinary assistance. Vaccines, anthelmintics, and topical medications can be purchased from veterinary wholesalers, reducing the operator's expense. The disadvantage in this scenario is increasing the operator's liability if the horse has a bad reaction to a vaccine, or does not recover perfectly from an injury.

In the comparison of different operation types of the same size, health costs differed on small (Table 4.13) and medium (Table 4.14) operations. There were no differences by operation type on large operations (Table 4.15).

On small operations, riding operations had a lower health cost than boarding or training operations (Table 4.13). This lower cost could be because the horses generally stay on the operation. This could result in a less intensive vaccination program, decreasing the annual health cost. Also, as mentioned earlier, the philosophy on the use of expensive medical procedures may differ between the operators of riding stables, and the owners of horses on boarding or training operations.

On medium operations, training stables have a higher health expense than boarding or riding stables (Table 4.14). This difference may be due to the increased level of physical activity of training horses, which could potentially result in more treatment for lameness. Also, because the training horses may travel more, they may need a more intensive

vaccination program, and may require more treatment for illness than would horses that stay on the facility.

Tack

On boarding operations, the only difference in tack expenses was between operations of 3-9 horses (small) and 10-19 horses (medium) (Table 4.10). The adjusted-log means for medium and large operations are very similar. The reason there was not a difference between small and large operations ($P < .1171$) may result in from the variance of response on large operations.

This variance could be explained in several ways. One would be in the instance of a operation which specializes in a discipline where the operator has lower, or less expensive, tack requirements.

An example would be a dressage or hunter/jumper trainer. In both of these disciplines, the same equipment is used for daily works and for showing. In addition, apparel is of a classic style, which changes little from year to year. A trainer specializing in halter horses would be expected to have lower tack costs than trainers who rode the horses. In contrast, a trainer of horses in the western discipline is subject to greater trends in both acceptable apparel and tack. A western saddle of the same quality also is likely to be more expensive than the dressage or hunter saddle because of increased quantities of decorative silver and leather work.

This effort to keep up with the latest styles is also probably more prevalent at the larger operations, because the more established trainers will probably compete at the higher levels of their discipline, where it is more important to follow the latest trends. If this is correct, there is a decrease in tack expense from the smallest size category to the two larger categories.

In the analysis of riding stables of different sizes, there were no differences present for tack expenditures (Table 4.11). Although the adjusted-log means demonstrate what appear to be differences based on size category, they are not significant. This may be because riding stables had the smallest number of observations (44) in the study. Because of this small number of observations, large variances within the operation type would be likely to result in no detectable differences between size categories.

As demonstrated by this comparison, the conclusions drawn when referring only to size category (that operations of over 20 horses had a lower tack cost), can be erroneous within operation types.

On training operations, the differences in tack expenses by size category within the operation type (Table 4.12) are the same as the differences demonstrated by size category alone (Table 4.9). There is no difference between small and medium operations and a high degree of difference between small and large, and medium and large operations. As stated

earlier, this is thought to be due to the larger number of animals providing a wider base for distribution of the cost of a fixed quantity of tack. A trainer can only ride one horse at a time, so doesn't need to increase tack purchases as the number of horses increases. This allows the cost to be distributed over a larger number of horses, reducing the cost per horse. It would appear that this decrease in tack expense occurs between medium (10-19 horses), and large (20 or more horses) operations. Before that point, the size category analysis indicates no difference in expenses, indicating that there is no decrease in tack expenses except on the largest of operations.

Training operations represent 82 of the 225 observations in this study. It appears the high level of difference between size categories expressed in training operations carries over to the size category comparison.

In the comparison of operation types within size categories tack expenses show differences on small, medium, and large operations.

On small operations (Table 4.13), training stables have the highest expenses, and riding stables have the lowest expenses. Training stables may require more tack because the heavy use of the tack shortens its life expectancy. In addition, untrained horses are more likely to break tack than the well-trained horses at most riding stables. Training stables may also need to buy more expensive show tack than

either riding or boarding stables.

Riding stables may have the lowest cost because the saddles and other tack they purchase have a long life. The well-trained horses on the riding operations will not damage equipment as much as the untrained horses that the training stable may have to deal with. The riding stable also will not need to buy expensive show tack.

On medium sized operations (Table 4.14) training stables once again had a higher tack expense than boarding stables. The reasons for this would be similar to the reasons for the higher expenses on small operations.

There was no difference between riding stables and either boarding or training stables in tack expense on medium operations.

Large operations also showed differences in tack expenses between training and boarding operations (Table 4.15). In this case, however, training stables had a lower cost than boarding stables. This may be due to distributing the cost of the same amount of tack over a larger number of horses. The trainer can only exercise a one horse at a time, therefore, a finite quantity of tack is needed.

There was no difference in tack expense between riding stables and either boarding or training stables (Table 4.15).

Bedding

Within boarding stables small operations had a higher

bedding cost than did medium operations. Medium operations had the lowest cost, but were statistically different only from small operations, not large ones (Table 4.10). It would seem that if there is a difference because of size, it would carry over to the larger size category, if only in the comparison small and large operations. In many of the other expenses analyzed in this study, differences were detected between small and medium operations, and small and large operations, but no difference between medium and large operations. This would seem to indicate a decrease in expense per horse on operations of more than 10 horses. This is not the case on bedding expenses, where operations with more than 20 horses (large) were not different from small or from medium operations. Use of a more expensive bedding material or limited storage space preventing the purchase of large quantities of bedding may contribute to large operations not being able to realize a bedding savings by purchasing large quantities at a single time.

Most boarding operations are located near urban areas. For this reason there may be a limited land base and large operations may not be able to purchase sufficient quantities of bedding to decrease their costs. For example, instead of buying shavings by the semi load, the operators may need to buy smaller quantities because of limited storage space. In addition, because large boarding stables tend to be located in urban or suburban areas, they may have a higher cost for

transportation of the bedding material than would a smaller operation located in a more rural area.

Bedding type may also have an effect on the costs on the different operations. Straw and shavings or sawdust are the most common types of bedding used on horse facilities. This difference would likely be spread over all size categories, as the use of a particular bedding material is frequently a personal preference. It would be expected that most large operations in urban areas to would use shavings, as they produce a lower volume of material which needs to be discarded. As mentioned earlier, large operations located in urban areas may have a limited land base, limiting the options available for manure management. Shavings are generally more expensive than straw, however on certain operations any savings seen at the time of purchase may be outweighed by the cost of removal.

This is an area that would merit further study as to the causes of this pattern. As concerns relative to manure management in urban areas increases, a greater understanding of management practices is needed.

Riding stables demonstrate no differences in bedding cost based on size category (Table 4.11). The adjusted-log mean reported for riding stables was considerably smaller than that reported for training or boarding stables (Table 4.7). This low cost overall may account for the absence of a difference based on size category. Because of the relatively small

number of observations (44) variance may also hinder the detection of differences.

Training stables demonstrate a difference in bedding cost between small and large operations, and medium and large operations (Table 4.12). In both of these cases larger operations have a lower cost. The means also demonstrate that costs for medium operations are lower than for small, although this does not meet the criteria for significance set forth by this study.

This is the difference that was expected in boarding stables of large size also. Large operations have the option to buy common bedding materials such as straw and shavings, at a bulk rate, which can save large amounts of money over the year. In addition, it would be expected that a larger operation would have more storage space, enabling the operator to purchase materials at a reduced price. The explanation for this disparity between boarding and training operations bedding expenses may lie in the location of the facility relative to human population centers, as discussed earlier in regards to boarding operations. MEMS data demonstrates increased equine population in suburban areas. Future studies indicating if there is a difference in location by operation type may indicate if this assumption is valid.

Bedding showed differences by operation type within size category on small (Table 4.13), medium (Table 4.14), and large (Table 4.15) operations.

On small operations (Table 4.13), riding showed a lower expense than either boarding or training stables. There was no difference in bedding expense between boarding and training stables.

Riding stables may have a lower bedding expense if more of the horses are housed on pasture, and not in stalls. As riding, especially in Michigan, tends to be seasonal, even if the horses are in stalls during the busy season, they may winter outside, thereby reducing the annual bedding cost.

Training and boarding stables may show no difference because the horses are housed in stalls, and what the horse does outside of the stall would have no effect on the amount of bedding utilized in the stall.

On medium operations (Table 4.14), training stables have the highest bedding costs. The comparison with boarding stables is significant, while the comparison with riding stables is not.

This difference is not significant in the comparison with riding stables, possibly because of a combination of small number of observations on riding stables, and a large range of responses. This assumption is based on the observation that the numerical values for bedding are lower on riding stables than on boarding stables (Table 4.14), yet the level of significance is not reached. Different management practices, such as the horses being housed inside or outside may account for this range in bedding expense on riding stables.

The difference between bedding on boarding and training stables may also be due to some horses being housed outside. The medium sized operation may have the facilities available to offer pasture board, which would reduce the operators bedding expense. The use of different bedding materials may also account for the existence of the difference in bedding expenses between medium boarding and training operations.

On large operations training stables have the lowest bedding cost numerically (Table 4.15). As on medium operations, the difference is significant when compared to boarding stables, but not significant when compared to riding stables.

Training stables of more than 20 horses may have more facilities available for storage of bedding, resulting in a lower cost. This may not be possible for boarding stables as proximity to suburban populations may limit the amount of space available for storage of bedding.

Insurance/Advertising/Farrier/Travel

Insurance, advertising, farrier, travel did not meet the qualifications for analysis by size category within operation type.

Labor

Although labor was not one of the top five expenses it is too important to ignore completely. On most livestock operations, labor is one of the highest expenses. Holleran's study in 1973, which accumulated both family and non-family labor values on horse operations, demonstrated labor was a major cost on recreational horse operations.

Labor, as defined by the questionnaire, is "labor expenditures (not reported elsewhere, such as jockey fees)". The assumption made by this study is that this was perceived as a question regarding paid labor only, not labor performed by the operation operator or members of the family. As mentioned earlier, most operations do not have full time hired labor, and labor that is hired is frequently seasonal.

Therefore, the values reported here are referring to labor hired by the operation only, not total daily labor required for operation of the facility. The second round of the MEMS Survey has addressed this concern by interviewing operators and asking specifically how many hours of labor do they pay for, at what price, and how many hours the operator and family members work on the operation in a month. Although this method is being used on a much smaller group than the 1991 questionnaire reached, it will reveal a more detailed concept of labor requirements on horse operations. This information is not yet available for inclusion in this discussion.

When examined by size category, there was a difference in hired labor between small and large operations (Table 4.9). In this comparison, the expenses on large operations were higher than those on the smaller operations. This can be explained because the larger operations will have to hire more people to help with work such as feeding, cleaning stalls, and exercising horses. On a larger riding stable, more labor would be required for preparing horses to be ridden, and possibly leading rides. The smaller operations could accomplish the same tasks with only the operator.

Although the comparison of small and medium operations does not meet this study's criterion for defining a difference, it approaches that criterion at $P < .1017$. In this comparison, the smaller size category has a lower annual cost for hired labor. The indication is that at approximately 10 horses, it is necessary to hire additional help to run the operation. Further study to clarify the place of labor in the horse industry, and at what point additional labor is needed, would be tremendously valuable to operators when considering expansion of their facilities.

The issue of labor on horse operations is important enough to merit more examination than is within the scope of this study. Common sense says that it should require more labor to manage an operation of 20 horses than one of 5, although the statistics do not indicate that this is so. A working knowledge of the horse industry would imply a training

stable was more labor intensive than a boarding stable, this also is not supported by the data available. Further examination of this topic is necessary to understand the labor demands of the horse industry.

Although miscellaneous costs and other costs showed a difference by size category within operation type, they will not be discussed in this study as the variables are too general to make any meaningful assumptions. Taxes also showed a difference by size category within operation type, but will not be discussed because they are beyond the control of the operator. Utilities, maintenance, equipment purchases and professional fees were also significant by size category within operation type but were of minor interest to this study, as they appeared to contribute only a small amount of the total expenses.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study demonstrates that there are differences in the expenses on horse facilities evaluated based on operation type, and to a lesser extent, facility size.

Training stables tended to have the highest expenses in categories which were analyzed, and riding tended to be the lowest. These do not apply to every expense, but there were trends in this direction. Training stables had the highest total expense. Riding stables appeared to have the lowest total expense, although it met this study's criteria for a difference only when compared to training stables.

Size category appeared to have a larger affect within facility type that across facility types. This is based on the differences in expenses demonstrated between sizes within a facility type, that showed no differences across facility type. Total expenses, tack and rent were the only expenses that met the criteria for further testing which demonstrated differences by size category with the GLM. When analyzed within operation types, feed, labor, health, tack, bedding and total expenses all showed differences by size category in at least one operation type.

This study has identified many areas where differences in expenses do exist on boarding, riding, and training stables. It also defines which expenses had the greatest impact on cash flow on the operations in this study.

Areas of high expense were identified, such as health and feed expenses, which merit additional study, as there are still many questions to be answered. Questions were also raised addressing the labor issue on horse facilities.

As indicated earlier, the horse industry is a vital part of Michigan's agricultural economy. A greater understanding of the economic challenges facing the operators of Michigan's horse facilities can help the industry become larger and stronger in the future.

CHAPTER VII

RECOMMENDATIONS

This study takes but the first step in analyzing the horse industry in Michigan, and barely scratches the surface of information available through the 1991 MEMS survey. This study analyzed operation types, size categories, and size categories within operation types. It would be of interest to also investigate operation types within size categories. That information, in combination with the data from this study, could identify if operation type or size had the greatest influence on expenses on horse operations.

Future studies may also wish to change the size categories, to discover if there are more optimal breaks than those used by this study, especially in the larger sizes. This study identifies many differences between the 3-9 size and the larger sizes, so this appears to be a legitimate place to break up the smaller facility.Use of different operation sizes may detect differences in expenses than were identified by this study. Further analysis may help identify where an economic efficiency would occur. This would be especially interesting in areas such as feed expense and bedding expense, where a difference by size category would be expected.

The current study identified an economy of size only on training operations. Dairy and swine operations both define the presence of an economy of size, and further study could help identify if this theory is present in the horse industry.

If there is a limited degree of economy of size in the horse industry, this information could be helpful to operator's considering expansion, or starting a facility.

One of the difficulties in identifying an economy of size is the variation in management practices in the horse industry. These variations may 'blur the lines' between different sizes. For this reason, examinations of management practices and their relationship to the economics of an operation would be of value.

More detailed examination of feeding programs would be one example which would be of interest. This study indicates no differences in feed expenses by operation type or size category. This study speculates that this is in part due to a large range of feeding philosophies that eliminate differences gained by size or operation. A more in depth analysis of feeding regimens could help clarify why there appears to be a greater economy of scale in feeding other livestock than there is in horses.

There are other areas in the current study that would appear to benefit from further examination. One of these is labor expense. As mentioned earlier, some work is already in progress in the area of clarifying the labor question. It appears in this study that most labor is family generated, not hired. Future studies could explore how much labor is actually used on horse operations. This has already been implemented by the MEMS study. Also, how is the labor divided

by a job perspective? Do the horse operations hire people for specific duties, or is it more of a "do what needs to be done" approach? A closer and more detailed examination of the labor required on horse operations could lead to increasing the effectiveness of programs geared to prepare students for participation in the horse industry. It would also increase the capacity of the industry to apply management philosophies that are successful in other business enterprises.

Another area that would be of interest for further study is health. As the second rated expense on all operation types, it is of great interest to the horse industry. The MEMS survey has begun a more exhaustive examination of the health expenses on horse operation. Preliminary data seem to indicate that lameness contributes to the largest number of work days lost, although colic is more of a concern on most operations (MEMS Phase 2-Final report). This is probably because colic, although it occurs less frequently, is more likely to result in loss of the animal.

A greater understanding of management techniques used on operations could assist in the prevention of health problems concerning the horse industry. Identification of the major problems would also assist in concentrating research efforts on those areas with the greatest impact on the industry.

Racing has been completely eliminated from this research, and merits an analysis of its own. As indicated by the decreased number of operations left in the condensed data base

after the elimination of racing, it is an important part of the Michigan horse industry. Also, over 12% of the horses in the MEMS survey were involved in either flat or harness racing as their primary activity. The State of Michigan Office of the Racing Commissioner estimates that racing generated $21.3 million in state revenue in 1992, as well as employing 40,000 to 50,000 people statewide. It also estimates that over $500 million are invested in acres and buildings devoted to horses, and racetracks. These figures indicated that the Michigan race industry has an impact on the statewide agricultural economy, and merit further study.

This study concentrated on expenses only. Future studies including income expenses would also be of interest as operations with higher expenses may still be more profitable if they are generating a greater income per horse.

APPENDIX

APPENDIX

1. Boarding of Equine (include stall fees and expenditures paid to others for boarding)	
2. Training fees (fees paid for training of equine and/or individuals)	
3. Breeding Fees (stud fees, etc.--not included in boarding)	
4. Health (including veterinary fees, medicines, parasite control,lab work, etc.	
5. Feed (include purchases of grains, hay pellets, and feed supplements and the value of grains and hay raised for equine)	
6. Insurance Premiums (equine related - liability, collision, mortality, etc.)	
7. Farrier (include shoeing, etc.)	
8. Travel and Lodging (include air travel,fuel, motels, meals, shipping of equine, etc.)	
9. Advertisement (include cost of ads, entertainment, pamphlets,subscriptions, etc.)	
10. Utilities (Equine related-telephone, water, heat,etc.)	
11. Capital Improvements (include total value of contracted labor and materials for construction of or additions to buildings, facilities fences, etc.)	
12. Maintenance/Repair (include contracted labor and materials for maintenance or repair of buildings, facilities, fencing,equipment, etc.)	
13. Bedding (include purchases of straw, shavings, etc., and the value of straw raised for equine)	
14. Tack (include clothing,halters, etc.) and grooming supplies (include clippers,soaps,etc.)	
15. Purchases of Equine (include total value of animals)	
16. Rent/Lease (include rental of land and buildings, of equine, equipment, etc.)	
17. Taxes (property tax on equine related land, excluding residence)	
18. Equipment Purchases (include total value of pick-ups, autos, campers, airplanes, treadmills, horse vans, trailers,tractors, hot walkers, starting gates, manure spreaders, motor homes, portable stalls, sulkies, carts, buggies, etc.)	
19. Professional Fees (include accounting, legal, etc., but exclude veterinarian and trainer)	
20.Miscellaneous (include registration, stakes payments, entry and membership fees, etc.,)	
21. Labor expenditures (not reported elsewhere, such as jockey fees)	
22. Other Expenditures not reported elsewhere (specify)	
TOTAL EQUINE EXPENDITURES FOR 1990 (Sum Items 1-22)	

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