Distance Cattle Travel to Water Affects Pasture Utilization Rate

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Abstract

It is a commonly accepted principle that location of watering sources in pasture and range situations affects distribution of grazing by ruminant animals. A study was conducted to determine the effect of distance travelled to water on pasture utilization rate by beef cow-calf pairs. Ten acre pastures with length width ratios of approximately 1 versus 4 were compared for uniformity of grazing distribution. The pastures more nearly square were grazed uniformly in all areas with a mean individual grazing period utilization rate of approximately 35% for a single grazing period. Rectangular pastures were more variable in grazing distribution with utilization rate ranging from between 40 and 50% at the front 100 to 200 ft of the pasture to less than 20% when distance from water exceeded approximately 1100 ft.

Introduction: Location of watering facilities on grazing lands has been widely recognized as a factor controlling grazing distribution by ruminants. In rangeland environments, the typical recommendations are that animals travel no farther than 2 miles to water on flat topography and no more than 1 mile in rough country (Smith, et al, 1986). In humid temperate environments less attention has been paid to water location and its effects on grazing distribution. Over several years we had visually noted that differences in grazing distribution occurred even in relatively small pastures and seemed to be oriented around water location.

The objective of this research was to determine how distance beef cows must travel to water affected grazing distribution and pasture utilization rate. As with most biological research, more than one parameter affects the final outcome. Stock density, topography, plant community will all affect grazing distribution. In this project stock density and total acreage in each paddock were held constant. Given this fact, distance from water necessarily became confounded with shape of paddock. That is a ten acre paddock with a maximum distance to water of 700 ft must be nearly square while a paddock with a maximum distance of 1400 ft to water cannot be square but must be rectangular with given dimfensions.

Materials and Methods: The experimental site was a 160 acre grazing cell located at the University of Missouri Forage Systems Research Center in north-central Missouri. The 160 acre cell was subdivided into 16, ten acre paddocks and was rotationally stocked with a single herd of beef cow-calf pairs. The pastures were well established cool-season grass-legume mixtures. Grazing periods were typically 2 to 4 days with a stocking density of 8.5 cow-calf pairs/acre. Paddock shifts were based upon pasture residual and animal observation. From approximately May 10 to July 10 either 2 or 3 bulls were also present on the pasture. The individual pastures used in this project have been established and grazed in the same configuration since 1982. However, from 1982 through 1991 they were typically continuously stocked from approximately May 1 through August.

Six paddocks were selected from the sixteen to provide a range in maximum distance which the stock must travel to water. All experimental pastures were 10 acres but were either nearly square (600 x 720 ft) or rectangular (1320 x 330 ft). Three rectangular pastures had water available at a corner location while the other two accessed water from a corner gate and travelled an additional 300 to 600 ft of lane to the water tank.

Paddocks were sampled during either 2 or 3 grazing cycles during the months of May, June, July, and August. Herbage on offer was determined prior to grazing and immediately following grazing on each of the selected paddocks. Each paddock was divided into sampling zones 100 ft in width beginning at the watering site. In each zone, four 20 x 3 ft strips were harvested prior to grazing using a Carter Harvester set at a 2 in cutting height. Strip samples were weighed wet in the field, a subsample taken for determination of moisture content, and dry matter yield was determined. Following grazing, a paired, parallel strip was harvested from within 4 to 8 ft of each pre-grazing harvest strip. Pasture utilization rate was determined to be the difference between the pre and post-grazing dry matter yields.

Regression analysis using distance from water as the independent variable and utilization rate as the dependent variable was used to determine grazing distribution across the paddocks. Individual analyses were conducted for each paddock at each grazing cycle. While a large degree of variance existed on a pasture to pasture basis, largely due to landscape differences, the general trend in utilization pattern was consistent. For this reason, all rectangular paddocks were combined in the final analysis and compared to the square paddock.

<u>Results and Discussion:</u> It is important to understand that grazing distribution across the landscape is influenced by a number of factors. These include topography, plant community, length:width ratio of the paddock, and stock density as well as distance travelled to water. In the rolling landscape typical of north Missouri, topographical location of the watering site will have an impact on grazing distribution in and of itself. As the pastures used in this project had been grazed in the same configuration for the 10 years preceding this study, pre-existing gradients in soil fertility and plant community were likely to exist. The type of relationships discussed in this paper must be considered in the context of the time continuum.

In all paddocks sampled, measured pre-grazing forage mass increased from front to rear (Figures 1 and 3). For some paddocks the increase was only marginally significant while for others it was quite significant. In the case of the square paddock, soil type changed from front to rear, with the soil to the rear being the more productive soil. The soil type in the front half of the square paddock had a productivity index of 56 while the soil in the back half had a productivity index of 74. This may explain a large part of the yield distribution in this paddock. In most of the rectangular paddocks, the increasing yield cannot be explained by soil type. Soil nutrient gradients in the paddocks were not significant in all paddocks and in some cases were high in the front and low in the back while other paddocks exhibited higher fertility in the back of the paddock compared to the front. Thus, the yield gradient cannot be explained adequately from a soil perspective in most cases.

We hypothesize that the yield distribution gradient in the rectangular paddocks is the result of several years of nonuniform grazing distribution. For the 10 years prior to this study each pasture had been used as an individual continuously stocked pasture. The plant species present in the front parts of the pastures tended to be those more tolerant of heavy grazing, such as bluegrass and white clover, while orchardgrass and red clover tended to be more common toward the rear of the pasture.

Grazing distribution was markedly different between the square paddock (Figure 2) and rectangular paddocks (Figure 4). Pasture utilization was very uniform across the square paddock whereas utilization rate in the rectangular paddocks began to decline rapidly once the animals had to travel more than 600 to 800 ft to water. Virtually all reports in the literature dealing with grazing distribution as it relates to water location are from semi-arid to arid range environments. Hart et al (1989) reported that distance to water had no effect on pasture utilization in relatively small pastures (60 acres) that were either continuously or rotationally grazed. In a larger 512 acre pasture, utilization rate dropped from 60% in the zone nearest to the water source to less than 30% when the cattle travelled 3 miles distance. These figures, however, represent total season utilization rate and not individual grazing period responses. It is likely that later in the season as forage supply nearer the water source becomes more limiting, the animals will in fact travel greater distances to satisfy dietary needs. Stuth (1991) indicated that no difference in range utilization occurred within 1/2 mile of the watering site but indicated a 10% drop in utilization rate when cattle travelled between 1/2 and 1 mile to water. Pasture and range cattle are very different in their foraging behavior. Part of these differences can be attributed to the forage mass typically available to the animals. Range cattle must travel greater distances to satisfy their intake needs than pasture cattle and are thus forced to travel greater distances on a regular basis. Pasture cattle will likely stay closer to water as long as forage is abundant in the front part of the pasture. A question that must be considered is whether the observed grazing distribution is the result of the distance the animals travel from water or is it the result of a square paddock compared to a rectangular paddock. Reports have been mixed regarding impact of paddock shape on grazing distribution but in almost all studies distance to water and shape have been confounded.

In conclusion this data illustrates that distance that livestock travel to water has a profound influence on grazing distribution and subsequent pasture utilization rates. This distance is apparently much less in humid temperate pastures than in semi-arid range environments. We recommend that pasture systems be designed to provide water sources within 600 to 800 feet of all areas of the pasture for optimum uniformity of grazing.

<u>Literature cited:</u>

Smith, Burt, PingSun Leung, and George Love. 1986. Intensive Grazing Management: Forage. Animals, Men, Profits. The Graziers Hui, Kamuela, Hawaii.

Hart, R.H., M.J. Samuel, J.W. Waggoner, and M.A. Smith. 1989. J. Soil Water Cons.

Stuth, J.W. 1991. Foraging Behavior in R.K. Heitschmidt and J.W. Stuth (eds) Grazing Management: An Ecological Perspective. Timber Press, Portland Oregon

Figure 1. *Forage mass distribution in a 10 acre paddock with a length: width ratio of 1.*

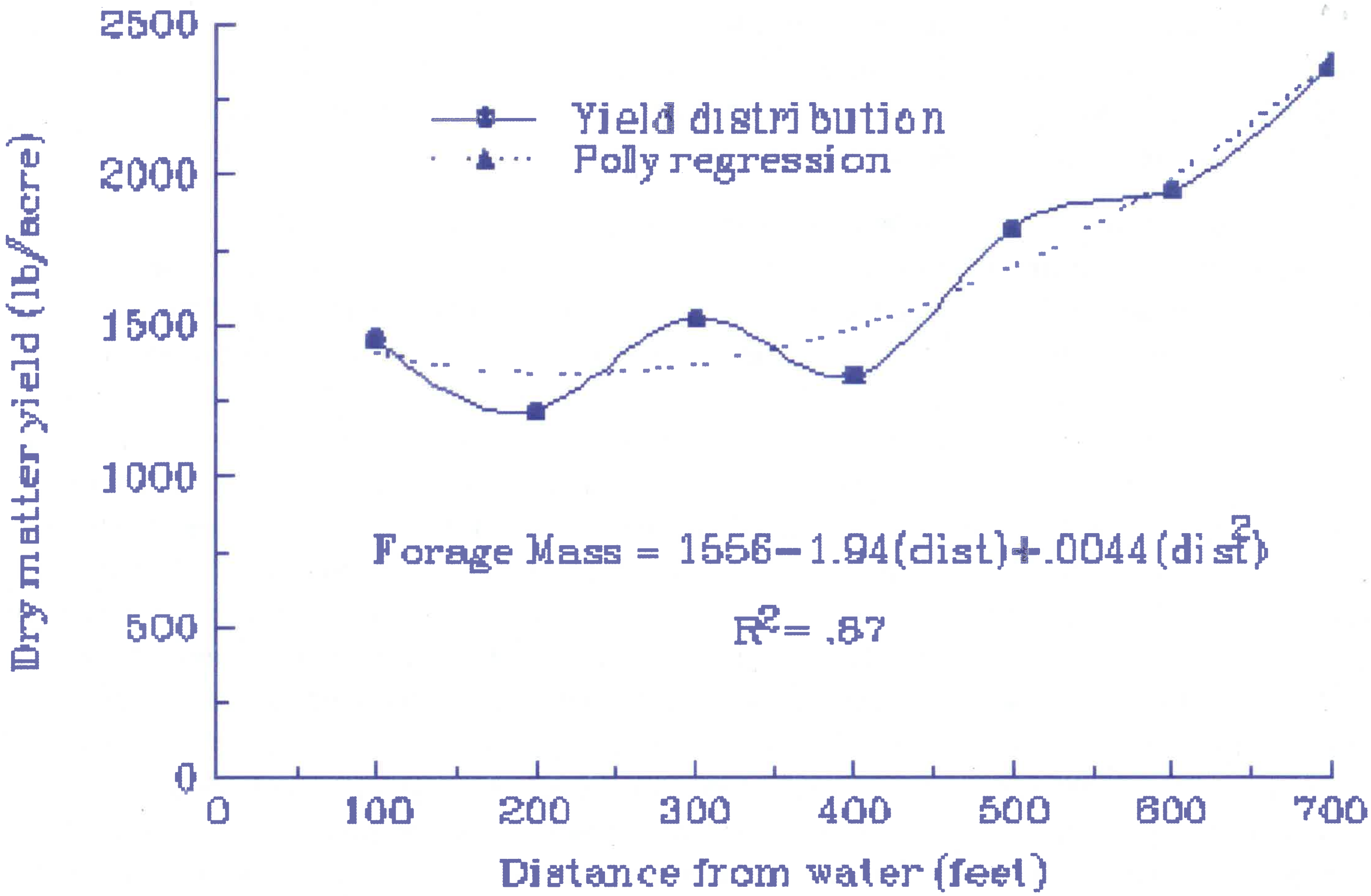

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Figure 2. *Pasture utilization rate in a 10 acre paddock with a length: width ratio of 1.*

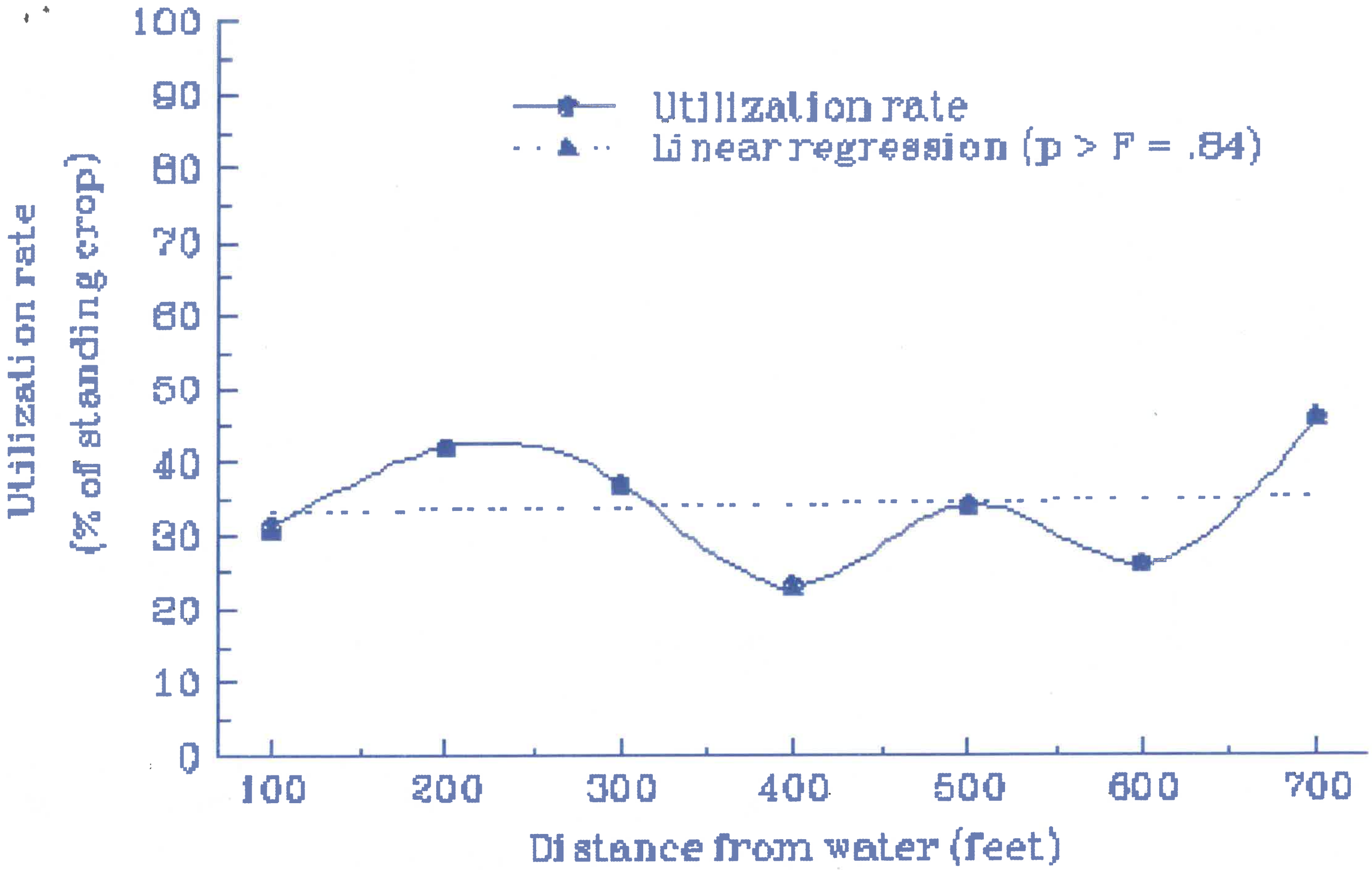

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Figure 3. *Forage mass distribution in 10 acre paddock with a length: width ratio of 4.*

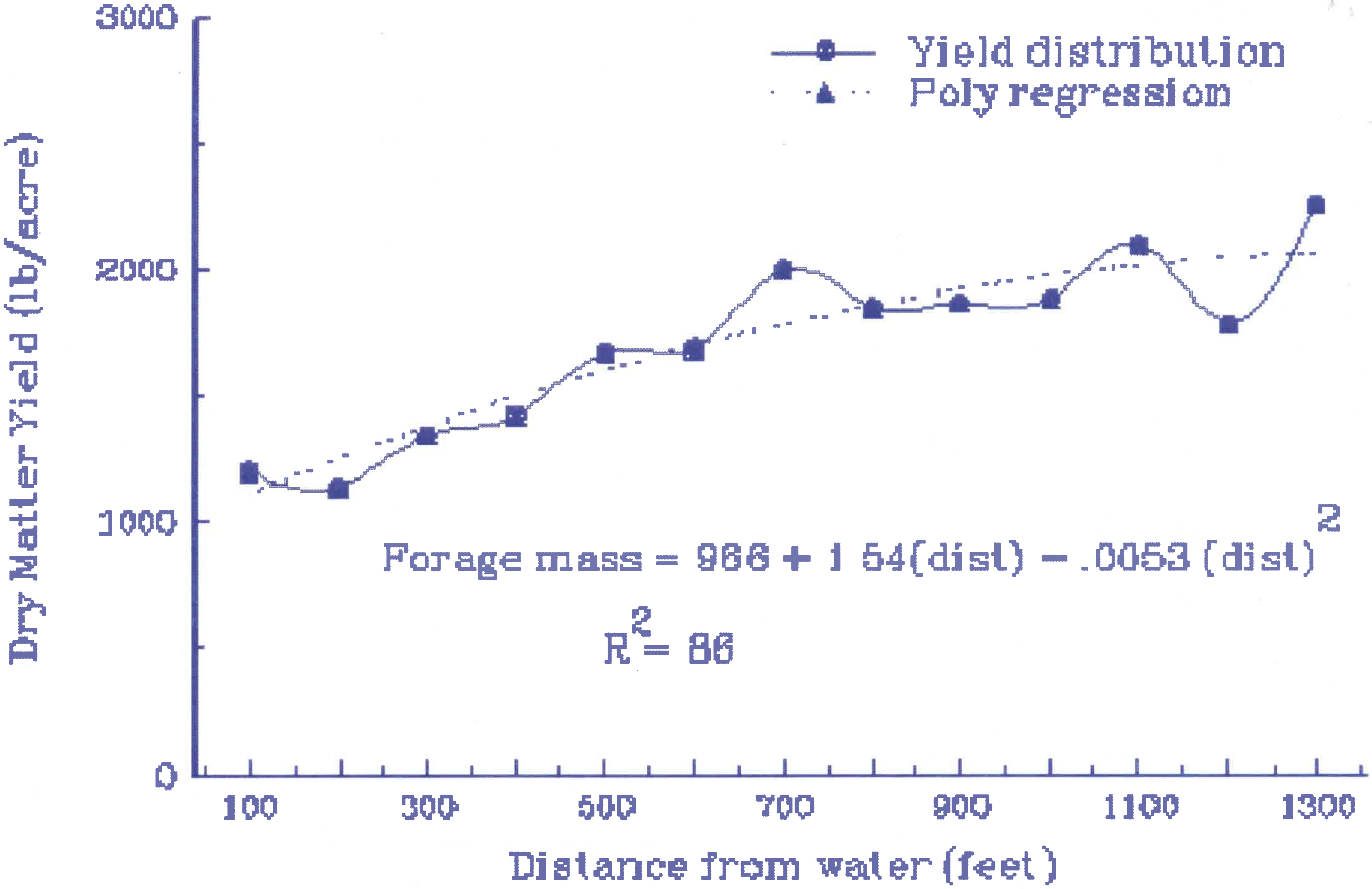

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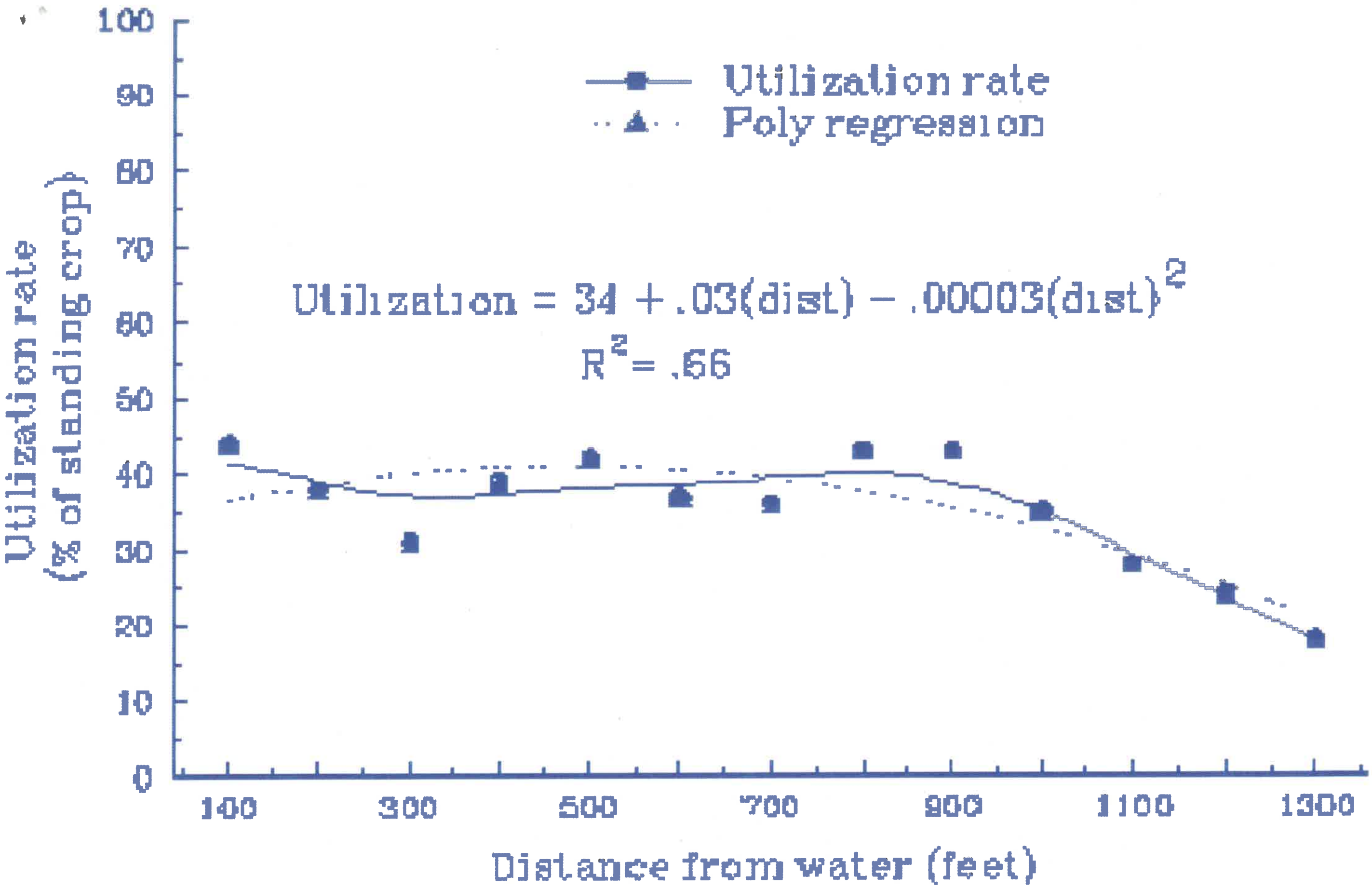
***Figure 4.**Pasture utilization rate in a 10 acre paddock with a length: width ratio of 4.*



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