

Short Duration Grazing Research in Africa

An extensive review of the Charter Grazing Trials and other short duration grazing studies on African rangelands.

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Over the past 30 years short-duration grazing has become both a popular and controversial approach to grazing management. Theories behind short-duration grazing, developed by Allan Savory in Zimbabwe, Africa, were initially introduced in the United States by Goodloe (1969) and Savory (1978). Later Allan Savory made a progressive series of refinements summarized by Savory and Parsons (1980), Savory (1983), Savory (1988), and Savory (1999). Various studies in North America attempting to evaluate Savory's theories on short-duration grazing were reviewed by Holechek et al. (2000).

The "Charter Grazing Trials" conducted in Rhodesia (now Zimbabwe) were the research foundation for short-duration grazing as originally conceived by Allan Savory (*Rangelands*, June 2000, letter to the editor, p. 32 & 33). Reader comments published in "Rangelands" under letters to the editor regarding the Holechek et al. (2000) review of short duration grazing in North America make repeated reference to the "Charter Trials" but a detailed analysis is lacking. Our objective is to review the three scientific papers on the "Charter Grazing Trials" as well as other African studies on short-duration grazing.

Primary references for our review of the Charter Trials are Clatworthy (1984), Worthington (1984), and Parsons (1984). These reports published in the *Zimbabwe Agricultural Journal*, provide summaries of vegetation, livestock and economic outcomes from the 7-year Charter Trials conducted between 1969 and 1975. This research project derives its name from the Charter Estate, a London based company, which provided land, cattle and facilities for conducting the research. The Rhodesian Minister of Agriculture arranged the trials. Vegetation monitoring was done by the Rhodesian (Zimbabwe) Research Station, while the University of Rhodesia conducted economic comparisons.

Mr. Savory, according to his letter to the editor (*Rangelands*, June 2000, p. 32 and 33) played a key role in planning and decision making for the "Charter Trials" and endorses the findings. The basis for the "Charter

Trials" was Mr. Savory's contention he could double the stocking rate on any land under conventional management, improve the land and make more profit using the planned grazing process then called short-duration grazing, but today called Holistic Planned Grazing (Savory, *Rangelands*, June 2000, letter to the editor, p.32).

The Charter Trials

In May 1969 the Charter Trials were initiated to evaluate three grazing approaches. These included S1 (Richman Savory), S2 (Poorman Savory), and C (Control). The study area was about 6,200 acres in size with each treatment implemented on roughly 2,000 acres. For both the S1 and S2 treatments, the period of grazing and stocking rates were determined by Mr. Allan Savory and Mr. David Worthington, Managing Director of Charter Estates.

The Richman Savory (S1) was designed for the rancher with adequate capital to sub-divide his ranchlands into 21 paddocks per single herd. Livestock were frequently moved from one paddock to another. The Poorman Savory (S2) was designed for the rancher who must rely on capital from livestock production profits for further sub-division. Initially five-paddocks and one herd were used but the number of paddocks was increased to 7 by the end of the trial. The Control (C) initially involved a four-paddock grazing system commonly used in Rhodesia (Zimbabwe). This system incorporates a spring burn every third or fourth year on each pasture apparently to reduce build up of tall course grasses and control brush.

Early in 1971 it was recognized that differences between veld types in the experimental areas, made meaningful comparisons between the three grazing treatments difficult. In June 1971 a second control (C2) was added to take into consideration differences between veld types. Apart from rotation procedures, cattle management was identical on all four grazing treatments.

Annual precipitation across the study area during the seven year study period averaged 29.7 inches per year. Based on this amount of rainfall and relatively warm

temperatures, we consider the area to have a sub-humid climate. Total annual rainfall was 23.7, 20.1, 27.2, 36.0, 14.5, 45.9, and 40.4 inches for consecutive years in the 1969 through 1975 period. The last three years of study received 42% more rainfall than the first three years. Long term average annual rainfall for the study area is near 24 inches. Precipitation during the Charter Trial was about 24% above the long term average.

Apparently the study area for the Charter trials involved relatively flat soils that are generally moderately shallow sandy loams but vary somewhat among grazing treatments. We were unable to discern the extent of this variation from the reports.

Vegetation changes on each of the four grazing treatments were evaluated with five plots, 0.75 acre in size distributed so they covered the variation in soils and plant communities within each pasture. Vegetation composition was expressed as the percentage frequency with which plant species occurred in 240 quadrats (40 x 20 cm in size) arranged in a grid pattern within each plot. Basal cover was the percentage interception at ground level along 48 lines each 5 m long arranged in a grid. All plots were photographed twice annually to preserve a visual impression of the amount of herbage at the start and end of the dry season.

Detailed records were kept on cattle numbers, cattle weights, pregnancy rates, death losses, income, and costs associated with each grazing treatment. Costs were broken into overhead costs (management, labor, tractor expenses), cattle costs, fencing costs, and water costs.

Vegetation Changes

During the seven year study period, neither plant species composition nor basal cover showed any consistent differences among grazing treatments or definite trends according to Clatworthy (1984). Some minor changes in frequency of occurrence were noted for particular grass species under individual grazing treatments. However short-duration grazing failed to produce the marked improvement in grass cover claimed from its application.

Great differences occurred in general appearance of the different systems due to the conservative stocking rate applied on the C1 and C2 controls. The grass grew tall and old growth accumulated in these treatments. Burning was considered necessary to remove this accumulation which was thought to hamper new growth. On the rotationally grazed treatments the heavy stocking rate kept the grass short with no build-up of dead material. Overall Clatworthy concluded that the short-duration pastures carried about 50% more cattle compared to controls without any evidence of harmful effects on the grass cover.

Apparently no quantitative evaluations were made of

forage production or grazing intensity on any of the four treatments. However in reviewing the qualitative assessment of grazing use by Clatworthy (1984), we are left with the impression that the two control pastures may have been understocked in four of the seven years and the two short-duration grazing pastures were overstocked in two of the seven years. The short-duration grazing pastures carried about 50% more grazing pressure than the control pastures without degrading the vegetation. However it is likely that the control pastures were understocked and could have safely carried more livestock. Keep in mind precipitation during the study was 24% above the long term average. Since the control pastures and the short-duration grazing pastures were not stocked equivocally it is not possible to separate stocking effects from rotation effects.

Grazing and burning effects are also difficult to separate in this study. The control pastures were burned while the short-duration pastures were not. It seems to us that more grazing would have been the best way to reduce the excessive vegetation accumulation on the control pastures. On the other hand Worthington (1984) believed woody plants were increasing on the short-duration pastures due to absence of burning and high stocking rates. Apparently periodic brush control is needed in this part of Africa. Accumulation of grasses under conservative stocking in wet years is advantageous in permitting control of brush with fire.

Individual Cattle Production

Cattle performance was reduced by both short-duration grazing treatments compared to controls but production per acre was increased (Worthington 1984) (Table 1). Beef production per acre was 40% higher for the Richman Savory than Control 1 and 29% higher for the Poorman Savory than Control 2. This was due to the higher stocking rate of Savory systems. Reduced diet quality and forage intake due to lower forage availability presumably explains the reduced livestock productivity under Savory grazing compared to controls.

Calf crops were reduced 11% and 15% for Richman and Poorman Savory systems compared to controls (Table 1). Calf weaning weights were also reduced by Savory grazing compared to controls.

Calf death losses were lower under the Savory systems than the controls (Table 1). This was presumably due to better livestock supervision under the two Savory systems.

Supplemental feed costs were higher for the two Savory grazing systems. This was due to lower forage availability in the Savory grazing system pastures during drought years.

Worthington (1984) commented that in the early years of study cattle groups being moved every second or third

Table 1. Beef production and financial characteristics of the Richman Savory (S1), Control 1 (C1), Poorman Savory (S2), and Control 2 (C2) for the Charter Grazing Trials in Zimbabwe (1969–1975) (from Worthington 1984).

Characteristics	Grazing Treatment			
	Richman Savory	Control 1	Poorman Savory	Control 2
Average stocking rate (acres/cow/year)	8.47	12.28	8.30	11.44
Average calf crop (%)	64	72	64	75
Average calf weight (lbs/year/calf)	377	429	392	416
Average beef production (lbs/acre/year)	35	25	36	28
Average calf loss/year	2.2	3.8	2.8	4.4
Average gross margin/acre/year (\$)	3.35	3.16	3.90	3.11
Average gross margin/cow/year (\$)	21.82	38.02	28.91	35.70
Average total gross margin (\$/year)	4,974	4,695	5,781	4,605

day under Savory grazing were highly stressed but with acclimatization this factor became of less importance. Both conception rates and weight gains were reduced for new compared to acclimatized cattle. A gradual period of cattle adaptation to rapid rotation was considered essential.

Financial Outcomes

Both Savory grazing systems gave higher monetary returns per acre but lower returns per cow than the controls (Parsons 1984) (Table 1). During the 7 year study ranchers would have averaged 6% more total income per year with the Richman Savory and 26% more income per year with the Poorman Savory than the controls. Financial comparisons for the Richman Savory involved the last 4 years when higher than average rainfall occurred while the comparisons for the Poorman Savory involved 6 years.

Conclusions Drawn by Worthington (1984)

After consideration of his own findings as well as those of Clatworthy (1984) and Parsons (1984) Worthington (1984) drew several conclusions from the Charter Trials which include:

1. Some form of rotational grazing is essential to obtain maximum production.
2. As grazing selectivity is reduced, individual animal performance suffers, but total performance per unit of land increases within practical limits.
3. The maximum carrying capacity should be judged for an average, or slightly below average rainfall year.
4. No advantage was noted for having more than 7 paddocks per herd.
5. The quicker the move, the greater the need for high standards of management.
6. With veld (rangeland) in good condition, no damage occurred nor improvement was noted under the high stocking pressure of the rotational grazing system. Similarly little or no change was noted under low stocking pressures. This situation possibly does not pertain in severely degraded veld (rangeland).

Other African Research on Short-Duration Grazing

We have reviewed other African research on short-duration grazing. A summary of South African grazing research is provided by O'Reagain and Turner (1992). We could find no evidence that short-duration grazing with 8 or more paddocks has any advantage in terms of improved livestock productivity, increased carrying capacity or improved rangeland condition over more simplistic grazing systems with 4 paddocks. Experimental evidence that even simplistic 2–4 pasture rotation systems can be advantageous over continuous grazing is lacking (O'Reagain and Turner 1992).

In Botswana Pratchett (1983) reported that continuous grazing and a 9 paddock rapid rotation grazing system during the 4 year period showed no difference in cattle performance, yield of grass or botanical composition at equivalent stocking rates. In this study stocking rate was the primary factor influencing vegetation performance. During drought heavy stocking more adversely affected vegetation cover and composition than moderate stocking.

In Rhodesia (Zimbabwe), Denny and Steyn (1977) compared a four paddock/1-herd and a 16 paddock/1-herd rapid rotation grazing system over a six year period at equivalent stocking rates. No differences occurred between the two systems in cattle performance or vegetation trend. Based on evidence from this trial and a previous trial (Denny et al. 1977), the authors concluded that intensive rotational grazing in multi-paddock systems does not provide a unique means to favorably modify veld composition.

Gammon (1984) provides an insightful analysis of the history of short-duration grazing in Zimbabwe. He mentions that during the 1970's when short-duration grazing was widely applied in Zimbabwe rainfall was well above average. Many reports of spectacular rangeland improvement under short-duration grazing in this period were based on visual impressions with no recorded measurements to monitor change. He mentions that similar

improvement may have occurred under less intensively managed systems.

On one ranch (Liebigs Ranch) spectacular improvement occurred under a 32 paddock short-duration system stocked at more than double the normal stocking rate. However he noted rainfall was 50% above average during this nine year period. Comparisons showed surrounding less intensively managed veld was in similar condition and probably had similar improvement. In the 1980-82 period rainfall was near average and stocking rates on the Liebig Ranch had to be progressively reduced to 50% above normal. By November 1982 the paddocks were so short of grass that complete destocking was required. It was concluded in years of high rainfall at least double the normal stocking recommendation could be carried under short-duration grazing but stocking rates would have to be greatly reduced in average or below average precipitation years.

Gammon (1984) further states that various rotational grazing system studies have shown no clear cut advantage for any particular form of management. More often than not the more intensive systems with large numbers of paddocks per herd lowered animal production, and there was no apparent improvement in botanical composition.

Our Conclusions

Our review of findings from African studies on short-duration grazing including the "Charter Trials" shows a very high similarity to those from North America summarized by Holechek et al. (2000). We could find no definite evidence in the African studies that short-duration grazing involving 5 or more paddocks will accelerate plant succession compared to more simple grazing systems or continuous grazing.

Short-duration grazing reduced individual cattle productivity in some of the African studies due to stress from heavy stocking and movement of cattle from one paddock to another. Some increase in stocking is possible with short-duration grazing compared to more simplistic systems because multi-paddocks improve livestock distribution. Gammon (1984) recommended stocking rate increases for short-duration grazing should be no more than 30% above conventional rates in years of approximately average precipitation. He further stated there is no established justification for more than 6 to 10 paddocks per herd.

We point out that the African and North American studies of short-duration grazing on native rangelands were all conducted in semi-arid or sub-humid environments and rangeland condition was considered good. Further studies involving arid environments, degraded rangelands, longer time periods, and more replication in

space would provide a more thorough understanding of short-duration grazing.

Lastly, it is noteworthy that both the African and North American studies are quite consistent in showing stocking rate to be much more important than type of grazing system in determining vegetation trend, livestock productivity and financial returns. No grazing system has yet shown the capability to overcome the long term effects of overstocking and/or drought on vegetation productivity. Conservative stocking has been the surest approach to improving rangeland condition and minimizing the adverse impacts of drought on vegetation and livestock in both Africa and North America.

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