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**CURRENT ISSUES IN RANGELAND RESOURCE ECONOMICS**

A Series of Papers Written by Members and Associates of  
Western Regional Coordinating Committee 55  
"Rangeland Resource Economics"

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## CURRENT ISSUES IN RANGELAND RESOURCE ECONOMICS

### Foreword

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Six of the papers presented at the Economics Session of the Society for Range Management (SRM) 1990 Annual Meeting in Reno, Nevada, were prepared by members of Western Regional Coordinating Committee 55 (WRCC-55) and their associates. Discussion drafts of four of the six papers had been previously presented and discussed at the 1989 Annual Meeting of WRCC-55 in San Antonio, Texas. Based on this earlier presentation and discussion, the four papers were revised for presentation at the SRM Annual Meeting.

The four papers in question dealt with alternative sides of two issues with which range and ranch economists seem to be continually involved--whether or not domestic livestock grazing should be permitted on public lands, and the use of traditional versus more sophisticated methodologies in range and ranch economics research. The remaining two papers concerned issues of current interest--resistance to the use of economics in decision processes within the Bureau of Land Management and the future of the stewardship approach to public land management.

## Introduction to the Economics Session

Society for Range Management 1990 Annual Meeting  
Reno, Nevada

by

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Range economics is a subdiscipline of agricultural and resource economics. It is loosely subdivided into two areas of inquiry, neither of which is independent of the other--rangeland resource economics and ranch economics. Both areas of emphasis draw heavily, in their applications, on the knowledge base of range science and related disciplines such as animal science and wildlife science.

Many of these applications address management issues that are contentious in nature. Contention characterizes the various issues addressed in the six papers presented at the Economics Session of the 1990 Annual Meeting of the Society for Range Management.

The first of these contentious issues addressed in the following papers is that of livestock grazing on public lands. Is that use of public lands defensible? E. Bruce Godfrey of Utah State University and C. Arden Pope III of Brigham Young University present the case, as argued by others but not necessarily themselves, against permitted grazing of domestic livestock on public lands. Countering their arguments are Thomas M. Quigley of the Forest Service and E. T. Bartlett of Colorado State University who present a reasonable defense of livestock grazing as a legitimate public land use.

The second issue for debate is one of long standing in rangeland economics research--the relative merits and weaknesses of older and more traditional versus recent and more sophisticated analytic tools in range and ranch (but not resource) economics research. Arguing in favor of the newer sophisticated methodologies are Daniel J. Bernardo of Oklahoma State University and J. Richard Conner of Texas A&M University. Advocating more traditional methods of static economic analysis are L. Allen Torell of New Mexico State University and John A. Tanaka of Oregon State University.

In one of the two remaining papers, R. K. Davis of the University of Colorado and E. G. Parsons of the Bureau of Land Management examine the possible reasons for the resistance to the use of economic

efficiency analysis by Bureau field personnel. In the final paper, Neil R. Rimbey and Lee A. Sharp, both of the University of Idaho, summarize the accomplishments of the Bureau of Land Management's Challis Area Experimental Stewardship Program while questioning the resistance to broader acceptance of that cooperative management approach within the federal land management agencies.

### The Future of Domestic Livestock Grazing on Public Lands

"Cattle free by '93?" Godfrey and Pope present "The Case for Removing Livestock from Public Lands." Some, but not all, of their arguments are rebutted by Quigley and Bartlett in their paper, "Livestock on Public Lands: Yes!"

Those who would reduce, or in the extreme eliminate, domestic livestock grazing on public lands base their case on three lines of reasoning. First, domestic livestock grazing has detrimental effects, i.e., imposes negative externalities, on public land resources and thus on alternative (and often more highly valued) uses. Second, ranchers who enjoy public land grazing privileges are unfairly subsidized, and at the American taxpayers' expense. Third, public lands provide, from a national perspective, a trivial portion of the aggregate supply of livestock forage. Hence, their removal from the food chain would have negligible effects on red meat supplies and/or retail prices.

Godfrey and Pope cite a considerable body of literature in support of each of these lines of reasoning. As examples of the negative externalities associated with public land livestock grazing, they point toward riparian area damage, soil erosion, water contamination, competition with wildlife for habitat and food supplies, damage to recreation sites and areas, and harm to aesthetic environmental qualities. Implicitly, these arguments suggest that the benefits attached to these adversely affected resources in their various nongrazing uses (opportunity costs) exceed the benefits gained from

continued domestic livestock grazing on public lands. This line of reasoning leads to the conclusion that the net social value stemming from all uses of public land resources is reduced if domestic livestock grazing is permitted.

Moreover, monetary value is purported to be lost through grazing use. Public land livestock grazing fees are argued to be administratively set at levels below their "fair market value" resulting in excessive grazing pressure on the public forage resource and leading to deteriorating range conditions. Low grazing fees represent a direct subsidy to privileged ranchers and place them in a position of unfair competitive advantage relative to other livestock producers. In addition, from a budgetary standpoint the public land livestock grazing programs of the Forest Service and the Bureau of Land Management are cost ineffective, with administrative program costs well in excess of grazing fee receipts.

Finally, Godfrey and Pope reiterate the claims that public lands contribute little, if at all, to the national supply of red meat while concurrently consumer demand for red meat continues to decline. Private feed and forage supplies are far larger than total permitted AUMs on federal lands; most permittees run small hobby or part-time livestock operations; and the public land portion of the domestic livestock sector is of little economic consequence. In short, the opposition argues that the use of public lands for domestic livestock grazing is inefficient, unfair, and unneeded.

Quigley and Bartlett counter by acknowledging that domestic livestock grazing on public lands can generate social and environmental costs. However, when considering the public policy issue of domestic livestock grazing on public lands, neither the benefits attributable to livestock grazing nor the notion of equity for both public land ranchers and their rural communities should be overlooked. Among the relevant benefits are preservation of a traditional way of life in the American West (an "existence" value); contribution to the maintenance and stability of both small rural communities (a "monetary" value) and ranch units that otherwise would be forced out of business (a "capital" value); and the complementary use value of domestic livestock as a vegetative management tool on public lands.

The case against domestic livestock grazing on public lands is seen to be less clear cut than detractors' claim. Seasonal public land forage dependency is high in many areas. When coupled with the fact that most public land ranchers run cow-calf operations, this means that potential red meat supply and retail meat price impacts from reduced public land livestock grazing would be

much greater than the national forage supply aggregates would imply. Grazing fee levels are shown to have little bearing on grazing pressure on public land forage resources. Certain types of grazing management systems and practices can lead to improvement in riparian areas and range condition. The actual net cost to the federal Treasury of Forest Service and Bureau of Land Management grazing programs is grossly overstated and misses the real point--more consideration should be given to joint production/multiple output opportunities with domestic livestock grazing as one part of the management equation.

Quigley and Bartlett conclude that domestic livestock grazing is an economically and environmentally justified use of public lands. Through range improvements and careful management ranchers and agency personnel have made a positive contribution to the public rangeland resource. They acknowledge, however, that problems remain--particularly the grazing fee, range condition, and riparian area issues. Until research results conclusively reveal what observation suggests, the supporters of domestic livestock grazing on public lands will continue to be on the defensive, even though continued grazing use of the public land resource is inevitable.

#### The Roles of Contemporary and Traditional Methodologies in Range and Ranch Economics Research

Most agricultural and resource economists, certainly all interested in range and ranch economics research, are familiar with an exchange of professional opinion that occurred in the early '70s. Writing in the *American Journal of Agricultural Economics*, Oscar Burt proposed that a dynamic programming approach be used to analyze the timing of capital investments in range improvements. Unfortunately, he had little or no useable data. Bill Martin responded with a healthy dose of skepticism, aptly captured in the title of his subsequent paper appearing in the same journal: "More Sophisticated Tools for Less Important Problems: The History of Range Improvement Research--A Comment."

Bernardo and Conner, the authors of "Contemporary Methodologies in Range Economics Research" and Torell and Tanaka, the authors of "Opportunities for Traditional Methodology in Range and Ranch Economics" are much closer in their positions. All agree that there are legitimate roles in range and ranch economics research for both traditional and more recent analytic tools. Their differences are a matter of relatively modest emphasis.

Both sets of authors agree on the fundamental nature of the rangeland ecosystem in interaction with domestic livestock under the managerial control of the rancher.

The rangeland ecosystem is complex and dynamic, subject to modification by livestock, influencing the performance of livestock and hence the financial status of the livestock operation, and manipulatable through both animal husbandry and range management practices. Thus, domestic livestock combine with the rangeland ecosystem in an interactive rangeland livestock system that is most appropriately viewed as a set of intra-seasonal, inter-seasonal, multiple year, multiple output, staged production/consumption relationships. Few complete physical or biological data sets are available reflecting this view of the rangeland livestock system--hence empirical economic research opportunities are limited at best.

Given these common grounds, the authors of the two papers put their best feet forward in defense of both conventional and newer analytic approaches to range and ranch economics research. Bernardo and Conner believe that there are productive opportunities for process oriented research--particularly biophysical simulation, and to a lesser extent dynamic optimization and artificial intelligence (expert systems). Torell and Tanaka hold that newer is not necessarily better, especially given the data constraints. The tried and true methods of marginal analysis, ranch and enterprise budgets, capital and partial budgets, cash-flow budgets, and linear programming still have legitimate places in the range economics researcher's tool kit.

Bernardo and Conner present an excellent review of the nature and applications of four categories of potentially useful methodologies in range and ranch economics research. These include operations research techniques, biophysical simulation models, dynamic optimization models including optimal control theory, and knowledge-based or expert systems.

The operations research techniques discussed by the two authors are mathematical programming and firm simulation. Early mathematical programming techniques are concluded to be of limited usefulness due to their basic linearity and deterministic characteristics. Similarly, data constraints and the absence of macroeconomic control policies in the rangeland livestock sector limit the applicability of firm simulation models.

Biophysical simulation is seen as holding considerable promise. Bernardo and Conner note that economists traditionally have shunned such models because many of their parameters are not statistically estimated, and the models are characteristically constructed in a nonoptimizing framework. Another drawback is that many biophysical simulation models are narrow in application, frequently focusing on a single homogeneous output--unlike the heterogeneous nature of the rangeland

livestock system. However, they argue that through active participation by economists in the construction of management-oriented, quasi-normative, biophysical simulation models, these limitations can be overcome. If so, "biophysical models hold the potential to provide response information, the lack of which has severely constrained our ability to conduct meaningful decision analysis for ranchers."

Dynamic optimization models have been widely used in range and ranch economics research, largely because they are well suited for the analysis of multiperiod dynamic decision problems. Historically, the major difficulty in the application of such models has been specification of underlying physical and biological production/consumption relationships. The models are well suited for the identification of needed relationships, parameters, and biophysical data. By "pointing the way" to data needs, dynamic optimization models are seen to have a valid place in range and ranch economics research. Even more fruitful opportunities may exist for applications of stochastic optimal control theory models solved using nonlinear optimization techniques.

Expert systems, a special form of artificial intelligence, when used as a "stand-alone" technique are best suited for Extension education activities--as a means of transferring problem solving knowledge from professional researchers to on-the-ground managers. In the research mode, the fact that expert systems require prior knowledge of the logic and methodology of problem solving limits their usefulness as analytic tools. They can be helpful in framing range and ranch research designs, in transferring the results obtained using other techniques, and/or as components of larger range livestock system models.

Bernardo and Conner conclude that the paucity of existing empirical knowledge of the rangeland livestock system leaves research economists with three choices. They may abandon range and ranch economics research efforts, continue to try to apply traditional static models using whatever data exists, or attempt to cooperate with range and animal scientists in the construction and application of meaningful rangeland livestock system models. The two authors prefer the third, discount the second, and discard the first alternative.

Torell and Tanaka similarly dismiss the notion of abandoning range and ranch economics research. Given the existing data constraints, they pragmatically conclude that relatively greater emphasis should be placed on traditional methodologies, but that efforts to apply more sophisticated techniques should continue. An underlying theme in their arguments is that practical, decision aiding information is needed by ranchers and range

managers--the type of information typically obtained from traditional static models. More sophisticated knowledge is less urgently needed, and is instead sought by research economists because it is favored by the professional reward system.

Torell and Tanaka provide numerous examples of appropriate applications of traditional methods of economic analysis. These include the use of marginal analysis in determining optimal resource use rates and optimal input and output levels. Whole farm or ranch plans are seen as useful aids in the managerial decision making process. Enterprise budgets help managers analyze and select alternatives, not all of which need to relate directly to livestock. Partial and capital budgets are well suited for range improvement feasibility analysis. Cash-flow budgets similarly are applicable for improvement and other ranch investment analyses. Most of these practical information needs also can be adequately addressed using conventional deterministic linear programming.

The authors do recognize that the assumptions underlying the traditional static approaches are violated when the models are used in the analysis of dynamic rangeland livestock system interactions. They argue, however, that the net effects of errors introduced through violation of underlying assumptions are quite small. Therefore, given the near absence of relevant biophysical data, traditional methods should continue to be used in range and ranch economics research.

Torell and Tanaka do not believe that strong multidisciplinary research teams are the answer to the rangeland resource data problem. They maintain that the research objectives of economists differ from the objectives of range and animal scientists, who in turn view economics as the "dismal science" with an appropriate role only at the tail end of multiple year research programs. Even if these perceived obstacles to multidisciplinary rangeland livestock system research could be overcome, the authors conclude that the greater need in range and ranch economics research remains the practical knowledge most appropriately obtained using traditional economic methodologies.

#### Resistance to the Use of Rangeland Economics Research Results

In their paper, "BLM's New Rangeland Investment Analysis Package," Davis and Parsons explore the various causes of the continued resistance within that public land management agency to the use of economic information, no matter how it may be obtained, in range improvement and investment analysis. They attribute that resistance more to the lack of economic training

among agency personnel, coupled with the absence of a specific legislative mandate for benefit-cost analysis, than to insufficient economic information on the values of relevant costs and benefits.

Davis and Parsons describe the evolution of BLM range improvement and investment policy, noting that efforts to include economic efficiency analysis in Bureau range and watershed investment programs have a 25 year history. However, specific internal requirements and procedures for economic analysis date only from 1982, and were the result of demands by the Office of Management and Budget and by the staff of the policy and budget office in the Department of the Interior for increased use of economic data in the expenditure of improvement dollars.

The procedures for efficiency analysis have been computerized and refined in recent years, but little progress has been made in overcoming internal resistance. The authors offer several reasons for that resistance. The computer program initially developed (SageRam) was placed on the BLM's Denver office mainframe, accessed through telephone lines from field stations. It was not user friendly and required staff to furnish their own estimates of many nonmarket values. A newer, more friendly, version for use on personal computers (IAM) has been developed but is still being field tested.

Davis and Parsons doubt whether the newer program will meet with substantially better acceptance among field staff. In addition to a prevailing lack of economic training, staff tend to believe that efficiency analysis should justify their prior decisions as professional resource managers rather than serve as one of several inputs in the decision process. They lack confidence in the value estimates provided to them by BLM economists, trusting instead in the "natural" values of improving range condition and wildlife populations instilled in them through their biological training and reinforced in the agency's institutional culture.

The authors conclude with the faint hope that through improved computer literacy, economic training, and managerial commitment economic efficiency analysis will become an accepted part of the public rangeland improvement process. If not, they suggest that, just as happened with the Forest Service, Congress may take the issue in its own hands and through legislation specifically require that the Bureau incorporate economic analysis in all of its public land management decision making processes.



### Taking Institutionalization One Step Farther

Rimbey and Sharp in their paper, "CRMP-Stewardship: An Economic Viewpoint," echo the suggestion of Davis and Parsons that public land management agencies change their ways or risk being directed to do so by Congress. Their subject is not really economic analysis, however. Rather, the authors detail the success of the Challis Experimental Stewardship Program, one of three such successful programs established under the auspices of Section 12 of the Public Rangeland Improvement Act of 1978 (PRIA). They question, given the success of these cooperative, coordinated approaches to public rangeland management, continued bureaucratic resistance to broader implementation of the stewardship approach.

Rimbey and Sharp summarize the political history of the Experimental Stewardship Program emphasizing that the political climate in the Challis area of Idaho was right when PRIA was enacted. Significant reductions in permitted livestock AUMs on BLM lands in the local area had been proposed. Local ranchers and community leaders were at odds with public land management agency personnel. Idaho Senators, the Governor, livestock associations, and environmental organizations were in conflict. Section 12 of PRIA provided an opportunity for cooperation and consensus in rangeland resource management and decision making. The opportunity was seized, and a broadly representative private/public coordinating group was created. Over the next seven years, conflicts were resolved, range improvements benefitting multiple uses and users were made, and the time required for planning and implementing coordinated public land management plans was significantly reduced.

The authors present empirical evidence of the economic efficiency and cost effectiveness of rangeland and watershed improvements made in the course of the Challis Experimental Stewardship Program. Perhaps more importantly, they document the remarkably smaller incidence of protests of the BLM Challis Area EIS prepared as part of the Stewardship Program relative to other Idaho BLM EISs prepared during the same time frame. They conclude that from all points of view the stewardship approach to public land management has been successful in Idaho. Left to be resolved is the lingering resistance to broader agency acceptance of that approach, with the authors asking the basic question, "Is there a fear that the agencies will relinquish their decision authority [if the stewardship approach to public land management is more widely adopted]?"