Range Research in the Next 20 Years

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Highlight

Range Research faces a challenge to help maintain a healthy range livestock industry and productive use of rangelands for water yields, wildlife, and recreation. Research findings could well mean the difference between a declining resource and a realization of potential productivity from rangelands, worldwide.

In the rapidly changing world of today the research of the future can be expected to take some dramatic turns in response to economic pressures generated by population, politics, and technology. Consider the population problem alone: By the year 2000 the population of the earth is expected to reach 6 billion. In terms of the theme for the annual meeting this year (1967), during the next 20 years we will see an increase in population of 1.5 billion. These additional humans, plus those existing will place great demands on the range resources of the world. Among their wants will be a demand for a greater supply of red meat, more fibers for clothes, abundant clean water for personal or industrial use, space to live in and escape the crush of other humans, and an aesthetic and safe environment to enjoy when they escape to the countryside.

There are even suggestions that livestock grazing on rangelands will eventually be a thing of the past. In a speech on March 20, 1967, Secretary of Agriculture Freeman described the scene across the U.S.A. in the year 2000, "Few livestock are visible although the U.S. produces twice as many as in the sixties. Livestock are now kept in the environmentally controlled shelters that dot the landscape. More people are eating meat for cattle, hogs, and sheep grow to market size on a third less feed and in a third less time." At an after-dinner talk to the California Section ASRM in 1963, Mr. Nelson Crow, Editor of the Western Livestock Journal, predicted an increasing number of livestock would be carried on improved pastures or in feedlots for extended periods because of unfavorable economic conditions on rangelands.

These may appear to be extreme views but they illustrate that Range Management research faces a challenge to help maintain a healthy range livestock industry. Research findings could well mean the difference between a viable industry and one plagued with problems.

To ensure that my perspective in this assignment was in proper focus I solicited ideas from research workers in the Pacific Northwest, the Great Basin, the Great Plains, the Chihuahuan grasslands, and the Annual Range. For what I say here, however, I take full responsibility.

In the past 20 years research has often been done on a "cut and try" basis to find the right fit. In the future we will see more action programs worked out on the basis of measurements and scientific principles. Thus, we can expect to understand more of the "why" and "how" of things we do in range management in addition to the "what."

We still do many things on the basis of guesswork and budgetary expediency. For example, range reseeding often takes place on a contractual basis from an administrative work plan, but it is a gamble against weather, rodents, insects, and seedling diseases, unfavorable soil conditions, and competition from existing vegetation. There is still no good "prescription" for successful seedling establishment; yet in other fields of agriculture, a grower would go broke using practices we take for granted in range management.

In the field of agricultural chemicals we are slow to make use of new materials and practices. Cost, difficulties of application, and complexities of the problem are given as excuses for slow results. A potential market of 900 million acres in the U.S.A. alone should serve as an incentive for the development of new chemicals and bring costs in line with ability to pay.

Even though we know many things about the physiology and autecology of forage and browse species we still are operating in the dark. What do we really know about the effects of grazing on growth potential, plant food reserves, and reproduction of forage and browse species? Why do some of our valuable forage species apparently fail to respond to nitrogen fertilization and yet others may accumulate toxic levels of NO, under certain environmental conditions? Are natural plant inhibitors effective in germination and plant competition? If so, how do they work and how can they be used to advantage in range management?

Much has been said about multiple use of rangelands over the past years but, like the weather, hardly anything has been done about it. Even the professional societies seem to go their own separate ways! For example, using a multiple use approach many ranchers in California pay their taxes with receipts from recreation activities on their ranches. Also, what is our potential for safely increasing rangeland water yield? Consider the situation in California where about 103 million acre feet of...
precipitation is received but only about 27 million is used. A large portion is lost on the watershed and never gets to the user. Several of the western states have disagreed for years over Colorado River water and yet many more million acre feet of water could be obtained by proper watershed vegetation manipulation.

What are the upper limits of productivity for rangelands? Have we ever considered our problem in such a context? In our agricultural science laboratories we are beginning to understand why some plants are more efficient in photosynthesis. Some of the reasons appear to be the result of quickly achieving a high leaf-area index, of being able to retain CO₂ during the dark period, to store the products of photosynthesis more efficiently, or to lose less water by transpiration. Yields as high as 43 tons/acre dry matter of Napier grass have been cited in Puerto Rico. We don’t have as favorable an environment on our rangelands but we should set as our goal the upper limit of production for our better species in all environments.

Future international considerations may well force greater competition with economic systems where land and labor costs are low. How efficient can we be in the use of our resources to produce various livestock products? Are we prepared to meet competition with an increase in efficiency of livestock production? “Ten pounds of feed are required to make a pound of beef (liveweight). If beef production efficiency were increased 40% (which is the increase made by broilers in the last 25 years) we would reduce present production costs by more than $1.5 billion per year. Converting feed to demanded types of meat with less fat would greatly reduce costs and might well result in better diets.”

Why have we apparently avoided research on the genetic selection and reseeding of shrubs for range use and improvement? It appears that we have left this area to the game managers and yet the nutritive value and ecological tolerance limits of such shrubs as Atriplex, Eurotia, Acacia, Kochia, etc. have much to offer in range management.

Why should forage be allowed to deteriorate at the end of the growing season? Is it necessary for perennial grasses? Do we have a good physiological answer for proper use factors that have been established for many species?

How can fuel concentrations of dense brush be reduced safely? How can a substitute cover be established and will such a substitute cover yield benefits of increased water yield, greater forage production, improved wildlife habitat, and recreational opportunities, in addition to the reduction of the fire hazard? There is still considerable controversy about the place of fire as a tool in range improvement in the U.S.A. and other countries.

How productive can we make desert areas? Is the best solution to reseed with shrubs, grasses, or cactus? Can we actually reseed when we wish or must we leave it up to chance?

These are only a few of the questions which face us in the future. Research must be developed to probe these and many other questions.

A few of the special areas that should receive intensified research in the next twenty years include:

1. Find new ways of environmental modification for increasing plant establishment under difficult environments. We must be able to bring about an improvement to such environmental factors as moisture, fertility, temperature, and competing organisms.
2. Intensify research on the physiology, ecology, and genetics of existing and potential forage and browse species. Information is needed on the physiology of grazing response, timing of use, plant constituents, and effect of environment. Plant morphology related to animal use would also be a fruitful area of study.
3. Develop range uses of agricultural chemicals to modify plant growth. More than just weed control is needed. Work should include selective chemicals for seedling establishment, soil conditioning, growth promotion, growth inhibition, increasing palatability, and maintaining forage quality. All should be studied for methodology of application and obtaining safe residue levels.
4. Expand research interests to problems associated with multiple use of rangelands, particularly increased recreation use. We must solve sociological problems involved in conflicts of land use. Research can provide the answers for compatibility of grazing and recreational use. Our research should result in closer ties with wildlife and recreation interests. If we fail to do this, other groups will take the leadership and leave us talking to ourselves!
5. Adapt vegetation analyses to high-speed computer techniques. Improve range plant and soil surveys and better determine range response to land use. Research can provide the answers for compatibility of grazing and recreational use.
6. Develop new techniques for increasing productivity including vegetation manipulation. We must develop new or adapted forage species, including shrubs. To accelerate research on shrubs I suggest the establishment of a shrub research foundation or laboratory with an international seed bank and browse seed orchards. Our studies should lead the way to new concepts in fertilization, forage manipulation, and grazing management. Since our rangelands are arid or semiarid, any practices which would promote more efficient moisture utilization should result in greater forage production.
Encourage research and application of plant pathology, entomology, and vertebrate zoology on range problems including biological control. Particularly needed is research from these fields to ensure greater success in seedling establishment and to increase plant longevity.

8. Improve economic analysis of rangeland resources as to their true value as a source of food, water, recreation, and wildlife.

9. Encourage research on the economic size of land units and land-tenure systems. This is of considerable importance in many countries of the world. The range management approach should receive consideration in land-use programs.

The foregoing list should not imply any priority for research. However, priorities should be made for existing and proposed research by each research organization and range scientist. Projects that are not expected to provide worthwhile information, those which promise to yield small returns for large investments, and projects which have become outdated should be terminated or remodeled.

Equally important as research is to the future of the Society of Range Management, are the research scientists themselves. An atmosphere of cooperation and mutual appreciation must be maintained in the Society and its publications. We need a greater exchange of ideas and a stimulating environment of inquiry. More time should be allocated in our meetings for discussion and debate.

A recent visitor to the U.S.A. commented in his report to the F.A.O. of the United Nations that he was surprised to find so little interchange of ideas among staffs of the various research stations. Our society must not become a group of individuals promoting their own or a particular public agency's interests.

I believe we must make a renewed effort to upgrade the professional image of the Society. There should be more of the basic research findings in the RANGE JOURNAL rather than to lose them to other journals. We can start by getting more research reports and research needs presented at the Annual Meetings of the Society. The program committee for the Seattle Meeting did a good job in this respect.

A continual evaluation of the educational standards of the profession is essential if we are to avoid a parochial outlook which could result in our becoming a second or third-choice profession. We should so model our range management curricula that we can serve as an entry for wildlife managers and for others interested in wildland resources. If we are not progressive in our attitudes we will become known for our narrow interest in forage alone and not the total resource.

Budgetary support for research must not be neglected. Economy is mentioned in some areas of the nation—yet our National Budget is the largest ever. We're spending over $40 billion to put a man on the moon but very little to find new ways to feed the billions left behind. Research budgets must be increased and streamlined if range management is to progress. The trend for a more basic approach in agricultural research requires the provision of adequate equipment to obtain the kinds of answers that are expected.

Only a few of the challenges that lie ahead have been mentioned here. Furthermore, we should not be unaware of the progress made in the past because the solution of past problems has often introduced or created the problems of the future. We must now eagerly tackle the truly difficult and new problems and avoid the rehash of lessons already learned. The team approach offers many exciting opportunities. Complex problems may be brought down to manageable proportions by the combined forces of range scientists, biometricians, geneticists, and others. The time is past, whether we admit it or not, when a range researcher could be a successful jack of all trades. The greatest progress will come from team research working on problems greater than any of us now imagine.

I believe the next 20 years will be a challenging period for research in Range Management. It will call forth the best from each of us to plan, administer, evaluate, understand, and apply the findings of studies that will make available to a changing and expanding population the rangeland resources of this continent and of the world.