Increasing Red Meat from Rangeland through Improved Range Management Practices

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Highlight: *The demand for red meat will likely increase, not because of an increase in per capita meat consumption but from a consuming population increase. Increased demand for land for non-livestock purposes will cause an intensification of management on rangelands and a gradual decline in feedlot beef. A shift to non-beef sources of red meat may be anticipated. Increasing meat production from rangelands will require careful application of science and the development of new and innovative management systems.*

The supply and demand for red meat is central to supplying the nutritional requirements of the growing human population of the world. The role of rangelands in supplying these human nutrients was recently discussed at the Annual Meeting of the Society for Range Management. In general, the panelists predict a growing demand for red meat in America with this demand being met by an additional 14 million beef cattle grazing the marginal cropland and humid pasture of the United States (Hodgson, 1974).

I support a slightly different scenario about the future demand for red meat than has been presented by most economists and livestock people. Most of them suggested that we will have an increase in per capita demand for beef (Skold, 1974; Guyer, 1974; Clanton, 1974). My position is that we will see a decrease on a per capita basis in the demand for red meat consumption. This decrease will come about because of increased prices for meat, increased human population pressures on the land resource, and a gradual shortening of the food chain. I believe that it is inevitable that the human population will shift to more plant products in their diet. Red meat will be eaten only by those affluent few who can afford it. However, this may not make a substantial difference when we consider the pressure on the range resource itself. Even though there have been some optimistic trends in this country and some of the developed countries regarding stabilizing human populations, the world population continues to grow.

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In addition to this, the age group of 15 to 35 years is increasing. This is the group that consumes most of the resources and they will put an increasing demand on foods and food products. Therefore, regardless of whether per capita red meat consumption increases or decreases, there will be a continuing, increased demand for red meat.

This increased demand for red meat will have to be met with a shrinking land base. Most crop land suitable for feed and fodder crops will be used to produce grain and other products for human food. Therefore, most of the marginal crop land that could be used for permanent pastures to increase the forage supply will not be available for that use. Neither will the many acres of marginal timber land that could be converted to forage crop production. The energy shortage has caused a shift from aluminum and plastic back to wood products and a complete rearranging of the timber industry. This will likely take most of the marginal timber land out of the forage production arena. The energy shortage may also cause a shift from the high energy-requiring synthetic fibers back to natural fibers. This shift will take land for fiber production, and the production of wool from rangelands will further reduce the land base for producing red meat.

Increased demands for recreational areas and for protection of watersheds for water quality concerns will further reduce the rangeland available for red meat production. Conservation groups have challenged the right of livestock to graze public lands, and these challenges could alter the use of western range (Heady et al., 1974). The western range covers many of the nation's energy reserves, and such activities as coal mining will reduce land available for livestock (Box et al., 1973). The end result of all these land use changes will be less land available for meat production and a declining of meat production in feedlots due to alternate uses of grains. Red meat will become a very expensive luxury product. High prices for red meats may cause people to accept non-traditional meat sources. We have recently seen Americans willing to buy horse meat. While most of the projections for red meat supply deal solely with beef, I think it is entirely reasonable to expect that horses, buffalo, goats, sheep, and possibly even other more exotic animals may well enter into the red meat mix in the future.

Therefore, I see the role of rangelands and range manage-

ment in the future as a very important one. They will be called upon to produce more meat with fewer resources. Range production will be limited to those areas too hot, too cold, too wet, or too high for crop production. It is inevitable that we will be expected to practice more intensified management on the so-called marginal lands. The level of intensification and the kind of practices used will vary between developed and developing countries.

In developed countries a major effort will be put in two areas—increasing forage supply and intensifying animal management. The intensive efforts to increase forage supply will be geared mainly around water efficiency and improved water management; since most rangelands are arid or semiarid in nature, and the probable payoff will be through more efficient water use. It has been estimated that in many west Texas ranges it takes over 100 tons of water to produce a pound of meat at the supermarket level (Thomas, 1970). Most of this inefficiency was the result of water wastage by nonedible plants.

One of the most obvious ways to improve forage production is through noxious plant control and vegetative type conversion. The removal of nonedible plants and the substitution of forage plants for them offer high potential throughout the range areas. Water wastage and the decrease in range forage have been well documented in the mesquite area throughout the American Southwest; and the feed supply from those yearlong ranges could almost be doubled with the removal of this one species alone (Schmutz et al., 1959; Rechenstien, 1964). Many of the spring-fall ranges throughout the Intermountain West have dense stands of pinyon and juniper and produce very little forage. Improving the forage-producing ability of these foothill ranges would not only increase production on those ranges but would allow more animals to be handled during the spring and fall that could be used to graze the summer mountain ranges and the winter desert ranges (Cook, 1966).

There is no accurate estimate of the extent to which forage supply could be increased with vegetation-type conversions alone. Studies have shown a range from as little as a 10% increase where some soils were not highly productive to 300 and 400% and, in some cases, even several thousand percent increases on the best sites with deep soils, favorable climate, and a very high potential (Vallentine, 1971). In my opinion a very conservative estimate would be an overall 25% increase in feed supply from type conversion alone.

Another major area for improving the production of rangelands is proper grazing management. Although simple grazing control has been taught in basic range management courses for more than half a century, there are still many areas where improper distribution occurs, animals are not balanced with the carrying capacity of the land, ranges are not grazed with the right kind of animals or grazed at the right season of the year. Simply bringing these areas under control has a reasonable chance for producing fairly sizable increases. However, the potential is even greater when one considers the number of successful grazing systems that are available and not applied in many areas of the United States. Spectacular successes have been received from the Merrill Deferred Rotation System, the Hormay Rest-Rotation System, and many other modifications since the basic philosophy of deferred rotation grazing was first outlined by Sampson (1913). Although a recipe-type grazing system may destroy rangelands if improperly applied, these systems properly

applied have the potential for increasing range production as much as 10 to 15% throughout the western United States.

Range fertilization has shown itself valuable in the more humid range regions. It is not a well-accepted technique in the more arid regions of the range area, but a number of recent studies in the semiarid areas indicate that fertilization allows more efficient use of moisture if it is properly applied (Dwyer, 1967; Roger and Lorenz, 1969). I believe that this technique alone might also increase range production 10 to 15%.

Fifteen years ago the thought of fertilizing the arid and semiarid rangelands would have been considered foolhardy. In fact, it may be by many today. If we consider technology that may become available in the next few years, it is conceivable that rangeland production may be doubled simply from that new technology. For instance, the few studies on chemical curing of annual rangelands have been largely ignored by range managers and most of our efforts have still been concentrated on converting annual rangelands to perennials. From a water efficiency standpoint, annual crops may out-produce perennials in total dry weight production. However, quality declines greatly after growth ceases, and the overall animal production is usually less on annual rangelands than on perennial type ranges. A cheap, efficient way of storing the nutrients produced by annual crops might change the entire approach to many range areas.

There have been some thought and some preliminary studies in chemically altering the palatability and digestibility of so-called useless range plants. If we could change sagebrush, mesquite, and creosote bush to forage plants, we would immediately triple the forage supply of the West. These suggestions may sound heretical, but I believe that potential for new technology can double range forage production. If we could couple new technology with new management schemes that will allow animals to be produced totally on forage by combining range forage with crop aftermath that is now wasted in many farming areas, the red meat producing animal supply could certainly be increased.

Such suggestions as combining crop aftermath with range will lead to more intensive animal management. One of the first needs will be to balance the nutrition of range animals yearlong. Again, this may sound like some basic statement from a beginning range management text. However, if this country and other developed countries move to a greater dependence on range forage with few feedlot operations, then whole new systems of management may have to be developed. These will involve integrating different kinds of rangelands with different kinds of crop aftermath and supplemental feeding to keep animals growing yearlong and producing a grass-fed, marketable animal at 2 to 2½ years of age. This may call for some rather large scale nomadic shifts of both breeding stock and growing animals. Breeding stock may be handled on crop aftermath and lower quality ranges with fattening animals moving from high quality ranges to temporary pastures such as winter wheat grazing in the plains and back to high altitude, higher quality summer range.

If the forage supply is to be called upon for both carrying the breeding animal and producing marketable cattle, the breeding practices of the livestock must be managed more efficiently. Such a simple and proven technique as culling nonproducers through pregnancy testing must become more widespread. A serious attempt will be made to get more offspring per female. This will include increasing the breeding

life of the female through earlier breeding, such as more widespread acceptance of breeding yearling heifers in the beef cattle industry and keeping those breeding animals as long as they will produce an offspring. The application of new technology to produce more live offspring per pregnancy in ungulates will become accepted more widely in the range areas. Such techniques as hormonal control of estrus, the production of multiple ovulations (Laster, 1973), etc., may become standard range practices.

New breeds, new strains within breeds, new crossbreeds of animals will be developed specifically for use of roughage and low-quality range forage supply. I think it is entirely reasonable to expect that we will see more so-called exotic breeds of beef cattle and sheep and perhaps even a move to hair sheep rather than wool sheep.

The move to non-traditional breeds of livestock may also result in a gradual transition to new forage harvesters and non-traditional kinds of livestock developed for specific range conditions (Macfarlane, 1968). I predict that we will see more new animals such as fat-rumped and fat-tailed sheep, goats, buffalo, and perhaps even donkeys and horses used as meat-producing animals. In addition, we may see even more exotic animals such as camels, oryx, eland, or other ungulates from dry areas being used on the ranges of developed countries.

At the same time that the intensification of management is going on in developed countries, there will be a parallel intensification in the developing countries of the world. However, their intensification will take a different form. The first step in developing countries is simply to apply the improved range management techniques that are now taught in most beginning range courses in America. Such simple things as the control of grazing for a more efficient use is inevitable. Livestock numbers must be balanced against the supply available to them. The application of proper range management could greatly increase forage production, but in order to effect it major sociological and economic changes have to take place. For instance, many nomadic pastoralists of the world continue to keep large numbers of animals for security purposes, and they will continue to do so until new marketing systems, new credit systems, and other techniques needed for stability of their life styles are developed (Box, 1969).

The proper distribution of animals cannot be obtained to many developing countries because of lack of water resources or disease restrictions such as tsetse fly areas. The removal of these obstacles and allowing the animals to fully use the range could greatly increase meat production. On the other hand, these techniques could destroy good rangelands if proper controls are not built into the development scheme. The removal of such physical or biological obstacles could also improve the season of grazing situation in many areas and allow for new kinds of rotational systems that are simply not practical now because animals cannot survive in the area during the time when planned grazing is most effective.

In my opinion, little will be done with the kind of animals in developing countries. In most cases the most efficient animal for using the particular forage has evolved along with the livestock production system of the nomads.

Another big increase in livestock production in developing countries may come about through the reclamation and restoration of heavily overgrazed ranges. However, any improvement here must be coupled with some system of animal control and a development of an alternate forage

supply to allow animals now grazing the deteriorated areas to be shifted temporarily.

Some of the most immediate payoffs in increasing red meat production from rangelands can come through improved animal management in the developing countries. Disease control and control of predators may allow an immediate and rather dramatic increase in meat supply. The control of tick-borne diseases, renderpest, bovine plural pneumonia, and foot-and-mouth disease would make many animals immediately available for world consumption. Removal of the predator problem in much of Africa would allow grazing animals to take advantage of night grazing where they are now penned and could increase production as much as 25 to 30%.

Proper breeding control also has a huge potential for immediate payoff, particularly in tropical monsoonal areas. There, cattle usually breed early in the wet with offspring being dropped in the middle of the dry. In some areas as few as 30% of the calves survive. Simply changing the breeding season through supplemental feeding or flushing of the females to get them to breed in the dry and drop their calves near the beginning of the wet could greatly increase turnoff. However, in order to employ even these simple management techniques, the animals must be brought under control.

The increase in quality of breeding stock may also dramatically increase the red meat production. Introduction of Sahiwal and Boran bulls into some of the native herds of East Africa has shown immediate and dramatic increases in live weights of animals turned off (Allen, 1973).

The need to balance nutrition yearlong in developing countries is perhaps greater than in developed countries. In the tropical areas of the world, there is a great imbalance between wet and dry periods, with animals gaining rapidly during the wet and losing most of the weight during the dry period. Introduction of forages that cure well or supplemental feeding during the dry in order to keep the animals growing or at least maintaining their own body weight during this period can lead to faster turnoff of animals and a greatly increased red meat supply. The same principle applies to many of the cold and moderate regions of the world where winter feed supply is short. Although the developing countries face essentially the same kinds of problems as developed countries, the sophistication in the solution of the problems may be much less and the acceptance of improved practices slower. It is imperative that improved marketing systems be developed in most of the developing countries to allow the livestock producer the incentive to move animals from rangelands as quickly as they are available for market.

My overall evaluation of the problem of increasing meat production from rangelands is as follows. First, the demand for red meat will increase. It will increase primarily because of an increase in population and an increase in the 15 to 35 age group rather than any per capita increase in demand for red meat. In fact, per capita demand will probably go down. The land available to produce meat will decrease. Red meat, then, will become a luxury product with high costs and be mostly produced from rangelands. These factors dictate that range management must intensify on rangelands and that this intensification of management will come quickly in developed countries and very slowly in the developing countries of the world. However, regardless of whether we live in a developed or developing country, the science of range management will play a key and central role in the production of red meat supply for the world in the next two decades.

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