

Range Study Tour in the Soviet Union

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Highlight

Range management and utilization in the semi-arid and arid zones of Kazakhstan, Turkestan, and Uzbekistan were presented to a group of Fellows who attended a nine-week Study Tour sponsored by F.A.O. Lectures and field trips disclosed the vast extent of these ranges, many in good condition, and the methods of handling of livestock on State and Collective Farms. Methods of research and grazing management and reseeding practices showed many similarities with developments in other regions of the world with similar climate and vegetation.

A group study tour organized in the Spring of 1964 provided an unusual opportunity for observing and studying the prog-

ress of range research and the status of range and livestock management in some little known portions of the Soviet Union. The tour was sponsored by the Food and Agriculture Organization of the United Nations. Arrangements for the tour and the lectures were made by the Ministry of Agriculture, Republic of Kazakhstan, U.S.S.R. The headquarters of the group was in the capital city of Alma Ata, and field trips extended over much of the arid and semi-arid regions of the Kazakhstan as well as of the Republics of Turkmen and Uzbekistan. Nine Fellows, from Argentina, Iran, Israel and Pakistan, participated in the tour which lasted for nine weeks.

The lectures, which covered a total of twenty days, presented

a detailed review of the vegetation, its distribution, botanical, taxonomic and ecological relationships and forage value. Range improvement by reseeding, soil and water conservation and other practices, and physical improvements through, for instance, road building, were also discussed. Herbarium specimens, wall maps and charts were used. All lectures were given in Russian with translation into English, the common language of the Fellows.

For the most part the lecturers were mature and experienced scientists with an intimate knowledge of their subject. They generally took the classical approach of basic botany with emphasis on detailed descriptions of a qualitative nature although in some cases, as in describing the physical resources of the area, many statistics were provided. The younger lecturers, although apparently capable, had restricted their thinking to their special field of interest and found it difficult to understand

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the viewpoint or queries of the Fellows from other countries. On the whole, the quality of the lectures, the references to experiment station results and observations on grazing exclosures extending back for periods of 40 years and more and the descriptions of detailed range inventories and mapping over vast areas, stimulated the interest of the Fellows and created impatience to see the work in the field.

The three major trips, carried out by plane, train, bus and jeep covered some 2,000 Km. (1,243 miles). The travel effectively showed the vastness of the grazing lands of the Kazakhstan and Uzbekistan regions and provided good opportunity to observe state farms, collective farms, camel breeding stations and the large and active Kazakhstan Institute of Animal Breeding.

On these trips our hosts spared no effort for the Fellows' comfort and provided lavish and abundant food, drink and entertainment. Many interesting and new technical developments were seen and the field trips were well managed. Language presented a difficulty, since, although all the Fellows were capable in English, practically none of the hosts were, and technical translation is difficult at best. There was a lack of emphasis on a basic scientific and technical approach in the fieldwork as opposed to the lectures. None of the lecturers in plant work accompanied the group on the trips and there seemed to be little understanding or appreciation of the fact that the Fellows would want to see range exclosures, re-seeding or other trials or studies, application of range inventory, range management trials or established experiment stations. The fact that the field trips were arranged by the Ministry of Agriculture which is concerned with practical production rather than technology may explain why we failed to see in the field

many of the extremely interesting things that were described in the classroom.

Rangelands and their Use

The countryside around Alma Ata is reminiscent of the plains and foothills of the Intermountain USA with vast sweeps of semi-desert and desert rangelands dominated by shrubs, but with a variety of grasses and forbs in the understory. To the south and east the conifer-clad slopes of the Tein Shan mountains rise to alpine meadows used for summer grazing.

The natural pasture lands of Kazakhstan cover more than 400 million acres and provide about 80% of the fodder requirements of the sheep, goats, camels, cattle and horses of the Republic. Animals graze the arid and semi-arid rangelands yearlong except for a few days each winter when snows up to several feet in depth, or more commonly freezing rain and ice make the forage unavailable.

About half of the total range area is not grazed because of lack of stock water. Rivers, springs, lakes, and other natural sources provide water for grazing about 100 million acres, and an intensive program of water development using wells, pipelines, and reservoirs has made possible the grazing of an almost equal area since 1955.

For the most part the productive conditions of the desert and semi-desert rangelands is good. Much of the area is understocked because of the remoteness of the region and lack of stock water. A large scale migration of about 30% of the livestock to neighbouring countries, which took place in the early 1930's substantially reduced grazing pressure and numbers are only recently being restored. The sheep population of Kazakhstan in 1954 was reported at 17.5 million head compared with slightly more than 30 million in

1964 and a goal of 50 million set for 1970.

Sheep are the most important species of livestock, accounting for 52% of the value of all livestock products of Kazakhstan. In addition to meat and wool they yield valuable karakul lamb skins as well as a large proportion of the milk supply. Many breeds which differ in fatness of tail, coarseness of wool, stature, adaptability and usefulness for meat, wool, lambskin and milk production have been developed. These have been selected from local types and developed by crossing with Merino, Romney Marsh, Lincoln, and other imported breeds, as well as with the wild Argali sheep of the local mountains.

Both camels and horses are raised more for the production of meat and milk than for transportation or work. Horse milk, especially is esteemed for its medicinal properties and commands a price of three times that of cows' milk. Over 200,000 mares are kept for milk in Kazakhstan. Improved breeds yield 3,400 litres per lactation of nine months and maintain a productive life of about eighteen years.

Cattle are not important range animals and are generally kept in small numbers, usually tethered, or closely herded.

The semi-arid rangelands of Kazakhstan cover some 130 million acres, mainly in the central portion of the Republic. Annual rainfall averages 6 to 8 inches with the most effective storms occurring in spring and summer. The most widespread range types are dominated by small species of *Artemisia* mixed with *Stipa* and *Festuca*. Soils are light chestnut, non-saline to slightly saline and moderately rocky. Depending on the soil, local climate, and relief, the following species in various mixtures occur: *Artemisia maritima*, *A. lessingiana*, *Stipa capillata*, *S. sareptana* and *Festuca sulcata*. A variety of other shrubs and grasses as well as forbs occur in lesser amounts. Air dry forage yields of from 200 to 500 lb/acre depending on site, are re-

ported. On sands and sandy loams other species of sagebrush (*A. pauciflora*, *A. arenaria*) occur and *Agropyron sibiricum* is the dominant grass with lesser amounts of *Aristida pennata* and *Elymus giganteus*. Several species of *Eurotia* add to the forage supply which amounts to 400- to 500 lb/acre.

Semi deserts are grazed yearlong although many of the livestock are moved to higher mountain pastures for the summer, or to sandy desert ranges for the winter. Even on year-long semi-desert ranges, seasonal use is recognized as a desirable practice. Thus during summer, full use is made of small moist areas in depressions and along water courses, and in winter most of the animals are grazed close to the major streams or in other areas of broken topography where there is some natural shelter from storms.

Desert rangelands receive from 4 to 6 inches of precipitation annually and cover very large areas. North of about 43° north latitude rainfall is rather evenly distributed through the year with a low maximum in spring. Temperatures exceed 90F in the summer and may fall below freezing for about 4 months in the winter. Soils are brown and grey-brown with low humus content and are frequently alkaline or salty. Southern deserts receive about 70% of the yearly precipitation in March and April. Summer temperatures frequently exceed 100F and freezing temperatures extend over about 3 months in winter. Grey desert soils predominate. Extensive sand areas occur within the desert range area. Sands cover about 65 million acres in Kazakhstan, and about 45% of Uzbekistan and 75% of Turkestan.

The desert range types are complex with a great variety of xerophytic growth forms and species representing many families. Two principal types are recognized: (1) "Semi-brush wormwood and thistle deserts" typified by species of *Artemisia* and perennial *Salsola* and (2) "Saksaul and brush deserts" dominated by large shrubs of which the genus *Haloxylon* is characteristic. Common in the first are *Artemisia terrae albae*, *A. turanica*, *A. semiarida*, *Salsola laricifolia* and *S. arbuscula*. Other shrubs include *Anabasis salsa*, *Atriplex cana*, *Euro-*

tia foliatum and *Kochia prostrata*. Grasses include *Stipa capillata*, *Lasiagrostis caragana* and *Agropyron sibiricum*. Ephemerals and ephemeroides include literally hundreds of species of *Agropyron*, *Bromus*, *Poa*, *Carex*, *Iris*, *Allium*, *Papaver*, *Plantago*, *Crepis* and many other genera. Forage yields amount to from 150 to 200 lb/acre.

Saksaul deserts may present a dwarf forest aspect because of the size of the brush species which includes *Haloxylon persicum*, *H. aphyllum*, *H. ammodendron*, *Calligonum* spp., *Ephedra strobilacea* and *Ammodendron conollyi*, *Aristida pennata*, *Agropyron sibiricum*, *Stipa* and a host of ephemerals make up the understory. Average forage production varies from 80 to 200 lb/acre. Most of the shrubby species of the deserts provide not only palatable and nutritious forage but are also valued as a source of fuel. Desert ranges are chiefly used for autumn, winter and spring grazing. Most of the livestock of the region winter in the extensive sandy deserts. In the spring full advantage is taken of the usually abundant forage provided by the annual ephemerals and ephemeroides.

Collective and state farms yield 87% of the meat and 94% of the wool produced in Kazakhstan. It was possible to obtain some idea of the organization and manner of handling the livestock through visits to a number of farms of both types. At the central headquarters of such farms are located dwellings for the workers, a social club, boarding school, kindergarten and day nurseries, a hospital, bathhouse and dining hall, veterinary station, shops and administrative offices. Major outstations on the range have living accommodations for 12 to 16 families, corrals, shearing and feed storage facilities, and veterinary and artificial insemination stations. At each isolated range watering place, dwellings for from 2 to 6 families and corrals for 800 to 2,500 sheep are established, the size of the development depending on the grazing capacity of the area served and the length of the grazing season. The goal in water development is between 4 and 8 miles between watering sites. Sheep are generally brought into the corrals each night and there artificial insemination and

veterinary service is provided and hay and supplements are fed in winter.

The Timur State Farm in the Chumkent Region comprises 388,000 acres of which about 15,000 are planted to barley, alfalfa, and maize. Annual precipitation at the headquarters averages about 8 inches. In 1955 when the state farm was organized, it carried 3,000 camels and 2,000 sheep. It now supports, without additional feedstuffs, 85,000 sheep, 16,000 camels, 1,800 cattle and 900 horses. The sheep are organized in bands of 800 to 850 head, each band being the responsibility of a single shepherd and his family.

A typical outstation visited, located in the semi desert, had 7,000 acres of summer range and 6,000 acres of winter range and provided for three bands of 800 sheep each. Winter range consisted of rough broken areas along a river while spring and summer grazing was provided by ephemerals, grasses and browse on *Artemisia* flats. At this outstation sheep received about 200 lb/head of hay as winter supplement. On other farms sheep might migrate several score miles to winter in sandy areas in the desert or to summer on mountain meadows. As on most state farms, all ewes are artificially inseminated by the shepherd and most receive hormone injections to induce multiple births. Twin lambs are the rule and four and five lambs per ewe are common. One shepherd achieved a 228% lamb crop. The farm average was 137% in 1964.

Most of the shepherds are young graduates of secondary school. The average annual income of a shepherd family was stated as equivalent to \$7,700 at the official rate of exchange. Some details were given of the record of an outstanding shepherd who had received the Order of Lenin for his efforts. His band totalled 810 sheep from which 11 were lost during the year. In 1964 this band returned the following gross income:

Lamb skins	— 8789 rubles	(\$ 9,668)
Meat	9576 "	(\$10,534)
Wool	3300 "	(\$ 3,630)

In the past three years gross income from this flock was quoted as equivalent to \$65,652 and net income as \$32,061. Details of expenditures were not available. The

salary of the shepherd and his family amounted to \$3,500 per year, and in 1964 he received a bonus of \$4,400 plus 110 lambs valued at about \$27 per head in 1964. Each shepherd is permitted to keep 10 ewes and their lambs, a cow and a camel for family use.

Range Management in the Kazakhstan and Uzbekistan Regions

In their reports on the Study Tour, the Fellows indicated the features which impressed them most. The more significant of these are as follows:

1. *Availability of Information.*—Much information is available on the vast area of grazing lands in the region. The basic importance of native plants, soils, and water resources was recognized before 1930 and since then many taxonomic and other botanical studies have been made. Beginning in 1948, the Ministry of Agriculture has been surveying and systematically studying these extensive ranges. Detailed ecological descriptions have been made of the principal natural communities and the seasonal growth, forage production, chemical composition and nutritive value of the important plant species have been determined. Maps showing the taxonomic, forage production, soil, water, and land use features of most of the area have now been completed. The usual scale is 1:100,000 but some individual farms have been mapped at 1:25,000. For administrative purposes, the area has been

divided into 34 "natural economic" districts.

2. *Production of Native Ranges.*—In general the native ranges are in good production condition. Over most of the area visited, ranges did not appear to be overstocked and it was not until the group approached concentration areas, such as the winter range close to the stock raising town of Ayderlye, that overgrazing was seen. On much of the tour route the vegetation was vigorous and composed of rather dense stands of a variety of palatable grasses, forbs and legumes. The signs of plant cover, forage composition, soil stability and general good condition were clear to all of the Fellows, many of whom had never seen such expansive areas of good productive range. It was evident that these ranges had had the benefit of light or moderate stocking for many years.

Some of the Fellows were apprehensive that the true value of this enormous range resource was not fully appreciated. An apparent lack of understanding of the principle of proper forage utilization on the part of men responsible for field operations, and indiscriminate plowing of good forage stands for cereal production seemed to warrant such apprehension.

3. *Domestication of Native Forage Plants.*—Many native forage plants have been domesticated and are used for range improvement. Although little of the basic research work was seen, the reseeding of large

areas to perennial native forage plants, such as species of *Agropyron*, *Elymus*, *Kochia*, *Salsola* and *Haloxylon* as well as of the traditional Alfalfa (*Medicago sativa*) and sainfoin, (*Onobrychis sativa*), is a common practice. In fact, it appeared to be so commonplace that it was difficult for those responsible for the itinerary to understand the interest of the group in seeing the extensive, well-established stands. Most of the large reseeded areas seen were planted to grasses, and although the Fellows expressed much interest in the reseeding of *Kochia prostrata* and *Salsola* spp. as described in the lectures, only small experimental plots of these species were seen in the field. Seeding of grasses usually begins with plowing in the autumn. In the following spring the area is harrowed, cultipacked and seeded with a disc drill. Seeding rates for *Agropyron* and *Elymus* were between 10 and 18 lb/acre, with seed placed at a depth of about one inch.

Several stands of reported intrageneric hybrids were seen. One such hybrid sought to combine the drought resistance of *Agropyron desertorum* the female parent, with the longevity of *A. sibiricum*, the male parent, while another was said to have the salt tolerance of *Elymus junceus* and the drought tolerance of *E. daurica*. The breeding method described was simply to plant the two parents in alternate rows, mow the male parent after flowering and harvest seed from the female parent.



Large areas of Kazakhstan's extensive rangelands have been reseeded to desirable native forage plants. Here the group inspects a vigorous stand of wheatgrass growing under less than 8" of precipitation.



Director, Sherim Ermanov, of the Timur State Sheep Farm, shows the Fellows a six-year old stand of Alfalfa growing in an 8" rainfall zone. This productive stand of 6,000 acres will be plowed and planted to barley to meet the quota for cereal production.

Studies have indicated that some combination of grazing and haying either in alternate years or after regrowth in the same year gave the highest yields and the best longevity. One two-year old stand of *Agropyron* was grazed by sheep at the rate of 8 head/acre in the spring after which it was allowed to produce seed which was harvested. Apparently most stands are used for seed production as well as grazing since the use of reseeding is expanding rapidly and seed is in short supply.

4. Climate and Weather.—The role of climate and weather in range management has received much study. The group saw field plots where quantitative data on forage production and the incidence of climatic factors had been collected for 15 years or more in an effort to determine correlations for use in forecasting grazing capacity. Unfortunately the data and the results of analysis were not available.

More complete information was provided on the system of weather forecasts and the means of warning shepherds of impending bad weather so that herds could be moved to protected areas and losses minimized. An elaborate meteorological system is maintained for the purpose of forecasting, and radio, colored rockets and flares and messenger services are used to insure that all shepherds receive notice of important weather changes.

5. Supplemental Forage and Fodder.

—Although livestock production in the region is based principally on grazing of native vegetation, the continental climate with hot dry summers and rigorous winters makes it necessary to store considerable forage reserves as hay or silage. Alfalfa and safflower (*Carthamus tinctorius*) are cultivated, mainly without irrigation and reseeded grasses on dry ranges are also harvested. Native ranges are extensively cut for hay. The operations seen by the group were on generally poor condition ranges supporting mainly ephemeral vegetation, including *Poa bulbosa*, annual species of *Bromus*, *Stipa*, *Agropyron*, *Trigonella*, *Salsola* and *Papaver* with small plants of *Artemisia* spp. Yields appeared to be extremely low and were reported as between 250 and 550 lb/acre.



The Fellows inspect some of the many breeds of sheep developed at the Kazakhstan Institute of Animal Breeding by Academician V. A. Balmont.



Hay for winter use is produced on native rangelands. Yield on this area was estimated at about 500 lb/acre.

6. Animal Breeding and Livestock Husbandry.—Important progress has been made in animal breeding and livestock husbandry. The Kazakh Scientific Research Institute of Animal Husbandry near Knij has greatly aided in the livestock development of the Alma Ata region and some of the contributions, such as those of the illustrious Academician, V.A. Balmont, are well known. The work of Academician Balmont in developing improved livestock breeds and getting them into practical use is an example of what can be done by a single dedicated scientist who has been allowed to work on the same problem at the same place for almost forty years. Recently, at least, he has been supported by adequate assistance, land, money, and livestock, as well as the

important tool of artificial insemination to enable him to work with large populations from which he could make selections.

This Institute has a technical staff of 180 qualified scientists working on two large experimental farms and involving 40,000 sheep and 3,500 cattle, as well as hogs, poultry and horses kept for meat and milk. The Kazakhstan Ministry of Agriculture is administratively responsible, although the Moscow and Kazakhstan Academies of Science coordinate methods of study and direct basic research. A number of improved breeds of sheep, goats, cattle, hogs, horses and poultry have been developed and introduced to the state farms where they are contributing to increased production. The overall impression gained is of a modern and efficient scientific organization covering basic research, applied research and extension in a single well-directed unit to provide effective agricultural leadership to a large area.

Similarity with Experience in USA

The problems and possible methods of their solution, of the utilization, management and improvement of arid and semi-arid rangelands are generally similar regardless of the part of the world involved. It is not surprising, therefore, to find a great similarity between the develop-

ments in the ranges of the Western United States and in those of Kazakhstan. For example, in both regions the need for inventory of the range resource and for estimating forage production and grazing capacity over wide areas and also specific range units was early recognized and much data has been accumulated. As a result of continued and rather exhaustive study, certain basic principles of range management have been developed. Those observed by the Fellows during the course include the need for using range areas at the proper season, the use of rotation grazing and the need for well-planned water facilities for livestock. Less in evidence in Kazakhstan was the principle of balancing livestock numbers with available forage supplies and the importance of range condition and trend and its relation to proper utilization and management.

In Kazakhstan, efforts to improve range production through artificial means are grouped as (1) "surface" improvements which are applied extensively over large areas and with low investment costs, and (2) "radical" improvements which involve such relatively expensive measures as replacing the natural vegetation with established pasture or reseeded rangeland. Surface improvement practices such as snow retention, runoff retention, overseeding, and fertilization have been effective only under special limited conditions. Radical improvement measures are justified only on the better sites where the increased returns justify the heavy costs. Experience in the Western United States has been similar.

Soviet Range Literature

Some of the recent Soviet work in range management and related fields is known through the reports of Soviet scientists to the International Grassland

Congress, International Botanical Congress and similar meetings and a few Soviet textbooks and journal articles have been translated into English (Larin, 1954, 1940; Ukrainskii, 1962). During the study tour and the visits to the various institutes and academies, opportunity was provided to see much more of the scientific literature especially that pertaining to arid and semi-arid rangelands.

A rather complete abstracting service is provided by the Academy of Sciences in the USSR (Mikhailov, 1964). Several good taxonomic works have been published, the most outstanding being a proposed ten-volume work on the Flora of Kazakhstan (Goloskoiov, 1962, Academy of Sciences of Kazakhstan, 1964. Seven volumes which give good coverage through the *Labiatae* have been published. Other apparently solid works deal with the distribution and character of natural vegetation (Bykov, 1962) the feeding value of semi desert plants (Kormanovsky, 1962), agro-climatology and methods of forecasting forage production by means of weather records (Fedoseev, 1964), animal breeds (Balmont, 1960) and plant ecology (Bykov, 1957). Publication of English versions of at least some of these would be most valuable and efforts are being made to arrange for the translation of some of them.

One publication that will be of interest and value to some readers even though it is in Russian is an index of seed available for exchange (Kazakhstan Academy of Sciences, 1963). Although many of the 2,657 species and varieties listed are for horticultural and ornamental plants, there are entries of 140 grasses and 143 legumes. Scientific as well as Russian common names are given and a request form for such samples in English is included.

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