Range Research in the Soviet Union

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In May and June 1979, we visited several locations in the Soviet Union where range research was being conducted. We were members of the "Arid Pastures and Rangelands Team" formed in conjunction with the US-USSR Agreement on Agriculture and Technology. The purpose of this exchange of rangelands teams was to increase cooperation in agricultural research and technological development through: (1) visiting selected USSR locations to review research on breeding, production, and utilization of forage produced from arid pastures and rangelands, and to examine the processes that tend to increase or decrease grazing land productivity; (2) discussing problems of mutual interest with scientists and practitioners within the USSR; and (3) developing specific cooperation exchanges and research activities for the mutual benefit of both countries. We visited locations in Moscow, Leningrad, and Stavropol in the Republic of Russia; Tselinograd, Alma-Ata, and Chimkent in the Republic of Kazakhstan; Samarkand in the Republic of Uzbekistan; and Ashkhabad in the Republic of Turkmenia.

Grassland agriculture in the Soviet Union has become recognized and studied as a science only within the last 40 years. Many of the departments relating to grasslands within the institutes we visited were established within the last 10 years. Thus, the scientific base for improving grassland productivity is just becoming firmly established. Most of the research that we observed is oriented toward the solution of practical problems in their system of state and collective farms. Thus, their concept of research is often oriented toward demonstration and production activities. We obtained only a limited feeling for the extent of basic research that would be applicable to grassland agriculture.

Agriculture is organized into about 28,000 collective farms (average size of 64 km^2) and 18,000 state farms (average size of 194 km^2). State farms function as "agricultural factories" on which farm workers are paid salaries. Collective farms, in theory, function like cooperatives where workers share in the profits, although decision making is more centralized.

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Editor's Note: This conversion table is for the convenience of readers:
1 hectare equals 2.47 acres
1 square kilometer equals 247 acres
1 kilometer equals .62 miles
1 mile equals 1.6 kilometers
1 meter equals 39.37 inches
1 centimeter equals .3937 inches
1 millimeter equals .03937 inches
1 inch equals 2.54 centimeters
1 kilogram equals 2.2 pounds
20 degrees C equals about 68 degrees F
30 degrees C equals about 87 degrees F

Forage resources germplasm continues to dominate the attention of Soviet scientists. They have searched their country for promising strains and species of forage plants. The most promising perennial plants are species of *Elymus* and *Agropyron* for the cold areas, and *Kochia, Haloxylon, Eurotia, Salsola,* and *Artemisia* for the warm deserts. Several species are in use and others are receiving attention for seed production, planting requirements and other cultural needs. Research is mostly on adaptation and cultural development; genetic research with range forage resources is limited.

The bank of germplasm in the USSR could be improved by adding material from other countries. Three native varieties of *Kochia prostrata* (summer cyprus) have been identified in the USSR: *villosissima* (sandy), *virescens* (clayey), and *canescens* (gravelly or stoney). It is found in several places in central Asia, Siberia, Iran, Afghanistan, and Australia. Some cytogenetics work in Alma-Ata indicates that there are diploid, tetraploid, and hexaploid forms. The diploid form is early maturing and the hexaploid is late maturing. Some physiological research at Samarkand has shown that *K. prostrata* maintains photosynthesis up to 40° C. We saw plantings of *K. prostrata* in the arid area out of Chimkent *(var. villosissima)* and near Nurate *(var. virescens),* and a row of it at Tselinograd.

At Leningrad it was mentioned that *Agropyron sibiricum* and *A. desertorum* were used on sands and loams, respectively, on areas with 100–400 mm annual precipitation. *Agropyron cristatum, A. desertorum,* and *A. sibiricum* were seeded on ranges of the Blacklands of Stavropol Kray, which are sandy soils that are black because of the organic matter and in an area of about 250 mm precipitation and average January temperature of 10° C and July temperature of 25° C. A cold-hardy variety of *Elymus junceus* was used in central

A map of the USSR showing locations visited by the authors.

A herd of Caucasian rams and a shepherd, on a sheep and range research station near Stavropol.

Siberia for grazing by horses. The variety used can withstand -60° C, has good nutritive value, and is salt tolerant. *Elymus sibiricus* is used in dry, cold areas near China. In Tselinograd we saw a breeding nursery of *E. junceus. E. giganteus* was also seeded on improved ranges in the Blacklands of Stavropol Kray.

Range Improvements of the type we know(brush control, pest control, seeding, fencing, water development, etc.) are limited on Soviet rangelands. *K. prostrata* is seeded at the rate of 3 kg/ha in the winter (December thru February) at Samarkand, and produces about 100 kg of seed per hectare. To establish it, the land is plowed 18-20 cm deep and strips 12-24 cm wide are seeded 1/2 cm deep. It grows 30-40 cm tall the first year and is not grazed until the second year. Even though the summers are quite dry, *K. prostrata* remains green and is grazed in the fall by sheep to flush them for breeding. It can withstand 70% utilization. Spring grazing is more detrimental to *K. prostrata* than summer or fall grazing. Its roots are 6-8 m deep, whereas the roots of the ephemerals in the area are only 30 cm deep. The sandy variety is seeded in the areas with a minimum of 110 mm annual precipitation and the clayey variety is seeded in the areas with a minimum of 160 mm of precipitation. Two varities of *K. prostrata* have been developed at Samarkand, cameleski and desert, from a collection of about 600 accessions. *K. prostrata* was also seeded on improved ranges of the Blacklands of Stavropol Kray.

Haloxylon aphyllum was seeded in strips about 10 m wide and 30-50 m apart at Nurate. These strips had been seeded in 1965 at the rate of 5 kg/ha of seed placed about 1/2 cm deep. The seed is harvested by shaking the tree and collecting the falling seed on a tarpaulin. Seed yields are 150-300 kg/ha; about 250 tons are collected annually. *Haloxylon aphyllum* is seeded in heavy soil, *H. persicum* in sandy soil, and *H. ammodendron* in colder areas. Evaporation and wind erosion are greatly reduced where *H. aphyllum* is planted in strips. Therefore, forage production from the native plants is two to three times greater than where it is not planted. Camels and sheep eat it, and villagers living in the vicinity use the wood for fuel. This latter practice prevents the use of the native *Artemisia* spp. for fuel. In Turkmenia, *Haloxylon aphyllum* and *H. persicum* are seeded on the Kara Kum desert where precipitation ranges from 110-160 mm. Plants seeded on sandy soils in Turkmenia include *H. aphyllum, H. persicum, Calligonum setosum, C. rubens, C. arborescens, Salsola richteri, S. paletzkiana* and *Ammodendron conollyi.*

Brush was said not to be a problem but we saw large areas dominated by small *Artemisia* plants. Seeding could be more widely used because grains were often growing in close proximity to grazing lands. We were told that some equipment has been developed for seeding. Fencing was minimal and perhaps is not needed because the animals are herded and returned to a night quarters much as they have been for many centuries in this region. Much more could be done with range improvements to increase production from the rangelands that we saw.

Grazing management systems are limited to repeated seasonal use in spring, early summer, and fall, with animals herded out in the morning and returned in the evening to corral and home locations. During the summer, many sheep go to the nearby mountains. Some of the farm managers and

Bud Purdy and Bob Barnes in front of a plant of Haloxylon aphyllum *used in range trials 120 km from Chimkent.*

other government officials were concerned about the heavy grazing intensity, increased erosion, and lack of grazing systems, but the primary mandate was to increase livestock production.

Range resource inventory and appraisal as we know them for the rangelands in the United States were not used in the region travelled. We saw maps of general soils types, pasture types, degrees of wind erosion, geomorphology, and other items on a republic or regional basis. Resource maps were made of state and collective farms for planning purposes. General indications of resource sampling such as measurements of forage variability from year to year were mentioned by the Soviets. Vegetational changes over time were described for the Repetek Reserve near Ashkhabad, but these changes had not been evaluated in terms of conditions and trends.

Multiple use of rangelands was recognized by the Soviet scientists, but the only efforts to manage for uses other than grazing appear to be regulation of shooting season, harvesting of Saiga antelope, and maintenance of livestock-free reserves. Use of the wildlands by people is minimal and does not conflict with use for grazing.

Heavy use of forage on arid and semiarid rangelands near water and habitation was shown by presence of trails, bare soil, and abundance of plants having low palatability. In fact, we believe that most of the rangeland we saw is in poor condition because of heavy and continued livestock use for as long as 2,500 years. Grain fields adjacent to rangeland of poor condition in the Samarkand and Chimkent regions suggest that the rangelands could produce grass forage of good quality if properly managed.

Forage and farming practices that we found interesting are:

a. Seedings of *Agropyron cristatum* were cut for hay and haylage in the Tselinograd region and were replanted every 5 or 6 years. Under grazing the stands were maintained for 10–12 years.

b. Strips a meter or two wide of uncut grass, planted *Brassica nigra*, and a plowed bank of snow were used to catch snow. Alternating wider strips of grass and wheat provided hay and grain and controlled erosion much as do stripcropping practices in the United States. The "New Lands" area has been largely developed for spring wheat and forage production (hay and haylage). We saw one native pasture maintained as a reserve and left ungrazed.

c. Some fallow rotations were 1 year of fallow to 3 or 4 years of grain, mostly wheat. A typical rotation might be 3 years of wheat, 1 year of barley, and 1 year of fallow.

d. *Kochia* and *Eurotia* were planted in strips on arid and semiarid areas for forage production with the claim that native forage plants between the strips were needed for variation in animal diet. *Haloxylon* in strips controlled sand dunes and permitted a cover to develop within 10 years.

e. Most of the cattle observed were used for both milk and meat production.

f. The Desert Research Institute near Ashkhabad had a good variety of desert shrubs but was lacking in trials of dryland grasses and forbs. The scientists seemed to be quite active in international affairs. It was mentioned that (1) they assisted some developing countries in solving their desert problems, (2) they organized symposia on reclamation of deserts, (3) they arranged training courses for participants from developing countries, and (4) they published a journal on desertification problems and their solution. Because irrigation water is available, some marginal sandy lands have been brought into crop production. Much of this land is above the canal and, therefore, the irrigation water must be pumped. Much of the work at the Desert Research Institute seems to be directed toward irrigating crops that can be grown on these sandy soils.

g. *Haloxylon apyllum, Eurotia ceratoides,* and *Kochia prostrata* were observed in an experimental seeding on a state farm, 120 km from Chimkent. All three species seem to be doing well in this area with about 125 mm annual precipitation. The *Eurotia ceratoides* was particularly impressive. This planting was producing about 1,000 kg/ha, whereas the native range of sagebrushes, medusahead, and *Aegilops* spp. produced only 200 kg/ha.

h. The Kazakhstan Republic produces seed of alfalfa, *K. prostrata, Agropyron pectiniforme,* and *A. sibiricum* for use in arid zones. In central and northeast parts of the Republic, sheep and cattle graze *K. prostrata* in the spring and fall and *A. sibiricum* in the summer. *Peganum harmala* grows here but is not a serious poisonous plant problem. *Bromus tectorum* occurs as a weed but it is used in hay production.

i. In Samarkand, a number of accessions of *Haloxylon aphyllum, K. prostrata, Allenia* spp., and *Salsola* spp. were studied. Mention was made of *Salsola orientalis* and *Camphorosma* spp. Near Nurate, about 80 km west of Samarkand a sheepherder rated palatability of native plants in descending order as *Poa bulbosa, Artemisia diffusa, Agropyron hirsutum, Bromus orientalis,* and *Taeniatherum asperum.*

A genuine spirit of cooperation and sincerity prevailed at the opening session at the Ministry of Agriculture in Moscow and continued throughout our trip. Although we met with scientists, visited laboratories and field experimental plots, as well as state and collective farms for 3 weeks, the time available for such activities was too limited. ●