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Silviculture and Forestry Exploitation in Mongolia

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In line with the collaboration between the Rumanian People's Republic and the People's Republic of Mongolia regarding problems of cultivation, exploitation, and industrialization of timber, a group of Rumanian engineers, among them the authors of this article, went in January 1959 to the People's Republic of Mongolia.

Few details are in general known about the forest economy of this distant country with its small but hard-working population. We therefore appreciate the fact that the presentation of some aspects of the silviculture and forestry exploitation of the People's Republic of Mongolia will awaken the interest of the specialists in our country.

The surface area of the People's Republic of Mongolia amounts to 154,270,000 hectares, of which 40,665,000 hectares are semi-desert. The wooded area is about 10,415,000 hectares, representing 6.8 percent of the total surface of the land. This wooded area does not include wooded areas having a surface of between 200 and 400 hectares. There are 11.70 hectares of woods per inhabitant (the country having a total of 900,000 inhabitants), which represents a very high percentage in comparison with the global situation, which is 1.60 hectares per capita.

The forests are administered by 15 Forest Districts (attached to the Ministry of Agriculture), the average of each being 700,000 hectares.

The organization of the management of the forest is now in progress, being effected by means of Soviet apparatuses

and the support of Soviet experts according to modern methods, aerophotogrammetry being used for charting.

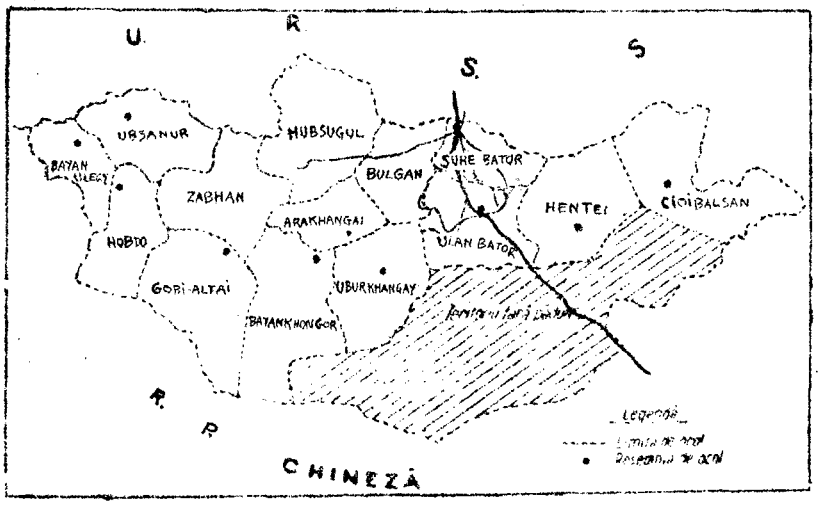

Fig 1. Map of the People's Republic of Mongolia divided into Forest Districts and surfaces not covered by forest.

The forests occupy zones between 1,200 and 2,200 meters in altitude.

The climate of the People's Republic of Mongolia is excessively continental. The dryness of the air, the low precipitation unevenly distributed (300 millimeters in the north and down to 60 millimeters in the south), the wide range of daily and annual temperatures (between +38 degrees centigrade and -40 degrees centigrade) create conditions generally unfavorable to timber. The average temperature in the coldest month (January) varies between -5 and -35 degrees centigrade and in the hottest months between +10 and +15 degrees centigrade (in July). The minimum temperature is registered in Ulan Bator (1,297 meters altitude) in January (-48 degrees centigrade).

The waters form two basins: the basin of the North Arctic Ocean and the basin of the Pacific Ocean. Into the Arctic Ocean runs the great Selenga River; the Onon, Kerulen, Uldza, and Halchingol Rivers are tributaries of the Amur River.

In the interior basins of Central Asia run the Kobda and Hulugun Rivers. The rivers of the Mongolian Altai

get their waters mainly from the melting of the glaciers.

The forests are unevenly distributed over the territory of the Republic. They are found grouped in the northern part of the country as a sort of extension of the southern limit of the Siberian forests. In the most northern part of the country they form unbroken massifs and are situated in the watersheds of the Iro, Cikoi, Onon, Kerulen, and Tola Rivers. Unbroken forests are also to be found in the elevated part of the Prihubsugul. Here the forests are located at an altitude of 1,700 to 2,200 meters, this last altitude being the limit for forests. The wooded percentage of the mountainous taiga varies between 60 and 80 percent and is 50 percent in Central Haigai.

Advancing toward the south from the north, the forest loses its charafter of continuity, being located only on the northern versants, and becomes increasingly sparser; in the semi-desert of Gobi only thickets of saxaul (Anabasis Holoxylon Ammodendron) are found.

Species: 1. Siberian larch (Larix) (66.4 percent) occupies the greatest surface, forming pure groves almost everywhere. In certain places it grows together with the Siberian pine and ordinary pine tree (Pinus Sylvestris) and sometimes mixed with birch and aspen.

Larch groves have an average productivity (third and fourth class production), and an average consistency of 0.5 to 0.6, / at / various ages. The volume per hectare varies between 150 and 300 cubic meters.

Larch regenerates well in a natural manner. This regeneration is hindered in many instances by grassy coverage (gramineae), which is well represented. The best natural regeneration is found on the northern versants.

2. Siberian Pine (10.7 percent), in terms of percentages, follows the larch. It covers the upper parts of the mountains, being well distributed in the Hentei and Prihubsugul Mountains. It forms pure groves but also grows mixed with larch. The groves have a low productivity (fifth class production).

3. The Pine tree (pinus Sylvestris) (6.4 percent) grows in the sands of the upper terraces of the Onon, Iro, Haara, and Selenga Rivers. It is found in pure groves or mixed frequently with larch and birch.

The most important pine tree forests are found on the Iro, Telega and Haara Rivers and at the source of the Onon River.

4. Birch (8.6 percent) is represented by two species (Betula tahurica and Betula angustifolia) and grows mixed with the pine and the larch.

5. Spruce, fir, and aspen are less extensive.

6. In the valleys of the rivers, in the northern parts of the country, grows the Populus laurifolia (a species of poplar) which forms pure groves of third-class production, with a consistency of 0.6 to 0.7. Apple, a certain kind of cherry tree, willow, and dodder also grow in river valleys.

In the semi-desert of Gobi are to be found the dwarf elm and the sexaul [unidentified], which grow in thickets. The predominant age is 120 to 170 years, the average consistency is between 0.4 and 0.6, which reduces the volume to 100 to 150 cubic meters per hectare.

The great diversity of types of forests and condition of terrain where they grow create different problems in the rational management of the forests, especially in regard to establishing and applying a treatment which would bring about their natural regeneration.

The forests are exploited especially near transportation and centers of population. Distant forests lacking roads are not exploited; these have passed the age of exploitation and constitute important reserves of timber.

The forest resources of the People's Republic of Mongolia also contain great surfaces of barren lands or forests degraded and depleted as a result of irrational exploitation, lack of care of the groves, attack by insects and fire. Among the forests visited it was noted that in felling the trees in the areas set aside for exploitation only resinous trees were extracted, and among these only the most valuable, the leafy and resinous trees with defects being left standing. Another negative aspect is that no attention is paid to regeneration in cutting; the cutting is not done from below, and many dead trees are left standing, thus becoming breeding places for insects as well as fire hazards, while branches and all the residues from exploitation are burned

in the felling areas, thus destroying the seedlings and sometimes causing forest fires over large areas of timber land. It is also to be noted that seeding areas are not protected, although they contain valuable species; when the less valuable but faster-growing species are not cleared, the pine and larch groves are soon replaced by birch and aspen groves.

These groves do not yield a production today according to the stational / stationale / conditions in which they develop, and because of this the productivity of the forest resources is reduced.

From the discussions and exchange of ideas with Mongol sylviculturists we arrived at the conclusion that in order to improve the situation certain decisions have to be made (like those already mentioned): the barren terrains have to be replanted; the degraded or felled groves have to be redeveloped, and the mixed groves formed by degradation should be replaced with pure groves of pine or larch trees.

It is also considered necessary in the process of tree felling that this should be done from the bottom, keeping in mind the regeneration of the trees; the branches and other residues should be carried away and out of the forests after cutting and burned under strict surveillance. The seeding areas of valuable species should be protected by clearing.

The exchange of opinions with the Mongol sylviculturists made us conclude that they have to take the initiative of creating green zones around all populated centers, collective farms, and zootechnical farms, mechanized centers, etc; to plant windreaks along the railways and to install forest plantations in the river valleys which cross barren regions (because of unfavorable climatic conditions) and in regions where wood is tranported from great distances.

It is noteworthy that the majority of the barren terrains which should be reforested are composed of degraded areas on the mountain slopes, and of a series of marshes, salt lakes, and marshy lands located in river valleys. In other instances the depleted areas are very grassy, covered with perennial plants, among which conchgrass (Agropyron repens) frequently appears.

The same situation prevails in the degraded groves in respect to the grassiness of the soil, the intervention of man, and erosion, which make the task of replanting and forest development under normal conditions so much more difficult.

Under such conditions, it is necessary to adopt special methods of restoring and to determine, after careful research, the characteristics of the area and of the corresponding species.

These tasks offer the sylviculturists difficult problems of an economic and technical nature. The Mongol sylviculturists realize the fact that they have to concentrate on the improvement of the forest resources and this within a short future period, because only in this way will it be possible for the forest resources to satisfy the demands of the national economy of the People's Republic of Mongolia.

The quantity of timber required for exploitation annually is 1.2 million cubic meters (the majority of which is pine and larch), which means 1.3 cubic meters per capita (in comparison with 0.57 cubic meters per capita on a world level). The quota exploited yearly represents about 6 percent of the normal possibility.

The receipt and delivery of the annual quantity of timber and the calculation of its revenue proceed according to the products manufactured.

The exploitation and industrialization of the timber are the object of various mixed enterprises but belong to separate departments (Construction, Mongol Railroads, Industry, Cooperatives, etc.).

The Ministry of Agriculture establishes, together with other beneficiaries, the annual volume to be exploited according to the demands indicated in the State Plan.

The location of the areas to be exploited depends on the capacity of the transport and installation facilities available.

The existence of the railroad and the highway connecting the two large cities of Ulan Bator and Suhe Bator has greatly contributed to grouping the exploitations in

the center of the country in the Iro, Tola, and Haara River Basins.

The forests in the Iro Basin (the most important) are mainly pine trees, Siberian pine, and larch. The trees have a basic diameter of 32 to 38 centimeters and a height of 22 to 26 meters.

Trees are felled and sectioned by manual or mechanical devices (Drujba saws imported from the USSR). The tools for manual labor are of superior quality and contribute greatly to the increase of production.

The number of assortments and lengths fashioned in the forests are few: "gater" logs of 4 to 6.5 meters length, mine logs of 2.6 meters for rural constructions, round firewood (the majority of which is resinous).

The extraction and carrying is done by caterpillar tractors, Soviet type (KT-12, S-80, TDT-60) and with beasts of burden, using the yak - an animal well adapted to the difficult climatic conditions, very undemanding, enduring, and powerful - yoked singly. It would be interesting to experiment with them in the mountain regions of our country, since they are so inexpensive, have high resistance to expreme tempratures, and do not need shelter. They are satisfied with simple food and have a traction power far superior to animals used by us. The pulling done by half dragging on simple skids with a capacity of 1,000 kilograms (the weight of a cubic meter of larch being about 850 kilograms and that of the pine about 700 kilograms). No picks, hooks, or chains are used for tying or manipulation. Rope and log-claws (tongs) are used.

A detail: the felling is done without tape by cutting from opposite sides on two levels, slightly inclined in regard to the horizontal and meeting in the center of the grove. This is necessitated in part by the cutting conditions (average), the relative uniform crown of the trees (0.4 to 0.6), which helps to direct the fall, as well as to the superior skill of the workers. No "spront" [unidentified] is made at either end of the logs. The distance covered by animal traction or tractors is 0.5 to 2 kilometers.

In general, transportation is by motorized means and only a small amount is floated freely on the Iro River or directed on the Tola River. The distances to rivers for

floating purposes are great (15 to 40 kilometers), and if /timber is/ transported directly to the factory or to the regular railroads the distance increases to as much as 150 kilometers.

Floating (free or directed) is done on distances of 35 to 150 kilometers and /timber is shipped by/ railroad from 100 to 330 kilometers. Consequently, round wood or assorted lumber sometimes cover 200 to 450 kilometers to reach the points of consumption.

The motor roads in forests, in general seasonal (in summer impracticable because of the marshes), are built of dirt without stone reinforcement.

Outside the forests, public roads are used which are easily maintained and usable almost all year round (/except/ in winter freezes and summer droughts).

The value of the construction work on these roads is 10,000 to 60,000 tugs (one tug=1.5 let) and their exploitation is easy because of the reduced inclines (average 2 to 4 percent, rarely 10 percent); maintenance is cheap thanks to lack of precipitation (annual average, 200 to 300 millimeters, 80 percent of which falls in the month of September).

Soviet trucks are used: ZIS 150-151 with or without single-axle trailers. Short logs (3 to 4 meters) and round firewood (2 meters) are transported in box trucks without trailers. No road tractors are used because of the long distances.

Exploitation workers, the majority seasonal with a one to three-year contract, are Mongols or Chinese having superior qualifications.

The forest regions are sparsely inhabited so that it is most important to outfit the camps ahead of time.

Log cabins are built in forests, and outside the forests spacious tents of cloth or leather (yourts) are used which are warm and clean.

The workers are well equipped and fed; the staple foods are rice, meat (lambor beef), vegetables (garlic and potatoes), rice flour, and for beverage, tea and milk. The

stores in forestry centers are as well stocked as those in the city and the prices are advantageous.

The pay system is global (a thing that in our country is in process of being introduced): the delivery in the forest is done by piece-work, the final payment being calculated by cubic meters loaded on trucks and measured at the factory or at the terminal depot: the method is stimulating to the worker, increases productivity, and reduces the number of technical personnel in exploitations. The evidence used by the enterprises of exploitation and industrialization is simple and the methodology clear, permitting them to function with a very small number of workers in the unit centers or outside them.

It is to be noted that, in order to reduce the time spent in loading and unloading railroad cars (sometimes with fixed walls), the logs are loaded with transverse logs placed after each row of logs of the same size: this method increases the index of the car's tonnage to about 65 to 75 percent, and even so the transportation cost on regular railroads is very reduced (0.6 tug per ton-kilometer). In our country this problem (insufficiently studied), is the cause today of a great deal of friction, the Depot Chiefs being blamed for not utilizing the railroad cars to full capacity.

The rhythm of the economic development of the People's Republic of Mongolia demands increased amounts of wood material for internal and external consumption.

Timber is the material which will contribute in large measure to the construction of new villages and farms and to future industrial objectives; it will have particular importance in the process of settling the nomadic population.

The organization od the new enterprises of exploitation and industrialization will be based on the most advanced techniques; mechanization being the only solution, it will have to ensure a superior productivity that requires little manpower for operation (the population being scarce).

The transport installations to be constructed have to be thoroughly studied because the climatic, orographic, and economic conditions raise special problems.

Floating (free or directed) is a means of transportation which requires expensive construction work on the rivers with a great consumption of lumber and needs replacement every 10 to 15 years. The floating season is short (100 days because of the freezing conditions). The majority of rivers are torrential in nature and transportation uncertain and uneven because of much meandering [of the rivers]; the distance covered is increased by about 43 percent. To float larch especially, new techniques for the extraction of the sap have to be applied.

On the other hand, transportation on water has great capacity and the cost is low (0.10 tug per ton-kilometer.)

Motor transportrequires relatively small investments since even terrains have easy slopes; maintenance is cheap thanks to the low precipitation. Exploitation is almost continuous, except in the marshy areas. To transport logs by motor vehicles, there is no need to extract the sap from the trees. The timber can be completely exploited (thin wood, firewood). Trucks and gasoline are imported and therefore motor transport is expensive (0.80 tug per ton-kilometer) and the capacity relatively limited.

The solutions to be adopted will include a complex of technical economic aspects and means of providing equipment and workers.

The Mongol forestry economy faces serious problems, but they can be resolved because the needed conditions are available: the people are hard-working and skillful, and to the common effort is added the material technical help of the USSR, the Chinese People's Republic, and the other people's democracies.

Photo Captions

Figure 2. An example of a forest pine after being felled in the People's Republic of Mongolia.

Figure 3. The pulling of pine logs by half dragging by yaks.

Figure 4. Manipulation of larch logs in the depot of the River Tola, Mongolia.

Figure 5. Pine logs being loaded on railroad cars on a regular railroad of Mongolia.

Figure 6. A pine log depot in Haara Station, Mongolia.

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