UDC 378

# TRAINING AND EXPERIMENTAL FORESTRY FARMS OF UNIVERSITIES AND TECHNOLOGICAL PROGRESS

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Training and experimental forestry farms and forest districts of universities must play the same role in the training of specialists for and development of forest science as clinics play for medical universities. Proper training of doctors and progress in medicine are unimaginable without a clinic, and in quite the same manner, training of a good forestry specialist and progress of forest management science appear impossible without well-run experimental forestry.

Significant research efforts are under way in nature reserves that include protected forests. The products of these efforts can be of high value to science and particularly to certain disciplines of forest science. They may be of some interest for the educational process, too. Still, nature reserves offer limited value for the training of forestry specialists.

Unlike a forest reserve, a training and experimental forestry farm is actively involved in forest farming activities. Its economic performance must be better than that of neighbouring industrial forestry enterprises. This does not mean it should not have any protected natural assets. On the contrary, training and experimental forestry farms should have some forest 'sanctuaries' (not necessarily large in area). These farms must employ both natural and management standards – the models of highly productive forest and sustainable forest management in line with cutting-edge scientific principles.

If a forestry farm has diverse natural elements, advanced equipment and qualified engineers and technicians, it can offer a high standard of training to students on the practical training course.

Training and experimental forestry farms and forest districts must try out new ideas through experimentation and make pioneering proposals to industry and practical applications. The uniqueness of the forest as the subject of forest science and the forest industry lies in the long duration of its life and development, in its longevity, which calls for long-term stationary research and continuity of such research with certain specific requirements.

Training and experimental forestry farms and forest districts must be the most suitable places for long-term stationary studies and must guarantee comprehensive continuity of the experiment. Frequently operating under certain constraints, these establishments have played a major role in the formulation and development of progressive forest management methods in our country.

Lisinskoye forest district (today Lisinsky forestry farm) of the Leningrad Forestry Academy and the experimental forest estate of the Timiryazev Moscow Agricultural Academy have a proud history. The latter may be referred to as a role model in comprehensive continuity of research and it provides opportunities for continuous case studies on growth plots planted a hundred years ago.

For the past 175 years, Lisinskoye forest district (Lisinsky forestry farm) has been used for practical training of students from the Leningrad Forestry Academy (until 1929 – Forestry Institute), which is the country's oldest forestry school. It has been the basis for numerous experiments and trials of unique felling methods devised by renowned forestry specialists, including D.M. Kravchinsky and M.M. Orlov. Unfortunately, this forestry farm has occasionally broken the continuity of experiments and the products of such experiments were not studied in due time. Moreover, military operations have caused significant damage to Lisinsky forest range.

Here, along with performance of modern-day experiments, historical forestry surveys are seen as an important task. In this context, we can mention the meaningful studies by G.I. Redko and A.S. Tikhonov, who identified the locations of past experiments in the Lisinskoye forest district relying on archival records and field data. Tikhonov found the long-forgotten Kravchinsky felling blocks and some other forestry assets that are of interest from the perspective of research continuity. Redko

has made a major effort to restore and confirm the list of silvicultural assets in the Lisinsky forestry farm from 1805 through 1979.

There are also some other known research efforts completed by training and experimental forestry farms of the institutes in Bryansk, Voronezh, Belarus, Moscow, Arkhangelsk, the Ukrainian Agricultural Academy and other forestry and agricultural educational and research institutions in the country.

There are some historical forestry assets on the territory of Shchelkovsky training and experimental forestry farm of the Moscow Forest Engineering Institute, specifically within the boundaries of the Vorya-Bogorodskoye and Ogudnevskoye forest districts. Nikolskaya forest estate of the Voznesenakaya Manufactory Partnership was established here in the 1880s. This forest area was first cultivated by renowned Russian Professor M.K. Tursky, who published a report on this project in 1886.

Pursuant to the forest management plan of that time, an audit of the forest began in 1899 under the supervision of the then Assistant Professor and later full Professor G.M. Tursky (the son of M.K. Tursky). He did not have a chance to complete this work owing to the war with Japan (he left to the scene of operations in 1904), and the audit was completed by a local forest warden, G.A. Sychev.

There are some highly productive forest stands in the Moscow Region that were created by a number of prominent forestry specialists of the past, most notably by M.K. Tursky and K.F. Turmer. Suffice it to say that K.F. Turmer is renowned for creating the standing volume of spruce and mixed pine-spruce and spruce-pine stands of a mature age totalling some 600–800 $m^3$/ha or more, and around 1500 $m^3$/ha of larch-tree stands. Forestry specialists show an interest in these historical assets all the time. Recently, some important investigations have been carried out there by M.D. Merzlenko.

These are convincing and obvious models of highly productive forests where students can be taught and educated. Vorya-Bogorodskoye forest district has a small plot of larch planted in 1872 (based on other records, in 1871) by Prof. M.K. Tursky. Today, it is a forest stand with an average height of 33 m, a mean diameter of 36 cm, a volume of some 600 $m^3$ per hectare, and quality class 1a. During the practical training course, we show students of the Moscow Forest Engineering Institute this forest plot that was created by forest engineers and later became a majestic natural sanctuary, paying homage to the work of the glorious pioneers of forest cultivation.

Visiting this place and getting to know it make a profound impression and are of significant educational and professional value.

In 1949, on the premises of Shelekovskaya forest estate of the training and experimental forestry farm of the Arkhangelsk Forestry Engineering Institute, the author of this work initiated a stationary comprehensive forest investigation (see Works of the Arkhangelsk Forestry Engineering Institute, 1954, Vol. 14). The subjects of the investigation included both plantations and cutover stands. The latter demonstrate the most vigorous processes, including changes in the ground vegetation, regeneration and development of the forest. Their stationary investigation helps formulate practical recommendations for the production industry in a relatively short time.

Fertilisation is becoming an important issue in today's forest management. This issue cannot be properly addressed without stationary experiments and this work is largely the responsibility of training and experimental forestry farms. Some of them (for example, Negorelsky training and experimental forestry farm of the Belarus Technology Institute) have been conducting such experiments for several years now. Some interesting examples of selection experiments can be found at the training and experimental forestry farm of Voronezh Forestry Institute, as well as forestry farms of some other forestry academies in the country.

In the early 1950s, on the premises of Lisinsky forestry farm of the Leningrad Forestry Academy, M.I. Saltykov initiated comprehensive research by the faculties of forest engineering and forest management into the impact of tree harvesting machines on forest reproduction, seeking to develop sustainable process flows.

Shchelkovsky forestry farm of the Moscow Forest Engineering Institute has conducted a number of noteworthy experiments that were launched already at the time when it was a training and experimental forestry farm. Some of these experiments are used for practical training today.

The academic efficiency of the experiments initiated at the training and experimental forestry farms during different periods could be further enhanced if the relevant records were made fully public. Today, the records of some of such forestry farms are still fragmented and remain in possession of the departments (and are far from complete) or even individual professors. It would make sense to compartmentalise them, consolidate them within the forestry farms and display them on map boards and plantation layouts.

The value of initiated experiments (permanent growth plots) grows over time. That is why it is very important to keep them secure and refresh the identification signs in due time. This must be the concern of the managers and specialists of the forestry farm, as well as the departments and individuals who launched these experiments. That would become an effective way to use the results of university research efforts in the educational process. Unfortunately, this initiative is not universally employed, which leads to data and records that are of value to the forest science and practices being lost.

In all the fields of science and technology, some discoveries, ideas and recommendations gradually lose their original value and become a part of history. Forest management is no exception. On the other hand, there is also a retroactive impact of the history of science and technology on their progress. The possibilities of using this in forest management in the interests of its progress are probably greater than in other domains, owing to the longevity of the forest and the long term of forest management rotations. It should be remembered, however, that using the history of forestry for the purpose of technological progress today does not mean there is a need for simple migration of the experiments of the past without any modifications. We have to take note of the new conditions and present-day developments in engineering, technology and science.

Knowledge of the forest and its nature is getting wider and deeper. Today, the forest can be viewed as a natural system on different levels: from the microlocal to the global.

Much attention today is drawn by the ecosystem, biogeocoenotical and dynamic aspects of the forest as a complex natural entity that is also subject to aggravating and diverse anthropogenic effects.

A proper understanding of these aspects is only possible if we get in touch with the forest and learn forest diagnostic techniques. It is also important to teach students not only to see and describe the forest as it is today but also to understand its past, i.e., its origin and development, and then use this knowledge and certain social and economic features to give an accurate forecast of both the natural and the economic future of the forest.

The Forestry Department of Moscow Forest Engineering Institute tries to do this starting from the very first field trip made by third-year students, when the forest is represented as a complex natural unity over space and time, and finishing with silvicultural and economic analysis during the practical training in the $4^{th}$ year. It is very useful for the educational process when forestry farm specialists help teachers and instructors during forest visits, especially during the $4^{th}$ year of study. In this context, the department and the forestry farm have a significant history of cooperation.

During practical training, apart from field trips, individual work performed by students under the supervision of their instructors and forestry farm specialists is also very important. It helps students fully grasp the intricacies of unassisted description and analysis of the forest, learn how to acquire and process field data, and formulate the necessary forest management actions.

To some extent, certain elements of the forest serve as the subjects of practical training by different departments of the forestry faculty. This differentiation is necessary and appropriate. Still, viewing the forest as a complex natural phenomenon in general requires a comprehensive approach. In this context, multifaceted field trips with participation by several departments and forestry farm specialists are advisable.

Multifaceted forestry field trips have long been practised by training and experimental forest districts and forestry farms. They were successfully conducted by Prof. M.E. Tkachenko at

Lisinskoye forest district of Leningrad Forestry Academy in the 1920s–40s. The author of this paper has also conducted such field trips at training and experimental forestry farms of the Arkhangelsk Forestry Engineering Institute and the Leningrad Forestry Academy. Multifaceted field trips are also conducted today at the training and experimental forestry farms of some forest management universities. Unfortunately, not all universities employ this practical training format, even though it has proven effective.

These are some aspects that are chiefly concerned with introducing students to the forest as a natural object and giving them an in-depth understanding of the forest as a complex natural phenomenon.

Yet the forest also plays the role of an economic asset, a subject of multi-pronged utilisation, regeneration, productivity enhancement and improvement of its condition. These objectives must be pursued using the latest scientific and technological achievements, especially at a training and experimental forestry farm, which is the showcase of the industry. From this perspective, training and experimental farms play a very special role in the education of forestry specialists.

Over past decades, the forest management industry has received some new equipment and technologies. Training and experimental forestry farms of universities might be expected to be the first to receive such novelties, but they obviously lack cutting-edge equipment capabilities. Not all such forestry farms boast adequate consistency and continuity of research. Many training and experimental forestry farms are far from model ones for neighbouring industrial forestry farms to copy and, in some cases, it is the other way around. For example, not all training farms have the ability to provide practical training in improvement felling using advanced machinery.

Ministries and agencies of the production industry could do more to help the training and experimental forestry farms of the Ministry of Higher Education institutions.

Practical training of mid-tier forestry specialists is remarkable for its high quality. The republican ministries of forest management that have different college-based forest farms within their jurisdiction provide these training farms with everything they need, including advanced equipment. We also appreciate the continuous interest in this matter shown by A.I. Zverev, Minister of Forest Management of the RSFSR. On the other hand, forestry universities train premium qualification specialists for the forest industry who later go to work in that industry. Consequently, forest management agencies should be interested in a high level of practical training of students also on the training and experimental forestry farms of universities. For that reason, we would appreciate some real support for these forestry farms from the forest management agencies.

In our large country, geographical differentiation of forest management measures based on local natural conditions and the production situation matters a lot. Each training and experimental forestry farm may offer answers to many important production-related questions in the area or region where it is located.

At the same time, training and experimental forestry farms working under specific geographical conditions must not confine themselves to handling routine challenges. They must look to the future: conduct experiments that are of no practical interest to their neighbouring industrial forestry farms at this time (for example, experiments in forest care in the areas where such forest care is not yet a regular practice), but tomorrow, with the advent of relevant economic and engineering capabilities, they will urgently need to address these issues under those specific natural conditions. This is a must in educating students, in training qualified specialists who will have to work with more advanced forestry production technologies tomorrow.

Since every forestry farm, including training and experimental farms, is located in a specific natural zone (subzone, province, belt, etc.) and is subject to this zonal distribution, its location and natural features influence the way students are trained, regardless of the unity of methodological and procedural principles inherent in a certain training course. This is beneficial to the training of those specialists who will work in the same natural zone after graduating. And this is the typical situation: Arkhangelsk Forestry Engineering Institute trains specialists chiefly for the European North, the Siberian Technological Institute – for Siberia, and many graduates of Moscow Forest Engineering Institute work in the zone of mixed coniferous-broad leaved forest of the Moscow

Region and neighbouring regions. Even so, some graduates of any forestry university end up in other regions of the country. It is a fact that they eventually assimilate the new environment and become robust specialists in these new settings. Nevertheless, they should get help in coping with this assimilation already at the university through an expansion of the geography of practical training. By such expansion, the author means field trips to distant regions. This approach is widely used abroad. For example, students of forestry universities in Sweden make three field trips throughout their training course – to the north, centre and south of Sweden.

In our country and for the purpose of this type of practical training, the training and experimental forestry farms of forest management universities could be used in a beneficial way. Universities could conduct exchange field trips of this kind. You may know that there are even certain country-to-country student exchange programmes. Departments and schools must be very closely related to the training and experimental forestry farms and forest districts, rely on them and help them.

Today, we must strengthen the role of training and experimental forestry farms in resolving some fundamental problems of forestry science. Above all, these include forest productivity enhancement and sustainable use and regeneration of all the valued elements of forests. Training and experimental forestry farms must be benchmarks for the culture of forestry production and models in setting the role of the forest as an environmental component.

Moscow Forest Engineering Institute is now converting Shchelkovsky training and experimental forestry farm into a new kind of integrated training and experimental asset that will be used for both transport and processing of raw wood using advanced machinery and technologies. Understandably, this asset will be used to investigate further the issues of forest management and regeneration of forests. Entities of this sort offer broader opportunities for training specialists in fields other than forest management.

At this point, we are faced with numerous challenges of resolving conflicts: between tree harvesting machines and technologies, on the one hand, and forest biology and ecology on the other; total utilisation of the biomass and the risk of soil impoverishment; the need for raw materials and for recreation and nature conservation. Appropriate resolution of these and other problems by training and experimental forestry farms would help intensify the forest industry on a wider geographical scale, as well.

We need to set up a regular exchange of information between forestry universities (and relevant schools of agricultural and other universities) on the products and opportunities of academic and research work on training and experimental forestry farms. The experience gained by different universities in using training and experimental forestry farms as a resource base for practical training and experimental studies of the forest should serve well to improve the training of top-qualification forestry specialists and make scientific research more effective.

The research potential of training and experimental forestry farms should be employed more aggressively.