

PRACTICE AND SCIENCE OF FORESTRY

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Of all the different branches of industry, forestry is probably the one most obviously based on practical experience. This peculiar character is due to the fact that until recently — and to some extent even today — forestry has exclusively implied indiscriminate exploitation of available natural resources, thus representing an activity with no other aim in view than economic interest. In addition, it should be borne in mind that until the revolutionizing introduction of the combustion engine into the field of manual labour, job performances in forestry were essentially based on the muscular strength and acquired skill of the individual worker, and on his capacity for adapting himself to working conditions which were often hard and primitive, whilst an abundant supply of manpower relieved the enterpriser from the necessity of attempting to develop methods and techniques. This primitive character of forestry, which was regarded as inevitable, constituted a barrier between forestry and a scientific outlook, preventing the introduction of research and scientific methods into this field.

Yet the situation depicted above did not prevent the elaboration, long ago, of fixed working patterns, or the adoption of implements which were the result of practical experimentation.

It should also be recalled that until the eighteenth century the tenor of scientific thought was utterly alien to a domain like forestry. Prior to that time, science meant jurisprudence, theology and philosophy. Natural science had long been tied to the Aristotelian outlook, which was much more a philosophical system than a true, living understanding of the essence and vital functions of nature.

After Linnaeus, the great detector and systematic classifier of plants and animals, science experienced a time of expansion aided by the rationalistic thinking of the eighteenth century and the simultaneous striving to utilise and gain from nature more and more commodities.

Since then, the contact between science and forestry has developed along two different lines. Firstly, the forest has attracted the interest of biologists as an object of research. Secondly, where forestry has been unsuccessful in solving its own problems, the need has arisen for theoretical investigations.

Since the forest has gradually become a factor of paramount importance to the community, it is now, with forestry, the subject of extensive investigation within the framework of a branch of science of its own.

Forest research involves close co-operation with all disciplines which are in any way related to this branch. The latter may be described as an endeavour to utilise and apply the results of pure science in order to attain practical ends with highly significant and far-reaching economic consequences.

The introduction of a scientific approach to forest problems has received a strong impetus from the relative deficiency of forests resulting from the increasing need for timber which accompanies an increasing density of population. It has become clear that for the capacity of the forests to be fully utilised, it is necessary to establish a rational cycle of production.

In Finland, forest research in a wide sense may today be said to date back a hundred years. Continuous, scientifically reliable investigations were commenced by Claes Wilhelm Gylden, who in 1853 published his remarkable book »Manual for Finnish Foresters». Next, there was Anton Gabriel Blomqvist, Director of the Forest Institute at Evo, who also carried out fundamental research of great importance. Blomqvist combined a knowledge of forestry with a scientific outlook, and during the four decades in which he taught the first generations of Finnish foresters he kindled in his pupils a spirit and created an understanding of the forest which have persisted until today.

It is with admiration and respect that we look back on the work performed by these pioneers, who stood alone, without the support of previous experience and tradition, often facing a disheartening lack of sympathy for their problems.

In a wide sense, forest research in Finland commenced with the foundation, in 1918, of the present Forest Research Institute, which is thus of the same age as the political independence of this country.

It should be noted that the idea of forest research on a scientific basis emanated as long ago as the 1860's from men who worked in the field. It was in the circle surrounding Blomqvist that this thought arose. The demands for a forest research centre may be attributed to recognition that forestry was urgently in need of a theoretical basis in regard to both the nature of the forests and the methods applicable to their treatment.

The relations between forestry and forest research are reflected in the development of higher education in this field. In order to maintain close contact with the forest, this education was in 1862 located at Evo, which was then a relatively remote place. But as it was difficult to arrange for teaching on a sufficiently wide scale there, and as the need arose to get in touch with other disciplines in order both to utilise their collections and to draw on their academic teachers, higher education in forestry was in 1908 transferred to the University of Helsinki.

This transference had been proposed by Blomqvist in a committee report of 1899, where he also emphasized the desirability of establishing a forest research institute which would function in close co-operation with this higher education.

That forestry in this country could prosper so long without any research work

was, perhaps, due to the fact that until the beginning of this century the trained foresters, who might have utilized academic results, were mostly state officers. Owing to force of circumstances, primarily poor sales conditions, these foresters as a rule had to confine themselves to a relatively passive policy as managers of the state forests, which were mostly located in the northern and eastern parts of Finland. Their activities seldom required any theoretical support.

A more active form of forestry existed, but up to this time it mostly consisted of heavy exploitation of privately owned forests without any thought of long-term production. This form of forestry chiefly required tough and energetic men with a markedly practical bent and a firm self-confidence. Within this exploiting business the number of trained foresters was small.

The exploiting type of forestry had no use for forest research. But as forestry was gradually converted into a long-term industry, need arose for investigations which would render a complete account of every aspect of the enterprise and the cycle of production.

The importance of the subsequent achievements of Finnish forest research to forestry and to the general trend of thought in this domain is obvious enough to anybody acquainted with forest conditions in this country.

An evaluation of the performances of different investigators is entirely outside the scope of this discourse, but reference may be made to the significance of Cajander's forest type system for the classification of our forests, to the part played by Heikinheimo as the Director of the Forest Research Institute and to his personal contributions in favour of a sound policy of stand treatment in this country, and to Ilvessalo's three forest inventories, which have yielded complete and detailed data regarding the resources and condition of the Finnish forests.

From the standpoint of forestry it would seem that the tasks of research can be classified into the following three main groups:

1. Basic research.
2. Investigations based on the results of practical experience and further development of current working methods.
3. Unravelling of special problems of significance to forestry.

Between the basic research and forestry the direct connections seem to be few. When research programmes are being drawn up, however, it would be of benefit if the immediate needs of forestry were considered as far as possible.

Within the branch of forest research characterized under point 2, theoretical investigations and forestry meet. Very often rules and working methods have been elaborated from practical experience during the course of years, but the reasons for the results obtained and of the advantages of particular methods have remained obscure. One important task of theoretical research is to shed light upon the causal relationships underlying these empirical methods, and to develop these methods to a higher level of accuracy and efficiency.

Hence, it is essential that investigators should be thoroughly acquainted with

the activities and methods of forestry. Only thus will they be able to plan experiments so as to correspond to the working conditions of forestry.

It is of fundamental importance in this field of research that close contact with forestry should be maintained. This need of contact is so essential that it ought to be extended onto the personal plane. Investigators and field workers ought to work together in the forests in order to learn to understand each other.

In this connection it should be emphatically stressed that, from the standpoint of forestry, a forester intending to become an investigator should work in the field for a certain period of time, for instance two or three years, before devoting himself to research. Only thus will he acquire the practical experience of working methods and the understanding of technical and economic conditions which are necessary if his future work is to be of optimal benefit to forestry. This contact with forestry should never be entirely abandoned. It should be the concern of every investigator to keep in touch with forestry, for instance by holding a minor commission as manager of a small private forest. This could be taken as an exciting week-end recreation. In forestry, the task of a forest manager will always remain the most valuable and fruitful form of work.

The progress of industrialization and the consequent rise in the general economic standard have rendered manual labour more expensive and led to a direct «escape from the woods», to easier jobs with better pay. Owing to these circumstances forest research has been prompted to take up the question of the rationalization of forest labour. These investigations, which are mostly concerned with machinery, perhaps represent the branch of research most closely connected with practical forestry.

The third type of contact between practice and research arises from a need for information, data and mensurations which the men in the field are unable to provide.

The typical situation is that a forester first tries to cope with the problem concerned himself, by perusing the literature available to him. As a rule, however, these studies are found to present much greater difficulties than he had anticipated.

Sometimes nothing has been published on the problem in question. In other cases a relevant literature exists, but it is so extensive and heavy that its digestion is a laborious and time-consuming task.

An additional difficulty consists in the tendency of all modern research to split up the subjects of investigation into narrower and narrower sections. In the individual case this development ensures increased possibilities for a successful study of details, but it entails a certain risk that the investigator will lose contact with the biological and economic totality.

With increasing specialization it will become ever more difficult for foresters working in the field to integrate theoretical results with the much wider context of forestry. The field workers are forced to attempt a synthesis of factors regard-

ing which they may be able to learn something, although an accurate evaluation of the interaction of these factors is often extremely difficult. If erroneous conclusions are drawn in regard to the treatment of stands, a drop in production will mostly ensue. Such mistakes can, as a rule, be repaired by regeneration, which, in addition, yields a considerable income from the sale of standing timber. But in the long run the result is a drop in production — which the forest will have to bear.

Considering that specialization within forest research will naturally proceed ever further, it appears that field workers are urgently in need of publications where the theoretical results are presented in a more popular or, better expressed, in a more applied form than has hitherto been the case.

An attempt in this direction to be mentioned with gratitude was the periodical «Metsätieto» (Forest Information), although it can no longer be regarded as fully meeting the requirements of the present day. It should be possible to present the diverse results of research in a wider, general context. In other words, what may be demanded is a synthesis involving the integration of those factors of significance with which forestry always has to reckon.

This important task could be assigned, for instance, to three foresters well acquainted both with forestry and with the theoretical results to be presented.

In this connection particular mention should be made of the direct help which forestry has received from research in the form of various reports based on the material collected during the three forest inventories.

Today, the total picture derived from a comparison of the data produced by the three forest inventories constitutes an essential part of the basis of our reasoning with regard to the forest. Prior to the first inventory there was always in the general trend of thought an element of apprehension that the supplies of timber might become exhausted. Hence, it was felt that the chief concern was to preserve the supplies.

Today we have a distinct picture of the present conditions and the possibilities of improvement within forestry, a picture based on thorough acquaintance with our forests and verified by the repeated inventories. The result is not only a conviction that the wood-working industry is capable of considerable expansion, but also a reasoning in terms of production which is based on the recognition that a sound distribution of age classes is essential.

Notwithstanding the close connection between research and forestry, these two lines of activity have their own, very different aims. The goal of research is to penetrate into all the problems relating to the various aspects of forestry. The task of forestry is to produce timber, extract it and convey it to the wood-working plant. Thus, investigators and foresters have different aims and different approaches to their work.

What, then, is the attitude of the field worker to the work performed by the investigators?

In the main, the working methods of forestry were evolved, during the course of time, by practical experience under rough and difficult conditions, which called for men with strength of will and physical ability, irrespective of their social position. As a form of free enterprise, forestry and the timber trade associated with it required a hard enterprising spirit and capacity for leadership if it was to succeed.

In the past, these circumstances may be said to have caused a certain boisterousness and a self-sufficiency, which estranged forestry from research. One had no use for it. It even happened that the title »scientist» was used with pity, if not with scorn, of a forester working in the field who showed scientific ambitions. This attitude is no longer taken, but it is referred to here in order to give an idea of the change that has taken place.

Today, the field workers regard forest research with esteem based on conviction. This is directly due to the fact that the results of forest research play a part in every phase of activity within forestry. Working methods, methods of management, tables and empirical figures, not to mention the numerous machines of high technical standard, everything has been developed, tested and approved by research. The field workers feel, although often without reflection, that research is all-pervading.

In their daily routine, however, they do not care to take advantage of scientific advances. It obviously causes least trouble to follow habitual methods, based on one's own experience. The appreciation of the theoretical achievements mostly rests in the subconscious, almost like a sort of religious conviction or confidence.

Normally, forest management does astonishingly well without any conscious and direct interference from research and its findings.

But when difficulties of an unrecognized nature crop up, thoughts immediately turn to research, whose task or even duty, it now appears, is to provide immediate help. As a rule, the need for assistance is very urgent in practical forestry.

Sometimes, in fact, science is capable of giving the help desired in the form of immediate information. But in other cases which require special investigation it takes a considerable time to study and elucidate the problem concerned.

In such cases a certain tension may arise between science and practice, chiefly owing to the fact that the field workers are not sufficiently aware of what forest research means, nor of its working methods.

All too often, foresters commit the error of regarding the results of scientific research not as the outcome of many different natural laws, but as some kind of patent medicine, bound to solve problems like a magical agency, without the forester himself needing to take the trouble of penetrating to their core.

It is tempting to compare this attitude to a sort of silvan paganism, characterized by an almost superstitious reverence for science. The latter has to provide the magic formula capable of producing almost any effect desired, like the vitamins and hormones of clever advertisements. It would seem that to the field

worker the greatest difficulty in his relationship with science consists in properly estimating its possibilities and limitations.

For the majority of foresters in this country, their main contact with forest research is probably derived through higher education at the university. Hence, this education will decisively affect the attitude of the future field worker towards science and research.

In order to meet the demands of forestry, it is obvious that the main purpose of the higher education must be to give the students extensive knowledge of, and experience in performing, all the various tasks of forestry. But as a foundation for his future work the forester needs both a good basic knowledge of biology, technical subjects and economics and a clear, systematic insight into the different branches of activity embraced by forestry. A systematic survey is essential if the forester is to integrate the knowledge obtained into a practically useful synthesis. In addition, it will enable him later to utilise both his own, practical experience and later advances in research.

It is a very important duty incumbent on the higher education in forestry to combine efficient practice with a clear, systematic survey of the theoretical results of forest research and of the leading principles, based on these results, for both the treatment of the forests and the economic utilisation of the timber produced.

Once he has completed his studies at the university, the forester seldom has enough time to keep abreast of subsequent advances in research. Essentially, it is the education which he receives at the university which determines the attitude of the forester towards forest research. The difficulties involved in keeping in touch with new trades in research seem only to grow with the progress of specialization, which raises barriers between ever narrower sections of this vast field of investigation.

To the forester, therefore, the new theoretical results which he tries to grasp and apply often appear more or less like set patterns of what the forest should be or like general rules, without it being possible for him to penetrate into the various aspects of the problems concerned or distinguish the various factors which play their part. The forester is forced to rely on authorities, and it is obvious that his interpretation and application will be readily influenced by his own ideas and wishes. With regard to the treatment of stands this often leads to operations which are too ambitious and therefore too hard and, finally, cause a drop in production.

In all its various phases, forestry has always been governed by economic conditions which have necessitated the invention of working methods of the greatest possible efficiency. Very often, therefore, research will have to start from the working methods of practical forestry. In this connection it seems appropriate to recall a remark made by one of the Swedish pioneers within forest research, Dr. Gunnar Andersson. When one of his colleagues demanded greater under-

standing for theoretical research work amongst forest officers, he said: »You must not look down on those forest managers, for they make such damn good suggestions.»

This remark, although made in the form of a joke, captures something of the essence of the relationship between the science and practice of forestry. It stresses the need for contact between these two lines of activity within the same vast industry, which is so important to the whole country. There should always be a close and mutual relationship.

It is important that the forester should be given a personal and distinct view of the achievements and the immediate aims of forest research. Information is also needed with regard to the way in which research is carried out in order to prevent hasty judgements, underrating of the possibilities or doubts regarding the good intentions of the scientist when field workers impatiently expect immediate help in their difficulties.

It is equally desirable, however, that those representing research should attempt to establish as close a contact as possible with practical forestry, and the importance of relationships on the personal plane should be emphasized. The mutual understanding and confidence which arise when problems are discussed in the field constitute the best guarantee of a co-ordinated endeavour to attain optimal results.

Contact with the investigator supplies the field worker with new theoretical information, which gives him a new approach to his problems and enhances his interest in both the forest and the available working methods.

Simultaneously, this contact should be stimulating to the investigator, in part by enabling him to establish personal relationships with colleagues in field work, in part by giving him a feeling that his results or his insight will have a better chance of being directly and more efficiently utilised in forestry.

Research must in no circumstances be allowed to become isolated from forestry. But when it demands immediate help and support over difficulties that arise, forestry must remember that research requires time and money in order to attain useful and valid results. For the results obtained have to be checked even when they appear to be indisputable. The leading principle of science is to be critical and objective.

Sometimes a conscientious investigator has to hold back a view, although he himself regards it as correct, because he cannot yet prove it convincingly. But if personal relationships exist between investigators and field workers, much may be gained by applying and testing the results in practice and on a broader basis than was, perhaps, possible under experimental conditions. It would also be of value if forestry were given an opportunity of utilising negative results of research, which should be given publicity in the form of warnings. Thus, forestry could often be spared considerable economic losses.

Acquaintance with the results of theoretical research will always create in the field worker an attitude of humility in face of the great and marvellous forces of nature, which he cannot disregard, but which he has the right to utilise in a positive direction. A frank and confident relationship with research will therefore contribute essentially to making his duties interesting and his profession a vocation.

Publications of the Society of Forestry in Finland:

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