

# FINNISH FOREST RESEARCH INSTITUTE

## METLA



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METSÄNTUTKIMUSLAITOS  
Kirjasto



## FOREWORD

One of the targets set by the Ministry of Agriculture and Forestry for the Finnish Forest Research Institute (Metla) in 1996 was to start preparations for the international evaluation of the institute. There have been several evaluations on the administration of Metla initiated by the institute itself in the last few years as can be seen in Appendix 14. An international overall evaluation is, however, first in its kind in Metla's history. The evaluation is a part of a more extensive evaluation process concerning several sector research organisations in Finland.

This file contains background information on Metla to be sent to the evaluators in advance. It gives a view on Metla's activities the emphasis being in the administration and management, national and international cooperation as well as Metla's role in the forest sector. The contents of the file was jointly agreed upon by Metla and the Ministry of Agriculture and Forestry. The actual report is by purpose quite short and the information it contains is in a compact form. The purpose is that the overall descriptions on Metla and Finnish forestry can be read in the brochures. On the other hand, various report topics are described in more detail in the Appendices.

Metla's operation idea is to solve problems in forestry through research. Changes in organisation structure and new management tools have all aimed at better meeting the needs for problem-based research as well as maintaining and improving its high quality. Several fields of forest research carried out by Metla have been nationally and internationally evaluated. In addition, each research project will be automatically evaluated at least at three-year intervals. According to the objectives of the present evaluation, the research projects, in spite of their importance, have not been dealt with in detail in this report.

The report has been compiled and edited by Metla's Secretary of International Affairs, Ms. Anne Ahti. The compiling work took place mainly in spring 1997 and the figures refer to the situation in 1996 or January 1997.

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# 1. METLA IN THE FINNISH FOREST RESEARCH SECTOR

## 1.1. History of Forest Research in Finland

In Finland forest research has its origins in the Turku University which was established in the 17th century and was the first university in Finland. During the 18th century many dissertations were published, based on one hand on the foreign examples, before all on the example of Linnaeus, the Swedish founder of botanical taxonomy and on the other hand on inclination to use domestic natural resources. Evidently these dissertations did not have apparent impact on practical forestry and timber industry including the emerging saw mill industry, tar distillation and manufacture of potash, although in the calendars and guidebooks directed to general public the influence of these dissertations can be detected.

The education of forestry officials for the needs of State forestry began in the 1860's in the middle of forested regions at Evo, 120 km north from Helsinki. Although the location was remote even under Finnish conditions, the teachers which were mainly educated in Germany began the forest research based on practical experiments in silviculture, forest mensuration and forest management. Research results were mainly published in Swedish and Finnish in publication series by the Finnish Forest Association.

In 1908 the higher education in forestry was transferred from Evo to the Faculty of Agriculture and Forestry which had been established at the University of Helsinki. About this time the Finnish Society of Forest Science was founded to act as a link between the forest researchers in different parts of the country who were employed either by the University of Helsinki or by the State forestry. From the beginning the Society included the publishing of forest research results as one of its tasks. The first of its publication series was Acta Forestalia Fennica whose first volume was published in 1913. This same publication series is still published in cooperation with Metla.

Finnish Forestry Experimental Institute, the predecessor of the Finnish Forest Research Institute, was founded in 1918 as a part of the State forest administration. According to the prevailing European opinion it was estimated that forest research carried out in universities would not be able to satisfy in all aspects the needs of society as a whole but instead it would be necessary to differentiate between the basic research in forest science carried out by universities and the applied forest research which was clearly based on practical experiments and which aimed at practical applications. From the beginning much of State's forest property was allotted to the use of the Finnish Forest Experimental Institute including valuable nature conservation sites such as Punkaharju.

Soon the Finnish Forest Experimental Institute established itself as an independent part of State forest administration and assumed a new name, Finnish Forest Research Institute which is still in use. Institutes first major accomplishment was the National Forest Inventory in 1921-1924, one of the first nationwide forest resource inventories in the world. To accompany the inventory, surveys on timber usage were developed which enable to calculate reliable forest balances and assess the sustainability of timber production in Finnish forests.

Resources of the University of Helsinki and the Finnish Forest Research Institute increased slowly until the 1960's when there was a period of rapid increase in resources. The main reason for this increase was the rapid increase in the demand for roundwood in forest industry which was about to surpass the sustainability of the timber production. The authorities emphasised practical measures which increased the forest land area and the efficiency of timber production. The funding of forest research was increased rapidly through many channels in order to reach this efficiency in timber production and utilise the potential which the forest sciences offered. In the 1960's the growth of the Finnish Forest Research Institute was emphasised by development of regional research station network and by acquiring new branches of science within the research programme of the Institute. The increase of resources continued until mid 1980's. However in the 1990's funding has decreased.

As part of governments regional policy the Faculty of Forestry was established in the University of Joensuu in 1982. The European Forest Institute which is mainly funded by the Ministry of Agriculture and Forestry was also founded in Joensuu in 1992.

The early history of forest research in Finland is discussed in more detail in Appendix 1.

## 1.2. Forest Research Sector Today

Figure 1 shows the structure of Research and Development in the forest sector in Finland.

The largest financing organisations are the Academy of Finland (subordinate to the Ministry of Education), TEKES (subordinate to the Ministry of Trade and Industry) and SITRA. The Academy of Finland sponsors mainly basic research carried out in universities while TEKES and SITRA have concentrated on supporting industrial product development and related research in public and private sector.

Certain Ministries, especially the Ministry of Trade and Industry distribute to some extent also direct general funding. The role of the Ministry of Agriculture and Forestry as a supplier of non-earmarked funding is minor; annually approximately FIM 7 million is distributed at discretion to cooperation projects in different organisations. The role of the Ministry of the Environment is more or less in the same scale.

The main part of funding from the ministries is ear-marked. Around 10 sectoral research institutes are subordinate to the Ministry of Agriculture and Forestry. Metla is one of them. In 1996 it received funding from the State budget FIM 170 million. Research which is to some extent connected to forest research is also carried out in the Finnish Fisheries and Game Research Institute (Fig. 1 RKTL) and in the Institute of Agricultural Engineering (VAKOLA) which is subordinate to the Agricultural Research Centre of Finland (MTT). Research in the Forest and Park Service concentrates mainly on managing nature conservation areas. It is estimated that in these bodies the share of the funding which is clearly allocated to forestry and wood technology related research is about FIM 2-3 million.

The Ministry of Agriculture and Forestry allocates funding also to some research institutes within private sector. In 1996 the total funding of the



European Forest Institute (Fig. 1 EFI) was FIM 12.1 million of which FIM 6.0 million was provided by the Ministry of Agriculture and Forestry. The overall budget of the Work Efficiency Institute (Fig. 1 TTS) was FIM 54 million of which FIM 3.8 million was provided by the Ministry. The financing of the Forestry Development Centre Tapio (Fig. 1 Tapio) was FIM 50 million of which FIM 28 million was provided by the Ministry. It is estimated that FIM 18 million of the funding by the Ministry is to be regarded as the share of R&D of forestry and wood technology.

Over twenty research institutes working in nine administrative fields are funded from the State budget. Their combined research volume equals that of the universities. The most important with respect of forestry and wood technology research is VTT, Technical Research Centre in Finland (Fig. 1 VTT) which is subordinate to the Ministry of Trade and Industry. In 1996 its turnover was FIM 996 million. The most important of VTT's research institutes with respect to forestry and wood technology research are VTT Energy (which includes wood energy research) and VTT Building Technology (which includes structure and characteristics of wood and usage of timber in structures). In 1996 the funding of VTT Energy was FIM 145 million and VTT Building Technology FIM 150 million. It is estimated that in these two research institutes the share of funding for forestry and wood technology would have been FIM 35 million.

The Finnish Environment Institute (Fig. 1 SYKE) which is subordinate to the Ministry of the Environment is also important from the perspective of forestry and wood technology research. In 1996 its operational expenses were FIM 195 million of which the share of forest research is about FIM 5.5-7.0 million.

The significance of private sector has increased during the last decade. The Finnish Pulp and Paper Research Institute (Fig. 1 KCL) is the biggest with the turnover of about FIM 114 million in 1996. It concentrates on research in pulp and paper industry and thus also carries out research on the characteristics of wood. Its ownership structure is based on forest industry. A similar ownership structure applies to Metsäteho Oy which concentrates on research of wood procurement and wood production. In 1996 its turnover was FIM 14.6 million.

R & D is also conducted in consulting companies. The biggest consulting company is Jaakko Pöyry Consulting Oy whose net sales in 1996 were FIM 180 million. Its main branches of expertise are pulp and paper industry and marketing of forest products. Part of Jaakko Pöyry Group is also Maa ja Vesi Oy (Soil and Water Ltd) whose net sales were FIM 89 million. Its main field of operation is environmental consulting. Other significant companies are Indufor Oy (turnover FIM 6.5 million in 1996) and Helsinki University Knowledge Services (about FIM 50 million). The overall turnover of forestry and wood technology research carried out in consulting companies is difficult to estimate but it may reach several tens of millions Finnish marks, maybe FIM 35-40 million.

## 2. ORGANISATION AND MANAGEMENT

### 2.1. Organisation

#### 2.1.1. Development of the Organisation Structure

Until 1992 Metla had a line organisation, which had been formed over a long period of time. In order to reduce unnecessary bureaucracy and to increase flexibility, so that the new demands could be met more efficiently, research departments were reorganised in the beginning of 1992. The number of departments was reduced from nine to three in order to transfer the resources from administration to research, to reduce overlapping functions, and to combine research projects more efficiently. The new departments were based on the previous research departments and their sub-divisions. The organisation of Metla from 1992 until 1994 consisted of three departments:

Forest Ecology,  
Forest Production, and  
Forest Resources.

This reorganisation in 1992 gave Metla a more flexible organisation. However, the reorganisation was considered to be inadequate to meet the objectives of problem oriented research and target management. To increase the operational efficiency of Metla the organisation of the Institute and the decree and standing orders concerning the Institute were reformed again in 1994. The division into departments and sub-divisions was changed into project based organisation where research is mainly carried out in scheduled projects.

The Decree and Standing Order of Metla are in Appendix 2.

Target areas, within which operating targets are set, are Research, Research Forests, Marketing and Sales, and Administrative Services. Operating units where different target areas are combined are the Helsinki and Vantaa Research Centres and eight local research stations. This operational model is based on an idea where the management of the Institute concentrates on strategic planning and setting of the operating targets while operating units are responsible for the operation in practise.

Metla's organisation is described in Figure 2.

#### 2.1.2. Target Areas

Metla's target areas are:

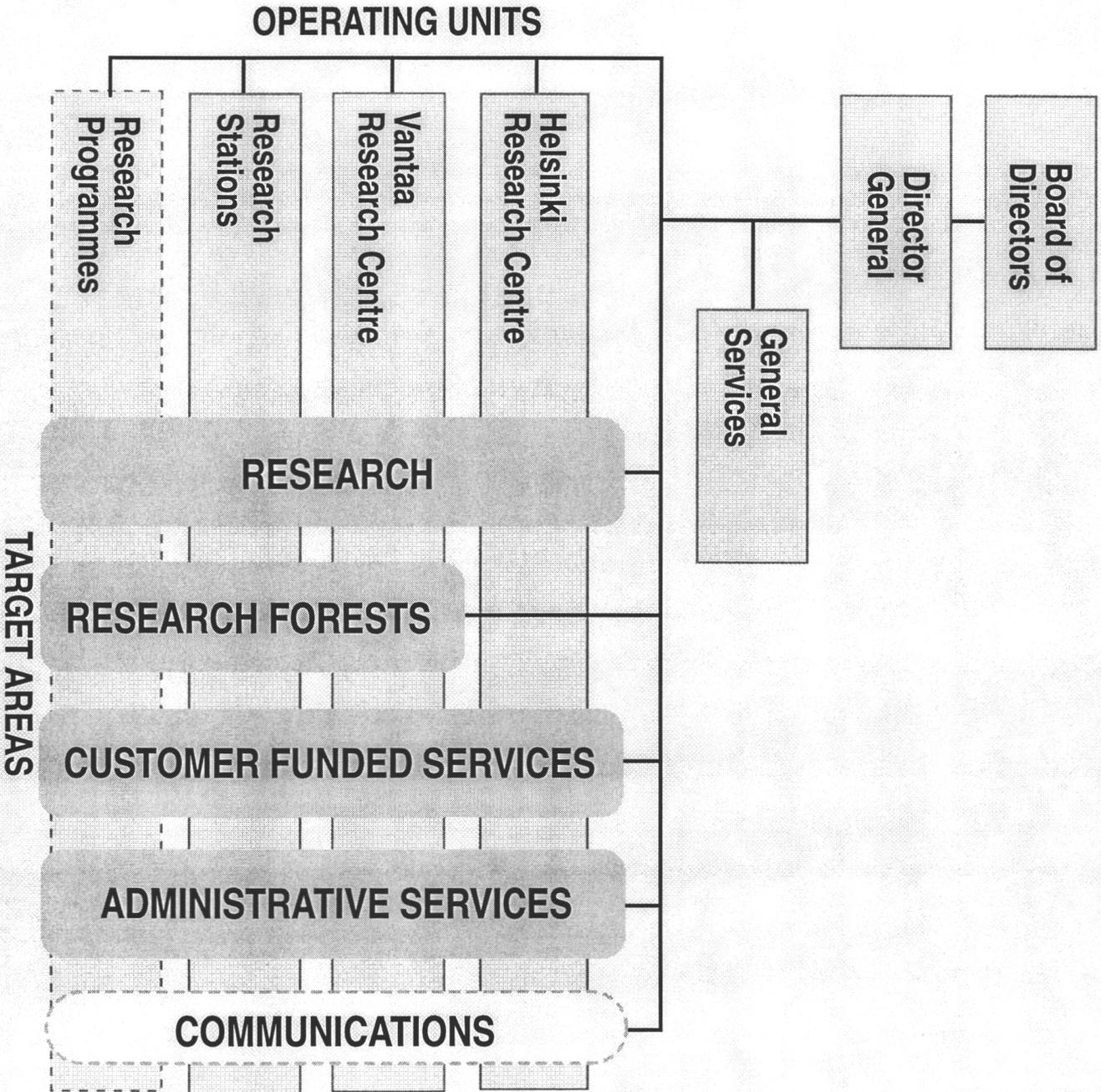
##### Research

Research is organised into problem-oriented projects, each managed by a principal research officer. The research projects are evaluated the latest at the end of the project. Research programmes are set up to cover main topics in research. Metla's research projects and programmes are listed in Appendix 3.

##### Research Forests

One of Metla's strengths lies in its network of research forests, which form the basis for the Institute's long-term field experiments. A diverse range of forest ecosystems is maintained for research purposes in the research forests. In

# Organization



addition to conservation and research functions, the nature conservation areas also provide outdoor recreation facilities.

#### Marketing and Sales

Metla's Marketing and Sales (ART) handles commissioned research, marketing and sales of know-how, and sales of Metla's publications. It also supports Metla's international activities. Metla's marketing and sales services are described in more detail in Chapter 4.

#### Administrative Services

The target area of Administrative Services is responsible for general, financial, personnel, real estate and information systems management.

#### Communication & PR

This target area is responsible for Institute's internal and public information services. It promotes forming of positive image of Metla in its interest groups. Communication Unit is responsible for the operation in practise (described in Chapter 2.1.4.).

### 2.1.3. Operating Units

The personnel and financing resources of Metla's operating units are described in Table 1.

Table 1. Metla's Operating Units in 1996.

	Researchers /Other Staff	Budget million FIM (%)
The Staff and National Service Projects	3/45	19.4 (9%)
Vantaan Research Centre	40/38	62.9 (28%)
Helsinki Research Centre	70/132	35.2 (15%)
Joensuu Research Station	13/21	15.0 (7%)
Kannus Research Station	3/22	7.1 (3%)
Kolari Research Station	2/26	10.2 (4%)
Muhos Research Station	6/40	11.8 (5%)
Parkano Research Station	5/30	11.2 (5%)
Punkaharju Research Station	5/29	10.3 (4%)
Rovaniemi Research Station	17/70	31 (14%)
Suonenjoki Research Station	9/34	13.2 (6%)

Descriptions of the Research Centres and Stations are given in Appendix 4.

#### 2.1.4. Communication Unit

Communications are an essential part of the activities at Metla in conveying research results to those who need that particular information. It is the duty of the Communication Unit to convey popularised information of Metla's research projects and their results, publications, the work in general and its significance to society, and of the research forests including the nature conservation areas open to the public and the services offered by them. Metla makes also public forecasts of plant damages, crops of berries and mushrooms, and forest pests as mentioned in the chapter 7.5.

The Communication Unit, which reports directly to the Director General, coordinates communication activities of the whole Institute according to the approved communications strategy, the institute's operating targets and the annual communications plan. The Communication Unit personnel consists of three people including the communication manager and two assistants.

The most important interest groups for the information conveyed by Metla are professionals in forestry, forest owners, political decision makers and the mass media and the public in general..

A press release is delivered of results of all research projects of special interests and others in the form of a leaflet. Press conferences are organised for the most important projects. The number of special issues has been about 40 a year and the leaflet has been published 3-4 times per year. At the beginning of 1997 Metla launched a quarterly customer newsletter. Researchers are also encouraged to take part in the discussion about forestry topics by writing popularised articles in different papers based on their special knowledge of the field. The Communication Unit assists if requested in completing the articles and in finding the suitable media.

Producing of Metla's annual reports, general brochures, video and slide shows as well as organising exhibitions are also duties of the Communication Unit.

Metla's Internet site includes several newsgroups and its home page is updated regularly.

The communication manager has the right to attend both the meeting of the Executive Board and of the Supervisory Board. The Communication Unit compiles and delivers the weekly internal newsletter for the whole of the personnel.

In order to enhance internal communications a special link person has been named in every operating unit. They also distribute newsletters of their own.

## 2.2. Management Systems

### 2.2.1. Target Management

Metla's operations are directed besides legislation by the regulations which apply to the State administration in general and by other authorities especially the Ministry of Agriculture and Forestry and in nature conservation

matters by the Ministry of the Environment. The Ministry of Agriculture and Forestry supervises the Institute by an operating and financial plan and an annual budget proposal process and by target management which complements the other measures. Operating targets are set for Metla according to the principles of target management. At the same time Metla's authority regarding the usage of funds and the responsibility attaining its operating targets increase.

Metla changed over to target management in 1993 when the Ministry of Agriculture and Forestry ratified the first operating targets, within the Institute the change over took place in 1995 after all in executive positions were given training in target management.

Metla holds target negotiations with the Ministry of Agriculture and Forestry. The Ministry ratifies with a statement the operating targets agreed in these negotiations. This statement includes also matters agreed with the Ministry of the Environment. Additionally, this statement includes guidelines concerning the usage of appropriations and the procedure for monitoring and reporting of operating targets. At the target negotiations Metla is represented by the Director General and directors of target areas. Besides approving the operating and financial plan and budget proposal the Supervisory Board has a chance to comment on the operating targets during the negotiations. These operating targets are then divided into annual operating plans and operating targets between the operating units, projects and persons.

Metla's operating targets for 1997 are given in Appendix 5.

Within Metla the Director General holds target negotiations with the target areas and directors of operating units which in turn negotiate with project leaders. Project leaders negotiate with the project personnel.

According to the target negotiations target operating plans are drawn which define the operation targets, monitoring mode and time, key duties, person(s) responsible, key resources and implementation period of target area, operating unit, project or sub-project. The follow-up reports on operating targets from operating units and projects are given once a year in February.

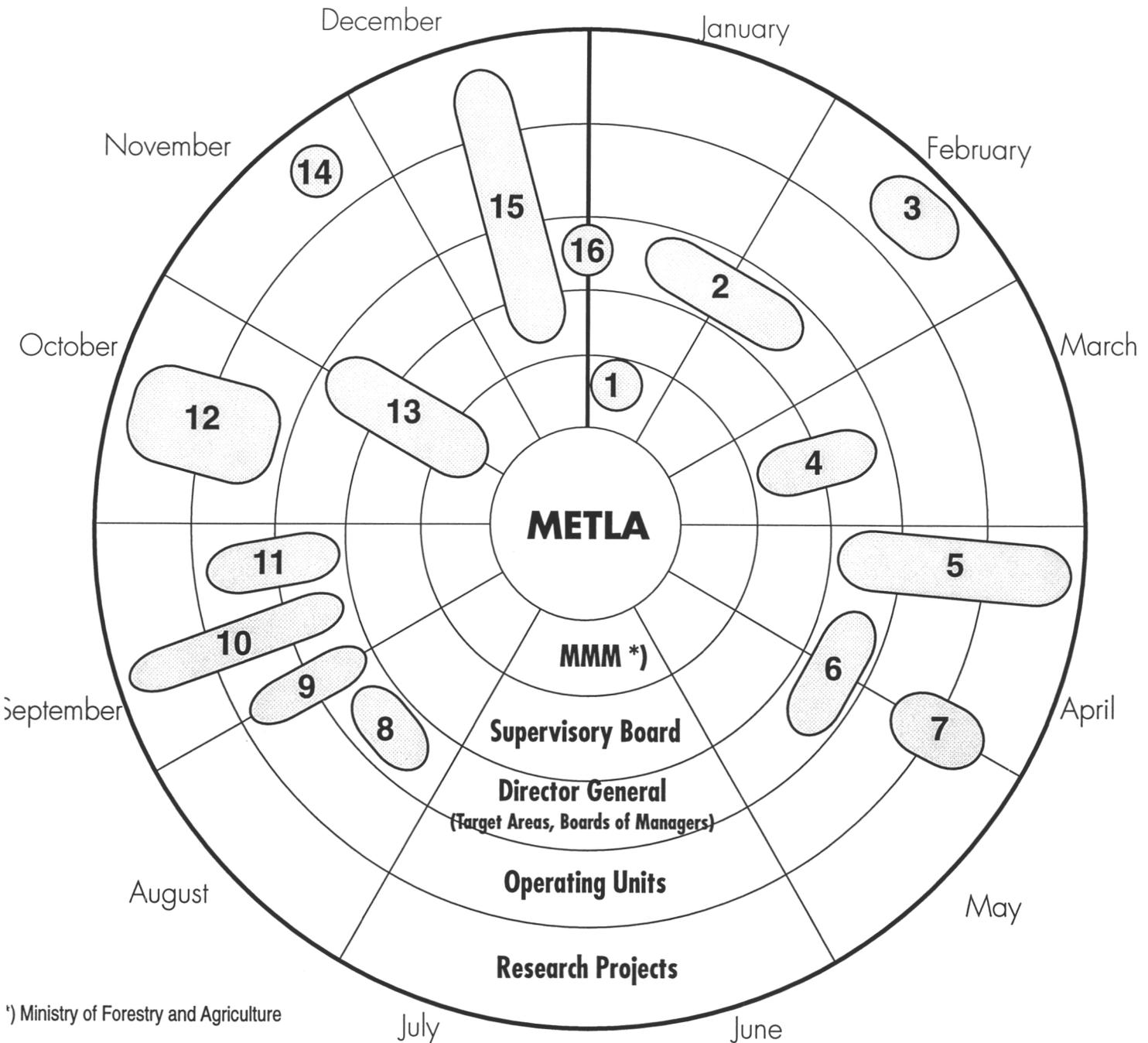
The general outline and schedule of the process of target management are shown by the Target Management Schedules in Figures 3 and 4.

### 2.2.2. Planning and Monitoring Systems

Several systems have been developed at Metla to support planning, management and monitoring. From the research point of view the most important systems are the Database for Research Planning and Monitoring and the Database for Achievements and Activities.

#### Database for Research Planning and Monitoring (*Tutkimussuunnittelun ja -seurannan tietokanta, TUSKA*)

This database contains basic information about research and service projects in Metla (name of the project, targets, duration, person in charge, etc.), their annual financial and time management plans as well as information on funds granted for the project by different sponsors.

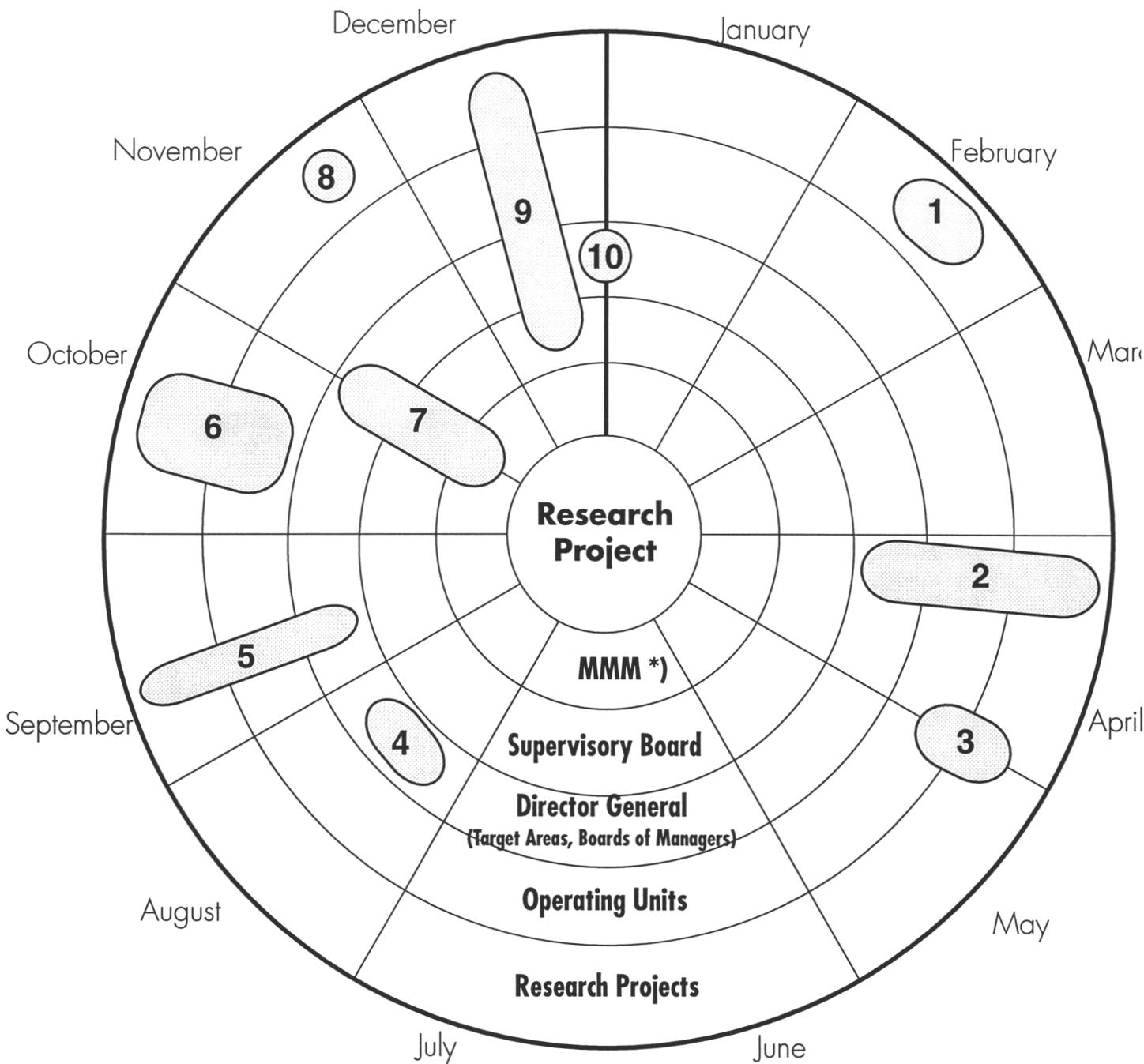


\*) Ministry of Forestry and Agriculture

## Target Management Schedule – Metla

1. Ministry of Agriculture and Forestry and Ministry of Finance give Metla the preliminary resource framework and instructions for drawing up the budget and plan of action.
2. Internal auditing of the accounts of the research projects.
3. Research project leaders give Interim Reports on their projects to the Director General (DG).
4. Supervisory Board approves Metlas budget proposal and action plan, which will be subsequently presented to the Ministry of Agriculture and Forestry.
5. Project leaders get feed-back from the DG on their Interim Reports.
6. Key Targets for the Institute and its Target Units are defined by the DG.
7. Ideas for new research projects are discussed.
8. Resource frameworks and instructions for plans of action are defined by the DG.
9. Operating units give the DG Interim Reports on the implementation of the targets.
10. Research Advisory Group gives its opinions on the ideas for new research projects.
11. Target negotiations between the Director General and Operating Units.
12. Target discussions between Heads of Operating Units and project leaders.
13. Research Advisory Group gives its comments on Metla's action plan, Target negotiations between Ministry of Agriculture and Forestry and Metla.
14. Target discussions of each project between project leader and partners of project.
15. Supervisory Board approves the resource frameworks and action plan of Metla's target areas for the following year.
16. Resources are allocated for the research projects.

Fig. 4.



\*) Ministry of Forestry and Agriculture

## Target Management Schedule – Research Project

1. Project leaders give Interim Reports on their projects.
2. Project leaders get feedback on the implementation of the project targets from the previous year.
3. Ideas for new research projects are discussed.
4. Resource frameworks and instructions for action plans are given by the Director General.
5. Research Advisory Group gives its comments on the ideas for new research projects.
6. Target discussions between heads of operational units and project leaders.
7. Research Advisory Group gives its comments on the action plans of the projects.
8. Target discussion between project leader and partners of project.
9. Supervisory Board approves the resource frameworks and action plans of Metla's target areas for the following year.
10. Resources are allocated for the research projects.

The development and usage of this information system began in 1992 and it is under continuing development. Planning information of the projects is collected from the researchers by Excel forms and text files. In units this information is fed into the programme either by Uniface application or www.

Internal www pages which include a general part for the internal use of the entire Institute and parts with restricted access for financial secretaries and management are used for reports. Information about payment transactions and working hours are monthly brought into the information system. Software has been produced at Metla.

#### Database for Achievements and Activities (*Suoriterekisteri*)

Research results, international operations and international and national cooperation are monitored through this database. It contains information on publications, lectures, other appearances in public, expert assignments, travels, and cooperation projects of Metla's personnel as well as information on visiting foreign researchers.

Employee can enter information by www application or give details to the project secretary. The person responsible for the contents of the database checks the information. Of those publications which are not published in Metla's own publication series or other public series a copy must be sent to the person responsible for the contents of the database.

Database for Achievements and Activities was established in 1992 and it was revised in 1996.

## 2.3. Management Structure

### 2.3.1. Supervisory Board

In 1991 the statutes concerning Metla were reformed. The new decree entered into force on 3rd February 1991 and according to its provisions the Council of State appointed the Supervisory Board for the Institute. According to the decree and its amendments (1994) the tasks of the Supervisory Board are:

- 1) confirm the operation principles of the Research Institute's research and service operations and set the research and other targets and monitor their attainment;
- 2) ratify the Research Institute's Standing Orders;
- 3) decide on the Research Institute's budget proposal and operating and financial plan as well as on the annual operating plan;
- 4) decide on establishing, abolishing, changing the name or scope of tasks of, or transferring a position within the scope of the Research Institute's authority unless otherwise provided in the Standing Orders;
- 5) decide on initiatives, statements and general regulations concerning the Research Institute to be issued to the Ministry or other authorities in matters which are in principle important and far-reaching;
- 6) appoint the Research Director, Professor and Administrative Director;

7) decide on the utilisation principles for experimental and nature conservation areas;

8) appoint deputies for the Director General; as well as

9) take charge of the other matters that the Supervisory Board decides to discuss upon the presentation of the Director General.

Supervisory Board's term of office is three years. Supervisory Board consists of the Director General and not more than seven other members who are familiar with the remit of the Research Institute and one of which represents the personnel of the Research Institute. The Council of State appoints the members of the Supervisory Board as well as the chairperson and the deputy chairperson.

The notice of the meeting for the Supervisory Board of the Research Institute is convened by the chairperson or by the deputy chairperson. The Supervisory Board is quorate when the chairperson and at least half of the other members are present. Decisions of the Supervisory Board are adopted by a simple majority of votes. In case of equally divided votes, the chairperson has the casting vote.

For the three year term from 1st March 1997 to 29th February 2000 the chairperson is the Special Adviser to the Minister of Agriculture and Forestry and the deputy chairperson is the Director General of Metla. The six other members represent the following organisations and interest groups:

Forestry producers

Forest industry

Academy of Finland (scientific body)

Finnish Environment Institute

Ministry of Trade and Industry

Metla's personnel

### 2.3.2. Director General

The Director General is the head of the Institute who according to the decree manages the operations of the Institute and is responsible for productivity of operations falling within the purview of the Research Institute. The Director General has the power of decision in matters which are not decided by the Supervisory Board or in which the power of decision has not been granted to another person in the Standing Orders or thereunder. The President of the Republic appoints the Director General from the presentation of the Council of State without announcing the vacancy. When necessary a leave of absence for the Director General is granted by the Ministry of Agriculture and Forestry .

The Director General is required to have a doctor's degree or demonstration of scholarship entitling to a doctor's degree suitable for the position, experience in forest research, practical knowledge of forestry and administration as well as managerial skills.

The Unit Directors and the Staff assist the Director General. The Director General's closest advisers from the Staff are the Research Director, Administrative Director, Director of Marketing and Sales, Communications Manager and the Chief Forester responsible for Research Forests. Metla's Executive Board consists of the above mentioned directors of target areas.

Communications Manager takes part in the Executive Board meetings where the secretary is the Assistant Researcher to the Research Director. The Executive Board meets approximately once a fortnight to discuss the current issues concerning Metla.

## 2.4. Financial Management

At the state level the Ministry of Finance is responsible for the State's financial administration. There are about hundred individual agencies. The organisation and the principles of financial administration of each accounting office are presented in their Financial Orders. Different statutes have been issued concerning payment of expenses and collection of revenues (Act and Decree on the Basis for Determining the Payment for State Services). Postal giro service is used for the payment transactions.

State economy is planned according to the operating and financial plans, annual budget proposal and agency related more detailed planning budgets. The State Treasury monitors through the central bookkeeping the realisation of the budget proposal decided by the parliament.

The Finnish Forest Research Institute is one of the accounting offices of the state and its accounting is conducted as a part of the accounting of the State in accordance with the Finnish Budget Act and Decree. Metla's payment transactions and bookkeeping is divided into payment offices. Besides the Helsinki main payment office other payment offices are located at the research stations.

## 2.5. Personnel Management

### 2.5.1. Collective Agreements and Payment Plans

Metla has three official records of the collective agreements which include e.g. the criteria for salaries with an appendix of salary classes. Metla has also made collective agreements with all the personnel unions about the fees of the shop stewards and certain bonuses for civil servants.

The criteria for payment of salaries is partly defined by the type of employment (permanent office/employment contract), and partly by the persons employment status. Salaries of civil servants are based on the State's centralised agreement system, according to which in an office a salary is paid according to total salary which is calculated by adding the standard salary and numerous bonuses as defined in the state's current general salaries table (salary classes A5 - A36).

Standard salaries for personnel under employment contracts are defined in the collective agreements between the Institute and the unions representing the personnel. For the personnel under employment contracts (includes the majority of Metla's researchers) and for the ADP experts with a Master level degree a so called flexible salaries system is being used. In this system salary is defined according to work requirements and work experience within the limits of a salary group. Other personnel has a fixed standard salary with experience bonuses in similar manner as the civil servants.

Metla has agreed with unions representing the personnel about an annual salary revision which includes all researchers and which aims to reward researcher's additional qualification through work and the essential increase in the requirements of the work. Reports on research related salaries and other statistics including mean salaries by titles and salary groups as well as the share of salaries between men and women are collected in order to calculate the pay rises. Written statements on the grounds for the pay rise are being requested from supervisors and decisions are made within the budget limits after the necessary adjustment negotiations. This salary revision which is carried out once a year has been expanded to include all the personnel groups within the Institute.

In addition temporary individual salary bonuses may be granted to personnel during special assignments. A routine pay rise will be granted to researchers after the completion of Licentiate's or Doctor's degree.

In the development principles of the state's salary system in 1993 it is stated that the current office salary system is inflexible and should thus be renewed and replaced by new salary systems which are more applicable to the needs of operation units. After a survey Metla decided to change over to analytical salaries system which is based on so called Weigh and See system. The development of this system began in 1995 and by the end of 1996 a 10-stage classifying system for salaries and the general descriptions of duties on each stage was produced.

In 1997 the requirement factors of work are being defined, work description forms, which help to assess the requirement level of an office or a work are being created, the system is being tested and the personnel is being trained, especially supervisors, to use the system. The implementation of the new salaries system is being negotiated with the unions representing personnel. This system should be fully operational by the beginning of the next agreement period (1st February 1998).

## 2.5.2. Personnel Management Systems

### System for Payment of Salaries

State's General System for Payment Of Salaries (*HEPLA*) is used for paying the personnel's salaries. At Metla these duties are handled by four office clerks to whom the operating units supply the necessary information. The authority of determining personnel's salaries belongs to Metla within the limits of its budget. The Administrative Director manages the payments administration with the assistance of the Head of Finance and a lawyer.

### Personnel Accountability System

The Personnel Accountability System (*henkilö- ja virkajärjestelmä, HEVI*) is used for managing the personnel routines. This system is part of the integrated system planned for the State administration. Through this system appointments are handled, register is kept, vacancies are monitored and duration of employment and annual vacations are calculated. Both standard print-outs and tailored reports can be produced through this system.

### 2.5.3. Cooperation between Employer and Employees

The Finnish Forest Research Institute and the unions representing the personnel of the Institute have made in compliance with the Act on State Cooperation an agreement between the employer and employees. The aim of the cooperation is to give the personnel a chance to influence the decision making concerning Metla. The employer has an obligation to negotiate with the personnel and inform the personnel about matters falling within the cooperation procedure. Such matters would include essential changes in duties, essential equipment purchases, changes in Metla's organisation, expanding or reducing the operations of the entire Institute or part of it, and development and rationalisation projects.

Cooperation is being realised daily on a local level between officials and employees and their supervisors. In an operating unit the cooperation procedure is replaced by cooperation representative's right of speech and attendance on the Board of Managers of the unit. A cooperation advisory committee has been set for the Institute in which the representatives for the employer are the Director General, Administrative Director and in health and safety matters the Health and Safety Manager. In this committee the personnel is represented by the representatives chosen by each union (4 representatives) and the Health and Safety Officer.

The agreement covers also cooperation in health and safety at the work place. All the work places in compliance with the health and safety regulations must have a Health and Safety Manager appointed by the employer who is responsible for the cooperation in health and safety matters between employer and employee. In addition there is a Health and Safety Manager whose operation territory is the entire Institute.

Employees elect amongst themselves a Health and Safety Officer and a Deputy Health and Safety Officer. If necessary a Health and Safety Representative may be elected. Implementation of cooperation in health and safety matters is the responsibility of the health and safety committees at operating units.

### 2.5.4. Personnel Policy and Strategy

Personnel within the State administration has decreased from 212 000 employees in 1989 to only 130 000 employees in 1995. Also other significant changes have taken place recently within the State administration, one of them being the change over to target management.

Metla's current personnel policy dates back to 1989. Its principles are rather general. Changes within the State administration have placed new challenges to the personnel policy and thus a preparation for a new policy began at Metla in 1996. Integral targets for the new policy are expertise, efficiency, well-being and competent management.

Personnel strategy comments on such matters as methods of management, training of management and personnel, recruiting, system for payment of salaries, health, motivation and work atmosphere. Personnel strategy is part of the Institute's operating strategy and it is planned annually at the same time when agreeing on operating targets of operating units. The development of the personnel strategy should be completed during 1997.

## 2.6. Information Management

### 2.6.1. Information Management Strategy

The guidelines for the information management at Metla in the 1990's were drawn up in the working group report *The Information Systems Strategy of the Forest Research Institute* (MT 350, 1990). The strategy was updated in 1995 to take account recent changes in technology, national economy, international environmental cooperation as well as changes within Metla. The revision was also influenced by the governmental decisions and encouraging attitudes concerning moving towards an information society. The resulting report was named *The Information Management Strategy of the Forest Research Institute in 1996* (MT 600, 1996).

The strategy report has been approved by the Director General as the basis for development of information management at Metla in the next few years. The report analyses the current situation at Metla, and lays down strategies for hardware, software, information management tools, groupware, information systems, and lifeware (= people, education, support and customer service).

The report ends with recommendations, which include e.g. (1) moving to a uniform Windows NT local area network in every unit, (2) maintaining the infrastructure so that the level of information technology services will not fall, (3) making all PC and printer purchases with the guidance of the local computer support personnel (to avoid too heterogeneous equipment), (4) using WorldWideWeb for outward and inward information sharing and as an interface to databases, (5) documenting the research data and information systems of Metla, and (6) persuading persons, who know and use some special programmes or devices, to instruct other employees in their units.

### 2.6.2. Information Systems Services

Information Systems Services (*Tietohallintopalvelut, THA*) is responsible for coordinating and regulating the organisation-wide information management, maintaining and operating the computer network and main servers, developing and supporting administrative and general information systems, and coordinating the support and training of statistical and mathematical methods.

THA is one of the organisation-wide service units under the headquarters. Every research centre and station has an information systems service project, which is responsible for the local computer support and customer service. In addition, some research projects have computer personnel of their own to install, and maintain the special programmes and devices of the project and to take care of the data processing in the project.

### 3. OPERATION PRINCIPLES, PRIORITIES AND TARGETS IN RESEARCH

#### 3.1. Background of Research Steering System

Metla has together with other state agencies and offices adopted the target management system. General principles of target management are applied to the research steering system at Metla. As the personnel is exceptionally well educated according to the requirements of research, target management is applied so that personnel's expertise is utilised as well as possible and the initiative required by research is promoted. The utilisation of personnel's innovation ability does not mean deviation from the general principle of target management but on the contrary enables to find such operational solutions which are not possible in the case of personnel with not so good educational background.

Steering system includes:

- 1 Planning and preparing of research projects
- 2 Selection and prioritising of projects
- 3 Steering and monitoring of projects
- 4 Evaluation of projects and researchers

#### 3.2. Planning and Preparing of Research Projects

At Metla new projects originate in two ways: as a result of target management or as a result of personnel's own initiative.

It is estimated that 10% of research projects originate directly through the Ministry or through Metla's management as a result of target management. In this chain of target management the high official evaluates the need for research and this message is passed via official channels to researchers who prepare the practical implementation of the project.

The estimate of 10% is low and may give an impression that the target management by the Ministry and research management is not efficient in practise. The low percentage should be interpreted otherwise. Metla holds a series of target negotiations with the Ministry once a year and as a result of this steering which creates guidelines and strategy within Metla may originate such innovation which would correspond to Ministry's views on what type of research is necessary to develop Finland's forestry and wood production.

The majority of research projects, about 90%, have originated with varying ways but with a bottom up model. By releasing selection criteria for evaluating prospective projects Metla's management has tried to encourage personnel's own initiative. Metla's interest groups' interests have been emphasised besides the scientific criteria since the research topics of applied sciences should focus on essential problems. In forest sciences what is essential can be assessed by e.g. what size of growing stock the problem deals with, how large is the forest area, what is the potential cost benefit ratio (economical, ecological, social), how many people are involved, etc.

It is important to direct the researchers' and personnel's ability to innovate towards identifying research problems and proposing research initiatives which are significant from the interest groups point of view. The researchers learn about interest groups' needs in training and negotiations where views about what direction the information needs of forestry and wood production will develop as a result of structural change and economic development in society as a whole are presented. The most recent survey concerning global trends was presented to the Supervisory Board in 1996 (Appendix 6).

In the seminars intended for the management of research centres and stations Metla's competitive position as one of the suppliers of research results has been discussed. Researchers' ability to innovate has been directed to research fields and projects in which Metla's relative advantages have been estimated the best in comparison to universities and other research institutes in the same field of research. The following are estimated to be Metla's competitive advantages:

1. Long-term studies.

In a public sectoral research institute, such as Metla, the research project is the responsibility of the institute and in this respect independent of duration of employment of researchers and other personnel. This allows long-term experiments and compilation of long observation series essentially easier than in an university where research projects are more tied to a particular researcher.

2. Own research forests.

The ability to allot national parks, strict nature reserves as well as managed forests to research purposes enables collection of such research material that other organisations do not have possibilities for. In own forests long-term experiments are guaranteed. In addition, concentration of experiments brings about expenditure savings. This guarantees reliable research results.

3. Practicability.

Since Metla owns almost 150 000 hectares of research forest it needs personnel who is able to deal with matters required by practical forestry and management of protected areas and recreation areas. This personnel is able to convey in research projects such perspectives which require good knowledge of practical forestry.

4. Interdisciplinary research.

Metla's project based organisation enables setting interdisciplinary research targets: in a one project a problem can be approached from the point of view of silviculture, wood production, technology, economy and even social issues. Similar interdisciplinary approach is difficult to achieve under different organisational model.

5. Potential for self-financing.

Metla's long-term budgeting (major part of funding is two year appropriations) allows using risk funding for pilot projects before big investments in a project are made. Organisations with no self-financing resources, such as universities, will not have this possibility.

6. Geographical coverage.

Metla's research stations and research forests are distributed throughout the country. This allows collection of research material efficiently from different conditions and geographical areas.

It has been estimated that to Metla the most suitable projects are those of long duration and extensive coverage (whole country or large parts of it). In addition, Metla has competitive advantage in projects which require forest experiment areas or which otherwise require practical knowledge of forestry, favour interdisciplinary approach and whose planning is improved by self-financed preliminary research.

In comparison to Metla universities also have competition benefits. Students and especially post-graduate students can quickly adapt to new research needs. This applies poorly to the long-term research practised in Metla where personnel time management has been planned well in advance in project level. New unexpected requirements would result in postponing the implementation of some of the existing research projects. Some research projects are best managed by planning them in cooperation with universities in order to employ efficiently strengths of all participants.

In comparison to consulting companies Metla has got approximately the same benefits as in comparison to the universities. Cooperation is favoured in similar situation where strengths of both parties can be exploited.

### 3.3. Selection and Prioritising of Projects

In the annual schedule new projects are planned so that the Research Advisory Group can discuss them in August-September. The Research Advisory Group consists of 10-12 people who are appointed for a fixed term by the Director General and who assist the Research Director in assessing the new project plans. All the members have completed a doctor's degree and represent different fields of science and regional operating units.

The Research Advisory Group discusses written project proposals and gives two written assessments of each proposal for internal use within the Institute. The practical and scientific significance as well as suggested personnel are assessed. Approved projects are then returned to their proposer for more detailed preparation. At the same time feedback can be given about defining the project, its main problems, personnel, and cooperation between different projects and research organisations.

Since the funding of projects in recent years has been problematic the expert group will when necessary prioritise between the projects and restrict the use of resources.

New projects are approved by the Director General upon submission. The Director General decides on the usage of funds annually within the resource limits. In principle almost all research funding is ear-marked and thus Metla's management has had little other funds at its disposal. However, in the future a few percent of non-allocated funding from the research budget will be reserved for unexpected research needs during the year.

In addition, contacts between researchers in different fields of science are encouraged. For this purpose each professor is given an appropriation which can be used for seminars and other activities within that particular field of science. This system was introduced in 1997 thus efficiency is yet to be tested.

### 3.4. Steering and Monitoring of Research Projects

All approved projects are entered into Metla's database for research planning and monitoring (*TUSKA*). Information on initial targets and implementation plans, annual targets and implementation plans and personnel and resources of a project is available in this database.

Follow-up reports and technical changes on the plans are made on an annual basis. Large changes such as those regarding the schedule of the project are discussed in the expert group and the Director General has the power of decision.

The most important input to the database for achievements and activities (*Suoriterekisteri*) from the project personnel is the publications in scientific publication series, other research publications, lectures, posters, radio and TV appearances as well as scientific positions and positions of trust. Researchers especially see to that the information on project publications is distributed as soon as possible. As a rule the data should be updated in the end of the year if it has not been submitted earlier.

All operation units have access to the database. Research management uses the database as a tool when assessing the progress of projects, including resource management. The database includes up-to-date information on usage of resources and achieved results as personnel's time management data is fed into the database almost in real-time.

Such openness concerning the entire personnel increases interest in the projects and motivates the personnel.

In practise active project steering takes place in discussions between operating unit management and project leaders and other personnel weekly or in irregular intervals. Scientific steering is left to the professor while the more general matters are the responsibility of the director of an operating unit. On the basis of reciprocity a director of a research station manages projects within his field of experience in his own and some other research station while a director of another station does the same within his field of experience.

The Research Director, who belongs to the Staff, holds discussions regularly with directors of operating units and also with individual researchers on questions which concern several operating units or the general strategy of Metla. The Research Director gives the report to the Director General usually in connection with the Executive Board meeting and when necessary the Director General will decide upon submission on steering of research projects. Directors of operating units are encouraged to take more responsibility for the steering of research in practise while the Director General and the Staff are responsible for strategic management and solving the coordination problems between units.

### 3.5. Evaluation of Projects and Researchers

All the research projects are evaluated the latest in the end of the project. Evaluation is carried out by two external experts who are appointed by the Research Director and who will give their opinion on attainment of the project targets and other matters such as the standard of results. Depending on the

project the experts may include besides scientists also representatives of practical forestry.

Researchers arrange a seminar where the project and achieved targets are presented to the evaluators. Experts give written assessments. In addition the Research Director may write an internal memorandum concentrating on the matters which arose from the evaluation.

In a long-term project an interim evaluation is usually organised for the research steering purposes. This applies also to programmes which include several projects.

According to Metla's guidelines evaluation of researchers is possible although it has not been applied independently from the project evaluation. The progress of researchers is being assessed through the database for achievements and activities. This database has not been used as a salary management tool but the information in the database affect undoubtedly the image Metla's management has on the efficiency of different operating units and their personnel. At the target negotiations attention has been paid to this observation of differences between operating units and the comparison is being used for motivating the personnel.

### 3.6. Evaluation of Research Priorities

Evaluation which emphasises the scientific significance of a project can assess the success of an individual project. Project evaluation also produces information on whether an individual research topic is significant for Metla's interest groups. However, evaluation which concentrates on projects does not assess the success of prioritising.

Assessment of research priorities should be carried out independent of projects. For this purpose Metla's scientific research has been divided into the following 12 groups:

- 1) Forest ecosystem, forest biodiversity and environmental impacts of forestry
- 2) Forest health, diseases and pests
- 3) Forest soil science, and site classification and description
- 4) Silvicultural works, forest regeneration, seedling production and seed supply
- 5) Forest genetics and tree breeding
- 6) Forestry and wood technology (timber harvesting and long distance transport, wood science and timber scaling, wood processing and energy use of wood)
- 7) Forest industry and labour force of forest sector (forest industry and its products, SME's and labour force of forest sector)
- 8) Forest inventory and forestry planning, and increment and yield research
- 9) Forest policy, timber trade and profitability of forestry
- 10) Multiple use of forests and coordination of uses
- 11) Forestry statistics and forest information systems
- 12) International forestry topics (forest research outside Finland)

In 1996 a postal questionnaire was introduced in which at every second year a survey about how Metla's interest groups assess the success of Metla's research priorities is carried out. An interest group is defined as being one that will or could change its own operations as a result of Metla's research results. For

Funding Of Metlia's Research from 1992 to 1996

	Metlias Funding (1000 FIM)					Total Funding (1000 FIM)				
	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996
Forest Ecosystems and Environmental Changes	7 689	7 739	8 293	8 572	8 455	14 419	14 056	14 077	14 065	12 822
Forest Soil Science	7 881	6 703	7 190	6 966	7 111	11 815	10 807	11 265	11 281	11 654
Site Classification and Description	2 250	1 133	1 127	1 043	1 141	2 526	1 228	1 234	1 183	1 289
Forest Genetics and Tree Breeding	7 750	9 467	6 575	6 727	5 632	9 646	10 807	10 092	10 994	9 734
Seedling Production	1 822	2 119	1 978	1 952	2 278	2 059	2 211	2 264	2 117	2 679
Forest Regeneration	6 836	5 657	5 110	3 445	3 743	9 303	7 842	7 154	4 976	5 375
Silvicultural Work	8 322	8 260	8 799	8 281	7 719	10 373	9 819	10 536	9 759	9 339
Logging and Transport of Wood	2 444	2 433	1 808	1 342	1 534	2 768	2 991	1 948	1 584	1 920
Wood Science and Timber Scaling	2 678	2 218	2 611	2 064	1 684	2 838	2 489	2 959	2 309	1 722
Wood Processing and Energy Use of Wood	233	194	937	1 091	1 326	233	426	1 612	1 462	1 905
Forest Health, Pests and Diseases	9 454	8 808	9 060	10 032	10 940	12 664	11 733	12 372	13 606	13 441
Environmental Impact of Forestry	1 924	1 999	2 207	2 540	2 968	3 189	3 404	3 877	4 429	4 675
Forest Inventory	8 881	8 021	8 025	7 729	7 359	9 312	8 584	8 859	8 362	8 144
Profitability of Forestry	814	712	1 019	723	429	1 001	1 049	1 344	922	762
Forestry Planning	1 751	1 816	1 994	2 059	2 374	2 181	2 403	2 408	2 757	3 759
Multiple Use of Forests	2 829	2 903	2 926	2 230	1 980	3 566	3 591	3 581	2 765	2 331
Forest Biodiversity	1 668	2 980	3 235	4 520	4 339	1 919	3 837	4 127	5 542	5 638
Timber Trade	262	450	465	601	1 129	327	567	680	874	1 542
Forest Industry and its Products	1 536	1 301	2 179	1 694	1 144	1 925	2 012	3 018	1 939	1 385
SME's and Labour Force of Forest Sector	299	311	337	570	949	390	415	447	678	1 000
Forest Policy	2 495	1 957	1 593	2 091	2 593	3 309	2 660	2 385	3 032	3 441
International Forestry Topics	429	464	474	588	657	570	736	877	969	836
Forestry Statistics	2 428	2 426	2 361	2 293	2 937	2 556	2 531	2 422	2 387	3 157
Forest Information Systems	2 199	2 799	2 380	1 754	1 877	2 441	3 090	2 731	2 079	2 114
Others	580	300	255	215	187	580	301	263	238	189
<b>TOTAL</b>	<b>85 456</b>	<b>83 171</b>	<b>82 938</b>	<b>81 120</b>	<b>82 488</b>	<b>111 911</b>	<b>109 588</b>	<b>112 530</b>	<b>110 311</b>	<b>110 852</b>

example when the substance of teaching in an educational institution may be affected due to Metla's research results, this institution is regarded as an interest group. Research organisations proper are excluded from the interest groups.

As a result of the first questionnaire Metla's research operations have been assessed both in general and on the basis of the above mentioned division into 12 groups. In the spring 1998 the second questionnaire will be sent and then an estimate can be given how Metla's research priorities have developed.

A disadvantage of this questionnaire system is that its sample material concentrates on fairly well educated people. Forest owners in general are not included in the sample. However, it can be assumed that their opinions are reflected in the opinions of their interest groups. It is obvious that methods to assess the forest owners opinions have to be developed.

### 3.7. Personnel Resources for Research Steering

The Research Director with assistance of the person in charge of Metla's development is responsible for direction, steering and monitoring of research. The Information Management Unit is responsible for the development of information management systems. Project secretaries are responsible for updating the data and other such duties concerning the project.

Directors of research centres and stations (10) are responsible for steering and monitoring research projects. They are also responsible for the target negotiations with project leaders.

### 3.8. Conclusions

In international comparison Metla's information systems for research steering and monitoring are of high quality and efficient. Systems are under continuous development. Research management can through PC-terminals monitor the use of resources and project results. In practise continuous discussions between the research management and project personnel are required since the written and numerical information does not convey the situation as a whole.

The main weakness of the research steering system is that the annual working schedule is fixed in advance. It has proved rather difficult to satisfy unexpected research needs if in the annual project plan no time has been allocated for them. In practise the project leaders (such as professors) must allocate some time for unscheduled work including orders from paying customers and other such tasks. Research management attempts to determine development possibilities of the steering system in order to control this time management problem.

## 4. CUSTOMER FUNDED ACTIVITIES

### 4.1. Background and Principles

Metla receives the majority of its funding from the government but direct customer funding covers a growing part of its activities. Customer funding, i.e. trading of services and products to clients, is basically defined in the Act on the Basis for Determining the Payment for State Services (*Valtion maksuperustelaki* 159/92). This law came into force in 1992. Instead of merely obeying the law Metla considers it as a challenge and has started to develop customer funded functions as an important new dimension of its sphere of activities.

Metla's goal is to solve forest related problems using scientific methods. The same idea refers to Metla's commercial activities. Characteristic for all customer funded activities is that they have direct links to research.

In Metla's organisation structure Customer Funded Activities, previously called Marketing and Sales, is one of the target areas of the institute. The acronym ART (for *Asiakasrahoitteinen toiminta*) is used in Metla and also in this text.

Distinctive features of ART activities are:

- financing comes from external sources as a compensation for services or products
- funding covers all expenses caused by the project including overheads
- funding may include profit
- costs are calculated according to the following Total Cost Estimate (TCE) algorithm: all direct expenses + salaries  $\times 1.65 \times 1.53 \times 1.10$ . The sum covers total personnel costs (coefficient 1.65) and organisational overheads (coefficient 1.53 for 1997) and it includes a moderate business revenue (coefficient 1.10).
- Customer funded projects are financially managed by ART Target Area
- trading of timber is not regarded as customer funded function.

Customer funded activities focus on research projects launched by a customers' orders, but there are also other forms of services for sale which are based on Metla's know-how. The priority order is as follows:

1. Customer ordered contract projects and scientific consultations
2. Data trade
3. Sales of publications (mainly research reports)
4. Testing, expert services, analysis, methodological consultations
5. Teaching and training
6. Production of data and information systems, software development and Internet service
7. Technical service, photographs, computer graphics, illustration and document copies
8. Visitors service in national parks
9. Tailor-made excursions

ART Target Area offers help for cost estimations and contract negotiations as well as technical management of customer funded projects. As a research institute Metla is allowed to use full cost principle for cost estimations. In turn its obligation is to indicate the cost breakdown and precise accounting of these projects.

## 4.2. Planning and Preparing of Customer Funded Projects

Metla's target management has been an appropriate tool also for ART activities. It sets goals for annual action plans. Long term planning is applied when new or redefined business functions are introduced.

As for its customer funded activities, Metla should be compared with business organisations which offer services to the society. Metla's products and services are based on forestry expertise. It's strengths in this respect are:

- solid background organisation
- scientific data collections
- methodological expertise
- well developed scientific infrastructure and networks

Additional strengths are a regionally extensive network of research stations, own research forests, advanced information technology, and access to international scientific networks.

ART projects are in general initiated by customers' demands. In a normal case a company or an organisation of private or public sector contacts Metla's researchers or management in order to get forest related services. After negotiations Metla presents an offer tending the request of the customer. When both parties agree, the customer submits an order and a contract on the commissioned project will be made. The procedure is described in Figure 5.

Metla participates in the functions of EU by carrying out Regulation based tasks launched by EU or by submitting project proposals to be included in the EU's RTD Framework Programmes. Planning of EU projects follows in principle the procedure of other research projects in Metla. The procedure is described in Chapter 3.2. The financial management and book keeping of these projects, requires a separate account and other special treatments.

In the following, an example of a successfully accomplished customer funded project is described.

### Effects of Infiltration by Sprinkling Lake Water on Forest Soil and Vegetation.

In May 1996 Vantaa Research Centre of Metla started a three-year research project on the impact of infiltration by sprinkling lake water on forest soil and vegetation. The project was initiated by the City of Hämeenlinna, which is one the first cities in Finland that has started making groundwater through sprinkling lake water directly on forest understorey vegetation and soil on an escarpment in the city. The aim of infiltration is to artificially recharge groundwater thus decreasing the concentrations of iron and manganese that are often a problem in Finnish drinking waters.

The new infiltration method by sprinkling seems to be more promising than the traditional basin infiltration for reaching the aims mentioned above. However, before a wider use of the new method can be justified, the effects of it on forest vegetation and soil, and further on the quality of groundwater, must be thoroughly studied. The results of the research project will be used by the water works of different cities for deciding on how the infiltration should be done for optimising the desired effects and minimising the possible negative effects on forests and groundwater.

The aim of the research project is to determine the effects of infiltration by lake water sprinkling on soil acidity and nutrient status, organic matter in soil, soil microbiological characteristics, especially the nitrogen cycle, species composition and health of the understorey vegetation, and tree growth and health. The project is scientifically very interesting, since there are hardly any field studies on the ecological effects of infiltrating large amounts of water (several thousands times the annual precipitation) through soil in boreal forests. Thus, the field studies increase the understanding of the key process in forest ecosystems.

Nine researchers of Metla representing expertise on the different processes in forest ecosystems participate in the project. The project is financed by the waterworks of the Cities of Hämeenlinna, Jyväskylä, Mikkeli, Tampere district, Turku district and Tuusula. The project is lead by a group including representatives from the financing cities, the Finnish Environmental Agency and Metla.

### 4.3. Steering and Monitoring of ART Projects

Administration of customer funded activities has been organised in a way that would cut down bureaucracy. Only the necessary functions are centralised. The director of the ART Target Area is responsible for the coordination, steering and monitoring of Metla's ART projects as a whole. He is assisted by a full-time secretary in practical matters (e.g. invoicing). A part-time researcher assists in marketing and sales administration and a part-time office employee takes care of the sales and distribution of publications. The ART director works in close collaboration with Metla's Financial Manager and is assisted by the Secretary of International Affairs.

The actual project management as well as the production and distribution of products take place in the operating units led by the head of the unit. In some units the coordination of ART services has been delegated to a particular project coordinator. In Metla's General Services units, MELA Service and Forest Statistical Service, responsibilities have been shared between several people. Both of these services have successfully been developed into products.

All tenders and business contracts are by the rule jointly signed by the director of the operating unit and the researcher in charge of the project. This is to ensure that the resources for accomplishing the commitment are available. It also makes the commitment official. Metla asan institute bears the final responsibility for the contract project although the operating unit in question is responsible for the resources and facilities. The project team is responsible for accomplishing the task. Responsibilities in an ART project are described in Figure 6.

The administration of an ART project is kept as light as possible. The operating unit has archives for all documents included in an ART project. The director of ART Target Area is informed well in advance about all financial engagements. Each project is evaluated before signing the contract. The pre-evaluation guarantees that the cost break-down has been correctly calculated and the expenses of Metla will be covered. Besides the financial evaluation an overall inspection on liabilities, technical structure, schedule and scientific contents of the contract will be made. Information on the project is entered into the data base for research planning and monitoring, TUSKA (see Chapter 2.2.2.).

Normally a commissioned project is started at a short notice. The unpredictability of these projects means new requirements for project management. When special expertise or technical staff is required, it has to be freed from other duties for the duration of the project. This may cause needs for temporary reallocations of personnel and possibly reviewing of the goals of other budget-based projects. Re-allocation of resources for an ART project is described in Figure 7.

The steering and monitoring of an ART project is described in the contract. It is usual that the customer participates intensively in the accomplishment of the project. In the work programme of Metla an ART project is regarded either as a

Fig. 5. Establishment of a Customer Funded Project

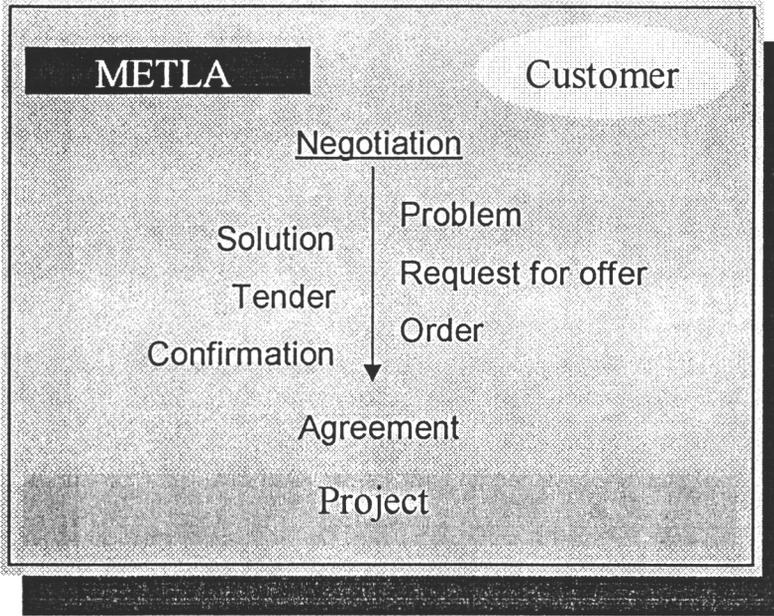


Fig. 6. Shared Responsibilities of an ART Project

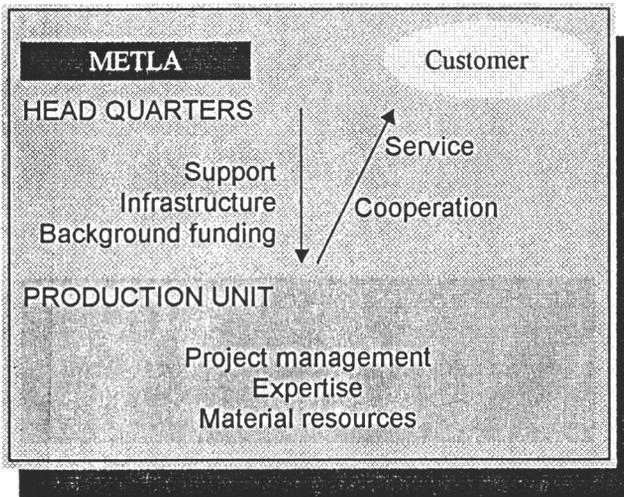


Fig. 7. Re-allocation of Resources for an ART Project

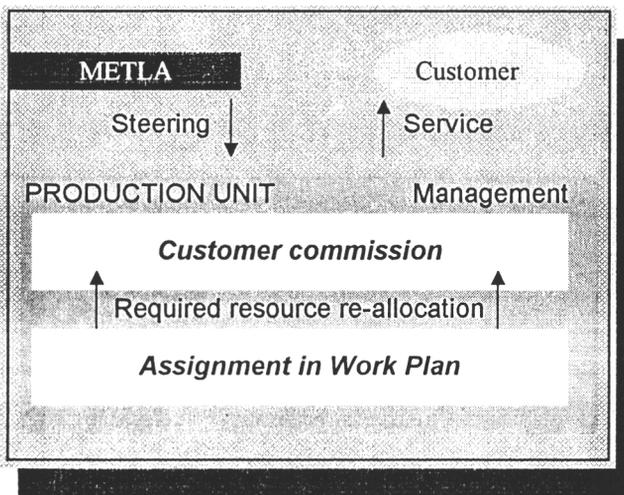


Fig. 8. Development of ART Financial Volume 1993-1996.

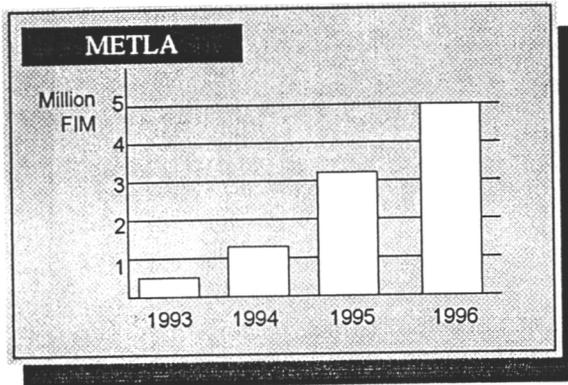


Fig. 10. ART Revenues by Sources of Finance.

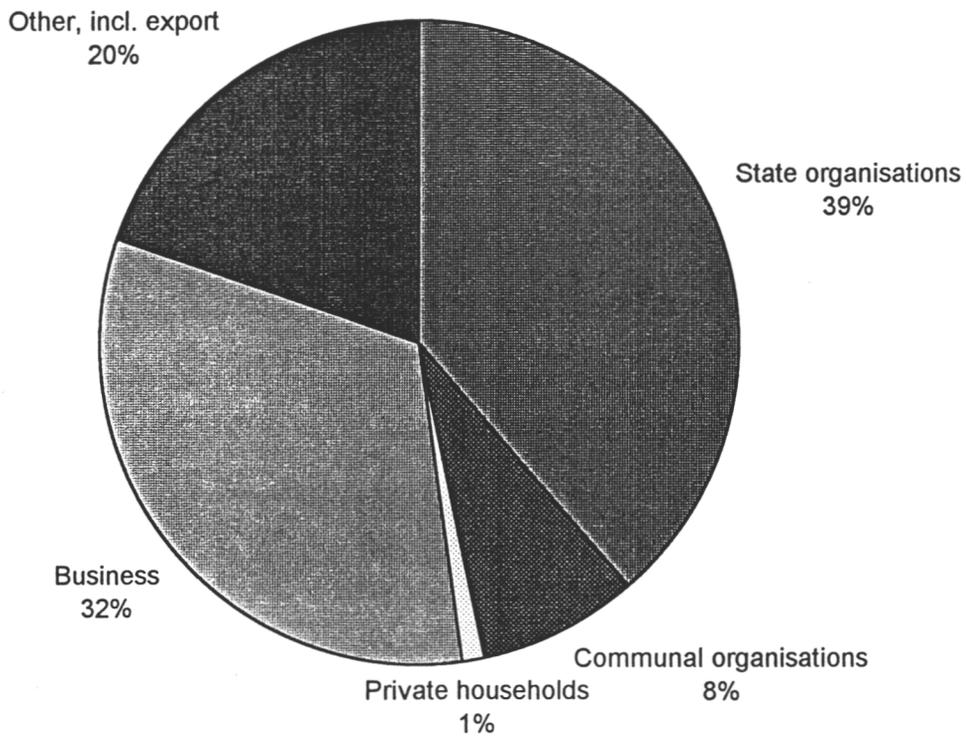
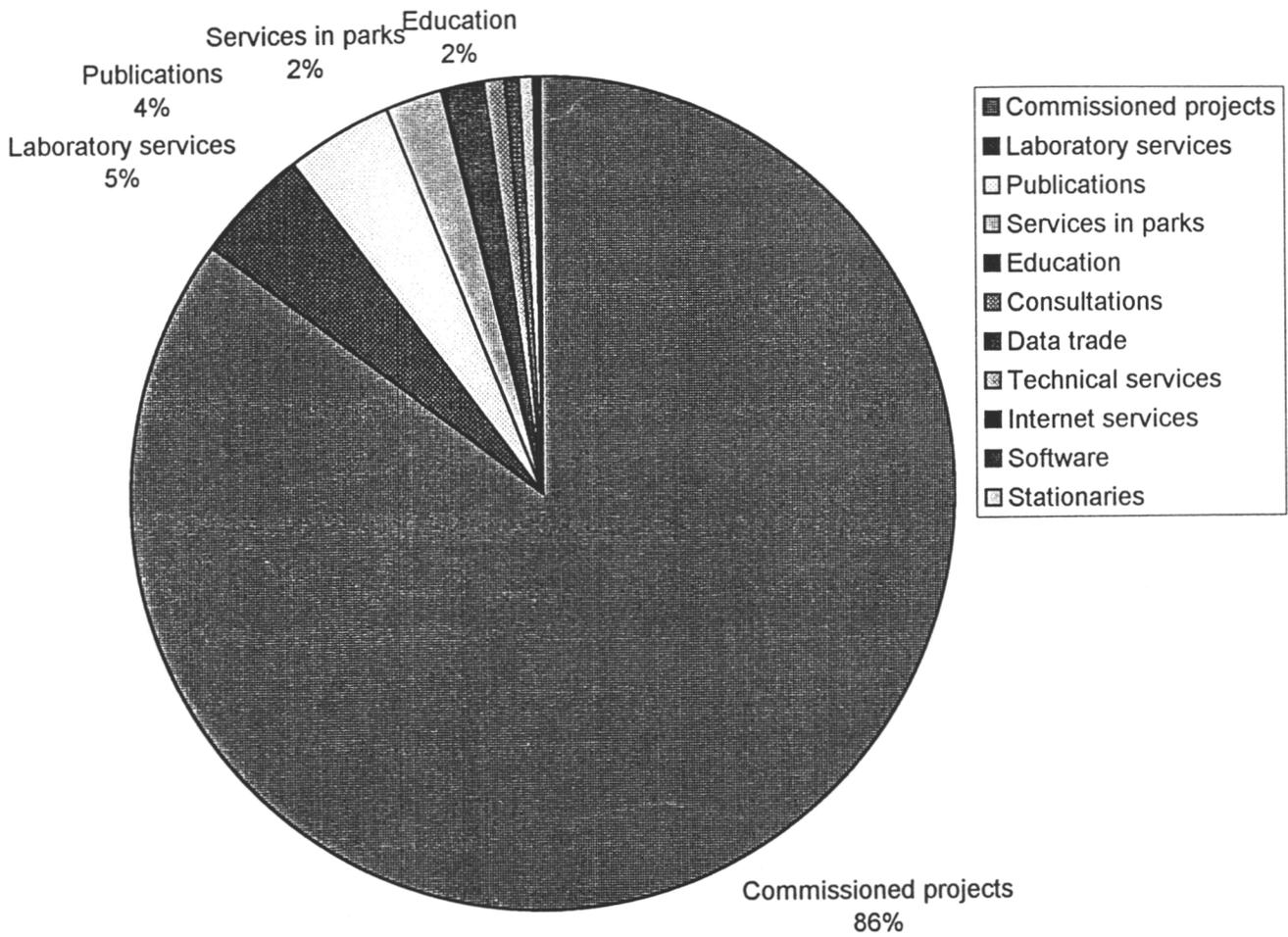


Fig. 9. ART Revenues by Products and Services.



separate project or a sub-project to an existing project. In TUSKA database the ART projects can be identified according to their numbering. According to this numbering working hours and direct costs of the projects can be separately followed in Metla's internal monitoring and book keeping systems.

Revenues from the ART projects are obtained through invoicing. Invoicing takes place in the ART Target Area. The procedure follows normal business manners:

- Metla and the customer make a business contract
- Metla provides the customer with the product or the service ordered
- Metla invoices the customer to reimburse expenses

#### 4.4. Activities in 1996

As figures, ART activities are still modest. The annual turnover has, however, grown rapidly: in 1993 it was FIM 0.6 million, in 1994 FIM 1.3 million, in 1995 FIM 3.1 million, and in 1996 FIM 5.0 million. No interest has been gained yet in the past few years. The deprivation of 13 % in 1996 can be considered as expected and moderate. The development of ART revenues is described in Figure 8.

The number of customer funded projects was 37 in 1996. Of the turnover of FIM 5 million, commissioned research and consultation projects covered the largest share. In addition, sales of publications and laboratory services made a financially distinctive result. The remaining activities covered less than 10% of the total revenues. The ART revenues by products and services are shown in Figure 9.

More than half of the revenues came from the private sector. Within the public organisations the majority of orders came from outside the field of the Ministry of Agriculture and Forestry. The sources of ART revenues in 1996 are described in Figure 10.

#### 4.5. Future Prospects

As for commercial activities in general, Metla's biggest challenge at present is to create markets for its products in order to establish continuity and predictability for the revenues. The first steps have now been taken and valuable experience has been gained. Instead of trying to extend the selection of its products and services, Metla will in the first place continue to improve their quality to better meet customers' demands.

Metla's intention is to gradually increase the volume of annual turnover of direct customer funding up to FIM 10 million. It is realistic that Metla will reach this goal by the year 2001. Also the goal of cost efficiency will be reached by that time. Although revenues from ART projects will stay at marginal level compared to government funding, the functional impact of ART activities is remarkable.

## 5. METLA'S RESOURCES

### 5.1. Finance

#### 5.1.1. Sources of Finance

In 1996 Metla's overall funding was FIM 216.3 million of which the share of direct government funding was FIM 170 million. The overall funding had increased by FIM 3.6 million from the previous year but it was over FIM 10 million less than in 1992. Changes in funding within the last five years are presented in Table 3. Figures are not fully comparable because the expenditure structure has changed significantly. In comparison with the earlier years within this period changes include rents of the property which has been transferred to the State Property Agency. Such properties are the buildings of the Vantaa and Helsinki Research Centres and the Joensuu Research Station. Metla's target is to compensate the decrease of government funding by financing acquired from the free research market.

Table 3. Funding 1992-1996, FIM million

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Direct government funding	182.6	171.0	156.5	160.2	170.0
Other sources	46.3	44.6	51.9	52.5	46.3
Total	228.9	215.6	208.4	212.7	216.3
Funding for Construction	23.3	15.0	5.0	11.5	10.0

In the last few years the funding from other Ministries than the Ministry of Agriculture and Forestry has been about 20 % of the overall funding and half of this originates from the Ministry of Labour. Non-government funding has been rather small. In 1992 it was FIM 1.2 million (0.5 % of the overall funding) and in 1995 and 1996 it was FIM 1.8 million (0.8 % of the overall funding). Metla's overall funding by sources of finance is presented in Table 4.

#### 5.1.2. Expenses and Incomes

Metla's expenses according to activities in 1996 and according to expenditure category during the last four years are presented in Tables 5 and 6.

Table 5. Expenses According to Activities in 1996.

	<u>FIM million</u>	<u>(%)</u>
Research	131.3	(57.8%)
Buildings, construction	35.4	(15.6%)
Research Forests	25.9	(11.4%)
General Services	15.0	(6.6%)
Office Services	12.2	(5.4%)
Management, administration, communications	3.0	(1.4 %)
Marketing and Sales	4.1	(1.8 %)
Total	227.1	(100%)

Table 4.

**The Development of the Total Financing of Metla  
by Sources of Finance from 1992 to 1996 (1000 marks)**

	1992	1993	1994	1995	1996
<u>Direct State Financing</u>	182 614	170 950	156 498	160 245	170 000
<u>Financing by Ministries</u>	41 839	40 078	47 042	47 877	41 215
Ministry of Agriculture and Forestry	7 458	8 459	11 182	9 028	8 816
Ministry of Labour	29 612	28 132	26 935	27 786	21 112
Ministry of Finance	258		4 469	7 022	7 622
Ministry of Environment	3 017	2 437	2 812	3 049	2 502
Ministry of Education	1 041	637	1 372	765	727
Ministry of Trade and Industry	453	413	272	227	536
<u>Other Financing by State Budget</u>	3 290	2 921	3 319	2 855	3 323
Academy of Finland	2 331	1 612	1 911	1 895	1 922
Universities, Research Institutes	418	859	4 944	2 22	4 24
Others	541	450	914	738	977
<u>Financing Outside State Budget</u>	1 200	1 589	1 538	1 771	1 790
*SNS, NSR	811	550	492	495	778
Donations	299	208	406	115	263
Others	90	831	640	1 161	749
<b>TOTAL</b>	<b>228 943</b>	<b>215 538</b>	<b>208 397</b>	<b>212 748</b>	<b>216 328</b>

\* SNS and NSR are organisations for Nordic forestry cooperation

Table 6. Expenses According to Expenditure Categories, FIM million (%).

	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Salaries and other personnel expenses	155 (72.6%)	157 (74.4%)	158 (71.7%)	158 (69.5%)
Purchased services	18 (8.7%)	17 (8.2%)	17 (7.7%)	20 (8.8%)
Material and supplies	12 (5.6%)	11 (5.1%)	11 (5.2%)	11 (5.1%)
Travel expenses	11 (5.0%)	11 (5.2%)	9 (4.2%)	10 (4.5%)
Rents	0	0	8 (3.7%)	12 (5.1%)
Purchased fixed assets	14 (6.5%)	7 (3.5%)	8 (3.5%)	8 (3.4%)
Value added tax	0	6 (2.7%)	7 (3.2%)	7 (3.3%)
Other expenses	3 (1.5%)	2 (1.0%)	2 (0.8%)	1 (0.4%)
Total	213	211	220	227

Within the last few years the share of personnel expenses and purchased services combined has decreased by a few percentages but still in 1996 covered almost 80 % of overall expenses. The remaining largest expenditure categories consisted of materials and supplies and travel expenses. In comparison to 1993 Institute's expenditure structure has two new factors: rents and value added tax whose share of the overall expenses exceeded 8 % in 1996.

The use of resources was distributed more or less equally between the central units (51.7 %) and regional units (48.3 %) corresponding the personnel resources.

Table 7. Metla's Income According to Activities in 1996.

	<u>FIM 1000</u>	
Income from gross budgeted operations		
Standing sale	5 952	
Delivery sale	3 813	
Seedling and seed sale	1 724	
Fishing and hunting licenses	82	
Other income from forestry	438	
Rents from land areas	3 414	
Income from accommodation	235	
Rents from buildings	1 131	
Miscellaneous income	214	17 003
Income from net budgeted operations		
Income from marketing and sales	5 028	
Sale of movable property	859	
EU funding	3 116	9 003

## 5.2. Research Forests

### 5.2.1 Research Forests - Past and Present

In 1917 when the Finnish Forest Research Institute was founded it was given areas for long term trials. Some of these areas were heritage landscapes which were trusted under the management of a responsible scientific organisation. The first national parks and strict nature reserves in Finland were established in 1938 and the management of these areas was given to the Finnish Forest Research Institute. In the following year the post of Inspector of State Nature Conservation was established at the Institute.

Since the 1950's after the Second World War conservation areas have mainly been established under the management of the National Board of Forestry because it had the regional organisation for such management. From 1960's to 1980's as the net of Metla's research stations was expanded, also Metla acquired a regional organisation suitable for managing conservation areas. During the 1990's some new conservation areas have been assigned under Metla's management. In these cases the location has been the decisive factor in the choice between Metla and the Forest and Park Service (former National Board of Forestry).

At the moment 149 000 ha of land are under the management of Metla of which 67 900 ha are school forests. Research forests form 19 and school forests 5 separate regional concentrations which are under the management of 9 operating units. The geographical location of these research forests is shown on Figure 11 and the surface areas and year of establishing in Table 8.

### 5.2.2. GIS-based Planning and Registering of Field Experiments

In order to make integrated use of Institute's field experiments and also to use for the needs of other organisations an Ingres based field experiment register has been developed for the Institute. This register contains information of trials carried out both in Institute's own research forests as well as in forests belonging to the Forest and Park Service, forest industry enterprises and private forest owners which all act as cooperation partners. There are 9 million individual trees in the register.

Table 9. Register of Field Experiments.

	All trials	Trials at Metla's research forests
Number of trials	5 763	2 191
Total surface area of trials (ha)	14 992	4 630
Number of sample plots and other sample units	448 692	103 306

The register allows the classification of trials e.g. according to the contents of research work and target, age of trial and stand as well as according to the site and geographical location.

### 5.2.3 Significance of Research Forests for Metla

Research forests have proved to be vital for Finnish forest research. For example the various silvicultural methods which have been employed in Finland in the course of time have been based on research carried out in Metla's research forests.

The greatest benefit of research forests is that they enable extensive, diverse and long term research and trials and ensure their continuity. In addition, testing of research results in practise ensures connection to practical forestry. The benefit of extensive research forests is the concentration of research which brings along savings and allows presentation of research results through trial and special demonstration plots. The best guarantee for the preservation and continuation of trials are Metla's own forests - here the continuity of trials refer to a period exceeding 50 years.

Forests outside active experiments are kept as a reserve for future research. In these reserves prerequisites for future research are created by distinctly varying silvicultural methods. The objective is to maintain abundantly varying forests so that in the future versatile research and trial arrangements would be possible. Metla's experience indicates that such diversified research will not be obtained merely by making agreements concerning different series of trials with owners of commercial forests and other owners (such as Forest and Park Service, forest industry enterprises and private land owners).

School forests are forests reserved for training purposes for Vocational Institutions of Forestry and Wood Technology. These forests are managed in accordance with the interest of teaching and research. In research they give especially additional possibilities to present the research results to future practical forestry professionals. This cooperation has long traditions but a new, more active phase began in 1996 when 4 599 ha of school forests were transferred under Metla's management.

Over half of the trials carried out by Metla in managed forests take place in other forests than Metla's own. Cooperation is based on contracts. Good experience has been gained from fertilising tests, growth density surveys and generally when series of trials are used to study the optimal level and effecting factors of a method applied in practical forestry. The most significant problem in practice is the destruction of trials and uncontrolled change of trial conditions when the landowner or the personnel of the owning organisation changes. Experiments which require special permanency and continuity are established, when possible, in Metla's own forests in order to reduce the risk of these experiments being destroyed.

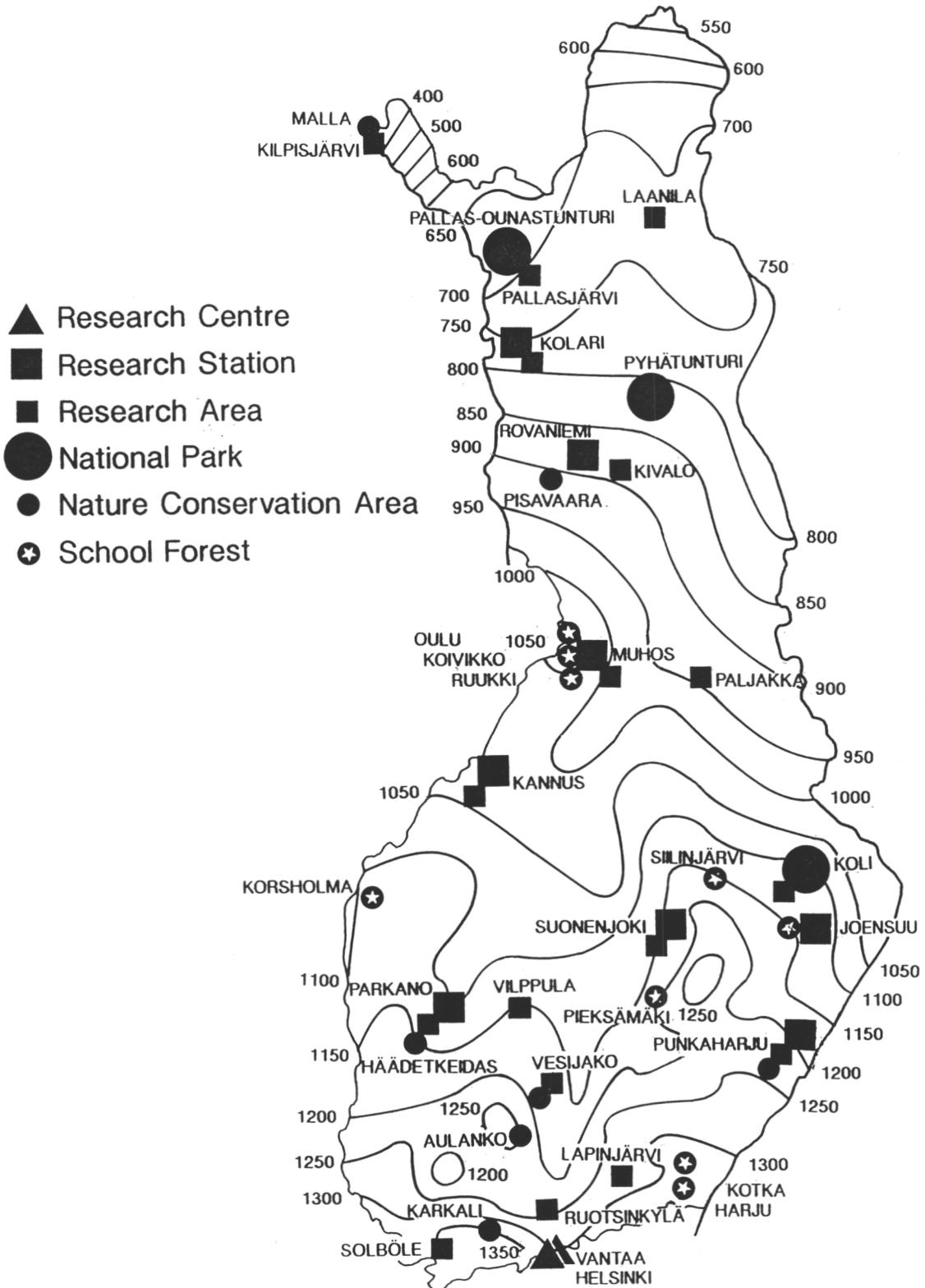
Research forests try to provide a representative picture of different characteristics of our forest ecosystems. Geographical coverage is still at places poor and the amount of research forests compared to research needs is small in some parts of the country and generally in Southern Finland it is insignificant. Although, the school forests which were transferred under Metla's management improved the situation.

In order to improve the research prerequisites the research forests are developed towards the outlined ideal future condition. In this ideal condition each of Metla's units would have a network of research forests which is structurally coherent and sufficiently represents the natural characteristics of the area. These

### Research Forests Of Metla (31 January 1996)

Research Areas			Nature Conservation Areas		
	Established	Area, ha		Established	Area, ha
Kannus	1961	4 309	<b>National Parks</b>		
Kilpisjärvi	1940-41	6 573	Koli	1991-96	2 602
Kivalo	1923	14 243	Pallas-Ounasturi	1938	50 129
Kolari	1961	7 413	Pyhänturi	1938	4 357
Koli	1923-25	435	<b>Strict Nature Reserves</b>		
Laanila	1926	13 877	Häädetkeidas	1956	560
Lapinjärvi	1933	1 900	Karkali	1963	100
Muhos	1923-24	5 245	Malla	1938	3 088
Paljakka	1961	1 410	Pisavaara	1938	4 888
Pallasjärvi	1945-48	7 051	Vesijako	1956	115
Parkano	1925	4 091	<b>Others</b>		
Punkaharju	1923-32	1 852	Aulanko	1963	155
Ruotsinkylä	1923-32	847	Punkaharju	1991	655
Solböle	1926	1 695	Separate Conservation Areas	30-60-80-90	1 223
Suonenjoki	1968	830			
Vesijako	1922-33	1 936			
Vilppula	1922-32	2 364			
<b>TOTAL</b>		<b>76 071</b>	<b>TOTAL</b>		<b>67 872</b>
<b>School Forests</b>					
Harju	1996	397			
Joensuu	1996	342			
Koivikko	1996	452			
Korsholm	1996	587			
Kotka	1996	544			
Oulu	1996	416			
Pieksämäki	1996	1 543	<b>Research Areas</b>		<b>76 071</b>
Ruukki	1996	140	<b>Nature Conservation Areas</b>		<b>67 872</b>
Siilinjärvi	1996	175	<b>School Forests</b>		<b>4 597</b>
<b>TOTAL</b>		<b>4 597</b>	<b>TOTAL</b>		<b>148 540</b>

# The Finnish Forest Research Institute (Metla) research forests and temperature sum degree areas



forests would include different types of forests for various utilisation purposes: managed forests, recreational forests, and different kinds of protected forests.

In the national network of nature conservation areas active research work is carried out in areas managed by Metla. The majority of scientific research carried out in protected areas in Finland have been carried out in areas under Metla's management. This applies to both research work carried out by Metla's own personnel and by researchers from universities.

### 5.3. Personnel

The development in the permanent personnel within the last few years is shown in the Table below.

Table 10. Metla's Permanent Personnel 1991-1996.

Year	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Directors	1	5	5	5	4	15
Researchers	225	216	202	202	197	173
Specialists	*	20	21	18	19	16
Technical staff	110	112	110	103	103	101
ADB staff	*	38	40	40	47	46
Administration	137	113	101	99	87	100
Laboratories	57	52	50	50	50	47
Research Assistants	100*	83	86	79	91	78
Service staff	2	52	39	37	36	29
Forest workers	64	69	63	63	61	55
Total	781	760	717	696	695	660

There has been no increase in the number of the personnel, on the contrary there is a decrease of 15 % compared to the year 1991. The corresponding decrease in the number of researchers is still bigger, 23 %. This development is mainly due to cuts of state budget granted for Metla. The share of salaries and other personnel costs is quite stable in the cost structure of Metla as can be seen in the figures below:

Table 11. Share of Personnel Costs of Total Costs 1991-1996.

<u>Year</u>	
1991	72.4 %
1992	70.4 %
1993	73.0 %
1994	74.4 %
1995	71.7 %
1996	69.5 %

The number of persons working with administrative tasks has been reduced by purpose through reorganising the administrative tasks. In 1991 the administrative staff counted for 17.5 % of the total personnel whereas the corresponding figure was 15 % in 1996.

In 1996 the amount of temporary field work assistants was 979 man-years. Personnel employed directly through government funding was 545 man-years.

With the funding provided by the Ministry of Labour's personnel for assisting, maintenance and some other temporary tasks within research was 194 man-years.

In the late 1980's there was a strong tendency towards decentralisation of governmental organisations in Finland. Also Metla had annual programmes for reducing the number of personnel in the capital area in favour of regional units. These demands have lightened since and the distribution now is based on research needs more than regional policy. Today about half of the personnel works in the two research centres located in the capital area of Helsinki.

In 1995 the average age of Metla's personnel was 43.9 years which is slightly higher than in the State administration in general (41 years). However, one third of Metla's personnel is under 40 years of age.

In 1995 the share of women employed was 40 %. Men form a clear majority among researchers and ADP personnel and e.g. all the forest workers and managers of the Institute are men. Women form the majority of the office and laboratory personnel. In administration, expert and maintenance personnel there is an equal share of men and women as well as in personnel assisting research.

In 1997, 87 of Metla's researchers (36 %) had completed a doctor's degree and 36 (15 %) had completed a licentiate's degree. The majority, 48, of those with doctor's degree had completed the degree of Doctor of Science in Agriculture and Forestry.

## 5.4. Other Resources

### 5.4.1. Laboratories

The Central Laboratory of Metla is located in the Vantaa Research Centre. It develops and coordinates the laboratory activities of the whole institute. The laboratory provides analytical services to research projects and develops analytical methods for this purpose.

The laboratory provides about 110 different analytical methods including inorganic and organic analyses and sample pre-treatments. Material analysed includes various kinds of waters, soil and plant samples.

The laboratory equipment includes:

- ICP emission spectrometer
- Atomic absorption spectrometer
- Carbon, nitrogen and hydrogen analyser
- Carbon analysers for solid and liquid samples
- Thermogravimetric analyser
- UV-VIS spectrophotometer
- FIA autoanalyzer
- Ion chromatograph
- Liquid chromatographs
- Gas chromatograph
- Mass spectrometer
- FTIR spectrometer
- SEM microscope
- Growth chambers

A major part of the laboratory capacity is used for the institute's own research projects, but the laboratory provides contract analytical services to other clients both in Finland and abroad. Usually these contract analyses are part of a research project carried out in cooperation with other institutes and organisations.

The total number of analytical results determined by the Central Laboratory is about half million per year.

The laboratory personnel consist of four chemists, eight laboratory technicians, one secretary and a number of temporary laboratory assistants. In addition, there are a number of researchers and laboratory technicians from specific research projects.

There are laboratories also in all the research stations. Some of them are very specialised like Punkaharju in gene manipulation and very low temperatures for seed storage. Otherwise, the laboratories have standard equipment. The best facilities are in Rovaniemi and Muhos which have long distance to the Central Laboratory.

#### 5.4.2. Library

The Finnish Forest Research Institute's library is a scientific library which offers its services primarily to the researchers of the institute. However, the collections are also available to other library users.

The library collection includes approximately 43 000 volumes and 1 300 regularly received periodicals, of which 730 are foreign. The library provides lending and photocopying services from its own collections and from other national and international libraries.

The library is responsible for the acquisition of publications needed by any unit of the institute. The collections are increased by international publication exchange with 53 countries. The address register presently consists of 2 500 mailing addresses.

The researchers and other staff of the institute may participate in journal circulation. In addition, copies of the contents of specific journals can be sent to individuals on request.

The information services attempt to cover all subject fields relevant to Metla. Two information specialists assist researchers to find and collect information on specific topics, to answer reference inquiries and to perform bibliographic retrievals or current awareness services on request. The information services advises how to find the most relevant information for specific purposes. The library utilises the most relevant databases to seek and retrieve information.

#### 5.4.3. Scientific Collections

The specimen collections of Metla are valuable both nationally and internationally. An Environmental Specimen Bank (ESB) was built in 1994 in Paljakka Experimental Area. The storage building has dark, fireproof

storerooms with stable air humidity and temperature conditions for dry storing. There is also a PC based relational database for registration of samples and for confirming the traceability of data for stored samples.

The main material stored in the ESB is moss samples collected from the permanent nationwide sampling network every five years since 1985 for both national and international heavy metal surveys. Correspondingly there are nationwide biomonitoring samples of epiphytic lichen, pine bark and humus for surveying atmospheric heavy metal deposition.

The bank is also a storage of forest litter collected from 1960's onwards. The large material, tens of thousands of sorted samples, is valuable for indicating environmental changes of the forest ecosystem. The collected litterfall samples have been sorted after drying into the following components: seeds, flowers, cones, needles, leaves, bark, epiphytes (mainly lichens) insect remains etc.

This ESB in Paljakka is Metla's largest integrated specimen storage. Also other units store specimens. For example at the Vantaa Research Centre there is a significant plant collection (approx. 60 000 samples), insect collection (approx. 40 000 samples), and fungus collection (approx. 40 000 samples).

## 6. NATIONAL AND INTERNATIONAL COOPERATION

### 6.1. National Cooperation

#### 6.1.1. Clients

The clients of the Finnish Forest Research Institute from the point of view of making use of the results are those who will or could change their operations as a result of Metla's research results or other activities. The significant part of Metla's cooperation is based on identifying such users and establishing a connection with them or with the bodies representing them. The purpose of this connection is

- to create awareness of clients opinions concerning topical problems that can be solved by the means of research or problems which are becoming topical within next few years
- to create discussion for testing the practicability of possible solutions, and
- to create a useful channel for dissemination and application of results besides the usual publication channels.

Both systematic and situation related work has been done to identify the clients. Systematic work has been carried out particularly when an attempt has been made to investigate various frames for sampling. The most significant of these frames concern purchasers of timber, forest owners and professionals in the forestry sector. Updating these frames is problematic and in practice the frames need to be renewed at least when it is a question of infrequent research projects. Situation related client identification is carried out in connection with every project aiming to practical solutions.

Metla's clients can be categorised as follows:

- 1 ) Forestry practitioners. It can be judged from the forest ownership figures that there are about 300 000 forestry practitioners in Finland. It is seldom that they use directly scientific publications but they are a significant group due to they large number and amount of forest property. It is estimated that Metla's greatest influence on this group is through the press in the forestry branch and newspapers. Indirect influence may be even more significant since Metla's research results affect the contents of textbooks and guidelines, short courses and other education and training as well as the expertise of forestry professionals.
- 2 ) Forestry professionals (forest officers, forestry engineers and technicians, and others with forestry education). There are about 20 000 forestry professionals in Finland. A small amount makes direct use of the research reports. More significant are the various courses and especially the textbooks.
- 3 ) Central Union of Agricultural Producers and Forest Owners (MTK) and other national interest groups of forest owners. Metla's scientific publications are used quite a lot. In addition to this there is personal interaction and participation in Metla's administration.
- 4 ) Finnish Forest Industries Federation and other national interest groups of forest industry and business. Metla's scientific publications are used quite a lot.

In addition to this there is personal interaction and participation in Metla's administration.

- 5) Teachers and researchers in the faculties and polytechnics of forestry. Metla's scientific publications are used constantly and they affect both teaching and research.
- 6) Teachers and researchers of other faculties and universities of technology. Metla's scientific publications are used selectively and they affect to some extent teaching and research.
- 7) Manufacturers of machines and devices. Metla's scientific publications are used only a little but the results of National Forest Inventories and various regularly published statistics affect the solutions/decisions within this field.
- 8) Seedling and seed producers. Metla's scientific publications which relate to seedling and seed production are followed closely. In addition there is personal interaction and participation in courses arranged by Metla.

Other significant clients include forest machinery contractors, entrepreneurs within tourism industry, game management districts and hunters organisations, nature conservation organisations and other environmentally oriented citizens organisations.

### 6.1.2. Scientific Partners

Metla, as an organisation mainly funded by the government seeks for cooperation with other scientific organisations. In Finland Metla is in special position due to its large market share (about 60% of data/information in forestry sector is supplied by Metla) which also increases its obligations as a cooperation partner.

The division between scientific cooperation and marketing and sales is in principle clear. When Metla either orally or in writing contracts to complete a project it is a question of marketing and sales activity. According to the Act on the Charge Criteria of the State (1992) a fee must be collected from such work. This applies also to the work between State authorities. It is a question of scientific research when parties participating cover their own expenses but complete the research work together.

There are several forms of cooperation. The most simple and frequently used form of cooperation by the researchers completing their diploma work outside Metla is to receive research material which is not needed in its original purpose any more and whose results have been calculated and published free-of-charge. For example material from the previous National Forest Inventories have been given to such scientific purposes.

Another form of cooperation is to divide the work according to the expertise of different parties, so that each party is responsible for their share but with cooperation aim at understanding the entity and possibly give a joint publication regarding the matter as a whole. This type of cooperation is so self-evident among researchers that to study its scope is not easy. An estimate can be drawn by calculating how many times researchers who do not work at Metla are mentioned at Metla's publication series and correspondingly how many times Metla's researchers appear in other scientific publications than those of

Metla. According to such analysis it can be estimated that about one-fifth of the work carried out in Metla is being done in one way or another in cooperation with researchers working elsewhere.

### 6.1.3. Joint Publishing

From 1994 Metla and the Finnish Society of Forest Science made agreement on co-publishing of three scientific journals: *Acta Forestalia Fennica*, *Silva Fennica* and *Folia Forestalia*. Editor-in-chief with scientific competence was engaged in co-operation with the Finnish Society of Forest Sciences. Researchers from universities and research institutes can submit manuscripts which will be peer reviewed. The publishing functions of the Finnish Society of Forest Science are supported by the Academy of Finland. Financing of journals is shared between Metla and the Finnish Society of Forest Science. The joint publications are described in Chapter 8.

## 6.2 International Cooperation

This chapter is a summary of Appendix 8 where the international cooperation of Metla is described in more detailed.

### 6.2.1. Researcher Exchange

In 1996 more than one hundred of Metla's personnel visited abroad. Two thirds of the visits were to Europe. Metla had in turn more than 70 individual or group visits from abroad. Many of Metla's researchers have worked or studied abroad. Since 1993 Metla's researchers have been allowed full salary for up to one year when they carry out research relevant to the activities of Metla abroad. Nine researchers used the possibility of researcher exchange in 1996. The most popular countries were the USA, Great Britain and Sweden. Correspondingly, nine researchers worked in Metla in 1996. In addition, the Erasmus and Leonardo programmes of the European Union brought several young people to work on their M.Sc. dissertations or otherwise work in Metla.

In the last few years Metla has organised in a small scale researcher training as customer funded services. Organising of these services is still to be developed.

### 6.2.2. Bilateral Cooperation

Traditionally the most important countries for bilateral cooperation from the point of view of the Finnish forest research are Sweden, Russia, Estonia, Germany, Canada, the USA, Poland and France. Cooperation is also carried out with more distant countries such as Chile, Brazil, China and Tanzania.

It is obvious that the significance of the bilateral framework agreements between the European countries will diminish and the emphasis will be shifted towards multilateral cooperation due to the EU research policy which promotes establishments of European networks.

In the so called Cross Border cooperation collaboration has been especially strong with **Russia**. In 1996 Metla had five joint research projects with Russia. In addition, the Protocol on the Finnish-Russian Forestry Cooperation (1995-2000) lists 15 topics for cooperation. The most important research projects deal with forest harvesting, forest health and biodiversity.

Also Metla's cooperation with **Estonia** has long traditions. Fields of cooperation are e.g. peatland forestry, forest tree breeding, forest protection and forest health. In the last few years cooperation with the other Baltic States, Latvia and Lithuania has been developed.

Cooperation with **Poland** includes a researcher exchange programme which enables 1-3 visits/year from Finland to Poland and vice versa. In 1996 visits included forest health and physiology of seed orchard seeds. Several visit topics have been listed for the exchange programme 1997 and 1998.

Before the national forestry education Finnish forest researchers received their education mainly in **Germany**. Germany is still an important partner in forest research. Fields of interest include e.g. forest health and timber quality measurements. One important joint research project concerns forest inventory in Nordrhein-Westfalen. In this customer funded project, Metla's expertise in forest inventory with multiple source technology was required.

The cooperation with **France** has been most active in the field of forest technology. Other research topics of mutual interest are e.g. fragmentation of forest ownership, forest genetics and information systems for timber procurement. One of Metla's researchers is the secretary and Finnish coordinator of the French-Finnish Forestry Cooperation activities.

One of Metla's professors is a member in a Steering Group for Canadian-Finnish Forestry Cooperation. A list of joint research topics between **Canada** and Finland was made in 1996 and it includes forest health monitoring, site classification in forestry and forest research, ecology and management of aspen, forestry in timberlines, forest harvesting methods and modelling of tree growth.

Metla has had organised cooperation with the **USA** since the 1980's. In 1996 seven of Metla's researchers were able to make a visit to the USA. In 1995 a Memorandum of Understanding was made which includes 14 fields of interest among them e.g. research on undisturbed forests, problems of old forest protection, socio-economic factors in forestry, forest inventory, eco-labelling and certification of timber.

Metla has had two large research projects with **China** in the 1990's. One project was based on the scientific-technical cooperation agreement and dealt with reforestation of a forest fire area. The most recent project concerned forest inventory in north-western China using field measurements and satellite technology.

Cooperation with the **New Zealand** Forest Research Institute (NZFRI) started in 1993. The goal of NZFRI was to study the Finnish inventory system and test it in New Zealand. The cooperation continues.

In 1985, Metla signed a cooperation agreement in forestry research with the Universidade do Paraná (UFPR) in **Brazil** and the cooperation with Brazil has continued since. The latest publication, published in 1996 deals with the

establishment and management of forest plantations in South-Brazil and with the results of container seedling project.

The cooperation between Metla and **Chilean** research institutions was initiated in the beginning of the 1990's. In December 1995 a new project was initiated for working out the feasibility plan of the Chilean Continuous National Forest Inventory, which will include also environmental topics related to the sustainability of forestry in the country. There is a mutual interest in both countries for continuing the cooperation in forest research.

Finland has had forestry cooperation with **Mexico** since the 1980's. The cooperation first focused on a development plan for the forestry and forest-based industries in the State of Guerrero. The next phase was national-level. Metla's Director General was the coordinator of the project.

In addition, Metla's researchers have been consultants on forest inventory and forest management e.g. in Nepal and Metla's professor was project coordinator in drawing up the first forest tree breeding programme in Turkey for 1994-2003. Nursery research is also planned with Malesia, Indonesia and Argentina.

Metla has several connections to the **developing countries**. One important research project concerns sustainable forestry and the environment. It produces research results from the developing countries in general and, in more detail, from Chile, Ethiopia, and the Philippines. A recent research project related to the developing countries in which Metla is involved is Support to Forestry Research in Tanzania. This project is part of the Finnish development cooperation. Metla's professor is the scientific coordinator of the project and Metla is responsible for the development and strengthening of the research management and scientific research. The project is managed by Metla's Marketing and Sales unit.

Earlier research project with the developing countries has been the 6-year long Zambia project (1982-1988) which aimed at e.g. identifying the needs for forest research and another project, Deforestation and its Environmental Costs in Ethiopia (1982-1986).

In addition, several researchers have gained experience in developing countries in carrying out externally funded research projects while on leave from Metla. Such projects have been carried out e.g. in Indonesia, Malesia, Sudan and Malawi.

### 6.2.3. Multilateral Cooperation

The cooperation with the Nordic Council of Ministers (*Nordiska Ministerrådet, NMR*) is based on the Action Plan for Nordic Forestry Cooperation 1996-2000. In 1996 NMR financed four research projects carried out by Metla. One of these projects includes also cooperation with the Baltic States aiming at developing forest statistics in these countries. Metla is involved also in a project initiated by NMR, which aims at standardised collection, storing and registering of environmental specimens.

The Nordic Forest Research Cooperation Committee (*Samarbetsnämnden för Nordisk Skogsforskning, SNS*) supports financially eight of Metla's research projects. One important joint Nordic project was included in Metla's research

programme on Forest Health. It concerns monitoring of the health of spruce stands in the Kvarken region of the Gulf of Bothnia. Another important project is Russian-Fennoscandian Larch Project which is carried out by Swedish, Norwegian, Finnish as well as several Russian research organisations.

An important Nordic organisation for Metla is also the Nordic Council of Forest Work Research (*Nordiska Skogsarbetsstudiernas Råd, NSR*). It supports financially two research projects where Metla is a partner. Scandinavian Society of Forest Economics, in turn, is an important joint Nordic organisation for Metla's forest economists.

The most important international collaborating organisation for Metla is the International Union of Forestry Research Organizations, IUFRO. Also according to the statistics most of the visits abroad made by Metla's researchers are linked to either SNS, sub-units of UN, or IUFRO. Seventeen researchers or professors are active IUFRO officers. Since 1995 the vice president of IUFRO is one of Metla's professors and one of the researchers coordinates IUFRO's project on global information network.

The most significant contribution to IUFRO and the most important target for the year 1995 for Metla was the successful organising of the XX World Congress of IUFRO. This Congress was the biggest-ever forest congress and it was attended by almost 3000 participants from 100 countries. The Congress was a success in every respect and it received a lot of positive feed-back. The Congress was very important to Metla and the whole country. The significance is reflected i.e. by the fact that 430 articles about the Congress were published in the Finnish press and one third of these articles concentrated on forest research.

Metla has participated in the ministerial cooperation to protect Europe's forests based on the United Nations Conference of Environment and Development. Metla is represented in different follow-up Steering Committees and active in the implementations of e.g. Resolutions 2 and 6 of the Strasbourg Ministerial Conference on the Protection of Forests in Europe. In 1996 Metla organised a network meeting of the European Forest Genetic Resources Programme (EUFORGEN), which is a collaborative programme to implement Resolution 2.

Metla's researchers are partners in joint research projects with UNEP/GRID and ECE/FAO, international programme of ECE and members in expert groups and panels of OECD, FAO as well as FAO/ECE/ILO. Metla has also participated three times in arrangements of FAO Expert Consultation on Global Forest Resources Assessment. The most recent meeting took place in Finland in June 1996.

Metla is a founding member of the European Forest Institute (EFI) and has joint research projects with the institute. Metla's Director General has been the president of the International Boreal Forests Research Association (IBFRA) until 1996. Other important international organisations where Metla is involved are the European Space Association (ESA), International Institute for Applied Systems Analysis (IIASA), International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests), International Peat Society (IPS), and the International European Space Association (ESA).

In addition, Metla's researchers are members in many international Editorial Boards and in Organising Committees of international scientific meetings in Finland and abroad.

Metla as an organisation or through its researchers is linked to several international networks. An example of these networks is the Global Atmosphere Watch Programme. The air quality measurement stations in Metla's Pallas-Ounastunturi National Park were linked to the programme in 1994.

Metla has done pioneer work in ADP applications of forestry information. The gopher service developed by Metla's Information Management Unit was the only forest related information service for a long time. In 1994 a WWW server was developed in Metla, which, with the Gopher, is also a well known forestry information service in Internet.

#### 6.2.4. Cooperation with EU

In January 1997 Metla had 9 shared cost research projects and 3 concerted actions with EU. Most of these projects are included in EU's FAIR and ENVIRONMENT programmes. The projects are listed in Appendix 8. In addition, Metla participated in three COST Actions and in proposals for new COST Actions.

The most significant financial aid from EU to Metla concerns monitoring of forest health based on EU's Regulation (EEC) 3528/86 article 2. The aid to these projects, which are listed in Appendix 8, totalled 1 307 188 ECUs (FIM 7.5 million) in 1995 and 1996.

Five of Metla's researchers are representatives or members in committees, working groups and councils of the Commission of the European Union. One of Metla's researchers is also Finland's representative in the Technical Committee of COST programme and chairman in one of its regions. In addition, Metla's researcher is the national specialist in EU's statistical office Eurostat and several researchers have participated in scientific evaluation of EU funded research projects.

#### 6.2.5. Future Targets

Metla encourages researchers to include personal contacts to international colleagues in their work. One of the priorities among the future targets is to develop the readiness and encourage the willingness of individual researchers to participate in international research cooperation.

Also the readiness of the institute to participate in international joint projects will be improved and e.g. the practical management of Metla's EU projects will be standardized through instructions and education.

Internationality is an essential part of scientific research. Metla's general policy has been to integrate international activities in all the research work and avoid differentiation of these activities into a separate unit or institute. According to Metla's policy, internationality should not, however, become an absolute value but the needs and feasibility should be defined from the research. Consequently, applications for EU funding should concern research projects which are included in the research traditions of the institute.

## 7. OTHER SERVICES

### 7.1. Metla's Tasks as State Authority

#### 7.1.1. Grounds for Forest Taxation

In Finland the forest taxation is based on two different forest taxation systems: a traditional area-based forest taxation system and a new system, adopted some years ago, based on stumpage revenues from selling timber. In 1993, a private forest owner had a possibility to select which of these systems will be carried out in his forest during the transition period of 13 years. From the beginning of 2006, all private forest owners will be taxed according to the actual stumpage revenue.

The area-based forest taxation in Finland is based on the assessed average value of the annual yield of the growing stock. Metla's statutory responsibility is to annually calculate the value of this yield per municipality. Metla collects price, removal and cost information needed for calculating the value of the yield. The National Forest Inventory of Metla provides information about the annual yield by site class.

#### 7.1.2. Registration of Regeneration Stock

Ministry of Agriculture and Forestry Resolution on Trade in Forest Regeneration Material sets 11 categories of origin for the forest regeneration material. All the material to be traded has to belong to one of these categories. According to the Decision it is a duty of the Finnish Forest Research Institute to define seed collection areas for source-identified material and set minimum requirements for all the other categories. In addition, Metla keeps lists of all the material belonging to each category, selects the stands belonging to these categories, approves officially the design of seed orchards and defines utilisation areas for seed orchard seed. For material belonging to tested categories the testing methods or genetic evaluation procedures have to be approved by the Metla. Metla also keeps records of the production of clone material and controls the maximal production that is allowed for certain material. Metla's duties include regular field inspections of seed sources, mostly seed orchards.

Metla assists the Ministry in the control of the international trade of forest regeneration material by giving statements on the suitability and possible utilisation area of each lot imported to Finland. It is likely that the control on import will decrease by the year 2000 when the Finnish legislation is harmonised to be in compliance with the new European Union directive. At the moment, Metla is intensively involved in the revision processes of both the EU directive and the OECD Scheme on the certification of the forest regeneration material moving in international trade.

#### 7.1.3. Inspection of Pesticides

The inspection and approval procedure for pesticides in Finland is regulated by Pesticides Act (327/69, main amendments 159/84 and 1204/95). In amendment 1204/95 Council Directive on placing of plant protection products on the market was implemented. A new status on pesticides took effect on 24 May 1995.

The Pesticide Commission, which is a specialist body composed of representatives of various authorities, decides on the approval and registration of a pesticide product. The maximum term of validity of the Pesticide Commission's decision on approval of a pesticide is eight years at a time.

Metla is requested by the Pesticide Division of the Plant Production Inspection Centre which is subordinate to the Ministry of Agriculture and Forestry to carry out inspections for determining the usefulness and biological efficacy of the products intended for use in forestry. The main groups of plant protection products (pesticides) are herbicides, insecticides and fungicides. The same regulations are applied also to the biological preparations and chemical repellents. The assessment of efficacy is mainly based on the results of trials in forest nurseries, regeneration or afforestation areas, and in stocks of timber. Only preliminary trials are performed in laboratory or greenhouse.

The project coordinator conducts field trials of different types of pesticides, collects the material and prepares the statements for the Pesticide Commission. Tests of rodenticides and repellents against voles and moose and deer species are conducted by specialised researchers in the Institute. The majority of personnel working on the project are stationed at Vantaa Research Centre. The field trials are located in the southern and central parts of the country, often near the research or field station.

#### 7.1.4. Timber Scaling

According to the Finnish legislation on timber scaling (Timber Measurement Act 365/1991, Section 11): "It is the duty of the Finnish Forest Research Institute to investigate by necessary studies the fundamental principles of timber scaling methods referred by Timber Measurement Act, Section 17, or provide the Timber Scaling Advisory Committee with pronouncements on principles investigated by other means, draft timber scaling instructions referred by Timber Measurement Act, Section 17, for the reading process of Timber Scaling Advisory Committee and attend to the maintenance of the calculation systems included in the timber scaling methods."

In the Finnish timber scaling system, the Ministry of Agriculture and Forestry ratifies the official technical instructions intended for the practical use in timber trade, harvesting and transport after the proposal by the Timber Scaling Committee. The committee consists of representatives from public organisations and parties involved in timber trade, harvesting and transport where timber scaling is needed.

Investigations of the principles of timber scaling methods are considered ordinary studies included in the research projects, whereas statements, preparation of instructions and maintenance of calculation systems are statutory duties, which do not produce any scientific reports. In practice, statutory duties comprise of representing the Forest Research Institute in the Timber Scaling Advisory Committee and related working groups, preparing practical scaling instructions in collaboration with other parties involved, providing statements for the committee, and maintenance of ADP-systems for the measurement of standing trees.

Vantaa Research Centre was responsible for the coordinating and performing the duties in 1992-1996 under the research project No. 3021, Timber Scaling and

No. 3145, Properties, Quality and Measurement of Wood Raw Materials in Relation to the Intensity of Forest Production. Joensuu Research Station is responsible for the coordination since the beginning of 1997, under the research project No. 3192, Quality, Measurement and Organising the Procurement of Wood Raw Materials for Specialising Wood Industries. In addition, Vantaa and Helsinki Research Centres participate in attending the duties. Currently, three researchers, one from Metla's Joensuu, Vantaa and Helsinki units, are involved with the activities, for which 1.5 to 2.5 man- months of researchers and 0.5 man-months of other staff were used annually in 1992-1996. The activities are financed by the Finnish Forest Research Institute, special studies excluded.

#### 7.1.5. Tasks based on EU Regulations

Metla's tasks based on the EU Regulations relate to the follow-up of the state of health of forests. The projects include the establishment of a network of observatory points and field experiments as well as an annual damage inventory (collection and transmission of data) specified in Article 2 of Regulation (EEC) No 3528/86, pilot and demonstration projects specified in the Article 4 of the same Regulation and intensive experiment plots specified in the Commission Regulation No 1091/94. Metla's projects based on EU Regulations are listed in Appendix 8.

### 7.2. Forest Statistics Information Service

Metla's forest statistic service provides consistent, reliable and up-to-date information about the forestry sector in Finland. The work is carried out by the Forest Statistic Information Service (FSIS), Metla's unit which consists of 13 people. The data originates from FSIS's own statistical enquiries and Metla's research projects, as well as from external statistical authorities and other organisations in the forestry sector.

In the Yearbook of Forest Statistics the annual timber production data is combined with the results from other sources such as national forest inventories and surveys on forest health. In addition, FSIS produces statistical bulletins covering e.g. roundwood sales prices, removals and exports of forest industry products. FSIS has developed a computerised forest information system, acronym METINFO. It is World Wide Web site on forest statistics, forestry legislation and forestry enterprises.

In addition to statistical routines proper, FSIS annually prepares a proposal for the value of the annual yield, applied in area-based forest taxation, for subsequent approval by the Government. FSIS is also involved in the development of forest statistic methods in the Baltic Countries.

### 7.3. Forest Damage Service

Forest damage advisory service is responsible for diagnosing and answering inquiries and about forest damages and diseases. The service makes it possible to find the best specialist for solving the problem. Site visits are done if so agreed and training is offered as well. There is a fee for detailed advice or assistance,

however, initial discussions by phone or correspondence through letters is free of charge.

Researchers dealing with advisory work study actual damage and disease and make disease prognosis. This information is then entered into a database.

The Forest Damage Service includes a WWW-based ADP programme, Sirex. The programme offers its user the possibility to actively identify the most common forest pests and diseases in Finland. In the User Interface Menu the user chooses first the geographical location of the damage, tree species in question, object of damage and description of the damage. Each damaging agent has its own WWW home page. Sirex presents the damaging agents by groups of species:

- 28 fungi
- 63 insects
- 10 vertebrata
- 13 abiotic factors

In addition, Sirex includes a glossary as well as legislation concerning forest damage and forest protection. It also includes descriptions on major forest damage cases in Finland.

## 7.4. MELA Service

MELA is a forestry model and an operational decision support system for solving problems such as, what are the production potentials of forests, and how to manage forest stands in order to achieve the overall goals for forestry. MELA was designed in the 1970's for regional and national timber production analyses in Finland. Currently, it is being also widely used in stand level forest management planning.

Besides analyses and planning results, MELA also serves as means for introducing research results to practical forestry, for incorporating new aspects in analyses, and for further development efforts.

With modifications, MELA is applicable for international forestry analysis, if compatible local forest data and models are available. There has been international applications since 1994, primarily in Lithuania and Estonia.

## 7.5. Other Services

There are a wide selection of other services offered for private forest owners and the public in general. Most of these services are free of charge. Among these services are:

- prognosis of plant damages
- prognosis of crops of berries and mushrooms
- prognosis of forest pests
- recreational services
- information and services in the Visitor Centres

## 8. PUBLICATIONS

### 8.1. Scientific Publication Series

Metla has published scientific series since the foundation of the Institute. At the turn of the 1990's the cooperation with the Finnish Society of Forest Science began for reforming and rationalising the publications of forest science in Finland. Joint publishing of three journals: Acta Forestalia Fennica, Silva Fennica, and Folia Forestalia began in 1994. The cooperation is described in Chapter 6.1.3.

The monograph series of Acta Forestalia Fennica and the quarterly journal of Silva Fennica are aimed at an international scientific audience and are published in English. Distinguished researchers from several countries have been invited to the scientific editorial board of both series (see Appendix 9). The board members represent all sectors of forest science. The editorial board was founded for promoting the journals' scientific level and international dissemination. Evaluation of manuscripts is done according scientific peer review. The board assists in finding reviewers. The editor-in-chief is responsible for the evaluation process and makes the publication decisions on grounds of peer review. Now about 60 % of reviews are by foreign experts and 40 % Finnish experts. The researchers from all countries can submit manuscripts to both publications. In 1996 55 % of the total number of the manuscripts, which were submitted to Silva Fennica, were by foreign authors and 45 % by Finnish authors.

Acta Forestalia Fennica is published intermittently, 3 to 6 issues per year. Silva Fennica is published in four issues per year.

Folia Forestalia is a quarterly journal which publishes national forest issues in Finnish or optionally in Swedish. Research manuscripts are evaluated according to scientific peer review. Publication assessment of manuscripts is made by the editor-in-chief on grounds of evaluation by peer reviewers. Besides research articles Folia Forestalia publishes extension and discussion papers. Folia Forestalia is published in four issues per year. The contents of Acta Forestalia Fennica, Silva Fennica, and Folia Forestalia can be seen in Appendices 10-12.

### 8.2. Other Publications

Metla publishes a series of reports titled *Metsäntutkimuslaitoksen Tiedonantoja* (Finnish Forest Research Institute, Research Papers). The research director approves the manuscripts for publishing introduced by the heads of research centres or stations. The series includes e.g. collections of discourses from workshops and seminars, preliminary results of research, and reports on research projects.

In co-ordination with publication reform the scientific researchers of the projects were given the permission to choose the journal, where to submit manuscripts. Number of papers published in international journals has currently increased. (see Appendix 13).

### 8.3. Editing, Printing and Distribution

The publication unit is responsible for editing the scientific journals co-published with Metla and the Finnish Society of Forest Science. The personnel consists of the editor-in-chief and two production editors.

Since the late 1980's the editors have made the page layout using DTP software. Files are then sent on disk to the printers.

Journals are distributed on subscription or academic exchange. The abstracts of the articles, instructions to authors and other information about the journals are also available on the www at <http://www.metla.fi/publish/>.

### 8.4. Statistics

Table 12. Submitted Manuscripts 1992-1996.

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
<i>Acta Forestalia Fennica</i>	13	9	7	6	9
<i>Silva Fennica</i>	34	26	91	92	47
<i>Folia Forestalia:</i>					
Research articles	16	17	30	24	36
Extension and discussion papers	-	-	10	15	27

Table 13. Publications in *Acta Forestalia Fennica* 1992 - 1996.

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Issues per year	10	7	3	5	4
Pages per year	560	380	161	380	322

Table 14. Publications in *Silva Fennica* 1992 - 1996.

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Articles per year	23	29	25	23	40
Pages per year	250	301	288	309	483

Table 15 Publications in *Folia Forestalia* 1992 - 1996.

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Articles and extension papers per year	19	25	17	38	48
Pages per year	448	527	184	342	446

Table 16. Publications in *Research Paper* Series 1992 - 1996.

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Issues per year	45	36	55	48	38
Pages per year	3409	3064	4179	4031	3372

Table 17. Publications by Metla's Researchers 1993 - 1996.

	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
International peer reviewed publications	71	91	119	140
National peer reviewed publications	45	26	32	42
Other publications, not peer reviewed	189	333	282	324
Periodicals	105	89	99	94
News papers	55	38	39	32
Other publications (abstracts, statistics, discussion papers etc.)	177	296	326	175

Table 18. Other Literal Activities 1993 - 1996.

	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Discourses at international meetings	170	220	240	200
Discourses at national meetings	400	390	380	360
Doctoral theses	7	6	8	12
Licentiate's dissertations	8	3	2	2

