

Estonian Higher Education Accreditation Center

Research Evaluation in Biotechnology and Food Technology

Institutes evaluated

Meat Institute
Dairy Institute
Faculty of Veterinary Science
Estonian Agricultural University

Department of Food Processing
Tallinn Technical University

Visit dates

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Expert team

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Part I

General Overview

Introduction

The evaluation team consisted of Prof. Eero Puolanne (University of Helsinki, Finland), Prof. Olle Holst (Lund University, Sweden) and Prof. Daina Karklina (Latvian University of Agriculture, Latvia).

The organizer for the evaluation was the Estonian Higher Education Accreditation Center (EHEAC). The evaluation was carried out by an examination of documents and a series of visits, interviews and consultations with research staff and students over a period of March 20-24, 2002. Each evaluator had received the self-assessment reports of the Meat Institute and Dairy Institute, Faculty of Veterinary Science, Estonian Agricultural University, and Department of Food Processing, Tallinn Technical University. Additional material was provided by the evaluated institutes, laboratories, research groups and individual scientists during the visit. The self-evaluation reports were mostly well prepared and informative. However, it was sometimes difficult to identify the research groups and active projects. The expert team had to use some efforts to clarify these aspects.

The visits to the institutes started with a general introduction on their organization, financing and main research topics given by the institute directors. The team leaders then gave presentations of their work. The evaluators discussed matters related to the ongoing research with individual team leaders, and took the opportunity to meet the doctoral and graduate students. These discussions and meetings gained us a good understanding of the current research activities. Sets of relevant recent publications that were provided for the Team, greatly assisted the evaluation.

Approach to the evaluation

The evaluators were asked to

1. Judge the activities of research and development in the units evaluated and the research topics implemented by them to ensure the governmental funding for internationally recognized research and development. The Team was asked to concentrate on research groups instead of research units (university departments).
2. Identify deficiencies in the activities of research and development units.
3. Give recommendations on the development concerning research and development and research areas to the state of Estonia.

The Team was given the following material: A working schedule, principles and criteria for evaluation of the research units, and self-evaluation reports created by the research units themselves. The Team arrived on March 19, 2002, in Tallinn, and was shortly briefed by Dr. Tiit Laasberg, Head of the Estonian Accreditation Centre, on a general introduction of the Estonian research organization and the financing, and the remit and practical arrangements as well.

Each research group was evaluated using the following criteria to be rated on a scale excellent ... unsatisfactory:

1. The novelty of the results of research and development;
2. The quality of research and development;
3. The strategy and perspective of research;
4. The competence of research groups and their capability for development;
5. The success in applying for funds and grants;
6. The national and international co-operation;
7. The implementation opportunities for the research results and their importance for the Estonian society;
8. The correspondence of research and development to the international level.

Additionally, the Team also emphasizes the quality of research in relation to material and financial resources available. Consideration has also been given to the organization of doctoral and graduate studies (levels and numbers of MSc and PhD students). Our discussions with the students were very enlightening in this respect. We also took into the consideration the total teaching load and extension activities of the research groups, but it was not used in rating.

Part II

General comments

The evaluation report for 'Estonian Research in Organic and Bioorganic Chemistry and Biochemistry' by Matti Saraste, Ari Koskinen and Jorma Mattinen of February 2, 2001, was given to the Team as an example for the evaluation report. The Team fully agrees with the general observations and recommendations on Estonian scientific systems of that very recent evaluation report and will not repeat similar comments in this report.

The Team found it slightly difficult to identify the 'research groups' of the departments. In many cases the same individuals participate in several projects, and some cases the group consisted of one person only. It would alleviate the work of future Evaluation Teams if the all material will be asked to be collected more clearly research-groupwise, including the list of publications, CVs of the group members and a list of graduate and post-graduate students. A general description of the units will also be useful just as it was given to the Team also at this time.

Teaching and administrative load would also be useful in the evaluation of the overall performance of the group. Now this information was given by some of the teachers only, and in Estonian only.

Part III

Evaluation of institutes and research groups

1. Meat Institute and Dairy Institute Faculty of Veterinary Science Estonian Agricultural University

General overview

Meat Institute

The Meat Institute is headed by Prof. Meili Rei. The institute has also a lecturer and two assistants. Furthermore, the Institute has one full-time and one half-time senior laboratory assistant and one laboratory assistant. The Student enrolment is 10 BSc students and one MSc student. At present there are two master students who are also half-time assistants. During 1997-2001 four master and 38 bachelor degrees have been defended. The Institute does not have any PhD students.

Dairy Institute

The Dairy Institute is headed by Lecturer Jana Pärn. The Institute has two associate professors and one additional lecturer. Furthermore, there is two senior laboratory assistants and one laboratory assistant. The Student enrolment is 10 BSc students and one MSc student. During 1997-2001 two doctoral, eight master and 39 bachelor degrees have been defended. The Institute has at present one doctoral student (Lecturer Jana Pärn).

Evaluation of the Institutes and recommendations

The Institutes have renovated facilities for their disposal. There is enough space for the activities for the planned education and research, and a marked increase in research activity is still possible. The instrumentation and analytical instruments, however, do not cover the minimum requirements for a research of the international level. The Team was informed that the Meat Institute have received a marked support for obtaining new instruments, which is a positive sign. We also heard that the Institute will have a pilot plant that will markedly enhance the possibilities to conduct their applied research.

When the Team visited the laboratories of the two institutes, nothing was going on there. Irrespective the fact that at that hour the students were having their lectures and the teachers were prepared themselves to be the whole day at the disposal of the Team, it was rather obvious that the laboratories were not used for an active research.

The Team is fully aware and has a deep understanding that the change of scientific paradigm has been extremely rapid in commodity-based subjects. The formerly needed thorough knowledge and experience in the immense body of practical knowledge is still relevant and on basic level still valid, but what the technological level concerns, rapidly developing. A science-based education, and even more important, the research cannot anymore rely on such an inductive approach. The scientific foundations should be strongly strengthened, on the cost of the material-bound applied material. On the university level, sophisticated methods in exact and natural sciences in both the education and research should be prioritized to present more applied tools. The Team also recognizes the great value of the work done in the past and has the full understanding that many individuals of present staff cannot possibly carry the heavy load of their present work and simultaneously study the new approach. Therefore, the main emphasis must be on the university level measures directed to the future education of new generation of graduates and researchers.

The Team realized that the Institutes have alone the full responsibility on both higher education and meat/dairy research in Estonia. The Team, however it not being particularly fair, had to make the evaluation using the international level as the standard.

The Team was informed that the Institutes and the Department of Food Hygiene will be fused to one department. The Team supports this idea to achieve a larger unit and to increase the co-operation within the future Department.

Meat Institute

The Meat Institute consists of one research group, only, although several projects can be identified. The Team noticed a very impressive record on applied research, many professional papers and books written in Estonian. Also much courses and other extension services were carried out by the staff of the Meat Institute. The Meat Institute participates to one marked international project on ‘Sustainability in the production of pork with improved nutritional and eating quality using strategic feeding in out-door production’. The external funding has been in total EKK 420.000 with a yearly variation of between EKK 50.000-140.000.

The international publications are published in congress proceedings and are of applied research. The research and the publications are directed to the national audience. Although the research group leader, Professor Meili Rei, is very experienced and competent in applied research, the Team evaluates the research and publications as **satisfactory to unsatisfactory** related to the international standard. The Team also feels that the overall capacity of the concerning novelty, strategy for future the development of meat sector in Estonia and their research contribution in that, and methodological skills, and national and international co-operation and fund-raising are **unsatisfactory** as well.

The results of the own and international research have been well implemented to Estonian meat sector as direct applications and as review information in connection of further education and national and international courses as well. The panel sees that these activities are of valuable significance to the Estonian Meat sector.

The Team is seriously concerned on the present status of the Institute. The new institute facilities and instrumentation will serve for further development. The resources of that level would, however, never enable a scientific work of international level nor a solid ground for master and doctor programs. The institute and the meat sector have an urgent need for younger senior scientists. The Team strongly suggest that the Ministries involved, EAU and meat industry jointly prepare a development plan, where a substantial increase in research funding, facilities and co-operation is included.

The Institute should also perform a thorough renovation in their master's and doctor's study programs by substantially increasing methodological (chemistry, biochemistry, physics etc.) material to programs. The Team is not well aware about the possibilities for that in EAU, but suggest to consider the respective options in Tartu University or joint programs with Tallinn Technical University.

Dairy Institute

The panel sees that the Dairy Institute shows clear signs of recovering from the generation shift that has taken place during the last few years. Lecturer Jana Pärn conducts herself a modern research, but she has not been yet able to activate the whole Institute.

There is another study line, lead by Assoc. Prof. Väinö Poikolainen. Most of the research is closer to animal science than dairy science, and most items of the extensive list of publications have been published in the Estonian professional journals. Recently the activities of this research line has been directed to the automatized milking, where Prof. Poikolainen is a member of an Nordic research team.

As in the case of Meat Institute, the Dairy Institute has a heavy teaching load, and organized additionally much national courses and further education for dairy industry. They also have implemented their research as new products and technology for the dairy industry. The external funding has been in total EKK 446.300 with a yearly variation of between EKK 20.000-110.000.

The level of scientific publications is improving, but is still far too low in numbers to reach the satisfactory level (grade **satisfactory to unsatisfactory**). Also the overall capacity of Dairy Institute is **unsatisfactory** based on a similar evaluation as above with Meat Institute.

The Dairy Institute is slightly larger in resources than the Meat Institute. It has at present somewhat better capabilities than Meat Institute. The dairy sector should also have a similar strategic development program than meat sector (see above). More specifically, there is research in dairy science conducted also in Tallinn Technical University. It is recommended that joint courses and research will be arranged between these two units.

Department of Food Processing Tallinn Technical University

General overview

The Department of Food Processing is headed by Prof. Raivo Vokk. In the Chair of Food Technology there are two professors (Chairman Toomas Paalme and Jüri Kann), two associate professors and one assistant, and in the Chair of Food Science there are one professor (Chairman Raivo Vokk), three associate professors and four assistant professors. The staff also includes one senior research fellow, two research fellows and one technical assistant.

The student enrolment is XX master's students. There have been three doctoral theses and 20 master's theses defended during 1997-2001. At present, there are 10 doctoral and 27 master students at the Department.

Evaluation of the Institute and recommendations

The Department has reasonably good facilities at their disposal. During the recent years also many sophisticated instruments have been bought by ca EKK 1.560.000. - Also in this case the laboratories were empty during the visit of the Team; the reason for this was mentioned to be that the researchers were prepared themselves to be at the disposal of the Team. Nevertheless, the Team also felt that not too much instrumental research was actively conducted in the laboratories, although some activities were noticed. The Team was told that biotechnology and microbiology was done in the Institute of Chemical Physics and Biophysics.

The Team was positively impressed on the Main Library and the direct possibilities to use international databases. This means that the researchers and students have the same opportunities to perform their research/studies as in any other university.

It was also seen as in the case of EAU in some cases the shift of generations and consequently the change of scientific paradigm and scientific approach. Also in the case of Department of Food Processing it is highly recommended to strengthen the education of masters and doctors in order to fulfill the needs of academia and other sectors of the society as well.

The Department has been rather successful in fund-raising, totaling EKK 3.970.000 in 1997-2001.

The group of Professor Jüri Kann was not evaluated because the Team thought that it was not dealing with food science.

Evaluation of the specific research groups

Cereal Technology and bakery foods group (Assoc. Prof. Aino Kann)

Prof. A. Kann is the head of research group studying the biochemistry and microbiology of local cereals and their possibilities for new dietary food products. The external funding has been in total EKK 870.000.

The novelty of this kind of work is not so high and is more on national level than on international level. The research group has good cooperation with other research units in Estonia. The Team would like to paid attention to that there were only MSc students in the research of the group, and no PhD students are involved. The publishing activity of the group has been rather low. The list of current publications is mostly consisting of articles in local journals. There are no high quality papers in leading Cereal and Food Science journals. The implementation of research results and connection with industry has to be improved. During discussion the Team did not find a clear focus and good strategy plans for future, but we think that research in this area will be an important component of the Department in the future. We rank this group as **satisfactory**.

Food Toxicology group (Assoc. Prof. Olev Tauts)

The research conducted by the food toxicology group is of **satisfactory to unsatisfactory** quality, but the output is very low. Concerning the novelty, strategy, multidisciplinary approach, co-operation and success in receiving external funding the panel evaluates the research group as **unsatisfactory**. There is an urgent need for strengthen the continuation of this research theme, which can be obtained e.g. by recruiting experienced chemist with knowledge on modern methodology and also by a close co-operation with Food Hygiene in Tartu and governmental food laboratories. Also master as well as PhD students should be enrolled.

Biotechnology group (Prof. Toomas Paalme)

Professor Paalme, who joined the department in 1997, leads the group. Five PhD students are currently working in the group and they at different level of their training ensuring a continuation of the work. The Team acknowledges the fact that one of them currently is working abroad.

Professor Paalme's research is innovative. Focus has been on new modes of operation for cultivating microorganisms as well as animal cells. The systems developed have been used for optimization of processes as well for elucidating of metabolic pathways. Current research includes studies on, e.g., Baker's yeast, non-starter lactic acid bacteria and recombinant protein expression. All of these topics are of high scientific and industrial relevance. Thus, the **implementation opportunities are good**. In fact, links have already been established and work has been conducted in connection with Estonian as well as foreign biotech industry, notably Baker's yeast production (Lallemand Inc., Canada) and vinegar production (JAPS. Inc., Pärnu).

Two PhDs and three MScs have defended their theses during the period. Six scientific papers have been published, most of them in prestigious journals. Several papers have also been submitted. The scientific work of the group has also been reported on several international conferences.

The research activities by this group are rated as **excellent to good**.

Concerning novelty, strategy, multi-disciplinary approach, co-operation (national and international) and success of receiving funds we rate this group as **good**. Professor Paalme has a good strategy for future activities; this includes e.g. collaboration with molecular biologist and functional genomics of lactic acid bacteria.

As a recommendation the group should strengthen their international collaboration, both in terms of joint research projects and in terms of exchange of personnel on all levels.

Dairy Technology/Food Rheology group (Ass. Prof. Margus Friedenthal)

The group is led by Assoc. Prof. Friedenthal and Assoc. Prof. M. Sirendi. Currently two PhD students and seven MSc students are members of the group. Three MSc students have been supervised.

It should be pointed out that this group has been “created” somewhat artificially by the Team based on what we understand as joint activities. We are aware of the fact that Prof. Friedenthal is organized under the chair of Food Technology and Assoc. Prof. Sirende under the chair of Food Science. Furthermore, we understand that Assoc. Prof. Sirendi is only working 25% at the department of Food Processing.

Main research topics are hydrocolloids and dairy science. Special attention is paid to studies of furcellaran, a sea weed based polysaccharide with interesting properties for applications in food industry. Another research area concerns the production of immunoglobulins from colostrum. The research activities by this group are rated as **satisfactory**.

Concerning novelty, strategy, multi-disciplinary approach, co-operation (national and international) and success of receiving funds we rate this group as **satisfactory**. Only a few papers have been published in international journals. The scientific work of the group has been reported on international conferences.

As both Assoc. Prof. Friedenthal and Assoc. Prof. Sirendi were absent at the time of our visit we did not have the opportunity to discuss with them. Thus the strategy for the group is not clear to us. We did, however, meet with two PhD students, and via that we could have a picture of the group.

The **implementation opportunities** for at least some of the work is **good** as illustrated by the close contact with e.g. Estagar on the production of furcellaran.

As a recommendation the group should strengthen their international collaboration, both in terms of joint research projects and in terms of exchange of personnel on all levels.

The Team is worried about the productivity (in terms of scientific publications) of the research group. The group must improve their dissemination of the scientific results.

Nutrition group (Prof. Raivo Vokk)

The Team well understands the need of nutrition for the food science and technology, but finds it somewhat strange that main responsibility is settled in a technical university. The nutrition group does also an extensive consultation work which has a great and valuable impact on the Estonian society. A large part of the activities are also very applied research and surveys that are connected to the nutritional status in Estonian and also closely linked with the catering education within the department. The Team suggests the TTU and the Ministry of Health decide which organization should be responsible for the basic and applied research on nutritional recommendations and which then for their implementation on food systems/consumers level.

The Nutrition group has directed the research to a strategic project on new product development, the usage of sea-buckthorn. The study covers of basic and applied aspects, especially isolation methods and testing of properties of bioactive compounds. There is also a project on the influence of cultivation conditions on the levels of water-soluble vitamins in Baker's yeast starting. Also this project has a basic and an applied dimension as well. The Team evaluates the research as **satisfactory**.

The originality of the research is on a satisfactory level, and the work done has a strong strategic basis and vision. The studies also aim well at a multidisciplinary approach. The Team did not find that the methodological skills and competence is above satisfactory level. Also the national and especially international co-operation should be strengthened.

The group has been fairly successful in receiving external funding. Taken as an overall capability the Team evaluates the group as **satisfactory**.

The Team suggests that the nutrition group and the food chemistry group including food toxicology will be fused and basic methodological and theoretical research will be prioritized. Actual basic research groups would need a principal investigator (usually professor) and senior scientists of various ages and then PhD and master students to execute the actual projects. By fusing the groups it would reach the critical mass and accrued competence to carry out basic and applied research of high international standard. The group should also carefully balance the nutrition research and the food chemistry research in order to have a good focus in their research activities, taking into the account of the fact that the activities are situated in a technical university. If food chemistry will be prioritized, simultaneously it must be made sure that the most important area, nutrition, will also be studied and taught in Estonia.

Part IV

Final Remarks

The Team would like to stress that Food Science and Technology research is very important with respect to food quality and safety as well as to the nutritional aspects of food products produced in Estonia. High quality research will also make them more competitive on international market. Therefore Food Science and Food Biotechnology need continuous long term support from the Government. This refers to material and financial resources to both Universities evaluated to develop and to incubate novel scientific ideas and research themes and to achieve international level.

We also found it of paramount importance to increase the funding for master and doctoral students and consequently research of international quality. In future Europe investing into higher education will be the only way for a nation to continue the development the society, and in this particular case, to ensure the self-sufficiency of the food supply. Because of the shift of generations and as a result of that the paradigm change, special efforts must now be executed to ensure the continuation of the scientific fields in question.

We also strongly recommend all groups to intensify their efforts to increase their international contacts, both in terms of research and personnel exchange.

During our visits we often found a lack of visions and consequently strategic plans for the future. The Team suggests an analysis of 'Purpose-Processes-Resources' to be used. The Team has seen that it is usually used in reverse order, i.e. the resources, human and physical, are decisive in setting the goals. 'Purpose' in this context is understood as ideas and visions originating from society needs and from the scientific community. 'Process' means how the ideas and visions are realized. 'Resources' are the means, human and material, needed to carry out the Process. The Team strongly advises that this will be performed at departmental and research group level. A regular SWOT analysis would be helpful in this procedure.

Tallinn, March 22, 2002

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