EPPO Colloquium

Can a decreasing scientific base sustain an increasing phytosanitary field?

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Scientific and technical capabilities are fundamental to phytosanitary regulations, inspections and control measures.

Policy making needs scientific support

In phytosanitary policy making, scientific expertise is required to analyse the risks posed by plant pests. The international treaty WTO-SPS requires that phytosanitary regulations and measures are based on scientifically sound pest risk analyses. Assessment of risk must be based on scientific expertise. Risk assessment is generally carried out by scientists trained in plant pathology, epidemiology and pest taxonomy. Economic expertise is increasingly required as well. Risk assessment is largely a neutral scientific activity. Risk management requires additional expertise like practical expertise, expertise about possible measures and their effectiveness, and expertise on diagnostics, sampling and statistics. The implementation of the WTO-SPS agreement requires an ever increasing demand for PRA-related expertise. Also, society more and more demands transparency and proof that regulations and measures make sense (*justification*). If measures are insufficiently underpinned by scientific justification, these measures may be challenged in court. Moreover, globalisation and increasing trade results in more and more introductions of new pests in the EPPO region. Ten years ago pest risk analysis did not exist for quarantine pests of plants, nowadays it is a key factor in policy making.

Inspection and diagnosis needs scientific support

The inspection of plants for quarantine pests and the diagnosis of samples resulting from inspection strongly relies on scientific and practical expertise. Inspections are effective only when knowledge of pests and disease symptoms is available. This requires training by specialists and accumulating expertise. Besides classical knowledge on pest taxonomy and symptomatology, affinity with modern test methods such as DNA test kits is increasingly required from inspectors. Knowledge and training are usually provided by specialists in the diagnostic laboratory.

Diagnosis of plant pests and diseases requires knowledge of a wide range of fields: taxonomy, microbiology, symptomatology, sampling and statistics, extraction and processing, biochemistry, antisera and molecular test methods, validation of test methods, and quality assurance systems. Classical

taxonomy is a threatened field but indispensable for plant quarantine, for identification of new and unknown pests and as golden standard for evaluating the efficacy of biochemical or molecular test methods. Well-kept collections of reference material of pests are essential for defining pest identity (type specimens), for studying diversity in pest populations, and for developing and testing biochemical and molecular test methods. Molecular biology has become an indispensable toolbox for diagnosis and will be so, in the near future, for inspection. It is revolutionising the diagnosis of plant pests, and often provides a reliable, sensitive, fast and practicable alternative to classical microscopical analysis. Larvae of insects such as *Liriomyza* species, for instance, cannot be differentiated under the microscope. Recently developed molecular kits allow for distinctions between regulated and other species within a few hours.

There is a strong need for developing molecular methods for diagnosis, identification and detection of regulated pests. This requires research and development integrating classical and molecular taxonomy (phylogeny), molecular technology (development of DNA kits and chips), and quality assurance sciences (validation, implementation, accreditation). Despite the power of molecular technology, such methods so far exist for relatively few regulated pests. Growers and trade increasingly expect molecular diagnostics from Plant Protection services, both for new pests as well as by way of update of classical methods.

Increasing needs and decreasing resources

The workload and the number of fields for which scientific expertise is required is continuously increasing. Governments ask for a closer scrutiny of the balance between epidemiological and economical risks, and for simple, efficient and effective inspection systems at the proper place in the production and trade chain. The field of economic expertise needs to be developed. However, the budget available for phytosanitary research and diagnosis is decreasing due to the tendency of governments to cut budgets and to develop leaner and meaner organisations.

While the need for scientific expertise increases, the key fields of expertise are rapidly disappearing. Classical plant pathology and taxonomy have largely disappeared and have been replaced by biotechnology and experimental molecular research at gene level. The number of research groups at universities working on plant pathology and pest taxonomy goes down very rapidly. So does education and training in these sciences. Remaining groups are faced with budgetary cuts and with obligations to attract contract research, detracting them from their core expertise. Moreover, results from privately financed research often are no longer public. Privatisation has wiped out many groups, and university professors usually are not replaced at retirement. The erosion of education, training and research in plant pathology and taxonomy results in gradual extinction of relevant specialists. Job mobility is high nowadays, and specialists eventually retire. Attracting well-trained specialists is an increasing problem.

Implications for the phytosanitary field

Phytosanitary services and policy departments usually have limited possibilities to counter these problems at a national level. Budget cuts at universities cannot be easily influenced. Some fields disappear entirely from Europe because no mechanisms are available for international coordination of expertise fields, while duplication exists or is created in other areas. Some of our services have attempted

to create a buffer in their own organisation by creating small research groups annex to the diagnostic laboratory. Critical mass of laboratories nevertheless remains small, often too small. Most laboratories have only very little budget for outsourcing research to universities or research institutes. When they do, the relevant expertise may no longer be there to carry out any urgent research on (new) quarantine pests or to develop new diagnostic methods for such pests.

The resources of today cannot fulfill the needs of yesterday, but the needs of tomorrow will be even bigger than today.

EPPO Conference recommendations

The concern is felt by many. In the Conclusions of the EPPO conference on *Quality of diagnostics and new diagnostic methods*, in April 2004, recommendations were made to make an official statement of concern with respect to the decrease of specialists and knowledge in the field of phytopathology. The decrease in knowledge was believed to seriously jeopardise the adequate performance of the current regulations with respect to quarantine pests in many countries. In particular the importance of well-maintained collections was emphasised, since these collections are crucial in relation to knowledge on the biology of known and newly discovered plant pests. Suggestions were also made for possible actions by EPPO and its member states.

What can we do?

What can we do to restore the scientific foundations for the phytosanitary field? First of all, we should proclaim the severity of the problem and its consequences within our administrations and internationally declare a *State of Emergency*. We should communicate our needs within our governments in such a manner that it reaches and influences policy makers, decision makers and politicians. We can inform them about our needs, ask them for support, and supply them with options for future policies and solutions. Such policies and solutions will have to properly address the problems, will need to fit in the political mainstream of this era, and will need to be specific, attainable, concrete, and realistic. But we should also consider our own responsibilities in this matter. We should address the need for international cooperation in the exchange of phytosanitary knowledge, in international exchange and training programmes for diagnostic specialists, in coordinated efforts to maintain relevant scientific disciplines and European research groups.

In order to operate effectively and to make an impact, we need a common view. This requires discussion on the nature of the problem and the mode that it should be addressed. The lectures in the present colloquium hopefully help to start the discussion. Several options and models could be considered.

Now is the time. Recently, at the Agricultural Council in July 2004, the Ministers of Agriculture of the EU supported a statement by the Dutch Presidency that "*knowledge areas which are not in the front rank of exploitative science but which, in the longer term, are vital for underpinning sound public policy, must be defined and protected, e.g. phytosanitary knowledge and taxonomy*". The tide is favourable.

What could be done?

When discussing models for future international cooperation, a distinction should be made between the following areas:

a. Research and development;
b. Education and training;
c. Institutional organisation of plant protection services;
d. International standardisation, harmonisation and accreditation;
e. Digital databases.

Among others, the following options could be considered to strengthen the scientific base of the phytosanitary field. The focus of this paper is especially what could be considered within the EU but it should not be limited to the EU.

a) Coordination of research and development

The European Union finances relevant R&D at universities and research institutes in, among others, the 6th framework programme (FP6). EU funds for R&D, however, amount to only 5% of national funds. Coordination of national funding can be achieved by starting a European Research Area network (ERA-net) for phytosanitary research. Such an ERA-net would provide a formal framework in which coordination of research funding by national governments takes place. Current examples are Coordinated Actions on Baltic Sea Research; Plant Genomics; Preventing a Crisis in Medical Emergency Research; and Cooperation in Rare Diseases Research. ERA-net funding covers all costs of governments for international coordination of their research programmes in the field involved, up to a maximum of 3 million euro. It will not cover the research itself. In the ERA-net, national funds may remain to be allocated nationally but in such a manner that complementarity is achieved with R&D in partner countries. In the 7th framework programme ERA-networking will become a main theme; a proposal for a phytosanitary ERA-net could possibly be made in the near future, prior to the main stream of applications. Our experience in other fields is that drafting a full proposal requires a year's work. Fortunately, the EU also provides funds for the start-up phase, up to a maximum of 200.000 euro. A total of 148 million euro has been allocated to the ERA-net scheme during FP6. Deadlines for submission of proposals are 5 October 2004, 2 March 2005 and 4 October 2005.

Under the 6th FP, so-called Networks Of Excellence (NOE) were introduced to stimulate international cooperation of researchers. Other options are Integrated Projects (IP) and Specific Targeted Research Projects (STREP). In 2004, the EU allocates 152.000.000 euro to NOE's, IP's and STREP's[1]. An option would be to lobby for a call for a NOE on Plant and Animal Health in the 7th FP, so as to obtain access to these large funds.

Cooperation between scientists themselves may presently be funded at a small scale through COST-actions, which covers meetings and coordination of research activities of scientists.

[1] *Background information on these networks and projects is provided separately.*

In the veterinary system, the EU also funds R&D on specific pests and diseases. This is done on a legal basis: several veterinary regulations included articles on EU-funded R&D.

b) Education and training

The funding of research groups at universities provides the best guarantee for the continuity of academic education and training in expertise fields relevant to plant protection. Additionally, bursary systems may provide help, such as the Marie Curie bursaries for women. Coordination of education and training in phytosanitary relevant fields may be incorporated in ERA-network applications.

c) Institutional organisation of plant protection services

The critical mass problem of plant protection services may be met by bilateral or multilateral agreements between countries to support each other or to divide tasks. At the European and Mediterranean level, an inventory would be useful of diagnostic laboratories and specialists in relevant disciplines. Such an inventory might provide a basis for international task allocation on a voluntary base. Governments could decide to support the continuity of specific expertise groups within the EPPO region or the EU. Such expertise groups might take responsibility for training and education of specialists from other countries.

In due course, but not necessarily, division of tasks between countries could be formalised. This has happened in the EU for breeders' rights research (identity testing for variety lists). Tasks are allocated to laboratories by the Communitary Bureau for Variety Lists in a tender system. This model, however, would result in loss of national sovereignty.

Another model exists in the veterinary field in the EU. Here, the laboratories with specific expertise have a formal role as reference laboratory under the veterinary regulations. For each disease,a Communitary reference laboratory exists which defines the laboratory standards, provides confirmatory test services, organizes ring testing, trains specialists from all countries and accredits national reference laboratories. At a higher level, reference laboratories of the Organisation Internationale des Epizooties (OIE) perform such tasks at a global level. The advantage of the veterinary system is that is offers solid protection of expertise. Within the European Union, basic costs are covered by the EU, which also provides funds for necessary R&D.

d) International standardisation, harmonisation and accreditation

International standardisation, harmonisation of methods and measures, and accreditation of laboratories are becoming increasingly important. This is a consequence of the WTO-SPS agreement and the International Plant Protection Convention on the one hand, and of trends in society requiring transparency and justification of government actions on the other hand. Standardisation, harmonisation and quality assurance systems by nature result in documents reflecting current knowledge on pests and diseases. The development of international standards for diagnosis of quarantine pests therefore deserves support. EPPO is the leading organisation in this field, and will continue to play an important role in the development of standards within the region and under IPPC.

e) Digital databases

The development of digital databases on pests and diseases, what they look like, what inspectors should look for, how they are diagnosed, risk analyses, findings and interceptions, measures taken, etcetera, offers prospects for knowledge sharing. Such a database is already operational in the UK and a similar system is under development in The Netherlands. International cooperation in this field could offer prospects but will require careful attention and resources for connecting databases and ensuring compatibility. Protection of confidential data will be important. Care should be taken to keep the system simple to build and simple to use: ICT projects often tend to run out of control.

Conclusions

The scientific basis of the phytosanitary field is rapidly eroding throughout Europe. The needs for knowledge and R&D in the phytosanitary field are increasing continuously, in policy making and implementation (including Pest Risk Analysis) and in inspection and diagnosis. There is an increasing shortage of research, expertise, diagnostic capacity, education, training, and international coordination and cooperation. The future of the phytosanitary field is at stake. Without coordinated international action, indispensable expertise and scientific disciplines may disappear completely and irreversibly.

Recommendations to the phytosanitary community

1. Declare the *State of Emergency*.
2. Develop a common view and strategy to revive the scientific basis of the phytosanitary field.
3. Address and influence policy makers, decision makers and politicians, based on this view and strategy.
4. Start discussion how to improve international cooperation, coordination of research funding, and international coordination of expertise and training.
5. For those who are a member state of the EU: give priority to initiation of an ERA-net Plant Health for coordination of government funding of phytosanitary R&D, and set up a lobby in Brussels to promote a call for a Plant Health Network of Excellence under FP7.
6. Support and progress of activities to revive the scientific base of the phytosanitary field should be a regular part of the agenda of EPPO Council and, where appropriate, Working Parties and Panels.