Workshop on plant protection education
2-3 December 2015
Report

Annika Djurle, Dept. of Forest Mycology and Plant Pathology, Uppsala
Lena Holm, Dept. of Biosystems and Technology, Alnarp

Platform Plant Protection SLU
https://internt.slu.se/platform-plant-protection
Report on a Workshop on plant protection education
2-3 December 2015

A workshop on collaboration in undergraduate education in plant protection was held at Marieborg folkhögskola och konferens in Norrköping on December 2-3, 2015.

The background for this was in part the results of a survey of undergraduate education in the plant protection areas at SLU (Djurle & Björklund, 2014). It pointed out strengths and weaknesses, and several areas for increased collaboration. In order to develop the education further and maintain its high quality, all resources at SLU need to be collected and utilized. For the future development of education in plant protection, it would also be relevant to express the role or importance of plant protection in SLU's education, and in the world outside.

The aim with the workshop was to bring SLU colleagues who work in different locations, faculties, departments, programs, courses etc. together in order to strengthen collaboration within undergraduate education in plant protection and to inspire each other. Some of the expected outcomes were answers to the following questions:

- How can we organize teachers and teaching in order to optimize competences, inspire each other, and exchange experiences and ideas across faculties and programmes?
- How important is plant protection in SLU's education programmes? What are the needs from our different sectors (forestry, agriculture, horticulture) and from society?
- How can plant protection become better integrated into SLU’s different education programmes?

The workshop was financed by the Plant Protection Platform at SLU (travel costs were paid by the participants). There were 22 participants (teachers and researchers) from the following departments at SLU: Plant Protection Biology (5), Biosystems and Technology (2), Forest Mycology and Plant Pathology (7), Plant Biology (1), Crop Production Ecology (2), Ecology (2), Wildlife, Fish and Environmental Studies (1), the Director of studies for the Agriculture programme – Soil and Plant Science, and a pedagogic consultant from the University Pedagogic Centre. There were only four participants representing the forestry sector and no representatives from the Landscape architecture area. The workshop language was English.

During the planning process all participants were asked to submit two or three questions that they wanted to discuss or work on during the workshop. A majority of the participants listed the three questions above that describe the expected outcomes of the workshop. Other questions touched on common elements across subject areas and how they could be used or benefited from, recruitment of students, distance learning, and teaching methodology.

The program consisted of short prepared talks, group work, and joint discussions (Appendix 1). Summaries of the respective sessions, outcomes, suggestions and conclusions are presented in the following pages. Sometimes suggestions are presented at the end of a section, and sometimes the section itself entirely consists of suggestions.

Plant protection education at SLU today

Short presentations were given about programmes and courses with plant protection content at the different SLU campuses. The presentations are summarized below and handout versions of slides from the respective presentations are found in Appendix 2.
**Alnarp:** Lena Holm & Peter Anderson, Dept. of Biosystems and Technology and Dept. of Plant Protection Biology

In Alnarp three 3-year Bachelor programmes are offered;
1. Horticultural Management - Gardening and Horticultural Production and - Gardening Design, respectively (Trädgårdsingenjör; odling resp. design)
2. Landscape Engineer programme (Landskapsingenjör) and
3. Agricultural and Rural Management programme (Lantmästare).

There are also two 5-year programmes;
1. Horticultural Science programme (Hortonom) and
2. Landscape architect.

In the Horticultural Science programme students can take 32.5 credits of plant protection, whereof 17.5 credits are compulsory. Most of this represents plant diseases and insect pests. Weed science, 5 credits, is found in the elective portion. In addition there is a 15 credits course in Insect chemical ecology and 15 credits are offered in a Practical research training course.

In the Horticultural Management - Gardening and Horticultural Production programme 10.5 credits of plant protection are included, with 7.5 credits compulsory. Students can also take some of the courses in the Horticultural Science program.

There are no specific courses in plant protection in the Landscape architecture and Landscape Engineer programmes. C:a 1.5 credits are included in other courses in the two programmes.

The Agricultural and Rural Management Programme offers plant protection education up to c:a 13 credits, whereof 5 are compulsory and half of them are weed science.

There is also one MSc programme in Agroecology and one named Euroforester, but plant protection does not take a large portion in them.

The teaching competences are good in general but sufficient competences in virology, nematology and application techniques are lacking, and due to retirements in the coming years the competences in practical horticultural and agricultural plant protection will not be covered in a long term perspective.

---

**Umeå and Skinnskatteberg:** Roger Pettersson, Dept. of Wildlife, Fish and Environmental studies

The number of credits in plant protection in the Forester programme (Degree of Master of Science in Forestry - Jägmästare.) has shifted a lot over the last 20 years. The programme is now under revision and it is not clear how much plant protection (pathogens and pests) that will be included in the new curriculum. Possibly there will be 4 credits at the basic level and another 15 credits at advanced level.

The Forest management - Bachelor's programme (Skogsmästare) contains 6 credits of plant protection which is integrated into two Silviculture courses.

---

**Uppsala:** Annika Djurle, Dept. of Forest Mycology and Plant Pathology

In the Agriculture programme - Soil and Plant Sciences (Agronomprogrammet mark/växt) c:a 6 credits in plant protection are compulsory. Half of this is within weed science. Among eligible courses, 10 credits about pests and diseases are available at the basic level. At the advanced level courses in Plant pathology (15 credits) and Plant-microbe interactions (10 credits) can be taken by the students. It is, however, very difficult to fit the Plant pathology course into individual students' study programmes due to time collisions with compulsory courses. There are no entomology courses at advanced level. A few credits (2-3) of weed
science are available at advanced level. In the other Agriculture programmes there is c:a 1 credit of plant protection in semi-compulsory courses.

The changes and challenges for the future have to do with recruitment of students, placing courses in the schedule so that they become available for students, keeping narrow and broad competences alive together and continuity in teaching when most teachers are externally financed.

A general conclusion is that plant protection education at SLU faces different problems regarding its volume (credits), balance between compulsory and eligible courses, and availability (schedule) in different educational programmes. The ongoing revisions of some programmes (e.g. Agriculture and Forester) still leave uncertainties as to how much time will be allocated for plant protection education.

There is a common need to assure that teacher competences within all subject areas are maintained in a long term perspective.

Why is plant protection important?

The main question "Why is plant protection important?" was supplemented with "How important is plant protection in SLU’s education programmes?" and "What are the needs from our different sectors and from society?"

Texts (drafts) suitable for a web-page, brochure, information leaflet or similar for a given target group (future students, the public, politicians, SLU's board and faculties) were written by four groups, revised by another group and posted on the wall for further revisions.

SLU in general is not visible enough in society, and plant protection is even less. One aim with this session was to develop some information material that can explain the importance of plant protection as constraints to cultivation of plants and production of plant products. The goal would be to increase visibility and awareness of plant protection in order to attract students, educate the public and politicians, and make statements for SLU's leadership.

As a background material, participants were given the (anonymous) replies from an enquiry to branch representatives ("Why is it important for a student to have plant protection in the education?"). We got 10 replies from representatives of the forestry, agriculture and horticulture sectors. Governmental agencies, regional advisors, forest companies, growers' organisations and chemical industries were all represented. With the overbridging goal to prevent and minimize damage and losses, the answers from the sectors could be summarized in five sentences:

1. A sound and substantial biological base of knowledge is needed.
2. Within all sectors understanding of the complex interactions that take place in all kinds of crops are important.
3. Pest, disease and weed control is important and knowledge about theories, principles, methods and environmental aspects are crucial.
4. New situations such as climate changes, introduction of new species, changes in regulations and pesticide availability have to be met and handled professionally.
5. Identification is also important.

A couple of replies were written from the starting point that plant protection = chemical control exclusively and some replies seemed to focus mostly on pathogens and pests (although weeds were clearly mentioned in the question) which stresses the fact that plant
protection is defined in many different ways and this has to be considered in all kinds of communication within and outside of SLU.

This session resulted in four text drafts which despite different target groups shared several of the following key elements:

- Plant protection is within SLU's mission
- A (nearly) unique subject area among Swedish universities
- Plants are the basis of almost all production and needed for food, feed, fibre and fuel.
- Food security and food safety
- Costs of production losses
- Challenges due to climate change and global change are expected
- Integrated pest management
- Sustainability

For different target groups this was taken up from different angles. When aimed for students, plant protection was put in a network with connections to the students' reality. For the public, wise and economic management, and IPM was important. Prevention and control, secure production, costs of damage and climate change were some key words in the text aimed for politicians. The draft for SLU's administration was about the mission, production, food security, complexity and communication.

This material provides a good basis for further work in order to finish them within a short time frame.

*SUGGESTION: Two persons are given the task, and financial resources, to finalize the texts and suggest how they should be distributed to, and within, the respective target groups, and present this to the board of the plant protection platform.*

**What is plant protection?**

Teaching in plant protection takes place at five of SLU’s campuses (Alnarp, Uppsala, Grimsö, Skinnskatteberg, and Umeå). In order to widen the students' perspectives and understanding of the role of plant protection in different production systems a general introduction could be made for all students irrespective of study programme.

The outcome of this was four drafts of presentations, or ideas of the contents, trying to address the whole range of production systems, pathogens, weeds, and pests.

Key elements in the draft presentations were:

- Classic historical examples
- Damages with high costs
- Diversity of damage
- Citations
- Food security
- Disease triangle
- IPM triangle
- Control
- Prevention

As with the texts about why plant protection is important, the material from this group work provides a good basis for further work in order to finish them within a short time frame.
**SUGGESTION:** Two persons are given the task, and financial resources, to make one common presentation based on the drafts from the workshop, suggest how it can be implemented in courses, and present this to the board of the plant protection platform. An alternative would be a grant proposal for a pedagogic project which aims at developing this material.

**A plant protection "catch phrase"**

In connection with discussions on what to present as a generic plant protection introduction, and plant protection introductory texts for different target groups, the concept of "catch phrases" came up. It was more a social than a work related activity and it resulted in some suggestions and a call for more.

**SUGGESTION:** When the abovementioned texts and presentations are finalized, a catch phrase would be useful and could be included in the finalization of these materials. A call for a catch phrase could be placed on the homepage of the Plant Protection Platform.

**Plant protection education in the future**

There were three short presentations about ongoing activities, briefly summarized below. Handout versions of slides from the respective presentations are found in Appendix 2.

**Anders Kvarnheden**, Dept. of Plant Biology in Uppsala, presented current and future MSc programmes in plant biology.

The present MSc education at SLU, with connections to plant protection, is represented by the programmes in Horticultural science and Agroecology in Alnarp, the Agriculture programme – soil and plant sciences, and Plant biology in Uppsala (the latter in collaboration with Uppsala and Stockholm universities), and Forestry science in Umeå plus a MSc programme at Umeå University.

A group of people is working on the development of a common MSc programme in plant biology for SLU and their report is expected in April 2016.

Anders Kvarnheden also informed about the "European plant breeding college" where SLU is a partner and referred to their homepage for more information (http://ec.europa.eu/programmes/erasmus-plus/projects/eplus-project-details-page/?nodeRef=workspace://SpacesStore/8b04c135-7fd3-4143-8fe3-fffaadf25309).

**Laura Grenville-Briggs and Erik Alexandersson**, Dept. of Plant Protection Biology in Alnarp, presented their project on developing teaching in the area of plant–microbe interactions in crop protection at Alnarp. So far they have identified areas that need strengthening (confirming the observations by Djurle & Björklund, 2014) and they are planning a study visit to Wageningen.

The Dept. of Plant Protection Biology is also part of the PlantLink MSc programme "SLU/LU Joint Masters programme Molecular Breeding & Plant Biotechnology". The programme is partly put on hold.
Since several years SLU is a partner in the EuroLeague for life science (ELLS) network and SLU-Alnarp participates in the subject area Plant Molecular breeding and Biotechnology. So far the subject area has organized two MSc summer courses. There is no subject area formed for plant protection and it was suggested that Erik Alexandersson will contact the ELLS secretariat and present the idea of forming a new subject area for plant protection.

**Gerd Johansson**, Director of studies for the Agriculture programme – Soil and Plant science, presented the new curriculum structure for education at SLU. The five agriculture programmes will be extended to 5 years. Internationalization, joint courses for all programmes and coordination between programmes, education for sustainable development and progression are some key elements for the new curriculum. It will start for 1st year students in September 2016 and be implemented for all in the academic year 2018/19.

**Education for sustainable development and Pedagogic key components**

Peter Aspengren, UPC (University pedagogic centre) at SLU: The University pedagogic centre at SLU (UPC) has started courses in "Education for sustainable development". Directors of studies for the different education programmes were the first target group, and course leaders are now offered the course. Peter gave a brief presentation of what education of sustainable development is and some of the questions that a teacher will have to relate to. This was followed by some linchpins (grundbultar) that represents good teaching.

*SUGGESTION: All course leaders in plant protection related courses try to participate in Education for sustainable development as soon as the opportunity comes.*

**Organization and integration of education in plant protection**

For this session the participants chose one of two topics that they wanted to discuss and groups were formed. The topics were given in the call for the workshop as expected outcomes of the workshop.

A. How can we organize teachers and teaching in order to optimize competences, inspire each other, and exchange experiences and ideas across faculties and programmes?

B. How can plant protection become better integrated into SLU’s different education programmes?

The most important topics and the way forward for each of them were reported as follows.

**A. How can we organize teachers and teaching in order to optimize competences, inspire each other, and exchange experiences and ideas across faculties and programmes?**

To optimize competences:

1. Make courses that run parallel on many campuses with common video linked lectures. This also reduces costs.
2. Video linked lectures are necessary to get the right competences. Better systems and more rooms equipped with video conference system are essential. Let teachers try to teach on video link in a safe place, e.g. at a pedagogic course.
3. Facilitate how to find teaching competences within SLU by having a central database for all the staff's competences in teaching. Instead of creating a specific teacher database, this can be done by better descriptions of personal profiles at the employee search on the SLU homepage. Also include teaching competence (that might not be the same as the person's research area) in the profiles. Some of the information can, if needed, be hidden for people outside SLU.

Erik Alexandersson took the responsibility to see if it is possible to include teaching competences in the description of employees on the SLU homepage.

4. Some researchers want to teach but aren't given the possibility. Support (coaching) for these persons is needed to come forward. External lecturers are sometimes booked even though excellent competence exists at another campus. A "rule" from above that SLU teachers should be used as far as it is possible can be a solution. There is also the opposite case that some researchers refuse to teach.

5. Travelling teachers from other campuses can be a problem for environmental certification of courses. Structural change from above is needed to avoid this obstacle.

To inspire each other, and exchange experiences and ideas across faculties and programmes:

1. Collaboration within subject areas over faculties. Look into the possibility to get money for time and travelling to meet and share material, inspiration etc.
2. Set up a teaching material data base for common material, e.g. Power Point presentations from lectures. This also helps teachers to see the content of courses and how their own teaching fit into a course or programme.
3. Is it possible to get funding to go as a guest teacher to another campus? Else lobby for this.
4. Collaboration between faculties to make a common structure and the same introduction to courses on many campuses.

B. How can plant protection become better integrated into SLU's different education programmes?

1. Motivate to course organizers or board of educational programmes why plant protection is important. Lobby.
2. Make "modules" which are presented to course organizers or the boards of educational programmes to "sell" these into courses. Can the Plant protection platform resources be used to create these modules? Modules could be about plant protection in general or thematic, such as historical events that shaped our societies". Such "early tastings" of the subject area could create an interest for further studies.

Good examples from teaching

Nine teachers presented good examples from teaching to inspire the others.

Lena Holm (Dept. of Biosystems and Technology), showed a digital plant protection collection that the students make to prepare for an exam in recognizing weeds, pests and damage symptoms. A secondary aim is to encourage students to go out into the field. The students take photos of weeds, pests or damage symptoms and developmental stages of crops. The photos are put into a Power Point presentation or Word file together with information on
what the photo shows, where it was taken and when. The students think it is a great task.

Anders Kvarnheden (Dept. of Plant Biology), presented teaching via video link on a joint course between SLU, University of Helsinki and NMBU (Norway). Lectures are shared by video link. Other shared activities are study questions (discussed locally), a Moodle homepage for literature and course information, common exam and one common lab week (funded by NOVA and shifting between countries).

Roger Pettersson (Dept. of Wildlife, Fish and Environmental studies), showed how pushpins can be used to point out where to look at e.g. trees and tree branches when showing damage symptoms to large student groups.

Boel Sandskär (Education Centre in Alnarp), showed how useful USB-microscopes can be in teaching. Boel and students use it in the lab. They have also made films, e.g. of a larvae eating a leaf. It can also be used in the field but it needs a steady surface, ex. stool or trunk of a car. USB-microscopes for computers cost about 800 kr and can be found at Kjell & Co etc. There are also USB-microscopes that can be connected to a smart-phone. They costs about 100 Kr at Kjell & Co or similar.

Jonathan Yuen (Dept. of Forest Mycology and Plant Pathology), Understanding resistance genes: Plant pathogens can develop variants that are able to overcome different resistance genes. The number of races that can be differentiated is thus determined by the number of resistance genes available. More genes allow one to differentiate more races. The theoretical number of races is the number $2^x$, where $x$ is the number of genes. Thus, 2 genes allow distinguishing 4 races, 3 genes 8 races etc.

Two isolates can appear to be identical when described with a small number of resistance genes, but will appear different as the number of resistance genes is increased. This can be demonstrated by making something similar to an 'advent calendar' where each calendar has a different combination of virulence and avirulence. The calendars are given to the students, and only two groups (or races) can be seen by opening the first window. As the number of windows opened increases, the number of races that can be distinguished will also increase.

This illustrates that the concept of 'race' is dependent on the existence of resistance genes, and two pathogen isolates may be the same race today, but different with a different set of differentials.

Dan Funck Jensen (Dept. of Forest Mycology and Plant Pathology), presented "theoretical exercise seminars" that he uses in an advanced plant pathology course. The students read an article before the seminar. They then work in groups with a number of questions given by the teacher for about 1.5 hours and the teacher comes by once or twice. Each group presents some of the questions orally for all students, but they won´t know which ones until 20 minutes beforehand. Sometimes students make their own questions or add additional questions to discuss.

Lars Andersson (Dept. of Crop Production Ecology), "The world of herbicides": In evaluations of the course "Växtproduktion" students have expressed a wish to learn more about the mode of action of pesticides. Since commercial herbicides encompass in total 40
active ingredients, in 14 groups of mode of actions, it is not realistic to present these in detail and expect the students to learn.

The learning outcome was instead set to i) have a general understanding of the 14 modes of action, ii) have a more detailed understanding of the three most important modes of action, and iii) understand the role of mode of action in development of herbicide resistance. Teacher’s presentation (overview) was combined with an exercise.

Students were divided into groups, each assigned the task to study in detail one mode of action. They were supplied with basic information and encouraged to search for literature and information on the web. After 1.5 hour, students explained and discussed "their" mode of action to the other groups. The ambition of presenting the full details of a large amount of facts was not realistic given the time available, and neither was it desirable considering learning aims of the agronomy programme. The combination of an overall presentation, group exercise and discussion was an example of active learning, which hopefully fulfilled the learning aims and raised interest among the students.

Laura Grenville-Briggs Didymus (Dept. of Plant Protection Biology), described how she had used a drama workshop/participatory game based approach to teach complex molecular plant-microbe interactions. Individuals were assigned roles as e.g. bacterial cell, protein on surface of bacterium, plant cell wall component or signalling molecule. Each of these had special rules to follow. The class had to play different scenarios, with different rules depending on whether the goal was to achieve disease or resistance.

Annika Djurle (Dept. of Forest Mycology and Plant Pathology): Case studies about plant diseases and insect pests are used in order for students to learn about diseases and insect pests in agriculture. A case consists of description of a disease or insect pest problem plus a picture, and students work on their own to identify its cause, the biology of the pest or pathogen and means for control. This is then discussed in groups and finally summarized in a general discussion between teachers and students. In a flipped classroom environment students practice problem solving, collection and compilation of facts, and communication skills in situations that resemble real working life.

Optional discussions

Upon registration, participants were asked to list three questions that they wanted to work on or discuss during the workshop. Of those suggested some were already included in the program and addressed above. For this session other subjects, as suggested by participants, were listed in the program and one additional subject was suggested. Groups were formed for four topics and the three to four most important topics and the way forward for each of them was reported as follows:

I. Recruitment of students, nationally and internationally, Nordic cooperation.

1. Increase visibility nationally. Visit high schools; e.g. PhD-students that visit high schools to present their research. This is done in a few places. High school students don't know what plant protection is. In advertising material; show interviews with younger students and not with those who graduated 15 years ago.
2. Recruit MSc students with broader biology background. This means that entry requirements need to be changed.
3. New MSc programmes or modules. ELLS subject area.
4. Research based lessons in high school. PhD students have been at labs in "Katedralskolan" in Uppsala. PlantLink in Alnarp also did some work with that.

II. Planning of courses across faculties and programs

1. A common introduction to plant protection. A generic power point presentation (see above) for anyone at any faculty to use. Apply for money to do this. Other subject areas within SLU could do the same.
2. If there was an MSc programme in plant protection with all faculties involved; would there be any students? Would they get jobs? Could they compete with students from the vocational programmes?
3. We discussed the possibilities of having a common plant protection course at advanced level and training courses (fortbildning), both in the form of distance learning. There was not a lot of optimism for a common course. Most students might prefer courses that cover a narrower host range than garden – field – forest crops. For training courses we could be more offensive and offer courses rather than waiting for a question about organizing a course.

III. Methodology.

1. The common situation with many different teachers in a course and that it is important for both teachers and students to understand how the different lectures/exercises fit together. Some course leaders organize short meetings before and after the course to keep the people involved informed. This is one way to help the teachers to understand how their lecture can be adjusted to fit into the rest of the activities.
2. Another potential problem could be that the students have very different backgrounds. This could be of great benefit for discussions in a course, as the students all come with different views on a situation, but it is also a challenge for the teachers to know how to adjust the lectures.
3. A good discussion climate in a course is really good for the whole group and often leads to better learning for the students.
4. Different examination forms, especially oral and written and experiences on how they can be made successful were discussed. In general, the importance of having a type of assessment that is closely linked to the course goals (constructive alignment) is always crucial.

IV. How can a platform for collaboration within subject areas be formed?

Why share material?
1. We don’t have time enough for all of us to re-invent ”the wheel”. Sharing decreases the vulnerability if a teacher e.g. gets sick, dies, or quits the job.
2. By sharing we also get to know the content of other courses on SLU. This makes it easier to make structural changes of programmes etc. when needed.

How can we share material?
1. Use e.g. SLU-sharepoint. One person has to be "webmaster". Another way might be to get access to other courses' Fronter pages.
2. Start with the responsible persons for plant protection in our different courses over faculty boarders (8-10 persons). This group should preferably also discuss course structure, examination forms etc. over courses/faculties.

3. Use UPC as help to structure this idea? Are there good existing examples from other universities (ask UPC and ICE-cap project (Helena Karlén)).

4. Try to apply for some money. Pedagogic project money? Development money for study directors from SLU to be used this spring?

Lena Holm will try to see if there is any possible funding to get this started and will ask UPC and the ICE-cap project if they have good existing examples on how to set this up.

Challenges and solutions

To conclude and summarize the workshop, reflections were made during a "speed dating". The participants formed groups of six persons. Half of them started as tellers and the rest as listeners. The tellers got two minutes to tell a listener about "What is the biggest challenge when enhancing plant protection education at SLU, and what can we do about them?" The instructions said "Skip reality and think of solution". The listener was only allowed to ask for clarifications. After two minutes the teller moved to the second listener and then the third. When all listeners had listened to all tellers, the roles were changed and the speed dating could start again. What happens during such a speed date is that a person’s story is changed over time by influence of what’s been told by the others.

When each participant had talked to two persons and listened to three other persons in the group, a new task was given. The group of six persons was now given two post-it-notes to write down the two most important challenges, one per note, and what we can do about them. Then the group had to position the notes in a triangle depending on at what level, or combination of responsibility levels, they thought something could be done about the challenge; teacher/course level, faculty/department level or SLU level. The notes were placed as shown in Figure 1. Each note is indicated with a number and the content of each note is shown in text boxes below the figure.

The impression, from a first glance at the positions of the notes, is that the university and the faculties/departments are given more responsibility for the answers than the teachers. Some participants wanted a square, rather than a triangle, with a fourth corner representing "department". With a square it would have been more difficult to see interactions so the triangle model, with faculty and department sharing one corner, was kept. If the responsibility was considered to be on the department or faculty level depended on the respective question.

The placement of the notes show that for the questions addressed it is not possible for an individual teacher or even teachers as a group to meet the challenges by themselves. The questions are too big and the solutions would require joint efforts by all categories in the triangle. The initiative would have to come from the teachers or possibly departments or the Plant protection platform – although its role is oriented towards research rather than education.
Figure 1. What are the biggest challenges when enhancing plant protection education at SLU? What can we do about them?

Each number in the figure represents a note and the text on the note is shown below:

1. Make visible for students and SLU
   - biology students + students at SLU: information and e-mail
   - within SLU: - talk to prorector/vice-chancellor, it's a sector responsibility

2. Get students from biology etc. – to masters programmes
   Employable? Länsstyrelse, regeringskansliet
   --> more practical/applied knowledge compared to "biologist"
   Recruit, information

3. We don't have a critical mass of students
   --> Lobbying, Advertise

4. Make the subject plant protection visible within SLU.

5. Society (including students) do not understand the importance of plants and plant protection
   --> Lobbying, Communication with public, schools

6. Faculty
   IPM – in courses with plant protection

7. Too little resources
   - Better coordination

8. Teaching continuity over years and campuses and programs
   --> University financing structure is changed
   <-- Lobbying Government
Conclusions and suggestions

This workshop was successful in several ways. Many of the participants had never talked to each other or met before, at least not in matters about education. Meetings eye to eye and getting to know persons better shortens the distance when it comes to taking initiatives for collaboration or help. It was clear to all that we have a lot in common irrespective of where we work and who our students are. The discussions about what is important and how the message can be presented to different audiences were signs of good collaboration and reminders that we have common goals.

Several suggestions were presented during the workshop. They are listed under the different sections above. For a few of them individual participants took the responsibility to go further with them:

- Erik Alexandersson will contact the ELLS secretariat about forming a plant protection subject area.
- Erik Alexandersson will check if it is possible to include teaching competences in the description of employees on SLU’s homepage.
- Lena Holm will look into the possibilities of getting funding for starting a platform for collaboration on sharing teaching material

The organisers of the workshop suggest that the board of the Plant Protection Platform allocates resources for finalizing the introductory texts about plant protection for different target groups and the common introduction to "What is plant protection?".

Many of the other suggestions involve actions at several levels and it is not clear who should take the initiative and how the suggested activities should be coordinated. The eight points in Figure 1 show important challenges and how they could be met. Unless it could be part of the mission for the current Plant Protection Platform a working group for education in plant protection could be organized and get the mandate to work on meeting the important challenges.

It was suggested that a new workshop should be organized in 1.5 to 2 years.

Uppsala and Alnarp, March 16, 2016
Annika Djurle, Dept. of Forest Mycology and Plant Pathology, Uppsala
Lena Holm, Dept. of Biosystems and Technology, Alnarp
# APPENDIX 1

## Program for Workshop – Plant protection education at SLU

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.45-11.30</td>
<td>Arrival and Coffee in small groups; Start to get to knowing each other</td>
</tr>
<tr>
<td>11.30-11.45</td>
<td>Welcome and practicalities</td>
</tr>
<tr>
<td>11.45-12.30</td>
<td>Plant protection education at SLU today. Short presentations (10 minutes) from: Alnarp; Lena Holm &amp; Peter Anderson, Umeå; Roger Pettersson, Uppsala; Annika Djurle</td>
</tr>
<tr>
<td>12.30-12.45</td>
<td>Introduction to the afternoon activities</td>
</tr>
<tr>
<td>12.45-13.30</td>
<td>Lunch</td>
</tr>
<tr>
<td>13.30-15.00</td>
<td>1. Why is plant protection important? Group work</td>
</tr>
<tr>
<td></td>
<td>2. What is plant protection? Group work</td>
</tr>
<tr>
<td>15.00-15.20</td>
<td>Coffee break</td>
</tr>
<tr>
<td>16.00-17.30</td>
<td>Education for sustainable development and Pedagogic key components. Peter Aspengren, UPC (University pedagogic centre) at SLU</td>
</tr>
<tr>
<td>17.30-17.45</td>
<td>Short information about tomorrow</td>
</tr>
<tr>
<td>17.45-19.00</td>
<td>Break</td>
</tr>
<tr>
<td>19.00-</td>
<td>Dinner and social activities</td>
</tr>
<tr>
<td>8.00-9.00</td>
<td>Group A: How can we organize teachers and teaching in order to optimize competences, inspire each other, and exchange experiences and ideas across faculties and programmes?</td>
</tr>
<tr>
<td>9.00-9.45</td>
<td>Reports from groups and discussion</td>
</tr>
<tr>
<td>9.45-10.15</td>
<td>Coffee break</td>
</tr>
<tr>
<td>10.15-11.45</td>
<td>Good examples from teaching. Short presentations (6 minutes) and discussion: Lena Holm, Anders Kvarnheden, Roger Pettersson, Boel Sandskär, Jonathan Yuen, Dan Funck Jensen, Lars Andersson, Laura Grenville-Briggs Didymus, Annika Djurle</td>
</tr>
<tr>
<td>11.45-12.30</td>
<td>Lunch</td>
</tr>
<tr>
<td>12.30-14.00</td>
<td>Group work. Subjects suggested by organizers or suggestions from participants. Choose your own group.</td>
</tr>
<tr>
<td>14.00-14.15</td>
<td>Coffee break</td>
</tr>
<tr>
<td>14.15-15.30</td>
<td>Reflections, summary, conclusions and next steps</td>
</tr>
<tr>
<td>15.30-</td>
<td>Departure</td>
</tr>
</tbody>
</table>
Appendix 2

- Teaching in plant protection in Alnarp, L. Holm & P. Anderson (slide 1-10)
- Education SLU Umeå, R.B. Pettersson (slide 11-21)
- Plant protection education in Uppsala, A. Djurle (slide 22-24)
- MSc programmes in plant biology, A. Kvarnheden (slide 25-32)
- Best-practice, PlantLink MSc and ELLS, E. Alexandersson & Laura Grenville-Briggs (slide 33-35)
- Workshop Plant protection; new curriculum structure, G. Johansson (slide 36-47)

---

Educational programmes

**3 years**
- Lantmästare
- Trädgårdsspecialist (Tring)
- Landskapsingenjör (Ling)

**5 years**
- Hortonom/Horticulturist
- Landskapsarkitekt/Landscape Architect

**Master**
- Agroecology

---

**Horticulture**

**Tring/Horticulturist**
- Växtskydd, grundkurs/ Plant Protection, Basic Course, 7.5 hp, semester 3

**Horticulturist**
- Växtskydd, påbyggad kurs/ Plant Protection, Basic Course Part II, 10 hp, semester 4
- Management of Pests, Diseases and Weeds. 15 hp, Master
- Insect Chemical Ecology, 15 hp, Master
- Practical Research Training, 15 hp, Master

**Tring**
- Odlingsföretag, 15 hp (3 hp plant protection), semester 4

---

**Landscape**

**Landscape Architect**
- Park- och naturmarksförvaltning med praktik/Park- and landscape management 15 hp (1.5 hp plant protection), semester 3

**Ling**
- Skötsel av grönytor och naturmarker/Maintenance of green areas and natural land 15 hp (1.5 hp plant protection), semester 3

**Several Educations**
- Urban Agriculture and Social Interactions, 15 hp (1.5 hp plant protection)

---

**Agriculture**

**Lantmästare**
- Växtodling, 20 hp + Växtproduktionens teknik och arbetsslutare samt introduktion till skogsbruk, 10 hp (5 hp crop protection), compulsory semester 2

- Växtodlingens styrmedel, 10 hp (8 hp crop protection), elective semester 4

**Agroecology**
- (A few hours)
Teaching competence

- Weed; biology and control
- Bacteriology
- Insects
- Fungi
- Pesticides
- IPM
- Plant-insect and Plant-pathogen interactions

Lacking competence

Currently
- Virology
- (Nematology)
- Application technique

Soon or in a few years time
- Practical horticultural and agricultural plant protection
- Diagnosis in the field

Växtskyddsstigen – Plant protection path

Education
SLU Umeå
Roger B Pettersson

1995→2005→2015
Forest Health and Protection
Basic level 4→10,5→7→4 hp
Forest Managers 180 hp
(Skögmästarskolan Skinnskatteberg)
Wildlife, Fish, and Environmental Studies
Plant protection at SLU Umeå

New program 2016
1st yr Study tour in Northern Sweden 7,5 hp
Content: important abiotic and biotic disturbances and forest health
10,5 hp → 7 hp → 4 or less hp? Basic level
2nd yr Forestry and Society 15 hp
Content: policy, law, conservation biology & forest health
2nd yr Forestry field studies in southern Sweden 7,5 hp
Schedule: 2 days forest entomology and pathology 9 → 7,5 hp = ?
3rd yr Silviculture and forest management planning 15 hp
Schedule: 2 h lecture wind- and snow damage (Erik Valinger)
Solution = advanced level 15 hp

Plant protection at VFM

Animal ecology and ecosystem functioning (13)
Wildlife Ecology

AVERAGE damage to a farm was not extreme,
but 21% of the farmers were losing 18% of
their income from oats, spring wheat and winter wheat –
and this is something what society needs to consider
in the “wild boar” debate.
Plant protection at VFM

Management of Fish and Wildlife Populations
Master's program

Herbivores (e.g. moose, wild boar, fallow deer) and their impacts on plants:

- estimate herbivore density in a wide variety of ways
- identify and quantify the browsing of different herbivore species
- perform adaptive resource management with various stakeholders, e.g. hunters, landowners

Conclusions

Foresters (jägmästare) 300 hp
4 hp basic level + 15 hp advanced

Forest managers (skogsmästare) 180 hp
6 hp integrated Silviculture I + II

Biotiska skador 3 hp + ? 1997-2004
Skogsskydd B 7,5 hp 2004-2006
TBE 3 hp 2005-2011
Skogens hälsa 7,5 hp 2007-2013
Boreal ekologi 6 hp 2012-2016
2017 → ?

Plant protection education in Uppsala, Annika Djurle

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture programme Soil &amp; Plant Science, Plant Biology MSc and Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>*Introductory course: W 0.5/10 hp</td>
</tr>
<tr>
<td></td>
<td>*Field course in crop production W+P&amp;D 2-3/5 hp</td>
</tr>
<tr>
<td>3</td>
<td>*Crop production: W+P&amp;D+U 3/20 hp</td>
</tr>
<tr>
<td></td>
<td>Diseases and pests in agriculture: P&amp;D 10/10hp</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture programme Soil &amp; Plant Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5</td>
<td>Plant pathology: D 15/15 hp</td>
</tr>
<tr>
<td></td>
<td>Collision with compulsory course</td>
</tr>
<tr>
<td>4-5</td>
<td>Genetic diversity and plant breeding</td>
</tr>
<tr>
<td></td>
<td>P&amp;D 1/15 hp</td>
</tr>
<tr>
<td>4-5</td>
<td>Plant microbe interactions</td>
</tr>
<tr>
<td></td>
<td>P&amp;D 10/10 hp</td>
</tr>
<tr>
<td>4-5</td>
<td>Biology and production of agric. plants</td>
</tr>
<tr>
<td></td>
<td>W+P&amp;D (?)</td>
</tr>
<tr>
<td>4-5</td>
<td>0-5/10 hp</td>
</tr>
<tr>
<td>4-5</td>
<td>Agr. cropping systems: W?</td>
</tr>
<tr>
<td></td>
<td>0.5/5 hp</td>
</tr>
<tr>
<td>4-5</td>
<td>Production and utilization of forage:</td>
</tr>
<tr>
<td></td>
<td>W&lt;0,5/10 hp</td>
</tr>
</tbody>
</table>

Year | Cancelled courses in Forestry programmes, MSc Plant biology, Other |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5</td>
<td>Ecology and management of diseases and pests of forest trees:</td>
</tr>
<tr>
<td></td>
<td>P&amp;D 15/15 hp</td>
</tr>
<tr>
<td></td>
<td>Diseases and pests of forest trees: P&amp;D 5/5 hp</td>
</tr>
</tbody>
</table>

Year | Agriculture programme (other than Soil & Plant Science) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td>*Agricultural crop production: W+P&amp;D 1/5 hp</td>
</tr>
</tbody>
</table>

Year | BSc programmes |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>Virology: (P&amp;D 1.5/5 hp)</td>
</tr>
</tbody>
</table>

Year | Landscape architecture programme |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>*Plant biology and plant design contd.: P&amp;D 1.5/6 hp</td>
</tr>
</tbody>
</table>
Changes & Challenges

- Students: too few
- Teachers: will retire
- External financing – continuity in teaching & research in danger
- Narrow & broad competences – both are needed – most difficult to maintain broad competences
- Collisions with compulsory courses – possible to change?

MSc programmes in plant biology

Anders Kvarnheden

Present MSc education at SLU

- Alnarp: Horticultural Science, Agroecology, planned MSc programme with Lund University
- Uppsala: Agriculture Soil/Plant, Plant Biology (with Stockholm Univ. and Uppsala Univ.)
- Umeå: Forest Science, MSc programme at Umeå University

Working group for developing a common master’s programme in plant biology

- L&T: Peter Anderson, Anders Carlsson
- N&J: Anders Kvarnheden, Martin Weih
- S: Ove Nilsson
- SLUSS: Anna Enocksson

- Report to UN in April 2016

Starting points

- Provide supporting material for a possible common master’s programme in plant biology
- Competences from all faculties
- Overlapping content should not be offered unless motivated by needs from professional programmes
- Distance learning
- Interaction with platforms and professional programmes

Previous working group

Peter Anderson and Anders Kvarnheden

Suggestion:
One programme with specialisations at the three locations Alnarp, Umeå and Uppsala
Suggestion evaluated by the new working group

- First term common for the three locations, including introductory course
- Collaboration between courses with similar content when possible
- Lectures by videoconference
- Shared activities through internet
- Mobility of teachers and students

European plant breeding college

Collaboration between:
- SLU
- Institut Polytechnique LaSalle Beauvais, France; Breeding
- Ghent University; Biotechnology
- Universitat Politècnica de València, Spain; Horticulture
- Ege University, Turkey; Seed technology
- Seed and breeding companies
- Funding from Erasmus+, EU, 2015-2017

European plant breeding college

- Pilot case project
- Online seminars
- Webinars (live)
- Intensive study programmes (2 weeks)
- Internship network
- Co-advisory system for master theses
- Communication tools
- Multiplier events

Best-practice, PlantLink MSc attempt and ELLS

Erik Alexandersson and Laura Grenville-Briggs
Dept of Plant Protection Biology

Best-practice money:
- plant-microbe interactions in crop protection at SLU Alnarp
- Meeting with Johan, Boel and Abby
  - Lacking: exercise on sampling and key-out, plant protection theory, monitoring and forecasting of pathogens, regulation of pesticides, competence in viruses
  - Need for more active coordination within Alnarp
- Study visit Wageningen

PlantLink MSc program: “SLU/LU Joint Master’s program Molecular Breeding & Plant Biotechnology”

Euroleague for life science (http://www.euroleague-study.org)
- Subject area: Plant Molecular Breeding and Biotechnology
  - So far 2 MSc summer courses

ELLs Fund for incentives
**Workshop - Plant protection**
Gerd Johansson, director of studies for the Agriculture programme – plant and soil science

---

**New curriculum structure for education at SLU**

- overall guidelines approved by the Vice Chancellor at SLU October 2013
- a curriculum structure with 15 credit courses

Deals also with e.g.
- entry requirements to education programs and courses
- internationalization of the education, student mobility
- new graduation requirements

---

**Guidelines**

- Courses must include 15 credits; full-time studies in a period.
- 7.5 + 7.5 credits can be used if justified
- Summer courses are excepted from the requirement
- Independent degree project courses will include 15, 30, 45 eller 60 credits

---

**Internationalization**

- 1 semester for the opportunity to study abroad at both undergraduate and graduate level
- Prerequisites for courses in semesters after "exchange semester" will not create problems for students after exchange

---

**Guidelines**

- 15 credits internship, study or equivalent (off campus)
- 10 credits of each of social sciences / biology / technology must be included in each of the five Agriculture programs and Agricultural and Rural Management Programme (lantmästarprogrammet)
- 60 credits shared content for all five Agriculture programs

---

**Further**

- Curriculum according to the new structure for students starting at year 1 at a basic level programme in autumn 2016
- Academic year 18/19 will all years at all programmes at basic and advanced level follow the new structure
- The five agriculture programs are extended to 5 years
New curriculum structure for education at SLU

More about this and with progression......

- Train generell competences and skills
- Education for sustainable development
- Internationalization
- Progression! Continue where the students are.

Agriculture programme – soil and plant science
New Curriculum structure from 2016

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2016/17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic course - Agriculture Plant and soil, 15 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant production I, 15 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant production II, 15 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil management in crop production, 15 cr (10 cr in period 3, cont. in period 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent degree project, bachelor level, 15 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project management, 15 hp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced courses in Biology, and Soil science, Applied Practicies for Agronomists, International rural development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent degree project, Masters thesis, 30 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Agriculture programme – soil and plant science
Curriculum for students applied autumn 2014

Agriculture programme – 4,5 year and Master in biology or soil science – 5 år

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant production, 10 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant production, 15 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field course in crop production, 15 cr (10 cr in period 3, cont. in period 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil management in crop production, 15 cr (10 cr in period 3, cont. in period 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent degree project, Masters thesis, 30 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant production, 15 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field course in crop production, 15 cr (10 cr in period 3, cont. in period 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent degree project, Masters thesis, 30 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

New curriculum structure for independent degree project at SLU level

- Coordination between the five agriculture programme (joint courses or parts of courses)
- Coordination between agriculture and bachelor’s programme
- Coordination between agriculture and master’s programme
- Joint syllabus for independent degree project at SLU level