



PlantLink

10 years

An evaluation of activities

Published spring 2021





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PlantLink at a glance — foreword by former PlantLink chair Marianne Sommarin

In the autumn of 2009, a working group was assigned by Lund University (LU) and the Swedish University of Agricultural Sciences (SLU Alnarp) to identify strong plant research areas and researchers in Southern Sweden. We found that the strong competencies in plant biotechnology, breeding and stress biology could form the base for a unique centre for basic and applied plant research. There were clear possible connections to the needs and future development of plant breeding companies in the region as well as other green industries. PlantLink was thus established in 2011 as an alliance between LU and SLU Alnarp and with initial financial support also from Region Skåne (the Skåne Regional Council). When looking back at the achievements during the past 10 years certain things stand out:

The importance of a good name. The name PlantLink turned out to be ideal when using in social media to launch the collaboration and to spread plant science news and information from a Southern Sweden perspective, as evidenced by the continuous regional, national and international interest received.

The successful seed money initiative, financed by the Skåne Regional Council, with the goal to stimulate novel, innovative pilot projects and kick-start new collaborations in plant science between LU and SLU Alnarp. This initiative has indeed resulted in several new external research grants with substantial funding.

All the important networking initiatives – meetings, workshops, educational initiatives, social media, homepage, monthly newsletter etc. – that have sparked interest in plant research and facilitated meetings between plant researchers in academia, industry and the society leading forward to new research ideas and innovation.

Last but not least, I want to acknowledge the great work done by Leif Bülow, LTH (former Director) and Erik Alexandersson, SLU (present Director) and their teams, as seen in this report. With enthusiasm, skill and energy, they took on the challenge to develop PlantLink into what it stands for today – an established, well-known and active actor that advocates plant research both regionally, nationally and internationally – as expressed by the new motto: “PlantLink – strengthening plant research, education, and innovation in Southern Sweden for a sustainable society”

Marianne Sommarin

January 2021



Marianne Sommarin

former chair

PlantLink 10 years — an evaluation of activities

The second term of PlantLink (2016-2021) is coming to an end. The agreement signed by the deans of LU's Faculty of Science and LTH and SLU's LTV faculty in 2016 stated that two evaluations should be done. A self-evaluation for the period 2016-2018 has already been presented and is available at www.plantlink.se/about/evaluation. For this second evaluation we have taken the liberty to assign an external reviewer as well as performed individual interviews with a panel representing 16 external stakeholders to obtain a broader, and hopefully more objective, view of PlantLink's activities. We have also taken the opportunity to summarise PlantLink's performance and assess its influence on plant research in the southern Swedish region from the start in 2011. In 2021 we will celebrate PlantLink's 10th year as a research network!

The evaluation was carried out by Erik Alexandersson (Director, SLU), Tina D'Herfeldt (Deputy Director, LU) and Sofia Marmon (PlantLink coordinator). Professor emeritus Per Gardeström at Umeå University has performed an external review of the research collaborations between LU and SLU as part of PlantLink. Marianne Sommarin, former chair of PlantLink (2011-2018), has written the foreword. Bibliometric evaluation of the impact of PlantLink was done in cooperation with Fredrik Åström at Lund University Library.

»In 2021 we will celebrate PlantLink's 10th year as a research network!«

PlantLink's first ten years at a glance

- 🌀 Kicked-off 27 September 2011 by LTV dean Tiina Sarap and LU vice chancellor Per Eriksson
 - 🌀 Created an active LU-SLU cross-disciplinary plant research environment for Southern Sweden
 - 🌀 Awarded 21 cross-universities seed money projects leading to 5 major grants (attracting >80 Million SEK) and so far 22 peer-reviewed publications
 - 🌀 Provided bioinformatics support to >30 projects with so far 30 publications
 - 🌀 Platform for networking with >30 meetings and workshops, social media, homepage, monthly newsletters
 - 🌀 Interactions with Swedish and international plant organisations through meetings, workshops, education and outreach activities
 - 🌀 Support to initiate the research centres SSF-funded ScanOats and NordForsk-funded NordPlant with total turn-over >120 Million SEK
 - 🌀 PhD education: >20 plant-specific courses, Industrial mentorship programme
 - 🌀 Master Education: Annual ELLS summer courses with over 200 MSc students
 - 🌀 Active memberships in European Plant Science Organisation and Plant Biologicals Network Southern Scandinavia
 - 🌀 Letter of collaboration signed with PLEN at University of Copenhagen
 - 🌀 Realization of five Fascination of Plants Days and other public outreach events
-

Description of PlantLink's aims and activities

PlantLink is a network for plant science in Southern Sweden. It was established in 2011 as an alliance between Lund University (LU) and the Swedish University of Agricultural Sciences in Alnarp (SLU Alnarp) with initial financial support from Region Skåne (the Skåne Regional Council).

Since the start, PlantLink's mission has been to provide a network platform to stimulate, unite and promote plant research and related higher education in the region.

PlantLink wants to lift the advantage of using both basic and applied plant research with the objective to provide plants for healthy food, medication, energy and new green materials in a sustainable way. This requires a wide variety of techniques over many scales – ranging from DNA sequencing to satellite imaging.

PlantLink strives to increase the interest and competence in plant science through education and information. Our goal is to create an environment that excels in plant research and innovation and that leads to dynamic interactions between the universities, private companies and the general public. Higher education in this discipline should be attractive internationally and offer a stimulating study environment in plant biology.

Initially the focus of PlantLink was on molecular biology and agricultural crops divided into 5 focus areas (see Table 1). The scope was expanded during the second term starting in 2016 to also include forestry as well as aspects of plants in relation to human society, resulting in the formation of the new sixth focus group, "Plants, people and society". This development has led to broader representation of researchers in the region, and an increased collaboration with Danish universities.

As part of this report, we want to present a new motto which better reflects our recent and current activities: **»PlantLink – strengthening plant research, education, and innovation in Southern Sweden for a sustainable society«**

This new motto highlights our ambition to be a quick-footed, regional unit to spark interest in plant research and facilitate meetings between plant researchers in academia, industry and the society leading to new research ideas and innovation.

We therefore leave our former vision "To create an internationally leading environment for plant research" behind. The former vision should of course still be the aim for the region, and we do feel that plant research and researchers stand stronger and better organised regionally now than when we entered the scene 10 years ago. But PlantLink will not in itself be the host of such an environment, instead we see ourselves going from being the creator to the facilitator of a vibrant plant research community.

**PlantLink –
Strengthening
plant research,
education, and
innovation in
Southern Sweden
for a sustainable
society**

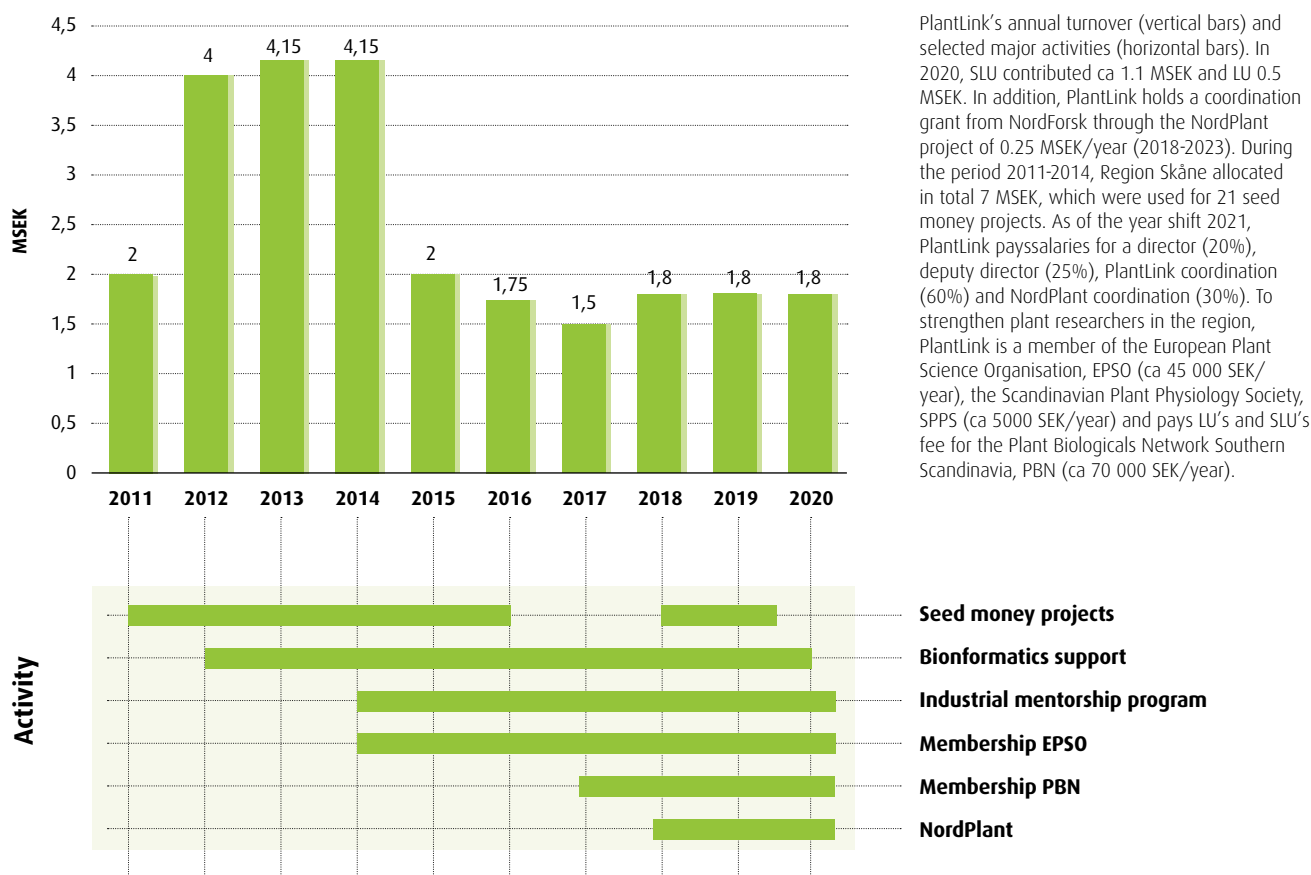
Table 1: Focus Areas

- 1 Plant breeding and engineering
- 2 'Post-harvest' — quality and new products
- 3 Abiotic stress
- 4 Biotic interactions
- 5 Modelling and informatics
- 6 Plants, people and society

In total, more than 40 principal investigators are represented as PlantLink-associated researchers.

For associated researchers see:
www.plantlink.se/associated-scientists

Fig 1 – Economy and PlantLink memberships



Results of PlantLink's activities

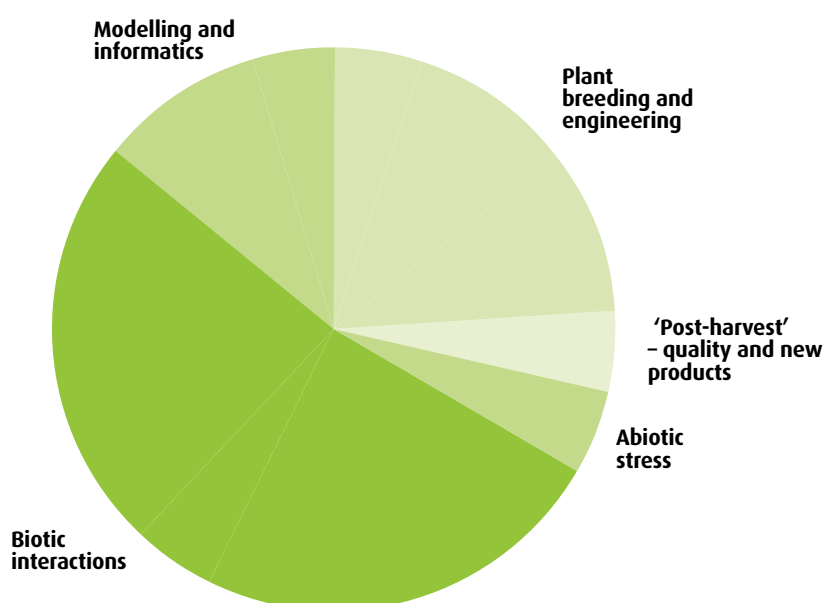
When PlantLink was initiated in 2011 it was decided to devote a large part of resources to seed money projects. The idea was to stimulate novel, innovative pilot projects and kick-start new collaborations in plant science between LU and SLU Alnarp. Scientific excellence, a high degree of freedom and a low administrative burden guided the calls. In total 21 seed money grants of 0.4-0.5 MSEK have been awarded (to 19 projects + 2 continuation grants).

The outcome of the first 18 seed money projects is summarized in the report "Summary of PlantLink Seed Money Projects" published in 2017 (www.plantlink.se/about/evaluation) For the current evaluation, all main researchers awarded seed money were asked to conduct an online survey at the end of 2020 on the outcomes of their projects. In addition, Per Gardeström, professor emeritus at Umeå University, has evaluated the outcome of these in his external review of PlantLink (page 20).

The seed money summary and the survey show that the seed money projects led to larger projects. International contacts were established, and further grants were awarded to at least eight of the different projects. The funding agencies include Crafoord, SIDA, SLU Grogrund, Mistra Biotech, the Ice-3 Strategic fund,

»The seed money summary and the survey show that the seed money projects led to larger projects.«

Fig 2 – Seedmoney Projects



Formas and VR. The Foundation for Strategic Research (SSF) granted funding to two former seed money projects, equalling over 80 MSEK together. The projects started in 2018 are still ongoing, and six of the other projects or new collaborations continued for at least two years after the seed money projects finished.

More than 50 researchers spread over seven university departments as well as several local companies have benefited from the seed money. The seed money projects have so far resulted in 21 peer reviewed publications (www.plantlink.se/about/evaluation). An overview of the topics covered in the seed money projects is seen in Figure 2.

Open seminars

PlantLink has organized open seminars for both academic and non-academic researchers on plant-related themes (www.plantlink.se/events). Each year, we arrange the PlantLink Day with invited international speakers under different themes to highlight PlantLink's work, projects we support and interesting new science. The PlantLink day alternates between Alnarp and Lund and has attracted between 70 and 110 participants each year.

Social media and homepage

PlantLink has worked extensively with social media to spread plant science news and information from a Southern Sweden perspective. Our Twitter account, which has been active since 2011, has more than 1300 followers representing important organizations in plant science such as journals, institutes and companies. Over 2000 follow our Facebook page. Nine newsletters are distributed per year and our homepage carries information on PlantLink's work and structure, associated researchers, relevant courses etc. Since 2018 we also administer NordPlant's homepage and newsletter (see more under NordPlant).

Outreach - high schools and general public

It is important to stimulate interest in plant research at an early stage. We have therefore welcomed guided visits for high school students and engaged in the research network Skåne (www.visvis.se), which has made it possible for over 20 high school students to do a two-week summer internship in plant science over the last nine years. Furthermore, PlantLink has arranged activities within the global event Fascination of Plants Day five times in the Malmö-Lund area.

Increased interactions with other actors in the Nordic countries

PlantLink and the Department of Plant and Environment Sciences (PLEN) at University of Copenhagen, have organized several joint events, and engaged in an active discussion around plant research in the region. To formalize this work, a Letter of Collaboration was signed in October 2017. A task force working on ►



- joint projects was formed in spring 2018 with members from SLU Alnarp, LU and Copenhagen University. The aim of the taskforce is to improve the flow of plant-related information between Skåne and Copenhagen and to identify areas of common interest, for example a joint job fair was arranged in Ystad.

PlantLink's interactions with the other national plant research centres Umeå Plant Science Center (UPSC) and The Linnean Center for Plant Biology in Uppsala (LCPU) have continued. Our interactions with other Nordic universities have been strengthened. Foremost with the University of Helsinki and Arctic University of Norway who like University of Copenhagen are members of NordPlant, and Aarhus university and the Norwegian University of Life Sciences (NMBU), that are part of the recently NKJ funded network, NordCrop. This network supported by PlantLink strives to identify more climate-robust Nordic field crops and runs 2020-2022.

NordPlant — a new externally funded Nordic University Hub led by PlantLink

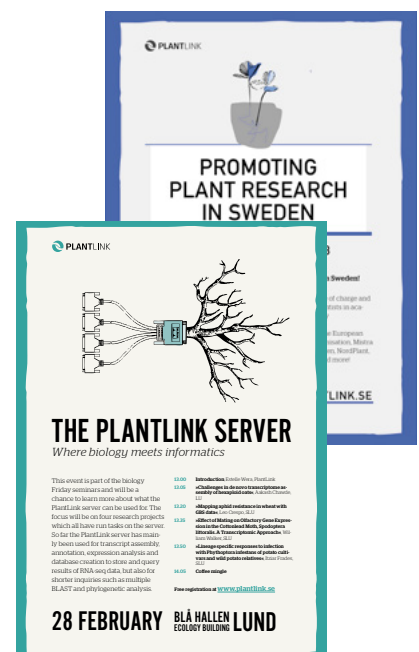
In December 2017, a PlantLink-led consortium was granted 16 MSEK from NordForsk with 32 MSEK in co-funding from the participating universities to establish a Nordic University Hub. The competition was stiff with only 6 out of 63 applications granted. A prolongation of three years was granted in 2020. "NordPlant - a Climate and Plant Phenomics Hub for Sustainable Agriculture and Forest Production in Future Nordic Climates" is a research hub focusing on plant phenotyping, growth facilities and climate modelling. Apart from specific research projects, NordPlant has a strong focus on joint data standards for handling and annotating data as well as practical facilitation of plant phenotyping experiments. By the beginning of 2021, NordPlant associated projects has led to over 20 research articles. In addition to LU and SLU, NordPlant consists of Arctic University of Norway, University of Helsinki and University of Copenhagen. For more information on NordPlant see www.nordplant.org.

Research education

Research education plays a very important part when it comes to stimulating cooperation across the traditional faculty and university boundaries. PlantLink has therefore established cooperation with existing research schools and courses at LU and the LTV faculty in Alnarp. The collaboration with Postgraduate Courses in Life Science (PCLS), where LTV now is a member, has been particularly important, since it has given PhD students at both LU and SLU Alnarp a wider access to postgraduate courses. This cooperation has provided students at SLU Alnarp with access to PCLS courses as LU students for the first time.

In all, PlantLink has supported and facilitated more than 20 courses since its start and is represented in the steering group of the Bioeconomy research school, which is coordinated by Deniz Koca, LU.

»Research education plays a very important part when it comes to stimulating cooperation across the traditional faculty and university boundaries.«



Industrial mentorship program for PhDs and postdocs

Since 2014 we have run a popular small-scale Industrial mentorship program for PhDs and postdocs in the area of plant research four times. The main goal has been for the students to feel comfortable in presenting their research to the mentors and for them to visit the mentors' workplaces to gain a better insight into work outside academia.

Together with the student unions and University of Copenhagen, a two-day job fair for postdocs and PhDs was organised in February 2019 with over 70 participants from Copenhagen University, SLU Alnarp and Lund University at the beautiful Ystad Saltsjöbad. The programme has created good communication channels between the universities and local companies.

Undergraduate education

We strive to stimulate student exchanges between LU and SLU Alnarp and that students at the respective universities interested in plant biology become aware of relevant courses and other activities at both universities in the region. On our homepage we have links to available plant-related courses at both LU and SLU.

PlantLink has been active in the Euroleague for Life Sciences (ELLS) since 2012. ELLS is a network of seven European and three non-European partner universities. Within ELLS, PlantLink has initiated two different "subject area" groups "Plant Molecular Breeding and Biotechnology" and "Plant health". ELLS has strongly contributed to PlantLink's international profile and draws attention to plant research in the region with yearly MSc summer schools.

PlantLink is also active in ESCAPaDe (2018-2021), an Erasmus program to improve and provide teaching tools for plant science (<http://escapade-erasmus.eu/>). ESCAPaDe has a course database and search tool that aims to help students in applied plant sciences plan their study. A summer school and a job fair also open for PhDs and postdocs will be organized together with ELLS in Alnarp in August 2021.

In 2018, a pilot teacher exchange between LU and SLU Alnarp was initiated where PlantLink covers the costs for the teaching hours. PlantLink has continued this support as the teachers reported that the exchange was appreciated and that it added knowledge to both universities on subjects that would otherwise be missing.

Innovation and private enterprises

Several of PlantLink's research activities are in close collaboration with local businesses, foremost in crop protection and plant breeding. One important outcome is the abovementioned PlantLink Industrial mentorship program. Representatives ►



»Since 2014 we have run a popular small-scale Industrial mentorship program for PhDs and postdocs.«

► from Lantmännen Lantbruk, MariboHilleshög, Corteva Agriscience, CropTailor, Bona kemi, Lindesro, Danone and Svea skog have participated as mentors.

PlantLink events have also been a meeting place between academia and private businesses, and during the annual PlantLink day representatives of companies have presented talks. Also worth mentioning is that both industry graduates and business representatives are welcome to and have participated in PlantLink-supported courses and workshops. We find that this creates a dynamic appreciated by both academy and industry researchers.

A network for networks?

Southern Sweden has during the last 10 years seen a remarkable increase in the number of networks and organizations for plant science. Since PlantLink is directly or indirectly related to a majority of the networks, we organized an Open Strategic network meeting with representatives of networks and organisations related to plant science in Skåne in March 2020.

The aim was to investigate how to collaborate in an efficient way in the growing eco-system of all these plant-related initiatives. During the meeting, 24 organizations discussed potential links in research, education and innovation. Annika Åhnberg (Växtnoden) summarized that plant research in the region is better organized today than at the start of PlantLink. In addition, the sector of plant science receives increased interest from society, providing options to work towards regional support. A discussion on innovation and policy, monitored by Lise Lykke Steffensen (NordGen), centered around communication, long-term commitment and building trust. The network-for-networks meeting concluded that there is certainly room for increased collaboration between the universities, industry and policymakers in the region. Based on this, PlantLink will investigate future initiatives for regional network-to-network interactions.

2020 – a challenging year for all networks

The global outbreak of covid-19 during spring 2020 called for new ways of networking. PlantLink tried to adapt quickly and the Open Strategic network meeting was with short notice shifted partly online. Furthermore, the outbreak triggered PlantLink to host its first international webinar: “Healthier plants with the help of Biologicals?”, which attracted over 150 participants all over the globe. This webinar was part of the UN’s International Year of Plant Health, which has been largely overshadowed by the covid-19 outbreak with most events cancelled or postponed. This event was followed up by a webinar on policy for plant biotechnology comparing sub-Saharan Africa and Europe in September. We also held our yearly PlantLink day online in October, which attracted more than 100 participants. We are looking into new, innovative ideas to keep the networking going online. ■



»Plant research in the region is better organized today than at the start of PlantLink.«



Future focus of PlantLink

PlantLink has, through its activities, established itself as a well-known actor and advocate for plant research regionally, nationally and internationally. It has strengthened the ties between LU and SLU and more lately also with the University of Copenhagen. Based on our experiences and development, we did a SWOT analysis and listed areas where PlantLink could engage in our previous self-evaluation (2016-2018). These are still highly relevant and should be developed further and refer to our previous evaluation for more details on our thinking. Here we again highlight the areas previously identified:

- Complementing other existing plant-related networks and research projects
- Strengthening of cross-disciplinary plant research
- Regulation of plant biotech
- Research on abiotic stress
- Integrated pest management and plant biologicals
- Outreach towards agri-tech and Artificial Intelligence (AI)

We have worked with these important areas in various ways during the last two years. We have made clear progress in engaging more with other plant-related networks and organisations in the region, manifested in a network event for plant-related networks and organisations in the region. Our recruitment of a coordinator mid-2020 has also clearly increased our abilities to interact and communicate.

Research on abiotic stress is becoming more important with climate change. To this end we managed to secure an NKJ network grant “NordCrop”, which focuses on crop physiology and abiotic stress. Regarding plant biologicals, PlantLink is now also covering the membership of LU in the Plant Biologicals Network, further strengthening Swedish representation.

NordPlant has continued its progress around agri-tech and artificial intelligence. For example, the annual meeting in Lund 2019 “Tech talks for plant phenotyping in the Nordic countries” had a clear focus on interaction with tech companies and we managed to do our most mixed event between academia and industry so far with almost half of the participants from industry.

Resources have been made available to develop PlantLink during the last 2-year period by terminating the PlantLink bioinformatics support. Still, PlantLink will need to focus the budget further due to the lower annual budget since the support from LU was halved in 2017. To fully take advantage of the positive outcomes of the efforts so far made by PlantLink we strongly think that an increase in the current base funding is needed.

»PlantLink has strengthened the ties between LU and SLU and more lately with University of Copenhagen.«

What others think about PlantLink

As part of this evaluation, we held discussions with representatives from 16 departments and organizations relevant for plant research in the region, see table 2. Earlier during the fall 2020 we had a similar meeting with Carin Jarl Sunesson, head of Department of Biology (LU), thus this organization was not included again.

The representatives were generally very positive towards PlantLink, and commented that PlantLink had contributed positively to their organizations and also pinpointed areas for further future collaboration. One statement was that "PlantLink gives plant research a face in the region". However, two representatives raised that PlantLink is still perceived to be too much oriented towards molecular biology (as a heritage from the original focus), and another ►

»PlantLink gives
plant research
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region.«

Table 2: Representatives met (online) for discussions about PlantLink's future

Name	Organization
Henrik Smith	Director of Centre for Environmental and Climate Science (LU)
Hanna Sassner	Head of Dept. of Biosystems and Technology (SLU)
Leif Bülow	Head of Dept. of Chemistry; Director Scanoats (LU)
Jonathan Seaquist	Head of Dept. of Physical Geography and Ecosystem Science (LU)
Anders Carlsson	Head of Dept. of Plant Breeding (SLU)
Rickard Ignell	Head at Dept. of Plant Protection Biology (SLU)
Jenny Bergsten	Food strategist at Dept. for Regional Development (Region Skåne)
Lena Ekelund Axelsson	Vice dean of LTV Faculty; FoodTech Links (SLU)
Emily Boyd	Director of LUCSUS (LU Centre for Sustainability Studies)
Olivier van Aken	Founder of LUPS (LU Plant Sciences)
Lise Lykke Steffensen	Director of NordGen
Dennis Eriksson	Founder of PlantED (SLU)
Eva Johansson	Director of SLU Grogrund
Carl-Otto Swarz	Director of SLU Partnership Alnarp
Vilis Brukas	Head of Southern Swedish Forest Research Centre (SLU)
Kristina Santen	Head of the Unit for Collaboration and Development (SLU)

-
- representative remarked that the PlantLink was relatively unknown in their organization. It was thus agreed that PlantLink should present itself in the latter organization and two more during spring 2021.

During the discussions, many representatives mentioned the newsletter to be very good and useful. Also, the seed-money was mentioned many times as having been very positive, and several representatives suggested ways for PlantLink to get additional funding to be able to support more seed-money-projects in the future. Other ideas to increase collaborations and connections between LU and SLU and other organizations were discussed, and seminars as well as PlantLink's good position in connecting researchers and stakeholders were mentioned in several discussions as positive. A new idea raised during an early discussion, and that many agreed would be relevant, was the organization of hack-a-thons, round-table discussions, or similar, to start more in-depth discussions. These should be around "hot" topics with relevance from both a research and stakeholder perspective, involve younger scientists and be strategically organized in time to be a good starting points for writing grant proposals. Another new idea that got a lot of support was that PlantLink should organize a seminar series where different plant networks and organizations could introduce themselves more to the plant research community. PlantLink was seen as ideal for arranging such events with its good connections to researchers, something that was mentioned in several discussions, especially by representatives from organizations other than university departments.

Online surveys

After our meetings the representatives were asked to score the importance of 18 future activities for PlantLink in an online survey. An open anonymous survey with the same questions was also distributed in our newsletter as well as by e-mails to company representatives, to get input from a larger number of people. The activities scored and detailed results from the survey can be found at www.plantlink.se/about/evaluation.

In the open survey, "PlantLink's newsletter" was ranked the highest (average 4.2 of 5), especially among academic researchers where over 90% ranked the newsletter as important or very important. The other top activities were "the Annual PlantLink Day", "Support to regional research infrastructures for plant research", "Meeting venue for academia and industry" and the "PlantLink Homepage". The company representatives answered a bit differently. In this group the newsletter was deemed less important, and "Meeting venue for academia and industry" was scored the highest. The lowest scored activity was "to appoint regional leaders of the focus areas and compensate them with some salary", followed by "undergraduate education". The representatives scored relatively similar to the general survey, where the top scores given to "Annual PlantLink Day", "Other seminars/workshops" and "PlantLinks newsletter". In general,

»PlantLink support
has resulted in
at least 52 peer-
reviewed articles.«

activities in which PlantLink has already been engaged for a longer time were given higher scores than ones we have not yet attempted.

Identifying future focus areas and additional external funding

PlantLink has continued to support several grant proposals. In 2019 this led to NordCrop being founded by NKJ, and the establishment of the Advanced study group "Species and Alien Species" by the Pufendorf Institute for Advanced Studies. PlantLink is part of the stakeholder group of the H2020 funded project CropBooster-P. PlantLink supports this project that is aiming at identifying priorities and opportunities to adapt and boost the productivity of crops in the light of coming environmental and societal changes. The objective is to produce a quantitative evaluation of the most promising practical approaches to achieve a sustainable food supply in the future.

Bibliometric evaluation 2020

PlantLink has supported many researchers, either through seed money grants, or through the assistance of a bioinformatician. This support has resulted in at least 52 peer-reviewed articles. Of these 47 were included in the bibliometric evaluation, since one was not covered in Scopus and four were reported after the evaluation. Of the articles 21 results from the seed-money projects and 31 from the bioinformatic support. 17 of the articles had authors from both LU and SLU. The number of publications from 2012-2020 is seen in Figure 3. ►

»Plant link support has resulted in several top-articles.«

Fig 3 – Number of publications

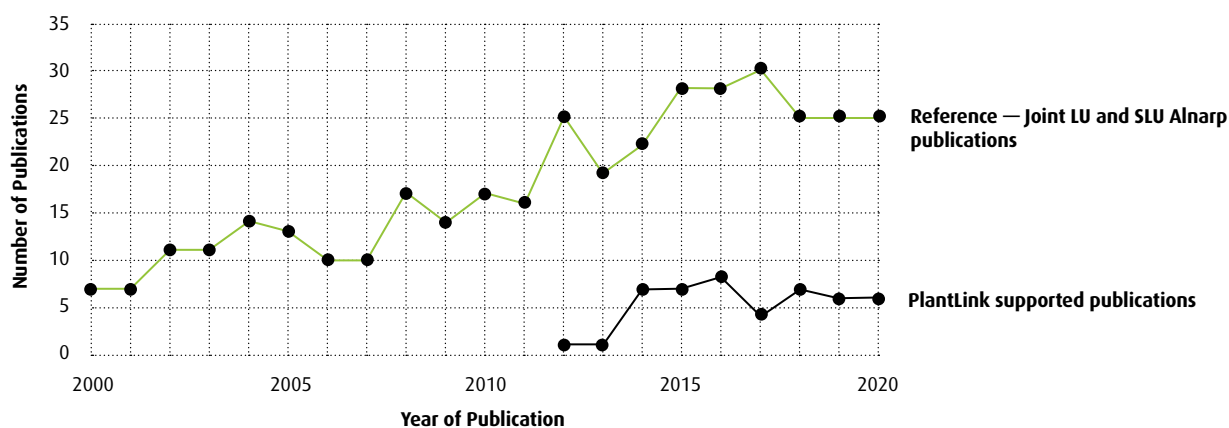
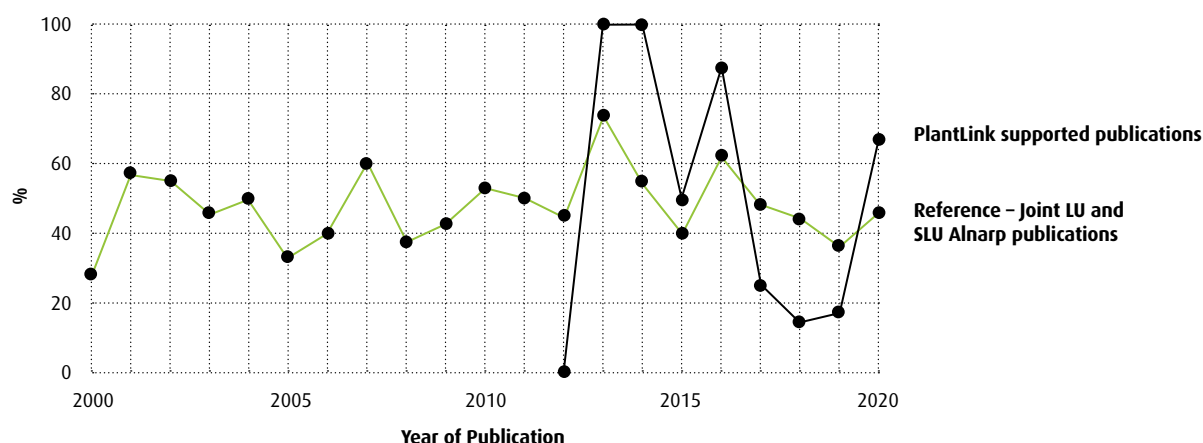


Fig 4 – Publications in Top 10% Journal Percentiles by SJR



- The publications were also evaluated based on the number of citations, field weighted citation impact, and publications in top 10% citation percentile. The overall conclusion is that the PlantLink support has resulted in several top-articles, which for example can be seen in Figure 4, showing the part of publications in top 10% Journal Percentiles by SJR, even if there is a large variation between publications. There is also a clear increase in overall joint LU and SLU Alnarp publications from 2011 when PlantLink was launched. ■

A list of all articles and more results from the bibliometric evaluation are found at: www.plantlink.se/about/evaluation



External evaluation of research co-operations supported by PlantLink

Plant Link started in 2011 with a main goal to increase research collaborations in the plant field between Lund University and SLU Alnarp. A major initiative towards this goal was to announce “seed money” for pilot research projects with the aim to support new collaborations between researchers from the two universities.

The seed money initiative was open for applications at five occasions, first four yearly calls during 2011-2014 and finally one call in 2018. A total of 68 applications were received covering many different research fields within plant sciences in the two universities. The evaluation of the applications involved external experts and 21 pilot projects were supported by grants of between 400 000 to 500 000 kr. Two of the projects got support for a second round; so in total 19 different projects were financed. The overall success rate was ca 30% with a span between 18% to 45% for the different announcements.

The goal to support new collaborations turned out to be very successful. In just a few of the projects (4 of the 21) prior co-publications between the partners were documented in Web of Science, however, those were mainly on projects not directly related to those applied from the seed money initiative. Most of the projects from the first four calls (2011-2014) have resulted in publications documented in Web of Science (13 out of the 19 projects) although in a few cases only with one partner represented in the author list. Anyway, given that all the projects were new this must be regarded as a very positive outcome. An even more positive effect is that over 40% of the projects (8 out of the 19) have resulted in successful applications to other funding agencies, some of them with major grants. The three projects from the last call in 2018 have not yet resulted in publications but give positive preliminary reports, and one of them has already received additional external funding.

An increased collaboration between LU and SLU Alnarp could be observed in a bibliometric study of co-publications using Scopus for the period between 2000 and 2020. During this period the number of co-publications doubled and about 40% of the increase detected in the last five-year period could be attributed to PlantLink activities. A similar trend could be seen from the publication statistics based on Web of Science. In the three years just before the seed money initiative (2009-2011) a total of 39 co-publications between LU and SLU Alnarp within the biology/chemistry area were found (with reservation to subjective classification from my part). In the three-year period 2017-2019 the co-publications increased by 24 to 63 in the same subject category. This 62% increase can be directly attributed to seed money projects to a substantial degree, but also to the program for bioinformatics support. In addition, a number of publications not listed in Web of Science were also reported.

As discussed above, the seed money initiative has been very successful but what could be the main elements behind this success? One important factor could be a suitable size of the grants for their purpose — sufficient to test



Per Gardeström

This part of the report is written by the external evaluator Professor emeritus Per Gardeström at Umeå University.

the ideas as indicated by publications from most projects but still allowing a substantial number of pilot projects to be supported. A second factor could be the repeated announcements, which would gradually increase the awareness of the possibility to obtain support for new projects. The first round had the lowest number of applications (resulting in the highest success rate), but more applications were then submitted to the following two calls with a dip at the fourth announcement. After the three year break the last announcement got the highest number of applications (but fewest supported projects). It would perhaps have been better to spread out the last two applications.

In addition to the success of the granted projects, even the applications that did not receive support could still give positive effects on future collaborations from the joint efforts to find and formulate possible common research activities. However, this aspect is quite difficult to evaluate.

In summary

The seed money initiative has been very successful in its goal to increase research collaborations in the plant field between researchers from Lund University and SLU Alnarp. The initiative has not only been a success with respect to research achievements but also in economic terms with at least ten-fold new external grants as compared to the cost of the initiative. Since the last call for seed money in 2018 received the highest number of applications it is obvious that the interest for this opportunity continues to be high. A possible future support along the seed money principles would therefore be very valuable. Perhaps a couple of announcements at two-year intervals would be a reasonable way to continue.

Per Gardeström

Umeå, December 2020

»The initiative has not only been a success with respect to research achievements but also in economical terms.«

»The seed money initiative has been very successful in its goal to increase research collaborations in the plant field between researchers from Lund University and SLU Alnarp.«

Strategies to further develop PlantLink — a summary

PlantLink will continue with networking initiatives in Southern Sweden to further develop research cooperation across disciplines. It is important that PlantLink collaborates closely with other national and international plant research networks and centers. The collaboration with University of Copenhagen was manifested in the end of 2017 through a Letter of Collaboration. Together with Umeå Plant Science Center (UPSC) and The Linnean Center for Plant Biology in Uppsala (LCPU) we have discussed to introduce biennial Plant Biology Days Sweden. According to our general survey, 50% of the respondents are positive or very positive to this idea. This could become a valuable national platform to highlight the importance of plant research in Sweden and to meet national funding bodies.

During the last year we have also intensified our engagement with other networks and organizations active in plant research in the region as we have seen many new, strong initiatives and feel that there is an increased local need for plant researchers both in academia and private sector. To further develop communications between the networks and interested researchers, a plan for the near future is for PlantLink to host a seminar series in which local networks and facilities introduce themselves.

PlantLink is coordinating NordPlant which has led to closer contacts with other Nordic Universities, NordForsk and NordGen. This gives good possibilities to develop research collaborations around AgriTech and robust plants in future climates, which we feel has the possibility to become strong in the region. On the European level we are continuing our engagement in European Plant Science Organisation (EPSO) to lift the importance of plant research and regulations of plant biotech favouring its development in Sweden and the EU.

Students and industry play an important part

Attracting students to plant science remains challenging and the low number of students is a clear threat to the regrowth of researchers in the region. Even if LU is not a formal member in the European League for Life Sciences (ELLS; SLU and

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University of Copenhagen are full members), this education network primarily targeting MSc students is also an important venue to promote the region's activity in plant education and research.

At the moment, PlantLink's primary direct contact with local companies is through our Industrial mentorship program as well as the open workshops and meetings organized by us. Despite the challenges related to the outbreak of covid-19 in 2020, we hope to continue strengthening these contacts as they will be pivotal to realize the research findings of the scientists in the network and drive plant research forward. The idea from our discussions (see p. 16) to host "hack-a-thons" with both researchers and stakeholders would be a new platform for increased direct contact.

Efforts to increase cross-disciplinary communication

To take a more active role as the spider in the web between researchers, private companies and large plant projects in the region we took the decision to cease our bioinformatics support during the last period and instead employed a coordinator as of June 2020. This has helped us to improve the spread of information and develop PlantLink towards a broader, more cross-disciplinary and forward-looking plant research network. Lack of coordination has hampered the possibilities to create strong cross-disciplinary networks and the support to preparation of grant proposals.

Overall, we feel that there is an increased need for a scientific understanding of plants to meet several of the global challenges of our time, and that this is manifested in a corresponding strong momentum around plant science with several large-scale projects. The full potential of this will probably emerge by cross-disciplinary projects, and here PlantLink continues to have an important role to play.

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Five future scenarios of PlantLink

1 **Spider in the web.** PlantLink focuses on seminars and workshops and making it easier for people to interact, as well as identifying priorities and opportunities for future fruitful plant research and innovation.

Yes! We are already fairly good at this. We are happy, and a little bit surprised, about the popularity of our simple newsletter, the success of which seems to be its simplicity and that it comes out like clockwork.

But... PlantLink might spread too thinly over many research areas, making it unclear for outside observers what type of research we support.

2 **Back to bioinformatics.** Plant researchers still need bioinformatics support (see survey).

Yes! There is a great need for bioinformatics, which also could help in meeting future demand for AI in plant research.

But... Other strong initiatives offering bioinformatics support are already in place and it has proven difficult to reach out with this service at both universities.

3 **Sweet bed of seed money.** Those seed money grants were popular! And led to several large projects scoping in over 80 MSEK.

Yes! There are many good ideas out there that still need to be tested, which are likely to lead to scientific breakthroughs and larger grants.

But... to make it possible PlantLink needs substantially more funding.

4 **Power to the nodes.** How do we engage the plant researchers out there? By connecting good ideas with the help of some money! This could be done by assigning resources and working time to the already identified subject areas to stimulate those vital nodes.

Yes! This would deepen the engagement in PlantLink and develop the parts of the network where the PlantLink team are not experts.

But... our current resources are limited and if powerful we would need to focus on a maximum of one-two of our subject areas at a time.

5 **We are fun! Come and work with us!** PlantLink makes plant research and innovation seen in the region, and through that helps to attract young plant researchers. This can help the regional actors recruit the right competence.

Yes! Improved recruitment channels is a clear need now with many ongoing plant research projects, and recruitment of better competence would obviously strengthen plant research in the region.

But... can we find the forms for this in a small organization such as PlantLink?

Links to attachments:

Additional information can be found at our website:

plantlink.se/about/evaluation

Including:

Steering committee & organization

Associated researchers

List of seed money projects

Seed money report

Supported publications

Survey December 2020 - summary

Bibliometric evaluation - summary

Events