D3.5: Report on educational strategy, year 3

WP3 – Future curriculum, education and training system

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Extended summary

1.1 Introduction

Addressing the sustainability challenges in agrifood and forestry systems requires a holistic and systemic approach and a wide range of competences. Competences for sustainable development cannot simply be taught but must be trained, which requires an action-based and -oriented education. There are certain knowledge gaps in sustainability education, and these are mainly pertaining to A) learning outcomes and competence development and B) what the change to action learning entails and requires. The major objective of the Nextfood project's work packages (WPs) 2 and 3 is to support a transition towards action learning in twelve diverse educational cases and to contribute to closing these knowledge gaps by conducting action research on their change process. The Nextfood educational model is a phenomenon-based and action-oriented approach to cultivating five competences identified as required for sustainable development, *viz.*, observation, reflection, dialogue, visionary thinking, and participation. In addition, there is emphasis on systems thinking. The Nextfood approach involves six essential 'shifts': from lecture hall to a diversity of learning arenas; from lecturing to co- and peer learning; from syllabus to supporting literature; from textbook to a diversity of teaching aids; from written exam to a diversity of assessment methods; and from lecturer to learning facilitator.

The knowledge gaps are addressed by a set of research questions that have been guiding an analysis of the cases' reports over the period since the previous report on the educational strategy (D3.4). The research questions constitute the headlines in section 1.3 below

It should be noted that the Nextfood cases are diverse and include a variety of learners, facilitators, and in-the field stakeholders. The terminology used when describing these actors can differ across cases and in the reported findings. In the Nextfood educational approach, one preferably speaks of 'learner' and 'facilitator', however, these terms are used interchangeably with 'student' and 'teacher' in this document.

1.2 Methods for data collection and analysis

The data material for this report consists of all the Nextfood cases' annual case development reports for the third year of Nextfood, together with notes and transcripts from the May 2021 Nextfood consortium meeting in WP2 and WP3. The reports were analyzed qualitatively, using an inductive approach (Bernard 2006) and with the use of the data analysis software NVIVO. The case development reports were coded according to the research questions to enable horizontal reading of their reported findings and to enable cross-case analyses. Prior to reporting on their case development, the cases received clear instructions on how to collect and analyze data, and a detailed template for writing their case development reports.

1.3 Sum-up of answers to the research questions

1.3.1 Students´ learning and competence development in twelve cases in transition to the Nextfood action learning approach questions

1.3.1.1 *How do students experience such a learning process with respect to learning goals, view on competences needed for sustainable development, recognition of own competences and competence development, and transformation?*

The cross-case analysis presented in this report strongly suggests that the Nextfood approach fostered a change – a personal transformation – in the subjected learners. This could either be in their understanding of the complexity of sustainability challenges in agrifood and forestry systems, their attitudes and values, their views on education and learning, or in terms of participation, interpersonal communication and collaboration across disciplines. The educational activities in many cases seemed to challenge the students' preconceptions, assumptions, and worldviews, and the learners reportedly also seemed to become more autonomous, responsible and self-directed as a result of the action-learning activities. Of course, there is a large diversity in how the learners experienced the Nextfood approach, which was new to most of them, as each class or course is delivered somewhat differently and consists of a number of different individuals from a variety of disciplines, backgrounds and experiences. Nonetheless, a common finding seems to be that the learners managed to constructively adapt to these differences. In terms how the learners viewed competences needed for sustainable development, some students changed their views to encompass values and interpersonal skills to a larger degree, and to also include the core competences of Nextfood. They seemingly also became more aware of the interconnectedness within and between systems and the need for systems thinking for dealing with complexity in farming, food and forestry systems.

1.3.1.2 *To what extent do educational activities enhance the students' competences in observation, reflection, visionary thinking, participation (engagement) and dialogue?*

When compiling the competence self-assessments from all cases, dialogue is the competence which the learners consider themselves to have improved the most. The findings presented in the case reports indicate that learners during the educational activities developed a deeper understanding of the competences and their properties. Such an understanding affected how much follow-up and support the facilitators needed to provide in order to enhance competence proficiency. Many cases reported that it takes time to adapt, understand, and accept the new approach. The competence development among learners in the cases can be summed up in four main arguments, which are presented in detail in the present report:

- Competence development is intrinsically linked to (transtheoretical) experiences in the world out there.
- Reflecting individually and in groups is crucial to enhance competence proficiency.
- Competence development depends on the students' feeling of being supported, safe, and comfortable.
- Online learning complicates training of some competences, although it fosters digital literacy and skills.

1.3.1.3   To what extent do educational activities enhance the students' abilities to deal with "the challenge of the whole"?

In the cases that reported on systems thinking (which not all cases did), the learners' reported systems thinking capacity seemed to serve as a way for them to make sense of complexity in farming and food systems, but also to understand how they could contribute to changing them. Additionally, one could argue that being introduced to systems thinking, to a certain extent, helped the learners to better understand their own learning, and the complexity of the new action-learning environment.

1.3.2   The development of the Nextfood approach in twelve cases

1.3.2.1   What are the supporting and hindering forces for change towards the Nextfood approach in education?

Overall, there are several common supporting and hindering forces which have been reported from the cases in their transition towards the Nextfood approach. What seems to be recurring across shifts, cases, and levels, are individual (intrinsic) motivation, openness, and willingness (to change and to participate), "red tape" – i.e., institutional culture, structure and support, time, effort, financial means or resources, and relationships between stakeholders or "the field" and the educational institutions, facilitators and learners.

1.3.2.2   How can we build on the supporting and address the hindering forces (reformulated as challenges) for change?

Based on the findings from the present analysis, a change towards the Nextfood approach requires an overall shift from mono- or oligoculture to diversity of learning arenas, teaching aids, learning sources and assessment methods and from lecturing to peer learning and from teaching to facilitating. The cases reported that guidance makes the learners more confident and that clear instructions and introductory sessions are ways to overcome the challenge of unfamiliarity and lack of understanding. Detailed planning and structure are emphasized as important, as is practicing more dialogue among those involved in the stages of planning stages the education, and training of the core competences also among the facilitators and course leaders. Moreover, the importance of building trust by interacting with the learners, and of familiarizing learners, facilitators, institutions, and stakeholders with the approach, is emphasized. A way to address these points could be to conduct training sessions, workshops, lessons or in other ways educate, encourage participation and engagement, and create platforms for interaction.

1.3.2.3   What does such a shift require from teachers, students, involved stakeholders and institutions"?

Recurring requirements for teachers, students, and institutions are first and foremost motivation, willingness, flexibility and openness. Additionally, courage, planning, and institutional support are mentioned. Further, a change towards the Nextfood educational approach arguably requires more interaction between all stakeholders, and especially between the world "out there" and academia. But also inside the educational institutions there are cultural and hegemonic relationships and roles that hinder educational change to happen. When asked to report on their plans on how to

move forward in their transition towards the Nextfood approach, the cases reported that there is a need for focusing more on cultivating the competences in real-life settings and for exploring the "dynamics of multi-actor relationships", building bridges between academia and extra-university stakeholders, and expanding the action learning culture that has been started. This rings true in several cases: there is a need for strengthening the bonds between field experiences and learning activities.

1.3.2.4 What do the teachers perceive as the greatest challenge to achieve such a shift?

From the case reports it seemed like action learning in many ways is a relatively new and small activity within a larger academic environment, which is somewhat lacking a competence-related culture, conceptual framework for sustainability, experience with action learning and institutional readiness for dealing with some of the issues specific to an action learning course, e.g., interdisciplinarity and systems thinking. Some contributors to and participants in the action learning courses, let alone the university bureaucracy and leadership, are still in the process of understanding the concept and its key processes. For instance, some students become overwhelmed by the different nature of phenomenon-based action learning compared to traditional, theory-first approaches common in mainstream education. Other challenges were related to the learners' need for follow-up, guidance and support in doing their work, i.e., trying to convince the learners that facilitators are not their only source of knowledge. In addition, a reported disconnect, or lack of connection, between academia and "the real world" is a challenge for both facilitators and stakeholders.

2 Introduction

Human activities, e.g., in agrifood and forestry systems, pose a plethora of challenges ranging from relatively simple technical problems to entangled ones and problems that may even be difficult to define, particularly when involving stakeholders with different views and interests. This is frequently called a messy situation with wicked problems (Batie, 2008; Hjortso et al., 2005). The sustainable development goals of the UN pertain to such situations, which require a system perspective (Weitz et al., 2018). This may be termed "the challenge of the whole" (Schmidt-Bleek et al., 2014) "Embarking on the path of sustainability will require a profound transformation of how we think and act" (UNESCO, 2017). It requires not only subject-specific knowledge and technical skills, but also cross-cutting competences related to human interaction and development (UNESCO, 2017), so-called 'sustainability' competences (Frisk & Larson, 2011). As competences cannot be learnt but must be trained, the dominant, often knowledge-centered education is insufficient for developing the capacity for facilitating change, e.g., at various levels of agrifood and forestry systems (Lieblein et al., 2019).

There is ample evidence of the need for a shift towards action-oriented and student-centered learning to train the competences required for dealing with sustainability challenges (Lieblein et al., 2019). There is also substantial knowledge about what constitutes such learning within an overall education for sustainability approach (UNESCO, 2017). What we need more knowledge about is A) the outcomes in terms of the learner's knowledge acquisition and competence development during and after the educational transition process and B) what the implementation phase during such a shift in education entails and requires. The latter also goes for the policies needed to support the transition process and further development of the education.

The major objective of Nextfood WP2 and WP3 is to contribute to bridging some of these knowledge gaps by conducting action research (Levin and Ravn, 2007) in twelve educational cases at various stages of transition from mainstream, theory-based teaching to the Nextfood model, which is a phenomenon-based, action-oriented approach to learning aimed at a transformative cultivation of the competences required for sustainable development (Lieblein et al., 2019). The approach has a student-centered emphasis on cross-cutting core competences or so-called soft skills (*wiz.*, observation, participation, dialogue, visionary thinking, reflection, and systems thinking), and it makes use of diverse learning arenas, learning sources, teaching aids, learning activities and assessment methods. The approach implies a shift from teaching to facilitating learning and competence development. It shares several features with the signature pedagogy for sustainable food systems education as described by Valley et al. (2017).

In WP2 and WP3, the two main knowledge gaps mentioned above, are addressed with the following research questions:

A. Students´ learning and competence development in twelve cases in transition to the Nextfood action learning approach

- How do students experience such a learning process with respect to,
  - learning goals?
  - view on competences needed for sustainable development?
  - recognition of own competences and competence development?
  - transformation into active, reflective, life-long learners?
- To what extent do educational activities enhance the students' competences in observation, reflection, visionary thinking, participation (engagement) and dialogue?
- To what extent do educational activities enhance the students' abilities to deal with "the challenge of the whole"?

B. The development of the Nextfood approach in twelve cases

- What are the supporting and hindering forces for change towards the Nextfood approach in education?
- How can we build on the supporting and address the hindering forces (reformulated as challenges) for change?
- What does such a shift require from teachers, students, involved stakeholders and institutions?
- What do the teachers perceive as the greatest challenge to achieve such a shift?

The present report covers data gathered in the twelve educational cases during the period since the previous report (Breland et al., 2020) was delivered and constitutes a synthesis of the individual case development reports as compiled in Bogstad et al. (2021, forthcoming) "D2.7 Annual case development report (year 3)".

3 Students´ learning and competence development

3.1 Methods of data collection and analysis

3.1.1 Methods of data collection

The data material consisted of all the Nextfood cases' M36 case development reports and of notes from the May 2021 consortium meeting workshops in WP2 and WP3. All data were analyzed qualitatively by the individual cases using an inductive approach (Bernard 2006).

3.1.1.1 Case development reports

As a part of the deliverable D2.7 (Bogstad et al., 2021 *forthcoming*), all the cases reported on both student learning and case development over the past Nextfood cycle. Their data material typically consisted of teachers' reflections and students' responses – be it reflection documents, self-assessments, or answers to questions at the start and end of the course activity. What data material is collected differs slightly between the cases. For example, some didn't collect teacher reflection documents, while others didn't collect students' answers to four initial and five final questions. Even though the data sources differ, the cases still had enough material to be able to conduct analysis of their students' experiences and learning, and of the development of their case. All the case development reports can be read in their entirety in D2.7.

3.1.1.2 Consortium meeting workshops

In addition to the case development reports, we included in the data material notes and minutes from the May 2021 Nextfood Consortium meeting workshops in WP2 and WP3. These data were collected by saving Zoom chat-logs from the workshop and by taking notes during the workshop discussions. Later, the notes were structured according to theme. These data sets served as a way for us to triangulate the results from analyzing the case development reports, as many of the same subjects and issues were addressed.

3.1.2 Methods of data analysis

All data from the case reports and the consortium meeting workshops were analyzed qualitatively using an inductive approach (Bernard 2006). The Nextfood cases were organized as 'Cases' in the qualitative data analysis software NVIVO (QSR International 2020), while all the case development reports were organized as files. Case and file classifications and attributes enabled cross-case analysis by providing an overview of how the cases had collected their data, but also how their courses were structured.

The M36 case development reports followed a revised template provided by the WP2 leaders (Appendix …. The template was structured to address the research questions.

As such, initially all the reports were clustered by applying "structure codes" to the material. This was done by using NVIVO (QSR International 2020). Each structure code pertained to one headline or research question. The process was followed by using these clustered reports as data units for further analysis. Prior to this, the case development reports had been read through in order to write up a summary for D2.7. Thus, some initial ideas about what the analysis would uncover had already emerged. The data analysis sequence followed the pattern of Creswell and Poth's 'Data analysis spiral' (Creswell and Poth 2018) and after memoing initial thoughts, the reports were analyzed and emerging themes were summarized in compiled notes, which formed the basis for the findings presented below. However, categories and themes have not yet been thoroughly identified and documented.

As mentioned above, the case development reports differ in what data material the subsequent analysis was based on and how the actual analysis was conducted. Even though not all cases have collected the same amount or type of data, or even if they have not reported on specified findings in an equally rigorous way, the case reports are still rich in material for the cross-case analysis we have conducted for D3.5, e.g., of the insightful reflections from the authors of the case development reports on their experiences and actions, which then constitutes the primary data in our cross-case analysis.

3.2 Results and discussion

3.2.1 How do students experience such a learning process with respect to?

3.2.1.1 Learning goals

The Nextfood cases' courses are all related to agrifood and forestry systems. Therefore, it is not surprising that the cases reported that their students' learning goals are to improve knowledge on theoretical and practical aspects of food and agriculture. Cases also reported that their students want to learn about participation, reflection or critical thinking, group work and problem solving, as well as to improve skills in communication. As sustainability is also a common denominator for the Nextfood courses, the students are interested in and motivated for learning more about sustainability issues in food, farming, and forestry systems.

In terms of how the learning goals developed during the educational activity, the University of Kerala (UoK) case reported changes in students' attitudes through the course, which helped them redefine their learning goals. In the ISEKI case, the students mentioned that the competition helped them to find answers to topical questions, but also answers on how to identify problems and find multiple solutions. Students developed skills in critical thinking, at both UNISG and UNIOR, and at UoK the learning process arguably "nurtured empathy" towards stakeholders and peers. In the University of Calcutta (UoC) case, the learning process helped the students adapt to the subject, and they reported how learning was fun for the students. At UNIOR, the students reportedly fulfilled their learning goals in many ways, but they wanted to learn

more about visionary thinking, as they found this highly relevant for the course subject of food innovation.

The AFS/IHU case reported that the student group had a very "vague idea of what they were going to be taught", and they were not used to being included in a discussion about their learning outcome. Hence, their participation was not very active. As the course progressed, the students reportedly engaged more in their learning process and took more responsibility. This is in line with what other cases reported as well. For example, in Kerala the students at the end of the course regarded learning as "self-directed", where "collective intelligence defines the quality of the process". These findings resonate with the AFS/IHU case, where the students apparently highlighted the concept of "will" as an important part of their learning process, i.e., "will to participate" or "will" as an important factor for how projects turn out. AFS/IHU calls this the "motivational strength of action learning methodologies". Perhaps comparative to the Kerala case of "collective intelligence" which improves the quality of the projects. In the NMBU case, there seemed to be a common goal among the students to become facilitators of change towards more sustainable agrifood systems, but they also voiced an interest in engaging more in their own learning process – to become lifelong and autonomous learners, as the official learning goals of the NMBU course states.

3.2.1.2   View on competences needed for sustainable development
"As mentioned before, students generally began the courses with a very vague idea, of what sustainable development means. From previous learning cycles and interviews in the course of the NEXTFOOD PROJECT we have seen that neither students nor professors have a firm grasp on ideas of sustainability or what is needed to follow sustainable development. Also, the idea of skills and competences itself is difficult to incorporate in their view of their education. **However, we saw that after the discussions we had, students began to think about this matter in a promising way. From the student reflections we see that students tend to talk about attitudes in the same way as they talk about competences.** *Here, we come across a challenge of methodology and definition in our work which is quite predictable.* **We need to accept that sustainable development relies on changes in attitudes as well as the development of competences. That is, we need to view and investigate our educational activities as an amalgamation of transformative learning in both attitudinal and competence terms.** *As such, we accept and incorporate a number of comments on attitudes as well as competences that students perceive as important for sustainable development."*

AFS/IHU Case development report_2021

One aim of the Nextfood educational approach is to see a shift or transition in the students' view on competences needed for sustainable development, i.e., from knowledges and skills to competences. As with the learning goals, the students in the Nextfood cases are initially focused on specific, practical, or more technical skills as the basis for working with sustainability in agrifood and forestry systems. Arguably, a transition is in some cases evident in how the students change attitudes or evolve their

thinking about sustainability issues, and solutions, during the courses. For example, the UoK case reported that their students at the end of the course had developed a "clarity of thought" in understanding the Nextfood competences as the combination of both skills and attitudes, i.e., a combination of the skills they had listed at the beginning of the course (e.g., communication skills, creative and critical thinking) and attitudes (e.g., empathy, confidence, and courage to break with conventional thinking, and readiness to accept change). Values and attitudes are often brought up when discussing students' views on competences needed for sustainable development, as there seems to be a common finding in the cases that the students' learning goals and outcomes depend a lot on the students' mindset. As AFS/IHU wrote in their case development report, "From the student reflections we see that students tend to talk about attitudes in the same way as they talk about competences […] sustainable development relies on changes in attitudes as well as the development of competences". At NMBU, students argued that developing humility is as important as developing competences, and they reflected on how positionality and awareness are crucial aspects of agroecology and sustainability practice.

In the ISEKI case, the students emphasized values and interpersonal skills to a higher degree at the end of the competition than at the beginning, when generic skills were more prevalent. Also, the need for a systemic or holistic approach is reported by UNISG, AFS/IHU, UoC, and NMBU as important to the students. Values and personality traits such as openness, willingness (to change/to participate), empathy, and autonomy were something students in the Nextfood cases saw as a part of building competences needed for sustainable development, and these "soft" qualities seemed to become increasingly important throughout the educational activity.

3.2.1.3   Recognition of own competences and competence development
The students in the Nextfood cases experienced the action-oriented educational approach in many different ways, and their reactions and competence developments differed. In every class, there are individuals from a variety of backgrounds and with many different experiences, pre-knowledges, and skills. Thus, when entering the courses, their expectations and brought-in competences are manifold. Some of the courses are shorter than others, and sizes also vary. However, there are certain commonalities across cases in how the students developed during the activities. For example, in the UoC case the students reportedly went from a "sedentary" to an "engaged" state of mind, and at UoK one student stated that the course helped develop a mindset to act as a change agent. In Kerala, they also stated that the course activities enabled the students to think holistically, and that their attitudes changed throughout the course. As mentioned, the Nextfood courses usually consist of students from multiple disciplines. One finding from the case development reports is that students learned to work with this diversity through their experiences in the courses. For example, ISEKI reported that the students are more focused on qualities related to group work and collaboration at the end, than at the start of the course, and at NMBU students emphasized peer-learning as important for competence development. Also, in UoC students learned to help each other across backgrounds, and make connections across disciplines. AFS/IHU reported that students developed soft skills such as dialogue and communication through group work and their ability to combine

different knowledge. UoK, NMBU and AFS/IHU reported that their students improved their ability to link theory to real-life situations. With regards to the core competences trained through the courses, students reported improving their understanding of them during the activities, and in the case of UNIOR the students became aware of the importance of the competences, their role, and how they can be trained over time. At NMBU students spoke of practicing the competences with more intention, while at UoK, students gained confidence and became more committed to the cause of sustainable development and went from being problem-focused to solution-oriented. In the ISEKI case, students reportedly developed the ability to "identify problems and find multiple solutions".

*"The students' reflection documents represent a **very important mirror** in which the students can identify the competences they have, the level of proficiency when using them, the development of these competences and the transformation processes that determined the improvement of some certain competences. Thus, during the course, they were able to better understand what each competence represents, what its role is and how it can be improved in time. More than this, they became aware of the importance of these competences and they started to write about them in their reflection documents [...]"*

UNIOR Case development report_2021

3.2.1.4   Transformation

The most frequently reported transformation in the cases is that of a change in students' mindset or attitudes, i.e., a personal development of some sort. These transformations or changes are not necessarily explicit but are sometimes expressed through the questions they ask at the start and end of the course. For instance, in the ISEKI case a shift in focus from problem-solving to interpersonal skills was reported, and students at UNISG asked more "how"-questions at the end, compared to the "what"-questions they asked in the beginning. This could imply that the students are more interested in how they can solve food and farming sustainability issues, rather than knowing just what the answer to said problems are. I.e., they arguably transitioned from merely wanting knowledge to understanding the need for competences to work with sustainability in food systems. One could hypothesize that these students gained an understanding of the fact that knowing doesn't necessarily lead to action.

In Kerala they reported on a two-faceted transformation in their students, firstly, how the course impacted the students' personalities – how their understanding of "their roles and responsibilities as humans" changed, and how the students also realized the transferability of the core competences to their personal life. One of their students was quoted saying

"[...] I realized that the competences I learnt from the course could be applied to my personal life to be a better human being. I could reflect on my strengths, weaknesses, opportunities, and threats to vision for my future. The experiences I gained through the course will leave a lifelong imprint on my approach to myself and my surroundings".

UoK, Case development report 2021

Secondly, in the Kerala case, they also reported a transformation in how the students envisioned a sustainability transition in agrifood and forestry systems. The findings from Kerala echo in the results from NMBU. Here too, students report on a personal transformation of attitudes, and in how the learning process provided opportunities for the students to challenge their preconceptions, assumptions, and worldviews. Also, the NMBU students transformed to become more autonomous learners and more confident in their abilities. At USB, AFS/IHU and UNIOR the findings are similar; the students became more active, independent, and confident during the course, and started to use critical thinking, ask questions, and speak their mind. AFS/IHU reported a transformation in the students' willingness to participate and their level of responsibility, and UNIOR wrote that participation was a challenge for their students at the beginning "due to their fears", but that most students overcame this fear and at the end "considered themselves active participants within the group". Transformations also occurred in the students' ability to practice the competences. In the ISEKI case, students emphasized dialogue and visionary thinking as important competences at the end, while students at UNIOR reported a change in how they perceived reflection as something valuable at the end of the course, as opposed to their initial thoughts of it as just a time-consuming activity. Interestingly, at UNIOR the facilitators were sceptical of introducing too much visioning, as they thought it was not a "serious competence to be considered". There, a transformation occurred on part of the facilitators as they were proven wrong by the students who really appreciated the competence and wanted to train and practice more visioning. At USB they reported that students – also previous ones – "very often mentioned the positive effect" of the action-learning, multi-actor approach, and their progress was clearly visible when compared to other student groups who were not subjected to this type of learning. The "Nextfood students" were more active and practiced dialogue in their work, compared to the "non-Nextfood" students. The students at AFS/IHU similarly mentioned a "significant difference" between action-learning education and other "mainstream" courses they had experiences with, in terms of "richness in learning environment, engagement, motivation and overall satisfaction" (AFS Case development report 2021).

Arguably, the Nextfood approach fostered a change, a transformation, in its learners. Either being in their understanding of complexity and sustainability issues in food and agriculture systems, their attitudes and values, their view on education and learning processes, or in terms of communication, participation, group work and transdisciplinary collaboration. All in all, one could assume that being subjected to the Nextfood approach, including training of the core competences, enables the participants to undergo some sort of personal transformation.

"The students' attitude towards the experiential, phenomenon-based approach tends to undergo a transformation from frustration to appreciation."

UoC, Case development report 2021

3.2.2 To what extent does the Nextfood approach enhance the students´ core competences?

The overall competence development in the twelve Nextfood cases can be summed up by looking at the students' self-assessment of their competence proficiency. These results indicated how the students themselves rate their own competence development, and as many of the cases individually reported, dialogue is the competence which the students feel that they had improved the most, followed by reflection. Observation and participation – competences arguably linked directly to real-life experience, which many cases experienced challenges with due to the Corona pandemic the last Nextfood cycle, were less prominent. However, there are always more nuanced reasons behind such changes, and one can't really draw any conclusions based on these averages – which summed up twelve cases, all very different in both structure, content, learners, and facilitators. The students' previous understanding, familiarity, and knowledge about the competences also impacted how they rated and assessed their proficiency. For example, the SEKEM case reported that their students "found difficulty to understand the statements when they were filling in the form at the beginning of the training".

Table 1: Self-assessments: mean competence development all cases

	Start	End	Change	Significance
Observation	4,33	5,43	1,10	***
Participation	4,75	5,87	1,12	***
Visioning	4,22	5,45	1,23	***
Reflection	4,62	5,97	1,35	***
Dialogue	4,55	5,99	1,45	***

Nonetheless, the cases' individual reporting based on their overall data collection indicated that a common denominator across cases was that students during the course developed a deeper understanding of the competences and their properties. For example, students reported learning the distinction between dialogue, discussion, and debate, as well as the difference between non-judgmental, unbiased observation and mere spectating. Moreover, they were familiarized with concept perhaps strange and unknown such as visioning. The competences and the introduction of them differed also depending on the facilitators' understanding of their validity. In the UNIOR case, the facilitators held back on introducing exercises in visionary thinking because they perceived the concept as unnecessary and irrelevant. The students, on the other hand, appreciated learning about visionary thinking and found the competence particularly useful in their field of food innovation and wanted to train the competence further. Thus, the facilitators changed their view on visionary thinking as a competence needed for sustainable food systems. These results say something about how also facilitators' openness to the Nextfood educational approach and willingness to change from traditional "transactional" academic activities are needed for the transition to succeed.

"In the past, the Romanian educational system didn't allow space for exercises that were stimulating the creativity and imagination of the students, because these competences were not values during communism. The communist doctrine was embracing the idea of all the people to be equal in all aspects of their life. Those that were creative and imaginative were considered rather exceptions and different from the others. Years after the disappearance of communism, the perception remained still the same because many of the students at that moment are the teachers of today. Thus, introducing such exercises was considered innovative and revolutionary but also risky from the teacher's point of view."

UNIOR Case development report 2021

On part of the facilitators, the cases reported how they were required to put in time and effort to train the students in the core competences, and that the students' previous knowledge of the competences and their properties defined how much work needed to be applied. For example, the Romanian students were reported to require a lot of support and follow-up to understand the value of reflection as a competence, and this was also seen as a very time-consuming activity from both students and facilitators. However, during the course these perceptions changed, and they ended up appreciating being able to reflect – as written in their final reflection documents. Also, AFS/IHU reported how their students were "awkward" in the beginning, and SEKEM reported how their students were insecure and timid. Towards the end of the course, the students developed more confidence and were better able to elaborate on their experiences and seemed to have improved their understanding of what the course expected of them. UoC also reported that students that are product of "the chalk and talk education system" needed time to adapt to the action learning method but loved it once they managed to familiarize with it. These results cast light on how it is important to spend time in introducing the approach and the competences – and their role in improving sustainability in agrifood and forestry systems. This also echoes through the cases overall; at NMBU, developing a collective understanding of the course's content and expectations is a recurring finding.

"When speaking about reflection, the situation is not surprising anymore, but it represents the common effort that both students and facilitators invested in this course. The numerous reflection moments corroborated with the extra time spent on learning how to write the reflection documents are reflected in this increase."

UNISG Case development report 2021

The Nextfood cases reported on training the competences in a variety of ways – specifically and generally. "Most of our activities involved a mixture of competence development with some targeting competences in more direct ways than others", AFS/IHU wrote in their case development report. The cases who conducted casework or field trips often included training of all the competences during these activities. For example, to observe the system at hand when entering the field, and to participate by engaging in hands-on experiences and interacting with stakeholders. Usually, a natural next step is practicing reflection upon the experiences, and many students in the

Nextfood cases were encouraged to keep a reflection log, to create rich pictures or mind maps, and to make connection between system parts, between theory and practice, and across disciplines. Dialogue was trained by the students interacting with stakeholders, through group work, casework, and class-reflection sessions, in which dialogue is naturally cultivated. In the SKOGFORSK case, they used a digital chat app to create a place for conversations and knowledge sharing on equal terms between facilitators and learners, training dialogue and using photos to cultivate observation. At UoK they also used chat technology to encourage conversations. At UNIOR they developed a specific tool – "observation sheet" – for the students to be more aware when observing in the field, and SEKEM had the students present their observations from their farm inquiry to the class. At UoK and NMBU observation was trained through "transect walks", and one UoK student wrote; "With the activity I realized that I was never been a good observer, since every time when I observe, I was trying to connect it with a previous experience rather than treating it afresh/ raw". The exercise of "rich picturing" – usually as a group activity – involved reflection, observation, and dialogue, and is commonly used in the Nextfood cases. At UoK and AFS/IHU the students completed a "photo novella" aimed at training observation, but also other competences.

Visionary thinking is a competence that to a variable degree is understood and trained. Most often the exercises in visioning were related to envisioning a future farm or food system in the cases. At NMBU it is linked to the real-life casework, and the students envisioned a desired future for their cases together with their stakeholders and farmers. In the UoK case they also worked together with farmers to co-create a shared vision, and at UoC the students presented visions to farmers in their casework. The students connected visionary thinking as a competence to that of reflection, and reflection and observation are also often paired. From the Nextfood consortium meeting WP3-workshop (May 2021) it was found that case leaders and other Nextfood consortium members considered visionary thinking is important to connect local problems to the agroecological approach.

"Students stated: "While drawing rich picture we started to dialogue with each other and were amazed at the diverse viewpoints we have but, were able to depict it with clarity using rich picture. Mind map is a powerful tool to understand any complex concept. While I drew the mind map, I understood the difference between observation and reflection"

UoK Case development report 2021

Below we present some of the most prominent findings regarding competence development from the cross-case analysis.

3.2.2.1   Competence development is intrinsically linked to experiences in "the world out there"
Participatory activities, as casework or group work, seemed to be an integral part of training and improving the Nextfood core competences. Engaging in experiences "in the field", either on farms or in food systems fostered competence development as it involved the learners in the realities which they were trying to understand. When

participating in classroom activities and engaging with facilitators and peers the students were familiarized with their abilities to merge different perspectives, to learn from each other, and to collaborate. They were also confronted with their own learning as they participated directly in their own, and their peers' educational process. In "the field" the students interacted with stakeholders and farmers. These experiences were important in creating a mutual understanding of the situation and system at hand, its complexity, and in envisioning a desired future state. Some cases directly worked together with farmers and stakeholders to create a future vision, as at UoK, UoC and NMBU, and most cases trained visionary thinking in relation to a real-life case. Nonetheless, participation in real-life phenomena served as an important "backdrop" to train the other core competences in, and as one student at NMBU said about their visioning session with a farmer:

"She was overwhelmed with emotion, and in these moments, I experienced how I was not a separate researcher in a lab, but an active participant in the agroecosystem. The way my group and I behaved had a direct influence on her openness and willingness to be vulnerable and participate in the visioning the future of the farm. Through these interactions, I experienced how one's quality of being as an agroecologist in the field and one's ability to communicate, establish trust, build relationships, listen, and be vulnerable were vital to agroecological practice."

NMBU Case development report 2021

In the NMBU case it was clear that the casework served as an opportunity for the students to feel like "insiders" rather than "outsiders" when approaching their farm systems, and it made them feel on the "same level" as the farmers, as well as it provided "rich and tangible" opportunities to learn more about food and farming systems. Similarly, the students at UoK reported that participating in farm and field work was important to build "rapport" with farmers and understand the farms. To them the greatest learning was to be engaged in action.

In the UNIOR case they reflected on how the students in Romania traditionally are not encouraged to participate in the learning activities, and thus they are used to being "passive" and distant observers in the classroom. In the Nextfood approach, however, they were prompted to actively engage in class, field, and group work, as well as to interact with peers, facilitators, and stakeholders. As the UoK case put it, participation "oriented the learners towards the new learning approach". I.e. the core of the Nextfood educational model, and the fundament for competence enhancement, is in fact the experience – starting with observation and participation. This also coincides with results from the Nextfood consortium meeting WP3-workshop in May 2021, where one finding was that the Nextfood approach requires the students to understand that action learning is an integral part of their competence development and not an "extra-curricular" activity.

"Other than this activity, the responses that we received from the students, contribute to our understanding that the most impactful activities for competence development are the group projects, the involvement of professional field actors in the modules and the training in research methods." AFS/IHU Case development report 2021

3.2.2.2 Reflecting – individually and in groups – is crucial to enhance competence proficiency

As observation and participation created the fundament that learning builds upon, reflecting upon these experiences is equally important for the competences to develop and for the students to evolve their competence proficiency and understanding. The cases reported on how using reflection was important to get the students to practice the other competences as well. As SEKEM reported, the exercise of observing real-world phenomena and later presenting these to their classmates, prompted the students to reflect upon connections in the system at hand. Also, ISEKI, UoK and UoC connected the observation competence to that of reflection, in how reflecting upon observations is an efficient way to train the students reflective capacity. One of the UoK students wrote: "reflection is a skill build on the foundations of observations. A good observation always leads to better reflection". Organizing reflection sessions after other course activities seemed to help the students in evaluating the activity and to improve their competences. This rings true in the cases of UoK, NMBU, UoC, ISEKI, AFS/IHU, and UNIOR.

For some students it was reportedly difficult to understand why reflection was needed in the beginning, as the UNIOR case development report stated. Their students found reflection to be a time-consuming and unnecessary competence at first, but after being subject to several organized and structured reflection sessions and exercises such as bring-home assignments, face-to-face meetings, reflection workshops etc., they appreciated the value of the competence. The development of the reflection competence showed that organized reflection is very efficient in cultivating the competence. For the UNIOR facilitators this proved to be a lot of work, and the students needed quite a lot of follow up with the reflection tasks at the beginning of the course. However, towards the end, the facilitators saw that less support was needed, and the students managed to reflect independently. Also, in AFS/IHU they arguably experienced success with introducing reflection as a structured activity of which the students were to conduct. They included lectures on reflection and wanted to introduce reflection in a concrete way.

"By this activity we aimed to introduce a cognitive framework that would help students practice reflection more fluently and more precisely. Thus, this activity increased the cognitive capacity for the competence of reflection directly."

AFS/IHU Case development report 2021

It would seem that providing the students with a reflection framework and certain tools for reflection was very important. At AFS/IHU some of the students were to use reflection and observation in their "photo novella" exercise, which also UoK introduced. At NMBU, UoK, AFS/IHU and other cases as well, the students were encouraged to keep a reflection log, in order to enable regular reflections. Most cases had the students' complete reflection documents as a final assignment, where they were prompted to reflect upon their learning experience. Collaborative and interactive reflection sessions in groups also helped the students to develop their ability to reflect. In the ISEKI case they created online break-out rooms for the students to come together and reflect on observations from previous sessions, which also fostered peer-

learning and co-creation. As such, reflection served as a magnifying glass for the other competences – i.e. in how the practice of reflecting helped to understand and improve them. Arguably the results indicated that the students' improvement in competence proficiency is related to their invested effort and ability to reflect intentionally.

"[…] a common denominator is how reflecting on reflection itself enabled the students to understand better how they learn and perceive things – a key to becoming agroecologists and life-long learners."

NMBU Case development report 2021

3.2.2.3 *Competence development is guided by the students feeling supported, safe, and comfortable*

As mentioned, participation in class is also important for competence development and learning, as the students experience what it is like to be a part of a learning community. In participating and interacting with peers and facilitators the students develop cohesion and a type of belonging. This is also important for competence development, due to the fact that students not only need to be open, flexible and committed, but they need to feel safe and comfortable in order to want to part-take and be able to exercise and train the core competences. As many students feel insecure, awkward, afraid, and shy at the beginning of the course, they need to be supported in order to feel like they are in a safe environment.

This finding was confirmed by the cases' reflections in the Consortium meeting WP3 workshop, held in May of 2021; the students need a lot of guidance to get used to the novel approach, and the core competences, and to develop confidence in practicing them.

Peer-to-peer interaction and support is also important to develop a safe learning environment. Cases reported that cohesion between classmates is key to strengthening the learning community and to enable the students to participate in the educational activities. Practicing the competences and being actively engaged requires the students to be vulnerable and open. If they don't feel comfortable in the group, the situations they encounter might make them feel insecure and negatively affect their learning progress. In the SKOGFORSK case they reported that the digital learning format made motivating their learners difficult, as they were not allowed to meet in real life. In an online setting one is not able to "feel the atmosphere" and keep eye contact, which affects interaction. As in other cases, some learners at SKOGFORSK were not comfortable with or used to practicing reflection and dialogue, and there was "an obvious need to build trust", which was not easy to cultivate between individuals who had never met before.

When the students spend more time together in class, a natural consequence is that they feel more comfortable as they get to know each other and the facilitators better.

However, findings from the cases also indicated that it is also important with additional support and dialogue, to not leave too much up to the peers (on part of the facilitators), but also to monitor and encourage empathy, understanding, and collaboration to build trust and create a non-judgmental class community.

"An important part of my time today was spent on offering support to all the students in writing their reflection documents. Even if several documents meant to exemplify the style the students need to adopt or the vocabulary they need to use, have been sent to them, many students needed extra validation on the text fragments they wrote at home." (TRD_T25_2019)

UNIOR Case development report 2021

"Like one student stated, their competence development in reflection, facilitation, critical thinking and self-awareness is "not a direct result of the course, but more a result from being in a close and intimate cohort of agroecology students and through creating our own highly stimulating learning environment"

NMBU Case development report 2021

3.2.2.4   Online learning complicates competence training

The last previous Nextfood cycle was highly affected by the Covid-19 pandemic that struck the world in 2020. Many of the cases were forced to re-structure their courses and had to move many course activities online. This came with several challenges and seemed to have a certain effect on students' learning and competence development. It did most certainly complicate competence training, as participatory action learning based around real-life cases was limited in an online environment. Nonetheless, the cases showed adaptability and flexibility in taking on this challenge. Notwithstanding, they still reported on how the online mode of implementing the Nextfood approach had its implications for their reported results. For the competences, it perhaps had the largest effect on enhancing the observation and participation – competences which largely are trained in a physical on-site learning arena. As USB reported, "Observation showed the least amount of change which could also be attributed to the online form of learning." (USB Case development report 2021), and even if some stakeholder interaction and casework experience was conducted, being mostly prone to online learning showed in the findings.

"Students have shown ability to interact with stakeholders without expressing judgement or bias, but observation has been limited due to distancing related to pandemic restrictions."

CIHEAM Case development report 2021

Some cases adjusted their casework to the new learning arena by creating farm "web-cases" (UNISG & NMBU), and at UoK and AFS/IHU the previously mentioned photo novella project provided the students with the opportunity to practice observation. Some also tried to connect students to local farms in their vicinity, with varying success.

As CIHEAM reported, it became difficult for them to follow-up with stakeholders in this format, and the students themselves struggled to communicate the objective of their activities in a clear manner, which resulted in the stakeholders' lack of interest. Also, UoC reported having similar experiences of a variation in farmers' openness to the approach, and that the online format influenced the facilitators contact with stakeholders.

"Observation competence has the lowest growth (1,08). This could be explained by online didactic activities provided to the students. Thus, web-case (instead of experiential part of action learning) allowed to the students to observe each farm online. For some of them it was an interesting experience, while other students (without agricultural background) had difficulties to receive a comprehensive understanding of a farm without their physical presence there. This could be interpreted as one of limitations of online action learning."

UNISG Case development report 2021

At the SKOGFORSK case the change in course format and structure had big consequences. The learners in the SKOGFORSK case are not students, but forestry professionals, working full-time. Thus, their schedule is limited. Trying to conduct the educational activities proved difficult, and participants fell through one-by-one. "The fact that we were not allowed to meet made it very difficult to motivate our learners", and the digital format made conducting good dialogue and building trust difficult. Therefore, the SKOGFORSK case had to end their activities early and hence training of the competences has been sparse. A low number of respondents made the material collected very small, and it was not possible for the SKOGFORSK research team to draw any significant conclusions from the data collected.

Despite big challenges, competences were still trained on the online learning arena, and transferable activities enabled competence development still. Participation and dialogue were enhanced through engaging in classroom activities, group work, and interacting with peers. Online students were "nudged" to engage in dialogue and to communicate with others, but individual differences in students to a large degree decided whether this enhanced or hindered competence proficiency. As USB reported from their case, the online mode made it easier for some students to remain passive and "hide", however some were able to share their thoughts and insight, even though the classroom environment would have enabled more engagement and contribution. (USB Case development report 2021).

"Rich picture and stakeholder document activities increased participation; however, the competence increase was not reported as the one with highest growth. This was argued to be because of the lack of physical participation, as the activities were online. In the master's program participation was said to be improved due to plenary discussions and group presentations."

UNISG Case development report 2021

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"This cycle's activities had certain specificities that may have hindered the optimal enhancement of observation, participation and dialogue. The on-line environment, added to the general uncertainty and novelty of the academic proceedings may have played a negative role in students' learning experience and may have hindered the competence development of less technologically or introverted individuals."

AFS/IHU Case development report 2021

3.2.3 To what extent does the education enhance the students' competences of dealing with "the challenge of the whole" (systems thinking)?

In the Nextfood educational approach, one aim is to foster holistic or systemic thinking to approach sustainability issues in agrifood and forestry systems, but also other complex and "messy" situations. In that regard, training the core competences is crucial, as addressed above. However, we also ask the cases to directly reflect upon their students' ability to "deal with the challenge of the whole", i.e., to think systemically. Not all cases reported on this explicitly, even though the totality of their results might say something about it. Nevertheless, below we present the results from the cases that did report on systems thinking.

At NMBU and UoK the students voiced not only improving their ability to approach complexity in their casework with farming and food systems, but also in conceptualizing and making sense of the new learning environment. The students at Kerala were able to make connections across and within systems, and between experience with theory. The educational activities reportedly also enabled students to critically examine the conventional learning process and the need for multidisciplinary learning arenas and action learning tools. In Norway the findings are similar. Students here reported that applying the systems thinking tools and methods in the casework highlighted the validity of action research methodology. One student spoke of how systems thinking requires intentionality in practicing the core competences, and at UoK they found that training especially observation and reflection played an important role in creating a deeper understanding of agroecology and sustainability. Their students also voiced that "Educational activities transformed the way in which problems relating to sustainability are viewed and triggered an attitudinal change in deciphering solutions" (UoK Case development report_2021). In the AFS/IHU case the educational activities contributed to an increased awareness of agrifood systems as a whole and the students were able to appreciate the different perspectives of systems. Moreover, they improved their reflexive capacity – i.e., their ability to see themselves as parts of these systems, with a sense of responsibility and agency. However, the pandemic provided no opportunity for the facilitators to observe the students' ability to deal with complex systems or be problem solvers in a practical and concrete manner. The circumstances did not allow for any hands-on experience, but the students were able to have conversations and discussions with stakeholders, and as such trained their systems thinking capacity.

In the NMBU case the students described how acknowledging assumptions and suspending judgement is crucial to systems thinking, which is similar to the findings from UNISG, where they reported that exercises such as rich picturing encouraged the

students to use non-judgmental thinking, to present multiple perspectives, and to see connections, while also develop visual thinking. They also reported that the web-casework helped the students to think critically about approaching complex situations. When preparing stakeholder documents in groups, the students fostered peer-learning and were able to collaborate and utilize each other's strengths from various academic and personal backgrounds – linking these to their experiences with stakeholders. At NMBU they reported how the students' experience with the casework and "the iterative process of visualizing and mapping the case systems increased the students' understanding of the systems at hand". As such, rich picturing as a tool was particularly helpful when making sense of these complex situations. The casework also provided ample opportunity for them to practice and cultivate the core competences, which again enhanced their ability to think holistically. Also, at CIHEAM they reported that their students during the course were able to understand the importance of the systemic approach/systems thinking, and they demonstrated their ability to see the bigger picture. At UoC the course introduced "various key conceptual successions to explain the root of agroecology", and applied systems thinking to "develop a more comprehensive model of farm systems to promote the understanding and application of agroecology". In all the cases above, the reported systems thinking capacity of the students seemed to serve as a way for them to make sense of complexity in farming and food systems, but also to understand how they could contribute to changing them.

4 The overall process of case development

4.1 Methods of data collection and analysis

4.1.1 Methods of data collection

As in Chapter 3 (Students' learning and competence development), the data material for the analysis presented below consisted of all the Nextfood cases' M36 case development reports and notes from the May 2021 consortium meeting workshops in WP2 and WP3. Within each case, the data collected to say something about the overall process of case development were, for example, teachers' reflection documents, course reflections and focus groups or interviews. For more information, see D2.7 "Annual case development report (year 3)" (Bogstad et al. (2021 *forthcoming*).

4.1.2 Methods of data analysis

The cases were asked to address in the case development reports (Bogstad et al. (2021 *forthcoming*) "D2.7 Annual case development report (year 3)") forces that support or hinder each essential shift in the Nextfood educational strategy. Furthermore, they were asked to suggest how to utilize supporting forces and how to remediate hindering ones.

In the present document, forces directly or indirectly supporting or hindering each shift are compiled across cases. Examples of direct forces may be institutional and financial support to an action learning initiative. Examples of indirect forces are perceived or documented advantages or disadvantages of a shift, e.g., how well it was received by the involved parties (students, teachers and external stakeholders) or its effect on learning outcome. Thus, in addition to encompassing the direct forces reported by the cases, the present synthesis includes data on how each shift influenced aspects of students' learning. Hence, it may be viewed as containing a breakdown by essential shift of the data presented in the section above entitled "Students´ learning and competence development". The presentation is mainly in the form of lists of forces as compiled across the case development reports, which were coded in NVIVO (QSR International 2020). The presentation is structured according to the case development reports in order to enable the reader easily to find the data source for the present compilation in "D2.7 Annual case development report (year 3)".

4.2 Results and discussion

4.2.1 What are the supporting and hindering forces for change towards the Nextfood approach in education?

On an aggregated level, there are several commonalities across cases in reported supporting and hindering forces when transitioning to the Nextfood approach. Generally, what seemed to be recurring "forces" (both supporting and hindering) across shifts, cases, and levels, are individual (intrinsic) motivation, openness, and willingness (to change and to participate), "red tape" – i.e., institutional culture,

structure and support, time, effort, financial means or resources, and finally relationships between stakeholders or "the field" and the educational institutions, facilitators and learners.

With regards to the hindering forces, common themes are lack of motivation, participation, commitment, confidence, familiarity, understanding and experience; cultural factors that affect the cordial or hegemonic relationship between students and teachers; disconnects between academia and practice; systemic and institutional factors and practicalities; and workload, time, energy and resources. Additionally, a large contributing hindering force this past Nextfood cycle was the Covid-19 pandemic, and the restrictions that followed, pushing much of the educational activities in the Nextfood cases online. This in turn led to hindrances in terms of uncertainty, unfocused attention, declining motivation, and difficulties in facilitation of, for example, peer-learning activities.

As for the supporting forces, many are "flipped" hindering forces such as financial, institutional and organizational support, time and effort, engagement, understanding and participation, as well as willingness and open-mindedness on part of all actors involved in the educational activity. Other supporting forces are positive responses and enthusiasm from especially students, but also stakeholders, and interaction and building of relationships between learners and stakeholders, learners and facilitators, and learner-to-learner (peer-to-peer). Despite all the related challenges, the online learning environment also supported action learning in how the classroom became more flexible and "could go anywhere", and more learners could be included across locations and time zones. The digital skills brought in by students, but also the skills developed in the online learning arena, were also a supporting force in that regard.

The cases in their reporting were also asked to say something about the teachers' or facilitators' perception of the greatest challenges, and these perceptions further confirm the hindering forces presented above. To summarize, the greatest challenges are pertaining to the mindset of students and authorities (UoC), and the students' or learners' perception of the facilitators as an information provider (UNIOR). Managing a group of learners is also a challenge, as the learners bring in a diversity of expectations, motivations, skills and abilities (NMBU, SEKEM). Also, figuring out how to best communicate and motivate the students and how to utilize action-learning methods when doing so, can be difficult (SEKEM), and even more so when one is lacking contents and tools to support the Nextfood pedagogy (UoC). It can also be a challenge to incorporate and manage multiple actors in course activities (CIHEAM, UoC) and to facilitate their "concern for action learning activities and its results" (CIHEAM). A full integration of action learning in an educational program requires coordination across many levels and between teachers and researchers that are used to domain-based activities. For many facilitators, it is a challenge to balance the diverging roles of a conventional academic teacher with that of an action-learning facilitator (NMBU, UoK). Certainly, also communicating and training the competences alone is a big challenge, and especially visionary thinking proved to be difficult to convey – particularly in an online format (CIHEAM). Moreover, the Nextfood cases

represent a large diversity of learners, facilitators, institutions, and educational programs, within a diversity of cultures and geographies. Thus, challenges with making the transition towards the Nextfood approach can be quite contrasting from one case to the next. In the SKOGFORSK case, they questioned how the Nextfood model as such can be applied to fit the needs of their learners, who are not full-time students, but busy working professionals, which presents additional hinderances.

The section below contains lists compiled across cases of forces that directly or indirectly support or hinder each essential shift in the Nextfood approach to action learning. The case acronyms in brackets indicate the data sources. In the lists of hindering forces, there are on some points mentioned possible remediations to overcome or address the hinderance, as reported by the cases in their case development reports. These remediations will later inform the findings related to the research question of how to build on the supporting forces and deal with the hindering forces for change towards the Nextfood approach.

4.2.1.1   *From lecture hall to a diversity of learning arenas*

4.2.1.1.1   Supporting forces

- **Institutional support.** As the UoK case reported they experienced permission and support by the university authorities as they acknowledged the model's positive outcome and impact.
- **Students feeling comfortable, stimulated, and motivated.** According to the NMBU case the students enjoyed changing the setting and appreciated the richness in the learning environment, which in turn supported the shift.
- **Students' appreciation (of the diversity of learning arenas).**
- **Developing human resources for promoting actions for change in farming and food systems.** In the UoC case a supporting force for this shift is the overall outcome of developing human resources for promoting agroecological action to rejuvenate and restore agriculture, food security, and rural economy.
- **Inclusion of 'distance learning' because of Covid-19.** The online learning arena led to increased learning of online education and communication, and this developed the digital literacy of students and teachers. Further the online format enabled connectedness among students and teachers located in different places, and time zones. As reported in the UNISG, UoC and NMBU cases, more students could participate and continue learning despite restrictions on physical attendance. Other supporting forces are:
    - **Human capital.** Responsiveness of students, their commitment to work and creation of social relations within the group and with the coaches (CIHEAM).
    - **Remotely connected farm cases.** Distance learning led to farm cases in different environments being connected to the learning community (NMBU).
    - **Increased availability of learning sources** due to the availability and flexibility of digital resources. I.e. web-cases, discussion for a, recorded classes etc. (UNISG, NMBU).
    - **Time management functions provided by digital learning platforms** (UNISG).
    - **Less interference from authorities** running the course (UoC).

- **Insufficient individual motivation and participation.** In the AFS/IHU case they reported how some students thought that the action learning approach was unnecessary and irrelevant, and that traditional learning was more suitable. Moreover, some students became overwhelmed by the different nature of phenomenon-based action learning compared to delivery of information neatly sorted according to topics in a pre-fixed syllabus.
    - o *Remediation*: In a flexible manner, build an academic culture of participation and active involvement (AFS/IHU, UoC)
- **Students' mindset.** E.g., as reported in the UoK case, students are unfocused when not in the classroom.
    - o *Remediation*: help students to understand action learning pedagogy (UoK)
- **Covid-19 restrictions** on field visits and classroom experiences resulted in:
    - o **Lack of participatory field experiences**, as reported in the cases at CIHEAM, UNISG, UoC and NMBU. At UNISG they found this to be more serious for students not having an agricultural background.
    - o **Reduced learner motivation**, as reported from SKOGFORSK and NMBU.
    - o **Reduced communication amongst students** when limited to online interaction. This could for example be due to network instabilities and other technical obstacles, as reported from USB, UoC, and NMBU.
    - o **Requirements of additional commitment and creativity from students and teaching team** (NMBU)
    - o *Remediation*: flexibility of staff (CIHEAM); modern technologies (CIHEAM); students visiting farms where they live (UoC; NMBU); focus on the advantages (see supporting forces)
- **Increased demand for time, energy, and resources.** In the UoK and NMBU cases they reported how the shift to a diversity of learning arenas demands more invested time and effort, which can be a hindering force in many ways.
    - o *Remediation*: mobilize more resources; assistance from the institution to help off-campus students connect with and build trust with their local stakeholders (NMBU).

4.2.1.2   *From lecturing to co- and peer learning*

- **Staff resources.** As reported in the CIHEAM case, sufficient staffing is important to enable co- and peer learning.
- **Teachers'/facilitators' open-mindedness.**
- **Diversity of resources due to students' different experiences, backgrounds, and disciplines.** In the AFS/IHU case they reported that these are resources that otherwise would remain unutilized. Moreover, in the UoK and NMBU case they reported that these resources are even more effective when students are consciously placed in working groups, taken into account the diversity.

- **Richness of information and knowledge from field situations.** As reported in the AFS/IHU case, co- and peer learning brings in a greater richness to the learning community after real-life, in-field experiences.
- **Stimulates creative and critical thinking.** As reported in the AFS/IHU case co- and peer learning stimulates creative and critical thinking, which further supports the shift.
- **Online group interaction.** Interactions online can improve group sensibilities, competence, and capacity for online interaction, and as such supports a shift towards more peer learning (AFS/IHU).
- **Team projects and peer learning serves as time management tools** in large classes, which motivates the teacher/facilitator, AFS/IHU reported. It is time- and resource efficient considering the many benefits of just one shift in educational strategy (AFS/IHU).
- **Experience sharing between previous and current students.** E.g., in the CIHEAM case they reported inviting previous-year students to share their experiences and reflect on the action learning cycle with the online students.
- **Students' appreciation** of taking "into account the students' voice" (UNIOR), learning from each other (NMBU), e.g., through group work, reflection sessions, and peer feedback (NMBU), and having more fun (UoC).
- **Facilitators recognition of the advantages of the shift.** These being advantages such as increased motivation of learners and facilitators (as reported in the points above, and by UoC, UoK, and NMBU), two-way communication between students and facilitators, and coupling of individual aspiration with the group's understanding (UoC).
- **Co-learning with various stakeholders helped the students in their orientation towards future jobs**, e.g. by creating contact with potential future employers, as reported in the UNIOR case.

4.2.1.2.2   Hindering forces
- **Students' limited experience in participatory learning** (AFS/IHU, SKOGFORSK)
- **Students' limited team management skills** (AFS/IHU)
- **Time shortage** (including time with external stakeholders) (AFS/IHU, UNIOR)
- **Students' motivation for and commitment to group tasks** (AFS/IHU)
- **Free riders** (UoK)
- **Covid-19 restrictions**
  - allowing mostly on-line interaction, which less effectively than direct interaction fosters trust and good group dynamics, particularly when network issues hampered interaction (SKOGFORSK, UoC, UoK, USB)
  - preventing direct interaction with last-year students (CIHEAM)
- **limiting participatory sessions** in general (USB)

Remediation: in general, a better training in groupwork skills, including building of trust among team members (AFS/IHU, SKOGFORSK); careful planning and structured implementation of peer learning activities; sub-sectioning of activities; on-line guidance and continuous monitoring and assessment of activities (e.g., individual grading to prevent free riding) (UoK)

4.2.1.3 From syllabus to supporting literature/diversity of learning sources

4.2.1.3.1 Supporting forces

- **Positive response to the shift** from both teachers and students, as reported by AFS/IHU and NMBU.
- **The students' trust in their abilities** to seek out and evaluate different sources of information and knowledge (NMBU)
- **Student's progress over time** and evidence of knowledge and research abilities (CIHEAM)
- **Students' IT orientation**, which should be further utilized, and improved for those who need it (even after the pandemic) (CIHEAM)
- **Flexible selection of learning sources** in accordance with the needs in each group and its action learning project (UNIOR, NMBU)
- **Digital tools to alleviate language issues** (UNISG)
- **Diversity is refreshing** (USB)

4.2.1.3.2 Hindering forces

- **Lack of previous experience and skills**. As reported in the AFS/IHU and CIHEAM cases students and professors lack experience and skill in using a diversity of learning sources, which leads to an uncertainty about the quality of student work and learning (AFS/IHU).
- **Hard to leave the security of the textbook**.
- **Rigid institutional requirements on syllabus** (UNIOR)
    - *Remediation*: recommend students to participate in extracurricular activities to acquire more practical knowledge and experience. (UNIOR)
- **Demanding task of selecting literature** (e.g., for pre-course assignments) that balances quantity, quality and compatibility with learning objectives and serves the needs of students from a diverse background. (UNISG, UoK)
    - *Remediation*: form an expert group to create a repository of essential readings and provide support to students (e.g., through literature seminars on key topics). (UoK)
- **Diversity in students' needs and perceptions**. As reported in the NMBU case there exists a diversity when it comes to the students' perceived needs and, therefore, potential unease and dissatisfaction with what is being offered.
- **Lack of agricultural background among some students** (SEKEM)
- **Technical problems** (instability of internet connection and device problems; lack of experience with on-line work) hampering access to alternative sources (USB)

4.2.1.4 From textbook to a diversity of teaching aids

4.2.1.4.1 Supporting forces

- **The motivation and willingness of all parties involved**, to learn and adapt to the circumstances (AFS/IHU)
- **The students' trust in their abilities to benefit from different teaching aids** (NMBU)
- **Experienced facilitators**. As UoK reported; mentors need to be trained (UoK)
- **A good understanding among the students**, and a good balance, of the functions of practical activities and theory in action learning (USB, NMBU)
- **The possibility of variation**, e.g., between on-line and on-site activities such as direct interaction and field visits, meant utilizing the best of several worlds

and led to increased student motivation, activity, idea generation and expressed appreciation (UNIOR, CIHEAM, UNISG, UoC)

- **Advantages of an e-learning platform** (supporting dialogue, space for questions, exchange of literature, creative group work, sharing of literature etc.) (CIHEAM, UNISG), which should be used even in a purely residential course (CIHEAM)
- **Students' digital competence**, enabling action learning despite the Covid-19 restrictions (CIHEAM, UoK)

4.2.1.4.2   Hindering forces

- **Lack of familiarity, lack of confidence, and skill gaps** among both teachers and students (AFS/IHU, NMBU). As reported in the NMBU case, students tend to rely on a textbook as the "course encyclopedia".
  - *Remediation*: Examples, testing and training of other teaching aids. (AFS/IHU) Facilitation of the students' unlearning (of relying on a textbook as the "course encyclopedia") and of training of core competences (NMBU)
- **Identification of literature supporting learning but not overloading the students** (CIHEAM)
- **Covid-19 restrictions limited possibilities of field education**.
  - *Remediation*: use of photos to describe phenomena and examples to discuss. (SKOGFORSK)
- **Time needed for learning the use of aids such as Teams and Zoom**.
  - *Remediation*: set off time learn. (UNIOR)
- **Lack of innovative educational activities**.
  - *Remediation:* targeted identification, use and assessment of alternative aids on the premises of educational objectives. (UoK)
- **Lack of resources** for finding, selecting, and experimenting with alternative teaching aids (UoK, USB).
  - Remediation: give priority to the task (UoK) and draw on resources and ideas from other courses (USB)
- **Insufficient understanding among teachers and facilitators of tools** beyond textbook and presentation to be used during on-line facilitation.
  - *Remediation*: preparatory sessions with contributors on beforehand. (UoC)

4.2.1.5   *From written exam to a diversity of assessment methods*

4.2.1.5.1   Supporting forces

- **Professors' willingness to go a step further**, which should be followed up by the educational institution, since the diversity of learning styles among students requires diverse methods for assessing their knowledge and competences (AFS/IHU)
- **Involvement of staff not directly involved in the Nextfood case** as a means of promoting institutional shift in assessment methods, as reported by CIHEAM.
- **The reflections on the students' work by teachers or external** actors improved the quality of continuous assessment, according to UoC.
- **The improved possibility of students to express** their creativity and greater freedom to express their ideas (UNISG)
- **Students' relief and increased motivation** for learning when not having to do a final written exam, which traditionally is being assessed in the form of a single, often not very informative grade. (UoC)

- **Students' appreciation** of the formative function of continuous, informative assessment (USB, NMBU), as well as their appreciation of an external committee participating in evaluation their projects.
- **Avoidance of rote learning** (UoC)
- "[G]roup assignments encouraged the students to learn from their peers, to share responsibility and improve dialogue competences." (UNISG Case development report 2021). As such, including group assignments as an assessment method can motivate and encourage, and in turn affect students learning – which also supports this particular shift.
- **Reshuffling of students among groups** reveal individual contributions to group work (UoK)

4.2.1.5.2 Hindering forces

- **The time, energy and organizational skills** needed to assess students (AFS/IHU, USB, NMBU)
  - o *Remediation*: examples needed.
- **Not yet settled methods** (NMBU), e.g., for assessing core competences (NMBU), which students find disturbing (CIHEAM).
  - o *Remediation*: reflexivity, awareness, and generally a high reflective capacity among the teachers; peer evaluation (NMBU).
- **Diversity among students results in very different forms and contents of outputs**, e.g., reflection journals, which can make assessments challenging.
  - o *Remediation*: give more specific instructions and questions (UoK)
- **Challenge of using written assignments**. In a course for practitioners (forest machine drivers), it was difficult to use written assignment, SKOGFORSK reported.
  - o *Remediation*: self-assessment of case-related topics and core competences (SKOGFORSK)
- **The pandemic delaying face-to-face final evaluation** in a meeting between students and an external committee evaluating the students' projects (UNIOR)
- **Institutional formalities** requiring a written exam.
  - o *Remediation*: discuss the issues with the authorities (UoK)

4.2.1.6 *From lecturer to learning facilitator*

4.2.1.6.1 Supporting forces

- **Open-mindedness of the coordinators/learning facilitators** (including external teachers and stakeholders) towards unlearning conventional teaching and learning facilitation instead (CIHEAM, UoK)
- **Facilitation experience** (SKOGFORSK)
- **Training in action learning**, e.g., through internal seminars/workshops about the concept and its implementation (UoC), and pre-session briefings of the involved teachers and external stakeholders (UNIOR, UoC)
- **A relaxed, informal atmosphere** accompanied with a set of rules established together with the students. (UNIOR)
- **Involvement of staff beyond the actual action learning course** and increase in the use of action learning in several courses would be desirable (CIHEAM)
- A good combination of lectures already given to the students with the action learning methodology (AFS/IHU, CIHEAM)
- **Students' appreciation of having facilitators with different approaches** in teaching and facilitation (UNISG)

- **Use of motivating factors** (e.g., exercises, presentations of student work, social interaction, re-use of methods such as rich picturing) for students to participate in facilitated activities (USB)

- **Expectations of traditional education**. The educational system and students' expectations many places are based mostly on content knowledge acquisition through "traditional frontal education" (USB) or "conventional chalk and talk education system" (UoC), the concepts of skills and competences are alien to the learning culture (AFS/IHU, USB) and there is disagreement in academia about what should be the teacher's role (UoK). Personality of students and others involved reinforce or weaken this predisposition. For example, USB reported that some of the external experts (especially farmers) were not used to the facilitator role and did not perceive the students as partners in a collective system inquiry or co-learning endeavor. UoK similarly reported about cultural factors preventing a cordial relationship between teachers and students. UNIOR reported that in the beginning it was a challenge to prevent the external facilitators from talking more than 40% of their time in order to allow for student activity, to stay away from distractions and to focus on the conversation, situation or issue at hand. A similar observation was made in the UoC case.
  - *Remediation*: framing of the learning activities to incorporate training of core competences and other learning skills such as information seeking, essay writing, presentation group work, critical thinking, systems thinking and problem-solving; time spent on establishing an atmosphere suitable for dialogue between external stakeholders and students; familiarization of the external stakeholders with their role; discussions and deliberations in academia on the teacher vs facilitator role (UoK)
- **Fear among the students** that their learning may be overly influenced by the specificity of the case, resulting in very different learning outcomes in different student groups. (CIHEAM)
  - *Remediation*: Dialogue in the planning stage between course organisers and external stakeholders with emphasis on the primary learning goals, which pertain to a systemic approach to taking informed action in a case rather than to specific subjects (CIHEAM, NMBU).
- **Some students' large need for and expectation on teacher participation**, feedback and guidance (NMBU)
- **The on-line environment** is somewhat limiting to the interaction between facilitators and students (time and other management; communication quality) (AFS/IHU, UNIOR, UNISG, NMBU).
  - Remediation: becoming familiar with the platforms (UNIOR)
- **Lack of institutional support for facilitation** (UNISG)
- **Lack of time for sufficient organization and reflection** (UNISG)

4.2.1.7   The most useful and inspiring experiences

In addition to reporting on the supporting and hindering forces of implementing the shifts, the cases are asked to say something about the most useful and inspiring experiences in their cases. For example, AFS/IHU and ISEKI reported the high level of motivation among the actors involved as inspiring. Also, AFS/IHU reported that the students expose a great need for participating in multi-actor, action-based activities and a receptiveness to ideas concerning sustainability, which is increasingly becoming

a part of everyday social narratives. CIHEAM wrote that they found students' happiness when getting in direct contact with external actors as inspiring, while UNIOR found students' appreciation of the hard work from the teaching team with the course. UoC reported that most of the students are the product of conventional chalk and talk education system and are not used to observation–participation–reflection kind of education. However, after some time needed to familiarize with the new system, they were loving it. In their case development report UoC wrote that how the students quite enjoyed the process of participating together with the facilitators was inspiring. From another case it was reported,

"Students did not initially anticipate the relevance and the help offered by such presentations [of students' project work]. However, we were pleasantly surprised by how students embraced all activities. This was depicted in their reflection documents."

AFS/IHU Case development report 2021

Further, students' appreciation of the richness in the learning environment, their engagement, openness, and willingness to play an active part, and their overall satisfaction was inspiring to the cases. UNIOR reported that the students' visioning (of new products) and their enthusiasm during the whole learning process inspired them. Additionally, the UNIOR students' final evaluations inspired everyone involved, and suggested that the course was a success. At UNISG they reported being inspired by the visible products of the action learning activities (e.g., presentations and reports). UoC found inspiring the students' belief in their of capabilities in being change agents, as a result of acquiring knowledge through bridging academic studies of farming and food systems, with their own life experiences. This echoes through what the NMBU case also reported. In their case students voiced an appreciation of the course's emphasis on autonomous learning, seeing the link to becoming life-long learners, and acknowledging the usefulness of the core competence, while they also reported about transformative learning. At USB they experienced how the students in the action learning course were more active participants and performed better when collaborating with students from conventional courses. In the AFS/IHU case professors, although having to deal with stressors such as time and budget limitations, as well as organizational hassle, seemed to improve their relationship with the students, which led to increased job satisfaction.

For many of the cases positive interaction with stakeholders contributed to inspiration. For example, in the ISEKI case they reported on how the external stakeholders played an active role, and at AFS/IHU professional actors and organizations have a strong interest in connecting with universities. Also USB had fruitful interaction with external experts, and received positive feedback from them. With regards to the online learning environment the cases learned how to work with action learning in a fully online mode, e.g. through digital casework and online reflection sessions in Zoom break-out rooms. Conducting the course off-line, amidst a pandemic, without compromising the Nextfood approach was in turn inspiring for the UoK case. At UNISG and NMBU they experienced successful use of a ready-made web-casework which enabled online

action learning. While at SKOGFORSK they were inspired by the good results obtained when all participants met outdoors, which enabled dialogue about what everyone could see at the same time, and knowledge sharing on an equal level. Finally, good collaboration within the teaching team (UNISG) and sufficient financial means (ISEKI) served as sources of inspiration.

4.2.1.8 Facilitators' view of greatest challenges to achieving such a shift

Below we present the teachers'/facilitators' views on the greatest challenges to achieving a shift to the Nextfood educational approach, as addressed in the work package 2 research question on case development. Some points are followed by a possible remediation of said challenge according to the solutions reported by the cases themselves, as in the above-presented hindering forces under the essential shifts.

- Action learning is a relatively new and small activity within a large university otherwise lacking a competence-related culture, conceptual framework for sustainability, experience with action learning and institutional readiness for dealing with some of the issues specific to an action learning course, e.g., interdisciplinarity (AFS/IHU, UNISG, UoC). Some contributors to and participants in the action learning course, let alone the university bureaucracy and leadership, are still in the process of understanding the action learning concept and its key process. (AFS/IHU, SEKEM) E.g., some students become overwhelmed by the different nature of phenomenon-based action learning compared to delivery of information neatly sorted according to topics in a pre-fixed syllabus (AFS/IHU, SEKEM). Another example is the reported challenge of instructing students how to write the reflection document and convincing them that teachers do not constitute their only source of knowledge. (UNIOR)
  - o *Remediation*: communication about this issue with professors and students that become involved in the action learning activities and with university authorities (AFS/IHU)
- Insufficient staffing (UNISG)
- Balancing or enabling the students to balance worktime and time off (UNISG)
- The general lack of connection between academia and other actors in society who would be able to inform and update curricula and offer opportunities for experiential learning. (AFS/IHU)
- Insufficient readiness among external stakeholders for participating in action learning caused communication challenges. (CIHEAM, UNISG, UoK)
  - o *Remediation*: educating the external partners (not only academia) (CIHEAM)
- The challenge of shifting a whole course, not only a single module, to action learning (CIHEAM)
- The reliance on digital, internet-based communication due to the Covid-19 situation resulted in susceptibility to technical problems such as unstable internet connection and fading laptop and phone batteries, which lead to declining motivation among course participants (SKOGFORSK).
- The Covid-19 restrictions made contact with external stakeholders more difficult (UoC, USB), and required adoption of new, online processes vulnerable to insufficient student participation and uncertainty of their results (UNISG)

- Lack of direct contact with students and students residing in different time zones reduced the quality of the communication and thus the learning environment. (UNISG)
- Density and intensity of the course (full week including evenings) (UNISG)

4.2.2 What does such a change require from teachers, students, and institutions?

AFS/IHU reported "we see that motivation, willingness and opportunities for alternative teaching methodologies are the most important factors for achieving the desirable shift". Similarly, UoC wrote that the circular process of co-creating knowledge among stakeholders including learners, facilitators, and farmers "presumes a change in the conventionally assigned role of each stakeholder in the education system which has to come from attitudinal changes." Moreover, CIHEAM considered "flexibility, a lot of flexibility, open mind, a bit of courage, good planning and institutional support" to be key. Further, the change arguably requires more interaction, and it would seem especially between the world "out there" and the academic realm, i.e. between stakeholders, institutions, and facilitators (and learners). But also, between facilitators and learners, as there are certain cultural and hegemonic structures and roles that hinder a reciprocal learning development to take place, as touched upon in the reported findings. Learners more importantly need to take charge of their own learning and understand that they themselves are responsible for it. To sum up requirements, the cases' reported findings are presented as listed bullet-points below.

4.2.2.1 *What does such a change require from teachers or facilitators*
- Better understanding of the action learning approach and the need for getting out of the knowledge transfer mode and into, e.g., the reflection mode (UoC)
- Attitudinal change resulting in a required change in the conventional teacher role; "practicing what they preach". (This also pertains to the roles of students and external stakeholders involved in the education) (UoK, NMBU)
- Being aware of one's limitations and being open to critique (NMBU)
- Flexibility and adaptability (NMBU)
- Training in being a facilitator (ISEKI)
- Motivation, determination, and engagement (UNIOR)
- Participation and dialogue (UNIOR); communication between and amongst teachers and students (NMBU)
- Consideration of student diversity, e.g., regarding expectations, motivation, learning style, autonomy and agency and need for guidance and support (NMBU)
- Clear communication about what action learning entails, what the course has to offer and what is expected from students, and mindful facilitation of the students' involvement in the action learning process (NMBU)
- Teacher interaction with potential contributors to the action learning arena from "the world out there" (ISEKI)
- Continuous evolution of teaching methods and facilitator tools, especially those fostering interaction and collaboration among students (ISEKI)
- Customization to target groups (SKOGFORSK)
- Spending sufficient time on course design during the planning, implementation and reflection phases (UNIOR)
- With reference to the need for on-line activity, readiness, flexibility. Adaptability, and familiarity with digital tools (UNISG, NMBU)
- Flexibility and willingness to give up control (Consortium meeting 2021)

- That they "demand an education that properly prepares them for their future professions." (AFS/IHU)
- More involvement and engagement in their studies (AFS/IHU and UNISG)
- The need for getting out of the knowledge transfer mode and into, e.g. the reflection mode (UoC)
- An understanding that they are in charge of their own learning (ISEKI) and switching to self-learning mode (UoC)
- Attitudinal change leading to a required change in the conventional student role (UoK)
- Trust in the process, the teachers, and themselves (NMBU)
- Being responsible, information seeking and prudent (UoK)
- Participation and dialogue (UNIOR)
- Patience (UNISG)
- Familiarity with digital tools (UNISG)
- Social skills, extrovert engagement with others (Consortium meeting 2021)
- A critical and reflection-based view on food and agricultural systems (Consortium meeting 2021)
- Open-mindedness and flexibility (Consortium meeting 2021)

4.2.2.3   *What does such a change require from institutions*

- "The willingness to widen the context of thinking" to include society involvement and building of "relationships with civil society rather than focusing on theoretical literature." (ISEKI)
- Need "to come out of the comfort zone of dealing with 'information' and has to start to act in society by creating a platform where relevant stakeholders can meet." (UoK)
- "Incorporate teaching methodology in their educational culture and mindset and make it a mainstream theme of discussion and teacher assessment" (AFS/IHU)
- "Incentive and training opportunities to professors to develop their teaching methodologies to deal with the challenges of the future" (AFS/IHU)
- "Be willing to see the data showing success of the Nextfood approach and apply the approach elsewhere." (ISEKI)
- Implement reflection at all stages – design, planning, implementation (Consortium meeting 2021)

4.2.3   How can we build on the supporting and address the hindering forces (reformulated as challenges) for change?

According to the findings from the cross-case analysis, one could summarize that a change towards the Nextfood approach requires an overall shift from mono- or oligoculture to diversity. The above-presented findings from looking at the cases' reported challenges, successes, and requirements in exercising the six essential shifts in Nextfood support this conclusion. In working with implementing the Nextfood approach, the cases also reported on how they see it fit to address the identified supporting and hindering forces, and how to overcome the challenges faced in each case. Some of these solutions are case- and culture specific, but certain common denominators are recurring. The cases reported that guidance makes the learners more confident and that clear instructions and introductory sessions are a way to

overcome the challenge of unfamiliarity and lack of understanding. Further, planning and structure are important, as is also practicing more dialogue in the planning stages of the process. Moreover, building trust is drawn forth as something to focus on, and doing so by interacting with learners, dialoguing, and communicating. To familiarize learners, facilitators, institutions and stakeholders with the approach, a solution could be to conduct training sessions, workshops, lessons or in other ways educate, and encourage participation and engagement. This goes not only for learners and facilitators, but also stakeholders, who just as much need to develop an understanding of this new approach, as reported by the cases. It is important to provide support and guidance when going through the 'shifts' and as such training is needed on several levels. Based on the findings from the cases in AFS/IHU, UoK, and others, supporting competence development is not only important in learners, but equally important for facilitators. As AFS/IHU stated in their case development report, "it takes time and perseverance in order to make a permanent change in culture", and it takes "concrete guidance and skill building on the part of the professors and the students to make [action learning] a reality".

When asked to report on their plans on how to move forward in their change towards the Nextfood approach and their case development, the cases noted a that there is a need to focus more on studying the competences in real-life setting and to explore the "dynamics of multi-actor relationships", strengthening ties between academia and practice or the professional world, and to expand the action learning culture that has been started (AFS/IHU). This rings true in several cases – the need to strengthen the bond between field experiences and learning activities, to "further expose students to multiple actors, activities" and landscapes (CIHEAM).

5 Reliability and validity of the reported findings

The reliability and validity of the presented results vary with the data material and analysis conducted in each specific case. This depends on the quality of the data collected and the amount of time and effort spent on systematic coding and. Most importantly, the validity of the results and the reporting from the Nextfood cases depend on the validity of the instruments for data collection (Bernard 2006) – i.e., how not only the WP2 and WP3 leaders have instructed the cases in their case development and action research, but also how the subjects of this action research (case participants) have understood the questions they have been asked and the Nextfood project. The cases are diverse in their structure and practice as well as in research conduct. Some cases report thoroughly and transparently based on the data material collected from their participants, but in many cases the action researchers are also the contributors to the educational activity of which the case is reporting upon, which requires awareness and meta-reflection (Levin and Ravn, 2007). This could lead to 'selection bias' in the presented results (Bernard 2006). However, the narratives in the case development reports contain valuable data on how the authors perceived the situation, even if lacking in transparency or rigor when it comes to the ontology of the case. It has been important for the process of cross-case comparison and analysis to be aware of these nuances and to account for the precision in the cases' data collection and reporting. This has been done, for example, by instructing the cases to fill in a check-list indicating what activities they have conducted and how the data have been collected.

Further, the reliability and validity of the cross-case analysis of the Nextfood cases depends on the thoroughness on part of the researchers conducting this analysis and the documentation and transparency of the process. To the best of our ability we have tried to document the process by noting down initial thoughts when approaching the data, and by reading through the material several times. In doing so, we initially looked at the individual case development reports as separate units of analysis, prior to structuring the sections of the reports as stand-alone data units and analysing the material horizontally and, for the shifts in educational strategies, conducting a vertical sum-up across the shifts of supporting and hindering forces. Providing detailed instructions for the cases' reporting of their action research results and following a structured strategy for cross-case analysis strengthens the reliability of the findings reported above.

The process of cross-case analysis was done by two NMBU Nextfood researchers, and a continuous dialogue was upheld throughout the process to ensure consistency and to increase 'interrater reliability' (Bernard 2006). It must be said that certain limitations to the work could have affected the reliability and validity of the results, for example, as we did not consistently write a coding log or document the final stages of the analysis in large detail. However, this will be followed up in the next cross-case reporting in the final report on educational strategy (D3.6). One could also hypothesize that the researchers' familiarity with the implementation of the Nextfood approach at

NMBU and in the other cases throughout the process, could affect to a certain degree the analysis and findings; one might have subjective expectations of what to find in the data and selection bias in which findings are emphasized (Bernard 2006). This has been discussed within the research team, and we hope that we have been rigorous in our reporting.

Moreover, the reliability of the results from the cross-case analysis will most likely be affected by the unique situation in which the Nextfood cases have found themselves in this last cycle – due to the Covid-19 pandemic and following restrictions. This has, of course, been reported on in both the case reports and addressed in the cross-case analysis. Nevertheless, that's not to say that the findings in this cycle are less generalizable.

6 Implications for future work

6.1 Connection to other work packages in Nextfood

The Nextfood Inventory of skills' seven themes of competences: Life-long learning, adaptability and problem-solving; Collaboration; Systems perspectives; Digital and technical skills; Building and maintaining networks; Strategic development and marketing; Interpretation and negotiation of sustainability (Rosenlund et al., 2019).

Previous research in Nextfood presented an inventory of skills and competences co-created by stakeholders in the agrifood and forestry system (Rosenlund et al., 2019). Seven themes of competences were identified as important for future professionals to be able to deal with sustainability challenges. Based on the analysis in this report, it can be concluded that all of these themes to various degrees are catered for in the Nextfood cases. Digital literacy and technical skills are not explicit learning goal in the Nextfood educational approach. Nevertheless, due to the pandemic during the past year, facilitators, stakeholders and learners have been working in a mostly online setting and have developed even digital literacy and technical skills. It is important to note though, that online work had its challenges and could, of course not fully compensate for the loss of not being physically present to observe and interact, which is the very core of action learning.

Cases reported that students developed self-direction and motivation in relation to their learning process. They developed critical thinking and got to collaborate with individuals from a variety of backgrounds and with many different experiences, pre-knowledges, and skills. These are all aspects of "life-long learning", which is one of the key future professional skills or competences identified in the inventory of skills (Rosenlund et al., 2019: pp 22). Additionally, in the report on inventory of skills (Rosenlund et al., 2019) it was also stated that "…mindset and motivation are important drivers for change and underlying most of the themes and skills in this document" (ibid., pp 22). We found that this also rings true in the present findings from the cross-case analysis, which will be further addressed in the theoretical discussion below.

Visionary thinking is a competence that to a variable degree has been understood and trained in the cases. Notwithstanding, envisioning a future farm or food system may be related to the development of skills in "innovation" and "problem-solving" as well as "adapting to climate change", somewhat depending on what the educational real-life casework entails. As for "life-long learning" these are competences important for navigating in a changing world (Rosenlund et al., 2019: pp 22). Furthermore, it was reported that students in the Nextfood cases developed skills that helped them to collaborate and deal with diversity. Collaboration has been identified as one of the most important skills for the development of a sustainable agrifood and forestry system (Rosenlund et al., 2019: pp 25). Our findings from the past cycle support this claim.

Systems thinking (or «the challenge of the whole») focuses on a need for skills that support professionals and practitioners to operate in complex agrifood and forestry systems where all 'pieces' of the system are interlinked (Rosenlund et al., 2019). Several of the Nextfood cases reported that learners developed systems perspective. The importance of future professionals having a holistic understanding of the agrifood and forestry systems in order to deal with complex sustainability challenges was emphasized by stakeholders in focus groups interviews and in existing literature (Rosenlund et al., 2019: pp 26). A systems thinking perspective is also in line with Dimitrievski et al. (2020), as it is one of the 'skilling pathways' included in the Audit Tool (Dimitrievski et al., 2020) for ranking the users' education. Thus, according to the above-mentioned findings in the cases, developing a systems thinking capacity in the learners seemed to serve as a way for them to make sense of complexity in farming and food systems, but also to understand how they could contribute to changing them. Some students highly appreciated educational activities targeted at improving system thinking and declared their willingness to use this ability in both their professional and personal lives. Additionally, the systems thinking capacity served as a way for the students to make sense of the complexity of their own learning and competence development, in many cases.

Working together with farmers and stakeholders to create a future vision (as in the cases at UoK, UoC and NMBU) offers an opportunity for the students to train competences that are important for building and maintaining networks (Rosenlund et al., 2019: pp 30). The students' development of skills related to collaboration and critical thinking will potentially also enhance their ability to act in various networks (which was discussed in Rosenlund et al. (2019)). Viaggi et al. (2019) described networking – or collaboration between different stakeholders – as one missing element in education policies. Findings from the cases and the inventory of skills (Rosenlund et al., 2019) echoed the need for stakeholder collaboration and networking as a competence required for sustainable development.

Strategic development is, according to agrifood and forestry stakeholders (Rosenlund et al., 2019: pp 31) an important future professional skill. It entails steering a business, or other organizations, towards sustainability. Even though the Nextfood cases are not within business management, it was found that the learning process motivated and trained the learners to become change agents. Further, learners reported on a personal transformation of attitudes, and how the learning process offered ample opportunity to challenge their preconceptions, assumptions, and worldviews in relation to a sustainability transition. To be able to negotiate different views on sustainability, will potentially become more important in the future (Rosenlund et al., 2019: pp 34), and being able to recognize these differences will be a valuable asset for future professionals.

The Nextfood project will create roadmaps for the transition towards a sustainability education in agrifood and forestry systems. This report presents several forces that directly or indirectly support or hinder such a transition for learners, facilitators, and

institutions. Therefore, this report makes an important contribution to the coming work in the project.

The analysis of the case reports could to some extent also be related to the gap analysis carried out in WP1. It should be explored whether the gaps highlighted in education and research are being closed or not in the action learning cases. Especially, it could be interesting to see which gaps were highlighted in official courses by our partners who also carry out case studies of action learning courses. The connections between the gap analysis and the cross-case analysis will be further explored in the final stages of the Nextfood action research process in WP2 and 3, in the coming year.

Below we will look at selected findings in light of relevant theory, while discussing possible implications and improvements for the final year of the Nextfood casework.

6.2 Going into the final Nextfood year

6.2.1 The Nextfood educational approach in 'Signature pedagogy' terminology

As discussed above, the Nextfood cases show us that in their diversity there are also similarities when applying and transitioning to the Nextfood educational approach. The results from our cross-case analysis resonate with other research findings such as those from the 'inventory of skills' (Rosenlund et al. 2019), as discussed above. One could also align the Nextfood educational approach to that of 'Signature pedagogy theory' (SP) (Valley, Wittman et al. 2018) and discuss the findings in that regard. Valley et al. speak of SP theory as terminology that enables scholars to share a common language when describing and exchanging experiences educating learners in sustainable food systems education (SFSE). A detailed application of the SP framework to the Nextfood educational approach is not a task for this particular report, however, the above-mentioned article does highlight the need for more examples of "pedagogical transformations" to identify successes and overcome challenges, for enhanced applicability across multiple higher education programs. They too identify a number of issues that need to be further discussed and draw forth four areas that require development to enhance students' learning experiences and create more reciprocal partnerships with stakeholders. These are: supporting students' reflection processes; creating safe spaces for dialogue; preparing students for non-hierarchical views of knowledge; and promoting discordant pluralism (Valley, Wittman et al. 2018). The latter supports a type of appreciation or utilization of disagreements as a basis for further discourse to happen ("agree to disagree"). One could argue that the findings reported from the Nextfood cases answer to the request voiced by Valley et al., namely, to assess to what extent programs in sustainable food systems education enhance their learners' ability to deal with complex challenges, but also how they cultivate "appropriate values, attitudes and dispositions towards diverse ways of seeing and knowing" (Valley, Wittman et al. 2018).

Arguably the Nextfood educational approach, when applied in the different cases, to a varying degree enhanced the learners' ability to deal with "the challenge of the whole", as reported in the above findings. Moreover, a central finding from the cross-case analysis is that the mindset, values, and attitudes of teachers or facilitators, institutions, stakeholders, and learners highly affect the learning process and the transition towards the novel action-learning approach that the Nextfood educational model is. The cases reported on how the motivation, willingness, and openness of the involved actors challenged and supported the implementation of the approach. A recurring issue seemed to be how to change mindsets and to facilitate motivation, and in general there seems to be a need to establish a common understanding of both the need for, and a belief in, the action learning pedagogy – i.e., the Nextfood educational approach.

6.2.2   Strengthening action learning participants' belief in action learning pedagogy

The mindset of all actors involved in action learning, including the belief in its justification and assumed outcome, was in several cases highlighted as a key supporting force when it was present and a hindering one when it was absent. It seems relevant to view this finding in relation to the term self-efficacy belief, i.e., the belief in one's ability to accomplish something. This is at the core in social cognitive and human agency theories (Bandura 1998, Bandura 2006). Proxy efficacy belief is the belief in the ability of a third party to accomplish something, e.g., the facilitators' belief in the students' efficacy, which is then a prerequisite for collective efficacy belief (Elias and Macdonald 2007, Bandura 1998). One could say that this is connected to both confidence and trust, and in learning, self-efficacy is linked to the belief in one's ability to influence competence development. In modern education today, learners have a greater personal control over their education and learning. Learners "are agents of their own learning, not just recipients of information" (Bandura, 2006 pp. 176), and enhanced sense of self-efficacy fosters academic development (ibid.). Thus, the theory of academic efficacy and agency in learning connects to the Nextfood approach, of which the goal is to educate the next generation of professional agents of change in transforming agrifood and forestry systems for a sustainable future.

Based on the latest cross-case analysis, one could argue that there is a symbiotic and reciprocal relationship between efficacy belief (and agency) at all levels of implementation of the Nextfood approach, i.e. , among learners, facilitators, institutions, and stakeholders. For the approach to be implemented successfully, one needs to facilitate increased efficacy belief in all participants. They need to believe in the approach's ability to contribute to change in food systems, and the other involved actors' ability to also act towards the same goal. Facilitators need to believe in their own efficacy when it comes to enabling learners' learning, agency, and sense of efficacy (proxy efficacy), as well as the learners' efficacy belief in competence enhancement and learning development (becoming a change agent). Further, the same goes for institutions towards both facilitators and learners, as well as their own self-efficacy belief. Additionally, findings related to peer-learning and group work from the Nextfood cases, prove the need for a collective efficacy belief in the collaborative effort of a groups' action and ability to foster change in a system and in learning. In turn, collective efficacy belief fosters belief in self-efficacy, and research has shown a relationship between these factors and 'academic efficacy' and performance, i.e.,

competence development (Elias and Macdonald 2007). Learners' self-efficacy belief can also be linked to the Nextfood core competences in multiple ways, for example, in how "turning visions into reality" requires a resilient and strong sense of efficacy (Bandura 2006 pp. 176), or how "Experiences become instructive through cognitive processing of efficacy information and reflective thought" (Bandura 1998 pp. 54). Many cases reported about learners' feeling of insecurity, lack of confidence and participation, motivation, and commitment as major hindering forces when changing towards the Nextfood approach. Enhancing learners' self-efficacy could serve as a potential way to overcome these challenges.

There are four 'modes of influence' in how to enhance an individual's belief in efficacy (Bandura 1998): 'mastery experience', which is the experience of success, and the factor that enhances self-efficacy belief the most (ibid.); 'vicarious experiences', i.e., seeing others who are similar to oneself succeed by applied efforts; 'social/verbal persuasion'; and 'physical and emotional states', which naturally affects how one judges personal capabilities. To further back up the connection to the Nextfood cases, Bandura's 'Efficacy activates processes' should also be mentioned (ibid.). These highlight how cognitive processes such as forethought in the form of setting goals are important to develop efficacy belief, as well as motivational and affective processes such as supportive relationships (ibid.). Forethought can easily be linked to the core competence of visionary thinking and indicates a connection between successful implementation and visionary thinking competence proficiency. Moreover, the cross-case analysis backs up the correlation between supportive relationships, efficacy belief and learning development. The UNIOR case reported that the facilitators in their case developed a strategy for the students to use when approaching a problem, and by doing so they created a supportive relationship between learner and facilitator, while also strengthening autonomy in the learners, and providing them with potential mastery experiences. Even though learners nowadays are more self-directed than before, the degree of autonomy and feeling of responsibility for own learning varies across cultures and individuals, which is indicated in the findings from for example UNIOR and USB, where the students are used to being led by their teachers. These are nuances that are important to consider. Research on academic self-efficacy belief shows that proxy efficacy belief (i.e. by facilitators) support enhanced sense of self-efficacy in students (Elias and Macdonald 2007), but to what degree students in higher education look to others in strengthening their own efficacy belief, depends largely on their ability to take responsibility for their own learning. The cultural variation in the Nextfood cases implies a diversity in the linkages between proxy efficacy and enhanced academic self-efficacy belief, but generally indicates that self-directedness and autonomy in learners is important for competence development.

The case at the University of Kerala wrote in their case development report the following, which illustrates further the connection between motivation, efficacy, and the transitioning towards the Nextfood approach:

"There is still difficult to motivate students for the activity, what affects especially the discussions, individual work of the students, their input into the course (e.g. presentation of own learning sources). This is problem om the national level, where after long years of passive approach of the students, which are not motivated for activity, we trying to completely change

their behavior and approach. It will be necessary to repeat this process each year, as the new students (not familiar with Nextfood methods), will join the course. Similarly, also by some of the external experts (especially farmers), the students are not perceived as partners and it takes some time to put them together and to create atmosphere suitable for dialogue."

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Also, the AFS/IHU case highlight this relationship:

"The lessons we learned is that it takes time and perseverance in order to make permanent change in culture. Although it is very common and easy to talk about action learning among professors and actors, it also takes concrete guidance and skill building on the part of the professors and the students to make it a reality. We have also learned that this support can be given with ease now that we have established a good relationship with the institution. At the moment we can utilize a vast amount of tools and experiences in order to continue and disseminate our work to other professors and more students."

AFS/IHU Case development report 2021

While deductively looking at the examples from AFS/IHU and UoK in the lens of self-efficacy theory, their experiences in their casework support the link between learners' poor efficacy belief and successful implementation. However, they also support the need for these 'mastery experiences' within the approach. Research on college performance and efficacy belief proves a relationship between past experiences (previous mastery experiences) and sense of academic efficacy and performance, as mentioned above (Elias and Macdonald 2007). Individuals that are placed in unfamiliar and "messy situations" such as in the Nextfood cases, arguably tend to rely heavily on past performance when judging their personal capabilities. However, more familiarity with the learning environment lowers the need for these past experiences, and in turn enhances efficacy belief (ibid.). The Nextfood learners' self-assessments of competences shed light on the students' efficacy belief, or at least their assessment of personal capabilities in the learning environment, and the hindering forces and challenges reported by the cases indicate that participants' limited experience, confidence, and familiarity is a challenge in both planning, implementing, and improving the casework. The results from the cases also prove a correlation between familiarity with the competences and enhanced proficiency, as suggested in the previously mentioned theory.

Let's use the AFS/IHU case as an example. In their case development report, they mentioned how they support facilitators, disseminate their results and the approach, and host workshops with stakeholders. They voiced how facilitators on these bases can support learners and stakeholders – and in turn each other – to build trust and enable these 'mastery experiences' and competence development, as well as efficacy belief both individually and collectively. As mentioned also in other cases (e.g., UoK and UNIOR), cultivating the core competences in the facilitators is as important as in the learners, and a "clarity of vision" can help to deal with challenges faced according to the UoK case report (2021). AFS/IHU further stated that they plan to "enhance action learning culture" by expanding the benefits they have seen to "the larger possible

population" through workshops, seminars, and dissemination work, i.e., supporting 'vicarious experiences'. As stated in the SKOGFORSK case development report (2021), an important lesson learned from the previous cycle is that it is necessary to "create a common understanding of the benefits of participating in the case before each learning cycle starts".

Based on these findings, one could assume requirements to enhance sense of efficacy in all actors within the Nextfood learning community, with the following "steps needed":

- **Introduce the approach** to increase familiarity, create a common understanding, and build ownership. **How?** By hosting workshops, seminars, meetings, focus groups etc.
- **Disseminate results** and **create vicarious experiences of success** – illustrate how the approach has been successful. **How?** For example, introducing mentors, as in the UoK case, or by hosting conversations between previous and current learners, as at CIHEAM and USB. Following-up and sharing experiences from previous stakeholders and actions research could also enable efficacy belief.
- **Create a common goal**, and a **vision for the future** as a fundament to build on further, and to create ownership and responsibility.
- **Design strategies for problem solving.** As mentioned above, strategies for problem solving can enable students' autonomy by successful experiences.
- **Enable 'mastery experiences' as soon as possible**. Many students have no knowledge about action learning (novel approach), and therefore there is a clear need to facilitate successful experiences when entering the course, in order to encourage participation and motivation. As shown in the reporting from the casework, participation is key to competence development, and there is a congruent relationship between successful experiences in the field and learning.
- **Provide support and positive affirmation.** Multi-level support is needed – i.e., between facilitators and learners, institutions and facilitators, facilitators and stakeholders, institutions and stakeholders, and within facilitator and learner groups. Moreover, there is a need for support in the Nextfood cases from WP2 leaders in case development, such as the successful support of peer-learning groups between Nextfood cases. **How?** For example, by enabling feedback and follow-up, careful facilitation, competence development in dialogue, and supportive peer-learning.

The analysis across cases – and cultures – in the Nextfood project all indicate a general connection between case development and action-learning transition and strengthened efficacy belief. The efficacy theory is one theorization of motivation that could explain the causal relationship between learning/competence development and motivation, willingness, and openness, as reported from the casework. In the future one could examine the relationship between the implementation of the Nextfood educational approach and efficacy belief more closely by approaching the data deductively based on this theory; it could be interesting to collect data aimed at

measuring (self-)efficacy belief in these learning environments. Moreover, for future discussion of the implications of the approach, one should also look into other theories that could shed light on the findings, which could be addressed in future publications from the project.

After looking at the findings from this cycle's cross-case analysis in light of some applicable theory, the following question seems relevant to address in the next D3.6 deliverable: is it important *how* the learners are subjected to the Nextfood educational approach, i.e., by their volition or something they are subjected to or persuaded into?

Further, this discussion suggests that facilitators' efficacy belief will increase with time – with increased mastery experience in practicing the approach. Arguably their (proxy) efficacy belief in their learners will, too. A relevant question then is: will it be easier for students (and other involved partiers) to develop their competences if they are subjected to action learning earlier in their education and, thus, will have past experiences to build further upon? To explore this question more data is needed on past learners and their endeavors post an action-learning course.

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