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FSA Insights report

Food System Approach and transdisciplinary research: what's the added value?

Reflections on experiences from the KB Programme Food Security and Valuing Water

Drawing lessons

This publication highlights the lessons drawn from using a Food System Approach and doing transdisciplinary research in Wageningen Research's Food Security and Valuing Water research programme. Researchers and the programme management reflect on how the Food System Approach and transdisciplinary research have contributed to the research results, the challenges involved, and what could be improved in future.

Extending the WUR knowledge base

In 2019, five research programmes were commissioned within Wageningen Research to strengthen the 'KennisBasis' (Knowledge Base) of the transitions identified in the Wageningen University & Research Strategic Plan 2019-2022. The aims of these programmes are to create new knowledge and innovation to contribute to the knowledge base, to prepare staff for future research questions, and to contribute to cooperation within the organisation, as in 'One WUR'.

Food Security and Valuing water

One of the five research programmes is Food Security and Valuing Water. Pivotal in this programme are the Food System Approach and transdisciplinary research. The research is organised around eight 'motifs', all of which include elements from both the Food System Approach and transdisciplinary research.

Preparations for the next phase

The preparations for the Wageningen Research programmes in 2023 and 2024 have started. In the new phase, the focus of the programme will remain the same, however the research projects and focus areas can be altered. Changes will be made in response to future research questions, experiences in current research and societal developments.

Interviews

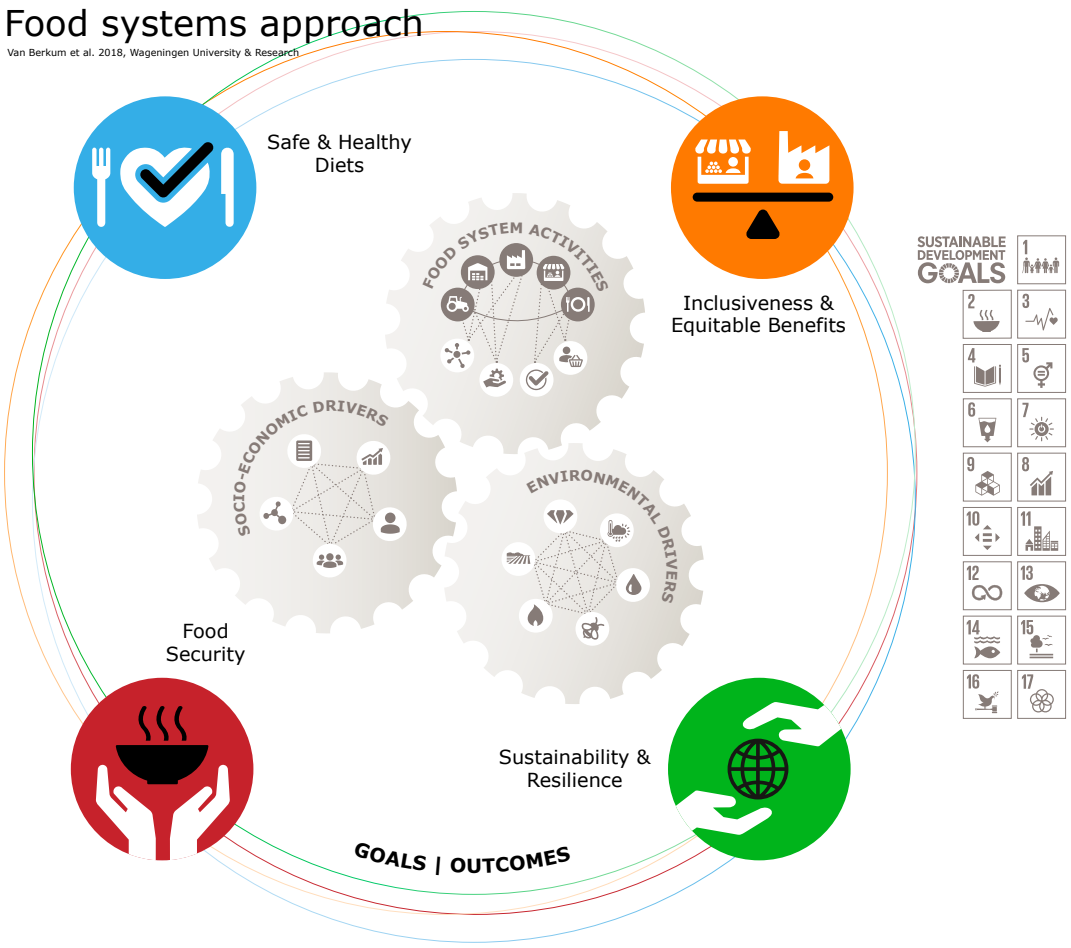
Autumn 2021 is a good moment to look back over the past 2.5 years and to capture the insights gained and the lessons learned from the current research. The (scientific) results of the research projects are shared through reports, papers, presentations and blogs. The more generic insights on what using a Food System Approach and transdisciplinary working in research entails, and how this contributes to the results, are not captured in these formats. That's why we requested science communicator Joris Tielens to conduct ten interviews with the research motif leaders and other researchers. The results of the interviews are presented in this booklet. In the concluding chapter, the core team of the Research Programme on Food Security and Valuing Water reflects on the outcomes so far.

More information on the content of the programme and its projects can be found through www.wur.eu/foodsecurity-valuingwater

Ivo Demmers, Programme Lead

Definitions

- Monodisciplinarity: Research questions are formulated from one scientific discipline only.
- Multidisciplinarity: Involvement of several disciplines in one research project, each exploring their 'own' issue.
- Interdisciplinarity ('between the disciplines'): Integration of discipline-based methods, tools, concepts, data, theories, ontologies and epistemologies.
- Transdisciplinarity: Integrating academic knowledge from various disciplines and non-academic knowledge from various perspectives. Throughout the research process, academic and non-academic stakeholders are in dialogue.



Interview

Huib Hengsdijk

‘Solutions to complex issues like food security never come from one discipline’

Adopting a food system approach involves cooperating with researchers from other disciplines and demands an open and flexible attitude, says Huib Hengsdijk. An agronomist, Hengsdijk is leader of the KB project *Improving food systems in less-favoured areas in East Africa*.

Introduction to the project

The project focuses on the transition of food systems in rural areas in Uganda and Ethiopia. The North-west Nile region in Uganda is a remote area with mainly subsistence farming. Not only is the local population growing, but the area is also experiencing an influx of refugees from South Sudan. The research showed that even if agricultural production were to increase by 50%, this region will be unable to provide the population with sufficient nutritious food in 2040. In Ethiopia, the project focuses on options to integrate livestock and crop production and to diversify farming systems. It uses models and data to support decisions of local stakeholders concerning the transition of food systems.

Transdisciplinary research needed for solutions

‘Transdisciplinary research enriches the research and it yields new insights,’ says Hengsdijk. Animal scientists, agronomists and other plant scientists, environmental scientists, and economists work together in this project. Hengsdijk mentions a colleague, a plant physiologist, who dived into the world of economic farm business models. ‘It helped her to see her own work within a wider context, which is needed to pinpoint where the trade-offs in the food system are.’ It became clear that improving crop yields in Ethiopia doesn’t help much if there is no business model to make a living from that crop.

Working with different disciplines can be challenging too, according to Hengsdijk. ‘Different perspectives mean that people see the project as having different objectives.’ As a result, more time is needed for discussion and dialogue in transdisciplinary research projects. Hengsdijk: ‘Yet

> ***Solutions to complex issues like food security never come from one discipline. You need to cooperate with others and then you learn things you would never have thought of yourself"***

solutions to complex issues like food security never come from one discipline,' Hengsdijk says. 'You need to cooperate with others, and it is fun to do so as well. You learn things you would never have thought of yourself.'

For many newcomers, this project was their first encounter with other WUR institutes and disciplines. 'A project like this really helps them to build a network within the organisation, which is invaluable for future work.'

Food system approach brings new insights

The food system approach is leading in this project, Hengsdijk continues. Having a food system lens brings new perspectives and shows where the trade-offs in the system are. 'For example, in Uganda, our regional land-use model revealed that increasing food production would lead to serious deforestation, resulting in biodiversity loss but also in fuelwood shortages.' Moreover, a food system approach brings a new focus to agronomists like Hengsdijk: 'In the past we used to focus on calories and staple crops. Now we focus much more on vegetables and other nutritious crops for a healthy diet.'

Joint strategy for WUR

'The food system approach has been widely adopted within WUR, though some struggle with it. It is a new approach and a new way of working, and people have to get used to it,' Hengsdijk observes. Nevertheless, he believes that the approach does bring benefits to WUR as a whole. It brings a joint strategy to the organisation. Given that the food system approach is increasingly being adopted worldwide, this paves the way to forming strong research consortia. Developing a common framework of understanding now will make cooperation across disciplines easier in the future. 'It is a good thing to broaden our experience and build capacities in this now, in this project.'

However, focussing on a food system approach should not be at the cost of disciplinary depth, Hengsdijk warns. 'Sometimes a breakthrough comes from new discoveries within a particular discipline.'

Adopting a food system approach, in cooperation with researchers from other disciplines, requires an open and flexible attitude, Hengsdijk adds. 'Sometimes it is difficult for people to take a step back and look at their own discipline from the outside. When you honestly embrace a food system approach, you have to acknowledge that sometimes what is needed most in a particular situation is not your own discipline.'

Future research agenda

'At present, we lack research methods specifically designed to cover the whole food system,' Hengsdijk says. Researchers tend to fall back on existing research methods, and these are discipline-bound. More methodological development is needed for future food system research, he concludes.

Interview

Bart de Steenhuijsen Piters

‘Transdisciplinary research has the potential to contribute to a more resilient food system’

The COVID-19 pandemic has been a reminder to us that we need a more resilient food system. Achieving this is no simple matter, however. And while transdisciplinary research has a key role to play, it hasn’t yet fulfilled its promise, says Bart de Steenhuijsen Piters, system agronomist and project leader of the KB project *Food system resilience*.

Introduction to the project

The COVID-19 crisis is just one in a series of shocks that have reminded us of the importance of building resilient food systems – ones that can withstand and recover from shocks. But what exactly do we mean by resilience, and how can we promote resilient food systems? This research project aims to contribute to common understanding between all stakeholders on this. Literature research was done and information on previous experiences within WUR was collected. Based on this, two workshops were held, after which two papers were produced.

Finding common understanding through transdisciplinary research

The project brought researchers from various fields together, including biology and ecology, economics, agronomy and sociology. ‘Obviously research on food systems should be transdisciplinary, as the food system by nature is complex and diverse and can only be understood when looked upon from different perspectives,’ says De Steenhuijsen Piters.

> ***Research on food systems should be transdisciplinary, as the food system by nature is complex and diverse and can only be understood when looked upon from different perspectives"***

Despite the differences between the various disciplines, it turned out to be quite possible to find common denominators and shared understanding on food systems and resilience, according to De Steenhuijsen Piters. ‘It requires that you really immerse yourself in another discipline. Then it becomes clear that there are more similarities than previously thought, and new aspects are discovered that are applicable beyond a single discipline.’

Transdisciplinary understanding is blocked by a lack of communication, use of jargon or underlying assumptions which have not been made explicit. ‘Therefore, we worked on a set of common concepts that were agreed upon by

all.' Some disciplines have deeply developed concepts. 'For example, in ecology the role of diversity in ecosystems is very well studied. Yet the concept can be used to explain resilience in other parts of the food system as well. For example, more diversity in retail increases the resilience of the economy.'

Food system approach unites researchers WUR-wide

'The food system approach as used within WUR is helpful because it is a common and shared frame of analysis,' De Steenhuijsen Piters says. 'I think we should try to keep it as simple as possible. Its role is not to explain everything in detail, but to provide a common base and joint overview. We need to look at the food system in its totality to judge and assess the effect of shocks, or innovation, on the whole food system.'

Several environmental and socio-economic drivers impact the performance and outcomes of the food system, in particular climate change, food trade and conflict. 'What I would like to see is a dialogue conducted with all stakeholders to determine the desired outcomes of our current food system and the trajectories required for a food system change. The outcome will not be clear-cut, as there are different interests between stakeholders. But by taking a transdisciplinary look at the food system, we can find the common ground where the majority agree.'

Lessons for policymakers

One of the outcomes of the transdisciplinary encounter in this KB project was a policy paper with a common framework and recommendations. It singles out four key properties of resilient food systems (the 'ABCD' of food system resilience): Increasing **a**gency, the ability of people to stand up for their own interests, is one of these properties. Having food **b**uffers in the system is also smart, but due to our strong focus in the past on efficiency in food value chains, buffers disappeared from our food system. Other key properties of resilient food systems are connectivity and **d**iversity.

Transdisciplinary research high on future research agenda

The history of science is one of increasing disciplinary specialisation, says De Steenhuijsen Piters. 'Transdisciplinary research has the potential to put that disciplinary knowledge back into the real world and link it up to real solutions for problems in our food systems.' That would greatly increase the value of scientific knowledge. 'However, transdisciplinary research still has to fulfil its promise. It is being applied more and more and I notice that in Wageningen people are increasingly looking for solutions between disciplines. But it hasn't gotten enough systematic funding yet.' The second outcome of the project is a white paper that describes the future research agenda on food system resilience based on transdisciplinary research.

Interview

Dolfi Debrot

‘We need a long-term vision on food system research’

In the past, research on intensive shrimp farming in the tropics led to unsustainable production. Transdisciplinary research using the integrated food system approach can prevent that, and offers much better and lasting solutions. But, to be effective, this kind of research needs small and focussed teams working on sharply delineated research questions, and to avoid boundless and paralysing discussion, says Dolfi Debrot, marine ecologist and project leader of the KB project *Aquatic food systems*.

Introduction to the project

Seaweed has great potential to help reduce world hunger. It is an effective and sustainable way to produce healthy food, it helps clean seawater and can be combined very well with fish farming. In this project WUR researchers work with universities and NGOs in Indonesia, who in turn work with farmers to develop sustainable polyculture of seaweed, shrimp, shellfish and tilapia in a variety of production systems.

The project encompasses research on the whole food system from ‘farm to fork’ Debrot explains. ‘Researchers from the Indonesian universities and NGOs work directly with farmers. Farmer welfare is central to our work.’

Food systems approach crucial to prevent unsustainable development

The food systems approach is crucial for long-term impact, says Debrot. ‘Taking a food system-wide approach is essential to prevent the kind of suboptimization we have had so far. A lot of research in the past was focussed on intensifying shrimp production. The approach was very ‘successful’ and led to very productive systems, but these ultimately destroyed the marine environment and productivity collapsed.’ Using a holistic approach that takes complexities and feedback loops into account offers more integrated, effective and sustainable solutions. ‘Involving all key actors is also crucial to the ultimate acceptance and application of results.’

Transdisciplinary research requires well defined questions and small, efficient teams

In this research project more than 20 scientists with various backgrounds from all institutes of WUR and from Indonesian universities work together. ‘The transdisciplinary nature of the food systems approach demands exchange between different perspectives to see the wider picture needed for lasting positive impact,’

Debrot says. The danger is that because food systems are complex and have wide, diffuse boundaries, the research can get bogged down in endless discussion. Hence, given a finite budget, time and number of experts, 'it is crucial to define boundaries for the various deliverables.'

Debrot and his team have managed to decide on sharply delineated research questions. For example, on developing a growth model of seaweed production and harvest. And on the food safety of seaweed in a variety of production systems. 'Small teams of 4 to 5 researchers from different disciplines work efficiently on each question. Later individual outcomes will again be assembled into the wider frame of the overall food system.'

Contribution of this approach to WUR

The KB project contributes greatly to teambuilding, internal cooperation and developing a common vision within WUR on this topic, according to Debrot. 'I have worked for the past 10 years on transdisciplinary research and this project is one of the best examples of what it can bring. We are now at the point that, derived from shared understanding of the wider context, specialised research is yielding delimited results which then get integrated back up into that wider context. That is a major advance toward achieving lasting sustainable impact.'

Needed: Trust and a long-term vision

Innovation rarely comes from large organisations, which tend to be less flexible than smaller teams, or business units. 'Large organisations tend to create risk-averse working cultures defined by procedures and protocols designed to exercise control, but which limit creativity and productivity. The KB programme offers the opportunity to partially shelter researchers from those burdens and restrictions in order to stimulate creativity. We complemented this by setting up small, flexible teams to deliver defined output. The management of the programme was also very helpful in providing as much certainty as possible about the continuity of the programme.'

> ***"It is absolutely essential that we adopt a long-term food system research agenda. Switching agendas too often is deadly"***

That brings Debrot to his wider recommendation: to enable more transdisciplinary food system research, researchers need the trust of and long-term commitment from higher management and funders of research. 'A research programme takes time to develop. To be successful in grant funding you need to build a track record first, but for that you need to demonstrate results, which in turn take time and investment. To get from research results via implementation to impact at the field level, takes even longer. So it is absolutely essential that we adopt a long-term food system research agenda. Switching agendas too often is deadly.'

Interview

Katrine Soma

‘It’s impossible to make a change in the food system without transdisciplinary work’

Transdisciplinary research resulted in a great improvement in the diet of many poor people in the Kibera slums in Kenya. For research to be truly transdisciplinary, the stakeholders on the ground need to have a say in the research, says Katrine Soma, economist and project leader of the KB project *Feeding cities & migration*.

Introduction to the project

Many cities in the world attract migrants and have a growing population. How are the inhabitants of these growing metropoles to be fed? This project focussed on the rural-urban streams of people, money, food and knowledge in and around the cities of Nairobi, Dhaka and Kampala. The needs of consumers were investigated across the cities, on the assumption that their needs will influence how food-system pathways transition.

In Kibera, Nairobi’s largest slum, this led to a new value chain. Female vendors formed a new selling market for undersized fish from aquaculture farmers in Nyeri district, North of Nairobi. Since last year, a tonne of fresh fish goes from Nyeri to the Kibera each week, improving food and nutrition security of the poor in the slum.

Transdisciplinary research should involve the real stakeholders

Economists and environmental scientists, and researchers from Wageningen Food and Biobased Research and Wageningen Centre for Development Innovation cooperated in this project. ‘We could not have achieved the results we did without adopting a holistic food system approach,’ Soma says. ‘And for that you really need researchers from different disciplines to come together with the stakeholders who will be impacted in practice.’

True transdisciplinary research means listening to the real stakeholders, Soma stresses, whereas researchers often work with the representatives of public stakeholders. ‘We choose to work directly with community leaders. And it is key not to position yourself as if you have the answers before listening and learning about the specific context, by sitting down and listening to what the local change-makers already know and need. Then you can suggest and develop solutions that fit the

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context-specific opportunities, and which can be experimented with in practice, together with people from the community.'

Having scientists involved from different backgrounds brings useful insights. As an example, Soma mentions a tool introduced by the environmental scientists, which enabled spatial analysis of the availability of water and electricity. This was used in workshops together with the local change-makers in Dhaka to arrive at smart and applicable spatial solutions.

Although absolutely essential, transdisciplinary research is demanding in terms of the time and energy of all involved, Soma adds. 'For example, sometimes you need to accept that a specific study is better done by someone else.' To prevent conflicts, it is vital to set clear targets and agree about tasks, she says. 'Moreover, within the cooperation, there should also be room for activities that are not done collectively.'

Solving the puzzle of the food system

'From day one of the project, we saw it as a puzzle,' Soma says about using a food systems approach. The researchers worked together in workshops to solve the puzzle, taking on a broad and holistic view, and trying to see where the bottlenecks and leverage points were. It soon became clear that some issues were a prerequisite for others. For example, in the case of the fish value chain to Kibera, if there are no freezers to keep the fish cool, there is no point transporting the fish there. Or, if lack of access to clean water causes diarrhoea, having healthy food doesn't help.

'A smart food system analysis from multiple perspectives, and with the involvement of stakeholders, can help to find the key in the food system that can unlock big changes with minimum resources,' Soma says.

The food system approach in this project also brought a focus on consumers. Many household surveys were held in the three cities. 'From a food system perspective, consumers are a logical point of entry. You need to know the nutritional needs of the people.'

WUR strategy should involve climate

'The food system approach is broadly embraced within WUR,' Soma says. 'Internationally seen, WUR is in a really unique position as it has all the different expertise in house.' Soma would like to add an extra focus on climate change and water scarcity to the food system approach, 'because these are going to be among the most pressing issues in future'. Moreover, she stresses that involving stakeholders in food systems work is key.

Interview

Sipke Joost Hiemstra

‘Encourage interaction needed to develop an integrated view’

With its wide variety of scientific disciplines and types of researchers, WUR is capable of developing an integrated view of food systems and the role that biodiversity plays in them. WUR should nurture this huge advantage, and develop larger programmes and encourage interaction among researchers, believes Sipke Joost Hiemstra. He is director of the Centre for Genetic Resources of the Netherlands and an animal breeder by training. He is also the project leader of the KB project *Biodiversity and Food Systems*.

Introduction to the project

80% of the world’s food is produced from only nine plant species. This KB project deals with the question of how a wider range of crops, animals, trees and fish can be used in agriculture as part of the transition towards a more sustainable and resilient food system. The project brings together existing knowledge in this field and promotes discussion among stakeholders. Discussions are planned with One Planet Business for Biodiversity (OP2B), a coalition of multinational companies. ‘The private sector is showing more and more interest in the topic of biodiversity,’ Hiemstra says. ‘They clearly see the importance, but don’t know how they can contribute.’ The KB project is linked to the Wageningen Biodiversity Initiative, which also unites researchers from various backgrounds around the topic of biodiversity.

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Transdisciplinary research: open mind about other’s truth

Researchers from all WUR institutes are involved in the research, including plant and animal scientists, specialists on food safety, economists and environmental scientists. ‘And they complement each other very well,’ Hiemstra adds.

Various notions of biodiversity exist among researchers in the project, and the same is true of the Biodiversity Initiative. ‘For me biodiversity is about genetic diversity of species used in agriculture. For others it is about the

functioning of ecosystems, or wild species. I think there is no one truth.'

Being open minded is a precondition for transdisciplinary work. 'You need to understand each other, connect with the other and integrate different views. However, at the same time, sometimes we need to delve into the matter and gain more disciplinary depth.'

Food system approach provides a framework for zooming in and out

The food system approach enables us to take a broad view, Hiemstra says. 'It reveals insights into the trade-offs in the food system. And it puts biodiversity into perspective, alongside other issues such as climate change and poverty. In some food system analyses, biodiversity is sometimes a bit concealed, and needs more explicit positioning. On the other hand, biodiversity should be seen in the wider context. Other issues are important as well. The food system approach allows a balanced assessment to be made, for each specific situation, and that is our unique selling point as WUR.'

To do that we need to be constantly zooming in and zooming out: sometimes looking at details in the food system, sometimes overseeing the whole of it. 'The food system approach offers a framework to do that.' How does it work in practice? 'By giving space to both the specialists and the system thinkers, and by organising interaction between them. That does not happen by itself. What we need is larger programmes, spread across different institutes, done in cooperation with major partners from the private sector, government or civil society. And we need to facilitate interaction within these programmes.' The KB project provides an incentive for this. 'Researchers need to get to know each other and connect and understand each other.' It also helps to have some time to interpret and fine tune concepts. 'That might not directly yield rocket science, but it does foster the capacity to explore, integrate and synthesise knowledge and bring together networks.' Both are prerequisites for starting new joint research programmes.

Gains for stakeholders

The biodiversity initiative and similar transdisciplinary activities are much appreciated by policy makers, Hiemstra believes. 'The same goes for large companies, who are wondering what to do with biodiversity. We can offer specific tools based on our approach, while also having the integrated overview to base advice on. And we should also play the role of critical researcher, not being afraid to ask the difficult questions.'

Future research agenda

Genetic diversity is key in food systems, Hiemstra believes, but we don't know enough about how it works exactly. 'We clearly need more research on the relation between greater diversity in crops, animals, trees and fish and healthy and resilient food systems.'

Interview

Catharien Terwisscha van Scheltinga

‘Our clients and partners in the field need solutions, not food system language’

In delta countries such as Bangladesh, the food system approach can help bring together experts from different fields and deliver more lasting research results. While we can use the approach internally as a tool, we should be careful not to bother partners in the field too much with food system lingo, says water management engineer Catharien Terwisscha van Scheltinga, leader of the KB project *Deltas under Pressure*.

Introduction to the project

Deltas in Bangladesh and Vietnam are under great pressure from climate change and urban development, while they are also important areas for food production. Climate change causes many problems: sea level rise, salinisation, water quality problems, floods and drought. In this project, a team of WUR researchers is working with local partners on these issues to support a sustainable transition of agriculture in these deltas.

Transdisciplinary research requires research to be adjusted step by step

This project involves researchers from Wageningen Marine, Plant, Livestock, Environmental and Social sciences working together, as well as experts from Wageningen Centre for Development Innovation and Wageningen Food and Biobased Research.

> ***In deltas, many processes take place at the same time, and they all affect each other. The food system approach is helpful as it gives insight into those processes and how they are linked"***

‘It takes time and effort to invest in transdisciplinary research, you need to build up trust in the team, confidence that the other discipline does indeed have something to offer,’ Terwisscha van Scheltinga says. ‘But I do see a lot of added value. If we didn’t do this in projects like this, we would lose the unique quality of WUR: the capacity to work across disciplines and have a network in other disciplines. If someone calls from Bangladesh with a problem, I link up with WUR colleagues who have the right expertise, so we can create new interdisciplinary knowledge and insights that partners in the field can get on with.’

An example is the work of livestock researchers on dairy farming, which is currently being linked to research on salinity by environmental researchers. Increasing salinity decreases the quality of fodder and milk. 'We used maps to link the two and are figuring out future scenarios on increasing salinity, which we will link to the interviews that the livestock people are doing with dairy farmers, and see what they think about that.'

Transdisciplinary research requires constant fine-tuning between researchers and adjustments as the research is being done. 'You can't just implement a research proposal like a previously prepared shopping list.' That also applies to the work with partners like international NGOs and local universities. 'Our research is done parallel to implementation in practice. We work on questions as they arise. It's a two-way partnership: we offer insights and scenarios, they bring in knowledge from the field, like realistic parameters.'

Food system approach doesn't match directly with water system thinking

'In food system thinking, water is a driver of the food system. But for me and other water experts, water is a system in itself,' Terwisscha van Scheltinga says. And the two don't always go together, as they use different concepts and have different discourses. 'As water experts we need to link up with a food system approach. For this, a concept like the water-footprint can be useful, as this reveals the water costs of food products. So we need to convince the water people that food is important, and to make clear to the food people that water is important.' It is a unifying concept and everybody has to make an effort. 'It brings different experts together.' In deltas, many processes take place at the same time, and they all affect each other. 'The food system approach is helpful as it gives insight into those processes and how they are linked.' It helps us to see the wider picture, and the long-term perspective.

Be careful not to get lost in food system lingo

The food system approach is becoming increasingly accepted within WUR, Terwisscha van Scheltinga says. 'It is good to be connected within WUR in this way, but we should be careful not to label everything with the food system terminology. Our clients and partners in the field are not familiar with these terms, and we should discuss the issues they deal with in plain language.' We need to continuously translate what the abstract food system terms and concepts mean in practical terms.

Future research agenda

Terwisscha van Scheltinga calls for investment in the knowledge infrastructure of local universities and research institutes in emerging countries like Bangladesh. 'In the past we supported projects that further agricultural production, now we should invest in the capacity of the Bangladeshi knowledge infrastructure to contribute to innovation.'

Interview

Marjolein Sterk

‘Nature-based solutions can solve issues in the food system’

The food system approach is a useful tool to see the wider picture, but it should not be the guiding principle for WUR. Other issues, like nature and biodiversity, are equally important, says ecologist Marjolein Sterk, leader of the KB project *Nature-based Solutions for Climate Resilient and Circular Food Systems*.

Introduction to the project

The question in this project is how nature can be used to make food systems more climate resilient and increase biodiversity. Research is being done on nature-based solutions. An example is strip cropping with a greater variety of crops in the Netherlands, which can increase resilience to pests and diseases. Herb-rich pastures are studied to see whether they are better able to withstand drought. The cattle grazing these pastures might be less vulnerable to diseases, which would mean that fewer antibiotics are needed. In Ghana, nature inspired techniques are used to save, purify and reuse water in agriculture.

Interdisciplinary research needed for nature-based solutions

The project involves 30 scientists from five different institutes within WUR working together. Among them are economists, social scientists, plant scientists, agronomists, animal scientists, ecologists, GIS-specialists and soil and water specialists.

‘To understand all aspects of nature-based solutions, you need an interdisciplinary approach. To gain new insights we need each other,’ says Sterk. ‘And it’s interesting to work with such a diverse group of people. We are open and honest with each other. Researchers from different disciplines bring in different perspectives, based on different approaches and literature. We try to welcome that, and avoid saying: what you say can’t be true.’

For example, ecologists can be very enthusiastic about herb-rich pastures, until they hear from an agronomist that this kind of grass can’t be ensiled. ‘Then you have to find a way around that.’ In Ghana, GIS-specialists made maps on how the water system can be adjusted. Input from social scientists on how people want to use these water technologies improved the maps.

Sometimes it is difficult, Sterk says, because concepts are not unambiguous. ‘For me biodiversity means diversity in the landscape. For someone else, it might be genetic diversity: the small differences between seven different kinds of peppers for example.’ The scales differ as well. ‘Some work in a lab, others talk with farmers in a field, or

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study a landscape. That brings different insights and also different time horizons into your research.'

Food system approach can't be the leading approach

The notion that what you do is part of the wider food system is important, Sterk says. 'For example, broccoli that is produced in a nature-based way may have tiny spots on it. Then we need to find a way to get consumers on the other side of the food system to accept that. The broad view invites you to look beyond your own profession. It was an eye-opener when I first heard about the food system approach.'

But the food system approach is just one approach among many others, Sterk says. She and her colleagues work in spatial projects, or do research on biodiversity and nature, for example vision NL2120, on how the Netherlands might look in a hundred years from now if nature were the leading factor in the country's development. The food system approach does not cover all these issues. And many of her colleagues have never heard of the approach. 'So, it would not be an integrating concept for us.'

'WUR's strength,' Sterk believes, 'is that we can integrate issues around food production into a broader context, and also include the natural system.'

Nature-based solutions on the agenda

The notion that not all is well with our natural environment and that biodiversity is decreasing has gained increasing recognition in recent years, Sterk says. And the idea that nature and biodiversity can be part of the solution of many issues in our food system is also on the rise. The KB project contributes to that, says Sterk. 'We can now work on new business cases and living labs around nature-based solutions.'

Future research agenda

Next year the project will continue to link its results to other research, Sterk says. 'We mostly work on nature-based solutions on the production side of the food system. It would be interesting to discuss our results with consumer researchers, and see what new nature-based products might be needed.'

Interview

Geerten Hengeveld and Lan van Wassenaer

‘To accept the perspective of someone else, without necessarily being converted’

To study ambiguous subjects such as the resilience of food systems, an ensemble approach was developed, which reveals different sides of the issue. New research methods like this are needed in future, say Geerten Hengeveld and Lan van Wassenaer who work in the KB project *Multiple scales & extreme events*.

Introduction to the project

This project aims to develop methodologies that support the quantification of food systems. It works on the integration of computer models, data and knowledge that originate in different disciplines. In one part of the project, researchers developed an ensemble approach that uses different model simulations alongside each other and makes use of the added value of different perspectives. This can offer a solution in situations where there is no agreement about purpose and outcome, as is the case when addressing the concept of resilience in food systems.

Building an ensemble approach for true multidisciplinary research

Researchers from various WUR institutes work together in this project, including plant scientists and economists, but also mathematicians and physicists. ‘Even within a scientific discipline, say economics, there are many different approaches and fields of study,’ says Lan van Wassenaer, herself an agricultural economist. ‘So it is important to be aware of the paradigm, the system of theories that someone is using as a framework for thinking,’ adds Geerten Hengeveld, a theoretical ecologist.

> ***“Key in the food system approach is to have a good balance between more generalist researchers who can ‘sketch the broad picture’ and specialists who can ‘colour in the details’”***

‘When a group of researchers start to cooperate in a project, like we did, in the beginning everybody has the tendency to think according to his or her own paradigm,’ Hengeveld says. ‘Often, everyone says they agree on a common aim and approach, but having said that, everybody starts doing his or her own thing.’ To avoid that happening, in this project the researchers started questioning the concept of resilience and food systems, which reviewed different views based on different assumptions that are often not explicitly stated.

The researchers then developed an ensemble approach. 'Compare this with the story of six blind men studying an elephant,' says Van Wassenaer. 'One man thinks it is a spear, as he feels the tusk, another thinks it is a rope, as he feels the tail.' The ensemble approach accepts that there are different perspectives, but tries to show these in a systematic way, like showing the different sides of a cube. 'That means making assumptions clear,' says Hengeveld, 'and forcing ourselves to come up with not one but various answers, also in the policy advice.'

This approach was applied to a case study in Ethiopia, which will eventually lead to a stress test for food system resilience.

Recognise the food system has shifting borders

'The food system approach is a useful concept for communicating with each other within WUR and outside, and for showing how we can work on the SDGs,' says Hengeveld. But WUR should not lean too much on one single approach, he adds. 'The boundaries of the system should depend on what question you ask.' For example, the food system approach tends to focus on food supply and consumption, while biodiversity and CO2 emissions are pushed to the side as drivers or outcomes of the system, says Hengeveld. If biodiversity is put centre stage, processing and trade of food are placed in a position of less importance, while natural processes come to the fore.

'We should embrace the idea of a flexible food system approach, with flexible boundaries,' Hengeveld says. It is like the comparison with the elephant. 'If someone says that the main issue is the spear, then someone hanging on to the tail at the back will start protesting. It's better to embrace the many different approaches we are capable of using at WUR.' Key in the food system approach, Hengeveld adds, is to have a good balance between more generalist researchers who can 'sketch the broad picture' and specialists who can 'colour in the details'.

New methodologies needed in future

The ensemble approach can be used to view the food system from different angles, Van Wassenaer adds. 'Having these new methodologies better anchored in the organisation enables us to do multidisciplinary research in the true sense of the word.' Key in the approach is to be able to continuously question yourself. 'And to be able to accept the perspective of someone else, without necessarily being converted,' Hengeveld concludes.

The KB project offered time and space to develop new methodologies and reflect on the process of how to get there, Van Wassenaer says. 'This has resulted in concrete tools and methods that can be used in future regular research for the ministry (BO) or other clients. For example, we now have much better models for doing research on the circular economy.'

Interview

Marleen Hermelink, Walter Rossi Cervi, Wouter Smolenaars, Lotte de Vos

‘You have to make a deliberate effort to become aware of differences’

Integrating simulation models can help quantify food system analysis. This requires interdisciplinary research, which is fun but also challenging, as unconscious assumptions need to be made visible. Four young researchers discuss this and reflect on their work in the KB project *Multiple scales & extreme events*.

Introduction to the project

This project aims to develop methodologies that support the quantification of food systems. It works on integrating computer models, data and knowledge originating from different disciplines. The project researchers are linking together simulation models that work in different fields and on different scales, in a so-called model-train. For example, the output of a bio-physical model on climate change, hydrology and production ecology is linked as input to a socio-economic model on consumer demand, trade and population dynamics, and vice versa. The integrated models are being applied in case studies in Europe, South Asia (Indus Basin) and Ethiopia.

Interdisciplinary research reveals differences

‘It’s nice to get to know each other and learn about new perspectives,’ says water engineer Wouter Smolenaars about doing interdisciplinary work within this project. ‘And although we have different scientific backgrounds, we are all modelling.’

Interdisciplinary work is useful and needed, adds Walter Rossi Cervi, who trained as a geographer in Brazil and is now working at Wageningen Economic Research. ‘Bringing different disciplines together, you can answer more complex questions. But sometimes we struggle with communication, as different disciplines use different terminology, and it takes time to get to understand each other. It helps if you have working experience in different disciplines.’

> ***The food system approach is rather vague, the concept is so broad, it can cover almost anything. The approach needs new tools and methodologies to be able to better quantify food system analysis. That’s what work on integrating models can contribute to"***

‘I realised how different perspectives can be when we grouped food crops,’ crop scientist Marleen Hermelink recounts. In a socio-economic model, the grouping is based on the value food has for the consumer. In a bio-physical model, food is grouped according to crop needs in terms of water or other bio-physical properties. ‘To integrate the models we had to match these groups.’

The problem is that researchers may use the same words but are not necessarily aware that they mean something different to others, says Lotte de Vos, who trained as a civil engineer and hydrologist at Delft University and now works at Wageningen Environmental Research. ‘You have to make a conscious effort to become aware of the differences. It can take a long time before you realise you’re talking about different things.’

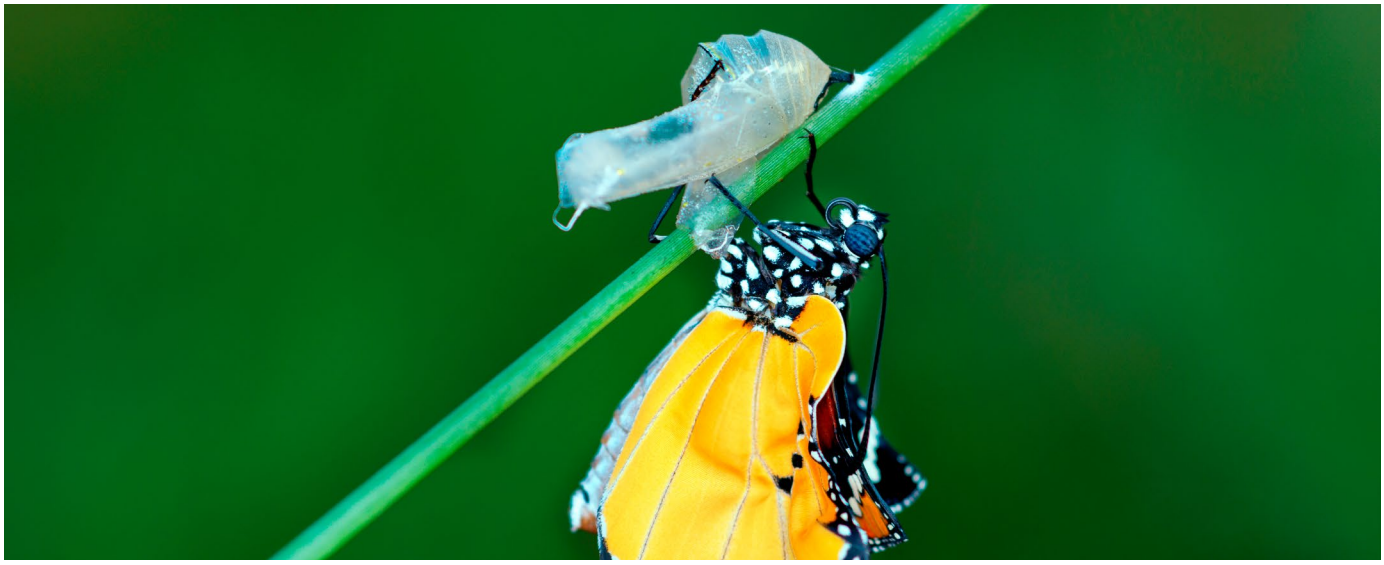
Food system approach needs new tools to quantify analysis

It helps to have the food system in the back of your mind, to contextualise results, says Walter Rossi Cervi. ‘For example, if a model shows a decrease of 50% in sugar crop yields, it makes a difference if you also find out that human consumption of sugar is on the decrease. You have to make the connection. Moreover, looking from a food systems perspective reminds us that while we work mostly on the production side of the value chain, we should not forget the consumer side.’

But the food system approach is rather vague, the young researchers agree. ‘The concept is so broad, it can cover almost anything,’ says Marleen Hermelink. The approach needs new tools and methodologies to be able to better quantify food system analysis, the researchers say, and that’s what their work on integrating models can contribute to. ‘With our connected models we can do better scenario analysis and cover more aspects,’ Hermelink explains. ‘For example, a social-economic model can reveal demand for a certain food crop group, depending on population and societal development, and then we can use a bio-physical model to see if it is possible to produce that amount of food given climate change in a certain area.’

Making policy choices tangible

Developing and maintaining these integrated models further needs continued investment, Lotte de Vos says. This will bring value for money, the researchers believe. As Wouter Smolenaars puts it: ‘The models we develop and the scenarios they bring give very tangible results in the hands of policymakers. Modelling in this way shows the consequences of policy choices. It can make a difference.’



Interview

Marijke Dijkshoorn-Dekker and Bram Bos

‘Food system approach needs to be more dynamic to support real change’

The food system approach is a useful framework within which to discuss the different dimensions in a food system, but is less suitable for bringing about change, as it does not show where the transition should be heading and who to involve in this, say Marijke Dijkshoorn-Dekker and Bram Bos, both of whom work in the KB project *Transition Pathways*. They want to add a dynamic aspect to the approach to be better able to support people involved in food system transitions.

Introduction to the project

This project overarches the other projects in the KB programme and aims to study food system transitions and advise those involved in transitions. The researchers worked closely with seven other research projects within the KB programme on their case studies and research questions. The aim was partly to support them with transition thinking and advice on stakeholder participation, but also to collect data and observe the processes of transition thinking in the other projects, and to draw lessons from the experiences. The project will deliver a practical guide, methods and tools to support stakeholders involved in food system transitions.

Beyond a food system approach

The food system approach is a useful tool for discussing relationships between the different aspects of a system, says project leader Marijke Dijkshoorn-Dekker. She has a background in plant ecology and natural resource management, and now works at Wageningen Economic Research. ‘It gives a clear and systematic overview of the issues at stake.’

> ***We want to expand the food system approach to include a more dynamic perspective and add what we have learnt from transition thinking. To support transitions, the important questions are who should be involved in the process? How can we set up a dialogue that brings us to a future vision?"***

‘But if the aim is a transition, which is a radical change, it is not a very useful concept,’ adds her colleague Bram

Bos, who was trained as a biologist and philosopher and now works at Wageningen Livestock Research. 'This is because the framework lacks the dynamic aspect needed,' he adds. In transitions, the key is a clear vision on where the transition should lead to – what the goal is – and to work from that vision on change, instead of trying to improve the existing situation. It is also crucial to know who to engage in the process, Bos explains. Both aspects are missing in the classic food system approach.

'We therefore want to expand the food system approach to include a more dynamic perspective and add what we have learnt from transition thinking,' Dijkshoorn-Dekker says. 'To support transitions, the important questions are who should be involved in the process? and how can we set up a dialogue that brings us to a future vision of where we want to go?'

Asking questions

'Our role was to ask questions of the researchers in other KB-projects,' says Bos. For example, on what the goal is and what the transition should lead to. 'That is uncomfortable terrain for many researchers,' he continues, 'as it is basically a political question, and it requires you to look beyond your own field of study or discipline. But it is vital to have a goal in mind when working on transitions.' Another KB-project provides a good example: instead of focussing on increasing milk production of cows in Ethiopia, the question is how to improve food and nutrition security. Improving the production may not be the smartest way.

Transdisciplinary view needed

To move from food system analysis to making a real contribution to transition requires transdisciplinary work, Dijkshoorn-Dekker says. 'You need to be able to rise above your own discipline and your own set of concepts and language. Every researcher has his or her own images and definitions in mind around concepts like 'food systems' or 'transitions'. Transdisciplinary research is needed to get to know each other's concepts and language, and that takes time. But it is very important to invest in this.' Many research projects are multi or interdisciplinary in name, but in practice researchers with similar backgrounds tend to seek each other out. In this project, all research was truly interdisciplinary, and many researchers have a background in multiple disciplines and are used to working across different units, like Dijkshoorn-Dekker and Bos do.

Future research

'I feel rather uncomfortable that a lot of research people from Wageningen tend to tell people in the global South what needs to be done', says Bram Bos. 'Research should be much more a co-production with stakeholders in the South.' Dijkshoorn-Dekker agrees and tells of a new research programme on just transitions that started recently. This works on the equal distribution of benefits from transitions. 'That raises questions on which stakeholders should be involved in Africa or Asia, and who are the problem owners, both issues that deserve more attention. Perhaps we should be more open to people in the South teaching us something, instead of the other way around.'

Conclusions

Lessons learned: Food System Approach and transdisciplinary research in KB research

Food System Approach

The Food System Approach can be considered a valuable element of research. It helps to bind projects and research together in multidisciplinary research projects because it provides a way of organising interaction between them, as well as giving space to both the specialists and the system thinkers. The Food System Approach has proven crucial for devising truly sustainable forms of production, for example of shrimp and seaweed. In addition to enhancing sustainability from an environmental perspective (e.g. climate), the approach helps to cast an eye over the consumer perspective, thus bringing in the nutritional perspective. Above all, the Food System Approach enables researchers to identify connections across scales (zooming in & zooming out).

The Food System concept itself is not applicable as an integrated quantitative tool (for example, for carrying out integrated assessments) but it does provide a means to connect outcomes, insights and data from existing concepts, models or tools (for example for crop, soil & water management), farming systems, value chains, resilience, economics and more. However, it does not replace or lead to integrated assessments on its own. Hence, it is important to be conscious of the goals that are being pursued in a particular situation or research project where the approach is applied. Being clear about the goals helps in choosing what to include and identifying the relevant components. The Food System Approach could be extended by adding a more dynamic and temporal perspective based on the learnings of transition thinking.

For the purposes of communication and outreach, the Food-System concepts and terminology may be too complex and abstract for stakeholders. It is important that they are continuously translated into what is meant in practical terms. A final point related to the complexity of Food Systems is that difficulties have been encountered in setting boundaries of the research. To this end, a paper on setting boundaries will be developed in 2021 to aid demarcation.

Transdisciplinary Research

Including a range of disciplines in a multidisciplinary research project has proven to be challenging. Going one step further, to transdisciplinary research, including other stakeholders in the research is even more challenging. However, this is considered vital for research, as societal

challenges span multiple disciplines and are influenced by many stakeholders. Moreover, it has been clearly stated that the Food System Approach requires transdisciplinary research. Therefore, it seems that the Food System Approach and transdisciplinary research are inextricably linked, which can easily make the setting up and execution of research projects very complicated. This risk will be taken into account in the process of designing new research projects for the follow-up phase of the research programme.

The researchers place great value on transdisciplinary research because they find it important to be 'open-minded about others' truth' and to integrate different views. However, to gain deep knowledge, disciplinary depth is also needed. Demarcation of the research for each project and dividing the research into clear and smaller (more monodisciplinary) packages is a way to safeguard progress. From the interviews one could also distil the notion that staff require additional training in multi- and transdisciplinary working. This is also in line with recommendations of the mid-term evaluation committee for the Wageningen Research Programmes (May 2021).

Transdisciplinary research has the potential to add greatly to common understanding. However, lack of communication, using jargon and not making underlying assumptions explicit can jeopardise the outcomes and should be explicitly dealt with.

Positive that the KB research projects last four years

It is clear from the interviews that the fact that the KB research projects are commissioned for four years is widely appreciated. As setting up, demarcating and interacting with stakeholders all take time, transdisciplinary research projects require long-term funding commitment. In addition, interaction with 'real' stakeholders (rather than the representatives of the stakeholders) is essential. Ideally, some of the stakeholders would be real long-term partners in the research too, including partners from the private sector, government or civil society.

The research questions for the new phase of the Research Programmes (starting 2023) will be identified early 2022. It may well be that our experience in Food System thinking leads to new exciting research questions not only on a system level, but also to identifying new (mono) disciplinary knowledge that is required to solve system challenges. These challenges include: trade- offs and synergies between food and climate change; the opportunities to increase nature positive (food) production and food from water; and how to develop new employment and empowerment options while transforming food systems.

Colofon

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Introduction and Lessons Learned
KB Programme Core team: Jakob Asjes, Arjan Budding, Karsten Beekmann, Ivo Demmers, Lucia Kaal-Lansbergen, Stijn Reinhard, Joost Snels, Jan Verhagen.

Interviews
Joris Tielen, 2021

English language editing
Sara Butler

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Wageningen University & Research, Communication Services

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