



Smart Food Production

The innovation agenda of East Netherlands



Investing in knowledge and innovation is crucial for a sustainable development of our economy

Our motivation

The sustainable production of healthy and affordable food is one of the biggest challenges facing our society. The world's population is growing and the urgency of climate objectives requires drastic changes. New production methods are needed to meet the challenges and to provide smart solutions. The need for a more circular food system that takes biodiversity into account is clear.

Traditionally, the East Netherlands has been strong in developing innovative solutions and testing them in practice. The region has a strong and broad primary sector and our knowledge institutions and agri-food technology companies are able to come up with integrated solutions for sustainable food production, worldwide. The region is one of the frontrunners in the field of protein transition.

Investing in knowledge and innovation is also crucial for the sustainable development of our economy. The corona pandemic and the war in Ukraine has reinforced the need for short(er) food chains in Europe, with more transparency and a different perspective on the use of labor in the agricultural industry. Digitalization and robotization can play an important role in this.

We want to invest particularly in producing smart and sustainable food and we are looking for partners to do so. In this document, we show where our focuses lie. Then, together with you, we would like to discuss which programmes contribute most to economic growth and a sustainable future.

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The strength of East Netherlands

The strength of East Netherlands lies in the diversity of its business community and its internationally recognised knowledge institutions. Wageningen University & Research (WUR) is the world's number one in agri- food research. The region has attracted research centres of food multinationals in the last decade. In addition, our innovative SMEs and large(r) companies, and agricultural cooperatives are important suppliers to the entire global food production system. Think of FrieslandCampina, Kraft Heinz, ForFarmers and Unilever. In the East Netherlands, we are strongly committed to these national and international connections to maximise the impact of research and innovation projects.



National and European objectives

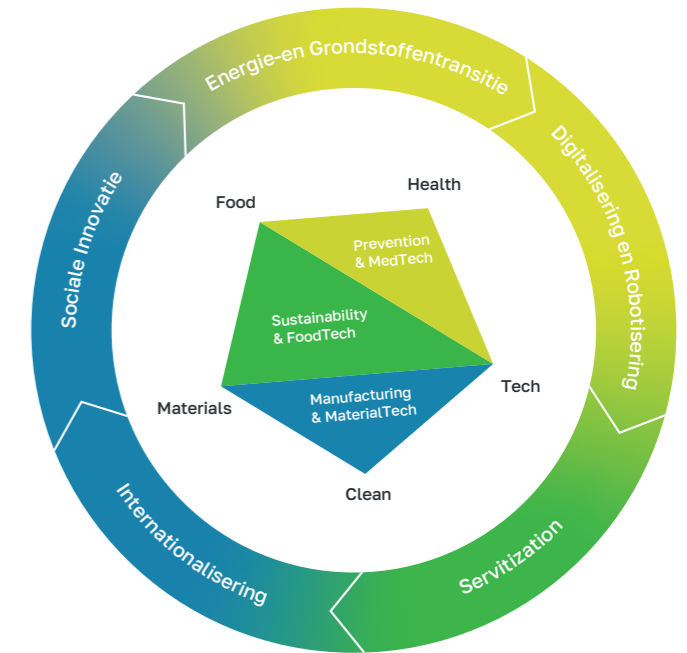
Within the budget of the European multi-annual financial framework for 2021-2027, the Green Deal provides important vision and direction, as expressed in the Farm to Fork strategy, among others. Climate-neutral agriculture, short chains and healthy food are central to this. Regionally, our innovation policy is in line with the national mission-driven innovation policy, particularly in the themes of agriculture, water and food.

The new Common Agricultural Policy contributes to the climate goals by at least 40%. Besides the Green Deal, other European Union frameworks and programs are also important, such as the Digital Europe program and the new framework programs and Horizon Europe. Digital transformation and key technologies, such as AI, are also going to lead to major changes for the food sector.

Within the Netherlands, the Realisation Plan LNV Visie Op weg met nieuw perspectief and the National Protein Strategy of the Ministry of Agriculture, Nature and Food Quality is an important guideline for a more sustainable food system.

A number of recently drafted, strategic documents underline the importance of strengthening the position of the East Netherlands to make an impact within the societal challenges related to sustainable food. Both the Regional Innovation Strategy (RIS3) and Strength of East2.0 emphasise the unique, strong position of the East Netherlands in this field.

In this strategic innovation investment agenda, we further explain our plans.



The East Netherlands has an important position in the global food system, and from this position we are able to make a significant contribution to finding new solutions to social challenges. It is not a coincidence that the region has a large number of field labs in which we can quickly test and share new developments. Companies and start-ups from home and abroad use our food ecosystem to develop themselves.

The East Netherlands actually offers room for both the implementation of nature-inclusive circular agriculture and the development and application of artificial intelligence (AI), sensorics and robotisation in agriculture and the food industry. This provides unique opportunities to further strengthen the crossovers between other specialisations of the region (health, technology, clean and circular materials).

With this agenda, we build on our strong organisational capacity. We do this both in the knowledge-intensive innovative area in the food industry (with the research organisations and Foodvalley NL) and in agricultural and food networks (for example Innofood, Kennispoort regio Zwolle, Greenport Gelderland, NEXTGarden, The Protein Community, Green Metropolis Twente). Long-term programmes such as Foodvalley2030,

OnePlanet, ICT Campus, Eat2Move, De Landbouwers, projects in the Regio- and SME- deals, and the ThinkEast Netherlands icon "Data-driven Transition in Food" ensure continuity and focus.

Start-ups from home and abroad use our food ecosystem to develop

SDG's

The urgency of the transition in which we find ourselves is also clearly reflected in the global Sustainable Development Goals (SDGs), where healthy and sustainably produced food is an objective. The increase in the world population is leading to a scaling-up of the food system with a negative impact on nature, the environment and the climate. The transition to a new sustainable food system requires changes in consumption, production, and a different approach to natural resources, residual flows and waste. These changes are part of the seventeen Sustainable Development Goals (SDGs). From the East Netherlands, we want to take a clear initiating role in the field of agri-food.

Food production is directly or indirectly related to many of the SDGs. Population growth and the current, often unhealthy, food patterns increase the demand

for healthy food. Think for example of sufficient and sustainably produced food, and healthier food based on fewer calories, more vitamins, and more vegetable protein balance (SDGs 2, 3 and 12). Climate change is pushing us towards climate- smart and sustainable food systems (SDG 13), with more attention paid to natural resources and to encouraging the reuse of raw materials.

Circular agriculture is promoted, partly to make more efficient and sustainable use of natural resources such as water and land (SDGs 6, 14 and 15). With the growth of the world's populations and environmental problems, the importance of innovation and the joining of forces of communities is high (SDGs 9 and 17). In addition, many people are employed in the entire food system in the Eastern Netherlands and agri-food is an important economic pillar (SDG 8).



Our focal points for food system transitions

In the field of agri-food, East Netherlands wants to continue playing an innovative pioneering role, both in developing new sustainable solutions and in testing and demonstrating innovations in practice. In doing so, we align with the national innovation policy and the European Farm to Fork strategy and focus on our spearheads: circular agriculture, protein transition, food technology and agro-tech/smart farming.

The regional production of protein crops for human consumption, insects and animal feed, and the innovation issues thereof, are becoming increasingly important for the East Netherlands. It contributes to the reduction of nitrogen emissions and climate objectives and offers new economic opportunities.

Food technology

It is important that food is healthier, tasty and increasingly in line with the wishes of various consumer groups. Several high- value technologies can be turned into important innovations. Think of bio-refining of vegetable proteins as a new vegan ingredient and the use of multispectral measurements for quality determination. The digitisation of food production and innovations for mild preservation and personalisation of food also fit within this spearhead.

Circular agriculture

Recycled agriculture has less negative impact on the climate, contributes to reducing emissions (nitrogen problems) and restoring biodiversity. It also offers a suitable earnings model for the farmer. The region actively promotes recycling agriculture and circularity in food. In this way, we offer room for innovations, for example in the field of residual flow valorisation, biomaterial development (e.g. for sustainable packaging), and prevention of food wastage. In order to preserve landscape and nature in the longer term, attention is also paid to new earning models, such as 'green and blue' ecosystem services.

Agro-Tech and Smart Farming

Protein transition

In the region, specific attention is paid to the protein transition; from farm to fork. From the perspective of a sustainable food system and circular economy, the balance between animal and vegetable protein must shift from 60:40 animal-plant to 40:60. The remaining livestock farming must become more sustainable in terms of animal feed, emissions, animal welfare and disease burden, while remaining economically viable.

At the crossroads of high-tech and agri-food, East Netherlands offers a lot of knowledge and many innovative (manufacturing) companies in globally established product niches. From large to small, they specialise in developing, making and selling innovative equipment and systems worldwide for farmers and food producers. In doing so, they contribute to answering the growing demand for food on the one hand, and to reducing the environmental impact and increasing animal welfare and biodiversity on the other. Further steps in the digital transition in agri- and food systems are regionally clustered in the ThinkEast Netherlands icon "Data-driven Transition in Food".



East Netherlands, the basis of many Smart Food innovations

Agri-food innovations often find their basis in the East of the Netherlands. In addition to WUR, there are many food multinationals and research companies that perform their agri-food R&D in East Netherlands. We also focus on the connection with regions outside East Netherlands, but also in East Netherlands itself. For example, strengthening the Food Valley and Twente axis to link knowledge in the field of high-tech and ICT to (smart) food production.

The Eastern Netherlands is home to many innovative organizations that are leading the way in smart food innovations. Think high-tech companies for soil research, animal management and large(er) food producing companies, the OnePlanet Research Center and suppliers of advanced food and farming equipment. The headquarters of the (cooperative) food industry can also be found here.



Below we show some companies, field labs, knowledge and educational institutions that are strongly committed to Smart Food. The map on the left shows how many these are per sector, per location. A selection of appealing organisations has been made. It is far from exhaustive.

Dutch companies

1. Nedap (Groenlo)
2. Royal Eijkelkamp (Giesbeek)
3. Euroma (Zwolle)
4. Bobeldijk Food Group (Deventer)
5. Food Connect (Almelo)
6. Keygene (Wageningen)
7. Vivera (Holten)
8. Ruitenberg Ingredients (Twello)
9. Noldus IT (Wageningen)
10. Ynsect (Ermelo)
11. Solynta (Wageningen)
12. Bieze food groep (Nijkerk)
13. Agrifirm (Apeldoorn)
14. ForFarmers (Lochem)
15. De Heus (Ede)
16. Moba (Barneveld)
17. Aliga (Oldenzaal)
18. Top BV (Wageningen)
19. Johma (Losser)
20. Nutrileads (Wageningen)

Foreign companies

1. Ausnutria (Kampen)
2. Grolsch/Asahi (Enschede)
3. The Kraft Heinz Company (Nijmegen)
4. Beyond Meat (Enschede)
5. Kubota (Wageningen)
6. Yili (Wageningen)
7. Nestlé (Nunspeet)
8. Reckitt Benckiser (Nijmegen)
9. Europastry (Oldenzaal)
10. Paul Mueller (Groenlo)
11. Marel (Lichtenvoorde)
12. KWS (Wageningen)
13. Eurofins (Wageningen)
14. Ben & Jerry's (Hellendoorn)

Ecosystem partners

1. ICT Valley (Veenendaal)
2. StartLife (Wageningen)
3. EIT Food (Leuven, België)
4. Dutch Poultry Centre (Barneveld)
5. The Green East (Raalte)
6. Stichting Innofood (Holten)
7. FoodvalleyNL (Wageningen)
8. LTO Noord (Zwolle)
9. Greenport Gelderland (Kerkdriel)

Education & Research

1. Wageningen UR (Wageningen)
2. OnePlanet (Wageningen)
3. Van Hall Larenstein (Velp)
4. NIZO (Ede)
5. Royal GD (Deventer)
6. Saxion Applied University (Enschede)
7. VKON (Den Ham)
8. Unilever Foods Innovation Center Hive (Wageningen)
9. FrieslandCampina Innovation Centre (Wageningen)
10. Upfield (Wageningen)
11. NovelIT (Enschede)
12. De Marke Agro Innovatiecentrum (Hengelo Gelderland)
13. World Food Center (Ede)

How is our region contributing to the transition to a new sustainable food system?

The East Netherlands has everything needed to tackle the social challenges involved in producing food and to also stimulate activity in this field. How do we do this?

Strong food ecosystem

The eastern part of the Netherlands distinguishes itself through a strongly organised and innovative ecosystem for agri and food. Foodvalley NL focuses on relevant challenges of the agri and food industry. Since 2020, this strong network of (inter)national companies and knowledge institutes focuses on protein transition, circular agriculture and food & health. In addition, Foodvalley NL acts as a leading European hub in the global Food Innovation Hubs network with support from the World Economic Forum and its partners.

The regionally anchored network Innofood brings together large and small food production companies from the East Netherlands on topics such as human capital and more sustainable production. Greenport Gelderland works in a triple helix context on innovative and sustainable solutions to horticulture. Collaboration also takes place in other regions in the food chain, such as around Zwolle led by Kennispoort, NEXTgarden (the greenhouse area between Arnhem and Nijmegen), Fruitteelt in Betuwe/Rivierland and Vruchtbare Kringloop Achterhoek and Liemers and Vruchtbare Kringloop Overijssel, which focuses on manure valorisation.

We see opportunities in the East Netherlands to further scale up the initiatives in sustainable food from Wageningen and Twente and apply them throughout the country and the Netherlands

StartLife

StartLife aims to help food and agri-food tech start-ups grow into leading companies. Promising start-ups are trained and coached in the acceleration programme. The linking with StartLife's corporate partners from across the food chain is very valuable. The start-ups will get in touch with substantive programme partners and relevant knowledge from WUR. As acceleration programme and venture capital fund, StartLife has helped over 250 start-ups both financially and in terms of content in its ten years of existence.

StartLife has a strong pull factor for high-tech start-ups in agri and food, now with a clear international appeal also. In addition to StartLife, the Business Innovation Program Food, set up by the regional development agencies, supports (start-up) entrepreneurs in the agrifood system; they must have a sustainable focus, for example on reducing food waste or new business models. For agri and food scale-ups there is a national support program, Fastlane, of which several regional organizations are partners and which is pulled by Invest-NL.

Icon ThinkEast Netherlands: Data-driven transition in Food

Since 2020, the regional partnership Think East Netherlands has formed the "Data-driven Transition in Food" icon. ThinkEast icon projects aim to profile specific strengths of the region in Europe, for example recently developed innovations of companies and the results of triple helix collaborations. In addition, an icon offers support in European project development on this theme and partners from the region join in. The core partners for the icon are the Foodvalley

region, Foodvalley NL, Saxion, Van Hall Larenstein, OnePlanet, WUR and Oost NL. Various innovative companies, regional and knowledge parties are also involved.

OnePlanet Research Center

Since 2019, OnePlanet has been an open innovation centre for healthy food, healthy living and a healthy environment. It is an initiative of Imec Nederland, WUR, Radboud University and Radboudumc. Here, they develop new solutions for the challenges of tomorrow. For example: how can we feed 10 billion mouths without exhausting the earth, using the latest digital technology? How do we keep healthcare affordable? How do we live longer and healthier lives? The collaboration with companies and other knowledge parties is developing rapidly.

Among others, the innovation centre works on:

- Smart, affordable sensors for plants that regulate conditions in the greenhouse;
- Producing more food with fewer resources by growing crops stacked in buildings;
- fine-grained measurement of emissions around farms and industry, in order to be able to take meaningful measures to reduce emissions;
- microchips that can predict and prevent disease.

International cooperation in food innovations

Collaboration between companies is essential for innovations in agri-food. Collaboration of companies in East Netherlands with companies from other European regions with a strong focus on agri-food strengthens the innovation power of the region and its competitive position within Europe. Cooperation with other regions in the European Union is taking

place via, among others, S3 platforms. Furthermore, intensive cross-border collaboration has been supported with ERDF/INTERREG funds, such as:

- Food2020 - supporting SMEs to develop concrete solutions (products, processes and services) that contribute to solving relevant challenges for the food sector. This bridges the gap between research and the market. This is an INTERREG programme aimed at German-Dutch cooperation;
- Blockstart - helps SMEs to strengthen their competitive position by using blockchain technology. Blockstart focuses on companies in the agri-food sector, among others. This is an INTERREG North-West Europe project.

Starting in 2023, several new agri and food projects will be developed for Interreg 6a and 6B and the EU's Interregional Innovation Investments (I3) Instrument.

The Protein Community

The Protein Community was set up to support SMEs in the development of plant-based alternatives to animal proteins and to share relevant knowledge and networks. This cluster - originally aimed at companies in Gelderland and Overijssel - is now also focusing on other regions and other countries. At present, more than 1000 companies are affiliated with it nationwide.



East Netherlands Innovation Agenda

The purpose of this Innovation agenda is to give practical application to the strategic plans for strengthening the unique position of the East Netherlands in the field of smart and sustainable food. The broad outlines, as set out in the RIS3, ThinkEast Netherlands position paper and the FoodSwitch plan, form the basis.



Innovation agenda on five themes

We use East Netherlands' strengths and skills to make the difference in the five themes: circular food system, smart food production, next generation protein solutions, living labs and key technologies.

Investments are essential to move these topics forward successfully. Various inventories - including a recent one for FoodSwitchNL - show that the regional

business community and knowledge institutions also want to co-invest in these topics. In order to further increase the impact, we ask the national government and Europe to explore with us these five themes in which East Netherlands has chosen to actively participate and to play a leading role. Based on the current inventory of projects from East Netherlands, there is a great demand for investment in order to make an impact regionally, nationally and internationally.



Circular food system

The systemic change towards circular agriculture is a transition that can only be achieved by making substantial investments and by engaging in more intensive collaboration between parties. From farm to fork, in which raw materials retain their value and residual flows are put to good use and - if possible - upgraded in the (food) chain. The East Netherlands has everything needed to become a hub for a circular food system. There are prominent knowledge institutions, motivated and experienced intermediary organisations, leading entrepreneurs from the primary sector, small and large food companies with R&D centres in the region and regional collaborations with food as a spearhead.

We invest in technological solutions, but also in system changes (e.g. chain shortening) and the development of new business models (e.g. ecosystem services).

Examples of investment initiatives:

- Circular solutions in animal husbandry, such as by Stichting Future Farm in Hardenberg (Overijssel) and at the De Marke in Hengelo (Gelderland) experimental farm
- Large-scale technological investment projects on the subject of residual waste processing, of e.g. beer brine and yeast, and setting up bundling initiatives such as waste hubs
- A knowledge & innovation centre on climate change, soil and dehydration for the agro, food and industry sectors, Soil Valley



Next generation protein solutions

The strong position of East Netherlands within the theme of protein transition forms the basis for further steps that contribute to a diet with less animal protein. Both knowledge institutions and companies are already fully committed to this. New investments are necessary to explore and develop more alternative sources of protein. We are thinking of relatively unknown vegetable protein sources that could be suitable for human consumption, but also of new sources such as water lentils, molds and algae. Refining proteins from residual flows is promising, but requires expensive hardware in pilot facilities. Solutions will eventually find application in consumer products and also in animal feed (as an alternative to imported soya).

In order to actually be able to process new proteins into products, it is important to pay specific attention to optimal functionality (for example, binding in bakery products) and the correct amino acid composition in order to offer a healthy alternative. The production and application of new proteins also necessitates investments in the area of food safety (including the development of 'novel food' dossiers).

Examples of investment initiatives:

- The Protein Community and R&D parties such as the WUR and NIZO Food Research: building production capacity for protein refining, expanding the ecosystem and investing in the production of alternative proteins through fermentation;
- improve protein crops through rapid plant breeding (e.g. lupin and field beans)
- Hub for Insect Knowledge transfer with themes such as setting up a central test site for insect cultivation with a focus on, among other things, new cultivation systems and the production of alternative feed; upscaling of water lentil production and its protein refining.

Smart food production

Providing a growing world population with healthy and sustainable food requires smart solutions. With the deployment of state-of-the-art chip and sensor technology, data-sciences & AI and robotics, the aim is to provide sustainable and modern food. “Data-driven Transition in Food” has therefore been chosen as a “food icon” from the ThiinkEast Netherlands collaboration.

Smart technologies should lead to less waste (e.g. by very early detection of declining quality), less emissions and energy consumption or higher animal welfare. Roboticization is also moving fast and becoming an essential production factor, both for the farmer and the food producer. Digital connections in the system up to the consumer are leading to chain changes, such as shorter chains.

Examples of investment initiatives:

- An agrifood AI Testing and Experimentation Facility node in the Netherlands, based in the eastern Netherlands;
- FruitBridge: implementation of a digital and connecting ecosystem and platform for the fruit sector, organised from Fruit Tech Campus;
- icon Think East Netherlands “Data Driven Transition in Food”;
- FoodX, business center of World Food Center B2B innovation showcase: show the world the food and food technology solutions from the broad business community;
- Making dairy farming more sustainable, through the application of data and sensing, both to boost agricultural cycles and to achieve long-lived, healthy cows.

Living labs

In East Netherlands, we test system changes (circular, protein & digital) in practice and further development takes place with (end) users. We do this under the name of ‘Proeftuinen’ (living labs). This way of working is an essential link in the implementation and further rollout of agri-food innovations. The East Netherlands in particular has a well-developed innovation ecosystem, an appropriate scale and wants to play an important role in this.

Specifically, we are thinking of collaborations such as shared pilot and research facilities, living labs for various sectors (poultry/insects/beef cattle/fruit) and around specific challenges such as drought on sandy soils and around the theme of fertilisers and emission reduction.

Examples of investment initiatives:

- implementing plans for expansion and start-up of new partnerships in which innovations can be tested, demonstrated and scaled up. Particularly sector-oriented, such as in poultry production, insect cultivation, cattle or fruit, cooperation can be quickly set up and scaled up. For example, an Insect Experience Centre at Aeres MBO in Barneveld, the expansion of activities at The Green East in Raalte, or the living lab initiatives mentioned earlier around the themes of circularity, alternative proteins and smart food production;
- investing in an extension of the Shared Pilot Facility scheme offers opportunities for more innovative Food entrepreneurs from the East Netherlands to convert their innovations from the lab into (pilot) productions;
- creating living labs around specific challenges such as drought on sandy soils and around the theme of fertilisers and emission reduction (including fieldlab nitrogen reduction innovations).

Key technologies

Investing in key technologies is investing in the future of the (Eastern) Netherlands. Three key technologies are prominent in making agri-food more sustainable:

- biotechnology: innovative breeding of plants, animals and micro-organisms;
- information technology: development and application of AI for food, sensorics, big data, IoT and connectivity;
- smart systems: combined high-quality technologies as used in robotics, monitoring and control, digital production processes, process automation and conversion and separation technology in production processes.

Examples of investment initiatives:

- In the area of key technologies, the “proposition AI East Netherlands” offers great opportunities for application in the animal sector, but also in the fruit sector, at food companies or for personalized nutrition;
- For the breeding of more resilient plants, CROP-XR has been funded by application to the National Growth Fund.
- OnePlanet Research Centre wants to work with parties from the region to implement key technologies in the field of sensing to tackle societal challenges (such as emission reduction, healthy living and circular use of raw materials) with data. The investment initiative for this is called OpenPlanet;
- Linking systems that collect data (e.g. drones with sensors) to systems that perform processing steps (e.g. robots that harvest, prune, mow, etc.), especially for precision agriculture. This requires major investments in data exchange and platform building. It can be implemented in living lab projects in multiple sectors and around specific challenges. Think of the FruitBridge initiative as described above.



Sustainable food

In the agri and food sector, labour plays an important role and therefore belongs in this strategic innovation investment agenda. Technological development is rapid and employees must continue to develop in order to be able to deal with this.

The transition tasks within the agri-food sector become a reality provided there is sufficient focus on human capital



Human Capital

In the agri and food sector, labour plays an important role and therefore belongs in this strategic innovation investment agenda. Technological development is rapid and employees must continue to develop in order to be able to deal with this.

At present, much repetitive work is carried out by workers from other European countries. How will this work be done in the future? Automation and robotisation are a focus of attention, but in many places they are still in their infancy. ABN Amro's report shows the great opportunities for its application both in the primary and food sectors. This also applies to the suppliers of these innovations, many of which are active in the East Netherlands.

In East Netherlands, we are working towards an inclusive, agile and future- oriented labour market. To keep the agri and food sector attractive for young entrepreneurs and employees in the future, it is important to invest in subjects like Precision Farming and Smart Food Production in education from intermediate vocational education to university. A number of investment projects include this aspect, for example the Fruit Tech campus. Another example

is Poultry Expertise Center in Barneveld with the Poultry Innovation Lab and Insect Experience Centre. In addition, we make smart solutions in practical situations visible at a regional level. The WUR wants to make more use of regional opportunities to test innovations. OnePlanet is already doing this in the Food Valley region, for example. The transition tasks within the agri and food sector will become a reality if there is sufficient attention to human capital. The agri and food sector is developing rapidly and thus offers new opportunities for socially relevant work for people in the region.

If you would like to contribute, please contact info@thinkeast.nl

In East Netherlands, we are working towards an inclusive, agile and future-oriented labour market



