



*Metrics Models and Foresight*  
for European **SUS**tainable Food and Nutrition  
Security

# SUMMARY

## State of play in the SUSFANS project

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May 2018



Grant633692  
Duration: 2015-2019

# Summary

## Introduction of the project

SUSFANS focuses on a number of core questions: How can we improve the food system of the EU, especially from the perspective of social, environmental and economic sustainability? How can we balance and encompass different views on balanced consumer diets and food and nutrition security in the EU? The research approach is built around the development of a set of metrics, models and foresight tools, which can be used to navigate through decisions on measures for achieving sustainable food and nutrition security. This approach results in a holistic, integrated and coherent vision of what entails sustainable food and nutrition security in the EU in a context of global change. It underpins a perspective on how EU policies on farming, fishing, food and nutrition could contribute to that vision with greater efficacy than today.

## How SUSFANS works

The research work in SUSFANS is divided in three pillars, aiming at:

- 1) Assessing sustainable FNS in the EU using conceptual mapping and innovative metrics for the food system;
- 2) Modelling sustainable FNS, its outcomes and possible innovation pathways;
- 3) Foresight and policy guidance for European diets and food systems at large (figure 1).

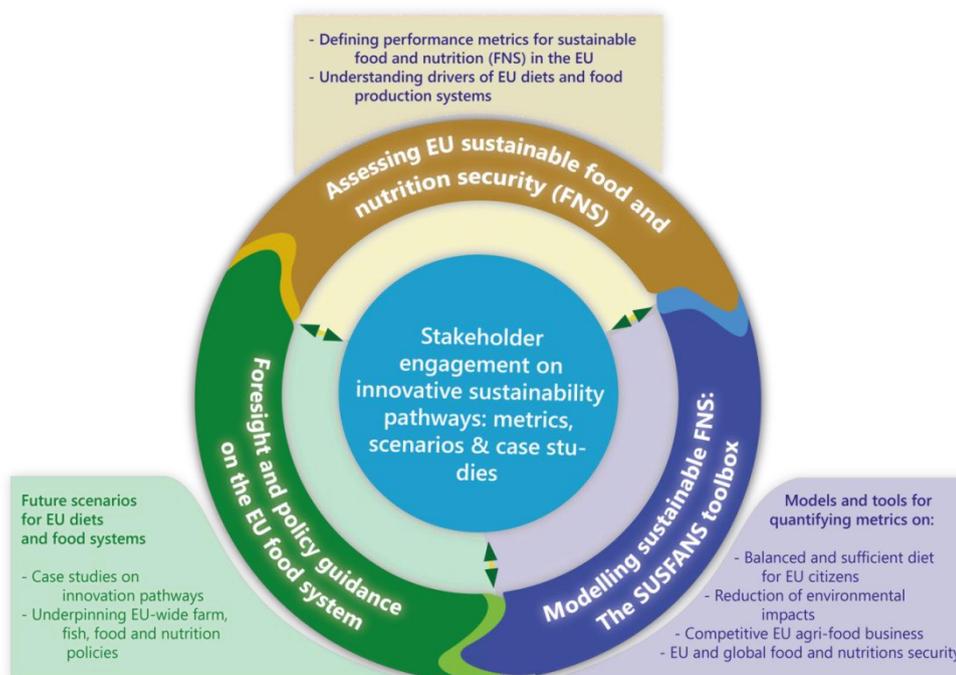


Figure 1. The research strategy of SUSFANS

## Scientific progress in the second reporting period of the project (October 2016 – March 2018)

In **Pillar 1**, SUSFANS is mapping the EU food system and establishes performance metrics for assessing sustainable EU food and nutrition outcomes, based on consultations with stakeholders from governments, private sector, and civil society. The framework and the metrics also address the various driving forces influencing the behavior of food system actors (producers, food chain actors and consumers) and establish a shared understanding of possible entry points to improve the food system's performance.

Progress under the first pillar:

- An integrated approach was developed in four steps to assessing sustainable food and nutrition security of the EU food system with the input and endorsement of the SUSFANS stakeholder core group: 1) a conceptual framework of the EU food system, 2) an integrated, hierarchical set of metrics for assessing options for change, 3) a modelling strategy for estimating the metrics and 4) a visualization tool across the metrics to enable an informed stakeholder debate on food system change ([Zurek et al. 2017](#), [Kuiper et al. 2017](#)).
- A comparison of dietary intakes across four EU countries (CZ, DK, FR and IT) provided a baseline for further research towards healthier and environmentally-friendlier diets ([Mertens et al. 2018](#)). The set of food-based dietary guideline

(FBDG) was not met by a large part of the population and/or population subgroup. Within countries, food intakes varied by socio-economic factors, but less pronounced by overweight status. In all countries, intakes were low for legumes, and nuts and seeds, but high for red and processed meat.

- Bringing diets more in line with FBGD would improve social welfare in France, Denmark and Finland, according to a modelling study ([Irz et al. 2018](#)). Healthy-eating recommendations (e.g. salt reductions) should be prioritized for promotion over climate-friendly diet recommendation targeting meat consumption or the total carbon footprint of the diet. While synergies dominate according to the award-winning paper, trade-offs between environmental and health objectives did occur.
- Insight into the drivers of sustainable food consumption, and into the leverage potential of push and pull factors in help changing current European diets. Consumer perceptions of sustainability and drivers of change were explored in experimental settings. Consumer information including labeling can be seen as supportive policies for a shift in consumer behaviour but evidence varies on the targeting of health and sustainability information to consumers: the sustainability information provided little benefit over health information in an experiment on a soy-based meat substitute ([Marette, 2017](#)); consumers preferred combined health and sustainability information in a choice experiment on fruit and vegetables products ([Bouwman et al., 2018](#)). Both experiments suggest the importance of price drivers in steering towards healthier dietary choices.
- Apart from the consumer drivers, studies also showed the importance of incentives within the food industry and food value chains to support health and sustainability benefits, for example around reformulation ([Spiteri and Soler, 2018](#)) and food quality standards (e.g. [Swinnen, 2017](#)).
- There is extensive debate on the position of farmers in the food chain, observes a policy review with contributions out of SUSFANS ([Falkovski et al. 2017](#)). Market concentration and technological advances are claimed to have shifted the balance of power in the food system to global retailers and other concentrated sectors. An extensive empirical study was done into the functioning of selected EU supply chains. The results show that farmers have a significantly higher volatility of mark-ups compared to other agents in food value chains, such as food processors, wholesalers and retailers ([Garrone and Swinnen, 2018](#)).
- Modeling of the environmental sustainability of production systems and post-harvest handling in the EU requires detailed data. For agricultural land use diversity and soil erosion data was collected at high spatial resolution ([Leip et al., 2017](#)); data on fisheries and aquaculture has been integrated with cropping and livestock systems; waste streams and opportunities for circular use of resources quantified ([Garmona-Garcia and Leip, 2017](#)).

**Pillar 2** concentrates on models and tools for quantifying metrics on balanced and sufficient diets for EU citizens, reducing environmental impacts, competitive EU agri-food businesses and food and nutrition security in the EU and globally. In order to assess the state of FNS in the EU and its sustainability over time, models are needed to project food and nutrition supply and demand, taking into account complex market interactions and the impact of a wide array of drivers of change as well as policies on sustainability.

Models are combined in a research toolbox for the quantification of diet and system scenarios.

Progress under the second pillar:

- A basic model for Sustainable, Healthy, Affordable, Reliable and Preferred (SHARP) diets has been developed to benchmark current healthier diets and to provide guidelines for improving less healthy diets. The model applies a novel optimisation approach geared to find healthier diets in a way that is acceptable by the studied population.
- A comprehensive database with high quality data on key sustainability indicators for 780 food items has been compiled (Mertens et al., forthcoming). This database, developed for the SHARP model and based on the FoodEx2 classification, covers more food items than any other database in the public domain. An improved version will become publicly available in 2018.
- To be better equipped to handle key questions in a search for healthy and sustainable diets the three macro models used for quantifying future developments (MAGNET, CAPRI and GLOBIOM) improved their ability to model changes in the crop sectors and were extended into four key directions: fish (wild catch and aquaculture), milling and slaughtering activities, post-farm waste (in retail and by consumers) (all reported in [Heckelei et al. 2018](#)) and nutritional content (now including micro nutrients) of available food ([Kuiper et al. 2018](#)).
- A forecasting system for agricultural commodity price and price volatility has been developed and applied for four agricultural commodities to provide forecasts on a horizon spanning from three months to one year. Macroeconomic conditions appear surprisingly important compared to other factors ([Crespo Cuarisma et al. 2018](#)). The model system will be used as an early warning system based on seasonal and decadal simulated weather and climate forecasts in combination with financial and macro-economic projections ([Crespo Cuarisma et al., 2018](#)).
- While short term markets conditions, such as droughts, may affect long-term outcomes for sustainable FNS, few models exist to explore this interaction. A version of the GLOBIOM model has been developed and tested for the effects of yield shocks of different frequency and severity on price developments, consumption, production and trade in the medium and long term (Boere et al. 2018).

**Pillar 3** aims at foresight and policy guidance for sustainable FNS in the EU, and recognizes the importance of stakeholder involvement in realizing impact on society. The conceptual framework (Pillar 1) and modelling (Pillar 2) of sustainable FNS in the EU can be used to provide foresight on future pathways for EU food production and consumption.

This is done on the basis of two case studies and several EU-wide scenarios, which are determined in close collaboration with stakeholders and consider the impacts of sector, product, trade, consumer, nutrition and health policies and/or

innovations. The results are used to formulate recommendations on using the SUSFANS framework to advance evidence-based food policy on sustainable FNS in the EU. The outreach and impact strategy involves national stakeholders in EU member states, the community of policy and business stakeholders in Brussels, and the global scientific community.

Progress under the third pillar:

- Engagement with the stakeholder core group (SCG) resulted in feedback on the 4-tier SUSFANS approach for assessing and modeling sustainable FNS; prioritization of research questions during a third SCG meeting with a focus on livestock-fish challenges for a sustainable food system; guidance on the presentation of the framework and performance metrics for maximum societal impact.
- The focal point for outreach towards the end of the project is the SUSFANS toolbox Europe tour. A preliminary strategy for the tour, including a strategy to address the challenges to meet a variety of local interests across European member states has been developed.
- Case study research on livestock-fish and fruit-vegetables provides insight into options for more sustainable production systems and healthier food consumption. Research priorities were defined with the stakeholder core group. The case studies will contribute innovation pathways to the SUSFANS foresight studies.
- First, based on the current environmental concerns with both livestock and fish production, novel feeding strategies are studied as the main production side innovation for the case of livestock-fish systems, also exploring the scope for increasing circularity in livestock production ([van Zanten et al. 2017](#)). It is estimated that livestock raised under the circular economy concept could provide a significant, non-negligible part (9-23g/per capita) of global daily protein needs (~50-60 g/per capita); this livestock then would not consume human-edible biomass, such as grains, but mainly convert leftovers from arable land and grass resources into valuable food, implying that production of livestock feed is largely decoupled from arable land ([van Zanten et al., 2018](#)).
- Second, based on a conceptual framework on the determinants of diet and physical activity (DONE framework), a wide set of variables related to consumers' behaviour have been clustered into three strategies for consumer side innovations: behavior change needed to go from the current diet to one in line with dietary and/or environmentally sustainable recommendations, product and production processes, and circular innovations such as reducing food waste ([Sijtsema et al., 2018](#)).
- The SUSFANS foresight was initiated with a quantification of three contextual scenarios developed with contributions from stakeholders: i) a business as usual baseline, representing the reference scenario, ii) a scenario representing high challenges for EU sustainable FNS and iii) a contextual scenario representing low challenges for the EU FNS ([Havlík et al. 2018](#)). An open access driver [database](#) has been made available.

#### The SUSFANS vision established in the academic literature

The scientific perspective of the SUSFANS project has been presented at conferences and is now established in the peer-reviewed scientific journal *Agricultural Systems* as:

Rutten et al. Metrics, models and foresight for European sustainable food and nutrition security: the vision of the SUSFANS project" *Agricultural Systems*, 2018, <http://dx.doi.org/10.1016/j.agsy.2016.10.014>

More information on project progress is available at [www.susfans.eu](http://www.susfans.eu).

# Impact

## Cumulative impact of the action, for the first three years of the project (reporting period 1 and 2)

SUSFANS aspires to achieve the following three overall impacts:

1. An analytical framework for a comprehensive assessment of food and nutrition security (FNS) in Europe, centred around the implications of the current diet for the sustainability of agro-food production and consumption in the EU, supports standardised monitoring of FNS in EU;
2. Strengthened capacity of policy makers to formulate longer term policies on the basis of advanced quantitative tools;
3. High-level foresight on the challenges for FNS in the EU in the near future (up to 5 years) and on the longer term (one or more decades ahead).

Although impact pathways for policy change are long and complex, the results of the project will, in time, allow the European Commission (EC), policy-makers in the Member States and stakeholders in the private sector and civil society to develop more appropriate strategies at the intersection of FNS-related domains. SUSFANS does not aim specifically at impact on SMEs.

The achievements and activities in the first and second reporting period have contributed to the partial realisation of these ambitions. While emphasis has been placed on the pathway towards the first impact, this impact is not considered completed, and efforts were also done on both other impact pathways.

### **Towards aspired impact 1: Strengthening the analytical capacity for assessing the state of EU FNS at sub-regional level (including the implications of fisheries and aquaculture)**

A framework for an integrated assessment and monitoring of EU sustainable food and nutrition security (FNS) is missing. Where the integral policy-making of agricultural production and environmental dimensions has made substantial progress, scientific guidance is needed for connecting the indicators and policy discourse on agri-food (including fisheries and aquaculture) and nutrition-health. SUSFANS aims to position its set of analytical methods as a standardised scientific framework for monitoring the state of FNS in terms of the composition and quality of EU diets and sustainability of EU agri-food production in the context of global drivers of change. The purpose of the standard framework is to support more effective decisions and dietary recommendations to improve the health of EU consumers, in the context of environmental and economic consequences.

Major impact outcomes (partially) achieved and how they were achieved:

- Enhanced stakeholder capacity to encompass full food system approaches in EU and national FNS policy making based on a better appreciation of interactive food system processes.

Completion of an integrated approach in four steps to assessing sustainable food and nutrition security of the EU food system with the input and endorsement of the SUSFANS stakeholder core group. The approach included the development of a conceptual framework of the EU food system, an integrated, hierarchical set of metrics for assessing options for change, a modelling strategy for estimating the metrics and a visualization tool (*see figure 2*) across the metrics to enable an informed stakeholder debate on food system change. The strength of the approach lies in:

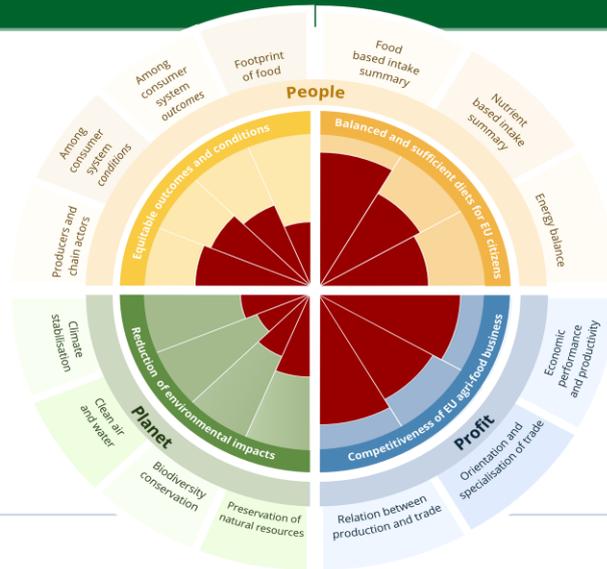
- The positioning of sectoral or national issues and interests in a wider system context. For example, observed variation in dietary quality among subgroups in the EU population calls for a national and European food system strategy with clear targeting;
- its ability to encompass various world views and perspectives on the public goods that food systems (should) deliver;
- its integration of policy domains (nutrition and health, competitiveness, environmental protection and equity) and explicit call for policy coordination across these domains, and across geographical scales in the EU (EU-wide, Member State and subnationally);
- scientific rigour in linking policy targets and performance indicators that are monitored under various EU policy frameworks, with foresight on the performance of the EU food system under global megatrends towards 2030 and beyond;
- ex ante evaluation of policies and programs. An example is substantial reduction of red meat consumption, which is a major public health interest with strong environmental benefits, but with implications on the economic viability of farming that depend heavily on the policy instruments used to achieve the goal.



## Performance metrics for the EU food system

The SUSFANS SFNS-impact visualizer showing a hypothetical assessment of the current EU sustainable FNS status

Zurek et al. (2018)



## Hierarchy of performance metrics: Goals and subgoals

Hierarchical approach to building performance metrics out of individual indicators, depicted in the SUSFANS SFNS-impact visualizer

Zurek et al. (2018)

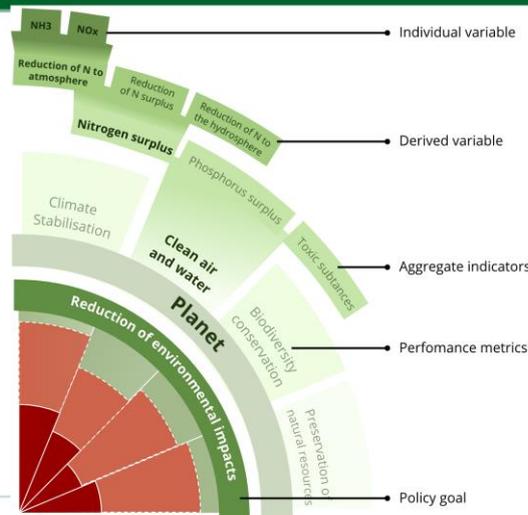


Figure 2 The SUSFANS performance metrics

The SUSFANS conceptual framework and approach has already been translated as a food systems lens for research and innovation policy at the level of the European Commission and beyond. SUSFANS has informed the design of the CSA [FIT4FOOD2030](#) and was presented to the consortium, the Commission and training participants where it was considered to be a useful approach for the FOOD2030 process. It has also informed an analysis on the global impact of the EU food system for the Joint EWARD-SCAR Strategic Working Group on ARCH (European Agricultural Research towards greater impact on global Challenges). The [paper](#) argues that EU trade and investment have impact on the food systems drivers and outcomes in trade partner countries beyond the economic domain. The SUSFANS framework and approach was also highlighted in a book chapter on 'Food Systems Approaches for the Future' which is to inform the debate within the CGIAR on addressing new food challenges for the future and applying new thinking and approaches to potential change within the CGIAR.

- Improved stakeholder understanding of sustainability from (i) their own perspective and (ii) that of other stakeholders elsewhere in the food system.

It is of prime importance to be responsive in the conceptual framework towards a variety of world views or stakeholder perspectives. A key milestone was to achieve commonality on the project's vision with and among the SCG, i.e. the need to

add the notion of sustainability to FNS, to take into account achieving FNS and reducing health burdens related to food consumption with less environmental costs by a thriving agribusiness sector and without neglecting the EU food system impacts on the globe. Within this vision, stakeholder views differ on priorities for a sustainable food system and roadmaps towards this turning this ambition a reality. SCG members endorsed, however, the SUSFANS approach of bringing together these various goals under a clear set of metrics and analytical tools to assess progress toward these goals (i.e. spider diagram) as a useful and generally valid approach for exploring the implications of various options for action and leverage points to deal with possible trade-offs, and to systematically monitor progress towards sustainable FNS. The SCG encouraged the consortium to balance scientific rigidity with communicative strength, and thereby helped to define the terms for the hierarchical metrics approach (D1.2 report) which was endorsed by the SCG for its capability to deliver a potentially impacting format for policy information on FNS.

- Standardization of the analytical methods in anticipation of implementation at the level of EU institutions and member states.

The pathway towards achieving this impact outcome is lengthy and complicated because it involves an outlook of changing practice within the European Food Safety Agency (EFSA) and well-established statutory nutrition and health institutions in the member states pertaining to their contribution to the process of making nutritional policy, e.g. informing the development of food-based dietary guidelines. Nonetheless, activities in the project have contributed to this outlook. First, the close interaction of partners from 4 member states, each with statutory tasks on nutrition surveillance, on a common analytical protocol (see deliverable D2.2) lays the basis for a European approach. A classification of food products that is widely used across the EU28 and maintained by EFSA, i.e. the FoodEx2 system, serves as a backbone of the protocol. The project has also involved EFSA as the central institutions that compiles the pan-European database of food intake data. The involvement of policy makers from European member states in the SCG (CZ, IT, NL), and their positive feedback on the approach lays a basis to build on in the rest of the project. Second, WU and LEI-WUR the preparations of a European Research Infrastructure (RI) on food, nutrition and health under the ESFRI roadmap (see [paper](#)) has have incorporated the SUSFANS concept as an approach to foster linkages between the FNH-RI and the integrated assessment community (see [blog](#)) Third, a further condition is the recognition in the scientific community which is complex as well given the many scientific disciplines involved in the integrative SUSFANS framework. The publication of the SUSFANS position paper ([Rutten et al., 2018](#)) in the respected journal *Agricultural Systems* provides a first step towards achieving this goal. The paper will become available as an open access article, and is already accessible through the SUSFANS website and the repository Researchgate.

**Towards aspired impact 2: Improve the capacity of policy makers to monitor its development, to carry out short-term projections and evidence-based risk assessments and to implement quantitative modelling of alternative future scenarios to aid the design and formulation of longer term agro-food policies**

The strengthening of sustainable FNS requires a long-term strategy because the lead time for several solutions are long (think of diet change and other social innovations, or developing new breeds). In addition, to effectively monitor the developments in sustainable FNS over time, forward-looking (ex ante analysis) is needed to provide a benchmark for assessing performance against business as usual, or for evaluating the impact of a policy intervention. SUSFANS will deliver a toolbox of modelling tools and scenarios for science-based decision-making by policy makers regarding future European food systems.

Major impact outcomes (partially) achieved and how they were achieved:

- Long term projections will account for the EU's sub-regional and socio-economic diversity, dietary and income trends, climate change and environmental sustainability, as well as technological change within agriculture, fisheries, food processing and packaging, and retailing.

The model toolbox has been advanced in order to improve the capacity of public and private sector actors to quantify alternative future scenarios supporting the design of longer term policies or investment decisions. Work has progressed towards delivering an encompassing toolbox combining integrated assessment with diets & nutrition modelling. Such a toolbox is intended to allow, perhaps even foster, a constructive cross-sector dialogue between public health and agrifood communities.

To be better equipped to handle key questions in a search for healthy and sustainable diets the long-term macro models used for quantifying future developments improved their ability to model changes in the crop sectors and were extended into four key directions: fish (wild catch and aquaculture), milling and slaughtering activities, post-farm waste (in retail and by consumers) and nutritional content of food. Explicit modelling of fish and its interactions with other sectors allows tracing of the sustainability impact of an increase in fish consumption often promoted as part of a healthy diet but mostly omitted from the macro models so far. Accounting for processing and waste improves the representation of food available for human consumption as well as offering new leverage points for quantifying interventions along the supply chain. Together with the improved representation of the nutritional value of available food these macro model extensions improve both the benchmarking of business-as-usual developments in SFNS, as well as offering new possibilities for quantifying public or private interventions towards a more desirable future.

A large part of the work has focused on the most innovative & challenging part of the model linking: establishing a connection between the macro production-focussed models (CAPRI, GLOBIOM, MAGNET) and the micro consumption-focussed nutrition data/model (nutrition surveillance data in EFSA's FoodEx2 classification, the SHARP model for benchmarking sustainable diets). A procedure for this connection has been developed conceptually, and will next be implemented alongside the scenario analyses under pillar 3.

A subset of modelling tools focused on short-term forecasting developed in the project is expected to contribute significantly to improving the capacity of policy makers to design policies aimed at stabilizing commodity markets. On the one hand, the models provide a framework to obtain out-of-sample predictions of commodity price dynamics and constructing leading indicators to counteract pressures in the commodity market. On the other hand, they enable to isolate the contribution of different drivers of commodity price changes.

The stakeholder core group has been sensitised to the capabilities of toolbox during the second and third workshop. A particular merit of the toolbox that was recognised was the capacity to go beyond a simple static assessment of the (the state of) sustainable FNS in Europe, towards a dynamic assessment in which the current image is translated into a status quo or business as usual scenario, and future food system challenges can be explored in the context of global drivers of change.

- Proof of principle

A first test of this application with the CAPRI modelling system has been performed. Further improvements in spatial disaggregation and yield gap estimates allow for the calculation of terrestrial agro-environmental sustainability indicators. These outcomes will support a standardised monitoring of FNS in the EU.

### **Towards aspired impact 3: Bring about foresight and identify long-term challenges to FNS and the role of the EU agro-food sector, thus improving the capacity of related policies to provide appropriate answers**

Merely by means of our framing and evidence of the policy issues on sustainable FNS, SUSFANS hope to present new insights and perspectives. Stakeholders have also recommended keeping check of important upcoming policy milestones or cycles (e.g. reviews of policies), so become “policy watchers”, in order to feed in impact at very timely moments and make sure that the project pro-actively seeks policy buy-in and channels for uptake of its scientific results in public or private information systems and monitoring cycles. More so, SUSFANS also aspires to make substantive contributions to ongoing policy debates.

Major impact outcomes (partially) achieved and how they were achieved:

- Exploration of the performance of EU food systems under plausible futures assessed with consistency to changes in the policy/economic settings over time – sustainable FNS in uncertain alternative futures.

The concept of the Foresight was discussed with participants of the 3<sup>rd</sup> Stakeholder workshop. SUSFANS does not strive to create new scenario sets, but rather explore plausible future directions of the food system on the basis of well-recognised scenarios. The project has invested efforts to improve the consistency and cross-referencing across scenario exercises in two ongoing EU projects (FOODSECURE and TRANSMANGO). The project team is again cross-referring the synthesised set with the so-called ‘shared socioeconomic pathways’ and ‘concentration pathways’; these make up the global climate change scenario framework of the International Panel on Climate Change (IPCC). This exercise ensures maximum consistency with the ongoing foresight investments at DG AGRI, JRC and DG CLIMA. It is assumed that this effort vastly expands the potential for outreach and impact of the foresight exercise. A database of quantified scenario drivers at the level of EU member states and global regions has been made available to foster country level policy discussions in the preparations of the Europe Toolbox tour and “policy labs” under FIT4FOOD2030.

- Contribution to science policy on nutrition security and sustainable food systems in Europe (FOOD 2030) and the CGIAR.

SUSFANS has contributed to the framing of science policy on European and global food and nutrition security under the FOOD 2030 agenda and conference of the European Commission, led by DG Research & Innovation. The concepts of SUSFANS are influential in giving directions to global science agenda of the CGIAR, in particular the agenda on food systems and healthy diets in the second phase of the research program Agriculture for Health and Nutrition (A4NH), 2017-2022.

- Consultation on intended (further) policy contributions (2017-18)

During the 2<sup>nd</sup> Plenary Project Meeting and 2<sup>nd</sup> SCG workshop, a consultation was done on the ongoing policy debates that we should target for contributions in 2017-18. The following achievements are reported:

Paris Agreement/stable climate	At present, policy discussions on the implementation of the UNFCCC Paris Agreement are taking place, with a focus on national commitments of EU member states and EU28 policy framework. The SUSFANS team has defined its ambition in this respect as providing the leading EU-based scientific contribution to the analysis of synergies and trade-offs of alternative mitigation options for meeting the Paris agreements and the implications for the dietary quality in the EU population. This contribution has been prepared and planned for the second half of 2018
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CAP Reform, e.g. incorporation of nutrition and equity perspectives	Healthy lifestyles and sustainable diets require changes from consumers as well as the food system at large, including governments. SUSFANS research has provided key evidence and insight for an influential policy brief that discusses how food systems innovation and transformation could support a change toward more sustainable diets. <a href="#">Van 't Veer, Poppe and Fresco (2017)</a> argue that Europe can underpin its contribution to this global process of meeting the goals of SDGs and Climate Agreement via expertise gained in the Common Agricultural Policy and EFSA's nutrition expertise. Starting from the Food2030 agenda, EU policy goals for food, nutrition and health should include balanced and sufficient diets for all citizens, reduced environmental impact (both in and outside the EU), viable and socially balanced agri-food business (in and outside the EU), and contributions to global food security through socio-economic connectivity. The paper was discussed with a high-level audience in Brussels.
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In relation to equity, there is extensive debate on the position of farmers in the food chain and how global price volatility and increasing concentration up and down the value chain is affecting farmers. Market concentration and technological advances are claimed to have shifted the balance of power in the food system to global retailers and other concentrated sectors. At a consultation workshop on "Unfair Trading Practices in the Food Supply Chain", organised by DG AGRI of the European Commission, on Brussels, 17-18 July 2017, Swinnen and Vandeveldelde have contributed a discussion on "Regulating UTPs: Diversity versus Harmonization", based on SUSFANS research. It analysed the functioning of supply chains in Italy and France in terms of mark-up dynamics, as proxy of market power. The results show that farmers have a significantly higher volatility of mark-ups compared to other agents in food value chains, such as food processors, wholesalers and retailers. These findings provide useful insights for policy debate on the way in which uptake by farmers could be increased and on how lessons can be drawn by other actors in the food value chain to stabilize mark-ups for farmers.

On nutrition and consumption, the SUSFANS project has identified the reach and potential economic impact of consumer and nutrition options: Guidelines for policy makers about dietary recommendations to promote in relation to their impact on public health and environment, and on consumers' welfare. Most cost-effective dietary recommendations were identified. In addition, insight was gained about the possibility to design similar information policies and promote similar dietary recommendations across countries in Europe.

UN sustainable development goals (SDGs)	The contribution of EU to the SDGs has been explicitly incorporated in the agenda for dialogue of the FIT4FOOD2030 CSA project. Members of the SUSFANS consortium which participate in the CSA will underpin this ambitions as an additional step in the quantification of SUSFANS foresight scenarios.
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EC and global food systems science	Contributions to the European framework for food systems science are developed through participation in a H2020 project for a coordination action on the FOOD 2030 platform, consultations with EU science policy programming platforms (JPIs, SCAR Strategic Working Groups) and contributions to policy briefs (see above) and stocktaking papers. For example, a contribution has been completed for SCAR SWG ARCH and another contribution is underway for SCAR SWG FOODSYSTEMS.
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Focal point for contributions to global platforms for food systems science are CGIAR and EAT. Opportunities for engagement are being explored with World Business Council for Sustainable Development, in particular the FRESH program aimed at business solutions for sustainable food systems and healthier diets.

## Events and activities towards maximizing impact in 2018-19

### SCG4 (June 2018)

An important part of the SUSFANS project is to collect input from stakeholders involved in food systems at all levels. Therefore, a Stakeholder Core Group (SCG) which consists of 30 selected experts and decision makers representing a wide range of stakeholder communities and hence 'worldviews' (e.g. primary producers, food industry, retail, consumer groups, investors, regulators, policymakers and academics) was created. This SCG will advise the SUSFANS consortium on key topics during 4 workshops (October 2015, October 2016, September 2017, June 2018).

The objectives of the 4<sup>th</sup> Stakeholder Core Group Workshop (June 2018) are:

- To inspire the consumer-oriented way of thinking facilitated by a stepwise approach and introducing the consumer drivers of food and dietary choice into prospective studies on the sustainability of the EU food system;
- To evaluate and prioritize the consumer-oriented innovation pathways on fruit and vegetables in the EU;
- To receive feedback on the ongoing foresight work of SUSFANS; To discuss the likely key outputs of the project and how these could be of use to the stakeholders and their organizations;
- To discuss with stakeholders how to deliver the outreach work of the project beyond the stakeholder core group itself by helping to shape the key messages of the project to the different stakeholder communities and discussing how the group could play an ambassadorial role for the project.

### Policy review (June 2018)

A key question that we have is how SUSFANS can maximise its uptake in the policy community in Brussels, and the strengthening of food systems approaches in the EU. In terms of an audience in the European Commission, several DGs stand out:

- DG AGRI, because of the economic implications of nutrition-driven food systems transformation for viable agribusiness and the implications of the framework for modelling sustainable European FNS
- DG SANTE, because of the need to encompass EU and member states policies and research on food, nutrition and health into a broader framework of sustainability of the food system.
- DG RTD, because of 1) the rising importance of food systems approaches in R&I under FOOD2030 and 2) in connection to the contribution of SUSFANS to FIT4FOOD2030 and 3) a European research infrastructure for food, nutrition and health (FNH-RI) under the ESFRI roadmap.
- DG ENV and DG CLIMA, because many of our results span into impacts on clean air, soil fertility, biodiversity, land use and carbon emissions.

### Toolbox tour (December 2018 to February 2019)

The SUSFANS Europe Tour aims at bringing together partners and stakeholders Europe-wide and reaching out to specific national audiences who cannot be reached by the project from a central position. This makes the project a European project.

The purpose of the Tour is to validate the use of the SUSFANS Toolbox as the scientific standard for assessing EU sustainable food and nutrition security. These out-reach meetings will be held in the four SUSFANS regions (Czech Republic, Denmark, France and Italy). They will seek to engage decision-makers and stakeholders at the national level in the process of integrating the SUSFANS methodology into their methods of strategies for making evidence-based policy in the domains of agri-food and nutrition-health.

### Business event and Brussels closing event (February/March 2019)

For two specific non-technical user target groups final stakeholder events will be organized to address all sectors in the complete EU food system to maximize the impact on the policy and business community, drawing from outputs of WP6 workshops and WP10. These events will take place in:

- Brussels for a European policy audience related to agriculture, food and nutrition;
- The Netherlands (tentatively) for Industry;

These events will target all relevant food system stakeholders, also beyond the Stakeholder Core Group, and are therefore organized out of WP11 as part of the Europe tour.

## Management

The overall management of the project has been geared towards achieving maximum impact. As described, substantial progress has been achieved towards the aspired scientific and societal impact.

The project coordination has made all possible efforts to implement the recommendations from the First Review. This resulted in a stronger emphasis towards impact pathways (information sharing, dialogue, joint learning) throughout all the project activities.

A point of concern are the delays in the reporting on the results of the tasks: of the 36 deliverables that were scheduled to be submitted for approval in period 2, the consortium has delivered 18 on time, 18 with delay (of which 7 have been postponed to period 3<sup>1</sup>).

The project coordination commands full accountability of the work package and task teams for meeting the agreed project timelines. Information on the progress of work and risks emerging is shared during frequent meetings of the project steering committee (WP & pillar leaders) and intense bilateral communication. Based on this we are able to conclude, that the reported delays have been unavoidable and minimised in duration given the circumstances and complexities of the tasks, as explained in the detailed WP reports. In the case of an unavoidable and minimised delay, the management focus of the coordinator has been to ensure that the overall project impact is not jeopardised.

Outlook: we begin reporting period 3 with a delay of at most 3 months in WP6, WP7, WP9 and WP10 (other WPs are on-time). We are confident that appropriate risk mitigation measures are put in place to manage the risk of underachieving on impact. Two overall measures are in place:

- To anticipate timely on the dependencies between results in the project, and to establish work relations and intermediate milestones for delivering results that other teams depend upon. This is particularly relevant for SUSFANS foresight (WP10) and SUSFANS Toolbox tour (WP11). Already at the second annual consortium meeting the contributions of various teams to these joint project results were identified. Work packages take this up in their work planning.
- To define the options of scientific linkages between project innovations along a gradient from feasible to most ambitious. This is particularly relevant for the integration of the SHARP model into the research toolbox (WP9) and SUSFANS foresight (WP10). A feasible linking has been developed, conceptually, while a more ambitious but higher risk linking remains on the agenda.

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<sup>1</sup> reference is the amended Grant Agreement approved April 2018