



**METRICS, MODELS AND FORESIGHT
FOR EUROPEAN SUSTAINABLE FOOD AND NUTRITION
SECURITY**

*H2020 / SFS-19-2014: Sustainable food and nutrition
security through evidence based EU agro-food policy*

GA no. 633692

**SUSFANS
PROCEEDINGS**

**SUSFANS WP1 “Conceptual
framework and
FNS sustainability metrics”
Second Workshop**

**Ewert House, Ewert Place, Oxford, OX2 7SG, UK
Mar 7&8/2016**

Internal Report

Overall chair: John Ingram (UOXF)

Rapporteur: Monika Zurek (UOXF), John Ingram (UOXF),
Joost Vervoort (UOF)



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The SUSFANS project

The research project SUSFANS addresses 'Metrics, Models and Foresight for European Sustainable Food and Nutrition Security'. Funded by the European Commission's Horizon 2020 programme for four years and on-going since April 2015, SUSFANS involves 16 organisations for delivering and disseminating research. The project wants to make a leading scientific contribution to a balanced and encompassing view on improving food and nutrition security outcomes and making food in the European Union (EU) more sustainable. In short: to achieve sustainable food and nutrition security (FNS) in the EU. The research is led by the notion that improvements in the diets of the European consumer must come from, and be supportive of, food systems that contribute to public health, environmental protection and thriving enterprise in the long term.

SUSFANS will deliver high-quality research on metrics, modelling and foresight to improve the navigation on sustainable food in the public and private arena. The group of 16 organisations in SUSFANS will cross barriers between the social sciences and agricultural and other food-related disciplines, and will engage intensively with stakeholders in the European food system. In doing so, SUSFANS builds bridges between the worlds of agriculture and food on one hand, and public health and nutrition on the other.

The specific objective of SUSFANS is to build a conceptual framework, an evidence base and analytical tools for underpinning EU-wide food policies – with respect to their impact on consumers' diets, on nutrition and public health, on the environment, on the competitiveness of the EU agricultural-food sector, as well as on global food and nutrition security. The 4-year project is organised in three pillars, which jointly comprise 12 Work Packages. With the integration of metrics, models and foresight, SUSFANS aims to set a scientific standard for assessing sustainable food and nutrition security in the EU. The project will inform policy reforms and innovations that contribute to better alignment of healthy consumption and food production in the EU. The exchange with stakeholders is considered essential for the research agenda and its impact towards a European food system.

Proceedings

Day 1 – Mar 7/2016

The first part of the afternoon of Mar 7th was used to update meeting participants on the progress of the project since its beginning. After a welcome by John Ingram and a round of introductions, project coordinator Thom Achterbosch gave a presentation on project activities over the first year of the project and on the schedule of deliverables over the next year. These include two deliverables for WP1, namely a paper on the SUSFANS conceptual framework (D1.1) and on the metrics for assessing sustainable FNS (D1.2 and D1.3). Particularly the work on finalizing the metrics was the focus of this workshop.

Monika Zurek and John Ingram of WP1 then presented the activities of this work package since the Kick-off meeting and set out the objectives for this meeting of WP1 with its contributors. The Oxford

team had developed the conceptual framework (CF) for the project further, based on the framework already set out in the proposal for the project, the first WP1 meeting in July 2015 and comments received from stakeholders in the meeting in Prague in October 2015. The framework aims to

- Provide a 'concise' picture of all food system components and their interactions relevant for analysis,
- Provide a checklist for all the metrics we would ideally like to have to assess the EU food system (and show gaps in data etc.),
- Provide a roadmap for a coherent analysis across all participating disciplines and project partners.

The CF already developed over the first year of the project. The team added a set of indirect and direct drivers of change to the EU food system to the CF from the bid, clarified expected outcomes of the food system activities and the food system as a whole and added a new outcome component on socio cultural wellbeing of the food system.

Furthermore the Oxford team had discussed the hierarchical approach to sustainability metrics chosen by SUSFANS with stakeholders, who confirmed the approach (Figure 1). Further the team had devised a set of preliminary definitions for the terms variables, indicators and metrics (which are revised after the meeting with received comments):

- Individual Variable: a measure that can be counted and/or quantified against a universally agreed upon standard (e.g. 250 hectares, number of farms, mg of salt intake)
- Derived Variable: Combines a number of individual variables to come up with a new measure (e.g. Ratio of energy intake vs expenditure, N input vs output)
- Aggregate Indicator: Combines various variables and assesses outcome against threshold (e.g. N pollution, water scarcity)
- Performance metric: Combines various indicators and helps to assess achievement against EU target (e.g. balanced diet for EU citizens)

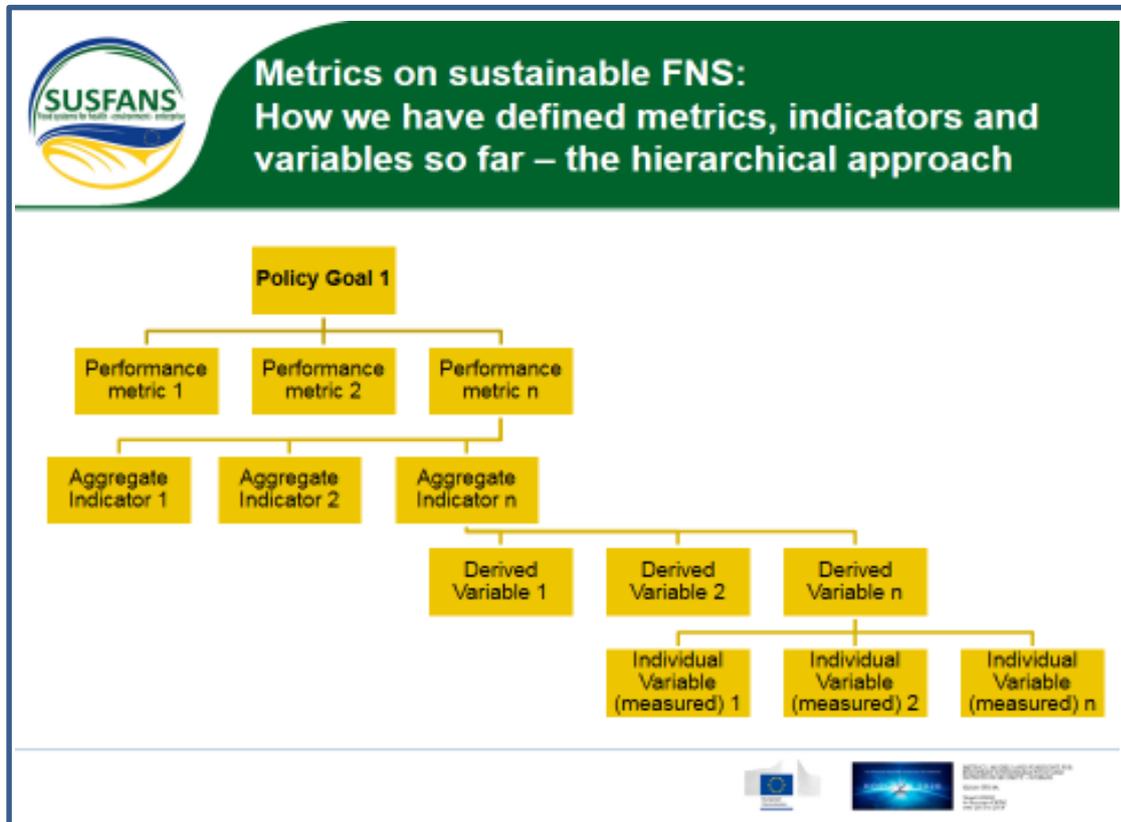
The Oxford team also presented the results of the stakeholder consultations specifically on metrics for the SUSFANS team to consider. These include recommendations of specific indicators for each of the four SUSFANS policy goals and on drivers, on the geographic resolution of the metrics as well as on what 'good' metrics constituted for the various stakeholder groups.

Objectives of the meeting were:

- Agree on justification and criteria for choice of indicators & performance metrics for each EU policy goal;
- Finalize and agree on set of indicators and metrics for each policy goal and the key underlying drivers;
- Discuss the approach for assessing trade-offs across policy goals;
- Agree on plan for quantification of metrics and indicators where possible;
- Develop a plan for dealing with spatial (EU, national, sub-national) and temporal (up to 5 years and decades ahead) scales and how the value chain/case studies interact with these;

- Discuss how the output from various WPs will be integrated in an assessment of EU sustainable FNS.

Figure 1: SUSFANS hierarchical approach to metrics on sustainable food and nutrition security



Expected results of the meeting were described as:

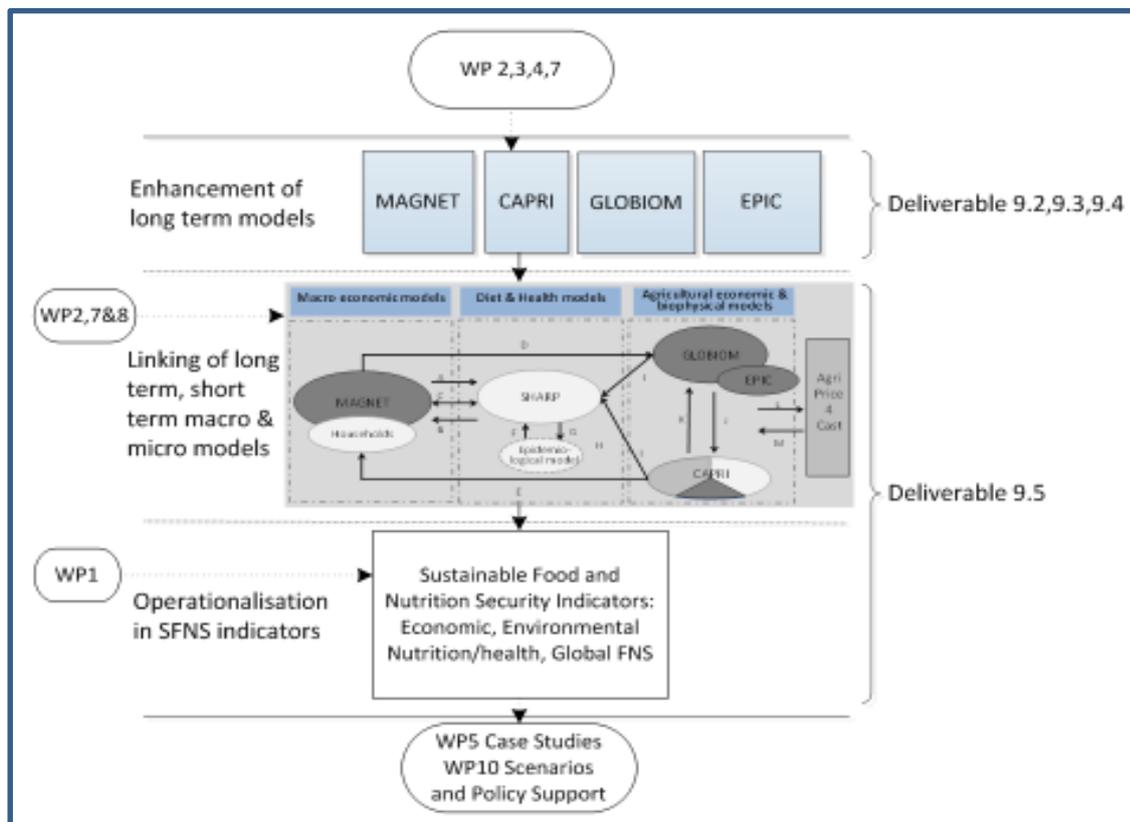
- The structure and logic of the “SUSFANS Conceptual framework” (Deliverable 1.1, due in June) and “Set of metrics/indicators for assessing sustainable FNS” (prelim. version due in September as D1.2, final version in March 2017 as D1.3, and used by WPs 2-3-4-7 etc.);
- A work plan for all WP1 deliverables including a “new” D1.5 : An integrated set of metrics for assessing the overall sustainability of food and nutrition security in the EU, due June 2017;
- Input for the completion of the Operational plan of the SUSFANS toolbox (D9.1, due in March) in terms of metrics and benchmarks;
- Input for the definition of case studies (proposal due at 2nd workshop of the Stakeholder Core Group in October) and “Baseline sustainability assessment of the current state of livestock/fish and fruit/vegetables supply chains” (D5.1, due March 2017).

Martine Rutten, leader of WP9, then presented on the status of the SUSFANS modelling work and toolbox and the different steps envisioned to set up the long-term modelling of sustainable FNS for the project. These involve:

1. Work plan for operationalizing the framework for assessing EU SFNS (WP1, 2 to 4) in a quantitative toolbox: links enhanced European and global economic and biophysical models, including short term models (WP8), and micro models (WP7);
2. To improve food demand modelling at the household level, building on WP2 and WP7;
3. To develop the modelling of food supply, building on WP4;
4. To enhance the modelling of the food chain, building on WP3;
5. To create the SUSFANS toolbox for assessing EU SFNS: enables consistent monitoring of EU SFNS in the short, medium and long term (up to 50 years) for use by case studies (WP5), foresight and policy support (WP10).

The current linkages between the different models used in SUSFANS that will constitute the SUSFANS toolbox and their links to the WPs are shown in Figure 2. A final version of the work plan to build the toolbox is delivered by end of March 2016 (as D9.1)¹. For that the modelling team is working on various model improvements such as better modelling of the demand and (e.g. developing household decomposition options and better modelling household behaviour) the primary production side (e.g. production functions, crop model simulations, how to represent fisheries and aquaculture) as well as on the food chain modelling (e.g. incorporation of food losses and waste, modelling imperfect competition and price transmission) and then linking across the various models.

Figure 2: Set up of the SUSFANS tool box and linkages to the different WPs



¹ The public version of the plan is available at <http://www.susfans.eu/portfolio/modelling-sustainability-and-nutrition-long-run-analyses-eu-agri-food-system-work-plan>.

Imke de Boer and Inge Tetens, leading WP5, reported on their work to pull the two SUSFANS case studies (on fruit and vegetable chains and on livestock and fish chains) together. Here they want to validate the CF and the sustainability metrics in a number of concrete settings while also explore innovation pathways with the potential to contribute to achieving sustainable FNS. Ideas for innovations to be explored will be developed over the summer in detail so that they can be discussed with stakeholder for their input at the 2nd stakeholder meeting in Oct 2016. These include various innovations to improve the health outcomes, such as reducing the intake of animal based protein, total number of calories eaten and the proportion of processed foods, as well as the environmental impacts of the food system (e.g. by reducing the feed-food competition or the consumption of locally produced plant proteins).

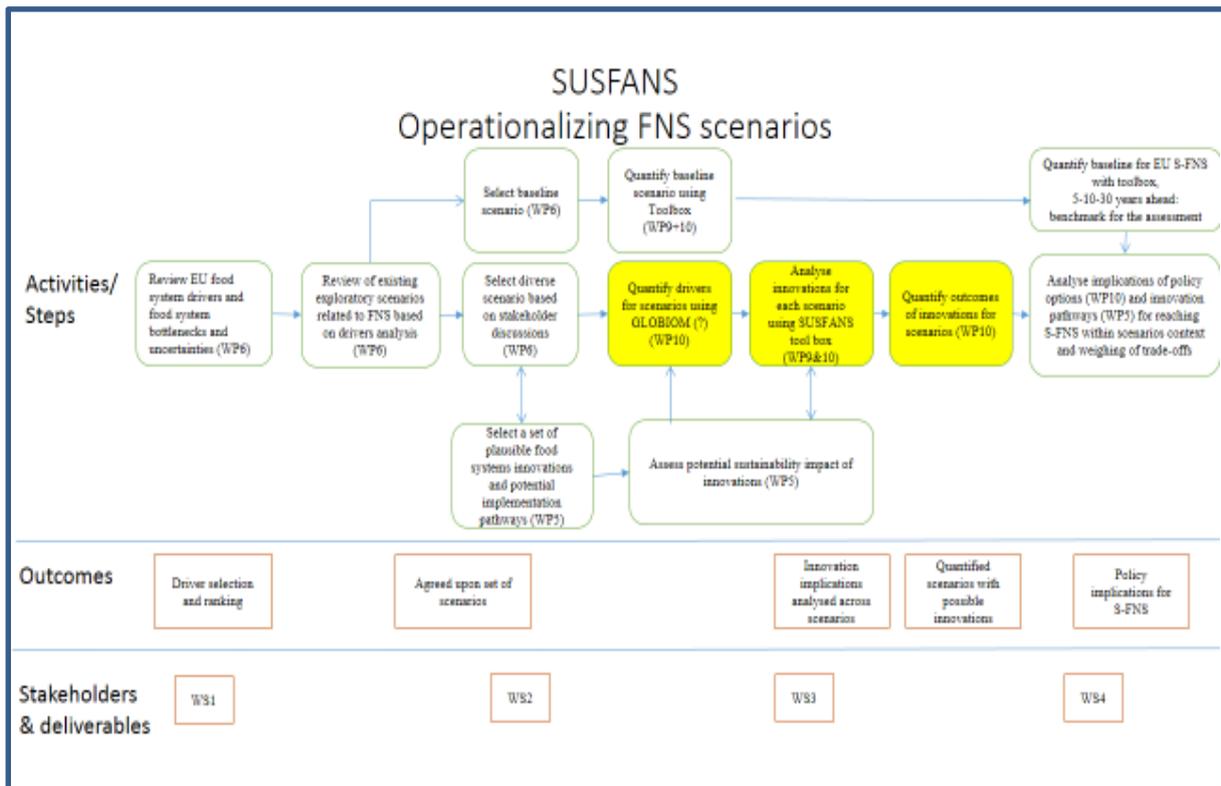
Petr Havlik, responsible for WP10, then gave a presentation on a first review of scenarios relevant for the SUSFANS forward looking work. Petr reported on the work currently going on in the IPCC on scenarios (SSPs and RCPs) and two EU funded projects, FOODSECURE and TRANSMANGO, which both have a scenarios component SUSFANS can build on and for which quantification work is going on. In addition, the project might draw on the recent OECD report on Alternative Futures for Global Food and Agriculture, the OECD-FAO agricultural outlook 2015-2024, the EU agricultural outlook to 2025, FAOs revision of the World Agriculture towards 2030/2050, and some regional scenarios work such as the CCAFS scenarios and more sector specific outlooks on energy (GECO 2015, European Commission energy trends to 2050).

In the team there had been some earlier discussions on how the scenarios work in WP6 would flow into the foresight modelling work of WP10, which Petr also reported on. The current status of discussion is shown in Figure 3. As SUSFANS proposed to build on existing/developing EU food system scenarios that are currently developed in other EU funded projects a diverse set of scenarios will be together with stakeholders and in accordance with the work on innovation pathways in WP5. These can then be quantified by using the GLOBIOM model and the new developed SUSFANS toolbox. The analysis of the scenarios will help to then craft policy options, weigh their potential trade-offs for different food system actors and refine innovation pathways for achieving sustainable FNS across various possible futures.

A plenary discussion on a number of cross-cutting topics related to the sustainability metrics concluded the first day of the meeting. The discussions, which continued the next day, included

- An agreement that the hierarchical approach employed by the project makes sense and will be continued;
- A review of definitions used for the terms 'performance metrics', 'aggregate indicator', 'derived variable' and 'individual variable',
- An agreement to add a section on direct and indirect drivers of the EU food system to the metrics table in order to capture all elements of the CF;
- Considerations on how to do benchmarking for the various performance metrics (for some metrics EU or country guidelines might be available (e.g. dietary guidelines) while a number of other metrics capture more relative or dynamic concepts for which benchmarks might be difficult to find) and the need for making an inventory of relevant guidelines and targets set either at EU or national levels;

Figure 3: Draft flow diagram depicting how SUSFANS is planning to operationalize the scenarios work



- Considerations on the need for normalisation of indicators as the metrics and indicators are very diverse and need to be made comparable; and
- Considerations of how to aggregate variables and indicators into metrics and what this might mean also for how to give weightings to different indicators, which is also important for the question of how to assess synergies and trade-offs across policy goals in policy formulation.

Day 2 – Mar 8/2016

The second day of the meeting was spent in various discussion groups as well in plenary to discuss the details of the metrics and indicators for each policy goal proposed up to date, the questions on benchmarking, aggregation and normalization of variables and the deliverables for WP1 and some of the other WPs that depend on the sustainability metrics (e.g. case studies).

Participants discussed and revised in breakout groups the previously developed metrics table for the four policy goals. The raw table coming out of the meeting can be found in Annex 3 (additional revisions have been undertaken since the meeting). In addition a new section on drivers will be added that SUSFANS members can contribute to in order to flesh these out in more detail. The aggregation steps from variables to indicators to metrics will be done as much as possible by the modelling teams in WP9 and WP10.

In the discussion on the geographical level at which the sustainability metrics need to work it was decided that where possible data on the EU level will be presented and analysed. In addition, country data will be collected as available in the four SUSFANS countries to populate the selected metrics for the national level.

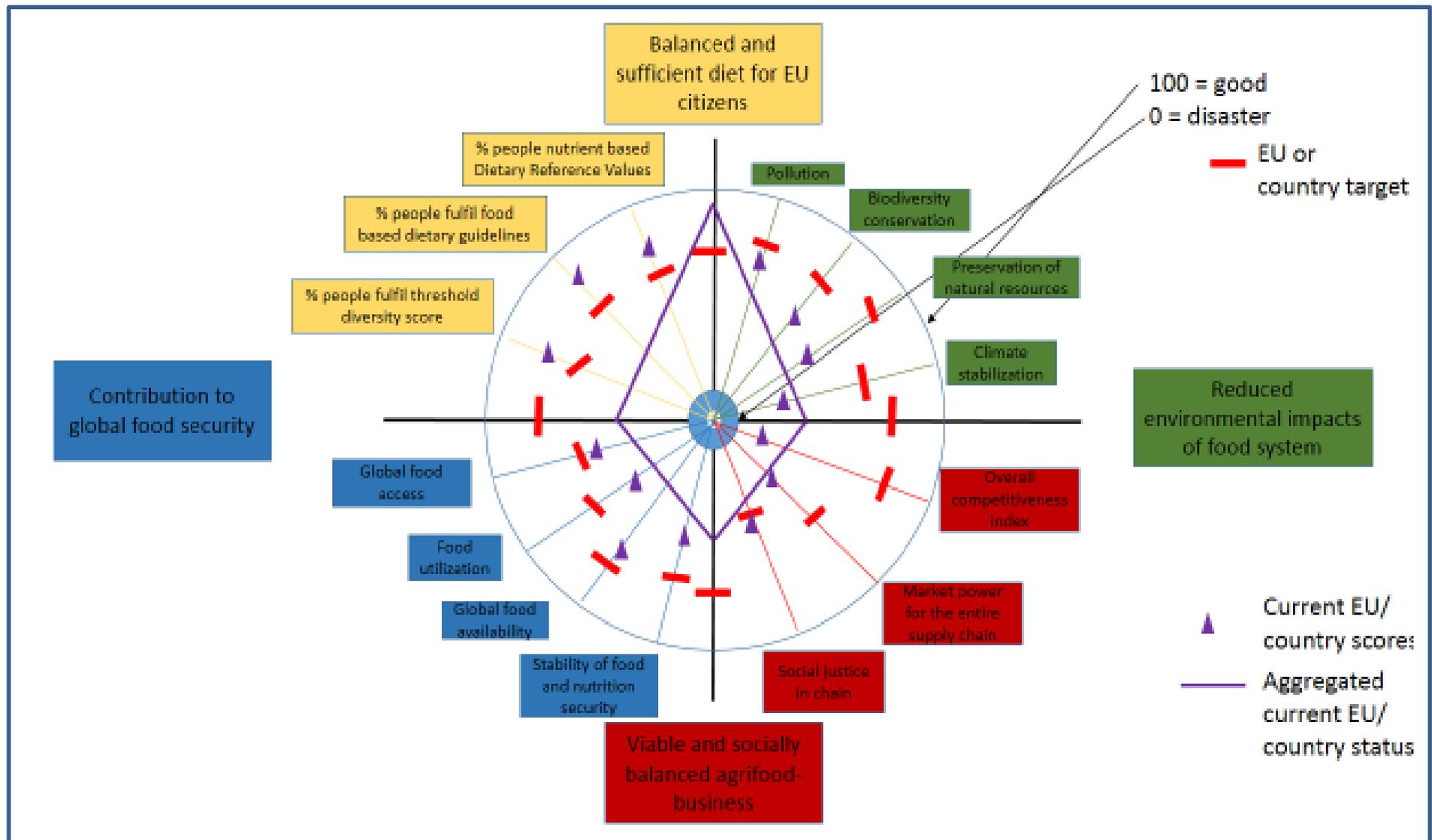
The discussion on how the different deliverables of WP1 relate to each other, and where the delineations and cross-overs to the work of the other WPs are, resulted in a decision that the sustainability metrics paper (D1.2 and D1.3) would cover the full set of metrics presented in the metrics table covering the whole food system. In the paper for D1.5, which asks for an integrated set of metrics to assess the overall sustainability of the EU food system, the performance metrics would be presented in form of a spider diagram showing where the EU currently stands on the selected metrics for all four policy goals. The spider diagram would show the actual performance of a specific metric against any available EU targets and against thresholds that should not be crossed to avoid food systems collapse (see a possible example in Figure 4). The spider diagram was imagined to allow for a visualisation of trade-offs through nested levels of detail in an easily accessible on-line format. Each level of detail represents a level in the hierarchy of metrics, indicators and variables; users can access specific subjects in greater detail if they have specific interests, or even choose to examine an entire next level of detail across the spider diagram. Going down hierarchical levels would ultimately lead to a level of variables and links to research sources, papers, databases et cetera. Underlying the nested spider diagram would be lookup tables that allow the users to mix and match scenarios without a need to run the model toolbox live (which would be too time-consuming and too unpredictable). While different in representation (because of the proposed use of the nested spider diagram), this tool was intended to have some similarities in interactivity to the Consensus tool presented by Petr Havlik.²

A timeline for D1.1 and D1.2 was also agreed:

- D1.1 CF Paper
 - MZ to identify people from whom to seek help on draft paper [mid-March]
 - Contributors to “sign-up” to helping with paper [April]
 - Contributors to send text to MZ [end-May]
 - Polish paper and send to all [mid-June]
- Finalise D1.1 [end-June]
- D1.2 Metrics Report/Table
 - All to refresh columns [end WS/mid-March]
 - MZ to check revised columns with contributors [May]
 - Contributors to send revised columns to MZ [early-July]
 - MZ finalises full table [end-July]
- D1.3 Sustainability quantification methods paper
- Wait until D1.2 is finalised

² See <http://platform.consensus-project.eu/consensus/>

Figure 4: Example of spider diagram showing the status of sustainable food and nutrition security across the four SUSFANS policy goals.



Various action points resulting from the meeting were summarized by the Thom Achterbosch, the SUSFANS project coordinator. These points will be worked on by various WPs.

1. Get clearer view on the questions we aim to answer with the SUSFANS methods and tools.
2. Show scientific committee and reviewers the amendments to the conceptual framework and metrics made based on their input.
3. Describe the rationale for the hierarchical approach.
4. Construct a similar hierarchical approach to the drivers of FNS.
5. Normalization procedure for going right-to-left through metrics table, going from aggregate indicator to performance metric.
6. Policy goals: make inventory on policy targets that connect to the societal goals.
7. Design criteria for the choice of case studies.
8. Chose or create a baseline scenario for long term projections.
9. Imperfect competition: explore cooperation between WP3-WP9 on a research agenda in relation to political economy elements in one or more case study themes.
10. Lay down responsibilities for automatically converting indicators (modelling output and data) into aggregate indicators and performance metrics. In part this is major modelling exercise (e.g. climate stabilization), other part is computation.
11. Adjust the metrics table with revisions March 8.
12. Assess how evaluation of sustainability-health-affordability of diets relates to (or can be juxtaposed to) evaluation on system performance. For example: import data from the metrics into the SHARP or DIET model, but note that this requires disentangling diets from other drivers.
13. Redefine the policy goal on 'vibrant agri-food business sector' to include social justice component.
14. Install ad hoc groups for each policy goal.

Annex 1: Summary of agenda

SUSFANS WP1 “Conceptual framework and FNS sustainability metrics”

Objectives of the meeting:

- Agree on justification and criteria for choice of indicators & performance metrics for each EU policy goal
- Finalize and agree on set of indicators and metrics for each policy goal and the key underlying drivers
- Discuss the approach for assessing trade-offs across policy goals
- Agree on plan for quantification of metrics and indicators where possible
- Develop a plan for dealing with spatial (EU, national, sub-national) and temporal (up to 5 years and decades ahead) scales and how the value chain/case studies interact with these
- Discuss how the output from various WPs will be integrated in an assessment of EU sustainable FNS

Expected results:

- The structure and logic of the “SUSFANS Conceptual framework” (Deliverable 1.1, due in June) and “Set of metrics/indicators for assessing sustainable FNS” (prelim. version due in September as D1.2, final version in March 2017 as D1.3, and used by WPs 2-3-4-7 etc.)
- A work plan for all WP1 deliverables including D1.5 : An integrated set of metrics for assessing the overall sustainability of food and nutrition security in the EU, due June 2017
- Input for the completion of the Operational plan of the SUSFANS toolbox (D9.1, due in March) in terms of metrics and benchmarks
- Input for the definition of case studies (proposal due at 2nd workshop of the Stakeholder Core Group in October) and “Baseline sustainability assessment of the current state of livestock/fish and fruit/vegetables supply chains” (D5.1, due March 2017)

March 7/2016

- 14.00 Welcome and introductions (*John Ingram*)
- 14.15 Update on the work of SUSFANS up to now and main challenges for 2016 (*Thom Achterbosch*)
- 14.30 Status of the work on the SUSFANS conceptual framework and sustainability metrics up to now (WP1) including the stakeholder consultations (WP6) (*Monika Zurek & John Ingram*)
- 14.50 Status of the SUSFANS modelling work and tool box (WP9) (*Martine Rutten*)
- 15.05 Status of the case studies (WP5) & Scenario review (WPs6/10) (*Imke de Boer & Petr Havlík/Monika Zurek*)
- 15.20 *Coffee/tea*
- 15.45 Plenary discussion on (*chair: John Ingram; suggested discussion leads in []*)
 - o Current hierarchical approach to selecting metrics and indicators to assess EU policy goals and use of terminology characteristics and justification for

the metrics including stakeholder feedback (i.e. as distinct to the scientific underpinning which is addressed in thematic groups in day 2) [Monika]

- How to relate the metrics of sustainable FNS to direct and indirect drivers in the SUSFANS conceptual framework [Martine/Monika]
- What is the benchmark(s) for assessing FNS? [Martine]
 - geographical benchmark, comparing to EU average or beyond EU
 - progress over time, looking backward and/or forward
 - policy targets or guidelines
- How to assess trade-offs across policy goals? [Thom]

17.30 Adjourn

(19.45 Group dinner at the Cherwell Boat House, Bardwell Rd, Oxford, OX2 6ST)

March 8/2016

9.00 Recap of Day 1 (John Ingram)

9.10 Plenary discussion on (chair: John Ingram)

- For which levels of analysis should we develop the metrics and who for?
 - Spatial levels (EU, national, sub-national) and temporal levels (up to 5 years and decades ahead)
 - Using SUSFANS metrics for the case studies at a range of spatial and temporal levels

10.00 Break out groups to agree on EU goal specific metrics and indicators based on Day 1 discussion of characteristics for 'good' indicators. These groups commence with a brief overview of the policy goals in the EU and will address social justice as a cross-cutting concern.

- Balanced diet
- Environmental impacts
- Competitive agri-food sector
- Global food security

11.00 Coffee/tea

11:20 Report back from break out groups and discussion

12.30 Lunch

13.30 Plenary discussion on (chair: Monika Zurek)

- Metrics and scales: what data and what modelling strategy do we need for assessing the agreed spatial and temporal levels?
- How do we do the benchmarking?

14.30 Coffee/tea

14.45 Work plan and next steps for deliverables D1.1 to D1.5, and the SUSFANS operational plan

- Input from the WPs
- Deadlines

16.30 Adjourn

Annex 2: Participant list

Attendees		
1	Thom Achterbosch	LEI - Wageningen University
2	Karin Zimmermann	LEI - Wageningen University
3	Denise Helmes	LEI - Wageningen University
4	Martine Rutten	LEI - Wageningen University
5	Anneleen Kuijsten	Wageningen University
6	Lindsay Shutes (Tuesday; Monday by Skype)	LEI - Wageningen University
7	Andrea Zimmerman	University of Bonn
8	Maria Garrone	CEPS
9	Louis George Soler	INRA
10	Petr Havlik	IIASA
11	Inge Tetens	Technical University of Denmark
12	Adrian Leip	JRC, European Commission
13	Sara Hornborg	SP Technical Research Institute of Sweden
14	John Ingram	University of Oxford
15	Monika Zurek	University of Oxford
16	Joost Vervoort	University of Oxford
17	Roger Sykes	University of Oxford
Participating via Skype		
1	Imke de Boer	Wageningen University
2	Thomas Heckelei	University of Bonn

Annex 3: Raw revised list of sustainability metrics for SUSFANS (additional changes implemented after the meeting)

Policy goals	Performance metrics (assessable against targets; B derived from C) shown in spider diagram on a scale from 0-100 where 100 is better (not necessarily more)	Aggregate indicators (C, derived from D)	Derived variable (D, derived from E)	Individual variable (E)	Other indicators/variables of interest
Balanced and sufficient diet for EU citizens	% people that fulfil threshold diversity score		Diversity score (EU specific, find out what is existing)		
	% of people fulfill (partly) food-based dietary guidelines	Compliance with dietary guidelines - use a summary score (list of 5-6 key foods to focus at)	Compliance with individual food based dietary guidelines	Dietary intake of food group level based on common set of food based dietary guidelines (20-30 food groups, TBD) linked to FoodEx2; 4 countries	
		TBD: what relevant summary scores are available? General on diets, specifics items)		<i>Example: Fruits, vegetables, meat (red, white meat),</i>	

				<i>fish, legumes, etc..grains.</i>	
		<i>Example: Healthy eating index, DASH, Mediterranean score/ etc.</i>			
			unprocessed vs processed food *scenario	F&V - maybe divided into European products and imported	
% of people fulfill nutrient-based Dietary Reference Values (DRVs)	Energy balance (%normal weight, %overweight, %obese)			BMI (body mass index of EU population)	
	Compliance with DRVs - use a summary score <i>Example, NRF9.3</i>	Compliance with DRVs		Protein, fat, carbohydrates, alcohol	
		Compliance with DRVs (reduction)		Intake of added sugar	
		Compliance with DRVs (reduction)		Intake of SFA (saturated fatty acids)	
		Compliance with DRVs (reduction)		Intake of sodium	
		Compliance with DRVs		Intake of dietary fibre	
	Nutrient density score (TBD)	Compliance with DRVs		Intake of folate/ folic acid	
		Compliance with DRVs		Vitamin D	
		Compliance with DRVs		Iron	
		Compliance with DRVs		Calcium	

			Compliance with DRVs	Iodine				
	<i>Acceptance of a sustainable diet</i>	<i>Affordability of a sustainable diet</i>	<i>TBD</i>					
	<i>Minimum cost of a healthy diet</i>			food prices related to end products				
Reduction of environmental impacts	Climate stabilization	GHG emissions reductions	CO2 eq	CO2				
				CH4				
				N2O				
	Pollution	Nitrogen surplus	N input and N output (maybe split of N surplus into emissions to the atmosphere: air pollution and emissions to the hydrosphere: water pollution)	Nitrogen input (fertiliser, manure, atmospheric deposition, biological fixation, feed) ;Nitrogen outputs (yield), change of soil stocks				
					Phosphorus surplus	P input and output		
					Toxic substances			
					Air pollution	Air quality		
	Biodiversity conservation	Emissions & Landuse combined -> share of Ag in change of biodiv						
		Protected areas (GLOBIOM)						
		Species rich hotspots (GLOBIOM)						
Fish								

	Preservation of Natural Resources	Water scarcity	Irrigation		
			fish		
			water supply		
		Soil degradation	Erosion		
			Soil carbon contents		
Competitive EU agri-food business	Overall competitiveness index Benchmark: world average of a variable over time (MAGNET) Normalisation to a scale of 0-100, method tbd	Competitiveness in trade (outward oriented)	(Growth in) world market shares (exports): reflects the outcome of competition on a global scale	Export value (by sector, agri-food sector; country, EU total, world total; 5 year time intervals)	Number of farms/firms; Employment; Average farm/firm income; Turn-over; Price/Mark-up (all by sector, agri-food sector; country, EU total)
			Relative Trade Advantage index = Balassa index for exports - Balassa index for imports. Balassa index = export (import) share by sector and country in country's total / export (import) share by sector for the world in the world's total. Value > 1 reflects comparative advantage as a country is more specialised in exports than in imports	Export and import values (by sector, agri-food sector, in total; country, EU total, world total; 5 year time intervals)	

		Competitiveness in economic performance (inward oriented)	Growth rate in labour productivity: reflects competitiveness in labour costs	Labour productivity (by sector, agri-food sector; country, EU total, world total; 5 year time intervals) calculated as value added divided by number of employees	
			Growth in the share of value added of a sector in agri-food or in total: reflects competitiveness for production factors between sectors within a country	Value added (by sector, agri-food sector, in total; country, EU total, world total; 5 year time intervals)	
	Market power for the entire supply chain (0-1)	Sub-sector market power: Agricultural sector Processing sector Retailers sector	Sales- or turnover-growth, and growth in inputs cost, i.e labour, material costs, capital value; input share in output, output elasticity etc. (the choice of the aggregate variable will depend on the final methodology used in T3.4)	Sales (turnover), cost of employment, cost of capital, cost of material (by sector, total supply chain, country (some), EU average based on the countries; 10 years' time	

Food and nutrition security	Global food availability	Food availability (EU, other developed countries, developing countries)	Total agri-food production (value in constant prices)	Production of commodities (value, quantity)	Domestic food production, food imports and exports, average dietary energy supply adequacy, average value of food production, share of dietary energy supply derived from cereals, roots and tubers, Food balance sheet at national level, demographic composition, and per capita energy needs average protein supply of animal origin
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	Global food access (either use range from scenarios or distance from reference cal/capita/day - both under and over consumption)	Food access (EU, other developed countries, developing countries)	Consumption (calories per capita per day)	Consumer prices, producer prices (as proxy for income), household income (general vs. specific contexts e.g. coffee farmers in West Africa)	Ratio of rural wage to cereal price (food access measure), domestic food price index, prevalence of undernourishment, share of food expenditure of the poor, depth of food deficit, prevalence of food inadequacy. Household income relative to consumption price of food; Share of household budget spent on food.
	Stability of FNS (to be discussed further)	World prices	Stochastic work from GLOBIOM and SHARP		Household savings, dependency on remittances and international aid. Cereal import dependency ratio, value of food imports over total merchandise exports.
	Utilisation not covered by the models but rather by first dimension on Balanced and Sufficient Diets in the EU			Balanced and sufficient intake of key macro and micro nutrients	Household food basket by food type and source. Household nutrient intake per capita relative to healthy diet guidelines so as to calculate FGT type nutrition/undernourishment indicators; Diet diversity score from food items available in the models