Strengthening European Food Chain Sustainability by Quality and Procurement Policy

Deliverable 3.2:

REPORT DETAILING THE METHODS AND INDICATORS FOR MEASURING THE SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPACTS OF FQS, SFSC AND VARYING PSFP POLICIES ON AGRI-FOOD CHAIN PARTICIPANTS AND RURAL TERRITORIES

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EXECUTIVE SUMMARY

The present methodological handbook provides the methodologies which will be applied in each work package of the Strength2Food project. In particular, it contains a list of indicators on how to assess the sustainability in food and agro-food supply chains. This methodological handbook aims at facilitating the task for field studies, both proposing several prioritizations (indicator, variable, value chain level), detailing how we will combine relatively common variables (e.g., number of animals per hectare, …) into indicators (e.g., carbon footprint) and indicating how we will obtain default values for the majority of the requested variables from european or international databases. Indeed, for one indicator, providing only 2-3 case-specific values and relying on default values for the other variables is enough to obtain a case-specific indicator. Methods and issues specific to each workpackage are also discussed in dedicated sections and the description of each indicator include a description of whether and how the indicator will be applied to Food Quality Schemes (WP5), Public Sector Food Procurement (WP6) and Short Food Supply Chains (WP7).

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LIST OF ABBREVIATIONS AND ACRONYMS

FQS: Food Quality Scheme

LAFS: Local Agri-Food System

LCA: Life Cycle Assessment

PSFP: Public Sector Food Procurement

SC: Supply Chain

SFSC: Short Food Supply Chain

Sustainability indicators for food quality schemes – a methodological handbook

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1. INTRODUCTION: CONTENTS OF THE METHODOLOGICAL HANDBOOK

The present methodological handbook provides the methodologies which will be applied in each work package of the Strength2Food (S2F) project. In particular, it contains a list of indicators on how to assess sustainability in food and agro-food supply chains. This list was obtained on the basis of literature review and the FAO's Sustainability Assessment of Food and Agriculture systems (SAFA) indicators (FAO, 2013). This list may seem impressive and a little bit discouraging for case study coordinators. However, this methodological handbook aims at facilitating the task for field studies, both proposing several prioritizations (indicator, variable, value chain level), detailing how we will combine relatively common variables (e.g., number of animals per hectare, …) into indicators (e.g., carbon footprint) and explaining how we will provide default values for the majority of the requested variables (for one indicator, providing only 2-3 case-specific values and relying on default values for the other variables is enough to obtain a case-specific indicator).

The work of WP3 and WPs 5-7 thus follows three stages:

i) Setting up of a list of indicators and related variables required by the literature review in order to scientifically assess sustainability of food and agro-food supply chains (WP3);

ii) Testing availability and reliability of data requested in stage i) through six pilot cases, and refining the short list of indicators (and therefore variables/data) to focus on;

iii) Carrying out the collection of – mainly secondary – data for the 30 planned case studies.

More specifically, this handbook is organized as follows:

- ✓ Section 1: contents, including WP-specific sub-sections (see below);
- ✓ Section 2: general points applying to all indicators and their analysis;
- ✓ Sections 3-7: specic methodological points for each WP (one section per WP);
- ✓ Section 8-17: a series of indicator index cards which explains which questions the indicators will help to answer, how the indicators will be computed, and which variables should be collected. Note that not all indicators will be applied to all work packages;
- ✓ Sections 18-19: some additional materials specific to WP5.

Disclaimer 1: while working on this handbook, we have kept in mind the resource constraints (time and budget) of the project for each case study and have tried to come up with the best compromise between academic quality and feasibility within the project constraints. More specifically, the following steps have been carried out:

- ✓ the fact that we are working on providing default values for many variables, e.g. for mostof the WP5 case studies, so that when a variable is not readily available and there is not good reason to expect a large difference with the default value, this default value can be used. **Only a few case-specific variables values will likely be enough to obtain a case-specific indicator**;
- ✓ the fact that some variables are "recycled" in several indicators (see supplementary material 1 – excel file – to visualize this);

- ✓ the effort to tell apart **key and secondary variables**, in order to convey a sense of priority;
- ✓ the effort to tell apart **key and secondary levels in the supply chain** for each indicator: a level is "key" if it is both important and if it is likely that the associated data can be obtained from existing reports/databases. As a result, o**ften a single supply chain level is prioritized for each indicator**;
- ✓ the effort to mostly rely on variables that likely do not require a specific survey (i.e. they are common enough to have been published elsewhere);
- ✓ the difficulty in gathering data is not solely assessed by the number of variables (e.g. the number of animals per hectare or cow productivity is something one would expect to find in most reports on a dairy product, while educational attainment of workers in a specific supply chain may not have been studied before).

Disclaimer 2: full clarity is difficult to achieve by written means only. Do not hesitate to plan for calls and/or to write to us repeatedly as the pilot cases and cases studies are being undertaken in order to clarify things, test the rationale for some of the choices we made and, if necessary, revise some of these choices.

Disclaimer 3: many adjustments to the handbook will likely be made after being tested on the pilot cases, that is in early 2017. Most importantly, pilot cases will allow to test whether the requested variables can be obtained and how much time is required to obtain them. Based on these reality checks, further prioritization of indicators may be established.

2. GENERAL POINTS ON INDICATORS AND THEIR ANALYSIS

2.1. Overview of indicators and minimal systematic comparison

Table 1 provides the list of indicators, together with a preliminary distinction between "systematic indicators" which should be computed on all case studies, after being tested in the pilot cases, and "complementary" indicators which would concern only a subset of case studies, often based on data availability.

The systematic indicators were chosen to restrict the number of indicators to 12 in total (4 indicators per each sustainability pillar, i.e. economic, social and environmental) while ensuring that the commitments outlined in the S2F Grant Agreement are fulfilled. Other criteria included the minimization of data collecting effort. This list, as many other elements in this methodological handbook, will be adapted based on the experience gained during the pilot case studies.

A coarse assessment of the associated data collecting effort has been conducted by counting the number of variables requested for systematic and complementary indicators. For a coarse assessment of the 12 systematic indicators, 63 variables are necessary (Table 2). Given that default values can be used for some of these variables, the actual number of variables will likely reduce to less than 40. As previously mentioned, most of these variables can most likely be obtained from existing reports and databases, thus without undertaking new field surveys.

Note however that the number of variables does not fully reflect the data collection effort for the following reasons:

- ✓ We are working on providing default values for many variables so that when a variable is not readily available and there is not good reason to expect a large difference with the default, the default value can be used. Only a few case-specific variables values will likely be enough to obtain a case-specific indicator;
- ✓ The difficulty in gathering data is not solely assessed by the number of variables (e.g. number of animals per hectare or cow productivity is something one would expect to find in most reports on a dairy product while educational attainment of workers in a specific supply chain may not have been studied before in many cases).

Indicator index cards are provided in sections 8-17. They provided the rationale for each indicator, the questions it will allow to answer, how the indicator will be computed and the list of variables necessary for its computation. For the sake of clarity, the cards are presented as applied to FQS (WP5) and a specific sub-section in each of them explains whether and how the indicator will be applied to PSFP (WP6) and SFSC (WP7).

Sustainability pillar	Type	Sub-type	Systematic / Complementary	Index card
Economic	Price premium	Price premium	Systematic	Ec1
Economic	Profitability and value added distribution	Gross Value-added	Systematic	Ec1
Economic	Trade	Share of value exported within Europe	Systematic	Ec1
Economic	Local multiplier effect (LM3)	Local multiplier effect (LM3)	Systematic	Ec2
Environmental	Carbon footprint	Carbon footprint per unit of product	Systematic	En1
Environmental	Foodmiles	Distance travelled per unit of product	Systematic	En2
Environmental	Water footprint	Green water footprint (net consumption of water)	Systematic	En3
Environmental	Water footprint	Grey water footprint (water pollution)	Systematic	En3
Social	Employment	Labour to production ratio	Systematic	So1
Social	Governance	Bargaining power distribution	Systematic	So2
Social	Social capital	Generational change	Systematic	So5
Social	Social capital	Gender equality	Systematic	So5
Economic	Profitability and value added distribution	Gross Operating Margin	Complementary	Ec1
Economic	Profitability and value added distribution	Net result	Complementary	Ec1
Economic	Trade	Share of value exported outside Europe	Complementary	Ec1
Economic	Trade	Share of volume exported within Europe	Complementary	Ec1
Economic	Trade	Share of volume exported outside Europe	Complementary	Ec1
Environmental	Carbon footprint	Carbon footprint per hectare	Complementary	En1
Environmental	Foodmiles	Emissions from transportation per unit of product	Complementary	En2
Environmental	Water footprint	Blue water footprint (gross consumption of water)	Complementary	En3
Social	Employment	Income to labour ratio	Complementary	So1
Social	Employment	Undesirable employee turnover rate	Complementary	So1
Social	Governance	Coopetition index	Complementary	So2
Social	Social capital	Educational attainment	Complementary	So3
Social	Transmissibility of knowledge and know-how	Transmissibility of knowledge and know-how	Complementary	So4

Table 1. List of sustainability indicators

	Key	Secondary
Systematic	63	68
Complementary	32	75

Table 2. Number of variables to be collected

This table sums up the number of variables to be collected depending on how much in-depth the case study conductor want to go with sustainability indicators. Minimally, the coarse computation of the 12 systematic indicator at key value chain levels requires the collection of 63 variables, some of which possibly being default values provided by INRA-D (e.g. national or regional averages, pedo-climatic data, …). A finer computation of the same indicators, mobilizing secondary variables, would require 68 more variables. The coarse computation of the 13 complementary indicators would require 32 more variables and their fine computation yet 75 more.

2.2. Counterfactual, data collection and metadata documentation

2.2.1. Selection of a counterfactual product/case: elements of guidance

In order to define the counterpart, we propose the following guidance composed of two objectives and three constraints. The two objectives are:

- ✓ Comparability of contexts: the two cases (FQS/SFSC/PSFP and its standard counterpart) should be produced in territorial contexts (in terms of location) as similar as possible;
- ✓ Comparability of the products: the two products/basket of products (FQS/SFSC/PSFP and their standard counterpart) should be as comparable as possible.

These objectives should be sought until one of the three following constraints are met:

- ✓ Data resolution limit: data for counterpart are only available at a larger scale than for the case studied.
- ✓ Confusion of the case and its counterpart: for example, for an apple under geographical indication (GI), the counterpart would ideally be the production of 'standard' apples in the same area. Nevertheless, if almost all the apple production of that area is under GI, a counterpart should be chosen at a larger scale (regional or even national scale).
- ✓ The case studied is the only one of its type: with the example of an apple under GI, the ideal counterpart would be a standard apple of the same variety. Nevertheless, as mentioned for geographic scale, data may be scarce at this detailed level (variety), or even all the apples of this variety may be sold under GI. In this case a suitable counterpart would be one, or a mix of, the main varieties.

In practice, the choice of a relevant counterpart by case study conductors will strongly depend on data availability, so that a national average can be used if a more suited counterpart cannot be documented. In the case of FQS (WP5), we hope to be able to provide values for at least a national counterpart for a large fraction indicators and cases. Moreover, a mix of specific counterparts and national averages can be used. For example, looking at the Comté cheese, some variables (e.g. price of milk, price of cheese, …) may be specific to Emmental, a non-FQS ripened, hard, cow-milk based cheese, while national averages are used for other variables (e.g. quantity of mineral fertilizer per hectare, share of exports over total production, …) for which Emmental-specific data are not readily available.

2.2.2. Data collection

1. Three angles of prioritization

The variables that case study conductors will have to collect and send to their WP leader/co-leader are listed in a dedicated sub-section of each index card (for WP5, the full list without duplicates for variables used in several indicators is in the see supplementary material 1 – excel

file). Overall, the more specific the variables are to the case study, the better. **Three distinctions were made to convey a sense of priority** (see Table 2**):**

- ✓ **Systematic vs complementary indicators**: we expect systematic indicators to be computed for all case studies while complementary ones could be restricted to a subset of cases which are particularly interesting;
- ✓ **Key vs secondary supply chain levels**[1]: we expect "systematic indicators" to be computed only at "key" levels of the supply chain while secondary levels could be obtained only in a subset of cases which are particularly interesting;
- ✓ **Key vs secondary variables**: we expect that a reasonable approximation of the indicator can be obtained from key variables data, while obtaining values for secondary variables would create even more precise estimates.

In other words, most of the data collection/gathering effort should be spent by the case study conductors on *key variables which contribute to systematic indicators at key levels of the supply chain*, while the rest should only be provided if data is readily available, and should not be the object of a dedicated data collection effort, unless the case study conductor is specifically interested in the associated indicator.

2. Relying on existing sources of information

In general, given the resource and time constraints of the S2F project, most variables should be obtained from existing studies, reports and databases. A good strategy for a comprehensive overview of existing sources, may be to conduct a few (3-5) interviews with key stakeholders in the chosen case study's value chain. The relevant WP leaders and co-leaders and the indicators' coordinators will be available throughout the project to find solutions or suggest sources of information in case study conductors struggle to collect data.

3. Default values

Whilst case study conductors will endeavour to obtain variables for their case studies and the appropriate counterparts as precisely as possible, INRA is conducting in parallel an effort of data collection to provide national and regional average values for as many variables as possible, and cover all the sectors studied in S2F (dairy, meat products, seafood/fish, cereals, fruits & vegetables). These values will not refer to specific products but to larger product categories which can be identified in systematic surveys. For this purpose, databases with pan-European coverage, such as the Farm Accountancy Data Network (FADN) and different surveys and datasets available via Eurostat database (i.e. Farm Structure Survey, Structural Business Statistics, Labour Force Survey, etc.) will be explored.

These default values are expected to ease the work of case study conductors. For instance, for the most complex indicators when only some variables can be informed for the studied product, default values can feed into the indicator calculation to replace missing values. In other cases, when a specific counterpart product cannot be documented, default values can be considered as a more general counterpart, as these will be collected at the regional and / or national scale.

2.2.3. Metadata documentation

For each variable value, three metadata must be documented:

- ✓ the source/reference for the values (e.g., Dupond et al., 2010);

[1] The level(s) of the supply chain which is(are) key may not be necessarily the same for each indicator and for each WP.

- ✓ whether it estimates the average, maximum, minimum or something else (e.g., from the technical specifications one will often obtain maximum/minimum values rather than averages). Ideally, one would rather get an estimated average, but maximum/minimum is better than nothing if they are more readily available than the average;
- ✓ to which time period the variables values correspond. Time periods should be as recent as possible, and to the extent possible, similar between different variables. When relevant and available, time-series and/or multi-year averages can be used.

2.3. Analysis of indicators

In multi-criteria analysis such as those undertaken in WPs 5-7, there are two ways to look at the indicators: one can either combine them into a single composite indicator or use radar charts (Figure 1) or similar display formats (Bockstaller et al., 2015; Rigby et al., 2001). Both have pros and cons: a composite indicator allows for a synthetic performance score for the system under study but results in a substantial information loss. In particular, one may miss threshold effects such as a system which is performing quite well overall but which seriously underperforms in one of the dimensions. In addition, the assumptions necessary to add up the "apples and pears" heavily weigh on the final results: should an equal weigh be applied to the economy and the environment? Should environmental indicators be converted into euros? Which externality valuating technique should be used? And many other fundamental questions.

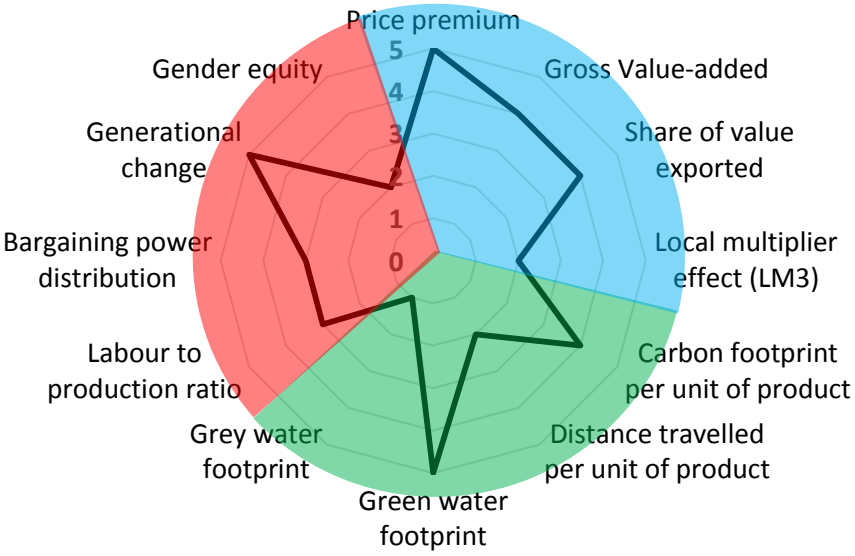

Figure 1. Multi-criteria performance of a quality scheme, example of radar chart display

As a result, we initially prefer not to combine indicators and instead resort to radar charts, possibly complemented by more quantitative tools, such as Factor Analysis of Mixed Data (FAMD).

3. METHODOLOGY FOR FQS CASE STUDIES (WP5)

Each case study conductor will be asked to provide two documents:

a) a short monograph providing general information on the case study

b) the filled in excel file entitled "16-07-05_list_of_variables&indicators.xlsx" (see supplementary matieral 1) after completing the green cell values. These green cells document variables which are then used to compute a series of sustainability indicators for the case study and the counterpart product.

The parts of the handbook relevant to WP5 are therefore:

- ✓ The *monograph outline* (section 18) which contains a suggested outline for the case study monograph. Most of the items in this outline are only suggestions on what may be interesting to discuss here and case study conductors should feel free to discard the items they think are not relevant or cannot be documented in their specific case. A few notable exceptions where information is required are highlighted in yellow and, most importantly, the technical diagram of the value chain is essential to paint a picture of the diversity of the FQS in the project.
- ✓ The aforementioned excel file (supplementary material 1) to be returned by case study conductors. The contents of this file are described in the first "Read me" sheet.
- ✓ The series of index cards mentioned in the excel file (supplementary material 1), and provided in sections 8-17 of this methodological handbook. These cards provide the rationale behind the choice of indicators, explaining how the variables requested will be used and which questions they seek to answer. Lastly, they also provide details on the methods used to compute the indicators.
- ✓ A draft publication strategy (section 19) laying out the plans of WP5 leaders on how to best value the work undertaken in WP5 and also ensure that all contributors are duly acknowledged through co-authorship.

4. METHODOLOGY FOR PSFP CASE STUDIES (WP6)

WP6 leaders have provided a specific methodological framework for PSFP (see below). The index cards outlined in this generic methodological handbook contain more detailed information on specific indicators also discussing whether and how they will be applied to PSFP.

In the short literature review on PSFP, carried out in the framework of D3.1 of Strength2Food, it has been emphasised that very few empirical studies evaluate impacts of alternative schemes. With the exception of nutritional studies, those that do tend to be reports commissioned by programme funding agencies, and a recognisable methodology employed is Social Return on Investment (SROI) (e.g. Jones et al 2012; Kersley, 2011; Lancaster and Durie, 2008, Thatcher and Sharp, 2008). SROI analysis involves (i) taking key stakeholders' own perceptions of desired outcomes of the programme, (ii) converting these abstract outcomes into tangible impacts that are quantified and measured in a transparent way to arrive at an SROI 'score' for the programme, (iii) taking account of 4 types of counterfactual: deadweight (what would have happened anyway without intervention of the programme), displacement (whether the beneficial impacts to certain actors are offset by losses to others), attribution (whether impacts are due specifically to the programme concerned) and drop-off (whether impacts are felt only in short or long term). The outcome is a ratio which expresses the value returned to the community, economy or local area from an initial expenditure/investment.

The proposed approach would thus consist in following the general approach of SROI in evaluating the impact of PSFP. PSFP schemes involve investments of public funds (e.g. from central government budgets and/or budgets of local authorities or municipalities), and SROI is particularly appropriate for such schemes. However, a modified approach to SROI will be adopted, which will involve two adjustments from the common method. First, we will pre-define the outcomes and measurement indicators we will use in our analysis, rather than devising these in consultation with PSFP participants. This is in order to respect the WP3 methodological process and need for harmonization with other WPs. Second, we will seek to monetise the economic and environmental impacts of PSFP models, but *not* their social impacts. Social impact monetisation is recognised as particularly difficult and speculative, and indeed is controversial within SROI. Instead, our approach will be to report social impacts in a descriptive way without converting them into a figure contributing to an overall SROI ratio.

In researching alternative PSFP programmes, we will also address the following conceptual and impact measurement issues:

- Need for clarity over the presumed beneficiaries of alternative PSFP models (e.g. central governments, municipalities, small farmers, catering companies, schools, children, staff, parents). This is particularly important where the interests of different stakeholders may be in conflict.
- Avoidance of tautology. For example, in relation to social impacts of alternative models, new actor networks/configurations are sometimes presented as a ‘requirement’ or input to alternative models, and then sometimes as a benefit/consequence of alternative models, contributing to quality of life. We will clearly specify directions of causality to make impact measurement intelligible.
- Avoidance of indicators which have yet to be defined clearly or quantified/operationalised in the literature, e.g. 'community vibrancy' (Stapleton and Garrod, 2008).

Impacts are listed in Table 3 according to the stakeholders relevant to PSFP, and relate to Environment (ENV), Economic (ECN), Social (SOC) impacts and Health/Nutritional (HEL) impacts. The table also lists items which refer to Costs/Revenues (COS), which are an important part of assessing the value of alternative PSFP programmes.

Stakeholders	Inputs	Intended/unintended changes	Outcomes	Indicator	How to Measure?
Local Authority (LA)	• Cost of catering contract • Cost of kitchen/dining facilities upgrading	• Increase uptake of school meals (COS)	• Increased uptake of meals	• No of meals consumed per week	• Record number of school meals consumed per week as proportion of school population
		• Improve nutritional content of meals (HEL)	• Improved healthiness of meals	• Nutritive value of school meals: energy value, macro and micro nutrients • Proportion of fruit and vegetables, fish and dairy products in school meals	• Calculate and validate nutritive value of school meals by Food Composition database, and proportion of fruit and vegetables, fish and dairy products in school • From school, get information on the number of school meals consumed per week and number of pupils who consumed and who do not consume school meals
		• Stimulate local economy (ECN)	• Increase in cash flows retained within local area	• Expenditures of recipients of LA spending on school meals	• LM3 - Record total spend of LA on school meals, record proportion of this spent by recipients in local area, record proportion of this spend by 2nd round recipients in local area
		• Improve environmental sustainability of school meals provision (ENV)	• Reduced CO2 emissions	• CO_2 emissions relating to transport from caterer to school • CO_2 emissions relating to transport from supplier to caterer • CO_2 emissions relating to agricultural production	• identify which foods to include in analysis – focus on those where difference likely exists between local/short chain, organic and lowest cost systems • estimate annual tonnage of these foods supplied to school • estimate km of distance involved in transport in supply chain for these foods • derive km per tonne for each food, and apply shadow price of carbon measure to calculate transport related CO_2 emissions • estimate CO_2 emissions relating to agricultural production, use recognised measure of environmental costs of organic/non-organic production • multiply this cost measure by annual tonnage of foods supplied to school (whether organic/non-organic)

Stakeholders	Inputs	Intended/unintended changes	Outcomes	Indicator	How to Measure?
		• Improve environmental sustainability of school meals provision (ENV)	• Reduced plate waste	• Volume of food wasted	• Record volumes of food left over after meals
Catering Company	• Extra staff time on programme	• Improve business performance (ECN) • Enhanced reputation (ECN)	• Improved business performance, reputation enhancement	• Gross margins or profit, value of business • N° of employees • New business won from reputation enhancement • Job satisfaction of employees	• Important to take into account the *proportion of total business* represented by programme contract
		• Improve working environment (SOC)	• Improved working environment	• Skills/training level of employees • Diversity of workforce • Social connections of staff	• N° of staff absences • N° of certificates, qualifications held by staff • N° of women, elderly, ethnic minorities employed • N° of local club/society memberships of staff
Suppliers, Farmers	• Extra staff time on programme • Extra costs borne from programme	• Improved business performance (ECN) • Enhanced reputation (ECN)	• Improved business performance, reputation enhancement	• Operating margins, turnover, value of business, value of land • N° of employees • New business won from reputation enhancement	• Important to take into account the *proportion of total business* represented by programme contract
		• Improve working environment (SOC)	• Improved working environment	• Job satisfaction of employees • Skills/training level of employees • Diversity of workforce • Social connections of staff	• N° of staff absences • N° of certificates, qualifications held by staff • N° of women, elderly, ethnic minorities employed • N° of local club/society memberships of staff
National Government		• Improve health of schoolchildren • Improve sustainability of school meals provision	• As for LA	• As for LA	• As for LA (but can estimate savings to NHS from drop in rates from obesity-related illnesses)

Table 3. Impact Assessment Map for PSFP

5. METHODOLOGY FOR SFSC CASE STUDIES (WP7)

5.1. Task 7.1: Qualitative assessment of motivations, practices and organisational development of SFSC

This task will provide an overview of the roles, motivations, attitudes and practices of actors in 12 studied cases on SFSCs in six European countries (France, Hungary, Italy, Norway, Poland and the UK). The main sources of data collection will be qualitative fieldwork in the participating countries (in-depth interviews and documentary analysis). The aim of the fieldwork is to permit a detailed exploration of the drivers, motivations, possibilities and barriers for development of the studied SFSCs. As the lead partner SIFO/HiOA will provide detailed guidelines for how to carry out the fieldwork, including common interview guides, based on the methodological framework outlined in *deliverable 3.1*. The aim of these guidelines is to secure a common set of research questions and methods to provide data for comparative analysis across all the cases and countries involved in the work package. A comparison between cases in different countries will allow us to discuss more general findings especially transferability of experiences between cases and countries and possibilities for further development and extension (up-scaling) of different initiatives (cases).

5.2. Task 7.2: Quantitative assessment

Factors that we have emphasized as relevant and important for the selection of indicators for WP7 are related to how can we best assess the economic, environmental and social impacts of SFSCs on the rural territory. In this methodological handbook, each indicator has been scrutinised to assess its relevance, applicability and feasibility for SFSCs.Therefore, some indicators have been adapted with minor modifications, some have been subject to major revisions (including the removal or addition or some new variables), and some indicators, which in our opinion are not relevant for SFSCs, will not be considered. Finally, we have suggested to include a new environmental indicator on food waste (see below).

The selected indicators will be subjected to a road-test in the pilot study (task 3.4.), to ensure their suitability and applicability in WP7. Hence, the final selection of indicators will take place after an evaluation of the results of the pilot test study.

5.2.1. Food waste

1. Background

Food waste is intended as the food loss during production, post-harvest and processing, marketing and consumption level. The minimisation of food waste is included in the sub-theme E5.3 on ‘waste reduction and disposal’ of the FAO’s SAFA guidelines, and follows some default types of indicators and targets, specifically:

- ✓ Waste Reduction Target: has the enterprise set a target in reducing the generation of waste, as well as the hazardousness of this waste, in or by its operations?
- ✓ Waste Reduction Practices: what practices and activities have been implemented that effectively reduced waste generation in the enterprise’s operation?
- ✓ Waste Disposal: how much solid waste does the enterprise generate that is not segregated, stored and in such a manner that it is rendered non-hazardous to humans and environment at the point of release from the enterprise?
- ✓ Food Loss and Waste Reduction: what is the share of food that is lost or wasted in the enterprise’s operations and what share is reused, recycled or recovered?

2. Relevance for SFSCs

Some of the environmental benefits associated with SFSCs mentioned in the literature concern the reduced use of packaging and food waste (King et al., 2010; Mundler and Laughrea, 2016; Galli and Brunori, 2013). It has been suggested that farmers generally provide only the amount of food that is actually needed (and specifically ordered) and consumers eat what they buy, thus hardly wasting any food at both production and consumption level. For instance, in box schemes, consumers pay in advance costs that are set beforehand, and producers are sure to sell their products at a given price (Brunori et al., 2011), contributing significantly to resource saving and reducing food waste. From the consumption side, buying fresh ingredients implies a higher quality of products, with a lower food waste.

3. Indicator and variables

The following equation quantifies the amount of wasted food (tonne):

$$Food\ waste\ (tonne) = \frac{total\ sold\ manufactured\ goods\ (tonne)}{100\% - Waste\ percentage\ (100\%)}$$

Alternatively, more simply as:

$$Food\ waste\ (\%) = \frac{food\ wasted\ in\ the\ chain}{food\ delivered\ to\ retailer\ (from\ farm,\ \ from\ processor)}$$

where: food wasted in the chain (tonnes) = food delivered to retailer (from farm, from processor) – food purchased by consumers

This indicator mirrors resource efficiency, since it relates to the amount of wasted food to the volumes produced (or more specifically, sold). The key indicators for waste at different levels of the value chain are listed in Table 4.

Sector	Indicator	Unit
Primary production	Amount of food waste or any fraction of it / sold unit	Tonnes/ Euro
Processing	Amount of food waste (tonnes) / total manufactured food sold (tonnes)	Tonnes/ tonnes
Wholesale and logistics	Amount of food waste in mass per year / total input of food products in mass per year (kg food waste per kg input)	Kg/ kg
Retail and markets	Amount of food waste generated per year	Kg
	Amount of food waste / turnover	Kg/ Euro
	Amount of food waste per year / total input of (food) products in mass per year	Kg/kg
Redistribution	Amount of food waste generated per year	Kg
	if applicable, Amount of food waste / turnover	Kg/ Euro
	Amount of food waste per year / total input of (food) products in mass per year (kg secondary resources per kg input)	Kg/kg
Food service	Amount of food waste in food service *storage* / produced amount food in food services per country	Kg/kg
	Amount of food waste in food service *preparation* / produced amount food in food services	Kg/kg
	Amount of food waste in food service for *serving (plate leftover and display waste)* / produced amount food in food services	Kg/kg
Households	Amount of *total* food waste in household per person	Kg/ person
	Amount of *edible* food waste in household per person	Kg/ person

Table 4. Key indicators for waste at different levels of the value chain (Møller et al., 2014)

However, there are several drawbacks. First of all, the measurement on food waste in production seem to have been rarely performed or to have not been recorded (FUSIONS, 2016). Moreover data collection and field sampling are time and money consuming. Therefore, despite the relevance of this indicator for SFSCs, its feasibility will be assessed during the pilot case study.

6. METHODOLOGY FOR WP8

WP8, on consumer research, covers a broad spectrum of methods using a combination of well-established, as well as novel methods to collect and analyse primary qualitative and quantitative data.

Two online consumer surveys will be conducted across seven countries (France, Germany, Hungary, Italy, Norway, Serbia and UK; on average n=600 per country, adjusted for country size). To ensure representativeness of the samples, data collection will be subcontracted to an international market research company.

The first survey investigates differences across the selected seven European countries and across various consumer segments with respect to consumers' knowledge, perception, and valuation of relevant EU/national/regional food quality labels and consumers' perceived barriers to buy products (both through mainstream and alternative retail channels) which are promoted by EU/national/regional quality schemes. Consumers' evaluation of additional/modified policy measures (e.g. adjustment of labels or standards behind the labels) to promote confidence in, and consumption of, sustainable products will also be investigated. The survey structure in its central constitution will be identical for all countries, however, to cover country and region specific labels parts of the questionnaire will be country specific. Descriptive statistics and multivariate methods of analysis (especially regression, cluster and factor analysis) will be used to analyze the data.

The second survey will focus on one EU/national/regional food quality label which has been identified as specifically relevant in the respective country during the first survey. Cognitive, affective and normative processes will be considered within an Integrated Choice and Latent Variable (ICLV) model. The methodology requires to simultaneously estimate a discrete choice model and latent variable structural and measurement model (Ben-Akiva et al., 2002). Merging structural equation modelling (SEM) with choice experiments allows the investigation of the impact of latent constructs such as cognitive and affective attitudes, trust, social norms, perceived barriers as well as values on product choice (e.g. O'Neill et al 2014; Rungie et al., 2011). This innovative approach transcend previous consumer research on FQS which relies on recognition analysis (London Economics, 2008), conjoint (van der Lans et al., 2001) or SEM (van Ittersum et al., 2007).

Qualitative research will be undertaken to investigate how European consumers understand, perceive, value, use and trust EU/national/regional food quality labels and public procurement measures to promote sustainable food chains. Attention is also given to the image of products with EU/national/regional food quality labels. Special emphasis is placed on better understanding of gaps between consumers' stated valuation of products promoted via EU food sustainability labels and their actual food practices including planning, purchasing, using, cooking, eating and disposal. This has been identified as a major gap in the existing literature (Padel and Foster, 2005).

In the above respect, consumers' perceptions and requests regarding additional or adjusted policy measures (e.g. assigning responsibility for sustainable consumption to the political level in the case of PSFP) will be investigated. The qualitative research will build on *ethnographic fieldwork* concerning consumption practices among 4-6 households in seven participating countries (France, Germany, Hungary, Italy, Norway, Serbia and the UK) to better understand and deepen the results from the quantitative study. Data collection will focus on the four complementary phases of consumption: planning, purchasing, using and disposal. Exploiting recent insights in practice methodology (Pink, 2007; Reckwitz, 2002; Wills et al., 2015), as well as Millers' work on shopping (1998) we will conduct regular contextual inquiries with informants from different generations within the same family, thus allowing for study of

perhaps complexly interwoven practices, habits and uses. Ethnographic field work, including several visits during three seasons, will be based on participant observation, film, photography and self-reflection. The fieldwork will commence with semi-structured interviews to understand representations and thoughts about FQS products within the household. Video recording will be used for observation of practices such as shopping together, making food together, etc. Households will also document FQS products in a photo album, as well as maintain spoken record in form of a diary and dialogue with the researcher. This novel ethnographic approach will deliver findings on gender roles and the biography of family food consumption practices that will deepen, complement and illustrate the quantitative results, as a part of the mixed method approach.

Based on the results of the online surveys and ethnographic fieldwork, potential policy interventions and commercial strategies to boost FQS sales will be identified and their effectiveness will be investigated in the framework of a virtual computerized supermarket application for three countries (Germany, UK and Serbia; on average n=300 per country, adjusted for country size). The virtual supermarket allows us to simulate experimental effects of e.g. price or labelling interventions in a virtual-reality setting (Nederkoorn et al., 2009; Waterlander et al., 2011). Study participants can choose in a manner comparable to a real supermarket among a wide variety of food items including both FQS products and alternative products of the same kind. Refined development of virtual supermarket environments will be aided by the involvement of the international grocery retailer KONZUM.

7. METHODOLOGY FOR WP9

The action research approach underpins WP9. Action research is a methodology which 'integrates theory and action with a goal of addressing important organizational, community and social issues together with those who experience them' (Coghlan & Brannick, 2014, p. 19). It seeks to stimulate change, develop self-competencies and problem solving to improve organisational performance and contribute to scientific knowledge (Coghlan & Shani, 2014). It is used in existent situations with a focus on resolving actual problems and is thus a means of integrating social practice and social science (Thomas, 2004).

Coghlan and Brannick (2014) identify three key characteristics of action research. Firstly, it involves research in action rather than research about action. The study of organisational and social problems should thus engage those *who experience them directly*, to implement effective change. Secondly, action research builds on the principle of collaborative partnership. In this regard, the research process should not privilege academics over the 'subjects' or 'objects' of their study, but rather engage relevant actors as equals in processes of action to co-generate knowledge. In other words 'research is constructed with people, rather than on or for them' (Coghlan & Shani, 2014, p. 525). Thirdly, action research is both a sequence of events and an approach to stimulate change. In terms of sequencing events, action research envisages an ordered process of collecting data, planning, taking action, evaluating outcomes, further planning and additional actions. In terms of stimulating change, all stages are undertaken jointly by 'clients' and researchers, so that there is far greater interaction between researchers and organisations than what is typically the case with other qualitative or quantitative methodologies. Proponents argue that by involving clients in the process leads to better learning, decisions and greater validity of the data generated regarding how systems work (Coghlan & Shani, 2014).

There are several variants of action research of which the clinical inquiry approach, developed by Schein (1987), is one of the most popular. Schein (1995) argues that too much action research still starts with the needs of the researcher rather than those of the client; with the method adopted by researchers because it is a superior means for collecting data rather than a desire to enhance an organization's wellbeing. In contrast, he proposes the clinical inquiry approach as a client driven process based on the notion of systemic health. This aims to understand the processes that hinder systemic health, devising and implementing appropriate actions to improve the organization's wellbeing with the client "actively involved in diagnosing their own situation and helping to formulate interventions that will work in their culture" (Schein, 1993, p. 703).

The principles of action research infuse each of the six pilot actions in WP9 which all involve at least one stakeholder 'client' and one academic partner. The pilot initiatives focus on specific client identified concerns such as stimulating a local short supply chain for fish or improving the returns to small-scale producers. Specifically, the six pilots are:

- ✓ *school meals initiative*, managed by the Ministry of Education, Science and Technological Development of the Republic of Serbia (MPN), to improve the nutritional and culinary qualities of school meals catering/procurement and economic benefits for local food producers. A major challenge will be developing a strategy to persuade all the stakeholder groups (e.g. parents, children, school staff and caterers) to adopt new practices.
- ✓ *in-store trials*, led by AGROKOR through its Konzum and Mercator retail chains (in Croatia and Serbia), of strategies to promote sales of local and organic produce (particularly fresh fruit and vegetables), experimenting with alternative logos (i.e. local, regional, national) and point of sale strategies, identifying whether this leads to

significant differences in sales. Other trials will draw on lessons of WP7 and WP8 to verify strategies to improve sales of local produce and returns to small-scale producers within mainstream food supply chains.

- ✓ implementing strategies *to improve sales of PDO products* in Poland, led by IJHAR – the Inspectorate for EU quality schemes in Poland, drawing on lessons from WP5 and WP8.
- ✓ an initiative to *increase sales of fish via a SFSC*, landed at the North Shields Fish Quay in the UK, to local restaurants and buyers, adding value to the fishing community. This pilot action will be managed by FoodNation and draws on the findings of WP7.
- ✓ an initiative to *expand regional food labelling* to improve returns to local producers (Hungary and Serbia), drawing on the expertise of ECO-SENSUS and the lessons of WPs 7 and 8.
- ✓ an initiative to improve the *impacts of food fairs and farmers' markets* (southern Italy, Serbia, Poland) aimed at promoting those products that, due to low volumes of production or supply chain organisation, cannot be sold through mainstream retail channels, led by Coldiretti, drawing on lessons from WPs 5, 7 and 8.

Each pilot is 'client' focused with non-academic partners implementing evidence based decision-making. Shared consortium expertise, from other stakeholder partners and more conventional research WPs will be used to develop effective strategies for these pilot actions and for future implementation and upscaling. The action research approach fits well with the principles of Horizon 2020, combining research with innovation and demonstration activities in a multi-actor project. In action research and Horizon 2020 multi-actor projects alike, stakeholder partners should be integral to the design, execution and demonstration of research.

8. INDICATOR INDEX CARD N°EC1: PRICE PREMIUM, PROFITABILITY AND VALUE DISTRIBUTION (ECONOMIC INDICATORS)

Coordinator: Sylvette Monier (INRA-T, France)

We define three kinds of economic indicators linked to price, profitability and international trade.

Some indicators will be calculated at different stages of the value chain. It is important to spell out **the stakeholders** (number and kind) directly or indirectly concerned by specifications/code of practice. Economic indicators should be determined on the basis of a detailed definition and characterization of the relevant value chain.

To capture potential **evolution**, it would be relevant to calculate indicators on two dates (t and t-10). In some cases, previous studies can be used to get indicators at previous points in time.

8.1. Questions we will try to answer with the indicator(s)

- ✓ Do FQS products command a higher price and guarantee a higher profitability than their standard counterparts?
- ✓ What stage(s) of the chain (farmers, processors, retailers) benefits the most from having access to a FQS?
- ✓ Are FQS a characteristic raising the international demand of the food product?

8.2. Indicators & methods to compute them

The FAO's SAFA indicators, include a dimension on "Economic resilience". 26 indicators are presented, covering a large spectrum about investment, vulnerability, quality and link with local economy. The economic indicators we take here have connection with 2 indicators: 1.4.1 *Net Income* and 1.4.2 *Cost of Production*, both concerning profitability. The other SAFA economic indicators are less consistent with S2F objectives. They mainly stress on aspects of management and firms strategies, while S2F project focuses mainly on measuring (economic) impacts and performance at an aggregated scale (FQS, SFSC or PSFP). Both the price premium and the trade indicators are somewhat connected with the "reputational value" of the product or scheme.

8.2.1. Price premium

The first question to answer is to know whether FQS products benefit from a price premium. This is relevant for each stage of the chain (from farmers to retailers).

One way of measuring the impact of FQS is to implement the hedonic method. Hedonic models have been widely used in consumer economics to evaluate the characteristics of food products. Many authors have used the hedonic price technique to determine how much the consumer is willing to pay for a FQS label (Desbois, 2015; Hassan and Monier-Dilhan, 2006; Loureiro and McCluskey, 2000). The drawback of this method is that it requires a lot of information on the characteristics of the products. A more economical way to deal with this issue is to compute the price premium. A positive value of this premium is a necessary condition for the profitability of the FQS, the actual profitability depends on the costs incurred.

- $\text{Price premium} = \frac{\text{PriceFQS} - \text{PriceBenchmark}}{\text{PriceBenchmark}}$

The prices may be directly available, if not they must be calculated using turnover and quantity.

- With $\text{Price}_j = \frac{\text{Total turnover}_j}{\text{Total quantity}_j}$ And j = FQS, counterpart product

This indicator will be computed for each level of the value chain (see appendix in section 8.4 for guidance on how the "price" may be defined at different levels of the chain).

Suggested data sources: Inter-branch committees, president or leading figures in consortium, Kantar Worldpanel (retail prices), FADN (the farm-gate unit-value price), national or regional public agency dedicated to FQS and/or agriculture and food sector[2] (price quotations, statistics on volume and value, technical and economic references, etc.).

Prices should be expressed in absolute terms rather than in indices. They should be representative of the value chain, in terms of volume, actors and according to possible seasonal variations, so that ideally they should be average prices weighed by the relative importance of each distribution channel.[3] The main stages of the value chain have to be considered depending on the type of product (see appendix to this card, Table 5). Prices at the processing stage are generally harder to collect than producer and retail prices.

8.2.2. Profitability and value distribution

Three classic analytical accounting indicators (Gross Value-Added, Gross Operating Margin, Net Result) should be computed for each FQS and its standard counterpart (Chatellier, 2002; Chatellier and Delattre, 2003; France AgriMer, 2011). For each indicator the following items have to be defined: the relevant steps of the value chain, the "product" (e.g., milk or cheese?), and the main categories of actors of the value chain. These definitions need to be specified by the case study conductor.

Either these three classical indicators have already been computed and published in an existing document or they can be computed based on the variables listed in section 8.3, as presented in Figure 2.

[2] For example, in France, the FranceAgriMer, which hosts the Observatory on prices and margins in the food sector (https://observatoire-prixmarges.franceagrimer.fr) or the Institut national de l'origine et de la qualité (INAO), in charge of FQS.

[3] For example, if 25% of the total volume is sold in national supermarkets at price a, 50% by direct selling at price b and 25% is exported at price c, the average price will be (0.25*a + 0.5*b + 0.25*c). The same logic applies for different presentation and type of products (raw or processed product, packaging, more or less aged, etc.).

Total turnover (= sales prices*quantity)

- Total intermediate consumption[4]
- insurance
- rent paid (tenant farming)
+ deductions and rebates
= Gross Value-added

- taxes and other dues
- wages paid
+ flat-rate refund of VAT
+ farm subsidies
+ insurance payments
= Gross Operating Margin (GOM)

- provisions for depreciation
- financial charges
+ transfer of charges
+ other operating income
+ financial products
= Pre-tax operating result
- social security costs of the owner
= Net Result (or Net Margin)

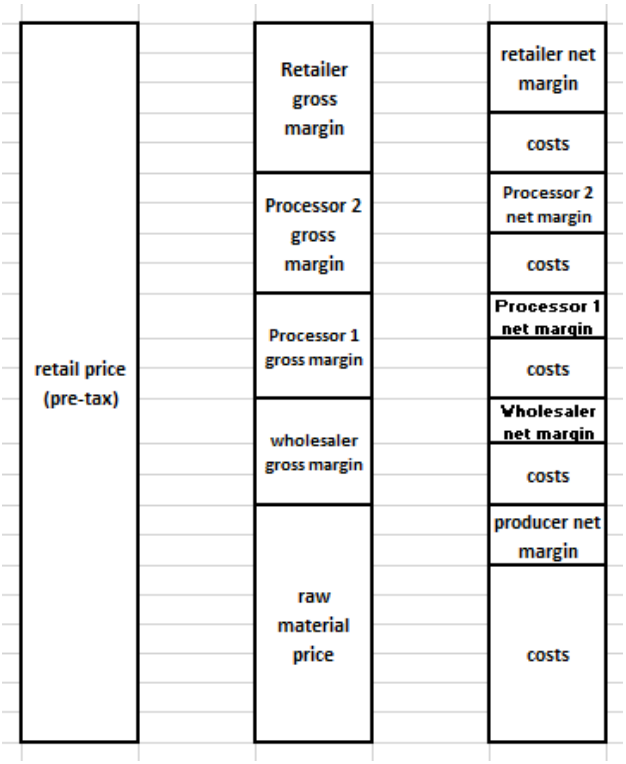

Figure 2. Conceptual model for distribution of costs and margins in a value chain

Indicators should be calculated per unit of output (€/kg, /L, etc.). Unit value can be calculated per raw material unit (liter of milk, kg of carcass, etc.) or per final product unit (kg of cheese, etc.).

These indicators computed at the main stages of the value chain (see appendix to this card, Table 5) allow analyzing the distribution of:

- ✓ revenues along the value chain
- ✓ gross margin along the value chain
- ✓ prices along the value chain (FQS vs. counterpart)

Data sources: these indicators require data that should be as accurate as possible (with respect to the product and its main steps of the value chain, especially retailer step), and that are not always directly available. Therefore, some suggestions include:

- ✓ To use the FADN about specialist farming in order to develop comparisons between the FQS product and the benchmark product. Two options can be used:
  - If the product is mostly representative of a FADN region with specialized farming, these data could be used as representative of FQS (for example, dairy farming in Franche-Comté region in France is a good proxy for farms involved in Comté PDO, cf. Colinet et al., 2006).

[4] Intermediate consumption is an accounting flow which consists of the total monetary value of goods and services consumed or used up as inputs in production by enterprises, including raw materials, services and various other operating expenses.

- In some countries, FADN may include information on FQS used by farmers. However, it is important to check the accuracy and the representativeness of such variable.

✓ To work with data from agricultural accounting centers, agricultural inter-branch organizations, president or leading figures in consortium.

Precautions: for operators involved in several productions, the main difficulty will be to be able to distinguish FQS production expenses and incomes from the other activities.

Data on costs and net margin by product at retail level are particularly difficult to obtain. If data are not available, a coarser estimate can be obtained based, on one hand on, the difference of volume and presentations between FQS and its benchmark product and, on the other hand, on the type of distribution network. For example, in the case of France, supermarket gross margin has been evaluated by France Agrimer as 18-20% of purchase and 15-17% of sales.

8.2.3. International trade indicators

The ratio of the products exported (volume or turnover) to the total production provides some information on market dynamism. The following indicators are relevant for investigating the contribution of the FQS to the national and European trade balance. These indicators are related to the final product.

- $\%\ export_{Vol} = \frac{\text{Export Volume}}{\text{Total turnover Volume}}$ $\%\ export_{Val} = \frac{\text{Export Value}}{\text{Total turnover Value}}$

Some European countries have numerous FQS so that consumers may be more aware of these labels in comparison to other countries outside Europe. Two situations can be distinguished according to the destination markets of the product.

- $\%\ export\ Europe_{Vol} = \frac{\text{Europe Export Volume}}{\text{Total turnover Volume}}$ $\%\ export\ Europe_{Val} = \frac{\text{Europe Export Value}}{\text{Total turnover Value}}$
- $\%\ export\ Extra\ Europe_{Vol} = \frac{\text{Extra Europe Export Volume}}{\text{Total turnover Volume}}$ $\%\ export\ Extra\ Europe_{Val} = \frac{\text{Extra Europe Export Value}}{\text{Total turnover Value}}$

The distinction between EU and non-EU countries allows comparing the relevance of the export channel and the profitability, with respect to the destination.

The incidence of export volume/value over the total volume/value is an indication of dynamism; nevertheless, it is not a necessary condition as in the case of products with small production volumes.

Data sources: inter-branch organization, president or leading figures in consortium.

8.2.4. Supply chain level prioritization

It is important to recognise that the most important differences in price premia, profitability and value distribution may not appear at the same level of the supply chain in different types of schemes (FQS, SFSC and PSFP). As a result, the following prioritization is suggested:

Value chain level (l)	FQS	SFSC	PSFP
Farm	key	key	key
Processing	key	secondary	key
Transportation	secondary	secondary	secondary
Retail	Key for price premium, secondary for other indicators	key	Not applicable

8.2.5. Adaptation of the method to SFSC and PSFP

The price premium indicator is directly applicable to PSFPs (taken as the price of the procurement) and SFSCs. So are the indicators related to profitability and value distribution: getting the data at all levels of the value chain and/or for all products may be challenging so a focus on some levels of the value chain and/or products may be warranted. To the contrary, the trade indicator is obviously irrelevant to PSFPs and SFSCs.

Economic indicators for WP7 should be determined on the basis of a detailed definition and characterization of the relevant value chain.

Price premium / Price difference - Adopting this indicator to the SFSC perspective we suggest to call it "price difference" that will be calculated as: Price SFSC – Price Benchmark (price benchmark stands for prices in a reference, conventional chains). This indicator will be calculated basically at 2 stages of the value chain: farm and retail. To capture potential **evolution**, it would be relevant to calculate indicators at least on two dates (t and t-10). In some cases, previous studies can be used to get indicators at previous points in time. Depending on the product, seasonality of sales and prices may be taken into account.

Profitability and value distribution - Two indicators will be adopted for SFSCs: Gross Value-Added and Gross Operating Margin. Indicators will be calculated for farm and retail stages of the chain, with the processing stage considered only if all the production of a given processor goes into the SFSC studied. Short and benchmark, conventional chain will be considered in the analyses. Indicators for the farm level will be calculated in accordance with the "conceptual model for distribution of costs and margins in a value chain" as presented in the handbook. At the retail level it is suggested to simplify the approach and use retailer's margin as the percentage of the retail price: (Retail price – purchase price)/Retail price [%].

8.3. List of underlying variables to be collected

Note that the following variables are to be filled in, to the extent possible, for each step in the value chain (farm, collection, processing plant …). See monograph outline to ensure that the steps in the value chain used here are consistent with the value chain diagram to be provided there.

8.3.1. Key variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
	Price premium			
price_l	Price at level l of the value chain	Euros[5]	It is necessary to obtain this information for the FQS product and the benchmark product	
turnover_l	Total annual turnover at level l of the supply chain for the certified product only.	Euros year-1		
prod_lz	Quantity of production at level l in zone z. If zone-specific data is not available, a proxy may be constructed based on the aggregated production at level l. Note that only production dedicated to the studied product should be counted (e. g., not all the milk of a zone z is used to process the studied cheese FQS). Also note that product-zones (lz) with the largest quantities in kg year-1 should be prioritized in the data collection effort. See card n°En2 on foodmiles for details and note	kg year-1		

[5] For non-Euro countries exchange rate conversion must be used and specified.

	that providing values per zone "z" is not necessary here.			
	Gross Value-added			
inter_ cons_l	Total intermediate consumption at level l of the value chain	Euros		
	Gross Operating Margin			
wages_l	Sum of wages paid for family workers and employees at level l of the value chain, including if necessary an approximated fixed hourly remuneration for (unpaid) family labour	Euros		
subsid	Farm subsidies	Euros		
	International Trade Indicators			
eur_Exp_Vol	Quantity (volume) of production at downstream level exported to European countries.	Unit of output		
eur_Exp_ Val	Turnover (value) at downstream level for products exported to European countries.	Euros		
extra_Eur_Exp_Vol	Quantity (volume) of production at downstream level exported to non-European countries.	Unit of output		
extra_Eur_Exp_Val	Turnover (value) at downstream level for products exported to non-European countries.	Euros		

The key variables for evaluating profitability have to be collected from Inter-branch committees, president or leading figures in consortium. However, it may be necessary to work at a less accurate level, for example Colinet et al. (2006) considered sample of specialized farms (FADN) in a given region as a proxy of FQS farms.

8.3.2. Secondary variables

We assume that the value of the following variables does not differ significantly depending whether the product is under FQS or not. So we can approximate these variables by a mean value.

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
	Gross Value-added			
insur_GVA_l	Insurance paid at level l of the supply chain	Euros		
rent_l	Rent paid (tenant farming) at level l of the value chain	Euros		
deduc_l	Deductions and rebates obtained at level l of the value chain	Euros		
	Gross Operating Margin			
taxes_l	Taxes and other dues to be paid at level l of the value chain	Euros		
refund_l	Flat-rate refund of VAT received at level l of the value chain	Euros		
insur_GOM_l	Insurance payments received by businesses at level l of the value chain	Euros		
	Net result			
prov_depre_l	provisions for depreciation to be paid at level l of the value chain	Euros		
fin_charges_l	Financial charges paid at level l of the value chain	Euros		
transfer_charges_l	Transfer of charges received at level l of the value chain	Euros		
operat_income_l	Other operating income received at level l of the value chain	Euros		
finprod_l	Financial products received at level l of the value chain	Euros		

soccosts_l	Social security costs of the owner to be paid at level l of the value chain	Euros		

8.4. Appendix

Stage of marketing	Meat products	Dairy	Cereal/Bakery	Fruit & Vegetable	Sea food/Fish	Coffee & Tea
Producer prices	Farmgate price usually not available	Producer price: depends on milk quality.	Producer price: some producers may integrate some wholesalers function (sorting, packaging, storage…)	Producer price: some producers may integrate some wholesalers function (sorting, packaging, storage…)	Fisherman or aquaculturist price: some producers may integrate some wholesalers function (sorting, packaging, storage…)	Producer price
Wholesaler price	Slaughterhouse entry carcass price: depends on carcass classification	Collector price (if milk collector is not integrated with processor)	Wholesaler (cooperative, shipper, etc.) price	Wholesaler (cooperative, shipper, etc.) price	Wholesaler price	Wholesaler (cooperative, shipper, …) price
Processor 1 price	Cut prices or pre-packaged products price (if directly made by slaughterhouse)	Processed dairy product (cheese, butter, etc.) price	Mill price	Processed products price (jam, sauce, etc.) or nothing if sold as fresh product	Processed products price (fish fillet, canned fish, etc.)	Processed products price
Processor 2 price	If made by other unit than slaughterhouse, processed meat	For cheese, mature price (if ripened differs from cheesemaker)				
Retail price	Retailer may or not perform some processing function (totally, from carcass; or partially, from cut)					
	Depending on the market share of each kind of retailer (supermarket, direct sales, artisanal trade…)					

Table 5. Main concerned stages and prices for each type of product covered in S2F WP5

9. INDICATOR INDEX CARD N°EC2: LM3 (ECONOMIC IMPACT)

Coordinator: Adam Wilkinson (IMPMENT, UK)

Background to Measurement of economic impact and LM3

Local Multiplier 3 (LM3) was originally developed by the New Economics Foundation as a way to demonstrate the benefit of local organisations to their communities. Adam Wilkinson then applied and developed the model on a large scale to all 26 local authorities in the North East of England with £4.5 billion annual spend and 140,000 suppliers to demonstrate local and regional impacts of public procurement on local and regional economies. This work was incorporated into the UK National procurement strategy and flexible framework. Technically the indicator is a retail multiplier when applied in the context of input/output models.

The model works by tracking empirically 3 generations of spending. For each round, the amount of spending that is retained within the local area is measured. Using a very simple formula this then produces an LM3 ratio. A simple LM3 is thus:

Round	€	
R1	10	original budget
R2	6	amount spend with suppliers within the local area
R3	4	amount re-spent by suppliers within the local area

LM3 calculation (10+6+4)/10 = 2.00 We can say that each €1 spent has resulted in €2 within the local economy. The ratio means that it is possible to compare different amounts of spending in terms of local economic benefit which, combined with the transparent and empirical data, make this measure usable within a public procurement environment. As such, this indicator parlty reflects territorial cohesion.

The model is now widely used in its online form which automates the data collection and calculation processes in large construction and other infrastructure projects. A free demonstration of the model in working form is available at lm3online.com

9.1. Questions we will try to answer with the indicator(s)

- ✓ What is the economic impact of a FQS/PSFP/SFSC on the community within a predefined geographical area?
- ✓ Do FQS, PSFP and SFSC provide a significantly greater benefit to communities than other forms of production?
- ✓ What is the relationship between the profitability indicator and economic impact (LM3)?

9.2. Indicator(s)

Two different forms of the model can be used. For FQSs, it is highly recommended that the methodology is used at the level of the processor rather than the producer. For PSFPs, the original level, that is the public entity, can be used. For SFSCs, the retail store is the most relevant level to start with. This approach entails that it is likely that only one or two organisations will need to be consulted to generate sufficient data to set up and run the models. As producers will be part of the processors' supply chain the wider socio-economic impacts will be picked up by this method.

9.2.1. Full LM3 (tier 2)

This indicator uses the full model to track the economic impact on a defined local area including money that initially moves out of the area and then returns. This would be the preferred methodology. However, it should be noted that some weighting would be needed, where defined local areas vary significantly in size. One way to approach this would be to pro rata results based on local area radius.

9.2.2. Indicative LM2/3 (tier 1)

The predictive module eliminates the need to interrogate the supply chain further, and instead uses system averages to calculate an indicative figure. This reduces the workload by approximately 80% and makes the process very quick. However, inevitably a much cruder result is obtained.

9.3. Method to compute the indicator(s)

For both methods and indicators, we propose to make available either the LM3 live (full) tool or the LM3 predictive module. Both are fully integrated web based solutions that work globally. However, we may need some translation of screens depending on how the tools are applied.

*Note: We also use the tools in a commercial context to collect other data from the supply chain for example no of apprenticeships created etc. This could be used across the whole project if needed as a data collection mechanism.

9.3.1. Method for Tier 2 full LM3 (applies to all types of quality schemes)

(Using standard LM3online model.)

The processor or public procurement organisation is the start point of the supply chain considered in the indicator.

The model requires for each processor/organisation:

R1 Processor/public budget + direct labour cost + other direct costs

R2 Processor supply chain by organisation with gross amount paid (including email address)

R3 Supply chain response either via email/web login or collected data shows % of payment spent in local area

Model will extrapolate results from responses received and make calculation as per example in introduction.

9.3.2. Method for Tier 1 Indicative (applies to all types of quality schemes)

(Using LM3 Predictive module), the model requires for each processor:

R1 Processor/public budget + direct labour cost + other direct costs

R2 Processor supply chain by organisation with gross amount paid (including email address)

- ✓ R3 Lm3Online Predictor uses existing system data to extrapolate R3 Calculation
- ✓ The model calculates an indicative value using all of the data submitted by all users of LM3online based on in or out area location of supplier.

9.4. Variables

9.4.1. Key variables (tier 1)

Variable name	Description	Unit	Applied Quality Scheme	Default value available?
	ROUND 1 – ORGANISATION (e. g., processor or public authority)			
area_definition	If the local area is defined as a circle around a central point, then provide this central point (e. g., name of the city, coordinates). Otherwise, provide the map of the local area and its name if it has one (e. g., if it corresponds to an administrative entity). In that case, the variable is partly redundant with "loc_lz" in the foodmiles card (En2) with "l" being the processing level here	No unit	All	No
area	Area of what is defined as "the local area".	Km2	All	No
organization_project_name	Name of project or organization/processing plant	No unit	All	No
turnover_l	Total turnover at level l of the supply chain (here organization or processor)	Euros		
inter_ cons_l	Total intermediate consumption at level l of the supply chain	Euros	All	tbc
wages_l	The wages paid may be approximated from fixed remuneration for family workers and employees at level l of the supply chain (here organization or processor)	Euros	All	tbc
prop_local_wages_l	The proportion of direct labour costs that are within the local area defined above at level l of the supply chain (here organization or processor)	percent	All	no
	ROUND 2 – SUPPLIERS Uploaded to the system as excel spreadsheet			
name_supplierX	Name of supplier number X	No unit	All	tbc
location_supplierX	Location of organization/supplier number X (e. g., city name, postal code, …). This variable is partly redundant with loc_lz in the foodmiles card (En2) but here, all suppliers are considered, not only farmers.	No unit	All	
amount_spent_supplierX	Amount spent with supplier n° X	Euros	All	tbc

9.4.2. Secondary variables (tier 2)

Variable name	Description	Unit	Applied Quality Scheme	Default value available?
	ROUND 3 – RESPENDING LM3 only			Tier 1 Full
prop_turnover_spent_locally	What % of turnover is respent in local area by supplier X	percent	All	
business_type_supplierX	Business type of supplier X: e. g., goods, services, construction, …	No unit	All	tbc
business_sector_supplierX	Business sector of supplier X: e. g., Public Limited Company, Not For Profit, Small/Medium Enterprise, …	No unit		

9.5. Appendix: example Lm3 Report full

Attached separately (supplementary material 2).

10. INDICATOR INDEX CARD N°EN1: CARBON FOOTPRINT

Coordinator: Valentin Bellassen (INRA-D, France)

10.1. Questions we will try to answer with the indicator(s)

- ✓ Do FQS products have a smaller carbon footprint than their standard counterparts?
- ✓ What are the key drivers of the carbon footprint difference between a FQS product and its standard counterpart?
- ✓ Is there a shift in the absolute and relative composition of the carbon footprint between FQS products and their standard counterparts? E.g. a much larger share of transportation to the processing plant for organic products

10.2. Indicator(s)

Two indicators will be computed for each FQS/PSFP/SFSC and its standard counterpart. Both require to define precisely which is the product in the supply chain considered (e.g. milk or cheese?). This definition needs to be specified by the case study conductor.

10.2.1. Product carbon footprint, in tCO_2e per kg of product

This indicator is the most intuitive and common one for product-oriented carbon footprinting (Röös et al., 2014). It corresponds to SAFA indicator E 1.1.3. Under the rather common assumption of fixed demand in quantity for the product, and in our case full substitutability between the FQS version and its counterpart, one of the advantages of this indicator is to control for carbon leakage (Colomb et al., 2012).

10.2.2. Carbon footprint of production area, in tCO_2e per hectare of utilized agricultural area (UAA)[6]

This indicator is more oriented towards the upstream of the supply chain. The implicit assumption is that the area used to produce the product is fixed and that demand in quantity will adapt to production levels. For example, if the FQS supply chain is less productive on a per hectare basis, this indicator assumes that overall product consumption decreases as the share of FQS rises. Thus productivity losses are implicitly assumed to be offset by decreased consumption in the overall carbon footprint of the supply chain.

In a way, the implicit economic assumptions behind these two mainstream indicators correspond to two unrealistic extremes: fixed demand and full substitutability (tCO2e/kg of product) or elastic demand and no substitutability (tCO2e per hectare). Hence the usefulness of computing both.

10.3. Method to compute the indicator(s)

10.3.1. Method for FQS

The producer (farmer) is the main part of the supply chain considered in the indicator for three reasons:

- ✓ 83-88% of the carbon footprint of the food sector occur at the production stage (Röös et al., 2014; Weber and Matthews, 2008). The collection and processing stages are therefore negligible in the general case;

[6] To be adapted for seafood: either irrelevant (for wild fish) or UAA replaced by area of fish/seafood farms.

- ✓ the relative impact of transportation can be important for alternative products based on roots, cereals and vegetables (Röös et al., 2014). For this reason, the carbon footprint of the collection stage, potentially very different between FQS and non-FQS, will be derived from the foodmiles indicator (see index card n° En2);
- ✓ the difference in energy demand between processes in FQS and non-FQS supply chains is likely negligible.

Based on this rationale, most farm-level variables are classified as "key"[7] while most variables pertaining to other levels are classified as "secondary".

The two indicators will be computed using the Cool Farm Tool (Hillier et al., 2011). This tool requires a few key variables (see 10.4.1) and some secondary ones (see 10.4.2). These variables are common in agricultural statistics and can likely be obtained from the following types of sources:

- ✓ Local statistics;
- ✓ Local farmer accountancy data;
- ✓ Report from farmer interviews;
- ✓ FQS technical specifications;
- ✓ Regional/national statistics, including national greenhouse gas inventories.

This method and the Cool Farm Tool allow to follow the Life Cycle Assessment (LCA) principles and to address the key methodological issues of LCAs as listed in JRC (2010):

- ✓ Which LCA modelling principle to follow (i.e. attributional or consequential)? -> attributional in our case
- ✓ Which LCA method approaches to employ for solving multifunctionality of processes (i.e. allocation or system expansion/substitution)? -> allocation in our case
- ✓ System boundaries: the definition and application of system boundaries and of quantitative cut-off criteria (including the question which kind of activities to include in LCA);
- ✓ Functional unit definition;
- ✓ etc.

LCA is however a standardized procedure which is very time consuming when properly implemented. Given the constraints of the project, we cannot conduct a full-fledged LCA on the studied products.

10.3.2. Adaptation of the method to SFSC and PSFP

SFSCs and PSFPs usually concern a basket of products and collecting the variables listed in section 10.4 for each product of the basket will likely exceed the resources available for the S2F project. Three simplifications may make it manageable:

a) Collect the variables only for the one or two most important – in quantity or in euros – products in the basket;

[7] Based on expert practice of carbon footprint calculation, some farm-level variables are nevertheless classified as secondary when they tend to represent a negligible fraction of the total footprint.

b) Elicit expert judgement to identify the key variables which are most likely to differ between the product within the SFSC/PSFP basket and the same product outside of the SFSC/PSFP basket;

c) Use default carbon footprint values per product type from existing literature (e.g., Environmental Working Group (2011)). In that case, the possible differences between case study and counterpart will stem from a difference in the basket/menu rather than from a difference between the same product in the case study vs its counterpart.

WP6 will use the approach c), possibly complemented by approaches a) and b) (see section 4 dedicated to the methodology for WP6).

WP7 will only focus on the transportation fraction of the carbon footprint (see card n°En2, section 11).

10.4. List of underlying variables to be collected

10.4.1. Key variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
	Crop/Fodder crop management			
prop_cropX	Proportion of crop X in final product or of fodder crop X in animal diet	%	all	
minN_cropX	Amount of mineral N fertilization for crop X	kgN ha^{-1}	All	Yes, per crop type
orgN_cropX	Amount of organic N fertilization for crop X	kgN ha^{-1}	All	tbc
yield_cropX	Yield for crop X	Ton of dry matter ha^{-1}	All	Yes, per crop type
	Animal characteristics			
meat_animal	Amount of meat per animal	t $head^{-1}$	Meat, Dairy, Sea food/fish	tbc
milk_animal	Amount of milk per animal	t $head^{-1}$ $year^{-1}$	Dairy	tbc
t_juvenile	Duration of juvenile stage (from birth to first lactation or reaching adult size)	years	Meat, Dairy, Sea food/fish	tbc
t_adult_prod	Duration of productive adult stage	years	Dairy	tbc
t_adult_non_prod	Duration of non-productive adult stage	years	Meat, Dairy, Sea food/fish	tbc
	Farm infrastructure and management			
manure_manX	Manure management system X	See section 10.5	Meat, Dairy	tbc
prop_manureX	Proportion of manure going to manure management system X	%	Meat, Dairy	
ener_source_gh	Source of energy for greenhouse heating (e.g. fuel, electricity, gas, …)		Fruits & Veg	
ener_gh	Quantity of energy for greenhouse heating	MWh $year^{-1}$	Fruits & Veg	
	Products			
meat_price	Farmgate price of meat	€ t^{-1}	Dairy	
milk_price	Farmgate price of milk	€ t^{-1}	Dairy	
final_prod_ratio	Final product/Raw product ratio (raw products are crops, milk or dead animal weight). To be repeated as many times as the number of raw products when several raw products enter in the composition of the final product under FQS.		All	

10.4.2. Secondary variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
diesel_crop	Diesel consumption for crop work	l ha^{-1} $year^{-1}$	All	Yes
ener_source_X	Source of energy for purpose X other than field work or greenhouse heating	no unit	All	No
ener_X	Quantity of energy for purpose X other than field work or greenhouse heating	MWh year-1	All	No
type_N	Type of N fertilizer used (ammonium nitrate, urea, …)	na	All	tbd
origin_cropX	Geographical origin of crop n°X (e. g., country, region, …). Relevant for imported fodder for example.	na	All	no
origin_N	Geographical origin of N fertilizers (e. g., country, region, …)	na	All	no
type_phyto_X	Type of phytosanitary product X	No unit	All	tbd
Q_phyto_X	Amount of phytosanitary product X	tbd	All	tbd
origin_phyto_X	Geographical origin of phytosanitary product X	No unit	All	tbd
type_other_input_X	Type of input X other than nitrogen and phytosanitary products (e. g., P, K, …)	No unit	All	tbd
Q_ other_input_X	Amount of input X	tbd	All	tbd
origin_ other_input_X	Geographical origin of input X (e. g., country, region, …)	No unit	All	tbd
soil_characteristics	Texture, soil organic matter, drainage quality, soil moisture, pH	tbd	All	tbd
crop_residue_management	Quantity of crop residues and their management	tbd	All	tbd
ener_source_X	Source of energy (e. g., coal, fuel, gas, …) X used in processing	No unit	All	tbd
ener_X	Quantity of energy X used in processing	MWh year-1	All	tbd
Other	Other information you have and think is relevant to the carbon footprint of your case study	tbd	All	tbd

10.5. Appendix: manure management systems

System	Definition
Grazing	The manure from pasture and range grazing animals is not managed. It is left on the field as deposited.
Daily spread	Manure is routinely removed from where it is confined and is applied to cropland or pasture within 24 hours of excretion.
Solid storage	Manure is stored in an unconfined pile or stack (usually for several months). Manure stacking is achieved by having a sufficient amount of bedding material or loss of moisture by evaporation.
Dry lot	Manure is accumulated on a paved or unpaved open confinement area (where there is no significant vegetative cover). It may be removed periodically.
Liquid/ Slurry	Manure is either stored as excreted or with a minimal addition of water in a containment facility outside of the animal housing (either a tank or pond). It is usually held for less than one year.
Uncovered anaerobic lagoon	This is a liquid storage system that combines both waste stabilization and storage. Lagoon supernatant is usually used to remove manure from the associated confinement facilities to the lagoon. Anaerobic lagoons are designed for varying lengths of storage time (can be up to a year or greater), which depends highly on the climate region and the volatile solids loading rate, among other factors. Lagoon water may also be recycled as flush waster or used to irrigate and/ or fertilize fields.
Pit storage below animal confinements	Manure is collected below a slated floor in an enclosed animal facility. It usually involves little or no water added and is usually for periods less than one year.
Anaerobic Digester	Animal excreta (with or without straw) is collected and anaerobically digested in a large containment vessel or covered lagoon. Digesters work to stabilize waste by using the microbial reduction of carbon dioxide and methane, which is captured and flared for used as fuel.
Deep bedding	As manure accumulates, bedding is continuously added to absorb moisture (this can be for the length of a production cycle or up to a 6-12 month period). This can also be called a "bedded pack" manure management system and can be combined with dry lot or pasture.
Composting – forced aeration	Composting with regular turning for mixing and aeration (at least daily).
Composting- non-forced aeration	Composting in windrows, but with infrequent turning for mixing and aeration.
Poultry manure with litter	Similar to cattle and swine deep bedding but not usually combined with a dry lot or pasture. Typically used for breeder flocks and other meat type chickens and fowl.
Poultry manure without litter	Can be similar to open pits in enclosed animal confinement facilities, or it may be designed to dry the manure as it accumulates (this is known as a "high-rise" manure management system and is a form of passive windrow composting when operated properly).
Aerobic treatment	The biological oxidation of manure that is collected as a liquid either with forced or natural aeration. Natural aeration is limited to aerobic and facultative ponds and wetland systems (due primarily to photosynthesis), but these systems typically become anoxic during periods without sunlight.

Source: IPCC (2006)

11. INDICATOR INDEX CARD N°EN2: EXTENDED FOOD MILES

Coordinator: Marion Drut (INRA-D, France)

11.1. Questions we will try to answer with the indicator(s)

- ✓ Do FQS products and their inputs travel shorter distances than their standard counterparts from the farm to the processing plant? To the end consumer?
- ✓ Are (localized) FQS products preferentially consumed locally or on the contrary, do they benefit from their reputation to be exported further than their standard counterparts?
- ✓ Is the transportation stage (collection of raw products to processing plant and/or to the end-consumer) a key driver of the carbon footprint difference between a FQS product and its standard counterpart? Of other environmental indicators (e. g., NOx emissions)?
- ✓ Does transportation represent a significant part of the value-added of the supply chain (see indicator n° Ec1)?

11.2. Indicator(s)

Two indicators will be computed for each FQS and its standard counterpart. Both require to define which is the actual product of the supply chain to be considered (e.g., milk or cheese?). This definition needs to be specified by the case study conductor. For both indicators, the upstream – from cradle to the processing plant – and downstream – from the processing plant to the end-consumer – parts will be estimated separately as they rely on different data sources and different stakeholders. The case study conductor should prioritize its data collection effort towards the upstream part which is more related to FQS specifications and for which data should be more readily available.

11.2.1. Distance traveled, in km per kg of product

This indicator is the most intuitive and striking for dissemination to the general public and it sticks to the basic idea of the concept of "food miles". However, this indicator is to be interpreted cautiously and need to be complemented by the estimation of the related carbon emissions. A longer distance traveled does not necessarily mean larger carbon emissions. Considering the logistics (transportation modes, volumes carried, and spatial repartition of the different stages) it is crucial to assess the environmental impact of transportation.

11.2.2. Carbon emissions related to the transportation stage, in tCO_2e per kg of product

This indicator is more relevant for assessing the environmental impact of products, since not only the distance but also the logistics of the collection stage of raw materials and of the distribution stage of the final product is considered. Moreover, it allows for a more comprehensive and precise estimate of the carbon footprint indicator (see Index card n° En1). It corresponds to a part of SAFA indicator E 1.1.3, with a focus on transportation and logistics.

11.3. Method to compute the indicator(s)

11.3.1. Method for FQS

Transportation stages of both upstream (collection of raw materials) and downstream (distribution of the final product) parts of the supply chain are considered in this indicator for the following reasons:

- ✓ 11% of life cycle greenhouse gas emissions of food products arise from transportation, and 4% are from final delivery from producer to retail (Weber and Matthews, 2008);
- ✓ the relative impact of transportation can be important for alternative products based on roots, cereals and vegetables (Röös et al., 2014). For this reason, the carbon footprint of the collection stage is potentially very different between FQS and non-FQS;
- ✓ the carbon footprint of food products can double when emissions from products traveling long-distances at the distribution stage are included (Lopez et al., 2015). For this reason, the carbon footprint of the distribution stage may be of interest and may exhibit different patterns between FQS and non-FQS;
- ✓ not only the distance between different stages but also the organization of the logistics (collection and distribution stages) can have significant impacts on the environment (Schlich and Fleissner, 2005).

The two indicators will be computed using the Cool Farm Tool (Hillier et al., 2011). This tool requires a few key variables (see 10.4.1) and some secondary ones (see 10.4.2). These can likely be obtained from the following types of sources:

- ✓ Local statistics;
- ✓ Local farmer/manufacturer accountancy data;
- ✓ Report from farmer/manufacturer interviews;
- ✓ FQS technical specifications;
- ✓ Regional/national statistics, including national input/output or trade balance;
- ✓ Elicitation of expert judgement[8].

These variables, listed in section 11.4, are the variables that case study collectors will have to collect and send to their WP leader and co-leader. The more specific the variables are to the case study, the better.

The scope of the food miles indicator as well as the structure of the variables required are given in Figure 3. The hypothetical example of a French PDO cheese production is given on an indicative basis, with the level of details expected from case study conductors.

[8] To increase the reliability of an expert judgement, specific methods have been documented, including the necessity for the expert to provide some elements in writing: his/her name, affiliation, the data/references considered in the judgement, etc.). See IPCC guidance for "a brief example of detailed expert judgement", p. 6.11 of http://www.ipcc-nggip.iges.or.jp/public/gp/english/6_Uncertainty.pdf

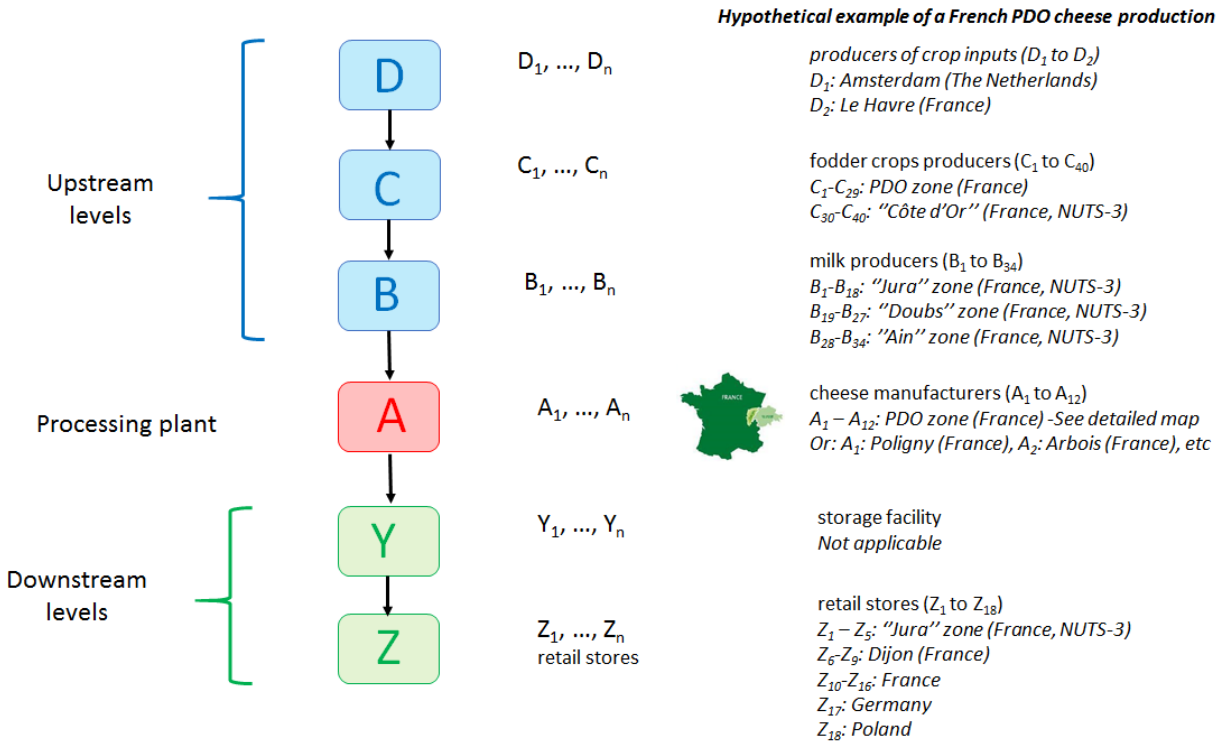

Figure 3. Scope of the food miles indicator

11.3.2. Adaptation of the method to SFSC and PSFP

SFSCs and PSFPs usually concern a basket of products and collecting the variables listed in section 11.4 for each product of the basket will likely exceed the resources available for the S2F project. Three simplifications may make it manageable:

- ✓ Collect the variables only for the one or two most important – in quantity or in euros – products in the basket;
- ✓ Elicit expert judgement to identify the key variables which are most likely to differ between the product within the SFSC/PSFP basket and the same product outside of the SFSC/PSFP basket;
- ✓ Considering the municipality as the key level, a two-step approach can be used: (i) from farm/supplier to catering firm/wholesaler, and (ii) from catering firm/wholesaler to school. The emissions generated at each of these stages will be summed.

WP6 will use the latter approach. Similarly to the carbon footprint, differences between case studies and their counterparts will also stem from the differences in menus: even if the beef and chicken served are the same, the frequency at which they are served imply differences in the carbon footprint and extended foodmiles of the menu.

WP7 will focus on the transportation of products in different chains. An attempt to integrate the consumer will be made by considering mileage and consumption of fossil fuels associated with the use of different chains by consumers.

It is important to recognise that the most important differences in distances and emissions from extended food miles may not appear at the same level of the supply chain in different types of schemes (FQS, SFSC and PSFP). The availability of information may also be different, with

difficulties to cover all types of retailers in FQSs for example. As a result, the following prioritization is suggested:

Value chain level (l)	FQS	SFSC	PSFP
Farm	Key	key	key
Processing	Key	secondary	secondary
Downstream/Retail	secondary	key	key

More specifically, regarding the extended food miles indicator, particular attention to the downstream level is required for SFSC. There is a lack of consensus in the literature about the environmental impact of SFSC: Schlich and Fleissner (2005) point out the role of the organization of supply-chains and find a larger environmental impact of SFSC compared to conventional supply-chains, while Pimentel et al. (2008) and Mundler and Rumpus (2012) support the environmental benefits of shorter distances. Coley et al. (2009) define threshold distances above which the environmental impact of SFSC products exceeds that of conventional ones. For this reason, the extended food miles indicator can only be accurately adapted to SFSC with a detailed knowledge of the supply-chain, including the packaging of products downstream (concentrated, bulk, bottled) and the distribution to the final consumer (not only to retail stores). The distance traveled and the downstream transportation modes are of particular importance to differentiate SFSC products from conventional ones.

11.4. List of underlying variables to be collected

11.4.1. Key variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
	Variables specific to this indicator			
Loc_lz	Location of zone z of producers/manufacturers/retailers at level l. Location may come in many formats: names of the city/region/country, GIS coordinates, map polygons with or without associated density of production, map points, raster of production density… Note that there may be only one zone per level if no finer level of information is available. Note that for FQSs, the union of all zones make up the Local Agri-Food System (LAFS) defined as the collection of municipalities listed in the code of practice/specifications.	No unit	All	no
Prod_lz	Quantity of production at level l in zone z. If zone-specific data is not available, a proxy may be constructed based on the aggregated production at level l. Note that only production dedicated to the studied product should be counted (e. g., not all the milk of a zone z is used to process the studied cheese FQS). Also note that product-zones (lz) with the largest quantities in kg year^{-1} should be prioritized in the data collection effort.	kg year^{-1}	All	no
Tpt_l	Transportation mode(s) of product for level l, including its carrying capacity (e. g., 38 tons truck). Please provide details when several transportation modes are used (e. g., mode 1 from location A to location B, mode 2 from location B to location C, etc). Note that if data is not available on the carrying capacity, a proxy can be constructed from the delivery frequency and the product quantity, or from	No unit	All	no

	the proportion of product from/to a specific zone or provider/retailer.			
	Variables from the carbon footprint indicator			
minN_cropX	Amount of mineral N fertilization for crop X	kgN ha^{-1}	All	Yes, per crop type
orgN_cropX	Amount of organic N fertilization for crop X	kgN ha^{-1}	All	tbc
yield_cropX	Yield for crop X	tdm ha^{-1}	All	Yes, per crop type
prop_cropX	Proportion of crop X in final product or of fodder crop X in animal diet	%	all	
meat_animal	Amount of meat per animal	t $head^{-1}$	Meat, Dairy, Sea food/fish	tbc
milk_animal	Amount of milk per animal	t $head^{-1}$ $year^{-1}$	Dairy	tbc
origin_cropX	Geographical indication on the origin of crop X (e. g., country, region, …)	na	All	no
origin_N	Geographical indication on the origin of N fertilizers (e. g., country, region, …)	na	All	no
type_phyto_X	Type of phytosanitary product X	N° unit	All	tbd
Q_phyto_X	Amount of phytosanitary product X	tbd	All	tbd
origin_phyto_X	Geographical origin of phytosanitary product X	No unit	All	tbd
type_other_input_X	Type of input X other than nitrogen and phytosanitary products (e. g., P, K, …)	No unit	All	tbd
Q_ other_input_X	Amount of input X	tbd	All	tbd
origin_ other_input_X	Geographical origin of input X (e. g., country, region, …)	No unit	All	tbd

11.4.2. Secondary variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
Ener_tpt_l	Energy used for transportation mode of product for level l	No unit	All	
Other	Other information you have and think is relevant to the carbon footprint of your case study	tbd	All	

12. INDICATOR INDEX CARD N°EN3: WATER FOOTPRINT

Coordinator: Antonio Bodini (UNIPR, Italy)

12.1. Questions we will try to answer with the indicator(s)

The water footprint of a product or a process is the amount of water that is consumed and polluted during all stages of its production. Water footprint, as composed of three metrics, is at the same time an indicator of water consumption and of water pollution. Therefore, it encompasses both quantitative and qualitative aspects. Applied to FQS, water footprint should tell us how much pressure a given FQS exerts on freshwater resources. The water footprint of a product is the sum of the water footprints of the processes/steps taken to produce the product during the whole production and within the value chain. Given the importance of this resource in food production and the pressing demand on it, reducing its consumption becomes essential for sustainability. It becomes thus important to assess the water footprint for the different food production schemes. In particular we are interested in answering these questions:

- ✓ Do FQS products have a different water footprint than their standard counterparts?
- ✓ What are the key drivers of the water footprint difference between a FQS product and its standard counterpart?
- ✓ Is there a shift in the absolute and relative composition of the water footprint between FQS products and their standard counterparts? What is the share of water footprint between the different phases within any FQS? Is the pressure in terms of blue+green+grey water footprint different for FQS product and their standard counterparts?

12.2. Indicator(s)

Three indicators compose the water footprint. They require that the main steps in any value chain are taken into account to measure the impact of the whole value chain. If different intermediate products (e.g., milk for cheese) serve the same value chain, calculation should be carefully planned considering the amount of the intermediate product(s) that is employed to obtain the final product. This aspect needs to be specified by the case study conductor.

12.2.1. Blue water footprint, in water volume per product unit (i.e. m^3/kg)

This metric is the most intuitive one as it accounts for the consumptive use of fresh surface or groundwater, the so called blue water. This metric accounts for freshwater needs in all the step-processes along the production chain: water evaporation, water that is incorporated into the products, water loss (which does not return in the same catchment area). Water that does not return in the same period, for example, it is withdrawn in a scarce period and returned in a wet period (Hoekstra et al., 2011).

12.2.2. Green water footprint, in water volume per product unit (i.e. m^3/kg)

This metric is the volume of rainwater consumed during the production process. This is particularly relevant for agricultural and forestry products (products based on crops or wood) as it refers to the total rainwater evapotranspiration (from fields and plants/plantations) plus the water incorporated into the harvested crop or wood (Hoekstra et al., 2011). This indicator corresponds to SAFA indicator E 2.1.3.

12.2.3. Grey water footprint, in water volume per product unit (i.e. m^3/kg)

This metric indicates the degree of freshwater pollution that can be associated with production in the whole value chain. It is defined as the volume of freshwater that is required to assimilate

the load of pollutants based on natural background concentrations and existing ambient water quality standards. The grey water footprint concept conveniently expresses water pollution in terms of size, which is the volume of water that is required to dilute pollutants that are produced along the value chain such that they become harmless (Hoekstra et al., 2011). This indicator corresponds to SAFA indicator E 2.2.3.

12.3. Method to compute the indicator(s) and sources of data

The three metrics that compose this indicator, in principle, are applicable to every and all the steps of the food value chain. To estimate the water footprint of a product, one will have to start by understanding the way a product is produced. For that reason, case study conductors in the "monograph outline" must identify the 'production system'. In order to calculate the water footprint, the starting point is to calculate the water footprints of the most distinctive resources (where the value chain starts) and then calculate, step-by-step, the water footprints of the intermediate products, until the final product. The first step is always to obtain the water footprints of the input products and the water used to process them into the output product. The total of these components is then distributed over the various output products, based on their volume fraction or value fraction.

The water footprint can be calculated for crops and their processed products in a FQS but also within the Local Agri-Food System (LAFS). The green and blue components in crop water use (m3/ha) are calculated by accumulation of daily evapo-transpiration (mm/day) over the complete growing period and the water that is incorporated in crop plants. Evapo-transpiration from a field can be either measured or estimated by means of a model based on empirical formulas. Measuring evapo-transpiration is costly and unusual. Generally, one estimates evapotranspiration indirectly by means of a model that uses data about climate, soil properties and crop characteristics as input. In particular, estimating the green, blue and grey water footprints of growing a crop requires data sources that concern:

- ✓ climate data (temperature, humidity, rainfall patterns, wind speed, from the nearest and most representative meteorological station(s) located near the area);
- ✓ crop parameters: crop coefficients (specific evapo-transpiration) and cropping pattern (planting and harvesting dates);
- ✓ crop yields: yield data can best be obtained locally;
- ✓ soil properties (i.e., soil mixture, soil nature): local data provided by regional agricultural plans should provide this information. Also, the FAO GeoNetwork website provides maximum available soil moisture data for certain types of crops;
- ✓ irrigation: usually, irrigation maps such as The Global Map of Irrigation Areas (GMIA) version 4.0.1 can be employed (Siebert et al., 2007). However, we can rely on local documentation (i.e., regional water protection plans, agricultural and rural planning); also the institutions in charge of water distribution and regulation of water use by farms provide data about irrigation as they have record of each farm request;
- ✓ fertilizer application rates: from local data (agricultural organization and stakeholders).
- ✓ pesticides application rates per typology of chemical (i.e., herbicides, pesticides): from local data (agricultural organization and stakeholders);
- ✓ leaching-runoff fractions: no databases seem to be available. We will have to work with experimental data from field studies and make rough assumptions. We can assume 10 per cent for nitrogen fertilizers;

- ✓ water quality standards: preferably use local standards as regulated in legislation. If no ambient water quality standards are available and the water body is to be suitable for drinking, drinking water standards can be applied. See, for example, EU (2000) and EPA (2005);
- ✓ natural concentrations in receiving water bodies: in more or less pristine rivers, we can assume that natural concentrations are equal to the actual concentrations and thus rely on long-term daily or monthly averages as measured in a nearby measuring station. River basin authorities should possess data about water quality in each of the water bodies in their district.

Several models are available to calculate the water footprint and require the data sources listed above. CROPWAT, developed by the FAO (FAO, 2010), provides a comprehensive online manual for the calculation of crop water requirements and irrigation requirements.

The grey component of the water footprint of growing a crop or tree (m^3/ton) is calculated as the chemical application rate to the field per hectare (kg/ha) times the leaching-runoff fraction (α) divided by the maximum acceptable concentration (kg/m^3) minus the natural concentration for the pollutant considered (kg/m^3) and then divided by the crop yield (ton/ha).

As a first proxy for blue water, we could use water withdrawals (both surface and underground) that are in general available from agricultural statistics offices. However, these data do not inform about the true blue consumptive water use, but it can be used as a proxy when the data required for the estimations specified above are lacking.

Food processing. The water footprint of output products is calculated based on the water footprints of the input products (i.e., milk production for cheese) and the process water footprint when processing the inputs into the outputs. The amount of water that evaporates during storage, transport, processing and disposal is generally not measured directly, but can be inferred from the difference between abstraction and final disposal volumes. The best sources for blue water consumption in manufacturing processes are the manufacturers themselves or regional or global branch organizations. For estimating the water footprint of a product, we will have to draw the blueprint of the production system making sure that a limited number of linked process steps are considered.

The Ecoinvent (Ecoinvent, 2012) database dedicated to LCA methods provides further information instrumental to calculating water consumption in production processes, with particular attention to the processing, packaging and distribution of the final products phases.

The datasources can be summarized as follows:

- ✓ Local statistics;
- ✓ Planning documents (i.e. water protection plans, river basin authorities' reports);
- ✓ Climatic data, climatic maps;
- ✓ Local farmer accountancy data;
- ✓ Report from farmer interviews;
- ✓ FQS technical specifications;
- ✓ Regional/national statistics.

12.4. Adaptation of the method to SFSC and PSFP

SFSCs and PSFPs concern a basket of products and collecting the variables listed in section 12.5 for each product will likely exceed the resources available for the S2F project.

WP6 (PSFPs) will therefore use existing estimates of water footprint per kg of product from conventional and organic production systems, multiplied by the product volumes procured in the case studies.

WP7 will not employ this indicator, as less relevant for SFSCs.

12.5. List of underlying variables to be collected

12.5.1. Key variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
Crop/Fodder crop management				
irrigation_water	Amount of surface and underground water used for irrigation	m^3 ha^{-1}	All	
rainfall	Amount of rainfall	mm	All	
prop_cropX	Proportion of crop X in final product or of fodder crop X in animal diet	percent	all	
yield_cropX	Yield of crop X	Ton of dry matter ha^{-1}	All	Yes, per crop type
Animal characteristics				
water_cons_animal	Amount of water that is consumed by productive animals	Liter $head^{-1}$ $year^{-1}$	All	
meat_animal	Amount of meat per animal	t $head^{-1}$	Meat, Dairy, Sea food/fish	tbc
milk_animal	Amount of milk per animal	t $head^{-1}$ $year^{-1}$	Dairy	tbc
Farm infrastructure and management				
minN_cropX	Amount of mineral N fertilization for crop X	KgN ha^{-1}	All	Yes, per crop type
orgN_cropX	Amount of organic N fertilization for crop X	KgN ha^{-1}	All	tbc
type_phyto_X	Type of phytosanitary product X	No unit	All	tbd
Q_phyto_X	Amount of phytosanitary product X	tbd	All	tbd
Variables relevant to all levels of the value chain				
surface_water_nitrate	Average nitrate concentration in rivers in the production area	mg/L	all	
groundwater_nitrate	Average nitrate concentration in aquifers in the production area	mg/L	all	
surface_water_phyto	Average phytosanitary products concentration in rivers in the production area	mg/L		
groundwater_phyto	Average phytosanitary products concentration in aquifers in the production area	mg/L	all	

12.5.2. Secondary variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
Crop/Fodder crop management				
soil_characteristics	Texture, soil moisture, run –off coefficients and properties	tbd	all	Probably
other_climate	Other climate data needed to estimate evapotranspiration through models (CROPWAT)	tbd	All	Probably
Products				
water_processing	Water consumption for food processing (data about single process from local productions or drawn from Ecoinvent LCA database)	tbd	all	Yes
water_packaging	Water consumption for packaging (data about single processes from local productions or Ecoinvent LCA database)	tbd	all	Yes
water_distribution	Water consumption for food distribution (data from distributors or estimated from Ecoinvent LCA database)	tbd	all	Yes
waste_water_treatment	Amount of water used at the processing stage(s) that is treated before being discharged	$m^3\ Kg^{-1}$	all	Yes

13. INDICATOR INDEX CARD N°SO1: EMPLOYMENT

Coordinator: Mohamed Hilal (INRA-D, France)

13.1. Questions we will try to answer with the indicators

- ✓ Are FQS products more or less labour-intensive than their standard counterparts?
- ✓ Is labour productivity in FQS value chains higher or lower than in the value chains of their standard counterparts?
- ✓ Do FQS products have an excessive employee turnover, which means an employment retention problem?

13.2. Indicators

Three "employment" indicators will be computed for each FQS and its standard counterpart. Two of them rely on variables that should be readily available in most case studies and are therefore classified as "key". The indicators apply to all types and sizes of enterprises, at all levels of the value chain. The case study conductor must specify the concerned level of the value chain and which "product" is actually considered (e.g., milk or cheese?).

13.2.1. Key indicators

13.2.2. Labour-to-production ratio, AWU per ton of product

Number of **annual work unit per ton** of product (totlab_awu/prod_tot, see section 13.5 for a precise description of these abbreviations). The labour use ratio indicator, calculated on the basis of output, reflects labour requirements for a unit of physical output (Just and Pope, 2001).

13.2.3. Profit-to-labour ratio, € per AWU

The labour productivity is measured as **profit-to-labour ratio** (Latruffe et al., 2005). It is expressed as the economic profit (net income) per annual work unit (ecopro_eur/totlab_awu, refer to section 13.5).

13.2.4. Secondary indicator: undesirable employee turnover rate, %

In the agricultural sector, activities are highly affected by the seasonality of production which, in turn, is a major determinant of employees turnover/employment dynamics. Beyond this structural impact, an excessive rate of **undesirable employees turnover** can be expensive and can upset activities, which in turn affect productivity. The undesirable employee turnover (turnover_per/reglab_per, refer to section 13.5) focuses on the number of employees who freely choose to leave a job (voluntary resignations) when employers did not request these departures (Griffeth and Hom, 2001).

13.3. Method to compute the indicators

Labour inputs are estimated using the calculation of labour units based on standardised figures, e.g., one Annual Work Unit, abbreviated AWU, for each person between 18 and 65 years who works full-time on the farm(s)/business unit(s). One annual work unit corresponds to the work performed by one person who is occupied on a full-time basis. Full-time means the minimum hours required by the relevant national provisions governing contracts of employment. If the national provisions do not indicate the number of hours, then 1 800 hours are taken to be the minimum annual working hours: equivalent to 225 working days of eight hours each. As the volume of labour is calculated on the basis of fulltime equivalent jobs,

nobody can represent more than one AWU, even if someone works for more than the maximum number of hours defining full-time work in that Member State.

Economic profit (average income) is defined as the difference between the net value added (total revenue earned) and the costs of production (total expenses that the enterprise has incurred, including all the operating expenses). See index card n°Ec1 for details.

For example, in FADN survey, average income is measured using farm net value added (FNVA). FNVA is equal to gross farm income minus costs of depreciation. It is used to remunerate the fixed factors of production (labour, land and capital), whether they are external or family factors. As a result, agricultural holdings can be compared regardless of the family/non-family nature of the factors of production used.

FNVA = output + Pillar I and Pillar II payments + any national subsidies + VAT balance - intermediate consumption - farm taxes (income taxes are not included) - depreciation.

The **undesirable employee turnover** rate is the ratio of the total voluntary resignations during a period of reference to the average annual workforce.

The three indicators can be calculated with a few key variables (see 13.5.1) and some secondary ones (see 13.5.2) very common in farmer/business unit accountancy data or can be obtained from interviews or technical specifications. The variables are also present in regional, national or European statistics (Survey on the structure of agricultural holdings, economic accounts for agriculture and structural business statistics).

13.4. Adaptation to PSFPs and SFSCs

For PSFPs, this indicator will be replaced by a subjective measure of job satisfaction.

For SFSCs, labour-to-production ratio will be computed only at the farm level and in relation to the products considered in the case study.

13.5. List of underlying variables to be collected

Note that the following variables are to be filled in, to the extent possible, for each step in the value chain (farm, collection, processing plant, …). See monograph outline to ensure that the steps in the value chain used here are consistent with the value chain diagram to be provided there.

It is important to recognise that the most important differences in employment indicators may not appear at the same level of the value chain in different types of schemes (FQS, SFSC and PSFP). As a result, the following prioritization is suggested:

Value chain level (l)	FQS	SFSC	PSFP
Farm	key	key	key
Processing	key	secondary	key
Transportation	secondary	secondary	secondary
Retail	secondary	secondary	secondary

13.5.1. Key variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
	Labour use			
totlab_awu_l	Total labour force directly employed by holdings and/or business units during a period of reference	awu	All	tbc

	calculated on the basis of fulltime equivalent jobs at level l of the value chain			
	Economics			
ecopro_eur_l	Net value added or net result or net margin at level l of the value chain. See index card n°Ec1 on economic indicators for details.	Euros	All	tbc
Prod_lz	**Quantity of production at level l in the LAFS.** If zone-specific data is not available, a proxy may be constructed based on the aggregated production at level l. Note that only production dedicated to the studied product should be counted (e.g., not all the milk in the LAFS is used to process the studied cheese FQS). Also note that zones within the LAFS (lz) with the largest quantities in kg year^{-1} should be prioritized in the data collection effort. See card n° En2 on foodmiles for details and note that providing values per zone "z" is not necessary here..	kg year^{-1}	All	tbc

13.5.2. Secondary variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
	Labour use			
reglab_per_l	Regular labour force[9] directly employed by holdings and/or business units at level l of the value chain	persons	All	tbc
	Undesirable employee turnover			
turnover_per_l	Total voluntary resignations during a period of reference at level l of the value chain	persons	All	tbc

[9] Regular labour force is defined as labour force employed all year round and is opposed to seasonal labour force, that is labour employed only for a few weeks or months for a specific task (e.g. fruit harvest).

14. INDICATOR INDEX CARD N°SO2: VALUE CHAIN GOVERNANCE

Coordinator: Paul Muller (INRA-D, France)

14.1. Aims and questions addressed through the indicator(s)

In a general way, food supply chains can be defined as sets of actors performing production, collection, processing and marketing tasks in order to satisfy food needs and requirements expressed by end consumers. Supply chains are usually viewed as organized along vertical relationships starting from raw agricultural goods to end products and either go through markets, or take the form of (quasi-) integration (Williamson, 1996). However, such a view of vertical relationships is not entirely satisfying in the case of FQS. As these rely on the existence of specifications that have been negotiated and accepted by stakeholders, FQS supply chains highlight the existence of collective strategies (Astley and Fombrun, 1983) and the need for considering their governance as key to their success. Governance is here underlaid by the idea that no single actor, whether public or private, is able to master all decision processes and that the complexity of power relations, and the productive problems to be solved at the supply-chain level, call for collective action (Torre and Wallet, 2013). Governance therefore aims at regulating conflicts of interests and of power determining the modalities of resource allocation among stakeholders through recourse to negotiated cooperation. Governance highlights the existence of complex horizontal and vertical relations associating cooperation and competition (Bengtsson and Kock, 2000).

Therefore, the proposed indicators aim to better understand governance patterns in FQS supply-chains. In so doing, they aim to address the following questions:

- ✓ Do FQS supply chains exhibit specific governance patterns compared to their standard counterparts?
- ✓ How do these patterns differ between FQSs?
- ✓ Can those specific governance patterns be considered as key for explaining value creation?

14.2. Indicator(s)

As our conception of value chain governance relies on the way productive actors manage to coordinate collective action and strategies, the indicators we would like to develop are of two kinds.

A first indicator is aimed at qualifying vertical and horizontal relationships between the actors. In this way, we rely on the typology of relationships developed in the frame of the 'coopetition' literature. This highlights the fact that relations between actors globally range from purely cooperative to purely competitive. It designates relations between two or more actors simultaneously involved in cooperation and competition interactions (Bengtsson and Kock, 2014). This distinction is key for understanding how firms manage to simultaneously engage into collective value creation activities, while individually reaping the value created through them (Ritala et al., 2013). As such, this indicator parlty reflects territorial and social cohesion.

A second indicator is complementary to the previous one because it is specifically concerned with the capacity of individual stakeholders to capture value created throughout value chains. It corresponds to the bargaining power of individual actors. If standard microeconomics has essentially equated bargaining power to market power, such an approach is limited to similar products and can hardly be applied to the analysis of value chains. This is why we rather adopt the five forces model of Porter. This model allows to assess actors' bargaining power at the value chain level while considering at the same time the threat of possible substitutes (Porter,

2008a). The five forces model was originally designed for assessing performance at the firm level through an explicit account of its environment (Porter, 1979). The model has been then applied to industries and value-chains and used for appraising the bargaining power at each of their stages (Besanko et al., 2009; Porter, 2008a). More precisely, the model is able to appraise a firm's bargaining power through the influence of five forces: the industry rivalry, the threat of new entrants, the threat of substitute products and services, bargaining power of suppliers, the bargaining power of customers (Figure 4). It is important to note that three forces (threat of new entrants, threat of substitute products and industry rivalry) apply at the considered stage of the value-chain and may thus be qualified as "horizontal forces" while the two others (bargaining power of suppliers and of customers) are concerned with vertical relations who are, in turn, expected to be subject to the same types of horizontal forces (see Crook & Combs, 2007). It follows that the bargaining power of suppliers and of customers in turn depends on horizontal forces at their respective levels.

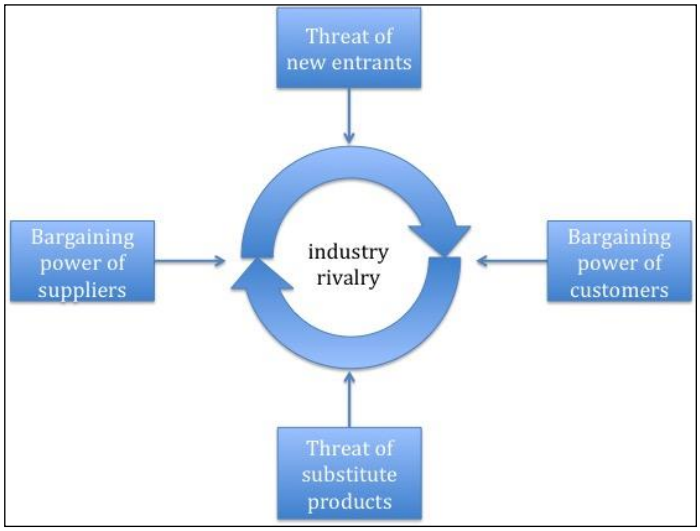

Figure 4. Original five forces model

Where:

- ✓ Internal rivalry refers to the level of horizontal competition existing between firms producing the same product or close substitutes and who are, therefore, located at the same stage of the value chain. For instance, in the French Comté value chain, cheese processors are to be considered as competitors from an economic point of view. The level of internal rivalry depends on the number of competitors at the considered stage and on their relative size.
- ✓ The threat of new entrants is expected to decrease the bargaining power of established firms at the considered stage of the value chain. In turn, it depends on the capacity of established firms to settle barriers to entry that, in turn, depend on different factors: to profit from economies of scale, to propose specific products and to exploit specific resources. In this way, highly specific productions are expected to be associated with higher barriers to entry than commoditized ones.
- ✓ The threat of substitute product and services depends on the capacity of alternative products to fulfil the same needs and functions than existing product. As for the threat of new entrants, highly specific products are expected to have an asset over commoditized ones.

14.3. Method for computing the indicators

Knowledge of the global structure of the FQS value chain through a value chain diagram forms a prerequisite to the construction of governance indicators (coopetition indicators and bargaining power). The construction of a value chain diagram aims at depicting its main features: its main processing steps, the main actors involved and their activity (see the monograph outline for guidelines on how to construct a value chain diagram).

14.3.1. Coopetition index

This index has to account for the balance between cooperation-oriented and competition-oriented behaviours. As coopetition consists in the co-occurrence of antagonistic behaviours, authors have adopted a matrix representation (adapted from Lado, et al. 1997).

Cooperative orientation	High	Collaborative behaviour	Syncretic/coopetitive behaviour
	Low	Monopolistic behaviour	Competitive behaviour
		Low	High
		Competitive orientation	

Table 6. Coopetition index

Therefore, this indicator is made up of two distinct components, one competitive-based relying on "traditional" variables for each supply chain level (number of firms, market share of the main firms) and one cooperation-based blending different types of phenomena (importance of agricultural cooperatives, existence of professional unions, etc.). This indicator is related to SAFA indicator G 3.3.1.

14.3.2. Bargaining power

This indicator, computed for each value chain level, aims at assessing the relative bargaining power among classes of actors. In so doing, it would become possible to qualify supply chains not only through loci of asymmetries in their bargaining power, but also in the source of those asymmetries: whether they are due to market power or to the possession of specific resources.

By cross checking coopetition and asymmetries in the bargaining power, it becomes possible to describe supply chain governance patterns along several ideal-typical categories (Figure 5).

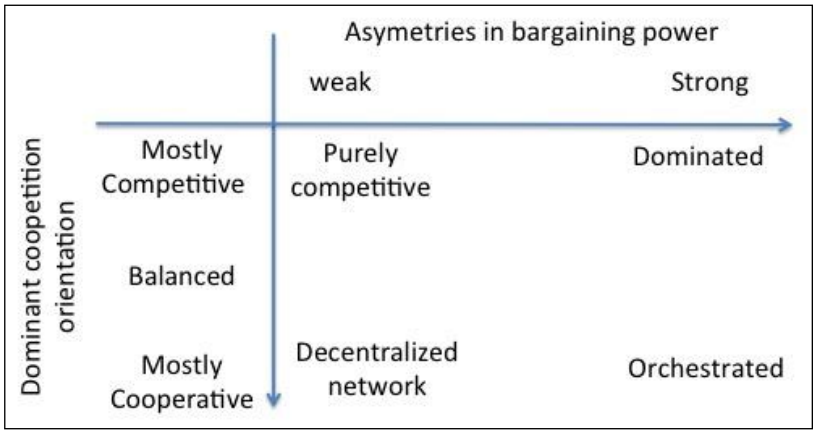

Figure 5. Value-chain ideal-types through dominant coopetition and bargaining power patterns.

By crossing coopetition and bargaining power dimensions, it is possible to identify different 'ideal' types of supplychains:

- ✓ Purely competitive supply chains are characterized by dominant competitive orientations and no category of actors is able to gain significant power. Vertical relations are here assumed to be mostly market-based while horizontal relations are seldom.
- ✓ Dominated supply chain are characterized by the existence of a dominant actor / category of actors which takes advantage of its relative position, combined to the relative absence of cooperation among other actors, to settle his power (Filippi and Muller, 2013).
- ✓ Decentralized networks are characterized by the existence of dense cooperation relations among actors but none of them is able to gather significant market power or control over specific resources, preventing him to attract most of bargaining power.
- ✓ Orchestrated supply chains are characterized by the existence of dense cooperation relations among actors even though a few actors or a category of actors enjoys a significant bargaining power. In this case, depending on the source of the bargaining power (market power vs. possession of specific resources), either his individual bargaining power is balanced by coalitions of other categories of actors or the actor plays the role of an orchestrating leader in the sense of Dhanaraj & Parkhe (2006) (Filippi and Muller, 2013).

14.3.3. Data collection

Main sources for data collection are:

- ✓ Specifications of each FQS supply chain
- ✓ Key informants for acquiring knowledge of the structure of the supply chain
- ✓ Main economic data concerning the supply-chain

Moreover, as governance is dealing with the way collective strategies and projects are built, monographies are considered as key analytical tools.

14.3.4. Prioritization suggestions (key vs secondary variables)

It is important to recognise that the most important differences in value chain governance may not appear at the same level of the value chain in different types of schemes (FQS and SFSC). As a result, the following prioritization is suggested:

Value chain level	FQS	SFSC
Farm	key	key
Processing	key	secondary
Transportation	secondary	key
Retail	key	secondary

14.4. Adaptation to PSFPs and SFSCs

With regards to PSFPs,the governance indicator does not transfer very well, and thus will not be used.

In the case of SFSCs,this governance indicator over the balance of power between actors is interesting and certainly relevant. As emphasised by the literature, 'fairer' power relations characterise SFSCs, in contrast to conventional food systems whereby producers tend to be more passive and subordinated (Schermer et al., 2011; Galli and Brunori, 2013). Moreover, the minimal number of intermediaries involved in SFSCs also imply that producers can enjoy a

higher degree of independence in production and marketing decisions (Wittman et al., 2012; Schermer et al., 2011). However, some adaptation in the variables may be required also due to data requirements.

14.5. List of variables and associated indicators

As our analysis focuses on governance dynamics involving vertical and horizontal relations among actors, data has to be collected for each stage of the value chain (through the prioritization list given in table 1): production of agricultural good, collection, processing, distribution. A list of variable and related indicators is provided in table 2. A method for computing the indices out of variables is provided in the annex.

Variable	Description	Unit	Indicator			Key variable?	References
			Coopetition		Bargaining power		
			Compet.	Cooper.			
num_compet_l	Number of entities producing similar/substituable products at level l of the value chain	No unit	X			X	Barney (1986); Porter (2008a)
trials_l	Are stakeholders involved in legal action with other actors involved at level l of the value chain?	Boolean	X				Dowling et al. (1996); Cusin et al. (2013); Loubaresse & Pestre (2014)
compet_landscape_l	Has the competitive structure (entry of new firms, withdrawal/bankruptcy…) at level l of the value chain changed significantly in the period 2010-2015?	5-point Likert scale (see annex) + short description	X				Barney (1986)
spec_content_l	Do the specifications precisely describe and put heavy constraints on the production process (production technology, origin of inputs, …) at level l of the value chain?	4-point Likert scale (see annex) + short description		X (horizontal & vertical)		X	Filippi & Muller (2013)
prop_contract	Proportion of transacted volumes that are subject to long-term contracts between value chain levels	percent		X (vertical)		X	Amisse et al. (2012)
coop_l	Market share of coops at level l of the value chain	percent		X (vertical)			Filippi & Torre (2003); Barjolle & Sylvander (2002)
unionFSC_l	Are firms at level l of the value chain involved in a product management consortium?	Boolean + description of their contribution		X		X	Torre (2002)
union_others_l	Are firms at level l of the value chain involved in other professional unions linked to the product?	Number + Short description of their main member categories		X (horizontal & vertical)			Amisse et al. (2012)
prod_proc_l	Does the level l of the value chain contribute to the differentiation of the product with potential substitutes	4-point Likert scale (see annex) + short description			X	X	Filippi & Muller (2013)
spec_res_l	Does the level l in the value chain require the possession of specific resources (natural, physical, knowledge/skills…) not accounted for in the specifications?	4-point Likert scale (see annex) + short description			X		Filippi & Muller (2013)

marketshare1_l	Market share of main actor at level l of the value chain	percent	X		X	X	Porter (2008a)
marketshare2_l	Market share of 2nd main actor at level l of the value chain	percent	X		X		(Porter, 2008b)

14.6. Annex: indicator computation method

Both the bargaining power and coopetition indices (through the competition and cooperation sub-indices) blend variables based on quantitative and scale values. In order to cope with this issue, it is here proposed that each variable is associated with a score and that the cooperation and bargaining power overall scores are obtained by summing up related variables individual scores. Threshold values as well as weights for each variable are indicative and will be finalized after the results from the pilot case studies. A formalization proposal for each index is given in Table 7. Setting the competition index follows a more algorithmic approach (Figure 6).

In a second step, values of competition, cooperation and bargaining power values obtained for each level of the supply chain will be aggregated for qualifying the value chain according to Table 6.

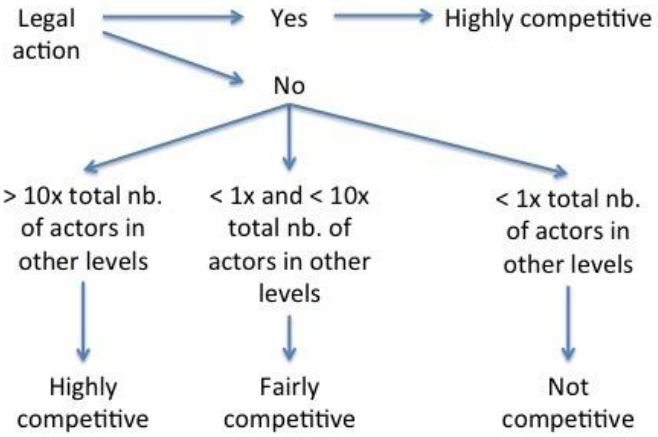

Figure 6. Algorithm for setting the value of the competition index

Index	Variable (section 14.5 above)	Value and associated scores
Coopetition	compet_landscape_l	Not at all: firms representing less than 5% of the total turnover entered/ withdrew: 0 Poorly: firms representing between 5% and 10% of the total turnover entered/ withdrew: 1 Significantly: firms representing between 10% and 20% of the total turnover entered/ withdrew: 2 Fundamentally: firms representing more than 20% of the total turnover entered/ withdrew: 3
	spec_content (4-point Likert scale)	No specific requirement / no: 0 Specific requirement putting light constraints on the production process / low barrier to the entry of potential competitors: 1 Specific requirement putting significant constraints on the production process / significant barrier to the entry of potential competitors: 2 Specific requirement preventing the entry of potential competitors: 3
	prop_contract	[0%; 25%[: 0 [25%; 50%[: 1 [50%; 75%[: 2 [75%; 100%]: 3
	coop_l	[0%; 25%[: 0 [25%; 50%[: 1 [50%; 75%[: 2 [75%; 100%]: 3
	unionFSC_l	Yes: 1 No: 0
	union_others_l	Yes: 1 No: 0
	Cooperation level and associated global score	[0;1]: very low [2;4]: low [5;6]: medium [7;9]: strong [10;11]: very strong

Bargaining power	prod_proc_l	Product of level l of the value chain is considered as commoditized: 0 Product of level l is specific but could be technically replaced by substitutes: 1 Product of level l is specific and cannot be technically replaced by substitutes: 2 Product of level l is specific and is fundamental for the specificity of the end product: 3	
	spec_res_l	Resources are generic: 0 Resources are specific but could easily / at low cost be technically replaced by substitutes: 1 Resources are specific but could hardly / at high cost be technically replaced by substitutes: 2 Resources are specific and cannot be technically replaced by substitutes: 3	
	marketshare1_l	[0%; 25%[: 0 [25%; 50%[: 1 [50%; 100%[: very strong	
	marketshare2_l	[0%; 25%[: 0 [25%; 50%[: very strong	
	Bargaining power level and associated global score	If neither marketshare1 nor marketshare2 values are "very strong"	[0;1]: very low [2;3]: low 4: medium [5;6]: strong 7: very strong
		Else	very strong

Table 7. Variable scores and construction of indices for each value-chain level

15. INDICATOR INDEX CARD N°SO3: EDUCATIONAL ATTAINMENT

Coordinator: Matthieu Duboys de labarre (INRA-D, France)

15.1. Questions we will try to answer with the indicator

- ✓ Is educational attainment of people who work in the FQS value chain higher than the educational attainment of people working in the counterpart product?
- ✓ If so, is this difference specific to a particular level in the value chain?
- ✓ Are there differences in educational attainment between different forms of production (FQS, SFSC, PSFP) or products (meat, dairy, cereals, etc.)?

15.2. Indicator

15.2.1. Background for the link between social capital and educational attainment

Both Putnam (2000) and Halpern (1999) identified education as key to the creation of social capital and greater educational achievement as an important outcome.

Education could be considered as an important cause of many forms of political and social engagement (Putnam, 1999). For these authors, a rise of educational attainment has a beneficial effect on trust and social engagement which are themselves key components of social capital. It is specifically the case for empirical political behaviour research which consistently observed a robust and positive relationship between education and political engagement (Hillygus, 2005). Educational attainment is also a predictor of political trust and liberal social attitudes (Schoon and al., 2010).The measurement of educational level allows us to indirectly measure some components of social capital.

The indicator will be constituted by the educational level of people who work in the supply chain.

15.2.2. Definition of the indicator

The educational attainment of a person is the highest level of an educational programme the person has successfully completed. The International Standard Classification of Education (ISCED) 2011 is the standard classification on educational attainment at the EU level.
The expression 'level successfully completed' must be associated with obtaining a certificate or a diploma.
At the European level, this indicator is used in several surveys. For example, it can be observed that from 2001 to 2006, in EU-27 the level of educational attainment of employees in agri-food sectors (agriculture, fishery, food and beverage) has increased considerably. The percentage of those with low educational level dropped from 52.7 % in 2001 to 41.4 % in 2006, whereas the medium and high educational level increased from 40.2 % to 50.2 %, and from 7.1 % to 8.4 % respectively (CEDEFOP, 2007). If we look at geographical differences, we can observe that the lowest rates of educational attainment are found among predominantly rural regions of Southern European countries but these rates are evolving positively (Rural Development in the European Union - Statistical and economic information – 2013). The main source of data about educational attainment for Europe is the Labour force survey from the Eurostat.

15.3. Method to compute the indicator

15.3.1. General method

As for all variables, data on educational level of workers will be collected from secondary sources if these are available (reports, existing database,etc.). Alternatively, one could survey workers/business owners and ask them the following question:

What is the highest level of education or training that you/your employees have successfully completed?

We will use The International Standard Classification of Education (ISCED) 2011.

The answer would be classified into five categories (note that the original result should be saved in case categories are modified later on):

- ✓ Primary education or less / less than middle school degree
- ✓ Secondary education or equivalent / middle school degree or equivalent
- ✓ Short cycle tertiary education, post-secondary non tertiary education or equivalent (one or two years after high school)
- ✓ Bachelors or equivalent level, three or four years after high school
- ✓ Higher education or equivalent level, at least five years after high school (e. g., master degree, PhD, …)

We take account of vocational education if this permits to complete a level as above. It is not necessary to have information about the nature of education attainment (e.g. degree in agriculture, media studies or arts…)

15.3.2. Prioritization suggestions (key vs secondary variables)

It is important to recognise that the most important differences in educational attainment may not appear at the same level of the supply chain in different types of schemes (FQS, SFSC and PSFP). As a result, the following prioritization is suggested:

Value chain level (l)	FQS
Farm	key
Processing	key
Transportation	secondary
Retail	secondary

15.4. Adaptation to PSFPs and SFSCs

This indicator will neither be used for PSFPs nor for SFSCs, as not relevant. For SFSCs, some aspects of social capital will be captured through the qualitative fieldwork (refer to task 7.1 outlined in WP7 methodology) and some specific variables may be developed in the pilot test study.

15.5. List of underlying variables to be collected

15.5.1. Key variables

Variable name	Description	Unit	Product types for which the variable is relevant	Default value available?
prop_primary_l	Proportion of the workforce at the level l of the value chain whose highest educational attainment is "Primary education or less / Less than middle school degree". Ideally the workforce is composed of permanent and seasonal workers (if the data of secondary sources permit it). If not, we must focus only on permanent workers.	percent	All	
prop_secondary_l	Proportion of the workforce at the level l of the value chain whose highest educational attainment is "Secondary education or equivalent / middle school degree or equivalent"	percent	All	
prop_short_tertiary_l	Proportion of the workforce at the level l of the value chain whose highest educational attainment is "Short cycle tertiary education, post-secondary non tertiary education or equivalent (one or two years after high school)"	percent	All	
prop_license_l	Proportion of the workforce at the level l of the value chain whose highest educational attainment is "Bachelors or equivalent level, three or four years after high school (e.g., license, …)"	percent	All	
prop_master_l	Proportion of the workforce at the level l of the value chain whose highest educational attainment is "Higher education or equivalent level, at least five years after high school (e.g., master degree, PhD, …)"	percent	All	no

16. INDICATOR INDEX CARD N°SO4: TRANSMISSION OF KNOWLEDGE AND KNOW-HOW

Coordinator: Marie-Hélène Vergote (INRA-D, France)

16.1. Aims and questions addressed through the indicator

Sustainability of an initiative relies, inter alia, on social dynamics within the initiative, be it a FQS a SFSC or a PSFP scheme. These social dynamics comprise a dimension referring to the ability to preserve and to transfer specific knowledges and know-how. If the formalization of a specification helps to stabilize some elements of knowledge, knowing perfectly the specification does not guarantee mastery of knowledge and skills. This also relies on social interactions.

The first kind of indicator of transmissibility is the effective transmission: the remaining of the initiative (its age) and its evolution in number (increase, stability or decrease of its members) and also its renewing, these information arising from monographic study and from other indexes (See age repartition).

A second kind of indicator, the one we describe hither, aims to give an account of the propensity of transmission within the initiative members. The assumption that members of a consortium supporting an initiative constitute a Community of Practices (COP, see box below) provides a frame to explore knowledge and know-how sustainability.

The notion of COP was created to study *situated learning* (Lave and Wenger, 1991). COP or *Constellation of Communities of Practices* is an interesting descriptive concept, as it allows to transcend the boundaries of the firms or organizations and helps giving an account of what's going on between different individuals "sharing a concern, a set of problem or a passion about a topic and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger et al., 1998, p.4). This definition can apply to members of a group supporting a FQS, a SFSC, or a PSFP initiative. Despite COP is rather an ideal-type, as it remains uncommon in real life (Cox, 2005), it matches with these initiatives relying on self-organization of local stakeholders.

According to the theoretical frame of COP, we will assume on the one hand, that stakeholders involved in the initiative constitute a community (or a constellation of communities) in the three dimensions described by Wenger (1998): mutual commitment, common project and shared repertoire.

Mutual commitment - the belonging to a community is defined as the result of commitment of its members, in actions of which they negotiate the sense, the ones with the others. It is based on knowledge complementarities and on the ability to connect their skills the ones with the others. It also means mutual aid. Some indices of commitment in a community of practice can be caught observing interactions: no introductory preambles in conversation, as if interactions form a continuous process in time, jargon, shortcuts in communication, shared stories, private jokes, knowing what the other know, their skills and how they can contribute to collective action, sustained mutual relations whether (Harmonious or conflictive), a common ways of committing to doing things together, shared discourse that reflects a certain way of seeing the world.

Common project (or joint enterprise) - which does not only refers to a common goal, but rather to collective action.

Shared repertoire - directory of elements such as physical supports (model, prototype), routines, words, tools procedures, stories, gestures, symbols, altogether composing resources for action.

On the other hand, we will follow the assumption that the practices within the community, rely on an equilibrium between two processes: *participation*, as an ability to discuss and act, to make sense, and *reification* creating focal points (documents, instruments, projections...) around which negotiation can develop. These two processes allow continuity and richness of the meanings produced together. For a constellation of Communities of practices, the continuity results from relationships between communities it comprises, including boundary objects, overlaps between practices, wordings traveling between communities and which aggregate (Chanal, 2000).

This equilibrium between participation and reification seems particularly relevant to give an account of sustainability of knowledges and know-hows. Indeed through participation, practices may be discussed and then can be changed: knowledges, know-hows, may be explicitly questioned and can be enriched, and might evolve. In fact they are made a living dimension. Then, reification described as creating focal points such as documents, instruments, projections, is associated with formalization, and stabilization. It allows leaving traces on knowledge and know-how that may be discussed later-on, and negotiated when needed. The hypothesis underlying the indicator we propose is that "being alive" for knowledges and know-how is a condition for transfer and it relies on the balance between participation and reification. As Chanal (Ibid) explains, two much participation leads to destabilization, and two much of reification prevents from evolving. It might lead to "sclerosis". This balance reminds Edgar Morin's theory on order and disorder.

Thereby, we need an indicator allowing us to give an account of participation's weight in relation with the weight of reification. The variables employed will give an indication of sustainability when put together as suggested in Figure 7.

Participation	Too much of participation Lack of stability	Sustainability (testified by the evolving of the specification)
weak/no participation	-	Too much of reification Lack of evolution
Participation variables ↑ Reification variable→	weak/no reification	Reification

Figure 7. Model of knowledges and know-how sustainability through equilibrium between participation and reification variables

16.2. Indicator

The indicator will be built from two kind of variables: participation variables and reification variables. Reification and participation variables will allow filling Figure 7.

16.2.1. Participation variables

The chosen variables aim to give an account of the intensity of interactions within the group, allowing both explicit and tacit knowledges and know-hows to be exchanged. We propose to measure the effective participation of stakeholders to meetings. It might give an idea of the effective influence stakeholders think they have within the initiative. When participation will

be equal or exceed the counterfactual participation we will consider that there is participation. Under the value of counterfactual participation we will consider it as a low participation.

16.2.2. Reification variables

We try to appraise the intensity or formalization work, through documents' elaboration and through situations of justification supported with traceability processes (audit situations). When the intensity of formalization work is equal or exceed the counterfactual variable will consider that there is reification. Under the value of counterfactual variable, will consider it's a low reification.

16.3. Method for computing the indicators

To help interpretation, the results obtained in each case-study will be matched with some other index and with some information learned from the monographic study.

- Matching knowledge sustainability with age repartition index
- Matching knowledge sustainability with several Information's
    - With the evolution of the number of participant at the level of producers and at the level of manufacturers
    - With the finding of evolutions in the specification of the product, which will testify that the initiative is alive
    - With the existence of obvious links with other organizations testified with the finding that members of the initiative are also participants in local, technical or professional, meetings and working groups.
    - With the existence of one or more festival(s) especially dedicated to the product, showing link of the initiative with cultural life
    - With the existence of device(s) dedicated to the training in specific knowledge and know how related to the product.

16.4. Adaptation to PSFPs and SFSCs

This indicator is neither relevant for PSFPs nor for SFSCs. For SFSCs some similar information may be gathered through the qualitative fieldwork in WP7 (task 7.1), which will closely explore, in the selected case studies, the organisation of the initiative, current practices and motivations of the participants involved.

16.5. List of variables and associated indicators

Primary Variables	Description	Units	Objective	Applies to	Counterfactual
Variables related to effective participation	Attendance at the general assembly (nb of attendees / nb of members) (PDO, PGI and SFSC or PSFP structured as an association) in 2015 (and if possible, in 2010)	Percent	Assessing the level of participation	All (FQS)	Attendance at the general assembly of the main national professional federation dedicated to the same kind of product.
Variables related to reification	Stakeholders have to register some information along both the processes of production / of transformation. This way they gather evidence of the compliance with specific requirement of the FQS or other initiative. How many traceability data are so required, along farming process/ along transformation process?	Number of traceability data registered to testify specificity of quality	Assessing the importance of stabilization devices	All (FQS)	- two kind of counterfactual that will be discussed on the October meeting > Number of food safety compliance criteria that need to be registered. If food safety is basic how much more endeavour is necessary to testify quality level or > Nb of criteria tracked for compliance on raw material in the major firm making the same kind of products and Nb of criteria tracked for compliance on finished products of the same category required by the main domestic retailer.
	To ensure that the requirements are met, FQS devices plan to carry out checks especially in the form of audits. We'll follow the number of audits carried out/year and divided by tons of product to make FQS of different sizes comparable - At production stage - At transformation stage	Nb audit/year/ton of products	Assessing the importance of stabilization devices	All (FQS)	Nb of inspections leaded by the domestic authorities on this kind of products divided by number of ton produced /year in the country At the production stage At the transformation stage (if a national reporting exists) The controls might include safety enforcement and fraud controls.
Secondary Variables	Description	Units	Objective	Applies to	Counterfactual

Variable related to reification	Nb of days of training activities per year and per annual work unit on specific knowledge to achieve the product quality. In 2015 At the production stage At the processing stage (operation workers)	Nbday/	Quantifying and compare with total employment in the relevant chain	All (FQS)	National average Nb of days of training activities /annual work unit in agrifood business, in 2015 -at production stage - at the processing stage (operation workers)

17. INDICATOR INDEX CARD N°SO5: GENERATIONAL CHANGE AND GENDER EQUALITY

Coordinator: Filippo Arfini (UNIPR, Italy)

17.1. Questions we will try to answer with the indicator(s)

- ✓ Is the Supply Chain (SC) (i.e., the part of the Value Chain inside the LAFS) of the product sustainable in terms of population dynamics, generational change and gender equality?
- ✓ Which are the stages of the SC, according the suggested prioritization, which are the least/most sustainable in terms of population dynamics, generational change and gender equality?

17.2. Indicators

The indicators are constructed according to the formulae below, provided that the suitable data for calculations can be collected at each stage of the SC of interest. It is expected that, following the prioritisation table for the identification of the stages of the SC relevant for each scheme (FQS, SFSC and PSFP), it will be possible to interview a sufficient number of experts for every key SC stage to have access to the data necessary to calculate the SC-level values of the indicators.

17.2.1. Generational Change

The extent of *GC* in each j^{th} stage of the supply chain is captured by the Young Age Index calculated as the percentage ratio between the number of employees in the 15-35 age bracket and the number of employees in the 45-65 age range in each j^{th} stage of the SC

$$GC_j\left(\%\right) = \frac{EMP_{15\div35;\,j}}{EMP_{45\div65;\,j}} \cdot 100$$

Data Source: data from existing publications/data sources or interviews to selected case study informants

17.2.2. Gender Equality

This indicator corresponds to SAFA indicator S 4.2.1. The extent of *GE* at each j^{th} stage of the SC is calculated as:

$$GE_j = 1 - \frac{HARM_j\left(G_{F;j}, G_{M;j}\right)}{G_{\overline{F},\overline{M};j}}$$

Where $HARM_j(G_{F;j},G_{M;j})$ is the equally distributed gender index obtained as:

$$HARM_j\left(G_{F;j}, G_{M;j}\right) = \left[\frac{G_{F;j}^{-1} + G_{M;j}^{-1}}{2}\right]^{-1}$$

And, in turn, $G_{F;j}$ and $G_{M;j}$ are the geometric means of the variables of interest: gender-based SC-level rate of employees with at least an upper secondary education ($EMPSE_i$), gender-based SC-level share of (agricultural) entrepreneurship (E_i) and gender-based SC-level employee composition (EMP_i)

$$G_{F;j} = \sqrt{\left(EMPSE_{F;j} \cdot E_{F;j}\right)^{1/2} \cdot EMP_{F;j}}$$

$$G_{M;j} = \sqrt{\left(EMPSE_{M;j} \cdot E_{M;j}\right)^{1/2} \cdot EMP_{M;j}}$$

Lastly, $G_{\bar{F},\bar{M};j}$ is the reference standard for computing inequality, defined as:

$$G_{\bar{F},\bar{M};j} = \sqrt{\overline{Empowerment}_j \cdot \overline{EMP}_j}$$

$$\overline{Empowerment}_j = \left(\left(ESE_{F;j} \cdot AE_{F;j}\right)^{1/2} + \left(ESE_{M;j} \cdot AE_{M;j}\right)^{1/2}\right) \Big/ 2$$

$$\overline{EMP}_j = \frac{EMP_{F;j} + EMP_{M;j}}{2}$$

Data Source: data from existing publications/data sources or interviews to selected case study informants

17.2.3. Prioritization and Extension to SFSC and PSFP

Note that the variables above are to be collected, to the extent possible, for each step in the supply chain (farm, collection, processing plant, …). See monograph outline to ensure that the steps in the value chain used here are consistent with the value chain diagram to be provided there.

However, it is important to recognise that the most important differences in outcomes may not appear at the same level of the supply chain in different types of schemes (FQS, SFSC and PSFP). As a result, the following prioritization is suggested:

Supply chain level (l)	FQS	SFSC	PSFP
Farm	key	key	key
Processing	key	secondary	key
Transportation	secondary	key	secondary
Retail	secondary	key	secondary

PSFPs – While it is worthwhile to record the age/gender profile of actors in FQS, PSFP and SFSCs, for PSFP – where absolute numbers of actors is small compared with well-established PDO systems –a simpler approach will be used, namely comparing average age/gender profile of the 'alternative' and LOW PSFP chains. This also reflects the fact that publicly available data on industry averages for age/gender profile may not be readily available for PSFP.

SFSCs - Out of these indicators only gender equality will be taken into account for SFSCs. Eventual adaption of the indicator will be made after the pilot study.

17.3. List of underlying variables to be collected

17.3.1. Key variables

Variable Name	Description	Time[10]	Unit	Disposability	Note
Generational Change					
emp15_35_l	Number of employees in the 15÷35 age bracket at level l of the supply chain	Present	Units	Secondary Data	Both employed for calculating the Young Age index (GC_j)
emp45_65_l	Number of employees in the 45÷65 age bracket at level l of the supply chain	Present	Units	Secondary Data	
Gender equality					
empse_F(M)_l	Gender-based rate of employees with an upper secondary education: the percentage of female (male) employees who obtained an upper secondary education on the total female (male) employees at level l of the supply chain at the farm/firm interviewed	Present	Percentage, %	Secondary Data	Employed for calculating the Gender Equality Index (GE_j)
e_F(M)_l	Gender-based share of (agricultural) entrepreneurship: the percentage of female (male)-driven farms/firms on total farm/firms at level l of the supply chain interviewed	Present	Percentage, %	Secondary Data	
emp_F(M)_l	Gender-based share of employment: the percentage of female (male) employees on the total number of employees at level l of the supply chain interviewed	Present	Percentage, %	Secondary Data	

[10] Collecting secondary data also for a few previous years, e.g., throughout the 2000 – 2010, would be a useful complement.

18. MONOGRAPH OUTLINE (WP5)

NB1: This outline is only a suggestion. Case study conductors should feel free to rearrange the sections and to add/remove elements as they see fit (except for highlighted elements, see NB3).

NB2: The titles in this outline describe the content of the section. In the actual monograph, case study conductors will likely need to change them in order to better reflect the specific content of the section (e.g. "Comté, 50 years as a PDO" instead of "historical background").

NB3: Highlighted bullet points are key elements that must be documented. Without these, several indicators cannot be computed. This applies in particular to the technical diagram of the value chain. Non-highlighted elements are suggestions which would help in interpreting the results on indicators.

NB4: Given the time constraint of S2F for case studies and the necessity for case study conductors to document both this monograph and the variables list, this monograph will likely be compiled based on pre-existing reports and a few (2-4) interviews of key stakeholders in the value chain.

NB5: The outline reflect the input of the methodological framework provided in WP3 and suitable for WPs 5-7 where the main drivers are quality, as defined in convention theory, the territory and the value chain.

18.1. What constitutes the quality of the Quality scheme under study

The first aspect that can be analyzed is the characteristics which build up the "quality" aspect of the FQS. Most of FQS are GI where the code of practice or technical specifications are written and readily available. For other quality schemes such as short food supply chains, the description of quality characteristics may not be codified but can nevertheless be described along the same lines. Quality is not only the territory then and may stem from other characters (intrinsic or extrinsic) perceived as "convention of quality" by consumers (domestic, quality, reputation quality, civic quality, market quality etc…).

18.1.1. Intrinsic attributes (color, flavor, taste) including the description of factors effecting the intrinsic quality attribute

18.1.2. Extrinsic quality attribute

- ✓ link with the territory, link with specific local variety, technics of production, etc.;
- ✓ presence of system of designation;
- ✓ description of the specific local resources necessary to the FQS (from code of practice);
- ✓ presence of system of certifications;
- ✓ any specific extrinsic attribute that contribute to generate a perception of quality from consumers and citizen. Including quality signs (labels both public and private).

18.1.3. Historical background

- ✓ History of the product;
- ✓ Date of registration of the technical specifications (data source: DOOR, others);
- ✓ Date of registration/first certification of the FQS (data source: DOOR, others);
- ✓ Key periods/historical choices in the developments of the product;

- ✓ History or description of the gastronomic use of the FQS (products);
- ✓ History of the production system: the evolution in time (when local production is established), whether the technology and organization of production has changed, whether the existence of professional schools, research / training centers, extension services have encouraged local roots, whether a cooperative system has developed, etc. An important milestone in the history of the supply chain may have been the recognition of the geographical name and the establishment of a recognized association.

A summary of the information can be presented by following the template of Figure 8.

Territory	
Geographical area	Constraints on its location, its size, which part(s) of the supply chain is(are) geographically constrained (if any)
Varieties/breeds	Constraints in terms of varieties or breeds that can/must be used or mixed to make the FQS product.
Arable farming practices	
Fertilization	Constraints in terms of mineral and organic fertilization
Plant health	Constraints in terms of phytosanitary products use
Field operations	Constraints on field operations: type of tillage allowed, timing restriction on certain operations (e.g. mowing), …
Other	
Animal management (where relevant)	
Fodder self sufficiency	Constraints on the proportion of animal feed that comes from the farm itself or its vicinity, etc.
Grass and pasture	Minimal/maximal time spent grazing, minimal/maximal proportion of grass and/or hay in total animal feed, etc.
Other animal feed constraints	E.g.: list of animal feed/concentrates allowed, minimum/maximum amount of a given type of animal feed and food supplements, GMOs allowed/forbidden, …
Animal health and welfare	Constraints on the use of antibiotics or other sanitary products, on the space per animal, …
Other	
Process	
First stage	
Second stage	
Transportation	
Conditioning	
Other	

Figure 8. Summary of the technical specifications/code of practice of the QS or of the elements that generate its quality

18.2. Description of the territory and the local production system related to the FQS

- ✓ Map featuring the territorial anchoring of the FQS: for PDO/PGI, the geographical limits if any. May be relevant for organic products if the case study has a territorial anchoring (e.g. organic flour from a specified organic mill, organic product which happens to be concentrated somewhere, …) or may not.
- ✓ Superposition of quality signs (GI and organic): share of the product with several signs. The coexistence of two signals on the same product may influence the economic results of this product.
- ✓ Social dimension of the territory: demographic trends, comparison with the region, others social variables (see the index card provided for social variables).
- ✓ Main economic characters of the region by means of description of regional economic drivers.
- ✓ The supply chain relationships with the market factors: purchase the input from outside or from within the Local Production system (LAFS). Is it dependent on the local system for inputs from other actors or businesses outside the area or even in other countries (e.g. seeds, machinery and equipment, etc.)? How much input supply within the area has helped to stimulate sectoral interdependencies?
- ✓ Presence of research / training and extension centers. Their activities carried out in favor of the FQS, in particular through direct links of research and development and training.
- ✓ Relations between QS and local context: tourism, natural resources, small and medium manufacturing industries, entrepreneurship, emigration / immigration processes, inward investment, public policies, etc.

18.3. Description of the value chain

- ✓ The reconstruction of the value chain - production, processing and wholesale marketing – is a paramount element for many variables and indicators. Providing a technical diagram with key steps of the value chain identified is therefore requested for all FQS case studies. Please use the template provided in Figure 9 (the editable source file to be filled in with the case-specific supply chain information is available in the excel file (supplementary material 1), together with the list of indicators and variables), using the same categories (upstream/collection/processing/downstream) and the same code (U1, U2, …, C1, …). Key elements on these steps (e.g. number of entities, number of jobs, sale revenues, quantity of product, …) may be added to the diagram.

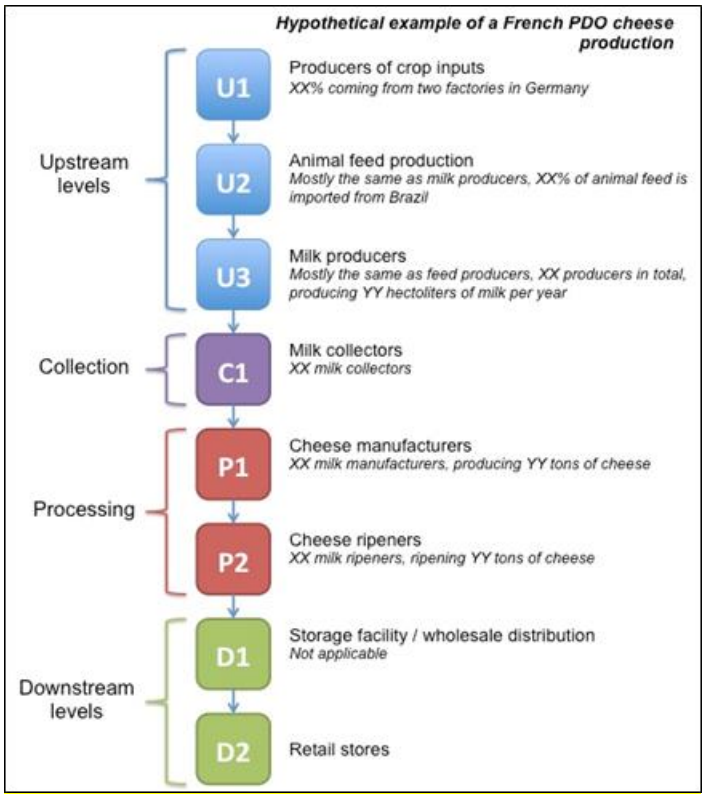

Figure 9. Template for the supply chain technical diagram

- ✓ The structure of the supply chain:
  - description of the stakeholders in the chain (farms, processing companies, marketing firms);
  - their structure, size and turnover, percentage/number of farms, hectares, quantity involved in QS-production (these variables provide insights on the status of the QS within the sector in terms of leader product, niche product or marginal product).
- ✓ FQS supply chain relationships with the product market (consumer): the different market destinations (local, regional, national, international) and the main forms of marketing of the finished product (direct sales, retail distribution, traditional commerce, wholesale markets).
- ✓ Strategic diagram focusing the main firms involved in the supply chain. This diagram aims at showing their vertical integration strategies (Figure 10).

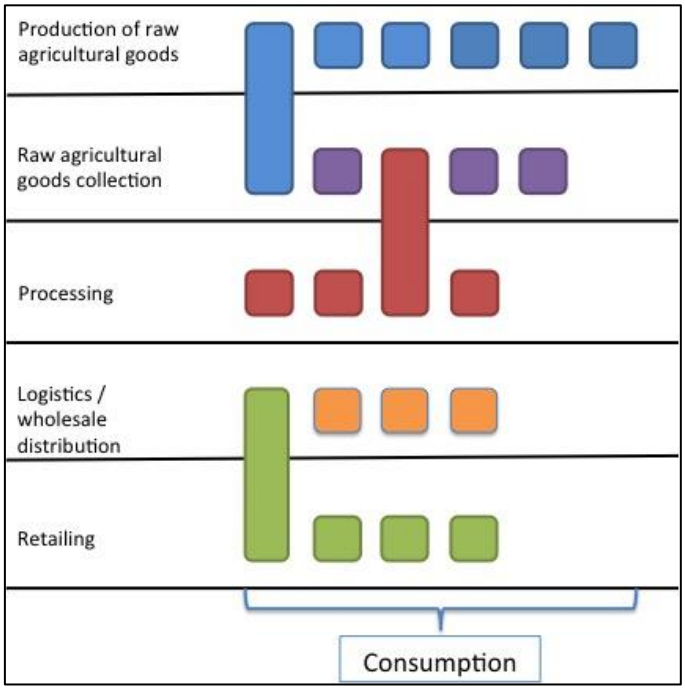

Figure 10. Representation of vertical intergration in a hypothetical supply chain

Stakeholders are depicted according to all activities in the supply chains they are involved in and coloured after the activity for which they realize the highest turnover.

- ✓ The Herfindahl-Hirschman Index (HHI) computed from the market share (s_i) of processor (middle of the supply chain) and the HHI oriented towards the downstream of the supply chain, that is at the brand level:

$$HHI = \sum_{i=1}^{n} s_i^2$$

These indicators tell us about market concentration.

Data source: Inter-branch committees (processor step), Kantar Worldpanel (retailer step).

- ✓ Sociological background of stakeholders involved at different stages of the value chain

18.4. Governance of the FQS

- ✓ Qualitative description of the FQS chain governance has the aim to describe the specificity of chain management regarding the capacity to manage internal and external relations and thus to adopt appropriate and effective management actions. Note that this section does not need to be very long given that three indicators for governance have been developed (see indicator index card n°So2 on governance).
- ✓ Presence and role of Intermediate institutions linked to the FQS: Producers Organization, cooperatives, associations, consortiums, etc. What are the main subjects of the leading sectors in non-specialized areas? Again consider public and private entities, including collective structures).
- ✓ Advertising expenses: Is communication about the FQS an important activity of the inter-branch committee? What are the respective share of national advertising campaign, tourism campaign and export activities?

Data source: Inter-branch committees

- ✓ FQS link with quality certification scheme: how is quality guaranteed by private and/or public entities.

18.5. Other important issues

- ✓ Aside from the economic, environmental and social indicators that will be obtain, some other aspects may be qualitatively discussed here:
    - Are there negative effects of production specialization and intensity of use of inputs on natural resources, biodiversity, soil quality, hydrogeological protection, energy consumption, etc.?
    - Are there similarly positive effects?
    - What is the main problem or critical point?
    - What are the major risks for the sustainability of the FQS?
- ✓ Any other issue that is important and does not fit in the previous sections for the report.

18.6. Conclusions

The crucial factors for the sustainability of FQS based on the analysis carried out in the previous paragraph to summarize the possible drivers of the sustainability performance of the FQS. You may consider in particular:

- ✓ the role of the code of practice
- ✓ the role of the production system
- ✓ The role of the territory (environment)
- ✓ The role of local actors
- ✓ The role of the marketing efficiency and its evolution.

19. PUBLICATION STRATEGY (WP5)

19.1. The materials we will have at the end of WP5

A summary of the materials we will have gathered at the end of WP5 can be viewed as a matrix of case studies (30 lines) and indicators (a dozen of columns, to be confirmed):

Case study name	Economic indicators			Environmental indicators			Social indicators		
	Price premium	Value added	…	Carbon footprint	Water footprint	…	Governance (tbc)	Gender equality (tbc)	..
1. Parmigiano cheese (PDO, Italy)									
2. Arilje raspberries (OF, Serbia)									
3. Comté cheese (PDO, France)									
4. Aiserey flour (OF, France)									
…									

19.2. Lines: a book, Food quality schemes in Europe: a collection of 30 case studies

One chapter = one monograph = one case study.

Authorship: the lead author of each chapter should be the case study conductor. He/she may then associate co-authors as he/she sees fit: people who help him/her conduct the case study, coordinators of indicators with whom he/she has had a tight collaboration, etc.

A couple of contextual and synthesis chapters may be added if relevant and if some partners are interested in writing them: history of FQS in Europe, similarities and differences across case studies, and so forth.

Although some results on the indicators may be used here, sustainability should not be the selling point. Rather the collection of case studies from which an interested reader could gather contextual elements, possible field examples and references to start a research on any topic related to FQS in Europe.

19.3. Columns

19.3.1. A special issue in a peer-reviewed journal, The sustainability of European food quality schemes

One indicator (or several when relevant) = one paper.

Authorship: the lead author of each chapter should be the coordinator of the relevant indicator index card. Case study conductors should be added as co-authors. Other co-authors may be added as the lead author sees fit.

Targeted journals: Food Policy (cat 3, 1.8), Food control (IF 2.8), Journal of Science of Food and Agriculture (IF 1.7), J of Ag and Food IO (cat 3, IF na), Rev of Ag and Env Studies (cat 4, IF na)

19.3.2. A high profile article synthetizing the tasks and answering the question: are European food quality schemes more sustainable than their standard counterparts?

Targeted journals (to be discussed): Ecological Economics (cat 1, IF 2.7), Env Sci & Policy (cat 3, IF 3), ERAE (cat 2, IF 1.3), JAE (cat 3, IF 1.3), Food Policy (cat 3, 1.8), Food control (IF 2.8), Journal of Science of Food and Agriculture (IF 1.7)

Authorship: all case study conductors and indicator index card coordinators should be co-authors. The lead author will be determined as the project evolves.

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The Strength2Food project in a nutshell

Strength2Food is a five-year, €6.9 million project to improve the effectiveness of EU food quality schemes (FQS), public sector food procurement (PSFP) and to stimulate Short Food Supply Chains (SFSC) through research, innovation and demonstration activities. The 30-partner consortium representing 11 EU and four non-EU countries combines academic, communication, SMEs and stakeholder organisations to ensure a multi-actor approach. It will undertake case study-based quantitative research to measure economic, environmental and social impacts of FQS, PSFP and SFSC. The impact of PSFP policies on nutrition in school meals will also be assessed. Primary research will be complemented by econometric analysis of existing datasets to determine impacts of FQS and SFSC participation on farm performance, as well as understand price transmission and trade patterns. Consumer knowledge, confidence in, valuation and use of FQS labels and products will be assessed via survey, ethnographic and virtual supermarket-based research. Lessons from the research will be applied and verified in 6 pilot initiatives which bring together academic and non-academic partners. Impact will be maximised through a knowledge exchange platform, hybrid forums, educational resources and a Massive Open Online Course.

www.strength2food.eu