Information sharing for sustainability impact reporting

Possibilities in the cocoa value chain

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To support ongoing processes by certification organisations and the private and public sector and partners to demonstrate and report on the impact of certification in cocoa and coffee chains, this report reflects on the types of systems needed to meet the growing needs of different stakeholders for credible, transparent and evidence-based impact reporting. The current state of impact reporting is outlined. The views of stakeholders involved in certification are summarised to provide insights into the key issues around data sharing. Trends in information and communication technologies that can aid data collection, handling large and complex databases and that can facilitate data sharing are presented, illustrated with successful examples. Conclusions are made about the potential to share data in the cocoa sector, the types of data which could be shared (country-based contextual data and baseline data) and the conditions which concern indicators, tools for analysis and interpretation, data quality, agreements on confidentiality and cost sharing.

Key words: Information systems, Data systems, cocoa value chain, impact assessment, impact reporting, sustainability impact

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1 Introduction

Impact reporting has become a prerequisite for credible certification schemes, which ensure that products are produced in a sustainable, specified way and can be traced back throughout the entire value chain. The methods are usually formulated in standards or codes of good practice, with an assessment of compliance with the respective requirements. The assessment is usually conducted by often third-party auditing firms that evaluate the product, production process, facilities and locations. Certification schemes are developed by standard-setting bodies that set the standards for the respective claims, such as sustainability claims. In some cases this is signalled to consumers through labels or logos.

Depending on the certifier, certification schemes encompass a set of standards and codes that can considerably vary in their focus or strategy for achieving a more sustainable production. While some certification schemes focus on the creation of sustainable and fair trade relations, others emphasise the improvement of productivity at the farm level, which is closely connected to the income and the livelihood of farmers. Overall, certification schemes aim at the implementation of good practices (both in the agri-food production as well as trading activities), in combination with capacity building, and sustainability goals have increasingly been emphasised. Note that farmers and their organisations as well as exporters may be certified by more than one certification scheme. This is referred to as multi-certification, which can lead to an extra effort for farmers or firms to become certified against different schemes certified by different certifiers with different, but sometimes similar, requirements and auditing companies. Note that multiple certification, i.e. being certified against different schemes, can open up different markets.

For certification, impact reporting plays an increasingly important role. There has been a tremendous increase in the demand for impact reporting that aims to provide evidence about the social and environmental impact of certification schemes. Impact reporting is required as a proof that the claims made by the organisations are according to certain standards and codes of practices. Next to the question of accountability and justification, impact reporting also may provide valuable insights for improvements in order to more easily reach the outcomes desired.

While demonstrating compliance with requirements is on the responsibility of farmers, farmers also provide information for impact reporting. For example, they are asked for detailed information about their production activities, inputs and yields and possibly other aspects relevant to impact assessment (regardless of whether an individual firm or farm or the product generated is certified). Given multi-certification, similar data or even the same information may be required by different certification organisations, which means a double burden for farmers. Audit results are strictly confidential and are thus not made public or simply given to certifiers or other organisations, for example research institutes that would ask for the information to conduct impact assessment. There is a clear overlap of information needs among certification organisations but also among governments and donors of programmes that have the same or similar goals related to sustainability. As mentioned, it should be noted that research institutes (and universities) engaged in impact assessment may also request the same information for their analysis, e.g. commissioned impact assessment.

While the need to share data seems to be obvious, the discussion on data sharing has only recently started. For example, possibilities of sharing data were discussed at the conference of the ISEAL Alliance[1] in June 2013. As concluded by the ISEAL Alliance, it seems to be useful to work together on

[1] The ISEAL Alliance is an group of leading voluntary (non-governmental) international standard-setting and conformity assessment organisations that focus on social and environmental issues, thereby strengthening sustainability standards systems ISEAL members collaborate on to build international recognition and legitimacy for their programmes. For further information see http://www.isealalliance.org/

data collection, sharing data and collection efforts. This report aims to contribute to the discussion on data sharing for credible, transparent and evidence-based impact reporting. In addition to information on aspects of data sharing, the report also provides insights into information systems and the possibilities of their usage in impact reporting. While presenting general information on data sharing and information systems for impact reporting, the certification of sustainable cocoa is taken as an example since cocoa constitutes an important commodity for trade of developing countries that is subject to advanced and well-established certification schemes (such as Rainforest Alliance, Fair Trade and UTZ Certified).

This study is one of the results of a five-year research project titled 'Enhanced sustainability of the imports of cocoa and coffee to the Netherlands: synergy between practice, policy, strategy and knowledge' (BO-10-030-001). This project is supported by the Dutch Top Sector research initiative through the Policy Support programme International Cooperation of the Dutch Ministry of Economic Affairs. The project is executed through a consortium of partners including IDH, Wageningen UR, DE Master Blenders 1753, the Ministry of Economic Affairs, CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement), UTZ Certified and KIT (Royal Tropical Institute).

After the introduction in this chapter, the 'state of the art' of impact reporting is outlined in Chapter 1 by summarising the main principles of monitoring and evaluation (M&E), which constitutes the basis of impact reporting. In order to obtain first-hand information, interviews with stakeholders involved in the certification of sustainable cocoa were conducted. The results of these interviews are presented in Chapter 2. The report also elaborates on information and communication technology (ICT) that can provide solutions for dealing with issues of data collection, handling huge and complex data bases and that could facilitate data sharing efforts. Chapter 3 is about the current trends of information systems used for data sharing, in which the focus is on the technical issues and practicalities for data management. In Appendix A4, examples of data sharing in the agri-food sector are provided to show possibilities that have successfully been implemented. These examples highlight ideas of what could be possible for data sharing for impact reporting. In Chapter 4, overall conclusions are drawn about the potential (including conditions) of data sharing for impact reporting and using information systems.

2 The ‘state of the art’ of impact reporting

2.1 Concepts and definitions

In general, impact reporting concerns the reporting on changes of certain indicators related to the desired outcomes, which can be attributed to an intervention, programme or certification. The changes presented are the results of impact evaluations, whereby causal linkages are made to determine effects. It can generally be differentiated between monitoring and evaluations (M&E). Evaluations are periodic updates of planned, ongoing or completed activities with specific questions on the implementation, practical matters as well as on outcomes and results. In contrast, monitoring is a continuous process that tracks what happens at the farm and/or firm level. As such, monitoring usually involves the collection of administrative data, day-to-day checks of business performance in order to compare the actual performance with expectations. Monitoring aims at helping management and decision-making of the production or service provision, by using firm-level or farm-level microdata. Impact reporting can be considered to embrace both monitoring and evaluation: Monitoring provides information relevant for determining a baseline, which appropriately presents the situation before or without the intervention (e.g. certification) actually taking place. Monitoring also helps to verify the appropriate implementation. In contrast, in the evaluation effects are determined either by 'before or after' comparisons or by a comparison against a baseline (‘difference in difference’) (see Section 1.3).

Impact reporting is best grounded in the impact logic as its backbone, which provides the fundamental underpinning of the conceptual thinking about causes and effects in impact evaluations (including conditions and assumptions). The theory of change is a description of how interventions are supposed to deliver the desired outcomes. More precisely, it gives the causal linkages of how and why outcomes are observed or not observed. The theory of change can be modelled in various ways, for example by using logical frames and result chains, and determines the link between inputs, activities, outputs and outcomes (short and medium term), with the latter leading to long-term impact. Note that the theory of change ideally considers causes and effects from a micro and macro perspective, whereby the context, specific conditions in terms of situations as well as the current state for example are also taken into account.

2.2 Which impacts are measured? Which indicators are used?

Indicators are needed for measuring impact. Especially when intangible outcomes are concerned, indicators are used to represent and quantify the outcomes and resulting impact. Indicators should be determined along the entire chain of results, capturing all levels of the value chain. As a rule of thumb, indicators are defined according to the Specific, Measurable, Attributable, Realistic and Targeted (SMART) principle; detailed info on selecting indicators is provided by World Bank (2011). Indicators depend on which outcomes and impacts should actually be measured. For sustainability in general, indicators comprise economic, social and environmental aspects, which need to be further specified for individual impact evaluations. Sustainability indicators can be defined according to specific commodities, whereby all stakeholders should have the opportunity to express their understanding and definition of sustainability and raise specific issues relevant to them. The stakeholder involvement is common good practise, and guarantees that the successful implementation of certification schemes and the subsequent reporting, as required (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012).

For cocoa, the Roundtable for a Sustainable Cocoa Economy (RSCE) for example is engaged in the definition of sustainable cocoa involving all stakeholders in the cocoa chain. In addition, main efforts have been undertaken to formulate requirements for sustainable cocoa products and corresponding indicators within the platform 'Cocoa Measurement and Progress (CocoaMAP)', which was launched by the World Cocoa Foundation. There are many initiatives dealing with sustainable cocoa, and many definitions and indicators have been discussed, without an agreement about which indicators actually reflect the aspects under review best and should be used by everybody. Sustainability indicators in general and specifically indicators for sustainable cocoa capture the following aspects, amongst others:

- *Economic aspects:* income, yield, productivity, efficiency, local economic development, industry development, consumer preferences, market expansion, diversification
- *Social aspects:* labour rights, occupational health, gender aspects, children's rights, community engagement, education, training
- *Environmental aspects*: ecosystem, wildlife, biodiversity, water, soil, climate change

The ISEAL Alliance distinguishes between specific sustainability aspects and presents indicators (see Appendix 2 and 3) to be used for impact reporting. The aspects refer to the aforementioned points, and the indicators are specifically developed for the alignment of ISEAL members' standards and to be able to compare the indicators that ISEAL members individually use.

2.3 How is impact measured?

There are several guides that describe the standard measurement method for M&E, for example Khandker et al. (2010) and World Bank (2011). In addition to the theoretical underpinning, World Bank (2011) provides practical guidance for the actual application as well as lessons learnt in impact evaluation. On the one hand, there is quantitative data in terms of measureable indicators (see chapter 1.2), and on the other hand qualitative information can be used. The latter provides crucial complementary information as a result of interviews with selected beneficiaries, focus groups, stakeholders and other key informants about the impacts under review. Hence, the current 'state of the art' for measuring impacts suggests the application of mixed methods, which combines quantitative and qualitative data information. The main topics that need to be considered when conducting scientifically sound M&E and that in some cases stand in direct relation with data can be summarised as follows:

- *Counterfactual problem:* The counterfactual constitutes the basis of comparison in order to determine net effects. Therefore it is necessary to respond to the question what would have happened if the intervention, e.g. certification, did not take place. This situation cannot be observed, and a so called 'comparison group' exhibiting the same characteristics as the group of participants ('treatment group') is used for an approximation.

- '*Before-and-after' versus 'with-and-without' comparisons*: The 'before and after' comparison provides information on the outcome for participants over time by comparing the situation prior to the intervention (certification) and subsequent to its introduction. In contrast, the 'with-and-without' comparison means that the situation for participants on the one hand and the situation for non-participants on the other hand are compared in order to determine the impact of an intervention, like certification. In the most rigorous approach to impact reporting, the 'difference-in-difference' method is used as a combination of 'before-and-after' and 'with-and-without' comparison, whereby changes in outcome between participants and non-participants are econometrically analysed over time (before and after the intervention). The latter is the preferred 'rigorous' approach in impact evaluations, as external factors (such as climatic conditions) potentially affecting the results of a programme are accounted for as non-participants are affected by the same factors.

- *Selection bias:* When investigating the effects, samples of participants and non-participants (to be used to assess the counterfactual) are necessary. Usually, there is a bias in the sample selection since characteristics like for example education, income level or other unobserved reasons influence the decision to participate or not to participate. Sampling methods like random selection methods

can help to eliminate such biases in the selection, or econometric methods are being used to account for biases in the quantitative analysis of effects (e.g. matching techniques to obtain groups with farmers with similar characteristics) in order to allow for the correct interpretations and generalisation of results.

- *Attribution:* There are many other factors that can influence the outcomes of interventions such as certification. Examples of factors include firm/farm characteristics, human capacity of labour but also the situation outside the production facility, for example infrastructure and services. The impact can hence not easily be attributed to the specific intervention, or certification, under review. All factors of influence need to be taken into account in the impact evaluation. The quantitative analysis takes such factors into account by incorporating variables in regression methods, while qualitative researchers apply analysis like process tracing.

- *Causal inferences and indirect effects:* Causal inference is the process of drawing a conclusion about the cause and the effect, i.e. the relationship between causes and effects. Such conclusions are usually drawn by using some kind of hypothesis testing, which are formulated according to the logical framework and result chain underlying the impact evaluation. While direct effects are part of the result chain, indirect effects tend to more difficult to consider since they are not specifically identified in the framework. However, indirect effects can be potentially important as they could provide unexpected insights about the intervention and how it works, and they may also trigger the direct effects observed in the data.

2.4 Conclusions for data sharing

Given the 'state of the art' methods of M&E, three main points have been identified as being crucial for data sharing and thus need to be considered when thinking about an information system that contains the shared data for impact reporting. First, an ‘impact logic’ (also known as a theory of change) provides the fundamental framework for impact evaluation. The intervention logic also determines the indicators needed to measures outcomes and resulting impact. If the data to be shared were used for individual impact reporting activities, it would be best to have a common understanding about causal linkages, i.e. the causes and effects according to the intervention logic, more specifically the result chain. The intervention logic should accommodate different aspects of sustainability since some aspects may be important to some users but not to others. Hence, the intervention logic needs to be as simple as possible but at the same time have sufficient detail to incorporate all relevant outcome areas that the key stakeholders/users of the research are interested in.

Second, there are various definitions about sustainability and indicators such that an information system containing the already available data would include several indicators for essentially the same piece of information and the same aspects covered. This would make the information system huge, and the database would potentially be unmanageable. In conclusion, some kind of agreement on suitable indicators seems to be useful when considering the sharing of data.

Third, the data necessary for impact evaluations exhibit considerable complexities, reflecting multi-layered and intertwined linkages between causes and effects. The data sets for impact evaluation would include information on causes and effects (including indirect effects) and can be expected to be very large, especially when time series data are collected. Time series data are necessary for a fully-fledged impact evaluation, which traces back changes throughout time and along the results chains according to the theory of change. Ideally, the state of affairs before implementing sustainability production and the state of affairs after implementing sustainability production would be compared in a 'before and after' comparison, which can be used in an impact assessment. In order to reduce the size of the potential database, the impact evaluation could concentrate on certain aspects, main actors and so on. However, note that the ‘state of the art’ impact evaluation requires the data for a counterfactual baseline, i.e. information about indicators for farmers that did not participate in the intervention or were not certified, and who are comparable to the treatment group. Thus this information needs to be included.

3 Stakeholders' opinions

This chapter presents the synthesis of mainly confidential interviews with stakeholders relevant to the certification of sustainable cocoa. Certifiers and their representation as well as cocoa traders were asked about their ideas about data sharing in an information system. Note that cocoa farmers were not interviewed, since the topic of data sharing for impart reporting seems to be most relevant to certifiers, standard-setters and traders. The questionnaire is provided in Appendix 3. In addition to providing general information on impact reporting (M&E), the questionnaire concerned the following aspects, which are elaborated in this chapter:

- Data needs (Section 3.1)
- Data sharing by using information systems (Section 3.2)
- Conditions for data sharing and information systems for impact reporting (Section 3.3).

3.1 Data needs

Definition and indicators of sustainability: The data needs very much depend on the focus of the sustainability programme, for example the target of the certification system, and there are quite some nuances with regard to the definition of indicators for the same aspects of sustainability in the cocoa economy. It thus seems to be difficult to agree on common aspects that define sustainable cocoa production and trade in general terms and for every sustainably programme, although they cover some common aspects. The ISEAL Alliance represents certifiers and has published a list of relevant aspects, which can be used as an orientation for defining sustainability (see Appendix 2), and assigns corresponding indicators. Certifiers that are ISEAL members or wish to become ISEAL members are requested to show - preferably voluntarily - that their individual sustainability indicators correspond with the definition by the ISEAL Alliance. This seems to be some kind of benchmarking to align members to the ISEAL definition in order to allow for collective reporting. Note that other actors along the value chain (businesses and traders) and governments do not necessarily use the same indicators.

Approach of impact assessment and reporting: Although there is a general agreement on the importance of impact reporting, considerable differences in measuring the impact of certification system have been identified. Differences occur in the frequency of reporting, the scope and details required. The further down in the value chain, data needs seem to become more detailed and elaborate. For example, traders and buyers of cocoa and other commodities tend to be interested in the exact and detailed information on farm performance in order to measure and monitor business practises. Looking at business performance, other information, for example information on environmental or social practises, is usually not collected. At the same time certifiers seem to lack the detailed information, and in some cases performance measures are estimated by using available average figures, as will be explained below.

As an example, the approach of assessing the impact of certification by the Rainforest Alliance is presented. Other certifiers follow similar approaches, and the principles of the approach are endorsed by the ISEAL impact code; see ISEAL (2014) and FAO (2013). Figure 1 illustrates the three levels of the approach of impact assessment: 1) programme-wide monitoring programme (e.g. yearly or quarterly business report, audit reports, at the bottom level); 2) specific reports on one or two aspects (e.g. water, environmental impact, climate, income) for a subsample (middle level); and 3) research presented in a few in-depth studies on specific aspects, issues and regions (locations) (top level).

Information content and collection: As shown in Figure 1, the details of information differ according to the level and extent of the impact assessment and also the data collection is different. The results obtained via the impact assessments can be considered the basis for a possible impact reporting. Usually, impact reports by certifiers contain overall information on the programmes and their coverage (for example number of farms/firms certified, number of people trained, number of workers employed

and paid,) which is usually collected by commissioned auditing companies or technical assistance practitioners. With regard to the programme-wide monitoring, the questions asked in the data collection tend to be as straightforward as possible, and details and complexities of the data are not taken into account. Certifiers and standard-setting bodies are aware of the data complexities, especially taking care of an appropriate usage of the data and their interpretation in impact reporting. Often, estimates about the quantity of products certified are reported instead of the actual quantity produced, yields, and in case of reporting production volume average productivity estimates are often used. This means that the 'real' impact reporting refers to case studies on either specific aspects (for example water usage) or specific issues (for example gender issues), thereby using the information provided on level 2 and level 3 (see Figure 1). In-depth case studies usually have a research perspective, and they are often commissioned to research institutes or scientific consultants. The data collection effort for the specific case studies can be considerable, especially when results of the case studies cannot be generalised to other programmes, commodities and enterprises as well as other countries and thus cannot be taken for broader impact reporting.

Traders and buyers generally collect farm-level or firm-level data (applying own technical devices, software and advice for firms). They mainly use microdata collected to measure and monitor the performance of the business in question.

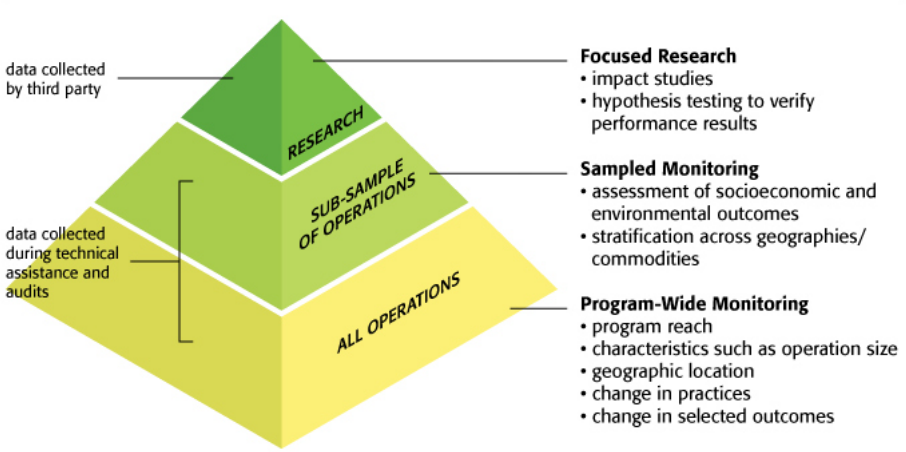

Figure 1 *Example of approach for impact assessment*
Source: Rainforest Alliance 2014.

In addition to micro-level data, macrodata providing information about circumstances such as the political situation, stability, human and labour rights as well as information concerning the location of firms/farms (e.g. climate and vegetation, precipitation, soil quality and biodiversity indicators) and natural sciences data (e.g. crop characteristics) is also used in impact reporting. This information is usually taken from existing databases of international organisations and institutes, such as World Bank, Food and Agricultural Organization (FAO) and International Climate Change Partnership (ICCP), and provides insights into the contextual factors in an impact evaluation. In the interviews, the difficulty of obtaining appropriate data on natural conditions was mentioned as a major challenge of impact assessment and subsequent impact reporting.

For certifiers, the information from auditing is available at an aggregated level of the certification holder level. With the common group certification, i.e. a number of smaller firms or farms are certified as one certification holder, the fine details are not available, and thus the possibility to zoom in on one firm or farm is not possible. As a result, impact reporting by certifiers is usually provided on the aggregate level by referring to groups of firms or farms per commodity and region, or country for example. In contrast, exporters and traders use detailed data, which they collect confidentially, and due to confidentially exporters and traders report aggregate or averages results for commodities, regions and countries.

Impact measurement: The counterfactual problem poses a big challenge to impact evaluation for indicators that aim to measure more indirectly the result of the certification process, which are largely out of the span of control of the intervention. Further, information tends to be absent or becomes available only later, once the intervention has already been implemented. Often, the data on firms or farms before they are certified is unknown and obviously not be collected ex-post. Further, the data necessary to select a credible control group are also not readily available. To meet the state of the art needs of impact evaluation, certifiers would have to (and some have already) have had to put a lot of effort into collecting data on non-participants (to provide control-group data) to set a baseline and reference point from which to determine impacts (see Section 1.3).

Especially in recent years, agri-food production has become globally connected, whereby the value chain embraces all actors delivering inputs from different regions and countries worldwide. Given this global trend of interconnectivity and also complexity of the value chain, reporting on input use is important and will become increasing important. Here, information on where and how inputs are produced in different parts of the world seems to be relevant. Such value chain data are usually not accounted for, and the data collection is tedious since tracing back and transparency are not guaranteed.

3.2 Data sharing

The opinion and willingness of stakeholders to share data on impact reporting differs according to data usage. Given the different interests in the data, entities along the value chain are more or less willing to share data. Table 1 summarises the factors that have been identified to determine the willingness for data sharing. Note that for completeness governments and farmers that have not been interviewed are also included in the table since both actors also have an interest in the data. Furthermore, manufacturers were not interviewed; their incentives for data sharing could be considered comparable to those of traders.

All persons interviewed agreed that data sharing should result in some value added for everybody involved, i.e. there should be clear advantage for those providing the respective data when sharing it with others. The advantage of data sharing seems to be clear for certifying companies and certifiers that usually outsource the data collection and preparation to auditing companies. They usually do not have access to all the details of the data collected. Others involved in the production and trading are usually more directly involved with the data, and the advantage for them seems to be rather moderate. Here, it is important to note that at the firm level, data have a strategic interest and are confidentially used for business purposes. Business partners such as traders have been investing in order to obtain the necessary data, building long-term business relations and improving business results, and for them, data sharing does not seem to be opportune.

There was a common agreement by respondents that similar or even the same information needs to be provided by farms or firms and thus that some kind of collaboration could increase the efficiency of data collection. Most importantly, the burden and costs for farms or firms could be reduced if data collection would be better coordinated and in fact streamlined. This is particularly true in case of multiple certification, which means that farms or firms are certified according to different certification standards and requirements. Note that multiple certification generally causes the problem of double counting if it is not possible to distinguish between the products certified according to one certification scheme and those that are certified according to another one. The interviewees mentioned the issue of appropriately capturing multiple certification, thereby avoiding double counting, as a particular challenge, which would need to be dealt with in a possible cooperation of data sharing.

Table 1

Incentives for data sharing.

Stakeholder	Main goal of impact reporting	Involvement in data collection	Main interest of obtaining which kind of type of data	Incentive for data sharing
Standard systems: Organisations and associations of standard setters (e.g. ISEAL, ISO…)	To sustain respective claims of the members, to ensure transparency	'Big data' from producers and (if relevant) data on the chain of custody (product tracking); monitoring data on reach, volumes, etc. ; and data collection in order to define terms of reference for external evaluations	Data on aspects of sustainability	Very open, possibly facilitating role to establish information system, which would need be hosted by third party, agreement for sharing which data with whom with clients
Certifiers	To sustain respective claims related to the specific focus of the relevant sustainability aspects To evaluate the achievement of sustainability goals set Learning and improvement	Own data collection on compliance with sustainability criteria when providing assistance to farms/firms and accounting firms	Data on specific aspects of sustainability that are relevant for the claim; baseline data for impact reporting; and context data (macro data);	Open, as long as value-added and certain requirements on the data quality and usage of the data are met, agreement for sharing which data with whom with clients.
Exporters, traders and farmer organisations	To improve performance	Data on sector and production: often data is managed in an the internal control system; market information; customer relations; and (if relevant) service provision to farmers;	Business data	Limited when traceable to origin.
Government	To enable support programmes for sustainability, check and control	Demographic data; economic data on the sector; information on enabling policies.	Sector data and demographics	Open
Farmers	To be supported or compensated for their data collection effort	Providing data	Benchmarking their productive performance with other farmers; marketing information; info on support services	Limited

Source: Results of the interviews.

Which data could be shared? Interviewees stated that more general data necessary for impact assessment could and should be shared. Such general data for example contain context indicators, general natural sciences information on commodities, standard production processes as well as information on the typical local circumstances. Overall, this refers to so-called level 2 data, which are collected in the effort of sample monitoring (compare Figure 1). Given the examples, it is clear that such data can be more or less easily generalised and that such data would be useful when setting the detailed farm- or firm-level data into context to prevailing or average situations and/or when evaluating for impact assessment. The idea behind data collaboration can generally be expressed as sharing key information for key aspects and key locations. For example, it was suggested that data sharing would be possible for macro information in the context of the country or region where the production takes place but also natural science data that are taken from existing databases and are not specifically collected. Furthermore, data sharing would also be welcome for deriving baselines, which reflect the situation before or without the application of certification schemes.

In addition, there are some issues that all persons interviewed mentioned as being important to improve impact reporting. More specifically, the value chain has to be considered to a certain degree as inputs into production, i.e. primary production but especially processing, are generated by different suppliers operating differently and in different locations, and certification thus requires some kind of tracking through the chain. Traceability adds complexity to impact assessment and reporting (as well as certification as information on inputs is to be considered, too. According to one person interviewed, a common approach, possibly developed by research, would be promising and would help to take the

value chain into account, as required in the globally interlinked market place. Another issue mentioned relates to linking micro and macro data, thereby extrapolating and aggregating results from the business level to the regional level.

3.3 Requirements for an information system

The interview contained questions about the conditions and requirements under which data sharing could and in fact should take place. The main points are presented in the following paragraphs.

Clear definitions: All interviewees stated that a common understanding of indicators and definitions would be a prerequisite since different certification programmes use different indicators, which in some cases differ only slightly. Here, clear definitions and in some cases also streamlining would be helpful, but at the same time the specific indicators would need to be respected since the goals and targets of the different certification programmes are not identical. A certain degree of flexibility and room for interpretation would therefore need to be ensured in a common information system for data sharing, for example. The ISEAL Alliance, of which the main certifiers for sustainable cocoa are also members, started the discussion on common indicators with members and has thus taken on the effort in the interest of ISEAL members.

Quality of the data: The data would need to be of appropriate quality to be useful for impact assessment. High quality and reliable data would help to conduct valuable impact reporting activities because not all data currently used in impact reporting are considered as being of high quality. As in some cases better quality data are collected but not necessarily shared; an information system compiling and matching existing data could be an advantage. In particular, the quality of data in generally could be improved by statistically analysing and cleaning the data before making it available in the information system. The quality of data and the shared effort for attaining better quality seems to be an incentive for data sharing.

Overall, the data collection should be impartial and scientifically sound. In fact, improving the data quality by cleaning, data mining and statistical analysis was mentioned as a major advantage of data sharing and establishing an information system for data sharing. The information system would need to provide up-to-date data, while storing old data for time series comparison for example.

Feasibility and practicality: It was also mentioned that the data sharing would need to have an added value for every stakeholder involved. That means that the relevant information would need to be included in the information system for data sharing, and that the information would actually be easy to use. The latter refers to the accessibility of the potentially complex and large data sets, which would require user-friendly and practical solutions for data extraction, summary and reporting. There should be the provided for user-friendly tools for data collection but also for tools for interpretation and analysis of the data.

Avoiding abuse: A common information system for data sharing bares a high risk that data are used without the context and without a clear understanding of the data. The question raised in the interviews is how to ensure that the data are used in an appropriate way, thereby preventing abuse. The solution could be agreement on the conditions of making data public, which would need to be implemented by those providing the information system. This includes dealing with confidentiality issues and data quality.

Sharing costs: All interviewees stated that the costs of a potential information system for data sharing would need to be shared, but first of all the costs of data sharing in terms of data collection and making the data collected accessible and maintaining the database in an information system needs to be carefully thought about. For sharing the costs, the value added that users obtain from data sharing would be taken into consideration and in fact determines the willingness to pay.

4 Data sharing: trends and bottlenecks

4.1 ICT trends and agricultural data sharing

In the farm sector, the use of ICT technology has strongly increased over the last decade. In industrialised countries developed countries Precision Agriculture (PA) techniques have been successfully introduced using modern sensing and monitoring technology resulting in many data. Combining these data within the farm system leads to more informed decision making. But data are still hardly shared with advisors or the processing industry, analysed by intelligent software or combined in regional analysis and advice. That will probably change in the coming years.

In agri-logistics tracing and tracking has become standard. The food scares (dioxin crisis, BSE) have stimulated that development, partly via European law. In some cases this has led to advanced systems that include the consumer stage. Bar codes are already used to provide consumers with information on the ingredients in food products. Retailers are using apps on smart phones to support consumers and to increase brand loyalty. Such apps help to create shopping lists and optimise shopping routes in the store. Home delivery systems are becoming more widespread. Sharp falls in prices of delivery services, also due to the liberalisation of the post and parcel market as well as the labour market, have helped farmers to set up web shops. ICT will further help to solve the so-called 'last mile' issue in several ways, from dynamic routing trucks to opening and closing the door of a garage or box by Internet via a phone call. Tracking and tracing, not only of products, but of their full history of treatments will become a reality. This will lead to more influence from business partners on the farm decision making, either by pricing environmental aspects, by advice or by contract. Service level agreements by advisors and e.g. companies that sell machines are possible. Food chains themselves will also be revolutionised by ICT, including developments in logistics and the (food) factory of the future. Here we will deal with only one scenario: the direct sales from farmers to consumers that becomes 'more easy' with the internet.

We see the following ICT trends that will greatly influence the possibilities of data sharing in the agricultural sector:

- Location-based sensing & monitoring and service delivery supported by Global Navigation Satellite Systems (e.g. GPS)
- Internet of Things (IoT) – everything and everyone gets connected through the internet. Every object (product, process, etc.) can get a virtual representation in the internet. Machine-to-machine (M2M) communication leads to autonomously communicating devices.
- Data explosion (Big Data, Linked Open Data) - large datasets that can be linked to each other leading to new innovative applications. These can be open (public) datasets or private ones or a mixture of them.
- Cloud services and app stores – the Internet is everywhere (smart phones, embedded networked devices, etc.) with new possibilities for service delivery, augmented reality, etc.
- Social media – more direct and instant interaction between stakeholders potentially leading to new market opportunities and channels, co-innovation, etc.

The previously described examples of data sharing in agriculture show that several actors in the food chain make already advanced use of ICT and experiment with new developments. However, this is just the start of what could become a revolution in agriculture, not unlike the introduction of the tractor and pesticides in the 1950s. It will change the way farms are operated and managed and it will change farm structure as well as the food chain in unexplored ways - just as in the 1950 ties the changes in the next three decades could not be foreseen. However, there are still several challenges to be overcome.

4.2 Challenges in data sharing in agriculture

The EU project agriXchange (www.agriXchange.eu) recently made a thorough analysis of the state of the art of data exchange in agriculture in the EU and Switzerland (Holster et al., 2011). The most important findings identified were:

1. An *aging population of farmers* manifesting itself through the lack of adoption of and investments in new technology, especially in Southern and Eastern countries.
2. *Broadband availability in rural areas:* a full-cabled infrastructure is usually too expensive. Mobile broadband (3G, 4G, etc.)[2] increasingly becomes available but full coverage in certain areas is still a major problem.

In a broader perspective, Wolfert et al. (2014) describe the main ICT challenges and bottlenecks for farming. They are also of the utmost important for data sharing in general and are thus considered as being relevant to exploring options of data sharing for impact reporting. The relevant ICT challenges and bottles are summarised as follows:

- **Handling large amounts of data from agricultural equipment**
  The farming sector has to deal with this increased managerial load by trying to handle manually a mass of information in order to make correct decisions. The increased use of computers and recent web services have improved and eased somewhat the task of handling and processing of internal information as well as acquiring external information. However, the acquisition and analysis of information still remains a demanding task, since information is produced from many sources and may be located over many sites and is not necessarily interrelated and collaborated.

- **Interoperability between various systems at farm level and in the value chain network**
  The issue of interoperability is crucial. Agri-food business stakeholders have voiced important concerns and problems including the time-consuming task of monitoring chain activities, managing finances, the need for additional information sources and advanced technologies to manage monitoring and data acquisition on-line. In terms of information handling, to support communication between all stakeholders along the value chain, stakeholders have to manage large amounts of information in order to make sound economic and environmental decisions. Currently, this process is very labour-intensive and for the most part is executed manually. Some external entities have set up their own systems (often web pages) to gather the required information on production, resulting in redundant data input.

- Network and communication infrastructures, devices, software, service and media technologies systems through the agri-food chain are predominantly produced and distributed on a national or regional basis, or by manufacturers in relation to specific subsectors. Data sharing between systems is almost entirely absent, and there is little tradition for incorporation of standardised components into the systems. This situation increases the costs of producing devices, software, service and media technologies systems, it slows down the introduction of new products to the market, and it causes frustration among the stakeholders throughout the agri-food chain. It is therefore essential to introduce appropriate technologies and business models for incorporating software and hardware for sharing of essential data throughout the agri-food chain.

- **Standardisation**
  Interoperability must not be driven by certain companies but by agreed standards. Present information systems in agriculture lack standardisation, hampering the efficient exchange of information. The exchange of information at whole chain or network levels is particularly poorly organised, and

[2] G3 is short for third generation of mobile technology systems, which support services that provide an information transfer rate of at least 200 kilobit per second; examples of 3G applications are wireless voice phones, mobile internet access, fixed wireless internet access, video calls and mobile television. G4 refers to the fourth generation. In addition to usual voice and other G3 services, the G4 system provides mobile ultra-broadband internet access, for example to laptops with USB, wireless modems, smartphones or other mobile devises.

requires common investments in architecture and infrastructure setup, which is hard to organise in such a complex and heterogeneous network like agriculture. Although sectors such as crop and livestock production have their own specific needs, there are many similarities in the need for an integrated approach. The introduction of satellite and GNSS technology in agriculture has led to additional requirements on spatial data exchange.

- The ISO 11783-10 international standard is an attempt to model one aspect of an Agricultural Network Information Model. A complete network information model is required for the whole agri-food, -logistics and -transport chain. For the optimisation of management practices in this particular chain, various decision components, data sources, users and systems (software and hardware) need to be integrated.

- **Small-scaled, regional and isolated software development**
  Since decisions throughout the agri-food chain are usually based on different geographical data sets, methods for the transfer and accessibility of this type of information are needed. Additionally, data sources and involved users may be experts in different domains. The diversified structure of data providers, systems and users is often a limiting factor in terms of data interoperability. Most agri-food applications require an interdisciplinary collaboration of several experts or services and therefore data exchange becomes one of the key factors for successful decision making. Collaborators can be spread over different locations, using specialised systems to handle the data. Not all of these systems target the handling and exchange of spatially located information. Even if they are concerned with geo-data processing, they often lack unified data formats for interoperability with other components.

- The stakeholder's choice of application software or operating system should not affect the data exchange. Only documented format standards should be used because undocumented formats are error-prone and not in accordance with generally agreed rules on interoperability. Otherwise, correct comparison of data, originating from different systems, will be impossible. In this respect, the perspective of Small and Medium Enterprises (SMEs) is to develop software and hardware systems that are prepared for several services and when the services are available locally, the value for money is added to the SME developed system automatically. However, reasonable data licensing, regional data protection and ownership should be agreed on. Access to data will not always be free of charge but the reason should only be a matter of legal property rights and not due to digital or technical barriers.

- **National or regional focus and cultural differences**
  All previously mentioned issues are greatly affected by the diversity among agricultural holdings in terms of farm type, size, geography, cultural differences, etc. and also among the different provision systems of agri-food products which have a significant impact on the decision making process of the stakeholders in the chain. As far as primary production is concerned, by structuring the complexity of farms, regions, and technologies for information-driven crop production, some indications have been derived which illustrate the issue of farm management information systems transferability. Based on the outlined differences, it is inherent that new information and communication systems must be designed to accommodate the geographic and cultural differences among different regions.

In conclusion, many challenges have to be overcome to achieve a large-scale expansion and adoption of effective, efficient and cheap information systems for farming. The next section will introduce a direction for solutions that can meet these challenges.

4.3 Internet-based platforms as a solution

It can be concluded that the rising trends in ICT and data sharing as described before result in big amounts of data in food chains that are often poorly integrated. For a real breakthrough at a macro level, data exchange platforms are needed to enable that these data will be used for better decision making throughout the food chain. Data needs to be exchanged with common standards and we need an Agri-Business Collaboration and Data Exchange Facility (an ABCDEF) as an infrastructure for this

data exchange (Poppe et al., 2013). This is a common pool investment, and the European Union has understood that it should help to build such infrastructure in the FIspace project (www.FIspace.eu) of the Future Internet Public-Private Partnership (www.FI-PPP.eu).

The objective of FIspace is to develop a cloud-based platform for business collaboration. Figure 2 shows a high-level picture of the architecture of the FIspace platform. FIspace has two particular components for business collaboration: the FIspace Store and the Real-Time B2B collaboration core. These key components are connected with several other modules to enable system integration (e.g. with IoT), to ensure Security, Privacy and Trust in business collaboration and an Operating Environment and Software Development Kit to support an ecosystem in which Apps for the FIspace store can be developed. The FIspace platform will be approachable through various type of front-ends (e.g. web or smartphone), but also direct M2M communication is possible. Eight use-case trials are used to develop and test the platform including the FI-Ware GEs that are used, in real experimentation settings. These trials are a follow-up of the trials in SmartAgriFood (www.SmartAgriFood.eu) and FInest (www.FInest-ppp.eu), so many of the Apps to be developed are focused on the agri-food sector.

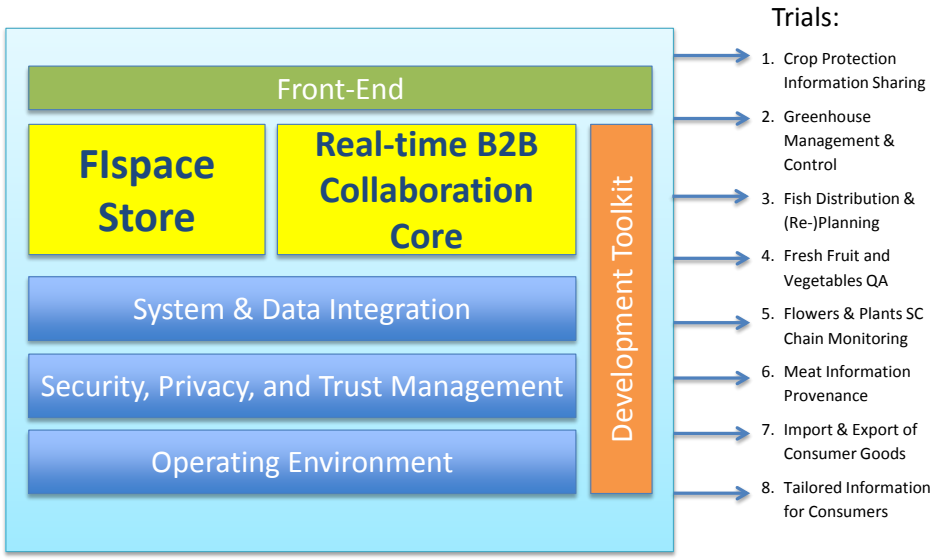

Figure 2 *High-level picture of the FIspace architecture*
Source: www.FIspace.eu.

Figure 3 depicts how the FIspace platform can be used specifically for the agri-food sector. The bottom of this figure shows that existing, local information systems are not necessarily replaced, but they are connected with the FIspace platform (through the system and data integration layer). Through the FIspace platform data and information can be linked to other data sources that are accessible through the internet. In the FIspace App store several services can be offered (e.g. on sustainability impact reporting) that transform information into intelligent applications. Through the front end layer, these apps are accessible in various ways (tablet, smart phone etc.). In SmartAgriFood, several prototype applications were developed based on this architecture, showcasing how it could work, indicating how this could be expanded at a large scale. For details see http://www.smartagrifood.eu/pilots.

For configuring agri-food specific applications (apps) and services more domain-specific knowledge and expertise will be needed. For that purpose, the aforementioned agriXchange platform could be used and extended. The overall objective of agriXchange was to coordinate and support the setting up of a sustainable network for developing a system for common data exchange in agriculture. This was achieved by 1) establishing a platform 2) developing a reference framework for interoperability and 3) identifying the main challenges for harmonising data exchange in agriculture. The agriXchange reference framework provides a structured aid for developing interoperable system solutions in agriculture. It mainly focuses on message interfaces between different processes, in particular for wide

scope use cases in which usually several stakeholders are involved. Users are provided with a rich knowledge base of existing use cases, including interface messages and references to standards, so that this knowledge and complete components can be easily re-used. This is further leveraged by the aXTool that supports this process by guiding the developer step-by-step through a process, supported by intelligent search functions (Pesonen et al., 2013).

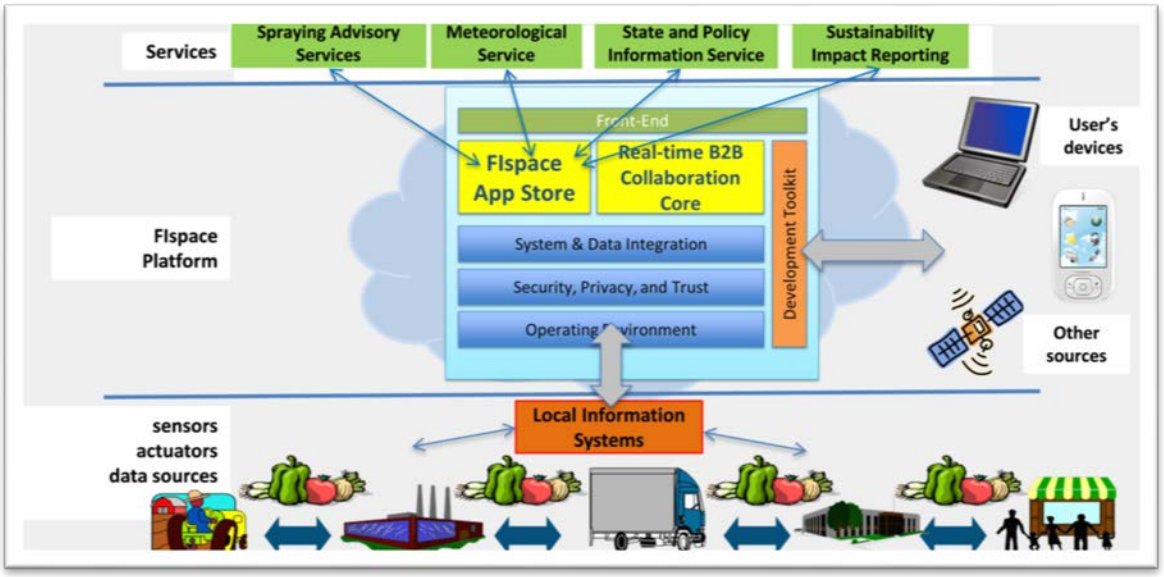

Figure 3 *High-level picture of the FIspace architecture*
Source: www.SmartAgriFood.eu

The approach of a cloud-based FIspace platform showed how one can provide specific solutions (e.g. sustainability impact reporting). The advantage is that many basic infrastructural elements (e.g. on security, system integration, front ends, etc.) are commonly used and do not have to be developed and maintained by the specific solution developer. Various information systems can be linked together through a system and data integration layer and can be disclosed for multiple purposes. This makes it attractive for information system providers to participate in such a platform by providing mapping and interface services for their specific system, or better, to develop a common standard for the same type of information. The specific knowledge on agri-food standards and existing information systems can be developed in a different platform (e.g. agriXchange) which easily can be further integrated into the FIspace platform. One of the big challenges is that such a platform will only work if many stakeholders are using it (e.g. Facebook, LinkedIn) and if there is a clear additional value for them to participate. The possibilities for exploitation of the FIspace platform and a specific configuration are currently investigated.

5 Conclusions for data sharing information systems

There is an increasing and widespread interest in if and how data can be shared to improve impact reporting. For cocoa certification, stakeholders believe that data sharing could reduce the costs of collecting data borne by farmers, firms and certification standard setting organisations. Data sharing makes sense as there is a considerable overlap of data requirements and current data collection efforts. However, definitions are not always clearly formulated, and different certification programmes emphasise different outcomes and data types according to their goals and targets. In some cases however, indicators differ only slightly. The interviews conducted for this report reveal the data needs that are elaborated in detail in Section1.1.

Willingness to share data

While data needs are similar for different stakeholders involved in certification, the willingness to share data seems to depend on the incentives for data collection and impact reporting. The interviews showed that all stakeholders demonstrate a general willingness to share data, with certification organisations and certifiers being most open within the legal limitations by contracts and ISO standards for bodies operating product certification systems. The ISEAL Alliance has started to explore options for data sharing with its members. Traders and exporters on the other hand are very cautious about data sharing. This is mainly due to their perception of data as confidential and as a strategic business asset.

Which data could be shared?

According to the interviews, the type of data that could be most easily shared are contextual data on the countries/regions, regional/country averages for benchmarking as well as scientific data, for example on the characteristics of crops, soil quality and information on standard production methods in the region and/or country (best practise according to the prevailing situation and possibilities). Such data are for example provided by the World Bank, FAO and other international institutions. Sharing these data would thus mean extracting the respective data of interest to stakeholders and making it available in an accessible and useful way for impact reporting. The available data would need to combined, i.e. linking different data sources by matching and compiling. Decisions would need to be made about the key information needed. Establishing an information system for key data on key commodities, and countries could be a starting point for further efforts of data sharing, serving as a pilot.

Another promising option would be to share data to create the baselines needed to provide 'before-and-after' or 'with and with-out' (counterfactual) impact assessments. Here, research organisations could help to develop a framework for creating baselines by applying state of the art methods and make these operational for practical application. Already existing databases could be utilised, with additional data needs identified.

Conditions

The following prerequisites for information systems for data sharing have been identified:

- Clear definition of information on and common understanding of intervention logic(s) and indicators to be measured.
- Agreement on user-friendly and accessible tools for data handling that facilitate the interpretation and analysis of data; a simple data compilation would not be sufficient to meet the needs of stakeholders.
- High data quality: up-to-date, reliable, impartial and scientifically sound data is required, and transparency about how it is collected and limitations.
- Agreement on measures to avoid abuse, e.g. agreements for treating confidentially issues, and possibilities to limit ad restrict use and publication of data.
- Sharing the costs of information systems for data sharing.

Possibilities for ICT solutions for data sharing

Current trends in ICT provide promising opportunities for data sharing. However, there are several bottlenecks that have to be solved, requiring an approach in which technical and organisational development goes hand-in-hand. New technologies (e.g. lightweight internet applications or apps) can make it easy and cheap to use solutions for digital information exchange. However, this requires a consistent backbone - a platform - where information between these different apps is combined. This goes beyond the current Apps (e.g. Apple, Android and Microsoft) which focus mainly on business-to-consumer services, and less on business-to-business collaboration. The FIspace platform described in section 4.3 could fulfil these needs although this is still under construction. It is meant to be an open platform where stakeholders can exchange data in a secure way and which provides services for impact reporting (as well as many other services using the collected data). Agreements on how and what information to exchange should be made regardless of which technical solution is chosen. This requires a substantial organisational work and standardisation.

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Annex 1 Sustainability issues identified by ISEAL

Social	
Labour Rights	Rights associated with conditions of work, conditions of employment and worker empowerment, as enshrined in the ILO Declaration on Fundamental Principles and Rights at Work
Gender Rights	Access to opportunities and empowerment of girls and women, as well as the reduction of discrimination and inequalities based on gender
Cultural Rights	Indigenous and minority rights and empowerment, including respect for self- determination, intellectual property, benefit sharing and religious tolerance
Social Services	Access to education, health care, clean water, food security and housing
Environmental	
Water	Marine and fresh water conservation and quality, including protection from pollution
Soil	Maintenance of organic matter and biological activity, including prevention of erosion and pollution
Biodiversity	Biodiversity conservation at the genetic, species and ecosystems levels
Energy	Efficient energy use, including reduction in total use and increased use of renewable energy
Carbon	Mitigation and sequestration of greenhouse gas emissions and increased resilience and adaptation capacity of people, their livelihoods and ecosystems to climate change
Natural Resources	Efficient management of natural resources from production to post-consumption, including integrity of ecosystem services, sustainable levels harvesting and extraction and reduction and effective management of waste
Economic	
Income	Provision of a minimum wage or access to a living wage
Enterprise Resilience	Assurance of self-reliance and ability to counter risk through economic diversification, access to finance and increased productivity and quality
Value Chains	Fairness and responsibility toward all actors in a value chain, including equitable trading relationships

Source: ISEAL Impact Code (2014).

Annex 2 Examples of ISEAL indicators for sustainability impact

What is the current reach and market presence of our standard systems? How has this changed in the last year?

Guiding questions	Indicator metric	Source of data	Level
What countries do we reach?	Country	Certificate holder	1
Where exactly are certified/verified operations located?	Geographic identified for certificate	Certificate holder	1
	Geographic identifier for certified entity	Certified entity / group member	2 and 3
	Perimeter of certified land area (polygon)	Certified entity / group member	3
How many and what types of certificate holders are included in our system?	Type of certificate (individual; group - producer group or community organisation; group -other)	Certificate holder	1
Product certified/verified	Certificate holder		1
How many individual operational units ('certified/verified entities') are covered by our standard?	Number of certified / verified entities included in certificate / verification (lowest operational unit e.g. farm, landowner, at end of calendar year)	Certificate holder	1
How many, and what type and gender of, workers and contractors are covered by our standard?	Number of employees or contractors of certificate holder covered by the standard, by gender and by type (full/part-time vs. seasonal/temporary)	Certificate holder	1
	Number employees or contractors of group members covered by the standard, by gender and by type (full/part-time vs. seasonal/temporary)	Certified entity / group member	2
How many producer groups, producers, and workers are trained through our system?	People trained in last calendar year in preparation for entry into programme or as requirement of standard, by gender and type of training ((1) agricultural innovative techniques and sustainable practices; 2) gender, 3) adult literacy, business and financial management, record keeping, accounting, administrative procedures; 4) health and safety; 5) ecosystems services and/or biodiversity conservation; 6) Business development (market access, strategy, quality control; 7) verification process, (8) Other)	Various	1
How much land is covered by our standard?	Hectares of land covered by the standard (reported)	Certificate holder	1
	Hectares of cultivation area covered by the standard (reported)	Certificate holder	1
What is the volume of production according to our standard?	Estimated volume of product produced according to the standard (production estimate for calendar year)	Certificate holder	1
	Reported actual volume of product produced according to the standard (reported production volume for calendar year)	Certified entity / group member	1 (ICS) or 2
	Volume of product purchased from certified/verified group members (volume purchased in calendar year)	Certificate holder	1
What is the extent of multiple certifications in our system? Are we bringing new producers and producer groups into certification?	Current list of valid sustainability certifications/verifications held by certificate holder, from standardised list	Certificate holder	1
	Number of other valid certifications/verifications to sustainability standards held at time of entry to programme	Certificate holder	1
	Current number of valid ISEAL member sustainability certifications/verifications covering production of the certified entity	Certified entity / group member	1
What is the longevity and turnover rate of certificate holders and producers in our system?	Year of programme entry (and years since programme entry)	Certificate holder	1
	Certificate holders entering and leaving programme in last year	Standard system owner	1
	Certified entities added to and exiting certification / verification in last year	Certificate holder	1

Source: ISEAL (2013a).

What types of producers and producer groups are we reaching with our system? Are we reaching smallholders and marginalised farmers?

Guiding questions	Indicator metric	Source of data	Level
What size and types of producer groups are included in our system?	Group size (total number of group members, whether certified/verified or not), at end of last calendar year	Certificate holder (group only)	1
	Dominant labour model of group members- group manager estimate: (family labour, family labour plus seasonal paid labour, family labour plus year-round paid labour, or year-round paid labour)	Certificate holder (group only)	3
	Dominant level of mechanisation among group members – group manager estimate: (unmechanised, semi-mechanised, mechanised)	Certificate holder (group only)	3
	Group's highest position in value chain: (1) production/extraction only (selling raw), (2) post-harvest processing or drying, (3) product transformation, or (4) trade/retailing	Certificate holder (group only)	3
What is the profile of producers in our systems? How many small holders and marginalised producers are included in our system?	Cultivation area, total hectares (actual or by size category: 0-1.99, 2-4.99, 5 – 9.99, 10+)	Certified entity / group member	1 (ICS - reported); 3 measured
	Land size, total hectares (actual or by size category: 0-1.99, 2-4.99, 5 – 9.99, 10+)	Certified entity / group member	1 (ICS) or 2; 3 measured
	Gender of farm/land manager – name in ICS or chief decision maker re: production	Certified entity / group member	1 (ICS) or 2
	Age of farm/land manager	Certified entity / group member	2
	Level of mechanisation (unmechanised, semi-mechanised – by sharing/borrowing, semi-mechanised – by ownership, mechanised – by sharing/borrowing, mechanised – by ownership)	Certified entity / group member	2
	Labour model (family labour, family labour plus seasonal paid labour, family labour plus year-round paid labour, or year-round paid labour)	Certified entity / group member	2
	Position in value chain: (1) production/extraction only (selling raw), (2) post-harvest processing or drying, (3) product transformation, and (4) trade/retailing	Certified entity / group member	2
	Production intensity (low, medium, high – to define by crop)	Certified entity / group member	2
	Age and variety of plants (indicator to develop on crop by crop basis)	Certified entity / group member	2
	PPI poverty status likelihood at time of entry to programme (PPI score using (1) likelihood of income being under 150% of the national poverty line and (2) under the international $2.50 per day poverty line)	Certified entity / group member, or household	2
	Land tenure ((1) own - have title deed, (2) lease or rent, (3) share crop, (4) squat, (5) traditional use rights, (6) other)	Certified entity / group member, or household	3
	Number of household members working in certified/verified entity, by gender, by adult/child, by level of involvement in production activities (primary occupation, seasonal, none)	Certified entity / group member, or household	3
	Household size	Certified entity / group member, or household	3

Source: ISEAL (2013a).

Do we see improvements in human well-being at the household level, particularly for small holders and marginalised producers?

Aspect of well-being	Indicator metric	Source of data	Level
Multidimensional	Degree of satisfaction with benefits of participation in certification programme	Certified / verified entity	2
	Under investigation: multidimensional poverty index / livelihood index	Household	3
Economic (income, assets, food security)	Perceived change in economic situation since entry into programme, by gender	Individuals in household	2
	Perception that farming/forestry (of certified product) could provide a viable livelihood for children, by gender	Individuals in household	2
	Incidence of / $ value of household capital investments / disinvestments in basic services or housing, productive assets, natural assets in last calendar year	Household	2 (incidence) / 3 (value)
	Months and days of in adequate access to food (Household Hunger Score +) – in development	Household	2
Total household income	Household		3
Environment and resources	Perception of change in quality of natural resources on which household depends	Certified / verified entity	2
	Soil health (indicator in development)	Certified / verified entity	3
	Perception of change in access to natural resources on which household depends	Household	3
Political	Perception of change in control and choice over production and product sales decisions	Certified / verified entity / Individuals	2 3 (by gender)
	Perception of change in control over future, by gender	Household / Individuals	3
	Perception of change in level of control over household decisions, by gender	Household / Individuals	3
Human	Electricity: has service, electricity consumption	Certified / verified entity / Household	2 3 (consumption)
	Access to school: Distance to primary school	Certified / verified entity	2
	Access to water: Distance to potable water source in dry season	Certified / verified entity	2
	Perceived change in quality of life	Household	3 (by gender)
	Primary cooking fuel	Household	3
	Primary source of drinking water	Household	3
	Type of sanitation available at home	Household	3
	School attendance of children under 12, by gender	Household	3
	% of children under 12 at grade level, by gender	Household	3

Source: ISEAL (2013a).

Annex 3 Questionnaire

1. Engagement in M&E, impact reporting

1.1 Do you engage in activities to report on the impact of certification? Yes -> go to question 1.2
1.2. Why do you engage in M&E, impact reporting?
1.3. If not – why not?
1.4. Who do you involve for impact assessment (monitoring and evaluation)

2. Which activities of impact assessment (monitoring and evaluation) are you involved with?

For example:
Defining a theory of change (impact logic), defining indicators, data collection (surveys), analysis preparing annual reports, quarterly business accounts, impact reports...

3. Impact Assessment

3.1. Which impact(s) do you measure?
3.2. Which indicators do you use?
3.3. Which method for the analysis - how do you measure the impact? Qualitative statements, progress measurements (e.g. nr of farmers involved/volumes of certified produce), quantitative assessments (before-after, with and without, difference in difference…)?

4. Data issues - referring to the impact/indicators mentioned in question 1.

4.1. Which data do you use? Which types of data, who collects it and why?
4.2. Which data would you like to use?
4.3. Do you use already existing data – if not why not? If yes, which types of data, who collects it?
4.4. At which level do you measure the impact: farmers' level, plantation level, per value chain partner, with regard to part of the value chain, with regard to the entire value chain, (please specify)
4.5. Which level of detail is necessary to conduct impact assessments?
4.6. How do you ensure the quality of the data?

5. How do you collect the data?

5.1. Who is involved in the data collection?
5.2. Data storage system?
5.3. How often do you collect the data?

6. What are the difficulties you face with regard to the following:

6.1. Measurement of impact – defining appropriate indicators
6.2. Data collection (reliability, confidentiality…)
6.3. Data analysis and interpretation

7. Data sharing

7.1. For which data would data sharing make sense in your opinion?
7.2. For what do you or would you like to use the data, other than reporting?
7.3. Would your data be available to others, too?
7.4. What would be possibilities for sharing the data with others (e.g. conditions under which they could be shared)?

8. Characteristics of an information system for impact reporting

8.1. What do you consider important aspects of credibility of information systems for impact reporting? E.g. expertise, independence of evaluator, transparency, quality of evaluation output, reporting success and failure, participation of stakeholders....
8.2. Which characteristic should such information systems have for the system to operate well?

9. Data collection, information system for M&E

9.1. Would you be in favour of an information system that would be accessible to multiple parties?
9.2. What would the conditions be for such a system to operate well?
9.3. Would you use such an information system for impact reporting?
No: why not? Yes: why? Would it help you and if yes in what way?
9.4. Under which conditions would you use it?
9.5. Would you contribute in the data collection (how? – pay, deliver data…)
9.6. What would be the advantages, disadvantages of such a system in your opinion?

Annex 4 Examples of data sharing in the agri-food sector

Digital information exchange in Dutch food value chains

Both private companies and public agencies keep developing value chain guarantee and certification Systems. Because private companies and public agencies have similar and complementary information requirements with respect to processes in the value chain and the accompanying Chain Guaranty Systems, there are possible economies in combining private and public information gathering and processing activities (see LNV 2008). For this reason, the Dutch Ministry of Agriculture, Nature Management and Food Quality has developed an e-dossier tool within the EDV-program (Electronic Service Provision). The e-dossier tool supports the exchange of information between private Chain Certification Systems and the databases of the Ministry of Agriculture, Nature Management and Food Quality. For example, the tool may be used to extract information from databases of private companies to support the monitoring and controlling functions of the Ministry of Agriculture, Nature Management and Food Quality. The e-dossier for Chain Certification Systems can also be linked to systems such as I&R (Identification and Registration) and the UBN-index (Unsatisfied Basic Needs index). It is also possible to link the tool with databases of Rendac (this enterprise processes rest materials and carrions) and of GD (an enterprise that offers independent, scientific veterinary knowledge).

FrugICom: Electronic standards in Dutch fresh produce

FrugICom puts great effort into promoting the use of standardised electronic communication in the fruit and vegetable value chain. The aim of FrugICom is to get all parties involved in order to make the standards actually work. For this reason, FrugICom informs various parties and tries to convince them of the benefits standardisation will bring. They also organize meetings to establish communication standards. FrugICom applies the GS1-standard that exists of multiple codes and a range of numbers. The main benefits of this standard are improved traceability, and the ability to attach knowledge about content, storage and shelf life, origin, quantity and quality. The success of the implementation of the GS1-standard is mainly dependent on the number of parties involved (network effect, see Chapter 5). Source: www.frugicom.nl

Potplantennet.nl

The platform Potplantennet (www.potplantennet.nl) has been established in order to strengthen the sector, as one of the elements of the SierteeltNet organisation. www.potplantennet.nl is an internet start page, or portal, for producers, manufacturers and subcontractors in the sector.
The website visitors can disclose specific information on cultivation. Also, various knowledge items are presented here. The website offers a well organised interactive trading platform for equipment, greenhouses and plant materials. Through this site people related to the specific niche of pot plants can find each other easily. Furthermore, besides the Horticulture Agenda, vacancies in Glasshouse Horticulture and the latest Growers News, there is also a focus on the following issues:

- Tuinbouw Vraagbaak - experts can ask other experts for advise,
- News for professional florists,
- Hortitube Horticulture movies, in the style of YouTube,
- APX Electra Dagmarkt with financial results and news.

The interaction between the various parties in the horticulture value chain and the mutual interaction between growers is seen as a very important function of the website. The medium of the world wide web makes it possible for many small and larger parties to find each other in one place, accessible from every office or single computer, sharing the same services, products and knowledge with parties spread over the country or even abroad.

BIO-Monitor (Source: Johan Bakker, LEI)

The BIO-Monitor is an annual measurement of consumer spending's in the Dutch market. It measures (organic) spending's in million euro (incl. VAT) for the total market and for organic food products.

Measured labels need to regulate more on environmental, social and animal friendliness than legally obligated. Additionally they need to be audited independently. The results for the organic market are presented in the annual June report on Dutch sustainability. The client for the BIO-Monitor is the Dutch Ministry of Economic Affairs. In order to collect the data, LEI collaborates with commercial market researchers. Approaches are different for different parts of the market. The main parts are:

- Retail: Data collection is based on UPC product codes and supplied by all retail formulas on the Dutch market. (except Aldi and Lidl)
- Out of Home[3]: Data collection is based on sales of the main suppliers of outlets in this sector. The results are standardised for the consumer level including VAT.
- Nature and specialty shops: Data collection is based on two sources. One measures the total level for all specialty shops and is based on sales of the suppliers. The second source is a sample from the cash registers of about 30% of all specialty shops. The results are used to divide sales over product groups.
- The rest of the sale channels; like Internet sales, box schemes, farmers markets, farm sales and direct selling is based on interviews with major players in that market.

When above mentioned data is collected, LEI aggregates the data and divide it per product group. For each product group (fruit and vegetables, dairy, meat, eggs, fish, coffee/tea and dry groceries) a Delphi based validation takes place with relevant and market leading stakeholders. Institutes that are involved are:

- A commercial UPC based market researcher (AC Nielsen / IRI Nederland).
- A commercial market researcher in the out of home sector.
- The umbrella organisation for the Dutch organic market suppliers.
- Numerous small stakeholders representing the rest of the sales channels.

All data suppliers need to have a sufficient understanding of the Dutch organic market, its players and the product varieties that are sold in the Netherlands. The results are presented through the internet. Easiest way to approach is on the site: www.monitorduurzaamvoedsel.nl. Although the BIO-Monitor exists for more than a decade now, quality improvements are always possible. The biggest challenge now is to obtain correct data from the retail channel. This data is judged by LEI now, because every year problems occur. These are the main bottlenecks:

UPC codes do not contain a reference for organic or sustainable labels. Combining the UPC codes with a sustainable label is manual labour, done through field audits by the commercial market researcher that supplies us their outcome. When a product is identified as containing a relevant label, a link between the label and the UPC product code is processed in the database of the commercial market researcher. Due to a lack of version control it is not possible to retain history data for a product code. When processed with a relevant label, a product code is assumed to contain this label always in his UPC code history. This is not correct. Sometimes products start without a label and later on achieve one. It is very difficult to collect data for PLU codes. The difference between a UPC and PLU is the volume and price. UPC codes have a fixed weight or content and price. PLU codes are almost always processed in the store. No weight or content is available and price depends on the weight of the product. The cash registers process UPC codes identically through the total market but for PLU codes different retail formulas and even different stores within one formula use different codes on the cash register. All PLU codes are cumulated by the commercial market researcher which gives LEI a less visible approach during control and validation.

The approach of the BIO-Monitor is planned to be revised this year. Having said that, it can be expected that data collection to be the same as before. The data is expected to be extended with some sort of overview of the impact of the different labels on environmental, social and animal friendliness. New is this year's start of the price development of sustainable (and thus organic) products compared to their regular varieties. This will give an inside of the price premium for sustainable varieties and the price developments of both sustainable and regular variety.

[3] The Out of Home sector includes restaurants, hotels, hospitals, prisons, in company catering and consumption on the go; at train- and petrol stations.

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LEI Wageningen UR carries out socio-economic research and is the strategic partner for governments and the business community in the field of sustainable economic development within the domain of food and the living environment. LEI is part of Wageningen UR (University and Research centre), forming the Social Sciences Group together with the Department of Social Sciences and Wageningen UR Centre for Development Innovation.

The mission of Wageningen UR (University & Research centre) is 'To explore the potential of nature to improve the quality of life'. Within Wageningen UR, nine specialised research institutes of the DLO Foundation have joined forces with Wageningen University to help answer the most important questions in the domain of healthy food and living environment. With approximately 30 locations, 6,000 members of staff and 9,000 students, Wageningen UR is one of the leading organisations in its domain worldwide. The integral approach to problems and the cooperation between the various disciplines are at the heart of the unique Wageningen Approach.

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MEMORANDUM
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