Delta Framework

Description of a common data model for the Delta Framework indicators

better cotton™

ICAC INTERNATIONAL COTTON ADVISORY COMMITTEE

INTERNATIONAL COFFEE ORGANIZATION

GLOBAL COFFEE PLATFORM for a sustainable coffee world

Delta Framework

Published 2022 by Better Cotton/ Delta Project Team[1]

Author: Elizabeth Kennedy

Acknowledgements:

This document was compiled and prepared for the Delta Project by Elizabeth Kennedy, building on original content prepared by Hector McNeill and additional technical input from Harald Puhl. Additional thanks go to Eliane Augareils, Priyanka Kalmane, Abishek Kumar, Francesca Mancini, Vidyun Rathore, Evonne Tan, and George Watene for their invaluable review and comments.

www.deltaframework.org

The project was possible thanks to a grant from the ISEAL Innovations Fund, which is supported by:

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Economic Affairs SECO

1 The four Delta Project partners are: Better Cotton, the Global Coffee Platform (GCP), the International Coffee Organisation (ICO) and the International Cotton Advisory Committee (ICAC).

Contents

1. Framing

The Delta Framework provides a set of 15 impact and outcome indicators to measure sustainability improvements within and across the cotton and the coffee sectors. In order to promote a globally harmonised approach for reporting sustainability results, the Delta Framework has a strong alignment with the Sustainable Development Goals (SDGs).

The Delta Framework comprises a set of guiding documents to integrate the indicators into existing monitoring systems, to collect and analyse data, and to properly communicate sustainability improvements.

These guidelines are available on the Delta Project website and include:

1. **Delta Framework Sustainability Indicators.** This document presents the set of 15 indicators, the rationale for their selection, definitions, methodological notes, and main references for each indicator. It also includes the learnings from pilot testing the indicators in different countries and settings.
2. **Integrating new performance indicators into sustainability systems: practical considerations.** This document includes considerations and a set of guiding questions designed to support the inclusion of the indicators in the Monitoring, Evaluation and Learning (MEL) systems of Voluntary Sustainability Standards (VSS) and other organisations;
3. **Basic guidance for obtaining informed consent for the Delta Framework indicators data collection.** This document guides the incorporation of informed consent for the Delta Framework indicators data collection into existing organisational data strategy and policies;
4. **Description of a common data model for the Delta Framework indicators.** This document supports the implementation of common data models to facilitate future data aggregation and collective reporting;
5. **Principles to define and communicate sustainability performance in the agricultural commodity sector.** This document directs public and private sector stakeholders on deriving sustainability information and messages on the production of agricultural commodities from the data.
6. **Guidance and tool to aggregate producer-level sustainability data and report progress at national level.** This methodology aims to support national commodity associations and other relevant public bodies to aggregate producer-level data using the Delta indicators to assess the sustainability performance of the commodity's production at country level.

This document is number four in the above list. The target audience includes Chief Information Officers and database engineers within organisations that adopt and implement the Delta Framework indicators. It outlines reasons to apply a common data model and describes a data model for each of the 15 Delta Framework indicators in the form of data reference tables (see Annexes 3 - 17). Each table describes the relevant variables and permissible values for the data associated with the indicators. This document does not address requirements for the exchange of the data or directly inform aggregation, analysis, or reporting processes for the data.

The data reference tables are platform agnostic, meaning they can be used within any information management system using any programming language and system configuration to inform an organisation's data architecture development.

Delta Framework Sustainability Indicators

- Indicators description
- Definitions
- Methodologies
- References
- Learnings from pilot testing the indicators

Integrating new performance indicators into sustainability systems: practical considerations

- Strategic framing for indicator integration process
- Data value chain
- Generation: data capture, acquisition, and obtaining informed consent
- Data transmission and validation
- Analytics: data processing and analysis
- Exchange: packaging and communicating insights, publishing, and sharing data

Basic guidance for obtaining Informed consent for Delta Framework indicator data collection

- Data protection and the categorisation of personal and sensitive data
- Recommendations for how to obtain informed consent

Description of a common data model for the Delta Framework indicators

- Overview of the information and data ecosystem
- Applying a common data model
- Mandatory data
- Application of existing data standards
- Ethical and data protection considerations
- Recommendations for how to apply the common reference data tables

Principles to define and communicate sustainability performance in the agricultural commodity sector

- Monitoring versus impact indicators
- Framework application principles
- Indicators-specific principles
- Data collection principles

Guidance and tool to aggregate producer-level sustainability data and report progress at national level

- Aggregate producer-level data
- Report sustainability progress at national level

2. Glossary

The definitions provided in this glossary relate to terms used in this document. The limited set of terms serves as a means of establishing common understanding for how they are used in this document, recognising that there may be other definitions for these terms and concepts.

Data ecosystem: A platform that combines data from numerous providers and builds value through the usage of processed data. A data ecosystem is essentially a partnership model among multiple stakeholders to share and manage data to create new value and insights that are not generally feasible in siloed systems. Data sharing is based on mutual value exchange, thus making data more beneficial for all participants. Sharing complies with relevant jurisdictional regulations and organisational policies.

Data model: An abstract representation of how data elements are organised and how they relate to one another and the properties of the Delta Framework indicators. Its primary function is to describe the definition, format, structure, manipulation, and integrity aspects of the data. A data model is used by business analysts and data system architects as a conceptual tool to aid in the development of their organisational information system. A data model is system agnostic and not specific to a particular software or implementation framework. A data model can be represented in many different formats. In this document, the data models for the individual Delta Framework indicators are presented as reference data tables.

Reference data table: A table which specifies the name, units of measure, type, and precisions for the data elements associated with a given Delta Framework indicator. This table also includes a description of the relevant algorithms, formula, and arithmetic procedures to calculate the indicator. For the Delta Framework indicators, it also includes brief descriptions of the data collection methods, and typical source points for the data.

3. Executive summary

The vision for the Delta Framework indicators is to support sector-wide and cross-sector reporting on a subset of 15 common performance indicators. To bring data from multiple sustainability systems and applications together can be an expensive and time–consuming initiative if the organisations do not share and understand the data in the same way. Therefore, the Delta Framework promotes a common data model. A common data model provides a shared data language for business and analytical concepts associated with the Delta Framework indicators. The use of a common data model makes it possible for data and its meaning to be shared across organisations, applications, and business processes of sustainability systems and associated stakeholders.

The common data model proposed includes a set of standardised reference data tables that the Delta Project partners have developed. This collection of predefined data reference tables includes the relevant data elements, attributes, and relationships for the concepts and analytic processes to simplify the creation, aggregation, and analysis of data for reporting on the Delta Framework indicators as a single organisation or collectively (e.g., globally for a specific sector or cross-commodity for a given geographic location).

4. Overview of the Delta Framework

The Delta Framework aims to align sustainability monitoring and reporting within and across the cotton and coffee sectors. It provides a common and standardised set of 15 impact and outcome indicators (Annex 1) to measure and report on sustainability improvements. The indicators are paired with guiding principles for generating and communicating sustainability information to certified entities and producers, governments, businesses, and ultimately consumers using the defined indicators. The framework has strong alignment with the Sustainable Development Goals (SDGs) to promote a harmonised approach for measuring and communicating sustainability results.

The intended goals associated with implementing and using the Delta Framework indicators include:

- Inform priorities for producer empowerment and capacity building to improve farm sustainability performance.
- Inform investment and approaches for upgrading extension services to support continuous improvement at farm level.
- Inform national reporting on the SDG commitments of national governments and businesses.
- Inform the ratification of relevant international conventions on chemicals, climate change, biodiversity, and labour rights.
- Produce evidence-based recommendations to streamline sustainability in agricultural policies.
- Promote transparency and communication with consumers on the actual environmental, social, and governance value of sustainably produced goods.
- Strengthen identification of business opportunities through leveraging sustainable value chains.

Realising these goals requires common data concepts and meanings for the sustainability results the Delta Framework indicators evaluate. Through promoting common data definitions and structures across a variety of stakeholders and organisations, the Delta Framework provides a common data model that fosters identification, use, and appropriate sharing and exchange of data and information among the various data value chain actors (Figure 1).

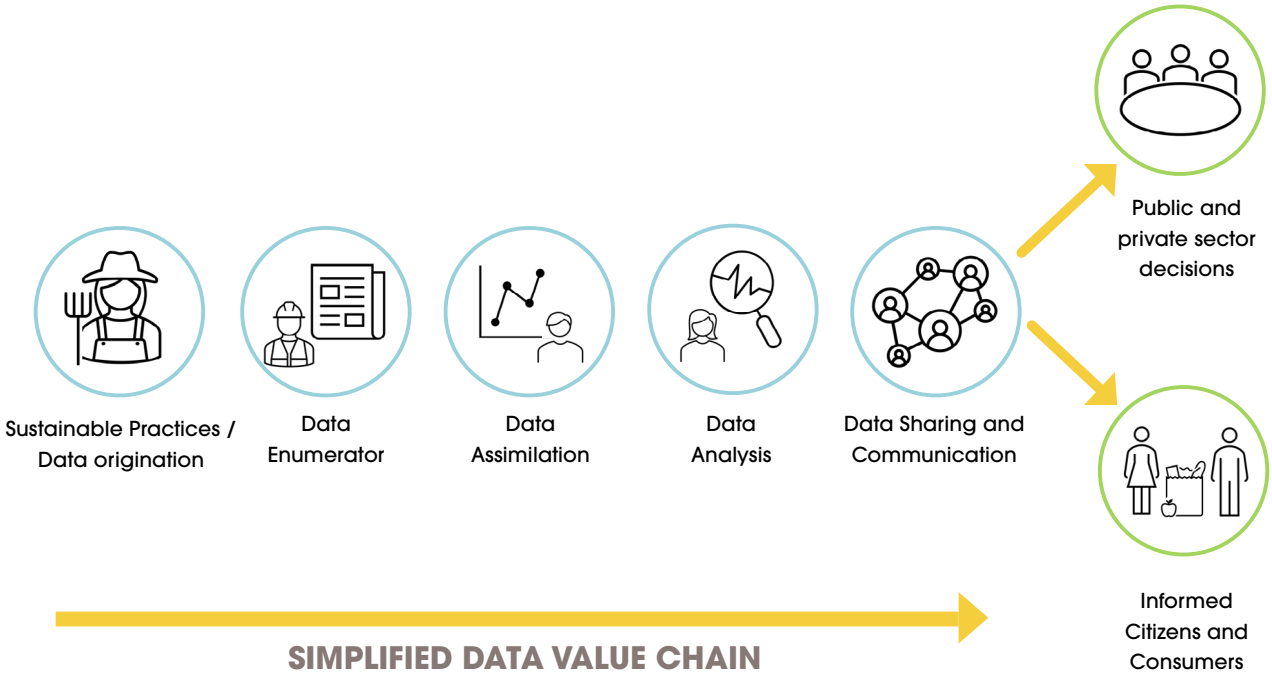

Figure 1. A simplified data value chain that identifies the types of actors who can benefit from a common data model for the Delta Framework indicators.

5. Overview of the information and data ecosystem for the Delta Framework indicators

In this section, an orientation of the key information and data ecosystem stakeholders that constitute the community of interest for the Delta Framework indicators is provided. For a detailed description of the value propositions, relevant business contexts, and use cases for implementing and using the Delta Framework indicators, see guidance documents 5 and 6.

The following information and data ecosystem description assumes that:

- There is an effective means of transferring data collected on farms through a secure chain of custody to make the results accessible to users in other locations.
- That the indicator set established each year is accessible in various reporting formats that are relevant to the key stakeholders in any location.
- Report formats and information content are prepared to suit the needs of each stakeholder.

The most obvious solution to these assumed requirements would be a centrally governed, online platform and data repository where all organisations implementing the Delta Framework indicators compile their primary datasets, and indicator values are calculated (see Figure 2). Stakeholders throughout the extended and broader data ecosystem (see Figure 3) could then access and download preformatted reports to comply with their specific requirements. This is something that can be addressed and created at a later stage.

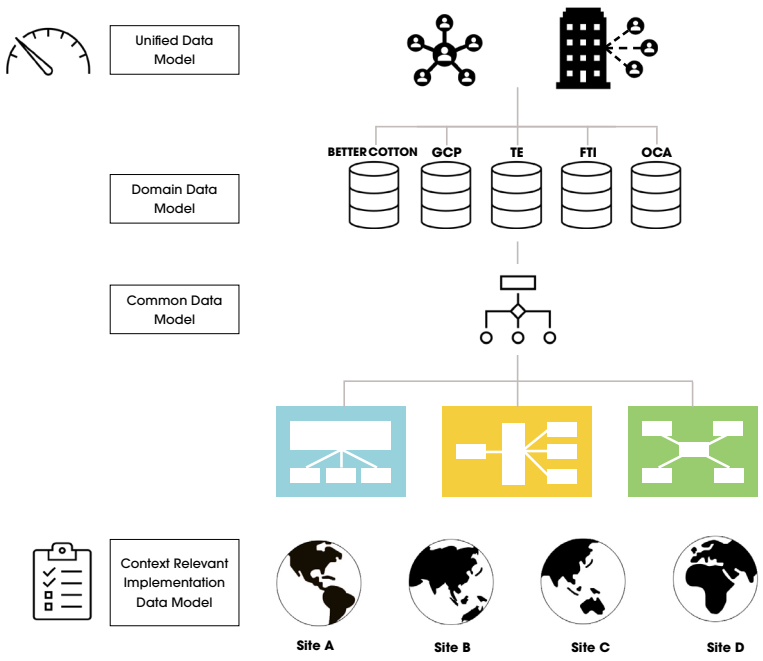

Figure 2. Stylised representation of how a common data model can facilitate data compilation, exchange and collective reporting across multiple sites, system architectures, and organisations to meet a range of stakeholder needs.

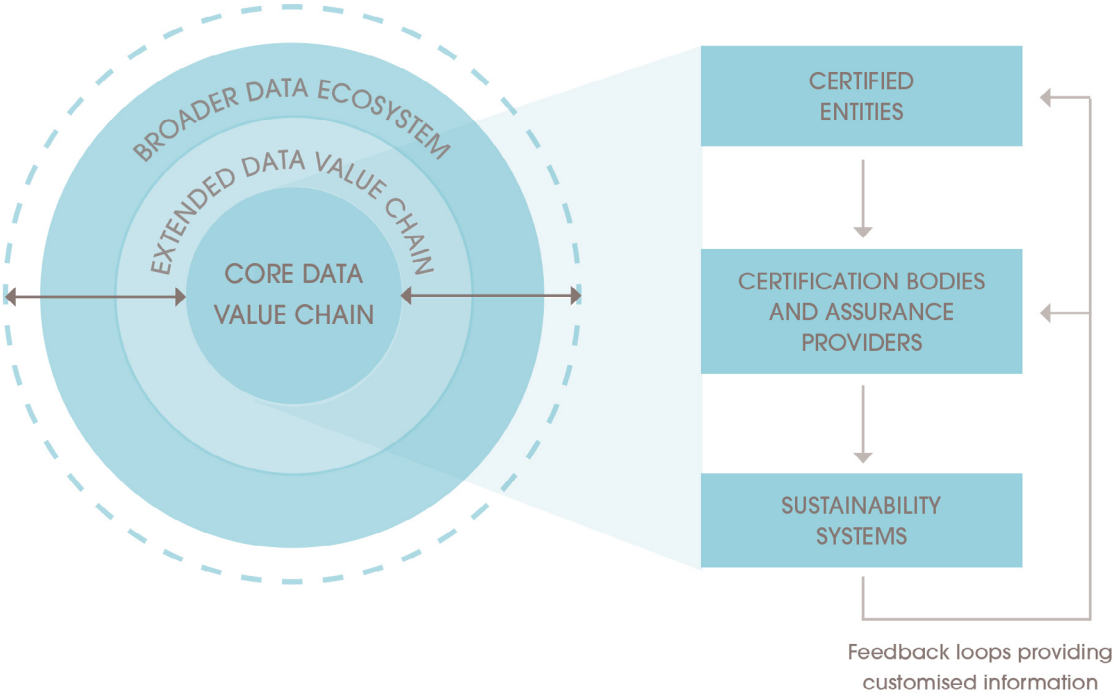

Figure 3. Simplified representation of the data ecosystem for sustainability systems (ISEAL, 2020[1]).

5.1 Core data value chain

A data value chain is the series of steps needed to generate value and useful insights from data. For sustainability systems, the core data value chain (see pull out in Figure 3) involves actors associated with their verification, assurance, and M&E processes. It principally includes the data subjects (certified clients), certification bodies and assurance providers, and the organisation that defined the normative standard for which verification occurs. Often customised/ tailored feedback loops provide information and services derived from data analysis from the sustainability system organisation back to those at earlier stages in the chain. An example feedback loop for certification bodies might be targeted risk profiling results, while for certified clients, it might be context-relevant comparisons or recommended actions for risk management. Data sharing is defined by a clear set of linked agreements that define data rights, controls, and terms of use.

Actors relevant to use case and Unified Model Language

- Data subjects (certified entities/ producers)
- Certification bodies/ assurance providers

[1] ISEAL, (2020). "Structuring data sharing and licensing agreements: Data rights, controls and ethical considerations for sustainability systems". Figure re-printed with permission.

- Sustainability system (this includes certification systems as well as public and private sector initiatives working with producers to achieve sustainable practices).

Typical data exchanged

Non-processed, raw performance and compliance data coming from assurance and monitoring processes is shared up the value chain, while processed analytic results and synthesised outputs are shared though the feedback loops.

5.2 Extended data value chain

Actors in this sphere are trusted partners with close relationships and roles that directly support individual sustainability systems to achieve their missions and goals (e.g., help develop tailored services for feedback loops in core data value chain or actors involved in the product supply chain). For these immediate partners, there is generally mutual sharing and development of bespoke solutions. Data sharing tends to be reciprocal, providing pre-defined benefits, and is defined by memorandums of understanding, partnership contract agreements, and one-off bespoke data sharing agreements.

Actors relevant to use case and Unified Model Language

- Retail partners
- Supply chain partners (factor input suppliers, processors, international trade exporters and importers)
- Consumers
- Field level implementation partners (extension service providers, non-governmental organisations)
- Research partnerships

Typical data exchanged

Because these actors are often working in deep collaboration with the sustainability system, the types of data will depend on the problem-solving objective or specific information requirements. For retail and supply chain partners, the type of data and information shared will generally include analytic outputs such as risk assessment and other types of heat maps to target investment and capacity building as well as summary reports on indicator status by geography and sector. For research partnerships and field level implementation partners, there are a variety of opportunities to share data based on learning objectives. For the consumer, it is tailored messaging related to sustainability claims and results.

5.3 Broader data ecosystem

This sphere is made up of diverse set of stakeholders with intersecting or parallel sustainability objectives. These actors represent opportunities for cooperation and collaboration and are also sometimes competitors. For actors in this outer sphere, data sharing is likely to be unidirectional, and generally more passive (e.g., through application programming interfaces, downloadable reports, website dashboards). Data sharing is most usually governed by data platform and website license terms and conditions where the data are published. In some instances, strategic alliances working toward common goals may require MOUs or one-off bespoke data sharing agreements to facilitate data sharing.

Actors relevant to use case and Unified Model Language

- Finance Sector
- Donors
- Industry, trade, and commerce associations
- Governmental partners
    - International agreement obligations
    - Foreign affairs and international development
    - Relevant ministries (e.g., agriculture, forestry, fisheries, environment, etc.,
    - Extension services
    - Research institutions
    - Economy, planning and policy analysis
    - Statistics (census, household surveys)
- Marketing firms, including media and publicity
- Research and academia
- Independent analytical and policy groups
- Non-governmental organisations
- Multilateral initiatives (Convention on Climate Change, Convention on Biodiversity, World Database of Protected Areas)
- Multi-stakeholder collaborations (e.g., landscape and jurisdictional initiatives)

Typical data exchanged

Data that can feed into global platforms, these are often thematically based (e.g., SDGs) and pre-defined for common reporting objectives. For emerging initiatives like the Delta Framework, data types and formats will need to be defined for the specific reporting context and purpose.

6. Applying a common data model for the Delta Framework indicators

Enabling information and data sharing and reuse across a community of interest is strengthened when there is sufficient alignment and understanding of data concepts and definitions, as well as collection and analysis approaches. A common data model provides a shared procedures framework, syntax and vocabulary that facilitates options to integrate heterogeneous sources of data, and information to provide reports and communication outputs that are tailored to stakeholder needs. It describes the objects which can be generated from the data architectures of different organisations within a defined community of interest (Figure 4) by applying a flexible and standards-based approach to:

- **Data description -** provides a means to uniformly describe data, thereby supporting its discovery and sharing.
- **Data context -** facilitates discovery of data through an approach to the categorisation of data according to controlled vocabularies. Additionally, enables the definition of authoritative data assets within a community of interest.
- **Data sharing -** Supports the access and exchange of data where access consists of ad hoc requests (such as a query of a data asset), and exchange consists of fixed, re-occurring transactions between parties. Enabled by capabilities provided by both the Data Context and Data Description standardisation areas.

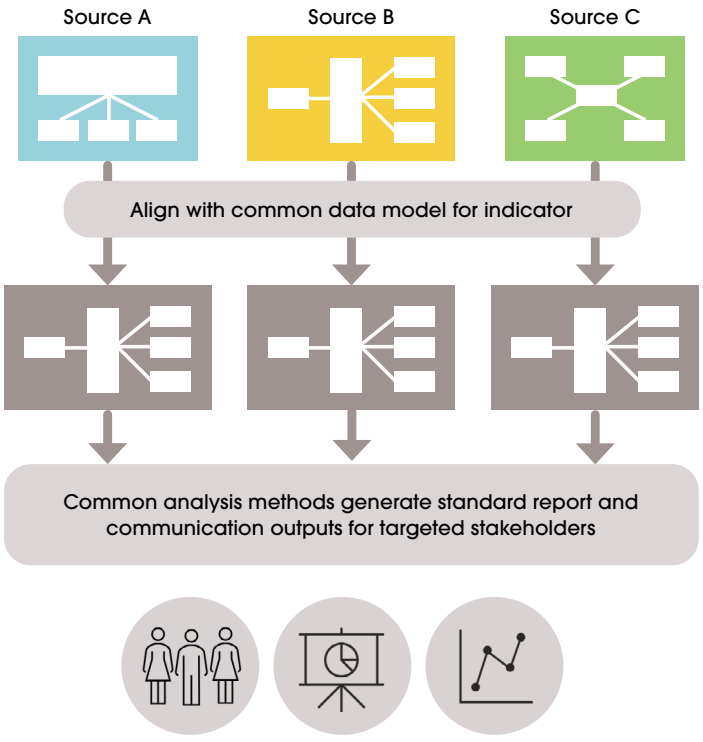

Figure 4. Simplified depiction for how a common data model can facilitate interoperability and collective reporting across different organisations.

A common data model allows the systematic analysis of disparate databases. It can provide a common format and representation such that systematic analysis using standard analytic routines can be performed.

A common data model aims to standardise the first elements of a logical infrastructure so that many related applications can operate on and share the same data. This is achieved through a uniform set of metadata that allows data and its meaning to be shared across uses and purposes. In addition to the uniform metadata, a common data model includes standardised data elements, attributes, and relationships. When all these components are defined, methods to access and use the data are developed so that all applications can implement these same, standardised procedures.

For the Delta Framework indicators, a common data model reference structure has been outlined (Table 1) and is henceforth referred to as "reference data table(s)" in this document. The reference data table contains descriptions of the indicator, formula for calculating the indicator, description of primary data elements, data collection method and point source for data collection. Each table provides a transparent reference for any organisation intending to implement the respective indicator from the Delta Framework.

Within the data reference tables, primary data elements are specified by:

- **property** (identity/ name)
- **metrics** (unit of measure)
- **type** (numeric, text, logical)
- **precision[2] and scale** (precision is the number of digits in a number, and scale is the number of digits to the right of the decimal point in a number). For example, the number 123.45 has a precision of 5 and a scale of 2. In the data reference tables this would be indicated as 5/2. Although precision usually applies to decimals in the reference data tables it is also applied to allowable length of text. In the case of text, the format is 40/0 which indicates a maximum of number 40 characters, including spaces.

It is assumed that the primary data collected on each farm, as well as additional data available from other sources, makes up the primary data in the individual reference data tables for each indicator.

[2] Precision is of importance in defining the levels of detail of information to be collected so that rounding up and down which occurs in calculation does not introduce errors of representation, for example the details of a small 1-hectare farm need to be coherent with those applied to large farms. If this is not the case the calculated indicators for small farms can become highly distorted. Also, the precision ensures that the data that enters the information management system is coherent within the design of the database that stores primary data. Defining minimum standards of precision reduces errors in the indicator value estimates.

Table 1. General structure and content captured in the common reference data tables for the Delta Framework indicators.

Rung	Consideration	Description (text narrative)	Details (specifications)
1	Specification	Description of indicator	Dimensional expression: the expression of the physical quantities used in the formulae for calculations.
2	Calculation formula	Description of calculation	Algorithm, formula, arithmetic procedure
3	Primary data elements	All required data elements to feed calculation	Data element properties, metrics, types, and precision
4	Data collection method	Method of data collection	Full population or sample survey or other
5	Point source	Where the data is at collection point	Where and when data is collected

7. Mandatory data

Classification of data as mandatory is common in many data models. For the Delta Framework indicators, all primary data is required. Ultimately this means that some value must be entered for these data elements.

Clearly, if a farm is applying hazardous pesticides (Annex 3) the information is captured as evidence for the respective data elements and is available for calculation of the indicator. In contrast, if a farm is organic or does not use hazardous pesticides this data is not applicable. Thus, in this instance, it is mandatory that a record of non-use status be provided as a basis for confirming that this data element was in fact assessed. Similarly, in the case of estimating gross margins (Annex 11), the range of variable inputs that apply to small holders may be fewer than those applicable to larger holders. Regardless, all variable input data elements must be completed to assess actual usage and inform individual farm sustainability profiles and recommendations for improvement of farm planning practices (see Annex 18 and note indicators that include individual farm sustainability information and which indicators inform the calculation of gross margins).

8. Application of existing data standards

Where possible the Delta Framework aspires to use existing standards and ontologies and follow FAIR[3] data sharing principles. A subset of the data elements described in the reference data tables use existing standardised

[3] FAIR Principles. The FAIR guiding principles for scientific data management and stewardship published in 2016 are intended to provide guidelines to improve the Findability, Accessibility, Interoperability and Reuse of digital assets. The principles emphasize machine actionability (e.g., the capacity of computational systems to find, access, interoperate and reuse data).

vocabularies (e.g., ISEAL Core Metadata Set) to facilitate interoperability and data exchange for the relevant indicator datasets. The reference data tables include the html addresses that link to the origin vocabulary or format recommendation for the relevant data elements.

9. Ethical and data protection considerations

Data protection is an ethical issue. It involves respect for individuals and their rights regarding privacy and the use of their information. As relevant, the European Union General Data Protection Regulation and other jurisdictional specific data protection legislation must be considered and adhered to as part of implementing the Delta Framework indicators. For non-personal data, it is also helpful to think about any ethical issues prior to the outset of data collection and include processes such as thorough data classification and obtaining informed consent for any non-personal data that can potentially be considered sensitive or cross-referenced with other data to identify an individual.

If you do not obtain consent, it is important to outline what measures you will build into your data management and governance processes to address any potential risks. For general guidance on the classification of non-personal data and steps to consider in obtaining informed consent and rights to use data consistent with the defined use cases, see Delta Framework document 3: Basic guidance for obtaining Informed consent for Delta Framework indicator data collection.

In general, a prudent security principle is to establish and define user permissions and access to only the minimum amount of data required for decision-making and doing their respective jobs. To do this, it is useful to identify various use cases, the broad categories of users, and what information they require to meet their needs. These access permissions should be in alignment with the organisations data classification and governance policies and procedures.

The following list includes typical considerations that should be addressed in developing governance requirements for the Delta Framework indicator data. For additional data governance considerations see Delta Sustainability Framework document 2: Integrating new performance indicators into sustainability systems: Practical Considerations.

1. Classify the data to determine if ethical or legal protections are needed:

    a. Does any of the data to be collected or processed contain personal information?

    b. Describe any restrictions on the data (personal and non-personal) being used or shared.

    c. Are there any restrictions associated with the use of third-party data that creates limitations on how or what it can be used for?

2. If yes, how will the ethical and legislative consequences of holding these data be addressed (GDPR and other data protection)?
3. What mechanisms will be put in place to ensure that personal or sensitive data is not accessed by unauthorised persons.
4. How will the data subject's permission to use data be collected?
5. How will you demonstrate to the data subject that the data collected is being used in the manner intended?
6. What is the anonymisation process to be applied?
7. How will you license the data?
8. Data inventory/ data catalogue functions:
    a. In what format will the data be made available to others?
    b. How will the data be shared with others?
    c. How will others become aware of or find the data?
    d. How will others obtain access to the data?
    e. How will the data be delivered to others?
    f. Where will the explanatory documentation (currently the reference data tables, but once within a system should be part of the enterprise documentation) be maintained?
        i. What metadata will be associated with the data?
        ii. How will the metadata be associated with the data?
        iii. What other documentation will be provided to describe the data?

10. Recommendations for how to apply the common reference data tables

Implementing the data model requires analysis of the existing data system and planning for how you want to create or adapt system elements to accommodate the Delta Framework indicator requirements.

The core recommendation is to follow best practice for database design and implementation. Additional recommendations can be found in Delta Sustainability Framework document 2: Integrating new performance indicators into sustainability systems: Practical Considerations. Underlying tenants to follow include:

1. Start with the use case. Strategically agree the use case(s) for these indicators and associated data.
2. Ensure the data integration process is participatory and involves all relevant stakeholders (data users and data stewards) throughout the integration process.
3. Establish clarity on the roles, permissions, and responsibilities for the data throughout the entire data value chain. This includes who and how the data will be handled during data collection, storage, verification and cleaning, analysis, and sharing (internal and external use and reporting) to clearly define the administrative and functional workflows for the relevant use cases.
4. Identify the target systems. The data are likely to be stored on multiple platforms through the data lifecycle. Determine the various tools used for data collection, data storage, data cleaning and analysis and ensure the data model can be adequately applied across all platforms used in a manner that ensures safety and security for the data throughout its lifecycle.
5. Apply an iterative approach that supports testing, verification, and validation of meeting expectations of users throughout the data value chain.

Annex 1. List of 15 indicators included in the Delta Framework and general overview of data requirements

The current list of the Delta Framework indicators includes:

1. Use of highly hazardous pesticides (HHPs)
2. Pesticide risk indicator
3. Water management (in irrigated farms)
    - 3.1. Water extracted for irrigation
    - 3.2. Irrigation efficiency
    - 3.3. Water productivity
4. Topsoil carbon content
5. Quantity of fertilizer used by type and nitrogen use efficiency
6. Forest, wetland, and grassland converted for crop production
7. Greenhouse gas emissions
8. Yield (average)
9. Gross margin from crop production (living income in future)
10. Price (at farmgate)
11. Proportion of workers earning a legal minimum wage (or above) by sex and by age
12. Incidence of child labour
13. Incidence of forced labour
14. Women's empowerment
15. Rate of fatalities and non-fatalities on the farm by sex

Time dependency of indicators

All indicator values captured and reported need to be considered for one year, which corresponds to the last 12 months of the growing season. The booking year (i.e., the year data will be allocated to) will be the year of

the harvest. This handling of the year needs to be adhered to so that comparable and compliable data sets can be obtained.

All data generated throughout the year are to be added up for the main crops. Intermediary crops are only reported whenever a crop selector is present in the data set.

Surfaces

The handling of the surfaces is left to the implementer. In general, there will be two possible cases:

- Considering the surface as the total surface of a farm being used for farming of coffee or cotton. In this case all values must be related to the total farming area of the farm.
- Handling individual plots allows for more detailed analysis (e.g., in cases where different growing methods are being used). In this case the plots must be well defined, and values must be recorded in relation to those plots.

In case of doubt, the "total surface" approach should be used for simplicity.

Annex 2. Reference data table for identification coordinates for instances of data collection on a farm

RN	Consideration	Description	Details			
1	Specification	General data to identity famer and farm				
2	Formula	No formula	None – data transfer to db as source data for coordinates			
3	Primary data Property, metric, type & precision. Note 1: ISO 3166-1: https://www.iso.org/obp/ui/#iso:std:iso:3166:-1:ed-4:v1:en ISO provides a short name in English, a two character alpha code, a three character alpha code and a three digit numeric code for country name. The ISEAL Core uses the two character ISO 3166-1 alpha code https://iseal-community.github.io/iseal-core/#cluster-global Note 2: Some recommend standard ISO 3266-2 in the administrative unit identifications below the country level. However, it is recommended that this be avoided because of the evolution in the divisions and amalgamation of administrative units resulting from changes in population and electoral district boundaries. In order to maintain relevance, it is best to use GPS only in these cases. In the ISEAL Core, we include the following that can be applied in Delta i. A control list for describing where the lat. and long. points are collected. https://iseal-community.github.io/iseal-core/#is-certifiedsite-coorddetail		**Property**	**Metric**	**Type**	**Precision**
			Country	ISO 3166-1 See note 1	Text	2/0
			Admin unit3	See note 2	Integer	GPS
			Admin unit2	See note 2	Integer	GPS
			Admin unit1	See note 2	Integer	GPS
			Town: name	See note 3	Text	40/0
			Village: name		Text	40/0
			Address		Text	40/0
			Street, Road	See note 4	Text	40/0
			Position		Text	40/0
			Post Code/Zip	See note 5	Text	40/0
			Telephone	See note 6	Integer	20/0
			GPS + altitude	Meters	Decimal	5/0
			GPS +latitude	Degrees	Decimal	8/5
			GPS + longitude	Degrees	Decimal	7/5

	ii. Precision requirements for latitude coordinate. https://iseal-community.github.io/iseal-core/#is-certifiedsite-lat iii. Precision requirements for longitude coordinate. https://iseal-community.github.io/iseal-core/#is-certifiedsite-long If you apply the ISEAL Core format, you would want three rows for each admin unit. Note 3: ISEAL Core uses https://iseal-community.github.io/iseal-core/#is-certifiedorganization-city Note 4: ISEAL Core uses https://iseal-community.github.io/iseal-core/#is-certifiedorganization-streetname Note 5: ISEAL Core uses https://iseal-community.github.io/iseal-core/#is-certifiedorganization-postcode Note 6: ISEAL Core use https://iseal-community.github.io/iseal-core/#is-certifiedorganization-phonecountrycode combined with https://iseal-community.github.io/iseal-core/#is-certifiedorganization-phonenumber Note 7: ISEAL Core uses https://iseal-community.github.io/iseal-core/#is-certifiedorganization-name Note 8: Operational status states whether rented, owner operated or some other operational contractual basis. Best is 3 option control list.		

Name of farmer	See note 7	Text	40/0
Land title owner		Text	40/0
Operational status	See note 8	Text	40/0
Soil texture	clay%:silt%:sand%		
Clay	Percentage	Decimal	3/0
Silt	Percentage	Decimal	3/0
Sand	Percentage	Decimal	3/0

4	Data collection method	Full population (ideally)	
5	Point source	Admin and farm data	Structures and personal registrations and operational arrangements in any contract documents, cross references to ISO 3166 series, national postal address data, GPS device measurements, soil sample.

Please note that the data in this section contains data that would be removed from any publication of data with personal linkages to any data in the primary data or indicator values in this document being removed to gain anonymity. This data is highlighted in yellow. A basic standard is for any type data to be published combining the data from at least 5 farms within a type. Care needs to be taken to take this into account to ensure enough sample points in each type to ensure precision of general results based on averages of data elements or indicator values.

Annex 3. Reference data table for Delta Framework indicator #1 - Use of highly hazardous pesticides (HHPs)

RN	Consideration	Description	Details
1	Specification	The sum of weights of active ingredients of each highly hazardous pesticide applied In (kg/ha).	A list of HHPs reported to be used on cotton and coffee production is provided in Annex 3 of the Delta Framework indicators. All applications of HHP are to be counted and added up. Each HHP has one or several active ingredients and only the weight of the active ingredients is to be counted, not the total weight of the HHP applied.
2	Formula	Consider all pesticides applied: 1. Use Active Ingredient and Annex 3 of the Delta Framework indicators to determine if the pesticide used is a HHP. Only consider such HHPs for the calculation, 2. For each such HHP calculate {mass of AI}(kg): 3. Sum up all masses {total mass of AI}(kg) 4. Normalise (divide) by surface (ha)	1. Use Active Ingredient to determine if the pesticide used is a HHP (Annex 3). Only consider such HHPs for the calculation, 2. For each such HHP calculate {mass of AI}(kg): If the AI concentration is given: {Input HHP}(kg or l) x {AI concentration}(g/kg or g/l) / 1000 else use percentage: {Input HHP}(kg or l) x {AI concentration}(%) / 100 3. Sum up all masses for {total mass of AI}(kg) {total mass of AI}(kg) += {mass of AI}(kg) 4. Normalise (divide) by surface (ha) {Indicator #1}(kg/ha)= {total mass of AI}(kg) / {Surface}(ha)

<table>
<tr><td rowspan="7">3</td><td rowspan="7">Primary data elements, units and types.</td><td rowspan="7">Data multiplicity:
• Multiple values may be present for HHP/AI. They each need to provide all of the data listed here.
• Only one value is present for Surface. This value can potentially be retrieved from the farm data set.

Conditions:
• One of concentration in weight or percent must be given. Otherwise, the data set is invalid
• Information about active ingredients is presented in grams (g/kg or g/l)
• Input must be in (kg) or (l) corresponding to the unit used for the concentration

Listed commercial names of pesticides country-specific due to distribution and marketing arrangements.

Need to create compendium of cross relationships between commercial names and identified active ingredients preferably as chemical name, in each one as well as any differences in concentration by weight or percentage.

This identity-active ingredient-concentration becomes a look up list for manual data inputs or a case list for automatic processing.</td><td>Property</td><td>Metric</td><td>Type</td><td>Precision</td></tr>
<tr><td>Trade Name of HHP</td><td></td><td>Text</td><td>40/0</td></tr>
<tr><td>Name of AI</td><td></td><td>Text</td><td>40/0</td></tr>
<tr><td>AI concentration in weight</td><td>g/kg or g/l</td><td>Decimal</td><td>4/0</td></tr>
<tr><td>AI concentration in percent</td><td>%</td><td>Decimal</td><td>6/2</td></tr>
<tr><td>Input as kg HHP</td><td>Kg.</td><td>Decimal</td><td>5/2</td></tr>
<tr><td>Surface</td><td>Ha.</td><td>Decimal</td><td>9/2</td></tr>
<tr><td>4</td><td>Method of collection</td><td>Sample survey</td><td colspan="4"></td></tr>
<tr><td>5</td><td>Point source</td><td>From farm records</td><td colspan="4">Labels of pesticide containers and manufacturer documentation</td></tr>
</table>

Annex 3 is a reference, not an exhaustive list of all the highly hazardous pesticides used in coffee and cotton production globally. It has been compiled based on the information available with the Delta Project Team at the time of the development of the Delta Framework.

Annex 3 requires regular updates against revisions of the WHO hazard classifications and new chemical conventions' decisions. Updates can be done referring to the regular reviews of lists undertaken by sustainability standards like British Cotton and GCP. Also, FAO has developed a Pesticide Registration Tool which include an excel tool to identify HHPs, which however requires a certain level of expertise.

Finally, several countries have developed and endorsed national lists of HHPs which include pesticides that have shown a high incidence of severe or irreversible adverse effects on human health or the environment under specific conditions of use. Here available, national list of HHPs should be considered in the application of this indicator.

Annex 4. Reference data table for Delta Framework indicator #2 – Pesticide risk indicator

RN	Consideration	Description	Details
1	Specification	Specific risk indicator score. There are two indicators, both must be provided.	
	Potential toxicological impacts (hazard)	TLI: Toxic Load Indicator	TLI is calculated through an external tool (which is updated on a regular basis). There are five values for each of Health, Environment and Environmental Transport, as well as a total score.
	Potential toxicological impacts (hazard)	ETL: Environmental Toxic Load The ETL indicator is calculated separately for algae, fish, Daphnia, and bees.	ETL is also calculated through a tool (from a different organisation, also updated). Data from four categories: algae, daphnia, honeybees, fish.
2	Formula	There is no calculation of the indicators as such. They are calculated by specific tools and their calculation should not be coded in any indicator reporting system, since the calculation may change.	TLI: Column names reference the XLS calculation tool From the 15 individual values, the 3 subtotals and the total must be calculated. All values are scores and as such there is no associated unit for the values: - Tox Total (column L = 2 x M + S + Y) - Tox Subtotal from 5 Health (column M) - Tox Subtotal from 5 Environment (column S) - Tox Subtotal from 5 Environmental Transport (column Y) ETL: The 4 indicators will be reported as such, no calculation is done
			Microsoft Word - Toxic Load Indicator methodology_final_260617 (pestizidexperte.de)

<table>
<tr><td rowspan="4">3</td><td rowspan="4">Primary data</td><td>For TLI the following data points are needed as inputs (5 per category):
- Health: tli_health{1,2,3,4,5}
- Environment: tli_env{1,2,3,4,5}
- Environmental transport: tli_env_trans{1,2,3,4,5}</td><td>Property</td><td>Metric</td><td>Type</td><td>Precision</td></tr>
<tr><td>tli_*</td><td>n/a</td><td>Decimal</td><td>6/2</td></tr>
<tr><td>etl_*</td><td>n/a</td><td>Decimal</td><td>6/2</td></tr>
<tr><td>And as calculated values:
- Subtotal health: tli_st_health
- Subtotal environment: tli_st_env
- Subtotal env. Transport: tli_st_env_trans
- Total: tli_total

For ETL the following data points are needed as inputs:
- Algae: etl_algae
- Daphnia: etl_daphnia
- Bees: etl_bees
- Fish: etl_fish</td><td colspan="4"></td></tr>
<tr><td>4</td><td>Method of collection</td><td>Sample survey</td><td colspan="4"></td></tr>
<tr><td>6</td><td>Point source</td><td>From farm records</td><td colspan="4">Labels of pesticide containers and manufacturer documentation</td></tr>
</table>

There are several complex models and indicators available to evaluate the environmental fate of plant protection products as well as occupational health and bystanders' exposure risk to pesticides. Results from different models are often not comparable. There are however two simplified indicators, out of the several options, that are already in use within the cotton sector, namely the Environmental Toxic Load (ETL) and the Toxic Load Indicator (TLI). Both these indicators have a low data requirement (actual total pesticide use by active ingredient) and can provide estimates of the **potential** pesticide risk useful to improve pesticide management at the farm level. As information on actual exposure are not accounted for, both indicators do not measure the **actual** risk (i.e., the probability of an adverse effect on organisms).

Annex 5. Reference data table for Delta Framework indicator # 3 – Water management (in irrigated farms)

RN	Consideration	Description	Details
1	Specification	3 sub-indicators: 1. Water extracted for irrigation 2. Irrigation efficiency 3. Water productivity	Ad 1: Pumped out of ground or diverted from rivers. Million liters (Ml). Ad 2: Counts the beneficially consumed water, i.e. water which is not lost in any way minus rainfall with respect to water extracted. Ad 3: Calculates water use with respect to yields.
2	Formula	All units are in Ml (million liters) if not specified otherwise, mm of rainfall need to be converted to liters (1mm corresponds to 1 liter for 1 m2): 1. Water extracted for irrigation Used water per surface, uses: - consolidated value of water used for the year (Ml) - surface (ha) 2. Irrigation efficiency (Benef. Consumed – Rain) / Extracted. All units must either be Ml/ha or be converted to it (potentially by dividing by the surface)	1. {Indicator 3.1}(Ml/ha) = {water extracted for irrigation}(Ml) / {surface}(ha) 2. {Indicator 3.2}(n/a) = ({ETc Beneficially consumed water}(Ml/ha) – {Rainfall x 10}(Ml/ha)) / {Water extracted for irrigation}(Ml/ha)

<table>
<tr><td></td><td></td><td>- ETc Beneficially consumed water (Ml/ha). The part of water which is used in the field and not lost somehow
- (Effective) Rainfall (mm -> Ml/ha) (should be the effective rainfall in high rain environments, coefficient should be 0.75 - 0.85. The coefficient is already contained in the value.) If mm are given they need to be converted to Ml/ha (see above, 1ha = 10000m2.
- Water extracted for irrigation (Ml -> Ml/ha)

3. Water productivity

Water productivity has 2 sub-sub-indicators

- yield per beneficially consumed water, which calculates only with respect to beneficially used water
- yield per irrigation and rainfall, which calculates the total quantity of water used and received</td><td colspan="4">3. Both sub-sub-indicators are defined in (kg/m3). Input variables are in (t/ha) and (Ml/ha). Since 1 t/Ml = 1000 kg/ 1000 m3, the conversion factor is just 1.

{Indicator 3.3.1 (WP lint/ET)}(kg/m3) = {Yield (cotton or green bean equivalent)}(t/ha) / {ETc Beneficially consumed water}(Ml/ha)

{Indicator 3.3.2} (WP lint/I+R)(kg/m3) = {Yield (cotton or green bean equivalent)}(t/ha) / ({water extracted for irrigation}(Ml/ha) + {rainfall}(Ml/ha))</td></tr>
<tr><td rowspan="6">3</td><td rowspan="6">Primary data elements, units and types.</td><td rowspan="6">Property, metric, type & precision</td><td>Property</td><td>Metric</td><td>Type</td><td>Precision</td></tr>
<tr><td>Surface</td><td>Ha.</td><td>Decimal</td><td>9/2</td></tr>
<tr><td>Water extracted for irrigation</td><td>Ml</td><td>Decimal</td><td>9/2</td></tr>
<tr><td>ETc Beneficially consumed water</td><td>Ml</td><td>Decimal</td><td>9/2</td></tr>
<tr><td>Rainfall</td><td>Ml</td><td>Decimal</td><td>9/2</td></tr>
<tr><td>Yield</td><td>t</td><td>Decimal</td><td>9/2</td></tr>
<tr><td>4</td><td>Method of collection</td><td>Sample survey</td><td colspan="4"></td></tr>
<tr><td>5</td><td>Point source</td><td>From farm records and secondary data sources</td><td colspan="4"></td></tr>
</table>

Annex 6. Reference data table for Delta Framework indicator #4 – Topsoil carbon content

This indicator refers to 2 third party estimation procedures both of which require a soil sample and the input to the procedure to calculate the indicator value. The methods include Walkley-Black method (Titration and colorimetric method) and the Dumas dry combustion method.

RN	Consideration	Description	Details			
1	Specification	Defined as grams of organic carbon per ton of soil.(g/t). Lab results are normally in % ((g organic per 100g of soil)) and need to be converted into (g/t). Field analysis can be in	Determination can be based onto 2 approaches: 1. Lab analysis, at least 2 options: Walkley-Black method (Titration and colorimetric method) Dumas dry combustion method 2. Field analysis: Munsell chart Visual assessment Portable scanner (e.g., AgroCare)			
2	Formula		3rd Party completes all analysis. Results need conversion: Lab: % = g/100g. Multiply by 10x1000 = 10000 to get (g/t) Munsell: Same as lab. Munsell chart has range, take average Scanner: g/kg. Multiply by 1000 to get (g/t)			
3	Primary data	Only one data point is required: Topsoil carbon content	**Property**	**Metric**	**Type**	**Precision**
			Topsoil carbon content	g/t	Decimal	6/0
4	Method of collection	Soil samples from a sample of farms				
5	Point source	Soil samples	Soil sample taken from representative soil segment in cropped area of farm to depth recommended by assay organisation.			

Annex 7. Reference data table for Delta Framework indicator #5 – Quantity of fertilizer use by type and Nitrogen Use Efficiency

RN	Consideration	Description	Details			
1	Specification	The weight (kg.) of macronutrient (NPK) of each listed fertilizer applied/ ha.	There is also an additional sub-indicator which covers the efficiency of fertilizer use: Nitrogen Use Efficiency (NUE)			
2	Formula	The quantities of macronutrients vary widely between products used. As such the values of N, P, K need to be calculated locally and be delivered individually. The final unit for each of the macronutrients is (kg/ha) For NUE there is no unit, the result is given in %. Crop harvested is related e.g., to lint cotton or GBE in the case of coffee.	Report each macronutrient individually, normalize by surface if required to obtain (kg/ha). {Indicator 5.1 (N)}{kg/ha} = {N}{kg/ha} {Indicator 5.2 (P)}{kg/ha} = {P}{kg/ha} {Indicator 5.3 (K)}{kg/ha} = {K}{kg/ha} {Indicator 5.4 (NUE%)}{%}={Indicator 5.1(N)}{kg/ha} / Crop harvested (kg/ha)			
3	Primary data	Property, metric, type & precision. Listed commercial names of fertilizers often country-specific due to distribution and marketing arrangements. Need to create compendium of cross relationships between commercial names and identified macronutrients preferably as chemical name, in each one as well as any differences in concentration by weight or percentage. This identity-macronutrient-concentration becomes a look up list for manual data inputs or a case list for automatic processing.	**Property**	**Metric**	**Type**	**Precision**
			N	Kg	Decimal	6/2
			P	Kg	Decimal	6/2
			K	Kg	Decimal	6/2
			Surface	Ha	Decimal	6/2
4	Method of collection	Sample survey				
5	Point source	From farm records	Labels of fertilizer containers and manufacturer documentation.			

Annex 8. Reference data table for Delta Framework indicator #6 – Forest, wetland and grassland converted for crop production

RN	Consideration	Description	Details
1	Specification	This indicator tracks the change of land use. It consists of 3 sub indicators: - land use change (ha) (forest -> cultivated) - land use change (ha) (wetland -> cultivated) - land use change (ha) (grassland -> cultivated)	Addressing deforestation. Not all have an assurance system. Sample taken by auditors locally is quite small. Global forest watch uses satellite image. Cotton is not covered by this, coffee is. No backward changes (conversion back to e.g., forest or wetlands) are tracked, the numbers are all >0 and track only changes from pristine state to cultivation. Originally the GPS coordinates of the converted land were considered, but since we have a farm-based reporting approach, this makes no sense in case of several plots. If plots are reported, GPS should be stored by plot.
2	Formula	All values come from either local evaluation or satellite images and must be delivered as change, given in (ha). The values are farm specific. For better identification and visual representation, the farm location should be stored as GPS coordinates. This can be taken from the general farm data. Currently there is no need to store the cultivated area as field polygons, but storage space should be reserved. If later a field polygon approach is to be used, the values must be reported by plot, not by farm, this may have an impact on all of the indicators reported and require summing/ calculation of the indicators over the plots.	{Indicator 6.1 (land use change forest -> cultivated)}(ha)= {from forest }(ha) {Indicator 6.2 (land use change wetland -> cultivated)}(ha) = {from wetland }(ha) {Indicator 6.3 (land use change grassland -> cultivated)}(ha) = {from grassland }(ha)

3	Primary data elements, units and types.	Property, metric, type & precision.	**Property**	**Metric**	**Type**	**Precision**
			From forest	Ha	Decimal	
			From wetland	Ha	Decimal	
			From grassland	Ha	Decimal	
			Farm location	GPS	GPS	
			Field polygon	GPS list	Text	1000/0
4	Method of collection	Sample survey (or full population if use of secondary data such as satellite imagery)				
5	Point source	From farm records and/or secondary data sources				

Annex 9. Reference data table for Delta Framework indicator #7 – Greenhouse gas emissions

RN	Consideration	Description	Details			
1	Specification	Greenhouse gas emissions. The following sub-indicators are defined: * Per surface: Emissions (t/ha) * Per product: Emissions (kg/kg) (coffee: GB, cherry; cotton: lint, seed) - harvested - marketed	An external platform is used to conduct the calculation. Those results are included for the indicator and no specific calculation is required.			
2	Formula	No calculation or conversion is needed, the indicators can be reported as delivered.	{Indicator 7.1 (Emissions per surface)}(t/ha) {Indicator 7.2 (Emissions per product harvested)}(t/ha) {Indicator 7.3 (Emissions per product marketed)}(t/ha)			
3	Primary data elements, units and types.	Property, metric, type & precision.	**Property**	**Metric**	**Type**	**Precision**
			Emissions per surface	t/ha	Decimal	6/2
			Emissions per product harvested	kg/kg	Decimal	4/2
			Emissions per product marketed	kg/kg	Decimal	4/2
4	Method of collection	Sample survey.				
5	Point source	From farm records and secondary data.				

Annex 10. Reference data table for Delta Framework indicator #8 – Yield (average)

RN	Point source	Description	Details
1	Specification	This is the weight of product of the sold produce produced on each hectare of cropland in (kg/ha).	It is left to the implementor if they want to have farm or plot data See Annex 1 description of surfaces.
2	Formula	This indicator really is, in contrast to the earlier indicators, an indicator per crop. I.e., that for each crop the total production of the farm is to be calculated and to be divided by the surface the crop is grown on. This implies that the primary data given below are to be used on a per-crop basis. Since a farm approach is used here, the plot-specific data are not required and are mentioned here only for future extension. This is also valid for GPS data.	For each crop: {Indicator 8.crop}(kg/ha) = {harvest.crop}(kg) / {surface.crop}(ha) In case GPS coordinates should be stored (there is no formal need for it), the following approach can be used: https://iseal-community.github.io/iseal-core/#is-certifiedsite-lat
3	Primary data	ATTENTION: these data have a multiplicity > 1. The whole block of data will be present for each crop if a farm produces more than 1 crop. The crop name should be taken from: https://www.fao.org/3/i4913e/i4913e.pdf Note 1: As use of the framework expands to other commodities, it is worth noting that FAO uses and internal classification. The list is available in the Annexes of World Programme for the Census of Agriculture 2020 (fao.org).	**Property** / **Metric** / **Type** / **Precision** Crop name / Code See note 1 / Text / 40/0 Plot name: p_i / / Text / 40/0 Plot ID: p_i / Number / Integral / 40/0 GPS / GPS / GPS / 8/5 Harvest. Crop / Kg / Decimal / 8/2 Surface. Crop / Ha / Decimal / 8/2
4	Method of collection	Sample survey	
5	Point source	Farm records	

Annex 11. Reference data table for Delta Framework indicator #9 - Gross margin from crop production (living income in future)

RN	Consideration	Description	Details
1	Specification	The Gross Margin (GM) (USD/ha) measures the contribution of a crop to total farm profit and this unit is used in farm planning to optimise the mix of sustainability score linked to social, economic, and environmental factors.	Conversion of local currencies must happen in the database, such values are not delivered by the enumerators. Possible sources: Conversion of local currencies must happen in the database, such values are not delivered by the enumerators. Possible sources: https://datahelp.imf.org/knowledgebase/articles/630877-data-services https://www.imf.org/external/np/fin/data/rms_mth.aspx?SelectDate=2022-04-30&reportType=SDRCV https://ec.europa.eu/info/funding-tenders/how-eu-funding-works/information-contractors-and-beneficiaries/exchange-rate-inforeuro_en We do not consider the typical 5% of currency conversion losses which give rates below the ECB rate.
2	Formula	* Gross margin = Revenue – Cost of cultivation * Revenue (USD/ha): Yield (#8) x Farm gate price (#10) * Cost for Gross Margin Calculation The following positions are considered for the cost of cultivation calculation: (Seed + 5:Fertilizer + 1:Pesticides + 7:Fuel + 3:Water + 11:Labour	{Gross margin}(USD/ha) = {Total sales of crop}(USD/ha) i.e. (8:yield(kg/ha) x 10:farm gate price(USD/kg))

		The following cost details can be reported but are not all part of Gross Margin calculation. They can be used for more detailed analysis though, like profitability calculations. * Cost of cultivation - Pest Management synthetic (#1), - Pest Management organic (#1), - Labour for agrochemical application, - Labour for weeding - Fertilizer (#5), Labour, fertilizer - Water, Labour Water, - Seed, Labour Seed, - Harvest, Labour Harvest, - Disposable Tools (e.g., rucksack) - Fuel (diesel) (#7) - Disposable Equipment (e.g., sacks, tape) - Maintenance - Electricity - Financial cost (interest and fees) of loans taken for the Corp cultivation (e.g.,inputs) * Operational Cost - Transport, - Interest * Investment Cost: - Tools - Equipment - Plot creation acquisition - Farm building - Interest	- {Total variable cost}(USD/ha) i.e.(Seed + 5:Fertilizer + 1:Pesticides + 7:Fuel3:Water + 11:Labour associated with them)

3	Primary data	Property, metric, type & precision. Note 1: As use of the framework expands to other commodities, it is worth noting that FAO uses and internal classification. The list is available in the Annexes of World Programme for the Census of Agriculture 2020 (fao.org). Data all have multiplicity n, all belonging to one crop. There may be more than one crop in a data set. Operational and investment cost have multiplicity 1, they are calculated per farm. Note 2 Pair of variables as input data as number of units used per hectare and unit price of purchase. The typical variables to be included depend on each farm's recipe of inputs but normally include: seed, fertilizer, water, labour input time, liquid fuels, applications, motor oil, equipment maintenance & parts, tools[4], contract services (ploughing, harvesting etc.), contract labour, power (electrical). Labour input time and rates can be divided into categories and gender (see indicator 11. Proportion of workers earning a legal minimum wage) and this data can contribute to some aspects of the information required under indicator: 14. Women empowerment. Note 3: Farmgate output prices only of sold produce and where necessary cost of insurance and freight are charged separately as a cost (see annex 2). Farmgate input prices must include cost, insurance, and freight for delivery. Farmgate prices for **INPUTS** includes costs of insurance and freight or account for these costs separately.	**Property**	**Metric**	**Type**	**Precision**
			Crop name: Cn_i	Code See note 1	Text	40/0
			Production: O_i	Kg	Decimal	7/2
			Yield: O_i/A_i	Kg/ ha.	Decimal	7.2
			Area of production: A_i	Ha.	Decimal	5/0
			Variable input name; v_i (options list)	See note 2	Text	40/0
			Quantity of input: qv_i	g, kg, l	Decimal	annex 2
			Specification: s_i	Kg, hours, l	Decimal	annex 2
			Input units:	Metric/ ha.	Decimal	annex 2
			Var input price: v_ip_i	National currency		
			Crop name: c_i and Genotype	Code See note 1	Text	40/0
			Crop ID: c_i FAO CPC/ICC Codes	Code See note 1	Integer or text	40/0

[4] Small hand tools that are used up within production year

		Farmgate price is the actual **OUTPUT** recorded price per unit of produce sold and received and recorded for **production. It is NOT simply the quoted market price and cannot be applied to production not sold within the accounting or agricultural year concerned.** See annex 2 to see list of possible options according to farm size and production system. Genotype is the crop variety	Farmgate output price: vop_i Refer to Farmgate price indicator	National currency/ spec si metric See note 3	Decimal	10/2
			Pest management synthetic	USD/ha	Decimal	10/2
			Pest management organic	USD/ha	Decimal	10/2
			Labour agrochemical application	USD/ha	Decimal	10/2
			Labour for weeding	USD/ha	Decimal	10/2
			Fertilizer	USD/ha	Decimal	10/2
			Labour for fertilizer	USD/ha	Decimal	10/2
			Water	USD/ha	Decimal	10/2
			Labour for irrigation	USD/ha	Decimal	10/2
			Seed	USD/ha	Decimal	10/2
			Labour for seeding	USD/ha	Decimal	10/2
			Harvest	USD/ha	Decimal	10/2
			Labour for harvesting	USD/ha	Decimal	10/2
			Tools	USD	Decimal	10/2
			Equipment	USD	Decimal	10/2
			Plot creation acquisition	USD	Decimal	10/2
			Farm building	USD	Decimal	10/2
			Transport	USD	Decimal	10/2
			Electricity	USD	Decimal	10/2

			Experts and consultants	USD	Decimal	10/2
			Tools (rucksack…)	USD	Decimal	10/2
			Fuel (diesel…)	USD	Decimal	10/2
			Equipment (sacks, tape…)	USD	Decimal	10/2
			Maintenance	USD	Decimal	10/2
			Interest	USD	Decimal	10/2
			Yield: **Refer to Yield indicator**			
4	Method of collection	Sample survey				
5	Point source	Farm records	Farm diary, accounts, return, recall			

Annex 12. Reference data table for Delta Framework indicator #10 - Price (at farmgate)

RN	Consideration	Description	Details
1	Specification	Farmgate price is the actual **OUTPUT** recorded price per unit of produce sold and received and recorded for **production. It is NOT simply the quoted market price and cannot be applied to production not sold within the accounting or agricultural year concerned.**	Farmgate price = Recorded unit price received for products in national currency and per unit of product;
2	Formula	The indicator consists of 4 sub-indicators: Farmgate price in USD and farmgate price in local currency are both split into normal and weighted average. The weighted average is used for indicator #9: - Farmgate price in USD average - Farmgate price in USD weighted - Farmgate price in local currency average - Farmgate price in local currency weighted	Price as recorded for each output: {Indicator 10.1 (farmgate price USD average).crop}(USD/kg) = Foreach sales process for the crop PriceSum += {Farmgate price USD}(USD/kg) Count += 1 Foreach end PriceSum / Count {Indicator 10.2 (farmgate price USD weighted).crop}(USD/kg) = Foreach sales process for the crop Turnover += {Farmgate price USD}(USD/kg) WeightSum += {Sold quantity}(n/a) Foreach end Turnover / WeightSum

<table>
<tr><td></td><td></td><td></td><td colspan="4">{Indicator 10.3 (farmgate price local currency average).crop}(local currency/kg) =
Foreach sales process for the crop
PriceSum += {Farmgate price local currency}(local currency/kg)
Count += 1
Foreach end
PriceSum / Count

{Indicator 10.4 (farmgate price local currency weighted).crop}(local currency/kg) =
Foreach sales process for the crop
Turnover += {Farmgate price local currency}(local currency/kg)
WeightSum += {Sold quantity}(n/a)
Foreach end
Turnover / WeightSum</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Primary data</td><td rowspan="4">Property, metric, type & precision.

Note 1: As use of the framework expands to other commodities, it is worth noting that FAO uses an internal classification. The list is available in the Annexes of World Programme for the Census of Agriculture 2020 (fao.org).

ATTENTION: these data have a multiplicity > 1. The whole block of data will be present for each crop if a farm produces more than 1 crop.

ATTENTION: these data have a second layer of multiplicity. For each crop there can be several sales events and hence farmgate prices.

The crop name should be taken from:</td><td>Property</td><td>Metric</td><td>Type</td><td>Precision</td></tr>
<tr><td>Crop namei</td><td>Code

See note 1</td><td>Text</td><td>40/0</td></tr>
<tr><td>Sold quantity</td><td>Kg</td><td>Decimal</td><td>10/2</td></tr>
<tr><td>Selling date (optional)</td><td>Date</td><td>Date</td><td>n/a</td></tr>
</table>

		World Programme for the Census of Agriculture 2020 (fao.org). Selling date is optional and only useful for time series analysis.	Farmgate price USD_i	USD/kg	Decimal	10/2
			Local currency	3-letter currency symbol	Text	3/0
			Farmgate price local currency	Local currency/ kg	Decimal	10/2
4	Method of data collection	Sample survey				
5	Point source	Farm records	Farm sales records			

Annex 13. Reference data table for Delta Framework indicator #11 - Proportion of workers earning a legal minimum wage (or above) by sex and by age

RN	Consideration	Description	Details
1	Specification	Percentage of workers paid at existing legal minimum wage. Consists of 3 sub-indicators: 1. For all genders 2. For men only 3. For women only Minimum wage can be national or local minimum wage are a sector minimum wage, whatever is higher. Note: While gender data is captured using four options (male, female, other (e.g., intersex, transgender), do not want to disclose), current analysis and reporting is only for the three sub-indicators listed.	The proportion of workers is based on the reports of individual workers: • For each worker the average daily wage is calculated over one year. • Cross commodity considerations only allow hourly/daily wages, any other type of wage (per task or piece or other quantity) needs to be converted into daily wage The workers are then grouped into categories and gender. Categories are defined locally and include: unskilled, skilled, … If the average daily wage of any member of a given category/gender combination is below the minimum wage this implies that all members of this category/gender class are considered not fulfilled. The indicator is then the number of workers being in classes earning all above the legal minimum divided by all workers.

<table>
<tr><td>2</td><td>Formula</td><td>For all sub-indicators proceed as follows:
1. Calculate average yearly wage for each worker.
2. Determine for each worker if the average salary is above the minimum wage.
3. Constitute classes for the workers according to worker A. category and gender and B. category only, assign each worker to a class for A and B.
4. For each class in A and B determine if there is at least one worker not earning minimum wage. If so, mark the whole class as below minimum wage.
5. For both cases A (male, female) and B (gender-independent) sum up the number of workers of all classes being marked as at or above minimum wage
6. Divide this by the total number of workers in the classes</td><td colspan="4">We calculate the following indicators:

{indicator 11.1 (minimum wage percentage independent of gender)} = follow description to the left, but do not separate according to genders (case B)

{indicator 11.2 (minimum wage percentage female)} = follow description to the left, but do only consider female gender (case A)

{indicator 11.3 (minimum wage percentage male)} = follow description to the left, but do only consider male gender (case A)

ATTENTION:

Somewhat counter-intuitively the calculation does not give the percentage as a percentage of individual workers paid according to minimum wage requirements, but rather the workers are divided into classes.

As soon as one member of a class is not getting minimum wage, the WHOLE CLASS is considered not getting minimum wage, independent of if this is true for the other workers in the class.

The percentage is then calculated by adding the number of all the workers belonging to a class being ALL at or above minimum wage divided by the number of workers in all classes.</td></tr>
<tr><td rowspan="6">3</td><td rowspan="6">Primary data</td><td rowspan="6">Property, metric, type & precision.

Note: The grade and gender classes can contribute base data in support of some analyses under indicator 14: Woman empowerment.

ATTENTION:

1. All data related to workers have a multiplicity > 1, i.e. every set of data contains the data for one worker only.</td><td>Property</td><td>Metric</td><td>Type</td><td>Precision</td></tr>
<tr><td>Gender of worker</td><td>Male/ female/ other (e.g., intersex, transgender)/ do not want to disclose</td><td>{m,f,o,n}</td><td>1/0</td></tr>
<tr><td>Name of worker (optional)</td><td>Combo first + family</td><td>Text</td><td>40/0</td></tr>
<tr><td>Worker ID (optional)</td><td>PIN or other</td><td>Integer</td><td>40/0</td></tr>
<tr><td>Worker class</td><td>Depends on specific farm situation</td><td>Text</td><td>40/0</td></tr>
<tr><td>Total payment:</td><td>Local currency</td><td>Decimal</td><td>10/2</td></tr>
</table>

		2. Since the minimum wage is subject to change and can vary between administrative units, it is imperative that the wage is added to each worker. 3. All data are related to daily wages and must be converted accordingly.	Days worked	Days	Decimal	6/2
			National minimum	National currency	Decimal	10/2
			Salary: NMS per day			
4	Method of collection	Sample survey				
5	Point source	Farm records and secondary data	Records of payment to contract, ad hoc and salaried labour. Basic GM records should contain this data. Units are currency/hour based on stated daily sum of hourly inputs.			

Annex 14. Reference data table for Delta Framework indicator #12 – Incidence of child labour

RN	Consideration	Description	Details
1	Specification	The worst forms of child labour have 2 components: • Either the number of hours worked with respect to age; or • The following activities considered hazardous work irrespective of the hours worked: - sharp objects - extreme environmental conditions - agrochemicals - long hours in fields - physically strenuous, repetitive or they: - work in slave-like conditions - take part in illicit activities	All children below 18 years are considered children in the sense of hazardous work. No additional age groups (like 4-15 or 15-17) are being used.
2	Formula	3 sub-indicators: - male + female - male - female Note: While gender data is captured using four options (male, female, other (e.g., intersex, transgender), do not want to disclose), current analysis and reporting is only for the three sub-indicators listed. The indicators solely consist in counting the children who either work:	{Indicator 12.1 (non-gender-specific)} = count all children working above the ILO limit or doing at least one hazardous activity or work in slave-like conditions or work for illicit activities (all genders) {Indicator 12.2 (non-gender-specific)} = count all children working above the ILO limit or doing at least one hazardous activity or work in slave-like conditions or work for illicit activities (only female gender)

<table>
<tr><td></td><td></td><td>long working hours or
- in any activity from the hazardous activity list or
- in slave-like conditions or
- for illicit activities

In terms of number of hours that define a child engaged in economic activities, ILO use te following categories: (a) children 5–11 years old who, during the reference week, did at least one hour of economic activity, (b) children 12–14 years old who, during the reference week, did at least 14 hours of economic activity, (c) children 15–17 years old who, during the reference week, did at least 43 hours of economic activity.</td><td colspan="4">{Indicator 12.3 (non-gender-specific)} = count all children working above the ILO limit or doing at least one hazardous activity or work in slave-like conditions or work for illicit activities (only male gender)

The limits of the ILO list – child labour if:
age 05 – 11: > 01 working hour
age 12 – 14: > 14 working hours
age 15 – 17: > 43 working hours</td></tr>
<tr><td rowspan="12">3</td><td rowspan="12">Primary data elements, units and types.</td><td rowspan="12">Property, metric, type & precision.

ATTENTION: Data have multiplicity n, i.e., there is one data set for each child</td><td>Property</td><td>Metric</td><td>Type</td><td></td></tr>
<tr><td>Child name</td><td>Combo first + family</td><td>Text</td><td>40/0</td></tr>
<tr><td>Child ID</td><td>PIN or other</td><td>Integer</td><td>40/0</td></tr>
<tr><td>Child age</td><td>Age</td><td>Integer</td><td>2/0</td></tr>
<tr><td>Child gender</td><td>Male/ female/ other (e.g. intersex, transgender)/ do not want to disclose</td><td>{m,f,o,n}</td><td>1/0</td></tr>
<tr><td>Child working hours per week</td><td>No of hours</td><td>Integer</td><td>2/0</td></tr>
<tr><td>Use of sharp objects</td><td>Yes/ no</td><td>Binary</td><td>1/0</td></tr>
<tr><td>Extreme environmental conditions</td><td>Yes/ no</td><td>Binary</td><td>1/0</td></tr>
<tr><td>Agrochemicals</td><td>Yes/ no</td><td>Binary</td><td>1/0</td></tr>
<tr><td>Long hours in fields</td><td>Yes/ no</td><td>Binary</td><td>1/0</td></tr>
<tr><td>Physically strenuous repetitive</td><td>Yes/ no</td><td>Binary</td><td>1/0</td></tr>
<tr><td>Slave-like conditions</td><td>Yes/ no</td><td>Binary</td><td>1/0</td></tr>
<tr><td>Illicit activities</td><td>Yes/ no</td><td>Binary</td><td>1/0</td></tr>
<tr><td>4</td><td>Method of collection</td><td>Sample audits</td><td colspan="4"></td></tr>
<tr><td>5</td><td>Point source</td><td>Farm records and secondary data</td><td colspan="4"></td></tr>
</table>

Annex 15. Reference data table for Delta Framework indicator #13 – Incidence of forced labour

RN	Consideration	Description	Details			
1	Specification	This indicator has 2 sub-indicators: 1. gives the number of cases of forced labour which is reported as such by the enumerator. 2. gives the risk of forced labour happening in each country/ district. It has 3 values: low, medium, high.	Data are grouped by age and gender. Only adults (age >= 18 years), children are considered in the child labour indicator.			
2	Formula		{Indicator 13.1}= Number of forced labour cases over all groups Additional sub-indicators can be calculated by group (age group or by gender). {Indicator13.2} = There is no calculation method defined for this sub-indicator. Data should be used as is.			
3	Primary data elements, units, and types.	Property, metric, type & precision. Forced labour is reported as a count by age and gender. I.e., the enumerator groups cases of forced labour by age and gender and reports the age and the gender of the group along with the number of workers concerned. This information has a multiplicity of >= 1, there will be one entry for each group of age and gender. The forced labour risk is reported for a given region or a country and is reported here with every group of forced labour, since we have here a farm-based data entry.	**Property**	**Metric**	**Type**	**Precision**
			Forced labour age	Age	Integer	2/0
			Forced labour gender	Male/ female/ other (e.g. intersex, transgender)/ do not want to disclose	{m,f,o,n}	1/0
			Forced labour quantity	Number of workers in group	Integer	4/0
			Forced labour risk	Risk value	{low,medium,high}	10/0

		Note: While gender data is captured using four options (male, female, other (e.g., intersex, transgender), do not want to disclose), current analysis and reporting is only for male and female genders.	
4	Method of collection	Sample audits	
5	Point source	Farm survey, secondary data	

Annex 16. Reference data table for Delta Framework indicator #14 – Women's empowerment

RN	Consideration	Description	Details
1	Specification	This indicator consists potentially of 2 sub-indicators: 1. Women's empowerment indicator 2. Gender parity score (optional) Both sub-indices are calculated from the following components: I Leadership 1. Self-efficacy 2. Communication and negotiation skills 3. Collective action II Decision-making 4. Input in productive decision making III Control of economic assets/ gender equality 5. Control of economic assets/ gender equality 1 6. Gender equitable attitudes/ gender equality 2 Note: While gender data is captured using four options (male, female, other (e.g., intersex, transgender), do not want to disclose), current analysis and reporting is only for the male and female genders under this indicator.	For small holder farms this is limited to 1 woman/ 1 man per farm. For larger farms at least 2 data points per farm and gender are used and averages are calculated. Also, the last 2 components have different names and give a more general picture on gender equality. Indicator = Leadership 1 + Leadership 2+ Leadership 3 + 3 x Decision making + 1.5 x (Control of economic assets 1 + Control of economic assets 2)
2	Formula	The values of the components are calculated externally though a catalogue of questions. They are reported and only need to be stored. The calculation of the indicator 14.1 is using a weighted sum of the components.	{Indicator 14.1 (Women's empowerment score)} = 1 x ({Self-efficacy} + {Communication and negotiation skills} + {Collective action})

<table>
<tr><td></td><td></td><td>The indicator 14.2 is the difference between the female and the male scores calculated on some grouping of farms, like regional or national groupings.</td><td colspan="4">+ 3 x {Input in productive decision making}

+ 1.5 x ({Control of economic assets/ Gender equality 1} + {Gender equitable attitudes/ Gender equality 2})

{Indicator 14.2 (Gender parity score)} =

{Averaged Indicator 14.1 female} - {Averaged Indicator 14.1 male}</td></tr>
<tr><td rowspan="7">3</td><td rowspan="7">Primary data elements, units, and types</td><td rowspan="7">Property, metric, type & precision.

All data are calculated externally by the enumerators, no calculation is needed on the data points themselves, only the indicator needs to be calculated.

If the Gender Parity Score is to be calculated (difference of scores for a group of farms), in lieu of the scores given here, the female and male scores need to be stored separately to be aggregated later. Since this calculation is optional, the data points are not listed in the table. The extension is trivial, the “Self-efficacy” component would get doubled into “Self-efficacy female” and “Self-efficacy male”. Likewise for the other components.</td><td>Property</td><td>Metric</td><td>Type</td><td>Precision</td></tr>
<tr><td>Self-efficacy</td><td>Score</td><td>Decimal</td><td>3/2</td></tr>
<tr><td>Communication and negotiation skills</td><td>Score</td><td>Decimal</td><td>3/2</td></tr>
<tr><td>Collective action</td><td>Score</td><td>Decimal</td><td>3/2</td></tr>
<tr><td>Input in productive decision making</td><td>Score</td><td>Decimal</td><td>3/2</td></tr>
<tr><td>Control of economic assets/ gender equality 1</td><td>Score</td><td>Decimal</td><td>3/2</td></tr>
<tr><td>Gender equitable attitudes/ gender equality 2</td><td>Score</td><td>Decimal</td><td>3/2</td></tr>
<tr><td>4</td><td>Method of collection</td><td>Sample survey</td><td colspan="4"></td></tr>
<tr><td>5</td><td>Point source</td><td>Farmer and farmer’s spouse interviews</td><td colspan="4"></td></tr>
</table>

Annex 17. Reference data table for Delta Framework indicator #15 – Rate of fatalities and non-fatalities on the farm by sex

RN	Consideration	Description	Details
1	Specification	Percentage of recorded deaths and non-fatal injured persons in a year linked to accidents related to agricultural activities as opposed to natural causes for a given group. The indicator has 8 sub-indicators: 1. Fatalities farmer male 2. Fatalities farmer female 3. Fatalities worker male 4. Fatalities worker female 5. Non-fatalities farmer male 6. Non-fatalities farmer female 7. Non-fatalities worker male 8. Non-fatalities worker female Note: While gender data is captured using four options (male, female, other (e.g., intersex, transgender), do not want to disclose), current analysis and reporting is only for the eight sub-indicators listed.	Both fatal and non-fatal injuries are counted. Non-fatal injuries require 2+ days inability to work. For every subgroup (gender, role) the number of fatalities and non-fatalities are reported by subgroup and summed for the overall total for the farm.
2	Formula	For the total indicator the sum of all persons having suffered a deadly or non-deadly accident is calculated and divided by the total number of persons working on the farm. For each sub-indicator the ratio of accidented persons in the group is counted and divided by the number of persons in the group. Other sub-indicators can be calculated in the same way (e.g., role-dependent only, or gender specific).	{Indicator 15 (Frequency of fatalities and non-fatalities)} = sum over all accidented workers / members of all group {Indicator 15{1,2,3,4,5,6,7,8} (Frequency of accidents in the respective group)} = sum over all accidented workers in the respective group / number of members of the respective group

3	Primary data	Property, metric, type & precision. Yellow highlighted variables not included in any published data. The grade and gender classes can contribute base data in support of some analyses under indicator 14: Woman empowerment. Note 1. ISEAL Core recommends all dates be recorded as YYYY-MM-DD format. ATTENTION: Accidented persons have multiplicity >= 1. The number of workers in the sub-indicator groups have multiplicity 1 for each sub indicator.	**Property**	**Metric**	**Type**	**Precision**
			Gender of worker: gi	Male/ female/ other (e.g. intersex, transgender)/ do not want to disclose	{m,f,o,n}	1/0
			Name of worker: ni	Combo first + family	Text	40/0
			Worker ID: idi	PIN or other	Integer	40/0
			Group	Group membership	{worker,farmer}	n/a
			Date	When accident occurred See note 1.	Datetime (decimal)	14/2
			Date	Datetime of record See note 1.	Datetime (decimal)	14/2
			Accident type	By listing	Text or integer	40/0 or 3/0
			Associated death	Yes/ no	Binary	1/0
			Members in fatal farmer male	Members in group	Integer	5/0
			Members in fatal farmer male	Members in group	Integer	5/0
			Members in fatal farmer male	Members in group	Integer	5/0
			Members in fatal farmer male	Members in group	Integer	5/0
			Members in fatal farmer male	Members in group	Integer	5/0
			Members in fatal farmer male	Members in group	Integer	5/0
			Members in fatal farmer male	Members in group	Integer	5/0
			Members in fatal farmer male	Members in group	Integer	5/0
4	Method of collection	Sample survey				
5	Point source	Farm records and other records	Records from farm, local doctors, health institutions, hospitals, registration of births deaths/ reasons for death.			

Annex 18. Occurrence of Delta Framework indicator primary data in the gross margin data set

Indicator	✓ Indicates primary data from indicator is used in calculating gross margin. m Indicates essential farm sustainability management information	
1. Use of highly hazardous pesticides (HHPs)	✓	m
2. Pesticide risk indicator		
3. Water management (in irrigated farms)		
3.1. Water extracted for irrigation	✓	m
3.2. Water efficiency	✓	m
3.3. Water productivity	✓	m
4. Topsoil carbon content		
5. Quantity of fertilizer used by type and nitrogen use efficiency	✓	m
6. Forest, wetland and grassland converted for crop production		
7. Greenhouse gas emissions	✓	m
8. Yield (average)	✓	m
9. Gross margin from crop production (living income in future)	✓	m
10. Price (at farmgate)	✓	m
11. Proportion of workers earning a legal minimum wage (or above) by sex and by age	✓	m
12. Incidence of child labour		
13. Incidence of forced labour		
14. Women empowerment		
15. Rate of fatalities and non-fatalities on the farm by sex		

Published 2022 by Better Cotton/ Delta Project Team

Better Cotton
Chemin de Balexert 7-9
1219 Chatelaine
Switzerland
www.deltaframework.org