

The decision to create an Expert Panel on the Social, Environmental, and Economic Performance of Cotton (SEEP) grew out of information provided during the 65th Plenary Meeting of the International Cotton Advisory Committee (ICAC) in Brazil, in September 2006. During the 485th Meeting of the Standing Committee in Washington DC, in November 2006, the Standing Committee approved the general Terms of Reference for the Expert Panel on SEEP:

- 1. Provide the ICAC with objective, science-based information on the negative and positive social, environmental and economic aspects of global cotton production;
- 2. Gather information from around the world on costs of agricultural labor and the factors that affect those costs to assess their impacts on the social performance of cotton; and
- 3. Make recommendations for further action as appropriate to improve the social, environmental and economic performance of the cotton industry.

Current members of the Expert Panel on SEEP are Mr. Allan Williams (Chair), Dr. Francesca Mancini (Vice-Chair), Mr. Fatih Dogan, Dr. Michel Fok Ah Chuen, Mr. Denilson Galbero Guedes, Dr. Kater Hake, Ms. Elke Hortmeyer, Mr. B.K. Mishra, Dr. Bill Norman, Mr. Savio Rafael Pereira, Mr. Jens Soth, Mr. Wilfried Yameogo, and Mr. Tu Dolphin Yu. Dr. Alejandro Plastina serves as Manager.

SEEP Executive Summary 3

This Executive Summary of the report, "Measuring sustainability in cotton farming systems: Towards a guidance framework" (2014, forthcoming) has been prepared by ICAC's Expert Panel on the Social, Environmental, and Economic Performance of Cotton (SEEP) for the 72nd Plenary meeting of the International Cotton Advisory Committee in Colombia. The forthcoming report provides an overview of sustainability issues in cotton and takes stock of indicators used to measure sustainability. These are then rated to arrive at a set of common indicators that can serve as a basis for discussion within the industry on the development of a framework to further enhance sustainability. As the final report will not be ready in time for the upcoming Plenary, it was decided to present an executive summary to provide an idea of the ongoing work.

The report is being developed on the understanding that any coordinated, industry-wide effort on measuring the sustainability of cotton farming will start with discussion and agreement on what are the key issues that need to be addressed, what are the best indicators to assess progress towards becoming more sustainable, and who are the appropriate stakeholders to undertake the responsibility for doing so. The list of recommended indicators detailed on pages 4 and 5 is presented as a starting point for discussion by delegates to the meeting as to the relevance, feasibility and usefulness of the indicators from their own perspective, so that areas of agreement on these key issues can be found.

The list of recommended indicators was developed by 1) reviewing a comprehensive range of programmes to extract their indicators and creating an inventory of potential indicators; 2) selecting the most relevant ones from this inventory through an objective rating system and 3) expert review of the selected indicators.

It needs to be stressed that the list of recommended indicators in this Executive Summary is not intended as a global list that every cotton—growing country should collect. The diversity and variability in cotton production across regions does not allow for a uniform set of comprehensive global indicators. Rather, the list is designed to be used as a starting point at the national level. Where a sustainability issue exists, an internationally-agreed list of sustainability indicators can provide a reference point for the indicator(s) that should be used to benchmark the current cotton industry 'performance', and track on-going improvements. Thus, where countries share common issues, agreement on the appropriate indicators will allow for the global cotton industry to better report on how the issue is being addressed internationally. It is also important to note that the list is not intended to establish a set of 'pass/fail' levels; the focus is on tracking continuous improvement, using agreed measures.

Support for this study has been provided by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Food and Agriculture Organization of the United Nations (FAO) and the Secretariat of the ICAC. The contributions of each organization, and by the members of SEEP, are very much appreciated.

Introduction

As a global industry, the conditions under which cotton is grown and the issues associated with its cultivation vary enormously due to differing environmental, agro-ecological, climatic, socio-economic and political conditions. These different conditions can mean that the cultivation of the same crop may result in significantly different social and environmental impacts, and that there are significantly different options and capabilities available to address these impacts. An assessment of the impacts of cotton growing, and development of the best options for managing impacts, should therefore only be done with reference to the specific context being assessed.

However, despite these highly variable conditions, and the site-specific nature of appropriate responses, the impacts of cotton growing are often considered globally. Both the cotton industry, and cotton as a raw material are assessed either generically, or based on the averaging of information from different countries without reference to the specific production location. Access to comprehensive, site-specific, robust and uniform data is necessary to ensure that this 'globalisation' of the impacts of cotton farming portrays the actual impacts as accurately as possible.

One of the responses to the impacts of cotton production has been the establishment of programmes or initiatives working with farmers to improve the sustainability of growing cotton. Development programmes promoting sustainable intensification of agriculture to protect and enhance the livelihoods of producers and the environment have long been working in cotton, and there has also been an increasing regulatory interest in resource management by agricultural producers, leading to the implementation of production risk management systems focused on responsible natural resource stewardship. In recent years there has been an emergence of initiatives aimed at promoting sustainability in cotton production that involve the downstream supply chain for cotton, in particular large retailers with a growing interest in improving their own overall footprint to provide customers with greater confidence in the integrity of their products. As a result, there are an increasing number of production standards and systems that claim to promote the objectives of sustainable farming.

While these developments are generally seen as positive, there is a growing need to understand their relevance to the cotton industry as a whole, including cotton producers. A consequence of the increase in market-based initiatives to address the impacts of cotton growing is that a wider range of perspectives are influencing the development of these sustainability initiatives,

TABLE: Recommended Sustainability Indicators for Cotton Production

	No.	Indicator
1.1	Pest an	d Pesticide Management
	1.1	Quantity of active ingredients of pesticides used (Kg/ha)
	1.2	Quantity of active ingredients of highly hazardous pesticides used (Kg/ha)
	1.3	Number of pesticide applications per season
	1.4	% of treatments that involve specific measures to minimize non target application and damage
	1.5	Existence of a time-bound IPM plan
	1.6	% of cotton area under IPM
	1.7	% of farmers that use only pesticides that are nationally registered for use on cotton
	1.8	% of farmers that use pesticides labelled according to national standards, in at least one national language
	1.9	% of farmers that use proper disposal methods for pesticide containers and contaminated materials including discarded pesticide application equipment
	1.10	% of farmers following recommended practices for pesticide mixing, application and cleaning of application equipment
	1.11	% of farmers with dedicated storage facilities that keep pesticides safely and out of reach by children
	1.12	Total number and % of cotton area involving vulnerable persons applying pesticides
M	1.13	% of workers applying pesticides that have received training in handling and use
viro	1.14	% of farmers having access to and using adequate protective equipment (by type)
Environmental Sustainability	2. Wa	ter Management
nen:	2.1	Quantity of water used for irrigation (m3/ha)
tal	2.2	Irrigation use efficiency (%)
Sus	2.3	Crop Water Use Productivity (m3 of water per ton of cotton lint)
stai	2.4	% of area under water conservation practices
nal	2.5	Groundwater table level (m from the surface)
billi	2.6	Salinity of soil and irrigation water (deciSiemens (dS) per metre, EC)
ţy	2.7	Quality of discharge water (various)
		l Management
	3.1	Soil characteristics: organic matter content, pH, N, P, K
	3.2	Use of soil sampling for N, P, K (% of farmers)
	3.3	Fertilizer used by type (kg/ha)
	3.4	% of area under soil erosion control and minimum / conservation tillage practices
		nd Use and Biodiversity
	4.1	Average yield (ton of cotton lint/ha)
	4.2	Total area (ha) and % of natural vegetation converted for cotton production (in ha)
	4.3	% of total farm area that is non-cropped
	4.4	Average number of cotton and other crops per 5-year period
		mate Change
	5.1	GHGs emissions and carbon sequestration per MT of cotton lint and / or ha (in CO2-e)
	5.2	On-farm energy use per MT of cotton lint and / or ha (GJ)

6. Economic Viability, Poverty reduction and Food Security 6.1 Average annual net income from cotton production 6.2 Price received per ton of cotton lint at farm gate 6.3 Returns above variable costs per hectare and t of cotton lint 6.4 Return on investment 6.5 Debt to asset ratio Number and % of household members living below the national poverty line 6.6 % of farmers/workers with access to productive resources 6.7 Average value of assets per producer household 6.8 6.9 % of producing households with a specific asset 6.10 Perception of change in economic situation over last five years (% of farmers) 6.11 Total number and % of cotton farming household members with kilojoule intake below the international norm Number of days with food deficiency per annum in cotton producing households 6.12 7. Economic risk management Cotton yield volatility 7.1 7.2 Farm gate cotton price volatility 73 % of farmers with measures in place to manage price risks by type 7.4 % of total household income that the largest income source represents 7.5 Average number of days after sale that farmers receive payment 7.6 % of farmers with access to equitable credit % of farmers showing understanding of the factors involved in price formation or have daily access to international 7.7 and domestic prices 8. Labor rights and standards % of children attending and completing appropriate level of school (by gender) 8.1 8.2 % of farmers/workers with effective access to health care facilities 8.3 % of farmers/workers with access to potable water 8.4 % of farmers/workers with access to sanitation facilities 8.5 Number of child labourers (by age and gender) 8.6 % of workers with an enforceable employment contract (by age and gender) % of workers who are paid a minimum or living wage and who always receive their full wage in time (by age and 8.7 Social Sustainability gender) Total number and % of workers being subordinated by forced labor 8.8 8.9 % of active cotton farmers and workers contributing to a pension scheme and / or eligible to receive a pension % of cotton farming households benefitting from income support in case of officially recognised extreme income 8.10 shocks 8.11 % of employed women that have the right to maternity leave and receive payments 9. Worker health and safety 9.1 Annual nonfatal incidences on cotton farms (total, % of workforce by age, gender) 9.2 Total number of fatalities on cotton farms per year 10. Equity and Gender % of leadership roles held by women in a producers' or workers' group 10.1 10.2 Gender and age wage differentials for the same quantity of produce or same type of work 10.3 % of women whose income from independent sources has increased / decreased 11. Farmers' Organizations 11.1 Numbers of farmers, workers who have attended training (by training type, age and sex) 11.2 Number of farmers and workers participating in democratic organizations (by age, gender)

including the approaches to sustainability information needs, collection and reporting. It is essential that the interests of all the participants in the cotton supply chain are considered. The specific information requirements of the different participants in the cotton industry will vary depending upon how the information will be used, and the value of the information that is being collected. This is especially so when it comes to the question of 'how is the sustainability of cotton farming assessed'. Amongst other things, collecting and reporting data requires a clear purpose, and clear links between the costs involved in collecting the data and the benefits from doing so.

The report, 'Measuring sustainability in cotton farming systems: towards a guidance framework' (Measuring Sustainability Report') was conceived as a means to draw together the work of programmes and initiatives seeking to reduce the possible negative impacts of cultivating cotton, with a focus on the question: by what indicators or measures should the sustainability of cotton farming be assessed? Answering this question at the global level would give rise to a range of potential benefits for the cotton industry:

- Providing a forum for the global cotton industry to discuss, debate and reach agreement on what the priorities are for measuring the sustainability performance of the cotton industry;
- Better understanding current levels of 'performance' environmental, economic and social, essential in order to improve that performance, as this better allows for actions to be targeted at the most critical areas requiring improvement.
- Data collection and reporting guided by an agreed set of indicators would be more globally relevant, comprehensive and efficient;
- Better meeting market needs: the expectations of retailers and consumers are changing and they have increasingly high expectations both about how products are produced with respect to their environmental and social impact, and more importantly about access to that information;
- Allowing the cotton industry to properly assess the data being used by the downstream supply chain to 'assess' the performance of cotton, and check that it is accurate and fairly represents the performance of cotton globally.

A note on Life Cycle Assessment (LCA) and LCA-based raw material assessment tools

The Measuring Sustainability Report focuses on the indicators being used to report on responsible cotton production by sustainability programmes, i.e. on programmes and initiatives that are working with cotton farmers to address the impacts associated with cotton production. Supply chain tools that assess the impacts of growing cotton (usually based on an LCA approach) to inform raw material sourcing, such as Made-By's *Environmental Benchmark for Fibre*, the Sustainable Apparel Coalition's *Materials Sustainability Index*, and the Sustainable Clothing Action Plan's *Clothing Footprint Calculator tool* were not assessed as part of the report, as they do not work with farmers. Nevertheless, the key sustainability issues identified in the report closely match the areas that these tools evaluate raw materials, for example, greenhouse gas emissions, pesticide toxicity, energy use, water use, and land use.

LCA is a systematic evaluation of the potential environmental impact (e.g. greenhouse gas emissions) and resource use (e.g. water use) of a product that looks at every stage of the product from raw material production all the way to disposal at the end of the product's life. For cotton products, this means evaluating cotton production, textile manufacturing and garment manufacturing and end- use.

Standardizing the indicators by which the performance of the global cotton industry is measured will allow for more focused data collection, and thereby improve the ability of the cotton industry, as a global entity, to understand, report on, and improve its social, environmental and economic performance.

The Measuring Sustainability Report therefore proposes a set of recommended indicators that could act as the starting point for anyone working with cotton farmers – governments, industry organisations, development agencies, funders and voluntary standards initiatives – as the basis for their reporting.

SEEP commissioned the Measuring Sustainability Report to first understand the situation regarding the indicators currently being used by these various programmes and initiatives, and secondly to inform the formulation of recommendations on the criteria and indicators that should be measured by any sustainability programme, initiative or project working with cotton farmers.

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Structure and Focus of the Measuring Sustainability Report

The Measuring Sustainability Report provides:

An overview of the current status of knowledge on possible environmental, economic and social impacts associated with
cotton production. To ensure that the indicators are relevant, the starting point for identifying suitable sustainability indicators is the social, environmental and economic impacts associated with cotton production, and an extensive bibliography
for sources of the information on sustainability issues is included.

- Details of each of the sustainability programmes and initiatives reviewed (including their associated indicators).
- A methodological framework to prioritize sustainability areas and indicators according to their relevance, usefulness and
 feasibility to a specific country, and / or regional context. Given the range of environmental, agro-ecological, climatic,
 socio-economic and political conditions under which cotton is grown, not all indicators will be relevant in every context.
 The report provides sufficient details to enable readers to prioritise indicators against these criteria based on their individual circumstances.

Importantly, the report:

- Is focused at the farm and farmer level. Issues relating to down-stream activities may be noted in passing, but are not covered in any detail. It should also be noted that many of the issues highlighted are relevant to agricultural production in general, not just cotton. No attempt was made to explicitly distinguish 'cotton-specific' issues from broader agricultural production issues.
- Is not intended as a rating of the merits of each sustainability framework or initiative reviewed, nor an attempt to identify
 a preferred system. While an element of commonality around how different programmes and initiatives report on their
 outcomes is considered desirable, it is recognised that these different programmes and initiatives are working in different
 countries on a range of issues.

The report begins with a brief overview of cotton production and trade (Chapter 2). It then proceeds with a review of the key components of sustainable development in agriculture as defined by the international community (Chapter 3), followed by a review of the key sustainability issues relevant to cotton production (Chapter 4). This is followed by an inventory, review and analysis of the indicators used for measuring sustainability performance across a range of different cotton-specific supply chain sustainability programmes and initiatives, as well as more generic initiatives aimed at assessing sustainability in agricultural (Chapter 5, with detailed background information on the sustainability initiatives included as Appendices). The purpose of the analysis was to extract the most relevant indicators from the inventory. The results are presented as a set of recommended indicators to measure sustainability in cotton production (Chapter 7). The report concludes with a discussion on the importance of country and stakeholder perspectives in complementing the recommended indicators with specific priorities (Chapter 8).

The key sustainability issues in the cotton sector

Following the Brundtland Report definition of sustainability, the key issues for the cotton industry were organised into the three pillars of sustainability – environmental, economic and social, as follows:

Environmental

Pest and pesticide management

- Integrated pest management
- Pesticide use
- Human exposure
- Environmental contamination
- Pesticide waste management

Water management

- Water depletion
- Crop water management
- Soil salinization
- Water quality

Soil management

- Soil fertility
- Soil erosion

Land Use

- Land conservation
- Land productivity

Biodiversity

Climate change

- Decomposition and mineralisation
- Energy use
- Carbon stock changes

Economic

Economic viability
Poverty reduction
Food security
Economic risk management

Social

Labor rights and standards

- Child labor
- Employment conditions
- Freedom of association
- Social protection

Occupational health and safety Equity and gender Farmer organisation

Identifying and prioritising the potential indicators

The following programmes were reviewed, and the indicators used by each programme identified; both cotton specific programmes and more general programmes aimed at sustainable agriculture were considered:

Cotton specific

- Better Cotton Initiative
- Cotton made in Africa
- Fairtrade cotton
- Organic cotton
- myBMP (Australian Best Management Practices programme)

Generic programmes

- The Committee on Sustainability Assessment Initiative
- Field to Market (The Alliance for Sustainable Agriculture)
- The Response Inducing Sustainability Evaluation (RISE)
- The FAO Sustainability Assessment of Food and Agriculture Systems (SAFA) Guidelines.

A summary of the main features of each programme is included as an Appendix, including the indicators used by them. Other information summarised for each programme (based on information directly requested from the programmes) includes a brief narrative overview, its scope and main objective, area covered, number of participating farmers, production, average yield, global market share, stakeholder involvement, financing model, major donors, total funding, verification process and technical assistance provided to farmers. A complete inventory list of all indicators used by these programmes is included as another Appendix to the report.

Some further indicators were included, where it appeared there were gaps between identified key issues, and the list developed from the reviewed sustainability programmes – in particular for food security.

The inventory list of indicators was then reviewed against three criteria:

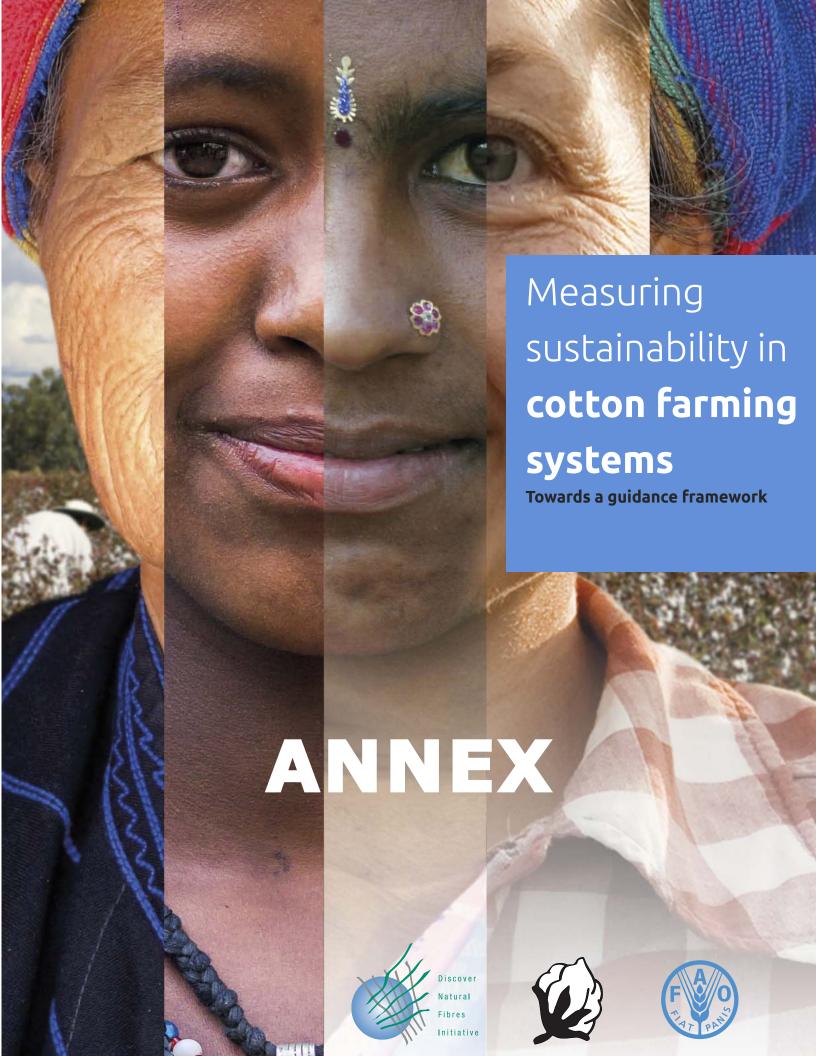
- 1. Their relevance: how well does the indicator align with sustainable development priorities at the global level, and for the cotton industry more specifically?
- 2. Their feasibility: how practical is it to actually collect the information, considering the costs involved, the availability of information and the likely accuracy of the data collected?
- 3. Their usefulness: how well does the indicator link the activity being measured and the outcomes sought: is it a logical and significant link, and is the information comparable?

The scores for each of these criteria were then assessed for 'balance', i.e. if there was too large a difference between average scores for the three different criteria for an indicator, the indicator was assessed as 'unbalanced' and potentially less relevant.

Each identified indicator was scored against the three criteria, which enabled the development of a more refined list of the most relevant indicators. These are included here as a Table at pages 4 and 5, organised under the 3 pillars of sustainability – environment, economic and social, and the key issues identified under each pillar (e.g. soil management under the environment pillar).

Many of the indicators identified are relevant for multiple sustainability issues (for example, pesticide use is relevant to a number of sustainability issues such as pest and pesticide management, as well as worker health and safety and associated labor rights and standards). To avoid duplication, the Table here only lists each sustainability indicator once, even though it may be relevant to several key sustainability issues.

The full list of indicators considered in the Measuring Sustainability Report is provided as an Appendix to the present Executive Summary.



Sustainability indicator	tainability indicator Rationale	VSIs ¹	Selection criteria ²			Indicator selected?
			Total score	Balance	Expert ex-/	
					inclusion	

A) Dimension: Environmental Sustainability

1) Pest and Pesticide Management

1)	Pest and Pesticide Management Environmental contamination & Integrated pest management						
1	Quantity of active ingredients of pesticides used (kg/ha)	Quantity of pesticides applied can provide an indication of the use of appropriate pest management practices (e.g. when compared with country-specific benchmarks) and negative environmental impact	myBMP, BCI, RISE	16	0,38		
2	Quantity of active ingredients of highly hazardous pesticides used (kg/ha)	Quantity of highly hazardous pesticides applied can provide an indication of the use of appropriate pest management practices (e.g. when compared with country-specific benchmarks) and negative environmental impact	BCI, myBMP, RISE	19	0,38		
3	Number of pesticide applications per season	High annual application frequencies/regularity of application may prevent the regeneration of non-target plants and organisms and may intensify the environmental impact of pesticides	myBMP	16	0,19		
4	Percentage of treatments that involve specific measures to minimize non target application and damage	Appropriate pesticide application techniques and timing can strongly decrease total volumes of pesticides applied, e.g. by reducing losses from application on nontargeted vegetation as well as leaching and runoff (edge of field, bottom of root zone)	myBMP	17	0,33		
5	Existence of a time-bound IPM plan (IPM plans should reference systematic scouting, pest control decisions that are based on thresholds for pest infestation, and agro-ecological management practices that prevent the development, spread and persistence of pest populations)	The presence of an IPM plan provides an indication of the use of good pest management practices	FT, CmiA, BCI	16	0,51		
6	Percentage of cotton area under IPM	The actual implementation of an IPM programme provides an indication of the use of good pest management practices		17	0,51		
7	Implementation of the International Code of Conduct and the three international conventions on the use and distribution of pesticides	The enforcement of international standards for the management of pesticides provides a good indicator for the existence of risk reduction measures in the country	CmiA, BCI	18	0,58	X	
8	Herbicide-resistant cotton: A management plan is set up to control weed escapes and cotton volunteers	Non-managed escapes promotes the emergence of resistant weeds	myBMP	14	0,69		
9	Extent of compliance with regulations for buffer zones and no-spray zones	Non-compliance with regulations on buffer zones may lead to negative environmental impacts	myBMP	14	0,00	X	
10	Extent of implementation of good farm hygiene practiced to minimise the movement of pests and pathogens onto and off the farm	Good farm hygiene practices reduces the likelihood of pest and pathogen infestation and spread, which can reduce the need for pesticides (e.g. of nematodes and fungi)	myBMP	12	0,19		
11	Percentage of farmers that use only pesticides that are nationally registered for use on cotton	Pesticides that are registered have been formally assessed, and the requirements for their poper use determined	myBMP, CmiA, BCI	17	0,33		
12	Percentage of farmers that use pesticides labelled according to national standards, in at least one national language	Proper pesticide labelling enhances the capacity of farmers to apply them efficiently and avoid negative environmental impacts	myBMP, BCI, CmiA, FT	17	0,33		
13	Percentage of farmers that use proper disposal methods for empty pesticide containers and contaminated materials including discarded pesticide application equipment	Inadequate waste disposal is correlated to leakage of pesticides and hazardous chemicals into the environment; Proper disposal of pesticide containers and application equipment minimizes the risk of environmental contamination	RISE, myBMP, CmiA, BCI, FT	16	0,38		

Sustainability indicator	Rationale	VSIs1	Selection criteria ²		Indicator selected?	
			Total	Balance	Expert	
			score		ex-/	
					inclusion	

1) Pest and Pesticide Management Human exposure

Human exposure						
Percentage of farmers following recommended practices for pesticide mixing, application and cleaning of application equipment	Use of recommended techniques of pesticide handling, mixing and application reduces the risk of exposure	RISE, myBMP, CmiA, FT, BCI	16	0,69	/	
Quantity of active ingredients of pesticides used (Kg/ha)	The amount of pesticides used may provide an indication of worker's total exposure to hazardous material, which may affect their health	myBMP, BCI, RISE	19	0,38		
Quantity of active ingredients of highly hazardous pesticides used [Kg/ha]	The amount of pesticides used may provide an indication of worker's total exposure to hazardous material, which may affect their health	BCI, myBMP, RISE	19	0,38		
Implementation of the International Code of Conduct and the three international conventions on the use and distribution of pesticides	The implementation of international tools for the management of pesticides provides a good indicator for the existence of risk reduction measures	CmiA, BCI	18	0,58	X	
Percentage of farmers that use proper disposal methods for empty pesticide containers and contaminated materials including discarded pesticide application equipment	Inadequate waste disposal is correlated to leakage of pesticides and hazardous chemicals into the environment; Proper disposal of pesticide containers and application equipment minimizes the risk of environmental contamination	RISE, myBMP, CmiA, BCI, FT	16	0,69	/	
Percentage of farmers with dedicated storage facilities that keep pesticides safely and out of reach by children	Appropriate pesticide storage reduces the risk of contact with hazardous pesticides	myBMP, CmiA, BCI, FT	17	0,51		
Percentage of farmers that use pesticides labelled according to national standards, in at least one national language	Use of properly labelled pesticides provides an indication of appropriate pesticide use and management	myBMP, BCI, CmiA, FT	17	0,33		
Percentage of farmers that use only pesticides that are nationally registered for use on cotton	Pesticides that are registered have been formally assessed, and the requirements for their poper use determined	myBMP, CmiA, BCI	17	0,33		
Existence of a time-bound IPM plan [IPM plans should reference systematic scouting, pest control decisions that are based on thresholds for pest infestation, and agro-ecological management practices that prevent the development, spread and persistence of pest populations]	The presence of an IPM program provides an indication of the use of good pest management practices	FT, CmiA, BCI	15	0,19		
Total number and percentage of cotton area involving vulnerable persons applying pesticides (e.g. persons below the age of 18, pregnant and breastfeeding women; disaggregated by age and gender)	Vulnerable groups are especially at risk of severe consequences from pesticide exposure	COSA, myBMP, FT, CmiA, BCI	15	0,67	/	
Percentage of workers applying pesticides that have received training in handling and use	The qualification level of workers applying pesticides reduces the risks associated with pesticide application	myBMP, FT, BCI, CmiA	16	0,51		
Percentage of farmers having access and using adequate protective equipment (by type)	The presence of adequate protective gear reduces the risks associated with pesticide application	SAFA, RISE, COSA, myBMP, FT, BCI	16	0,19		
Frequency of pesticide applications within 10 meters from ongoing human activity (housing, canteens, offices, warehouses or similar)	Pesticide application in proximity to human activity exposes non-protected individuals with pesticides and hazardous chemicals	FT	16	0,96		
	Percentage of farmers following recommended practices for pesticide mixing, application and cleaning of application equipment Quantity of active ingredients of pesticides used (Kg/ha) Quantity of active ingredients of highly hazardous pesticides used (Kg/ha) Implementation of the International Code of Conduct and the three international conventions on the use and distribution of pesticides Percentage of farmers that use proper disposal methods for empty pesticide containers and contaminated materials including discarded pesticide application equipment Percentage of farmers with dedicated storage facilities that keep pesticides safely and out of reach by children Percentage of farmers that use pesticides labelled according to national standards, in at least one national language Percentage of farmers that use only pesticides that are nationally registered for use on cotton Existence of a time-bound IPM plan (IPM plans should reference systematic scouting, pest control decisions that are based on thresholds for pest infestation, and agro-ecological management practices that prevent the development, spread and persistence of pest populations) Total number and percentage of cotton area involving vulnerable persons applying pesticides (e.g. persons below the age of 18, pregnant and breastfeeding women; disaggregated by age and gender) Percentage of workers applying pesticides that have received training in handling and use Percentage of farmers having access and using adequate protective equipment (by type)	Percentage of farmers following recommended practices for pesticide mixing, application and cleaning of application equipment Quantity of active ingredients of pesticides used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Quantity of active ingredients of highly heat possible used (lkg/ha) Pure minimity of pesticides used (lkg/ha) Percentage of farmers that use possible used (lkg/ha) Percentage of farmers with dedicated storage facilities that keep pesticides application equipment minimity est her isk of contact with hazardous pesticides safety and out of reach by children Percentage of farmers that use pesticides and management Percentage of farmers that use only pesticides that are nationally registered for use on cotton Existence of a time-bound IPM plan (IPM plan should reference systematic scouting, pesticides that are nationally registered for use on cotton Total number and percentage of cotton area involving vulnerable persons applying pesticides that have received training in handling and use Percentage of farmers having access and using adequate protective equipment (Percentage of farmers following recommended practices for pesticide mixing, application and cleaning of application equipment Quantity of active ingredients of pesticides used may provide an indication of worker's total exposure to flighth and are active ingredients of pesticides used may provide an indication of worker's total exposure to hazardous material, which may affect their health Quantity of active ingredients of highly flight and indication of worker's total exposure to hazardous material, which may affect their health Quantity of active ingredients of highly health with may affect their health Quantity of active ingredients of highly hazardous pesticides used may provide an indication of worker's total exposure to hazardous material, which may affect their health Implementation of the International code of Conduct and the three international conventions on the use and distribution of pesticides on the use and distribution of pesticides on the use and distribution of pesticides and hazardous conventions on the use and distribution of pesticides and hazardous conventions on the use and distribution of pesticides and hazardous conventions on the use and distribution of pesticides and hazardous conventions on the use and distribution of pesticides for empty pesticides application equipment minimizes the risk of contact with hazardous pesticides and hazardous contact of the existence of risk reduction massures. 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Sustainability indicator	Rationale	VSIs1	Selection criteria ²		Indicator selected?	
			Total score	Balance	Expert ex-/	

1) Pest and Pesticide Management

Human exposure

27	Extent of aerial spraying carried out above or around human activities or open water sources	Aerial spraying that exposes humans and water bodies to pesticides may have impacts on human health and the environment	FT	13	0,88	
28	Percentage of pesticide applications in of locally suitable meteorological conditions	Pesticide application in unsuitable meteorological conditions may increase the amount of off-site pesticide movement	myBMP, BCI	17	0,77	
29	Number of pesticide applications per season	Provides an indication of worker total potential exposure to pesticides	myMBP	16	1,00	
30	Are protective gear, application and mixing equipment decontaminated in an adequate way and frequency as based on recommendations	Contaminated protective gear, mixing and application equipment can be a source of human pesticide exposure	myBMP	18	0,33 🗙	
31	Percentage of farmers that possesses adequate emergency equipment to provide first aid (e.g. treating wounds or pesticide spills / exposure)	Emergency equipment may greatly reduce the severity and health consequences from accidents at work	FT, myBMP, BCI	13	0,19	

2) Water Management

Water depletion

32	Quantity of water used for irrigation (m³/ha)	Provides a measure of the amount o f water used per ha, which can give an indication of productivity and water depletion	SAFA, RISE, FtM, myBMP, BCI	17	0,51		
33	Irrigation use efficiency (%)	When used with country-specific benchmarks, irrigation use efficiency may provide an indication of the relative performance	myBMP, RISE	16	0,69	/	
34	Groundwater table level (m from the surface)	Provides an indication of the state of groundwater resources and water depletion. (monitoring over time is needed)	RISE, myBMP	16	0,19		
35	Total volume and percentage of surface water used for irrigation		RISE	13	0,84		
36	Total area and percentage of cotton production area under irrigation by type of irrigation		myBMP	19	0,51	X	
37	Ratio of the recharge rate of groundwater aquifer [m³/year] to the groundwater extraction per year [m³/year]	Measures the impact of water withdrawal on groundwater tables, taking into account the degree of groundwater recharge		15	0,88		

Crop water management

38	Percentage of area under water
	conservation practices
	(based on the context of concernation tills

(based on the context e.g. conservation tillage, mulching, enhanced irrigation scheduling and uniformity, contour bunds and terracing, inclusion of less water demanding crops/varieties in rotations, compost application etc.)

The presence of water conservation practices provides an indication of the use of appropriate water management practices

COSA, myBMP, BCI

14

0,33

Su	stainability indicator	Rationale	VSIs¹	Selec	tion crite	ria²	Indicator selected?
	,			Total score	Balance	Expert ex-/ inclusion	
2)	Water Management						
	Crop water management						
39	Crop water use productivity (m³ of water per ton of cotton lint)	When used with country-specific benchmarks, crop water productivity may provide an indication of the relative performance	FtM, myBMP	16	0,69	/	
40	Marginal crop water productivity (m³ of water per ton of cotton lint)		FtM	15	0,67		
41	Salinity of soil and irrigation water (measured by the electrical conductivity in deciSiemens (dS) per meter. EC)	High levels of irrigation water salinity decrease crop yields, while very low concentrations reduce water infiltration which indirectly affects the crop	RISE, myBMP	16	0,38		
42	Percentage and total cotton production area managed under a water management plan (specifying amount and timing of irrigation, estimation of Plant Available Water Content (PAWC) and Readily Available Water (RAW))	Provides an indication of the implementation of appropriate water management	myBMP, BCI, RISE	13	0,19		
43	Percentage of farmers trained in measures of water management	The existence of training on water management provides an indication of the use of appropriate water management practices	FT	9	0,38		
	Soil salinization						
44	Salinity of soil and irrigation water (measured by the electrical conductivity in deciSiemens (dS) per meter. EC)	High levels of irrigation water salinity decrease crop yields, while very low concentrations reduce water infiltration which indirectly affects the crop	RISE, myBMP	18	0,38		
45	Quantity of water used for irrigation [m³/ha]	Volume of water used per hectare together with levels of salinity of irrigation water provides an indication of risk of soil salinity	SAFA, RISE, FtM, myBMP, BCI	16	0,69		
46	Total area and percentage of cotton production area under irrigation by type of irrigation	The type of irrigation applied can affect the distribution and amount of salts deposited	myBMP	19	0,51	X	
47	Percentage and total cotton production area managed under a water management plan (specifying amount and timing of irrigation, estimation of Plant Available Water Content (PAWC) and Readily Available Water (RAW))	The presence of a water management plan may indicate reduced exposure to salinization	myBMP, BCI, RISE	13	0,67		
48	Irrigation use efficiency (%)	When used with region-specific benchmarks, irrigation use efficiency may provide an indication of the amount of salts delivered to the soil	myBMP, RISE	16	0,69		
	Water quality						
49	Quality of discharge water (based on context conditions this can include acidity, pH, Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), Biochemical Oxygen Demand (BOD), faecal coliforms, salinity, nitrates, metals, phosphorus, total solids, temperature, turbidity)	The monitoring of water quality parameters offers a direct evaluation of water quality	SAFA, RISE, COSA	15	0,19		
50	Extent that riparian vegetation is retained and protected	Riparian vegetation contributes to the functioning of the overall ecosystem, including water quality	myBMP, RISE	13	0,19		

Sustainability indicator	Rationale	VSIs1	Select	ion crite	ria²	selected?
			Total score	Balance	Expert ex-/ inclusion	

2) Water Management Water quality

51	Existence of waste water discharge control practices	The presence of waste water discharge control practices may provide an indication of the use of appropriate waste water management practices, and reduced risk of water eutrophication and pollution	RISE	13	0,67	
52	Percentage of pesticide applications in of locally suitable meteorological conditions	Pesticide application in unsuitable meteorological conditions may increase the amount of off-site pesticide movement	myBMP, BCI	15	0,19	X
53	Percentage of water bodies separated from cotton fields by buffer stripes	Buffer stripes may diminish the amount of sediment, nutrients and contaminants that end up in surface waters	RISE, FT	13	0,19	

3) Soil Management

Soil fertility

54	Soil organic matter content	A measure of soil health	RISE, Organic, myBMP, COSA	19	0,51		
55	Soil sampling of N, P, K concentration	Soil samples, when compared with region- specific benchmarks, provide an indication of soil fertility	RISE, myBMP	18	0,58		
56	Use of soil sampling for N, P, K (% of farmers)	Soil sampling by farmers supports targeted fertilization rates and helps minimize overfertilization		17	0,51		
57	Soil pH	Soil pH can provide an indication of the presence of microfauna within the soil	RISE	16	0,69	/	
58	Average yield (t of cotton lint/ha)	Average yield trends can provides a proxy for soil fertility	RISE, FtM, COSA, BCI	16	0,38	X	
59	Fertilizer used by type (kg/ha)	Quantity and type of fertilizer applied can provide an indication of integrated soil fertility (especially if compared to country- specific benchmarks)	RISE, BCI, myBMP, COSA	18	0,51		
60	Quality of discharge water (based on context conditions this can include acidity, pH, Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), Biochemical Oxygen Demand (BOD), faecal coliforms, salinity, nitrates, metals, phosphorus, total solids, temperature, turbidity)	Elevated concentrations of nutrients and organic matter in discharge water from cotton production areas may indicate inefficient and environmental harmful methods of soil management. In aquatic ecosystems this may cause algal blooms/red tides, fish kills and reduce the microbiological quality and biodiversity	SAFA, RISE, COSA	15	0,19	X	
61	Ratio of nutrient supply and demand at farm or field level (especially for nitrogen and phosphorus)	Nutrient demand and needs (and its corresponding ratio) provide a measure of soil health	SAFA, RISE, COSA	16	0,69		
62	Percentage of on-farm N and P self-sufficiency	Nutrient self-sufficiency on farm-level is one element of an integrated farming system	RISE, COSA	12	0,38		
63	Total and percentage of cotton area benefiting from manuring (recycling of local nutrients)	The use of compost provides an indication of the presence of management practices that promote soil fertility	RISE, Organic, myBMP, COSA	10	0,51		
64	Soil physical structure: Share of the utilized land characterized by good conditions of soil physical structure in consideration of the local climate and bedrock	Soil physical structure is an important determinant of permeability and water holding capacity of soils which in turn influences fertility	SAFA, myBMP, BCI	15	0,19	×	

Su	stainability indicator	Rationale	VSIs1	Select	ion criter		Indicator selected?
				Total score	(Expert ex-/ inclusion	
3)	Soil Management Soil fertility						
65	Soil biological quality: Share of the utilized land characterized by high biological soil quality in consideration of the local climate and bedrock	The presence of diverse soil organisms ensures a working soil food web contributing to nutrient cycling and soil fertility	SAFA, Organic	15	0,19	X	
66	Share of cultivated cotton area for which a fertilizer budget is prepared to optimise nutrient inputs, taking account of nutrient availability and removal from crops	Specifically targeted fertilization rates guarantee adequate nutrient availability and minimize overfertilization	myBMP, BCI, COSA, RICE	15	0,19	X	
67	Percentage of farmers trained in fertilizer use	The presence of training on fertilizer use may provide an indication of the use of appropriate fertilizer management practices,	FT	9	0,38		
	Soil erosion						
68	Percentage of area under soil erosion control and minimum/conservation tillage practices (including various forms of soil conservation, crop residue management, conservation agriculture, agroforestry, ridges, contour bunds, use of terraces and ditches)	Soil erosion and prevailing tillage practices are strong determinants of soil organic matter and soil fertility	SAFA, COSA, Organic, myBMP, CmiA, BCI	15	0,19		
69	Total amount of soil lost annually through erosion (in kg/ha) and share of land subject to erosion	Provides a direct measure of soil erosion	SAFA, RISE, FtM, COSA	14	0,84		
70	Percentage of farmers trained to manage soil erosion	Provides an indication of the capacity to manage soil erosion	FT	10	0,33		
71	Ratio of net loss to net gain of productive land: What is the ratio between rehabilitated land and degraded land in your operations	Provides a direct measure of the net change in productive land	SAFA	11	0,33		
4)	Land use and Biodiversity						
	Land conservation						
72	Total area and percentage of natural vegetation converted for cotton production (in ha)	Direct measure of land conversion	SAFA, RISE, COSA, Organic, myBMP, CmiA, BCI	14	0,84	/	
73	Percentage of total farm area that is non-cropped (including buffer zones, set aside areas, etc)	Non-cropped farm areas may indicate low pressure for converting land	RISE, COSA	12	0,51	/	
	Land productivity						
74	Average yield (t of cotton lint/ha)	Average yield is a direct measure of land productivity, indicates the degree of land use efficiency and land productivity	RISE, FtM, COSA, BCI	16	0,38		
75	Average number of cotton and other crops per 5-year period (including cotton itself & intercropping)	Crop rotation can provide an indication of soil health and corresponding pressure for land conversion	RISE, Organic, CmiA	17	0,33		
76	Soil sampling of N, P, K concentration		RISE, myBMP	18	0,58	X	
77	Soil organic matter content	Percentage of organic matter provides an indication of soil health and land productivity	RISE, Organic, myBMP, COSA	18	0,51	X	

Su	stainability indicator	Rationale	VSIs1	Select	tion crite	ria²	Indicator selected?
				Total score	Balance	Expert ex-/ inclusion	
<u>(</u>)	Land use and Biodiversity Land productivity						
78	Share of planted area not harvested and share of harvested quantity lost as waste in farm operations	High levels of crop loss contribute to low land productivity	SAFA	13	0,58		
	Biodiversity						
79	Total area and percentage of natural vegetation converted for cotton production [in ha]	The conversion of natural and near-natural ecosystems may be associated with decreases in biodiversity	SAFA, RISE, COSA, Organic, myBMP, CmiA, BCI	15	0,51		
80	Percentage of total farm area that is non-cropped (including buffer zones, set aside areas, etc)	The conversion of natural and near-natural ecosystems may be associated with decreases in biodiversity	RISE, COSA	14	0,84	/	
81	Quantity of active ingredients of pesticides used (kg/ha)	The use of pesticides may decrease biodiversity	myBMP, BCI, RISE	16	0,38	X	
82	Quantity of active ingredients of highly hazardous pesticides used (kg/ha)	The use of highly hazardous pesticides may decrease biodiversity	BCI, myBMP, RISE	19	0,38	X	
83	Number of pesticide applications per season	High annual application frequencies/ regularity of application may prevent the regeneration of non-target plants and organisms and reduce biodiversity	myBMP	15	0,19	X	
84	Percentage of cotton area under IPM	The presence of an IPM program provides an indicator of the use of good pest management practices, which may have positive effects for biodiversity		16	0,51	X	
85	Percentage of area covered by border trees and overstory on farm	The percentage and degree of overstory on farm may provide an indicator of the conservation of natural habitats, which may have positive effects for biodiversity	COSA	15	0,67		
86	Soil organic matter content	The presence of organic matter can affect the presence of microorganisms within soil, which may positively contribute to biodiversity	RISE, Organic, myBMP, COSA	18	0,51	X	
87	Percentage of farmers receiving training on biodiversity protection	The presence of training on biodiversity protection may provide an indicator of the capacity to implement conservation practices	FT	9	0,38		
88	Average number of species found in habitats within sphere of influence	Provides a measure of species diversity which constitutes an element of biodiversity	SAFA	14	0,84	ı	
89	Fish kills attributed to cotton pesticides or % of fish mortality linked to cotton pesticides		myBMP	14	0,84	ı	
90	Average number of cotton and other crops per 5-year period (including cotton itself & intercropping)	A higher number of different crops identifies a diversified agricultural landscape	RISE, Organic, CmiA	15	0,51		
91	Number of hectares and percentage of total area cultivated as GMO crop		Organic, FT, CmiA	14	0,69		
92	Share of cotton production from others than the most common genetic lineage/breed	A higher number of different varieties might indicate higher intra-varietal genetic variability (agro-biodiversity)	SAFA	15	0,51	X	
93	Locally adapted and traditional varieties and breeds: What is the share of production accounted for by locally adapted varieties/breeds and by rare and traditional (heirloom) varieties and breeds	The cultivation of local and traditional varieties prevents their extinction and promotes additional environmental services as compared to pure conservation in genebanks	SAFA	13	0,19		

Sus	stainability indicator	Rationale	VSIs ¹		ion crite		Indicator selected?
				Total score	Balance	Expert ex-/ inclusion	
4)	Land use and Biodiversity Biodiversity						
94	Ecosystem connectivity: What share of the natural and semi-natural ecosystems in your operation are connected with similar ecosystems (within and adjacent to your operation's borders) in a way that allows an exchange between populations of key species	The presence and conservation of natural corridors contributes to habitat conservation for species	SAFA, RISE	12	0,19		
95	Riparian vegetation is retained and protected	Riparian vegetation contributes to the functioning of the overall ecosystem, including water quality	туВМР	13	0,19		
5)	Climate Change						
96	GHGs emission and carbon sequestration per cotton lint and/or ha $[\text{in CO}_2\text{-e}]$	Provides a per unit measure of the balance of GHG emissions & carbon sequestration	SAFA, RISE, FtM	13	0,88	/	
97	Total emission reduction by and efficacy rating of GHG mitigation measures, including carbon sequestration by soils and vegetation, and carbon off-set schemes	Provides a measure of net emission reductions	SAFA, FT	14	0,69		
	Decomposition & Mineralization						
98	Fertilizer used by type (kg/ha)	Volumes of fertilizers used is directly linked to emissions of N_2O and CO_2 through application and production (specifications in tons of N, Urea, P2O5 and CaCO $_3$ per haneeded)	RISE, BCI, myBMP, COSA	18	0,51	×	
99	Percentage of area affected by water logging longer than 20 days (usually n.a. in cotton)	Water logged soil may result in methane emissions	RISE	14	0,69		
	Carbon stock changes						
100	Total area and percentage of natural vegetation converted for cotton production [in ha]	Deforested area reduces carbon stocks through soil carbon losses and losses in biomass, while the conversion of other types of natural vegetation may have similar impacts	SAFA, RISE, COSA, Organic, myBMP, CmiA, BCI	16	0,88		
101	Percentage of total farm area that is non-cropped (including buffer zones, set aside areas, etc)	Non-cropped farm areas may be correlated to natural areas with higher levels of biomass	RISE, COSA	8	0,19		
102	Percentage of area covered by border trees and overstory on farm	Trees at the margin and within the farm plot (e.g. shear nut trees) store additional carbon in their biomass	COSA	13	0,67		
103	Percentage of area affected by residue burning	Burning of crop residues reduces soil carbon levels and causes the release of $\ensuremath{\text{CO}}_2$		15	0,84		
104	Percentage of area managed under advanced management practices (precision agriculture, improved nutrient mgmt, improved crop rotation, reduced tillage, residue mulching, cover crops, IPM, investment in energy efficient machinery)	Improved management can practices reduce GHG emissions	Organic, FT	11	0,33		

Sustainability indicator	Rationale	VSIs1	Select	ion crite	ria²	Indicator selected?
			Total score	Balance	Expert ex-/inclusion	

5) Climate Change

Energy use

105	Amount of other artificial inputs (in tons per ha; e.g. pesticides, herbicides, fungicides etc.)	Volumes of artificial inputs applied translate into indirect CO2 emissions from production, storage and transport		17	0,38	X	
106	On-farm energy use per t of cotton lint and/or ha (GJ)	Fossil fuel and energy used per area or quantity produced provides a measure of energy intensity of production and production efficiency	SAFA, RISE, FtM, myBMP, FT, COSA	14	0,67	✓	
107	Existence of recycling	The existence of recycling may provide an indication of advanced waste management and waste reuse that decreases resource use intensity and thus contributes to avoid GHG emissions	SAFA, COSA, FT	13	0,58		
108	Percentage of recycling of total material inputs	The existence of recycling may provide an indication of advanced waste management and waste reuse that decreases resource use intensity and thus contributes to avoid GHG emissions	SAFA	13	0,67		

B) Economic Sustainability

6) Economic viability, poverty reduction and food security **Economic viability**

109	Average annual net income from cotton production (per ha and per farmer, or per person-day)	Average annual incomes per unit provide an indication of poverty when compared with average national incomes	SAFA, RISE, COSA, BCI	17	0,51
110	Average yield (t of cotton lint/ha)	Average yields are one determinant of production efficiency and the economic viability of cotton production systems	RISE, FtM, COSA, BCI	16	0,38 🗶
111	Price received per t of cotton lint at farm gate	Product prices are one determinant of economic viability of cotton production systems	COSA	15	0,19
112	Returns above variable costs per hectare and t of cotton lint	Returns above variable costs are an important indicator of the profitability and economic viability of cotton production systems	FtM	17	0,51
113	Returns on investment	The return on investments provides a measure of the of economic viability of cotton production systems	RISE	15	0,51
114	Debt to asset ratio	The debt to asset ratio may indicate the long term economic viability of cotton production systems	RISE, FtM	16	0,69 🗸
115	Total value and share of cotton production in regional and national agricultural GDP	The share of cotton production systems in agricultural GDP provides an indication of the economic importance for a territory and may complement questions of economic viability	FtM	10	0,51

	Poverty reduction						
116	Number and percentage of household members living below the national poverty line	The headcount ratio is a direct measure of the spread of poverty	RISE, COSA	15	0,51		
117	Number and percentage of household members with a daily income of less than \$1.25 and \$2 a day (PPP)	The headcount ratio is a direct measure of the spread of poverty		15	0,51	×	

						Indicator
Sus	stainability indicator	Rationale	VSIs ¹	Select	ion criteria²	selected?
				Total score	Balance Expert ex-/ inclusion	
6)	Economic viability, poverty redu Poverty reduction	uction and food security				
	1 overty reduction					
118	Poverty gap of members from cotton producing households at national poverty line	The poverty gap is a measure for the intensity of poverty	RISE	12	0,38	
119	Poverty gap at \$1.25 and \$2 a day (PPP) of members from cotton producing households	The poverty gap is a measure for the intensity of poverty		12	0,38	
120	Percentage of farmers/workers with access to productive resources (subdifferentiated by land, water, inputs, etc.)	Access to productive resources determines whether the economically most viable production methods are available to the household and indicates poverty	SAFA	13	1,02 🗸	
121	Average value of assets per producer household (sum of land, real estate, machinery, livestock etc.)	Asset values per household may provide an indication of poverty when compared with regional norms	COSA	17	0,51	
122	Percentage of producer households with a specific asset (bicycle, mobile phone, etc.)	The presence of specific assets may provide an indication of buying power		16	0,38	
123	Financial amounts invested by farmers, producer groups, partners in community and social development, organisational and capacity building, infrastructure development etc.	Investment in social development provides an indication of capital flows to farmers, which may reduce poverty	SAFA, COSA, FT	12	0,38	
124	Perception of change in economic situation over last five years (% of farmers)	Provides an indication of perceived change in wealth and/or well-being	COSA	16	0,38	
	Food security					
125	Total number and percentage of cotton farming household members with kilojoule intake below the international norm	Proportion of the population estimated to be at risk of caloric inadequacy	RISE, COSA	14	0,33	
126	Average Dietary Supply Adequacy of cotton farming household members	The indicator expresses the Dietary Energy Supply (DES) as a percentage of the Average Dietary Energy Requirement (ADER)		14	0,67	
127	Depth of the Food Deficit (concerning food deficient cotton farming household members)	The depth of the food deficit indicates how many calories would be needed to lift an individual out of food deficiency		14	0,67	
128	Per capita food supply variability of members from cotton producing households (standard deviation of the average food supply)	Variable food supply may indicate periods of food insecurity or the extent of the risk of food insecurity		11	0,33	
129	Share of food expenditure in producers' total household expenditure	The share of expenditure for food gives in low-income countries an indication of the living standard as well as the vulnerability to food price increases and variability		11	0,33	
130	Percentage of children in cotton producing households under 5 years of age who are stunted	Stunting describes the condition that a child's height-for-age is lower than 2 standard deviations of the WHO Child Growth Standards median. Under most conditions it is caused by food insecurity		12	0,38	
131	Percentage of children in cotton producing households that are under 5 years of age affected by wasting	Wasting describes the condition that a child's weight-for-height is lower than 2 standard deviations of the WHO Child Growth Standards median. Under most conditions it is caused by food insecurity		12	0,38	

Sustainability indicator	Rationale	VSIs¹	Select	ion crite	ria²	Indicator selected?
			Total score	Balance	Expert ex-/	
					inclusion	

6) Economic viability, poverty reduction and food security Food security

132	Percentage of children in cotton producing households under 5 years of age who are underweight	Underweight describes the condition that a child's weight-for-age is lower than 2 standard deviations of the WHO Child Growth Standards median. Under most conditions it is caused by food insecurity	15	0,51 🗶	
133	Percentage of adults in cotton producing households who are underweight	Adults underweight is defined by a Body Mass Index (weight/squared height) below the international reference standard of 18.5. It may indicate situations of food insecurity	14	0,00 🗙	
134	Share and market value of food produced by the household per household member	The average food production per household indicates whether a bigger share of the household's food requirements can be covered by own sources. In case of absence of other cash revenue it can provide an important indicator for vulnerability to food insecurity	12	0,38	
135	Share of dietary energy supply of producer households derived from cereals, roots and tubers	Healthy diets are characterized by variability in composition. Diets with strong tendency to be composed exclusively from cereals, roots and tubers are very likely caused by food insecurity	12	0,38	
136	Average protein supply of producer households per day and household member	Protein insufficient diets are very likely caused by food insecurity and indicate poor nutritional status of a household	12	0,38	
137	Domestic Food Price Level Index	The Domestic Food Price Level Index is calculated by dividing the Food Purchasing Power Parity (FPPP) by the General PPP, thus providing an index of the price of food in the country relative to the price of the generic consumption basket	14	0,67	
138	Number of days with food deficiency per annum in cotton producing households	Provides a measure of food security COSA	15	0,58	

7) Economic risk management

Cotton yield volatility	Yield volatility provides an indication of potential cash shortfalls, which can increase liquidity risk	COSA	15	0,19
Farm gate cotton price volatility	High volatility in prices is a major cause of economic risk for producers	COSA	15	0,19
Percentage of farmers with measures in place to manage price risks by type	Missing risk management strategies for price volatility increase the negative impacts of fluctuating prices	SAFA	14	0,33
Percentage of total household income that the largest income source represents	Provides an indicator for economic vulnerability in case of shocks to the main income source	RISE, COSA	16	0,69 🗸
Average number of days after sale that farmers receive payment	Timely payment reduces the risk of farmers engaging in non-beneficial coping strategies when facing cash constraints	5	17	0,33
Percentage of farmers with access to equitable credit	Access to credit provides an indication of a farmer's ability to invest in their farm and withstand a liquidity crisis	COSA, FT	18	0,51
	in place to manage price risks by type Percentage of total household income that the largest income source represents Average number of days after sale that farmers receive payment Percentage of farmers with access	potential cash shortfalls, which can increase liquidity risk Farm gate cotton price volatility High volatility in prices is a major cause of economic risk for producers Missing risk management strategies for price volatility increase the negative impacts of fluctuating prices Percentage of total household income that the largest income source represents Provides an indicator for economic vulnerability in case of shocks to the main income source Timely payment reduces the risk of farmers engaging in non-beneficial coping strategies when facing cash constraints Percentage of farmers with access to credit provides an indication of a farmer's ability to invest in their farm and	potential cash shortfalls, which can increase liquidity risk Farm gate cotton price volatility High volatility in prices is a major cause of economic risk for producers Missing risk management strategies for price volatility increase the negative impacts of fluctuating prices Percentage of total household income that the largest income source represents Provides an indicator for economic vulnerability in case of shocks to the main income source Timely payment reduces the risk of farmers engaging in non-beneficial coping strategies when facing cash constraints Percentage of farmers with access to credit provides an indication of a farmer's ability to invest in their farm and ETT.	potential cash shortfalls, which can increase liquidity risk Farm gate cotton price volatility High volatility in prices is a major cause of economic risk for producers Missing risk management strategies for price volatility increase the negative impacts of fluctuating prices Percentage of total household income that the largest income source represents Provides an indicator for economic vulnerability in case of shocks to the main income source Timely payment reduces the risk of farmers engaging in non-beneficial coping strategies when facing cash constraints Percentage of farmers with access to credit provides an indication of a farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and to the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer's ability to invest in their farm and the farmer and the farmer and the farmer

Sustainability indicator	Rationale	VSIs1	Select	ion crite	ria²	Indicator selected?
			Total score	Balance	Expert ex-/ inclusion	

7) Economic risk management

145	Percentage of farmers showing understanding of the factors involved in price formation or have daily access to international and domestic prices	Access to market information provides an indication of a farmer's ability to analyse and adapt to changing market conditions, which can affect risk management	COSA, CmiA, FT	11	0,33 🗸
146	Frequency of liquidity crisis	Provides a proxy for a farmer's ability to manage risk	SAFA	13	0,84
147	Number of actual and alternative buyers	Provides a proxy for the risk of marketing and income problems in case of loss of selected buyers	SAFA	17	0,77
148	Share of inputs coming from biggest single supplier	Provides a proxy of the stability of supply	SAFA	13	0,19
149	Total annual production costs for cotton per hectare	High production costs may contribute to economic risk	COSA, SAFA, RISE	13	0,19

C) Social Sustainability

8) Labour rights and standards

Child labour

150	Percentage of children attending and completing appropriate level of school (disaggregated by gender; age 5-12 attending school; age 12-15 completed primary)	Provides a measure of the proportion of children attending school	COSA	17	0,38
151	Access to primary education for all children	Provides an indication of the amount of children attending school	RISE	10	0,38
152	Number of child labourers (disaggregated by age and gender)		SAFA, RISE, COSA, Organic, FT, CmiA, BCI	15	0,88 🗸

Employment conditions

153	Share of workers with enforceable employment contract (disaggregated by age and gender)	Provides an indicator of the ability to enforce labour laws and normsProvides an indicator of the extent of protection of workers afforded by labour laws and norms	SAFA, RISE, FT, CmiA, BCI	17	0,33	
154	Percentage of farm workers who are paid a minimum or living wage and who always receive their full wage in time (disaggregated by age and gender)	The share of workers benefitting from a living wage indicates one aspect of decent employment	SAFA, COSA, FT, CmiA, BCI	16	0,88 🗸	
155	Number of human rights abuses	Direct indicator of human rights violation	Organic	13	0,88	
156	Number of incidents of corporal punishment, mental or physical coercion or verbal abuse	Direct indicator of human rights violation	FT, BCI	12	0,38	
157	Total number and percentage of workers being subordinated by forced labour	Direct indicator of forced labour	SAFA, RISE, Organic, FT, CmiA, BCI	15	0,51	

Suc	stainability indicator	Rationale	VSIs¹	Salac	tion crite	ria²	Indicator selected?
<u> </u>	reality marcator	Retionate	1015	Total score	Balance		Jordan .
8)	Labour rights and standards Employment conditions						
158	Percentage of workers and farmers with access for dispute settlement to an independent court with enforcement power	The access to a forum for dispute settlement is a precondition for fair dispute settlement and the possibility to enforce contracts	SAFA	14	0,00	X	
159	Can the enterprise show evidence of a prompt and responsible response to legal, regulatory, international human rights and voluntary code breaches, including detailed response on how the breach was remedied, how the effects of the breach will be restored or compensated and the policies and processes instituted to prevent further breaches	Direct indicator of the presence of institutions that discourage, prevent and sanction the violation of basic rights and enforce their adherence	SAFA	12	0,69		
160	Average working time per week (in hours) and total working days per year	Indicator of working conditions	RISE, CmiA, BCI	15	0,51	×	
161	Average labour productivity of cotton farmers and cotton workers	Labour productivity may be related to remuneration levels and thus contribute to decent employment	COSA	13	0,19		
162	Existence of practices that make employment or housing conditional on the simultaneous employment of spouses or children	Conditional contracts including other family members limits their personal freedom and bargaining position	FT, CmiA	11	0,33		
163	Percentage of farmers/workers with effective access to health care facilities	Access to health care facilities is a major determinant of living standards and wellbeing	COSA, CmiA, BCI	18	0,38		
164	Percentage of farmers/workers with access to potable water	Access to potable water is an important dimension of living standards and poverty	COSA, FT, BCI	16	0,38		
165	Percentage of farmers/workers with access to sanitation facilities	Existence and usage of proper maintained sanitation facilities reduces the transmission of diseases as well as pollution of water and other resources, which contributes to overall health and wellbeing	FT, BCI	14	0,00		
	Freedom of association						
166	Share of farm workers that are free to form workers' organizations and participate in group negotiations of contracts		SAFA, RISE, Organic, FT, CmiA, BCI	11	0,38		
	Social protection						
167	Percentage of active cotton farmers and workers contributing to a pension scheme and/or eligible to receive a pension	Direct indicator of social security coverage	SAFA, RISE	16	0,19		
168	Percentage of cotton farming households being covered by a health care insurance	Direct indicator of social security coverage	BCI, SAFA, RISE, CmiA, COSA	16	0,38	X	
169	Percentage of cotton farming households benefitting from income support in case of officially recognised extreme income shocks	Direct indicator of social security coverage	RISE, SAFA	14	0,33		

Su	stainability indicator	Rationale	VSIs1	Select	tion crite	ria²	Indicator selected?
				Total score	Balance	Expert ex-/ inclusion	
8)	Labour rights and standards						
	Social protection						
170	Percentage of employed women that have the right to maternity leave and receive payments	Direct indicator of social security coverage	FT, SAFA	14	0,33		
9)	Occupational safety and health						
171	Percentage of farmers having access and using adequate protective equipment (by type)	The presence of adequate protective gear reduces the risks associated with pesticide application	SAFA, RISE, COSA, myBMP, FT, BCI	16	0,19	X	

171	and using adequate protective equipment (by type)	reduces the risks associated with pesticide application	SAFA, RISE, COSA, myBMP, FT, BCI	16	0,19	
172	Annual nonfatal incidences on cotton farms (total and percentage of workforce by age and gender)	Provides a measure of worker's health and safety	RISE, FtM, COSA	15	0,51	
173	Numbers of total workdays lost due to nonfatal injuries	Provides an approximate measure of the severity of non-fatal injuries as well as the associated economic consequences	FtM	12	0,19	
174	Total number of fatalities on cotton farms per year	Provides a measure of worker's health and safety	RISE, FtM, COSA	15	0,51	
175	Number of working days in which workers are exposed to dangerous processes, machinery and equipment	Provides a measure of worker's exposure to risks of injury	FT	14	0,69	
176	Percentage of farm personnel, consultants, contractors and relevant visitors that are briefed on the farm's hygiene and biosecurity practices and requirements	Provides a measure of awareness of adequate safety behavior and reduced risk of injury from hazards	SAFA, RISE, myBMP	11	0,33	
177	Percentage of farmers that systematically assess and register safety risks	Risk screening and communication reduces the risk from work hazards	RISE, myBMP, FT, BCI	12	0,51	
178	Percentage of farmers that possesses adequate emergency equipment to provide first aid (e.g. treating wounds or pesticide spills affecting humans)	Emergency equipment may greatly reduce the severity and health consequences from accidents at work	FT, myBMP, BCI	13	0,19	

10) Equity and gender

179	Percentage of leadership roles held by women in a producers' or workers' group	Provides a measure of gender equity	COSA, CmiA	16	0,38
180	Gender and age wage differentials for the same quantity of produce or the same type of work	Provides a measure of gender equity	SAFA, RISE, COSA, FT, Organic, BCI	17	0,33
181	Equal participation of different producers (gender, ethnicity, social class) in training or skills development activities (participation rates as compared to share in population)	Equal participation in central activities of individuals from various backgrounds signifies higher levels of social equity	SAFA, RISE, COSA, FT, CmiA, BCI	11	0,58
182	Percentage of women whose income from independent sources has increased/decreased	Own control of an income source is a central determinant of equal economic and social opportunities and contributes to empowerment of women as a vulnerable group	CmiA	14	0,00
183	Percentage of women headed households		COSA, CmiA	14	0,69

Sustainability indicator	Rationale	VSIs1	Select	ion crite	ria ²	Indicator selected?
			Total score	Balance	Expert ex-/	

10) Equity and gender

184	Percentage of youth of cotton producing households (15-24) neither in education nor in employment	Provides an indication of the state of youth inclusiveness and promotion		16	0,38	X
185	Can actors involved in cotton production identify potential conflicts of interest with and among various stakeholder groups, and provide examples of resolution through collaborative dialogue, based on respect, mutual understanding and equal power	The active participation of all stakeholders influenced by cotton production systems facilitates the active distribution of decision power	SAFA	9	0,38	
186	Free, prior and informed consent: Is the enterprise aware of stakeholders' pre-existing access to land, water and resources, has it mapped this to the satisfaction of all affected stakeholders and agreed to take no action to reduce this access until it has fully informed stakeholders, negotiated on equal terms and provided for mutually agreeable compensation, sufficient to allow sustainable livelihoods	Non-formalized ownership and use rights of natural resources by indigenous communities, smallholder farmers or other actors that use formal land registers only to a limited extend can be easily not respected by more formal acting, profitoriented entities	SAFA	10	0,33	

11) Farmer organization

187	Number of farmers/workers who have attended training (disaggregated by training type, age and gender)	Provides an indication of programs in place to promote worker equity	SAFA, COSA, CmiA	16	0,38	
188	Number of farmers/workers participating in democratic organizations (disaggregated by age and gender)	The degree of organization of farmers may indicate to which extent farmers are organized and benefit from collective action and lower transaction costs	COSA, FT	19	0,38	
189	Existence of on-farm and off-farm management procedures and instruments (e.g. risk management, environmental impact assessment) to identify and address sustainability challenges	Organizational capacity and institutionalized management structures devoted to sustainability management are prerequisites for long term improved sustainability outcomes	SAFA	12	0,88	

1 VSIs (Voluntary Sustainability Initiatives)

Considered Voluntary Sustainability Initiatives (VSIs): Better Cotton Initiative (BCI), Cotton made in Africa (CmiA), Faritrade (FT), my Best Management Practices (myBMP), Organic Cotton (Organic), The Committee on Sustainability Assessment (COSA), Field to Market (FtM), The Response-Inducing Sustainability Evaluation (RISE), The Sustainability Assessment of Food and Agriculture Systems (SAFA).

The column VSIs indicates whether the presented indicator can be found in one or several VSIs - either exactly in the form the indicator is presented or capturing only very selective parts of them. Since nearly all of the presented indicators have been reformulated by SEEP as to best capture the intended sustainability aspects, the differences between the given formulation and the closest corresponding indicator of the VSI may in selected cases be considerable. The VSIs are still listed in such cases to identify that they consider the wider sustainability aspect as part of their indicator set.

2 Indicator Scoring

Indicator Scoring: The decision of whether an indicator presented in this list was included in the more concise core set of sustainability indicators, depended firstly on its total score, secondly on whether the indicator scored invariably high across all three scoring dimensions (relevance, usefulness and feasibility) and thirdly on the expert judgment of SEEP. Indicators have been scored from 1-3 on 7 criteria covering the three scoring dimensions relevance, usefulness and feasibility. The sum of the seven scores had to reach at least 14 in order to qualify for inclusion into the proposed core sustainability indicator set. Furthermore the standard deviation between the average scores of the three scoring dimensions (relevance, usefulness, feasibility) had to be lower than 0.59, in order for an indicator to qualify as balanced. SEEP reserved the right to outvote these criteria in few selected cases and in-/exclude selected indicators upon their expert judgment.