Sustainable intensification of food production through resilient farming systems in West & North Africa

Deliverable D5.3

Revised screening metrics

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GENERAL DATA

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DELIVERABLE LEADER:	Nicola Houlihan, WP5 Lead **SHA**
AUTHOR:	Paul Wagstaff, Head of the Global Technical Advisory and Research Team, **SHA**
CONTRIBUTORS:	Generosa Jenny Calabrese, Biodiversity & Agro-Ecology Expert, **CIHEAM** Andi Mehmeti, Sustainability Consultant **CIHEAM** Mary Corbett, Nutrition Advisor, **SHA** Mary Sweeney, Gender and Equality Advisor, **SHA** Connor Steele-McCutcheon, Global Advisor for Community-based Collaborative Programming, **SHA** Yacouba Bologo, Gender Advisor (BF), **SHA** Ludovic Sawadogo, Enterprise Advisor (BF) **SHA**
DISSEMINATION LEVEL:	CO

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ABSTRACT

A key role of WP5: Sustainability, replicability & exploitation of successful practices, is to screen the methods, technologies, and solutions developed by SustInAfrica for climate resilience, impact on gender, nutrition and the environment, and the potential for replicability and scaling. A list of Socioeconomic and environmental screening metrics was submitted in 2020 (Deliverable D5.1).

This report presents a revised list of metrics for assessing these criteria based on the data collected during the baseline phase; challenges and barriers to data collection experienced during the baseline surveys; and an assessment of the capacities of partners, students and research facilities to collect the data required for these metrics. As far as possible the metrics are internationally accepted standard metrics or metrics the investigators are already using.

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List of abbreviations and acronyms

AEZ	Agro-Ecological Zone
BF	Burkina Faso
CICES	Common International Classification of Ecosystem Services
CIHEAM	Centre International de Hautes Etudes Agronomiques Méditerranéennes
DHS	National Demographic Survey
FAO	Food and Agriculture Organisation
FCS/HFCS	Household Food Consumption Score
FGD	Focus Group Discussion
GAM	Global Acute Malnutrition
HH	Household
Ha	Hectare
ICT	Information and Communication Technologies
IRR	Internal Rate of Return
MDDW	Minimum Dietary Diversity for Women
MUAC	Mid Upper Arm Circumference
NPV	Net Present Value
SAM	Severe Acute Malnutrition
SDG	Sustainable Development Goal
SHA	Self Help Africa
SIA	SustInAfrica
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WP (WP5)	Work Package (5)
WP	Water Productivity
WUE	Water Use Efficiency

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Summary of Proposed Changes to Metrics

Metric	Proposed Action
Nutrition	
Minimum Dietary Diversity for Women (MDDW)	Remove
Household Food Consumption Score (HFCS)	Continue with the indicators after additional enumerator training
Stunting rates	Retain
Severe Acute Malnutrition (SAM) and Global Acute Malnutrition (GAM) Rates	Retain
Food calendars/ seasonal availability	Retain
Micronutrient deficiencies	Retain
Food production at the household Level	Review when more data is available
Food safety	Retain
Yield Quality	Retain
Food storage	Remove
Water sources	Retain
Water quality: Microbial & Chemical contamination	Retain, desk study only
Agricultural Income and Food expenditure	Retain
Suitability for current and future climates and resilience to climatic shocks and stresses	
Sustainably increase agricultural productivity and incomes	Retain
Assessment of exposure to current and future climate shocks and stresses in project areas	Retain
Gender and Social Equality	
Gender Analysis	Retain and add 6th dimension on social norms
Gender and Age disaggregated data sets	retain
User Led Design: Women's Involvement in the research	Remove
Gender Analysis Framework: Activity Profile	Remove
Gender Analysis Framework: Ownership, Access and Control Profile	Remove
Gender Analysis Framework: Analysis of factors and trends	Remove
Workload of Women (Seasonal) / Female Energy Expenditure	Remove
Potential impact on migrant pastoralist communities and indigenous communities who share common resources.	Remove
Environment Metrics	
Provisioning Services	Retain
Regulation & Maintenance	See detailed list of metrics.
Cultural	Remove
Insect Biodiversity	Retain
Replicability	
characterising the AEZs	See detailed list of metrics.
Social	See detailed list of metrics.
Economic Assessment	
Gross Margin (GM) Analysis	Retain
Returns to Family Labour	Retain

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Project Costs and Benefits	Retain
Net Present Value (NPV)	Retain
Benefit: cost ratio	Retain
Internal Rate of Return (IRR)	Retain
Risk Benefit Analysis	Retain
Value Chain Analysis	Retain

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1. Introduction

The overall objective of WP5: Sustainability, replicability & exploitation of successful practices, is to ensure the lasting impact of African-EU joint research at the local level by screening the methods, technologies, and solutions developed by SustInAfrica for climate resilience, impact on gender, nutrition and the environment, and the potential for replicability and scaling before developing exploitation strategies, which will include costed business plans for commercially viable technologies and extension strategies for Public Goods.

The specific objectives are to:

- OB5.1: Gain deep understanding of the potential impacts of the technologies implemented under SustInAfrica:
- Assess impact of methods, technologies and solutions developed by SustInAfrica on the environment, social and economic systems.
- OB5.2: Ensure the replicability of SustInAfrica: Assess the replicability and readiness for scaling of the methods, technologies and solutions developed by SustInAfrica.
- OB5.3: Ensure exploitation of SustInAfrica's outcomes: Develop sustainable costed strategies, models and business plans for scaling-up/scaling-out of SustInAfrica methods, technologies and solutions through private and public investors.

To do this WP5 will:

- Develop a system to assess sustainability, resilience, gender equity, agricultural performance and impact on ecosystem services against international metrics (Fig. 1).
- Set up approaches to ensure sustainability and resilience of changed agro-food systems
- Explore and develop business models and commercialisation pathways
- Prepare policy and industry briefs and recommendations

An initial set of metrics was proposed in Deliverable D5.1 Socioeconomic and environmental screening metrics. The second stage of the process is to review and confirm which of these metrics will be used to check the actual or potential impact of the research outputs, technologies, products and practical solutions, hereafter referred to as "outputs", based on a review of the initial data sets and an assessment of the capacity of the research partners to collect the data.

This report validates the final set of metrics for the indicator toolbox and includes the metrics required for the Replicability Assessment, following the finalisation of the baseline data collection process. As far as possible the metrics are internationally accepted standard metrics, such as UNICEF/WHO/WFP Nutrition Indicators and UN FAO's definition of Climate Smart Agriculture. The benefit of using these indicators is that the methodologies are well-tested, several of these indicators link directly with the SDGs (Sustainable Development Goals), the SustInAfrica investigators are familiar with collecting them, and they will allow comparisons with other work.

2. Nutrition Metrics

Initially when the screening metrics for nutrition was considered it was decided to collect both primary data and use data from secondary sources such as the national demographic survey (DHS) for specific nutrition data, particularly for malnutrition in young children and micro-nutrient deficiency related malnutrition. The following Nutrition Metrics were proposed in D5.1:

- Minimum Dietary Diversity for Women (MDDW)
- Household Food Consumption Score (HFCS)
- Stunting rates
- Severe Acute Malnutrition (SAM) and Global Acute Malnutrition (GAM) Rates

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- Food calendars/ seasonal availability
- Micronutrient deficiencies/ hidden hunger
- Food Production, Processing, and storage
- Food production at the household Level
- Food Safety
- Yield Quality
- Food storage
- Quality of Drinking and irrigation water
- Water sources
- Water quality: Microbial and Chemical contamination (heavy metals, fluoride)
- Agricultural Income and Food expenditure

Minimum Dietary Diversity for Women (MDDW)

This metric (previously known as the Women's Dietary Diversity Score, WDDS) was developed by FAO/USAID to measure impact of interventions from a nutrition perspective. The metric measures the number of food groups consumed by women of reproductive age, 15-49 years, in the past 24 hours.

Current Status

A survey tool was developed however it was decided not to measure the **minimum dietary diversity for women** because the project does not include nutrition specific activities, which would be required to generate a change in the metric over time. Mergdata

Proposed action

Removed from the list of metrics.

Household Food Consumption Score (HFCS)

This assesses dietary diversity within a household over a 7-day period of 7 weighted food groups: Starch staples, pulses, vegetables, fruit, fats, sugars, meat/fish/eggs, milk/dairy and condiments. The sum of the weighted food group values is the HFCS. The scores are reported as: poor (very limited dietary diversity), Borderline, Acceptable and Acceptable+ (a highly diverse diet).

Current Status

An online survey tool was developed (Mergdata) and tested during the Baseline surveys. The data needs to be collected at household level by the female that cooks the food normally within the household.

Household food consumption score based on meals eaten over the previous seven days

Mergdata

To ensure understanding of the tool used to collect the FCS data a two pager was developed on how to collect this data, together with a short video (3mins) also explaining how this data is collected. During the workshop in Tunisia hands on training was conducted with the Master Trainers on the tool a well as a presentation on nutrition and the value of the data being collected in terms of understanding nutrition within the community. Following on from this baseline data was collected in each country using the FCS tool.

Table 1: Summary of the FCS data per country, prior to cleaning data, for the first survey round. Sample size: 521.

Country	Total responses	Female responses	Food Consumption Scores

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			Poor	Borderline	Acceptable	Acceptable Plus
Burkina Faso	43	11	35%	30%	16%	19%
Ghana	170	111	18%	6%	20%	56%
Niger	228	43	33%	25%	25%	17%
Tunisia	54	2	0%	0%	0%	100%
Egypt	4	4				
Total	**499**	**171 (34%)**				

The baseline data is unreliable. It is recommended that they should be filled in at the Household (hh) level by the female in the HH. Only 1/3 of the questionnaires were filled in by women, and as men were present at some of these questionnaires it is clear who answered the questions. It is also not clear if the questionnaires were filled in at community level or HH level. The sample size in 3 of the countries is extremely low (Burkina Faso, Tunisia and Egypt). Only 2 women out of 54 were responsible for filling in the FCS in Tunisia.

Proposed action
Retain. The project will continue to use this indicator following conduct further enumerator training and with larger samples.

Stunting rates
Stunting rates, measured as Height for Age scores or Mid Upper Arm Circumference (MUAC), are standard international indicators of long-term malnutrition caused by inadequate diet and feeding practices, poor sanitation, micronutrient deficiencies, unsafe food, presence of nutrition inhibitors in the diet, repeated gastro-intestinal infections and high parasite burdens. Stunting rates are described as Z-scores.

Current Status
WP5 will not collect data but will review secondary data to build a picture of risks within the farming systems, disaggregated by AEZ/ farming system from UNICEF and DHS.

Proposed action
Retain.

Severe Acute Malnutrition (SAM) and Global Acute Malnutrition (GAM) Rates
Acute malnutrition is an indicator of short-term acute deficiencies in food intake and is measured using Weight for Age Scores and Mid Upper Arm Circumference (MUAC). These rates are international indicators. Stunting rates are described as Z-scores.

Current Status
SustInAfrica does not propose to collect anthropometric data but rely on secondary data to build a picture of risks within the farming systems (Fig. 3) from UNICEF and DHS.

Proposed action
Retain.

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Food calendars/ seasonal availability

The calendar will identify seasonal food gaps (lean/ hunger season). The survey was intended to be conducted during the baseline using SHA's digital tool.

Current Status

Due to the size of the baseline survey and the risk of overwhelming both the enumerators and respondents the food calendar studies were postponed.

Proposed action

Retain. The survey will be conducted using SHAs digital tool for selected locations by local research students.

Micronutrient deficiencies/ hidden hunger

Micronutrient deficiencies in the diet (Iodine, zinc, iron, vitamin A, calcium, selenium) are common in Africa and have a significant impact on maternal and child growth and development.

Current Status

WP5 will identify potential food safety risks in each of the farming systems from secondary data but will not conduct specific research to identify micronutrient deficiencies.

Proposed action

Retain.

Food production at the household Level

This will be assessed from the following WP1 and WP3 metrics: Land holding size, Farming System Analysis, Land area, Harvested Yield, Yield Gap, Livestock productivity, Crop diversity. These metrics will be collected from the baselines and field trial data sets.

Current Status

This metric relies on data from the field trials, which is not yet available.

Proposed action

Review the metric when field trial data becomes available.

Food safety

WP5 will identify potential food safety risks in each of the farming systems that may impact on nutrition. This will be a desk study based on the Farming Systems Analysis and secondary data.

Current Status

The farming system analysis data is being finalised by WP1 & 3.

Proposed action

Retain.

Yield Quality

The harvests will be assessed against appropriate quality standards as this will provide a standardised indication of quality, marketability and safety.

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Current Status
No harvests have yet been reported or assessed.

Proposed action
Retain.

Food storage
Will the technologies test in the project have a positive impact on crop storage and processing?

Current Status
None of the technologies so far tested cover post-harvest storage, processing and handling so this indicator may not be relevant.

Proposed action
Remove

Water sources
Changes in quality of water may impact negatively/positively in health and nutrition outcomes. WP5 does not intend to conduct water testing of all water sources but intended to use water source types as a proxy Indication of the risk of exposure to water borne diseases that can impact on nutrition.

Current Status
The baseline collect data on the type of water sources in the target communities.
1. Household Farmers Survey Module Socioeconomic
Mergdata

Proposed action
Retain.

Water quality: Microbial and Chemical contamination (heavy metals, salt, fluoride)
Current Status
It is not feasible with the current project laboratory and financial resources to collect and test water samples for microbial, heavy metal and salt levels.

Proposed action
Conduct a literature review to identify risks in the project areas and triangulate results with staff on the ground.

Agricultural Income and Food expenditure
The potential for new technologies to increase incomes, and therefor ability to purchase foods from the market to diversify diets will be assessed based on increases in Gross Margins for crops.

Current Status
No Gross Margin Analysis has been conducted for the crop trials so far.

Proposed action
Retain.

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3. Suitability for current and future climates and resilience to climatic shocks and stresses

The project proposed to assess the suitability of the innovations for current and future climate scenarios, shocks and stresses by assessing each technology / innovation against FAOs three pillars of Climate Smart Agriculture:

1. Sustainably increase agricultural productivity and incomes (Assets).
2. Adapt and build resilience to climate change (Vulnerability, Adaptation and Resilience).
3. Reduce and/or remove greenhouse gas emissions, where possible (Mitigation)

Sustainably increase agricultural productivity and incomes

This metric will be assessed using crop yield data, gross margin analysis and returns to family labour data.

Current Status

Field trial data not yet available.

Proposed action

Retain.

Adapt and build resilience to climate change

To assess the resilience of the agriculture practices and technologies to current and future climates WP5 will consider **Exposure** and **Sensitivity**.

Assessment of Exposure and Sensitivity to current and future climate shocks and stresses in project areas

The crop requirements will be assessed against current and future climatic conditions to estimate the suitability of the technologies for future climates. This assessment was intended to be conducted using a combination of a desk review and a participatory process through key informants and focus groups in the communities. A training video was produced to guide enumerators on the participatory process.

Current Status

The desk assessment of the level of exposure of the crops and varieties under trial in the project was completed but there have been changes in the crop trials and the assessment need to be updated. No participatory assessments have been conducted in the field.

Proposed action

Cancel the participatory risk assessments and focus on a desk review to update the climate risk assessment using the latest information on the varieties used in the field trials.

Reduce and/or remove greenhouse gas emissions.

WP5 proposed that the third Pillar of CSA should not be assessed.

Current Status

N/a

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Proposed action
N/a

4. Gender and Social Equality Metrics
Gender analysis is the systematic gathering and examination of information on gender differences and relationships between women and men, girls and boys, in terms of the distribution of resources, opportunities, constraints and power in a given context. A gender analysis is the starting point to identify, understand and redress gender inequalities and look at the different impacts of development interventions on women, men, girls and boys. A gender analysis requires separating data by sex and it is an imperative to carry out a gender analysis when conducting research.

Gender Analysis
In the framework chosen for the project there are 5 dimensions:
Dimension one: Livelihood activities, roles and relations
Dimension two: Assets and capabilities
Dimension three: Power and decision making
Dimension four: needs/priorities
Dimension five: Institutions/governance

It has been suggested by consortium partners that we add a 6th Dimension;
Dimension six: Social norms

What social norms affect women's ability or inability to perform livelihood activities? Outline with particularly emphasis on X crop
What social norms affect men's ability or inability to perform livelihood activities? Outline with particularly emphasis on X crop
What social norms affect youth's ability or inability to perform livelihood activities? Outline with particularly emphasis on X crop
How could social/cultural norms be changed to better support equal opportunities and benefits for women, men and youth involved in the production of X crop?

Current Status
No surveys conducted to date.

Proposed action
Retain and add 6th dimension on social norms, a survey focussing on the 6 dimensions needs to be undertaken (separately) to analyse and deepen our understanding regarding each particular crop and on how all 6 dimensions affect men and women differently or the same.

Data disaggregated by age and sex.
The starting point of all SustInAfrica research projects will be the collection of gender disaggregated data sets. All research projects, field experiments and user trials will involve, as far as possible, equal numbers of male and female farmers/ users/ clients and the research teams will disaggregate their results by the gender of the farmer/ user/ client.

Current Status
Data collected so far has not been disaggregated by age and sex. Names are provided, which can be used to determine the gender of the respondents.

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Proposed action
Retain. All further data collected should be disaggregated by age and sex

User Led Design: Women's Involvement in the research
User Led Design should, in theory, reduce the high levels of technology rejection and dis-adoption experienced by most agricultural development research projects. Female farmers will be involved at each stage of the research and their contributions documented in research reports.

Current Status
No progress.

Proposed action
Remove.

Gender Analysis Framework: Activity Profile
The baseline will assess who does what in the farming system, to help understand the roles of men, women and children and elders in each of the farm enterprises.

Current Status
While a specific gender survey was not conducted, some questions were asked on the socio-economic survey but unfortunately answers were not significant.

Proposed action
Remove. This framework is replaced by the one referred to above focussing on 6 dimensions.

Gender Analysis Framework: Ownership, Access and Control Profile
The access and control profile will assess who has access to, and control of, resources, services and decision making in each of the farm enterprises that constitute the farming systems.

Current Status
This framework will not be used – replaced instead by the 6 dimensions framework which collects similar data and is less complicated to use.

Proposed action
Remove Ownership, Access and Control Profile.

Gender Analysis Framework: Analysis of factors and trends
WP5 will use secondary sources (national statistics, Ministries of Gender, UNICEF, UNIFEM, NGO reports) and key informant interviews, with gender researchers and women leaders to determine how activities, access and control patterns are shaped by structural, cultural, religious and attitudinal factors and how are these trends changing.

Current Status
No analysis conducted so far.

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Proposed action
Remove.

Workload of Women (Seasonal) / Female Energy Expenditure
Outputs from the project will only be adopted if they reduce workload or provide higher returns for the same workload.

Current Status
Data will be collected from the field trials.

Proposed action
Retain.

Potential impact on migrant pastoralist communities and indigenous communities who share common resources.
WP5 will review the sites chosen for the field trials against known transhumance patterns and local knowledge to ensure that SustInAfrica's work does not risk creating conflicts

Current Status
Insufficient information has been collected to assess this metric.

Proposed action
Remove.

5. Environment Metrics
WP5 will use the Common International Classification of Ecosystem Services (CICES v5.1),

- **Provisioning services:** food, raw materials, freshwater,
- **Regulating and Maintenance services:** air quality, carbon sequestration, moderation of extreme events, wastewater treatment, erosion prevention and soil fertility, pollination, biological control, regulation of water flow,
- **Cultural services:** recreational and mental and physical health, tourism, aesthetic appreciation and inspiration for culture, art and design, spiritual experience and sense of place

Provisioning Services
These will be assessed using the following metrics: Crop Yields; production of animal-based products; Irrigation water balances from surface water and groundwater.

Current Status
This metric relies on data from the field trials, which is not yet available.

Proposed action
Retain.

Regulation & Maintenance
These will be assessed using the following metrics:

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Soil Physics and Chemistry	Data Source	Current Status	Proposed Action
Erosion rates	Field Trials, RUSLE	Not yet available	Remove
Leaf Area Index	Field Trials	Not yet available	Remove
% mulch cover.	Field Trials	Not yet available	Retain
Soil Analysis (Soil classification,	Field Trials	Not yet available	Retain, pending review of soil analysis capacity
Soil Texture,	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Bulk Density,	Field Trials	Not yet available	Retain, pending review of soil analysis capacity
Macro nutrients,	Field Trials	Not yet available	Retain, pending review of soil analysis capacity
Soil pH (H2O or CaCl2/KCl),	Field Trials	Not yet available	Retain, pending review of soil analysis capacity
Soil carbon and Soil Organic Matter (SOM),	Field Trials	Not yet available	Retain, pending review of soil analysis capacity
Soil Electrical Conductivity/ soil salinity,	Field Trials	Not yet available	Retain, pending review of soil analysis capacity
Biological:			
biological activity/ soil respiration,	Field Trials	Not yet available	Remove
Soil enzymes,	Field Trials	Not yet available	Remove
decomposition rates	Field Trials	Not yet available	Remove
Hydrological cycle regulation:			
amount of surface water needed for irrigation	Household Farmers Survey Module Agrophysical Mergdata BluLeaf data	Collected (573 responses)	Retain
soil humidity in crop systems	Field Trials BluLeaf data	Not yet available	Remove
Wind protection:			
presence of trees in farming systems that form wind breaks.	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Pollination:			

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crop diversity disaggregated by wind and insect (animal) pollinated crops.	Field Trials	Not yet available	Retain
Pest control:			
Field data of damage to crops from invertebrate and vertebrate pests.	Field Trials	Not yet available	Retain
Evidence of predators and hyper parasites in farming systems:			
insect traps,	Insectamon trials	Not yet available	Retain
bird counts,	Field Trials	Not yet available	Remove No expertise in the field teams to assess bird populations.
presence of lizards, frogs, small mammalian insectivores/ carnivores in farming systems	Field Trials	Not yet available	Remove No expertise in the field teams to assess predator populations.
Disease control:			
field data on incidence of plant diseases in crop systems.	Field Trials	Not yet available	Retain

Cultural

a. Elements of living systems that have sacred or religious meaning. recognition of crops or livestock important by local communities in terms of spiritual or symbolic meaning.
b. Characteristics of living systems that are resonant in terms of culture or heritage. Recognition of a crop or livestock as a cultural heritage by the local communities in terms of empiric knowledge and as a heritage to future generations.

Current Status

No progress has been made in designing surveys or collecting data.

Proposed action

Remove.

Insect Biodiversity

Tracking insect biodiversity provides both a measure of ecosystem health and the status of pest and predator populations of the insect pests targeted by the project.

Current Status

Pheromone sticky traps and malaise traps have been installed on field trial sites as part of research on biological control options and to create learning and testing datasets for **Insectamon**.

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Proposed action
Retain, using data from the traps.

Diversification of Farming Systems:
This indicator is shared with Replicability.

Current Status
Waiting for field trial data.

Proposed action
Retain.

6. Assess Replicability
Transforming farming systems into more resilient ones necessitates the adoption of innovations that will cause changes in socio-economical aspects and behaviours, as well as the generation of new pathways to change.

Replicability: characterising the AEZs and the related cropping systems
Replicability will be assessed using a large range of metrics from baselines and field trials.

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	Data Source	Current Status	Proposed Action
Total farm surface	Farmer Profile survey Mergdata	Not yet collected	Retain
Utilized Agricultural Area	Farmer Profile survey Mergdata	Not yet collected	Retain
Plot Size	Farmer Profile survey Mergdata Field Trial Data	Not yet collected	Retain
Species Richness	Field Trial Data	Not yet collected	Retain
Field density	Remote sensing	Some data collected	Retain
Duration of Rotation	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Crop diversity	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Permanent crop density	Field Trial Data	Not yet available	Retain
Herbaceous crop density	Field Trial Data	Not yet available	Retain
Crop Yield	Household Farmers Survey Module Agrophysical Mergdata Field Trial Data	Collected (573 responses)	Retain
Amount of yield losses from pests	Household Farmers Survey Module Agrophysical Mergdata Field trial data	Collected (573 responses)	Retain
Share of cropland under integrated Pest management	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Increase in production from the adoption of new agroecological practices	Field trials. Endline?	Not yet collected	Retain
Increase in production from adoption innovations (INSECTAMON, BLUELEAF)	Field trials	Not yet collected	Retain

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Water Use Efficiency (WUE)	Modelling Field trial data BluLeaf data	Only assessed by projects using BluLeaf	Retain
Water Productivity (WP)	Modelling Field trial data BluLeaf data	Only assessed by projects using BluLeaf	Retain
Change in Water Use Efficiency	Endline? Field trials BluLeaf data	Only assessed by projects using BluLeaf	Retain
Level of water stress	Modelling, Secondary data	Only assessed by projects using BluLeaf	Retain
Water delivery performance	BluLeaf Modelling	Only assessed by projects using BluLeaf	Retain
Annual water supply	Calculated from Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Pollutant loadings	Lab analysis	Not yet collected	Remove no budget or lab facilities to measure pollutants
Resource availability and efficiency of use	?	Not yet collected	Remove
The proportion of agricultural area under productive and sustainable agriculture	Calculated from secondary data the Farmer Profile survey Mergdata	Not yet collected	Retain
No. of farmers applying new practices and innovations	# of farmers involved in Field trials?	Not yet available	Retain
Good practices applied on farm to improve resilience	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Food loss/increment index	Interviews and survey	Survey not yet designed	Remove Very difficult to collect reliable data unless the research is focussed on PHL

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Time to recover from production loss	Survey	Survey not yet designed	Remove Requires crop modelling to estimate.
Maximum of yield per average, wet and dry year	Partly covered by: Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Degree of integrated water resources management (IWRM) implementation	Secondary data, surveys	Not yet analysed	Remove. Difficult to assess unless the research is focused on IWRM
Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	Secondary data	Not yet analysed	Retain
Value of production	Field trial data (Gross Margins)	Not yet available	Retain
Benefit/Cost ratio	Field trial data (Gross Margins)	Not yet available	Retain
Economic viability	Field trial data (Gross Margins)	Not yet available	Retain
% Increase in income of producers from adoption practices and innovations	Interviews & Survey	Not yet available	Retain
Managers/ farmers satisfied with agricultural services as a percentage of all managers/farmers	Interviews & Survey	Not yet available	Remove The project is not working on extension service reforms so attribution will not be possible
Day of training provided	Field Work Progress Mergdata	No responses to date	Retain

Replicability: social

	Data Source	**Current Status**	**Proposed Action**
Household size	Farmer Profile survey Mergdata Household Farmers Survey Module Socioeconomic Mergdata	Not yet collected. Collected (607 responses)	Retain Retain

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Education	Farmer Profile survey Mergdata Household Farmers Survey Module Socioeconomic Mergdata	Not yet collected Collected (607 responses)	Retain
Time spent in farming	Household Farmers Survey Module Socioeconomic Mergdata	Collected (607 responses)	Retain
Workload	Household Farmers Survey Module Socioeconomic Mergdata	Collected (607 responses)	Retain
Crop yield by crop per AEZ	Field trial data	Not yet available	Retain
Global Food loss	Surveys	Survey not yet designed	Remove Very difficult to collect reliable data unless the research is focussed on PHL
Access to irrigation	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Type of irrigation method	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Gross irrigation water	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Energy (pumping, conveyance, water application)	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Machinery (tractors, pumps; cutting and spraying etc.)	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain

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Fertilizer use (NPK) and their types	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Pesticide use and their type	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Farming challenges and production constraints	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Adoption of key management and conservation practices	Endline	Survey not yet designed	Remove Not sure if this can be assessed given the short time left in the project
Access to credit	Household Farmers Survey Module Socioeconomic Mergdata	Collected (607 responses)	Retain
Access to information, extension/advisory services and ICT	Household Farmers Survey Module Socioeconomic Mergdata	Collected (607 responses)	Retain
Level of ICT use	Household Farmers Survey Module Socioeconomic Mergdata	Collected (607 responses)	Retain
Access to electricity	Household Farmers Survey Module Socioeconomic Mergdata	Collected (607 responses)	Retain
Net revenue per hectare	Gross Margins Field trial data	Not yet available	Retain
Producing under organic farming (certified)/certified social products	Survey form not yet designed	No survey	Retain for specific countries
Total annual cost	Gross Margins Field trial data	Not yet available	Retain
Cost reduction (water, energy, pesticide, etc.)	Gross Margins Field trial data	Not yet available	Retain

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Environmental issues of products and services over the whole life cycle	Secondary data	Not yet assessed	Retain
Higher productivity per employee	Modelling	Not yet assessed	Remove The project is not working with enterprises with significant numbers of employees
Higher Return-on Investment	See economic indicators	Not yet available	Retain
Work time use efficiency	Field trial data	Not yet available	Retain
Pesticide use reduction	Modelled based on field trial data	Not yet available	Retain
Water use reduction	Field Trial data	Not yet available	Retain
Resource use efficiency	Field trial data	Not yet available	Retain
Increased production efficiency	Field trial data	Not yet available	Retain
Fertilizer use reduction (N-use)	Field Trial data	Not yet available	Retain
Production costs reduction	Field Trial data	Not yet available	Retain
Phytosanitary measures	Field Trial data	Not yet available	Retain
Increase in turnover	See economic indicators	Not yet available	Retain
Increase in sale/Cost of control	See economic indicators	Not yet available	Retain
Quality improvement	Field Trial data	Not yet available	Retain
Improved traceability		Not collected	Remove
Nitrogen use reduction	Field Trial data	Not yet available	Retain
Fungicide use (late blight control)	Field Trial data	Not yet available	Retain
Herbicide use reduction (Haulm killing)	Field Trial data	Not yet available	Retain
Reduction in frequency of treatment	Field Trial data	Not yet available	Retain
Soil herbicide use reduction	Field Trial data	Not yet available	Retain
Pesticide use reduction	Field Trial data	Not yet available	Retain
Land use	Household Farmers Survey Module Agrophysical Mergdata	Collected (573 responses)	Retain
Energy use (CO2 emission reduction)	Modelled based on field trial data	Not yet available	Retain
Nitrogen leaching reduction	Modelled based on field trial data	Not yet collected	Remove no budget or lab facilities to measure pollutants

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GHG reduction	Modelled based on field trial data	Not yet available	Retain
Reduction of crop wasted/ rejected at harvest (%)	Field trial data	Not yet available	Retain
Better soil structure	See environmental indicators	Concerns over soil analysis facilities yet to be resolved.	pending
Effective time use	Partly covered by Returns to Family Labour	Not yet available	Remove Duplicated metric
Stress reduction	Surveys	Survey not yet designed	Remove
Increased level of satisfaction of producer	Surveys	Survey not yet designed	Remove
Lower level of pesticide active ingredients	Lab tests	Survey not yet designed	Remove The project has no control over pesticide formulations. Legal implications (pesticide registration)
Increased quality food and food safety	Lab tests	Survey not yet designed	Remove The project does not have the resources to conduct food safety tests.
Trust in the quality of food products	Surveys	Survey not yet designed	Remove
Predicted yield	Field trial data	Not yet available	Retain

7. Economic Assessment

Gross Margin (GM) Analysis

The field trials will record the costs of inputs, labour hours and costs and the yield, the average price for the harvest and the total revenue to calculate the Gross Margins (GM). This data is required for several metrics.

Current Status

Some baseline GM data is has been collected.

Proposed action

Retain.

Returns to Family Labour

This is a measure of the economic returns from investing time and labour in a farm enterprise, recorded as the net income per person hour (or day).

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Current Status
The data will be collected from the field trials but is not yet available.

Proposed action
Retain.

Project Costs and Benefits
Using the data from the Gross Margin Analysis the with and without project (SustInAfrica research output v. traditional practices) the project effect can be calculated.

Current Status
The data will be collected from the field trials but is not yet available.

Proposed action
Retain.

Net Present Value (NPV)
The NPV will be essential to analyse the profitability of a projected investment for example a technology developed as a result of the project.

Current Status
The data will be collected from the field trials but is not yet available.

Proposed action
Retain.

Benefit: cost ratio
The Benefit: cost ratio is calculated for a range of discount rates.

Current Status

The data will be collected from the field trials but is not yet available.

Proposed action
Retain.

Internal Rate of Return (IRR)
The NPV for costs and benefits are compared over a range of discount rates to identify the rate above which the investment is no longer viable (Fig. 8). In addition, the IRR will be essential to analyse the profitability of a projected investment developed as a result of the project.

Current Status
The data will be collected from the field trials but is not yet available.

Proposed action
Retain.

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Risk Benefit Analysis

Innovations need to show a higher ratio of benefits to risks than those of existing technologies.

Current Status

The data will be collected from the field trials but is not yet available.

Proposed action

Retain.

Value Chain Analysis

Value chain analysis (VCA) is a process that identifies primary and support activities that add value to a final product and then analyses these activities to reduce costs or increase differentiation.

Current Status

Limited data collected.

Proposed action

Retain

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Annex 1: Gender Analysis Matrix

Aim

To get sex disaggregated data and identify the differences between women and men regarding their specific activities, conditions, needs, access to and control over resources and decision making. The gender analysis is a tool to help us better understand the different social, economic, cultural and political realities of women, men, boys and girls.

Preparation.

- Select a date and a suitable time for men and women to undertake questionnaire survey
- Invite participants and ensure their consent before interviewing.
- Select a safe venue
- Have a field notepad and pens – best practice to have two enumerators work together – one to ask questions and the other to record the answers
- Arrange any drinks and food required

In the field

Welcome the participants and introduce the research explaining why you are undertaking it. Outline that you are undertaking research on sustainable farming and that getting information related to men and women is very important, specifically in relation to whatever crop is being researched. (*Every country can explain why the crop being researched was chosen*) Emphasize that the data collected on gender is crucial and will help inform decisions around components of the research project going forward. Explain to those willing to participate that this research is part of a bigger study that includes Ghana, Burkina Faso, Niger, Tunisia and Egypt. Thank all for their time and participation and confirm that all are participating on a voluntary basis.

Question the women by themselves as they will be less intimidated and able to speak more freely than when in the company of men. Men too can be questioned separately.

Explain that each questionnaire is divided into 6 different domains and will take about I hour to complete – approx. 10 minutes per domain. Ensure each participant is happy to participate and remind the women and men that it is important to share their answers as honestly as possible as there is no right or wrong answer. Explain that some of the information shared may be published but no names will be used as the data will be anonymous meaning no names will be shared to protect each participants identity. The most important aspect of the interview is that each participant feels comfortable and safe, willing to share truthfully to ensure the validity of the research.

The participant and enumerator sit together in a quiet space - any questions the participant may have should be answered now by the enumerator to ensure she/he is comfortable reminding her/him that the discussion can be stopped at any time without any reason having to be given.

The enumerator begins by asking questions from Dimension One.

Dimension one: Livelihood activities, roles and relations

- What activities do women do specifically in relation to X crop
- What activities do men do specifically in relation to X crop
- What specific roles do women play in the value chain of X crop
- What specific roles do men play in the value chain of X crop

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- What constraints do women face in the production, marketing and sale of X crop?
- What constraints do men face in the production, marketing and sale of X crop?

Once satisfied that she/he (enumerator) has recorded the answers well the enumerator moves onto dimension two. Sometimes the enumerator may have to drill down a little to ensure she/he is interpreting the answer well and may have to ask another way – appropriate to the context and culture – to ensure accurate and correct reporting. This should be done after each domain.

Dimension Two: Assets and capabilities

- What assets do women have to support their work in the X value chain
- What assets do men have to support their work in the X value chain
- What capabilities do women have in relation to all aspects of the production and sale of X crop?
- What capabilities do men have in relation to all aspects of the production and sale of X crop?
- Is there equal access and control for women over productive resources (including land, cash, fertilizers, and credit)in relation to X crop. If not, why?
- Is there equal access and control for men over productive resources in relation to X crop. If not, why?
- What are the different vulnerabilities of women in relation to X crop?
- What are the different vulnerabilities of men in relation to X crop?
- What are the different coping mechanisms of women in relation to X crop?
- What are the different coping mechanisms of men in relation to X crop

Once satisfied that she/he (enumerator) has recorded the answers well for dimension two the enumerator moves onto dimension three.

Dimension Three: Power and decision making

- What decision making do women participate in regarding X crop
- What decision making do men participate in regarding X cr
- What decision making do women control in relation to X crop
- What decision making do men control in relation to X crop
- What constraints do women face in relation to X crop
- What constraints do men face in relation to X crop
- Do women have access to agricultural information (weather forecast, agricultural inputs, and techniques etc) specifically on X crop. Explain and give examples
- Do men have access to agricultural information specifically on X crop. Explain and give examples

Once satisfied that she/he (enumerator) has recorded the answers well for dimension three the enumerator moves onto dimension four and at this half way mark can check in that the participant is happy with the process.

Dimension four: needs/priorities

- What are women's needs and priorities in relation to X crop? Please outline.
- What are men's needs and priorities in relation to X crop? Please outline
- What are women's aspirations/priorities for the future regarding X crop? Please outline
- What are men's aspirations/priorities for the future regarding X crop? Please outline.
- *Once satisfied that she/he (enumerator) has recorded the answers well for dimension four the enumerator moves onto dimension five*

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Dimension five: Institutions/Governance

- Do women have free and equal access to markets, if not please explain why? How could this be changed?
- Do men have free and equal access to markets, If not please explain why? How could this be changed?
- Do institutions take into account women's concerns in relation to crop X – if not – why?
- Do institutions take into account men's concerns in relation to crop X - If not – why?
- Are there laws and regulations to ensure equal access and control over agriculture resources and opportunities for women and men – is there affirmative action supporting these? Outline

Once satisfied that she/he (enumerator) has recorded the answers well for dimension five the enumerator moves onto the final dimension – dimension six.

Dimension six: Social norms

- What social norms affect women's ability or inability to perform livelihood activities? Outline with particularly emphasis on X crop
- What social norms affect men's ability or inability to perform livelihood activities? Outline with particularly emphasis on X crop?
- How could social/cultural norms be changed to better support equal opportunities and benefits for women, men and youth involved in the production of X crop?

When finished the enumerator can ask the participant if there is anything else she/he would like to add or question. Any area the enumerator would like to go over to ensure the accuracy of the information should be done now before the interview is finished. The enumerator then thanks the participant for their time and interest and wishes her/him a good day.

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