Food and Agriculture Organization
of the United Nations

SELF-EVALUATION AND HOLISTIC ASSESSMENT OF CLIMATE RESILIENCE OF FARMERS AND PASTORALISTS

BIODIVERSITY & ECOSYSTEM SERVICES IN AGRICULTURAL PRODUCTION SYSTEMS

SELF-EVALUATION AND HOLISTIC ASSESSMENT OF CLIMATE RESILIENCE OF FARMERS AND PASTORALISTS

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME 2015

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ACKNOWLEDGEMENTS

This version of SHARP was coordinated and edited by John Choptiany (FAO), Benjamin Graub (FAO), Suzanne Phillips (FAO) and David Colozza (FAO), however SHARP is a collaborative effort. We are therefore much indebted to the following people for all their work, support and input of this process and document: Caterina Batello (FAO), William Settle (FAO), Monica Petri (ICRISAT), Jami Dixon (LTS International), Jean-Marie Laurent (Independent), Anne-Sophie Poisot (FAO), Gualbert Gbehounou (FAO), Nadia Scialabba (FAO), James Okoth (FAO), Soumaré Mohamed (FAO), Avilio Franco, Barbara Herren (FAO), Manuela Allara (FAO), Nadine Azzu (FAO), Juliette Prazak (FAO), Kata Wagner (FAO), Sibyl Nelson (FAO), Toufic Elasmar (FAO), Stefano Mondovi (FAO), Rikke Olivera (FAO), Fritjof Boerstler (FAO, Gael Sola (FAO), Caitlin Hoffman (FAO), Frédéric Castell (FAO), Lindsay Stringer (University of Leeds), Kennedy Igbokwe (FAO), Caroline Haywood (ODI), Daniela Cuellar (IDLO), Maria Hernandez Lagana (FAO), Marie-Claire Cordonier Segger (IDLO), Jacques Somda (IUCN), Samuel Ledermann (Biovision Foundation), Valeria Gonzalez Riggio (FAO), Stefano Diulgheroff (FAO), Frank Escobar (FAO), Raffaele D'Annolfo (FAO), Luca Russo (FAO), Ugo Pica Ciamarra (FAO), Brent Simpson (FAO), Emma Fatou Batta (Groundswell International), Peter Gubbels (Groundswell International), Pietro Chiappini Carpena (Self Help Africa), Benjamin deRidder (FAO), Michelle Grant (ETH Zurich World Food System Center), all participants of the workshops and testing missions, especially the FAO offices in Angola, Mali, Senegal and Uganda.

This document has been supported in part by the project:
Land rehabilitation and rangelands management in smallholder agro-pastoral production systems in south western Angola (RETESA)
PROJECT SYMBOL: GCP/ANG/048/GFF

The project is a joint effort by the Ministério do Ambiente (MINAMB), Ministério da Agricultura e do Desenvolvimento Rural (MINAGRI), Governo Província l do Namibe, Governo Província l do Huila, and Governo Província l de Benguela, together with FAO and GEF. The project specifically targets five municipalities (Chongoroi, Quilengues, Bibala, Camacuio, Namibe, and Virei) that are the core of the transhumance route in south western Angola.

RETESA PROJECT AREAS OF INTERVENTION

RETESA PROJECT acts in the 5 Municipalities covering main transhumance route: Virel (1), Bibala (2), and Camucuio (3) in Namibe Province, Quilengues in Huila Province and Chongoroi in Benguela Province

LEGENDA

- Transhumance main areas
- Transhumance routes starting points
- RETESA Project Provinces
- RETESA Project Municipalities

N

The project's specific objectives are to: (i) pursue land degradation neutrality by enhancing the capacity of south western Angola's smallholder agro-pastoral sector to mitigate the impact of land degradation processes and to rehabilitate degraded lands by mainstreaming Sustainable Land Management (SLM) technologies into agro-pastoral and agricultural development initiatives (environmental objective) and, (ii) to simultaneously improve the livelihoods of targeted communities by introducing locally adapted SLM approaches and by strengthening and diversifying livestock and non-livestock based value chains (development objective).

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SHARP training of government officials including field visits to Virei and Bibala. March 2015

Through the use of SHARP and other tools in the context of agro-pastoral field schools the project aims to better understand the needs of the local agro-pastoralists in terms of land degradation and climate resilience. SHARP is being used in this needs assessment by ranking resilience priorities as well as to aid in the teaching of agro-pastoral field schools (APFS) through engendering discussion on climate resilience.

We thank the project for their support of SHARP and assisting in the improvement of the tool.

To find out more information about the RETESA project please contact:
www.fao.org/agriculture/crops/intranet/projects-database/detail/en/c/179132/

ACRONYMS

ACCCRN	Asian Cities Climate Change Resilience Network
ADapCC	Adaptation for smallholders to Climate Change
AGP	Agricultural Plant Production and Protection division (UN FAO)
AGPM	Agricultural Plant Production and Protection Management division
APFS	Agro-Pastoral Field Schools
ASAP	Adaptation for Smallholder Agriculture Programme
CARE	Cooperative for Assistance and Relief Everywhere
CCAFS	Climate Change Agriculture and Food Security
CoBRA	Community-Based Resilience Analysis
CVCA	Climate Vulnerability and Capacity Analysis
CDKN	Climate & Development Knowledge Network
CP4Dev	Climate Proofing for Development
CREFSCA	Climate Resilience and Food Security in Central America
CRAM	Climate Resilient Agriculture Module
CRiSTAL	Community-based Risk Screening Tool – Adaptation and Livelihoods
CSA	Climate-Smart Agriculture
DRR	Disaster Risk Reduction
ECHO	European Commission's Humanitarian Aid branch
EU	European Union
FAO	The Food and Agriculture Organization of the United Nations
FSR	Farming System Research
FFS	Farmer Field Schools (methodology for training farmers in sustainable natural resource management practices)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)
HEA	Household Economic Assessment
IFAD	International Fund for Agricultural Development
IIED	International Institute for Environment and Development
IISD	International Institute for Sustainable Development
IPM	Integrated Pest Management
IUCN	International Union for Conservation of Nature
IYFF	International Year of Family Farming

LADA	Land Degradation Assessment in drylands
M&E	Monitoring and Evaluation
MASSCOTE	Mapping System and Services for Canal Operation Techniques
MASSLIS	Mapping System and Services for Lift Irrigation System
NGO	Non-Governmental Organization
PDRA	Participatory Disaster Risk Assessment
PMERL	Participatory Monitoring, Evaluation, Reflection and Learning for community-based adaptation
SAFA	Sustainability Assessment of Food and Agriculture systems
SEI	Stockholm Environment Institute
SES	Social-Ecological System
SHARP	Schema Holitisque pour l'Auto-evaluation Paysanne de la Resilience climatique/ Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists
SMART	Specific, Measurable, Achievable, Relevant, Time-bound
SRC	Stockholm Resilience Centre
UN-ISDR	United Nations International Strategy for Disaster Reduction

KEY TERMS

Adaptation is "a process of deliberate change, often in response to, or anticipation of, multiple pressures and changes that affect people's lives" (Stringer *et al.* 2010: 146).

Adaptive capacity (in relation to climate):

- "The capacity of actors in a system to influence resilience" (Folke *et al.* 2010: 20);
- "The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (IPCC, 2007);
- A learning approach, which refers to iterative and learning-based processes of decision making and problem solving in the face of change (CCCAFS, 2013).

Climate resilience is the resilience of a system or part of a system to climate-related shocks and stresses. It is the ability to survive, recover from, and even thrive in changing climatic conditions (ACCRN, online).

Climate risk management is a generic term referring to an approach to climate-sensitive decision making. It encompasses approaches seeking to promote sustainable development by reducing the vulnerability associated with climate risks (Hellmuth *et al.* 2007).

Climate change adaptation refers to adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, undertaken in order to moderate harm or exploit beneficial opportunities (IPCC, 2007).

Crop rotation is an agriculture practice where a set of different crops are planted in the same land in a specific order (e.g. maize-cotton-soybeans) (FAO-TECA, 2013).

Development refers to the short to medium term outcome of desirable targets (Sumner, 2008).

Disaster risk reduction is "the systematic development and application of policies, strategies and practices to minimise vulnerabilities, hazards and the unfolding of disaster impacts throughout a society, in the broad context of sustainable development" (UNISDR, 2004: 3).

Ecological Vulnerability is the combination of ecological exposure, ecological sensitivity, and ecological recovery potential (Cinner *et al.* 2013)

Farm system refers to a household, its resources, and the resource flows and interactions at the individual farm level (Dixon *et al.* 2001).

Farmer field school is "a school without walls. A group of farmers gets together in one of their own fields to learn about their crops and things that affect them. They learn how to farm better by observing, analysing and trying out new ideas on their own fields" (FAO-NR, 2013).

Farming system is "[a] population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate" (Dixon *et al.* 2001).

Farming systems approach developed from the 1970s, it has since been described as the beginning of a radical shift from top-down views of agricultural development towards a more holistic perspective (Cleary *et al.* 2003). Darnhofer *et al.* (2013) suggest that three characteristics make it distinct: it requires interdisciplinary approaches, uses systems thinking and fosters participation.

General resilience refers to the resilience of any and/or all parts of a system to all kinds of shocks and stresses (Folke *et al.* 2010).

Holistic approach is an approach recognizing that ecological and human components of any system, in this case a farm or farming systems, are interconnected.

Human development is a process of enlarging people's choices. The most critical ones are to lead a long and healthy life, to be educated and to enjoy a decent standard of living. Additional choices include political freedom, guaranteed human rights and self- respect – what Adam Smith called the ability to mix with others without being "ashamed to appear in public" (Alkire, 2010).

Resilience:

- is "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of self-organization, and the capacity to adapt to stress and change" (IPCC, 2007).
- "is the potential of a system to remain in a particular configuration and to maintain its feedbacks and functions, and involves the ability of the system to reorganize following disturbance driven change" (Walker *et al.* 2002).
- Disaster resilience is the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses – such as earthquakes, drought or violent conflict – without compromising their long-term prospects (DFID, 2011).
- the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth (USAID, 2012).
- An inherent as well as acquired condition achieved by managing risks over time at individual, household, community and societal levels in ways that minimize costs, build capacity to manage and sustain development momentum, and maximize transformative potential (UNDP, 2013).

Resilience analysis and management involves analysing resilience and enabling people to discover how the SES in which they live might be made more resilient to shocks, and more able to renew or reorganize itself, should larger or more frequent shocks occur (Walker *et al.* 2002).

Social-ecological systems (SES):

- Emphasise that humans must be seen as a part of, not apart from, nature and that the delineation between social and ecological systems is artificial and arbitrary (Walker and Salt, 2006);
- Refer to complex systems where humans and nature are interdependent (Folke *et al.* 2010).

Social resilience refers to the ability of individuals, groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change (Adger, 2000).

Specified resilience is the resilience "of what, to what"; resilience of some particular part of a system, to one or more identified kinds of shocks and/or stresses (Folke *et al.* 2010).

Stakeholder engagement is the two-way communication between stakeholders and implementing organizations where information is exchanged in some sort of dialogue or negotiation (Rowe and Frewer, 2000).

Self-evaluation or self-assessment is an assessment or evaluation of oneself or one's situation, actions, attitudes, or performance (Oxford English Dictionary, 2015).

Transformation is the process by which a system changes to become a fundamentally new system when ecological, economic or social structures make the existing system untenable or undesirable (Folke *et al.* 2010).

Vulnerability in natural hazards studies is the propensity to suffer some degree of loss from a hazardous event (Etkin *et al.* 2004). More broadly, vulnerability refers to the extent that a system is susceptible to and unable to cope with shocks and stresses, determined by different social, ecological, and political factors interacting across different scales (Berman *et al.* 2012; Blaikie *et al.* 1994; IPCC, 2007).

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EXECUTIVE SUMMARY

When an unexpected flood hit Mr Sow and his farming community in rural Senegal a few years ago, it constituted a devastating blow, which destroyed large parts of the agricultural production underpinning the community's livelihood. The community took several years to recover from the event. While an isolated flood cannot be used as a proof of changing climate patterns, the case does illustrate how increased climatic variability can affect the lives and livelihoods of food producers. Shocks and stresses often cannot be prevented, thus emphasis should be placed on improving the resilience of those affected (Levine and Mosel, 2014). Based on these incidences of shocks and on scientific evidence showing an increase in the variability and intensity of climate events (Stern, 2006; IPCC, 2014), the international community has started putting in place numerous projects and programmes to empower food producers in their struggle to improve their capacity to survive, recover from, and even thrive in changing climatic conditions (e.g. the ASAP programme of IFAD, the RIMA programme of FAO, the GEF's LDCF Fund; the Climate Change Resilient Development (CCRD) project of USAID and partners in the Sahel, the European Commission's SHARE and AGIR initiatives, respectively in the Horn of Africa and Sahel).

In this context, the need to measure and monitor climate resilience while at the same time empowering smallholder farmers and pastoralists to develop climate resilience in a participatory manner has become more and more apparent. The Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) tool has been developed to fill this gap. This document aims to outline the tool, its development and its implementation.

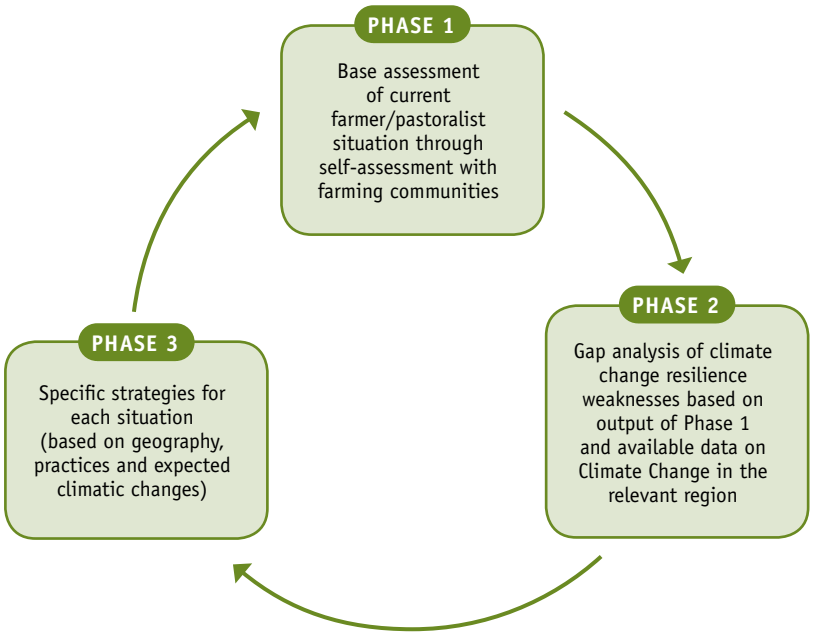
The Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) is a tool developed in a collaborative manner by the Food and Agriculture Organization of the United Nations (FAO) and external partners. SHARP addresses the need to better understand and incorporate the situations, concerns and interests of farmers and pastoralists relating to climate resilience and agriculture. It fills a void identified in farming system resilience assessments in an integrated, participatory and yet scientific manner that is tailored to the needs of smallholder farmers and pastoralists.

SHARP fills this niche by incorporating three distinct phases (Figure 1):

1. A participatory self-assessment survey of smallholder farmers and pastoralists regarding their climate resilience. Besides serving as the base assessment for further analysis, data collected through the survey gives households an indication of strengths and weaknesses in terms of their climate change resilience that will be immediately available to them;

2. A gap analysis and assessment of the responses at both the local level with the farmers and pastoralists in a rapid assessment and through a cross-sectional review of multiple assessments, which includes engagement with local government officials and policy makers to assess agricultural and pastoral policies regarding effectiveness and gaps; and
3. Use of this information in conjunction with climate data to inform and guide farmers' practices as well as curricula and local and national policies.

Figure 1. **Phases of SHARP process**



SHARP is built on the concept of participatory learning exchanges and has four main assessment areas: environment, social, economic, governance, as well as a fifth general information category. This reflects the need to understand all aspects of the farm system and external environment that may impact the climate resilience of farmers and pastoralists. A thorough literature review was conducted to ensure that the conceptual foundation of resilience was included in SHARP. Thirteen components to resilience were identified from peer-reviewed articles. A set of 54 practical questions were created to ensure that each component was sufficiently assessed.

The first phase of SHARP, the self-assessment survey portion, is conducted by agro-pastoral/ farmer field school facilitators (or equivalent) on an individual level (representing a farm household). Questions are asked in a manner that farmers and pastoralists understand (in local languages) and are integrated wherever possible into existing learning curricula and programmes. The survey is complemented by participatory activities such as community mapping and cropping calendar development.

The self-assessment survey is conducted in a manner in which farmers'/ pastoralists' responses are combined with their assessment of adequacy and importance of different aspects of their farming/ pastoralist system to their livelihood. Using this set of data, a priority ranking is produced to identify which areas of the farm system-livelihood should be prioritised for building resilience. For example, a farmer may get a low resilience "score" of 3/10 on water access, self-assess their water access adequacy also low, (e.g. 3/10) and indicate that it is extremely important to their livelihood (e.g. 9/10). This would result in a high priority for addressing that aspect of their livelihood.

Phase 2 involves a rapid assessment, review of farmer's responses and engaging with field school facilitators, local community leaders and policy-makers. A priority ranking of resilience components is quickly made using the SHARP survey tablet application. The facilitators will then work with the farmers/ pastoralists to discuss the areas of low resilience and about possible ways to improve their resilience, for instance by jointly identifying resilience priority actions at household and FFS level. Also in Phase 2 the information gained through SHARP is paired with additional external data and used to inform local project staff and farmers/ pastoralists and support Phase 3. Finally, during Phase 3 the information that is gained in Phase 2 is used to inform and plan for interventions, including new policies, AP/FFS curricula and to create targeted projects and programmes to address identified gaps in resilience.

SHARP will therefore work in its simplest form as a participatory baseline assessment but is also designed to provide a holistic understanding of farmers' and pastoralists' practices and conditions along with offering the opportunity to identify trends and patterns for targeted interventions. SHARP will provide a greater understanding of which practices work and empower farmers and pastoralists to better adapt to climate change. It will also enable policies to be developed to promote good practices and address concerns where needed.

SHARP is an ongoing process that will evolve over time in its application and with respect to how the information is used to improve practices and policies. Although SHARP is focused on climate resilience, it will provide benefits beyond those related to climate change and work to improve farmers' and pastoralists' lives while advising policy makers.

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01
BACKGROUND

Climate variability jeopardizes livelihoods, wellbeing, and socio-economic elements needed for coping with threats to environmental and human systems that underpin farming systems. In sub-Saharan Africa, more than 60 percent of the population is employed in agricultural activities, which accounts for approximately 30 percent of the gross domestic product of those countries (Kandlikar and Risbey, 2000; Nhemachena and Hassan, 2008). Climate change projections highlight that there will be long-term changes in temperature and rainfall patterns and an increase in the frequency and intensity of extreme weather events, such as droughts, floods and storms (IPCC, 2007). Significant relationships between climate and crop yields have been identified, showing that up to 50 percent of yield variability is attributable to climatic conditions (Challinor *et al.* 2003). Research into the impacts of a changing and variable climate on agriculture has shown that crop productivity, indicated by crop yield, is highly dependent on weather and climate (Challinor *et al.* 2004). Adverse weather and climatic conditions negatively impact agricultural production and food security (Kinuthia, 1997). Higher temperatures can result in reduced yields and encourage weed and pest growth (Abdulah *et al.* 2013) with smallholder farmers lacking the resources and support to adequately tackle these threats. Increased rainfall variation increases the probability of short-term crop failures and the potential for lower yields in the long term. Food crises linked to climate drivers are no longer rare events and a concerted effort is needed to build the resilience of farmers and pastoralists (Gubbels, 2011). Improved resilience will also reduce loss of life and costs associated with extreme events. Resilience has thus emerged as a key concept for understanding the ways that complex socio-ecological systems react to a range of trends, cycles and shocks (IIED, 2013). Resilience has also emerged as a goal of both policy and projects but measuring it has proven difficult to date (UNDP, 2014).[1]

Climate resilience is often described as the ability to withstand the challenges of climate – challenges that include rainfall failure, increased temperatures and greater variability. Climate resilience is thus highly relevant to maintaining and improving farmers' and pastoralists' livelihoods worldwide. It is recognized that higher yielding crops alone will not necessarily protect against hunger as, for example, famines or child malnutrition are often not a result of a lack in total food but that many other factors contribute (Sen, 1981; Smith and Haddad, 2015). In the Sahel, it is

[1] See for example: FAOSTAT for more details http://faostat3.fao.org/; http://data.worldbank.org/indicator/SL.AGR.EMPL.ZS; http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS/countries

increasingly evident that it is the interplay between the bio-physical factors and a broad range of socio-economic factors that underlies social resilience. Increasingly relevant are the operation of markets, social networks and political institutions – all interacting in ways that can increase or diminish the impact of and recovery from particular risks (IIED, 2013).

The Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) tool works to better understand these factors from a scientific and farmer/ pastoralist perspective. As part of the FAO Agricultural Plant Production and Protection Management division (AGP)'s work through Global Environment Facility (GEF)-financed agro-pastoral (APFS) and farmer field school (FFS) projects, a tool is proposed in this document for farmers and pastoralists to self-assess their climate-resilience through knowledge exchange. Subsequently, the results collected through the tool can be used to inform AP/FFS curricula and contribute to policies necessary to improve climate resilience. An additional aim of SHARP is to contribute to FAO's Strategic Objectives 2[2], 3[3], and 5[4] and to be included in the work of major donors or other ongoing initiatives within and outside of FAO.

AP/FFS are a form of adult education involving field experimentation and observations (van der Berg, 2004). FFS were first trialled in Indonesia in 1989 by FAO in response to the increased pesticide resistance experienced by rice farmers (Pontius *et al.* 2002; Settle *et al.* 2014). Integrated Pest Management (IPM) was employed to address this issue as part of FFS as an alternative to indiscriminate pesticide spraying. FFS have evolved to address issues beyond IPM as well as including other crops and have spread to over 40 countries. FFS have also branched out into Agro-pastoral field schools (APFS). A typical AP/FFS includes a group of 20 to 30 farmers/pastoralists who share a common geographic location and interest with weekly or biweekly meetings (Okoth *et al.* 2013). Curricula are developed with the input and interests of the farmers/pastoralists and follow a "seed to seed" or "egg to egg" approach where concepts follow the full lifecycle of a crop or animal (Gallagher, 2003). AP/FFS can last between 3 and 18 months depending on the curricula and type of agriculture/ pastoralism being practiced. Farmers and pastoralists are encouraged to participate in multiple field schools to increase their knowledge and skills (as curricula can change each season to meet specific community needs). SHARP was derived from the need to increase the understanding of climate resilience of farmers and pastoralists using a participatory approach. SHARP integrates and complements AP/FFS where possible and is also flexible enough to be used outside of them.

SHARP leverages the knowledge and networks developed in AP/FFS programmes in order to reach remote communities and build upon the knowledge that the farmers and pastoralists have learned in the field schools. AP/FFS also provide an ideal platform to study and introduce changes, where needed, to improve climate resilience.

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[2] Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner (FAO, 2013a)

[3] Reduce rural poverty (FAO, 2013a)

[4] Increase the resilience of livelihoods to threats and crises (FAO, 2013a)

02
IDENTIFYING THE NEED FOR SHARP[5]

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The development of SHARP started out of a practical necessity within projects that aimed to improve the adaptation to climate change of farmers and pastoralists. In order to ensure that SHARP addressed issues that are not yet covered by other tools, we used a multi-step process to identify, review and analyze existing tools for resilience assessments. Tools in this context were defined as methodologies, frameworks and approaches aimed at providing a practical assessment of resilience. Academics and practitioners attending an international workshop in Burkina Faso (May 21-23, 2013) organized by FAO, to develop a self-assessment tool of farm resilience, were asked to suggest relevant resilience tools that had been used in practice. Following the workshop, a systematic web-based search for tools was conducted using an online search engine (Google scholar, November 2013) alongside searches of academic journals. The benefits of using a systematic process are outlined in Lorenz (2013).

Informed by a wider review of resilience literature and by the boundaries set by the scope of this work, selection criteria were designed to select relevant tools for analysis (Table 1). We also used the literature review (described below) to frame key issues from the resilience literature (Table 2). Search terms stemming from the literature review are presented in Table 1. While we only considered the top 20 tools resulting from the search, to be included, tools also had to meet two or more of the criteria set out in Table 1. As part of an ongoing process (May – December 2013), agricultural experts from FAO suggested additional tools, leading to an overall set of 24 tools for the next stage of the analysis.

[5] Note that this section was elaborated mostly by Jami Dixon (LTS International/ University of Leeds) and Lindsay Stringer (University of Leeds) and builds the basis of a peer-reviewed publication on this topic: Dixon and Stringer (2015).

Table 1. **Key selection criteria and search terms used to identify tools and assign relevance score.**

SELECTION CRITERIA	JUSTIFICATION FOR SELECTION	KEY WORDS FOR RELEVANCE SCORE
1. Applicability in a rural, developing country context	Developing countries are projected to disproportionately affected by the impacts of future climate change and variability (IPCC, 2007)	rural, dev*, livelihood,
2. Specific to agriculture / farming systems	Agriculture is an important sector, both in terms of adaptation and mitigation (IPCC, 2007)	agric*, farm*, food
3. Relevant to climate resilience	Resilience is one way to reduce vulnerability to the uncertainties surrounding future climate change (Tyler and Moench, 2012)	climat*, resilience*, vulnerab*
4. Evidence of use in multiple countries / used by international organizations	Provides an indication of the coverage, utility and/or acceptability of the tool.	N/A
5. A practical assessment tool	Links to the gap that SHARP aims to address.	assess*, tool, framework

In total, 24 tools were identified and reviewed (Table 2), to highlight similarities and differences, and to establish potential gaps. In Table 2 those presented at the stakeholder workshop in Burkina Faso are in white boxes, those identified through the internet search are shaded in light green boxes and additional FAO tool recommendations are in dark grey boxes.

Table 2. **Overview of existing tools identified through selection process.**

NO.	NAME OF THE TOOL	SOURCE	AIM / GOAL
1	Household Economy Approach (HEA/ AEM)	Save the Children; Global Information and Early Warning System; Food and Agriculture Organization (FAO), 2008	To improve the predictive ability of short-term assessments of changes in food access based on an analysis of peoples' access to the goods and services that they require to survive.
2	Climate-Smart Agriculture (CSA) Sourcebook	Food and Agriculture Organization (FAO), 2013	To develop the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change.
3	SAFA, Sustainability Assessment of Food and Agriculture systems (SAFA)	Food and Agriculture Organization (FAO), 2013	To enable people and companies undertaking the self-assessment to identify areas of high sustainability and areas where action is needed to improve sustainability.
4	Trousse à Outils de Planification et Suivi Evaluation des Capacités d'Adaptation au Changement climatique (ToP-SECAC) (Toolkit for planning and monitoring of climate change adaptation capacities)	International Union for Conservation of Nature (IUCN), Consultative Group on International Agricultural Research (CGIAR), National Agricultural Research Services (NARS) of Burkina Faso, Ghana, Mali, Niger and Senegal, Institute of Environmental and Agricultural Research (INERA) of Burkina Faso, 2011	To harmonize monitoring and evaluation of climate change adaptation projects through a participatory learning process bringing together various rural development actors enabling the user to identify, implement, monitor and evaluate adaptation activities. This toolbox also includes tool number 8 below (CRiSTAL).

NO.	NAME OF THE TOOL	SOURCE	AIM / GOAL
5	Climate proofing for Development (CP4Dev)	Gessellschaft fuer Internationale Zusammenarbeit, (GIZ), 2011	To make development interventions more efficient and resilient by providing a methodological approach to the analysis of development measures with regard to the current and future challenges and opportunities presented by climate change
6	MASSCOTE, MApping System and Services for Canal Operation TEchniques	Food and Agriculture Organization (FAO), 2007	To evaluate and analyze different components of irrigation and canal systems in order to develop a modernisation plan.
7	LADA, Land Degradation Assessment in Drylands	United Nations Environment Programme (UNEP); Food and Agriculture Organization (FAO), 2006	To assess land degradation at the subregional, regional, national and global scales.
8	CRiSTAL, Community-based Risk Screening Tool – Adaptation and Livelihoods	International Institute for Sustainable Development (IISD); International Union for Conservation of Nature (IUCN); Stockholm Environment Institute (SEI), 2012	To systematically assess the impacts of a project on some of the local determinants of vulnerability and exposure, so that project planners and managers can design activities that foster climate adaptation (i.e. adaptation to climate variability and change).
9	CCVA, Climate Vulnerability and Capacity Analysis	Care International; International Institute for Sustainable Development (IISD), 2009	To present a new participatory methodology for Climate Vulnerability and Capacity Analysis.
10	CREFSCA, Climate Resilience and Food Security in Central America	International Institute for Sustainable Development (IISD); Climate Development Knowledge Network (CDKN), 2012	To strengthen the long-term food security of vulnerable populations in Central America by improving the climate resilience of food systems at different spatial and temporal scales.
11	CRAM, Climate Resilient Agriculture Module	Care International, 2012	To support research and development partners in gathering information that will help them design inclusive and gender sensitive programmes in climate resilient agriculture.
12	Climate Resilience Framework (CRF)	Asian Cities Climate Change Resilience Network (ACCRN)	To build networked resilience that is capable of addressing emerging, indirect and slow-onset climate impacts and hazards.
13	iResilience (including other assessment tools & quizzes like this)	Robertson cooper, online	To provide a comprehensive understanding of personal resilience and give examples of how this could impact on users responses to demanding work situations.
14	LG_SAT, UN-ISDR, International Strategy for Disaster Reduction	International Institute for Sustainable Development (IISD); World Bank's Global Facility for Disaster Risk Reduction (DRR); European Commission's Humanitarian Aid branch (ECHO), 2011	To assist disaster reduction efforts by cities and local governments that have signed up to the global "Making Cities Resilient" Campaign.

NO.	NAME OF THE TOOL	SOURCE	AIM / GOAL
15	Climate Resilient Cities	World Bank, 2008	To aid urban planning responses in the East Asia region to plan for climate change impacts and impending natural disasters in a manner that vulnerabilities are reduced .
16	A Self-Assessment To Address Climate Change Readiness in Your Community	Midwestern Regional Climate Centre, online	To provide communities with a climate change readiness index.
17	ADAPT	World Bank, 2008	To bring together climate databases and expert assessment of the threats and opportunities arising from climate variability and change.
18	The resilience tool	Food and Agriculture Organization (FAO), 2010	To provide a framework for understanding the most effective combination of short and long term strategies for lifting families out of cycles of poverty and hunger.
19	Incorporating climate change considerations into agricultural investment programmes. Rapid Assessment	Food and Agriculture Organization (FAO), 2012	To assist investment project formulation practitioners in incorporating climate change considerations into agricultural investment projects and programmes.
20	Resilience Assessment Workbook: Assessing Resilience in Social-Ecological Systems	Resilience Alliance, 2010	To provide a step-by-step approach to assessing resilience of a social-ecological system with the long term goal of sustainable delivery of environmental benefits linked to human well-being.
21	Social-Ecological Inventory	Resilience Alliance, 2011	To identify existing knowledge and activities already underway in an area or sector, as well as the key actors involved with particular issues.
22	PMERL (Participatory Monitoring, Evaluation, Reflection and Learning for Community-based Adaptation)	Care International IIED, 2012	To build the resilience of vulnerable individuals, households, communities and societies from the ground up.
23	Analysing Urban Digital Infrastructure Interventions Through a Resilience Lens	Heeks and Ospina, 2010.	To develop a well-conceptualised model of resilience that can be used in both research and practice to understand and evaluate climate change and other interventions in urban settlements.
24	Indicator Framework for Assessing Agro-ecosystem Resilience	Cabell and Oelosfe, 2012	To present an index of behaviour-based indicators that, when identified in an agro-ecosystem, suggest that it is resilient and endowed with a capacity for adaptation and transformation.

Tools presented at the stakeholder workshop in Burkina Faso are in white boxes, those identified through the internet search in are shaded in light green boxes and additional FAO tool recommendations are in dark green boxes

The relevance of the selected 24 tools was qualitatively determined using the search terms and criteria (Table 1). Tools were then given a numerical 'relevance score' based on how well they matched the criteria 1-5 (Table 1). They were then ranked accordingly. The 'relevance score' was calculated according to how well the tool met the selection criteria. For selection criteria 1-3 and 5, we searched for words listed in the 'Aim/Goal' column in Table 3. Scoring for criterion 4 was based on the information available where 'yes' was equal to 1, and 'no' or 'unknown' were assigned a value of 0. Criteria were considered as equally important.

Following identification of relevant tools, the content of the tools were qualitatively analyzed. We posed questions in relation to the selection criteria and issues raised in the literature as important to consider. The purpose was to classify existing tools to identify similarities and differences. This enables the identification of design aspects that may need to be incorporated in future tools. As part of this process, we also searched the *Web of Science* database to check whether there was evidence of peer review of the tools. We then compared two peer reviewed resilience tools to analyze the extent to which they address the key issues emerging from the resilience literature. This allowed us to highlight important gaps and lessons for the design and implementation of future theoretically grounded assessment tools such as SHARP.

Table 3. **Key issues identified from the resilience literature.**

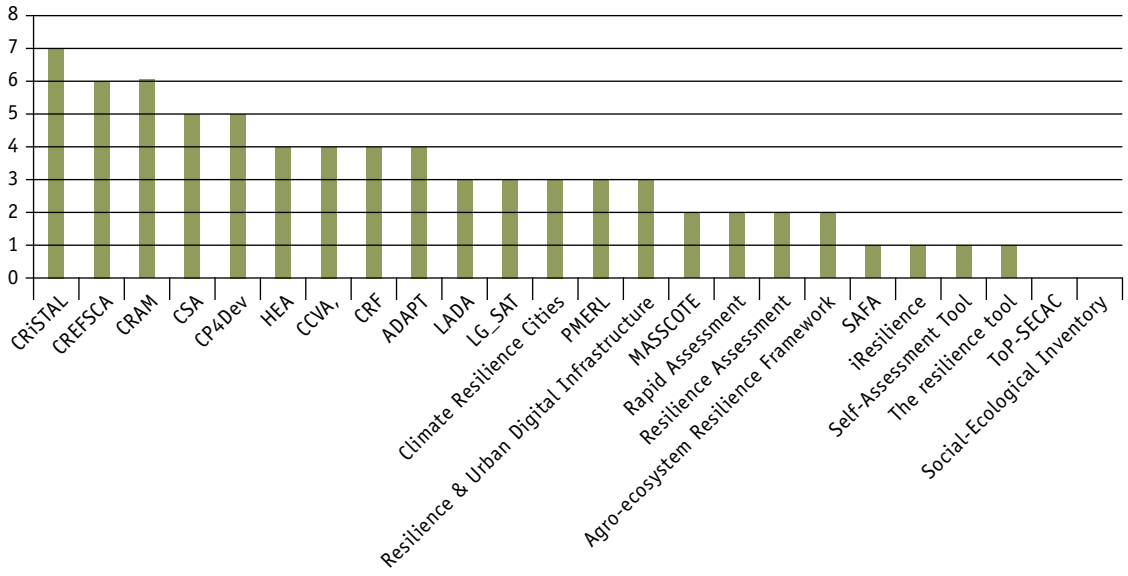
KEY ISSUES HIGHLIGHTED IN THE RESILIENCE LITERATURE	REFERENCE
1. Resilience indicators should include financial, political, and institutional considerations.	Twyman *et al.* 2011
2. Holistic approaches are required to understand interactions, interconnectedness and interdependence between human and biophysical components of a single complex system.	Berkes *et al.* 2003
3. Resilience requires flexibility, learning and change.	Adger *et al.* 2005; Berkes, *et al.* 2003; Miller *et al.* 2010
4. Resilience is an intrinsic system property or process, independent of exposure to a shock or stress.	Folke, 2006
5. Tools to test the assumption that that all individual or systems can learn from past exposure.	Carpenter *et al.* 2001
6. Social dynamics related to issues of power and agency are important	Leach, 2008
7. Resilience is not always a positive attribute.	Carpenter *et al.* 2001; Walker *et al.* 2006
8. Strengthening resilience in the short term may reduce resilience in the long term, highlighting the temporal dimension to resilience.	Cabell and Oelofse, 2012
9. Spatial scale is important to recognize there may be 'winners and losers'	Kates, 2000

A summary of the tools and the methodology used to identify them through this process is presented in the literature review (Annexes 1, 2 and 3). Once their relevance was determined qualitatively, tools were then given a 'relevance score' based on how well they matched the criteria. Tools were then ranked according to their relevance score.

Using the relevance score to rank the top five tools from highest to lowest relevance provides results as follows: CRiSTAL; CREFSCA; CRAM; CSA; CP4DEV (Figure 2). As the relevance score is based on how well the tool met the selection criteria, these tools provided a potential starting point for identifying ways forward and avoiding duplication of existing tools.

However, because all parts of the scoring system were weighted equally, it is possible that the top five tools score well in certain areas, but not in others. For example, a score of six could be linked to a good match with two of the five criteria, but have no relevance for the other three. Similarly a tool with a low score of three, could match three of the criteria. In addition, whether or not the tool has been peer reviewed was omitted from the relevance score. This decision ensured that the breadth of tools used in practice was captured.

Figure 2. **Ranking of tools according to resilience score (n=24)**



Data presented in Table 4 show that the largest number of tools, six, targeted multiple scales. Findings also suggest that an array of tools exist that assess communities and projects, with five tools for each, compared with only two that focussed on a household or individual level (Table 4). In addition, three of the tools focused on the system level, with two focussing specifically on urban systems. Only one of the tools targeted at agro-ecosystems resilience was specifically relevant to farming systems.

Nine of the 24 tools underwent peer-review. Two of these nine tools focussed on resilience. From the data available it was established that six of these nine tools had been used by more than one organization and used in more than one country. Overall, data availability on the geographical application of tools was limited. Similarly it was difficult to obtain data on which organizations were using, or had used, various tools.

Table 4. **A summary of the 21 tools identified, their relevance scores, selected relevance criteria and other information used to identify gaps in existing tools.**

TOOL ACRONYM	CLIMATE RELATED YES / NO	CLASSIFICATION OF CLIMATE TOOLS RESILIENCE (R), VULNERABILITY (V), OTHER (O).	RELEVANCE SCORE	USED BY >1 ORGANIZATION			USED IN >1 COUNTRY			SPATIAL SCALE							PEER REVIEWED?
				Yes	No	Unknown	Yes	No	Unknown	Individual	Household	Community	System	Urban	Project	Multiple	
CRiSTAL	YES	V	7	X					X						X		Y
CREFSCA	YES	R/V	6	X			X					X					N
CRAM	YES	O	6	X					X			X					N
CSA Sourcebook	YES	O	5			X	X									X	N
CP4Dev	YES	O	5	X			X									X	Y
HEA/ AEM	NO	O	4	X			X				X						Y
CCVA	YES	V	4	X					X			X					Y
CRF	YES	R	4	X			X									X	Y
ADAPT	YES	O	4		X		X								X		N
LADA	NO	O	3	X			X									X	Y
LG_SAT	NO	O	3	X			X							X			N
Climate Resilient Cities	YES	R	3		X				X					X			N
PMERL	NO	R/V	3	X					X			X					N
Analysing Urban Digital...	YES	R	3			X			X						X		N
MASSCOTE	NO	O	2			X	X						X				Y
Rapid Assessment	YES	O	2			X			X						X		N
Resilience Assessment Workbook	NO	R	2			X			X				X				N
Indicator Framework for...	NO	R	2		X			X					X				Y
SAFA	NO	O	1			X			X							X	N
iResilience	NO	R	1		X				X	X							N
A Self-Assessment...	YES	O	1		X				X			X					N
The resilience tool	NO	R	1		X				X		X						N
ToP-SECAC	NO	O	0			X			X						X		N
21	NO	O	0			X			X							X	Y
TOTALS	Yes = 12	R=9, V=4, O=13	NA	10	6	8	9	1	14	1	2	5	3	2	5	6	Y = 9

2.1 TOOL GAPS

One of the findings of the gap analysis was that an array of tools exist that assess community, system and projects resilience, with additional tools that can be applied at multiple scales. Overall, it appears that more climate-related tools **focus on resilience** compared with vulnerability, while few mention both resilience and vulnerability and consider the relationship between the two, for instance by collecting data both on the vulnerability context and on the resilience level at the level assessed (for a more in-depth analysis of resilience and vulnerability see Section 3.1 of this document).

The gap analysis also shows that existing resilience tools have been **designed mainly for urban environments and have mostly been tested in Asia**. There is potential to adapt these approaches and tools (and the lessons learned) to suit rural and agricultural development contexts across the developing world. For the tools related to climate vulnerability, the tools are predominantly **informed by risk management approaches**. These top-down approaches draw heavily on the natural hazards literature, which emphasises the biophysical nature of much risk related research. The rise of 'bottom-up' approaches to understand the social, economic and political context in which vulnerability is embedded, i.e. contextual vulnerability, has also led to the emergence of new tools such as CRiSTAL[6] and CoBRA[7]. Yet, such tools and approaches assume that vulnerability is an antonym of resilience. This does not reflect the range of conceptual debates and approaches established in academic literature (Bahadur *et al.* 2010). Furthermore, one could argue that in the case of CRiSTAL the focus is more on general guidelines than an actual tool: "The approach and specific methods selected for engaging local stakeholders in applying CRiSTAL are flexible and generally left to the discretion of the user." A similar observation can be made of FAO's "Incorporating climate change considerations into agricultural investment programmes", which mainly gives general guidance. The Rapid Assessment connected to that document is a specific tool but in its approach focuses almost solely on the biophysical part of resilience work (FAO, 2012). However, CRiSTAL provides useful tips and references on how to collect most of the information: "Specific information on participatory methods that can be used for each analytical step can be found in the second part of this manual" (IISD, 2012). CRiSTAL is aimed only at project design while SHARP aims more at the whole project cycle (for a more in-depth comparison of the most relevant tools to SHARP see Annexes 1, 2 and 3). We also identified tools from health and psychology disciplines, which aimed at assessing individual or community psychological resilience. These were deemed as not applicable (N/A) in the classification of climate-related tools (Figure 3). While these tools may not seem directly relevant for SHARP, important lessons could nevertheless be learned from their approaches to measuring and assessing resilience, especially in terms of the self-assessment approach that is used here.

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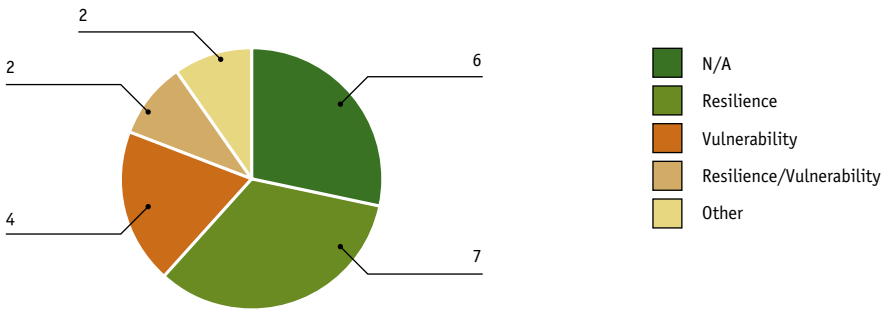
6 www.iisd.org/cristaltool/

7 www.disasterriskreduction.net/drought-online/cobra/en/

In summary, from the analysis of existing tools, the following **gaps relevant to SHARP** are:

» the lack of tools that assess general or climate resilience – most focus on risk reduction and hazards;
» the lack of true resilience tools – most tools conceptualize resilience as the antonym of vulnerability;
» the limited number of climate related tools targeted at the household level;
» the lack of practically applicable tools aimed at assessing agriculture specifically or resilience in a rural context;
» the lack of tools that integrate quantitative and qualitative data;
» the limited number of new tools operationalize the assessment to develop strategies to strengthen resilience; and
» that there are currently no climate-resilience self-assessment tools aimed at the level of individuals and aggregated at household and community level.

Figure 3. **Classification of the approaches used by existing tools showing the number of tools assessed in each category**



2.2 LESSONS LEARNED

Following the identification of tools, we also evaluated the strengths, weaknesses and lessons for SHARP related to each tool. We then grouped together similar 'lessons for SHARP' to identify those that reoccurred. From this, we identified 15 categories of lessons and aimed to integrate at least the top ten into SHARP (Table 5). Therefore, despite the multiple tools already available, our analysis demonstrates that there is need for:

» a simple, self-assessment tool targeted at the individual or household level, but which considers multi-scalar interactions;
» data and assessments that allow comparability between sites;
» a tool specifically designed for farm systems as integrated social-ecological systems (SES);
» strong theoretical grounding;

» an integrated quantitative and qualitative approach;
» moving beyond providing past and present resilience assessments to also incorporate an approach to strengthening future resilience;
» an approach that fosters notions of participation, learning and empowerment.

These lessons learned have constituted the basis for the construction of SHARP as they became the principles underlying the development of the tool.

Table 5. **Results from grouping exercise to highlight the key and reoccurring lessons learned from the review of existing tools.**

LESSONS LEARNED FROM THE REVIEW OF EXISTING TOOLS	COUNT OF NUMBER OF TIMES IT OCCURRED AS A LESSON LEARNED
Participation and empowerment should be central	7
Be action focused	6
Multi-step / phase methodologies are important	5
Stakeholder engagement is important	5
Flexibility - Account for contextual differences	4
Use integrated approaches	4
Tool/ approach should be accessible and easy to understand	3
A training manual / book is useful	3
Findings should be comparable, standard recording sheets can help	3
Time taken to complete should be considered	3
Validating findings/data and triangulation is important	2
Approach should foster learning	2
Capacity building	1
Approaches should take in account uncertainty	1
Practicalities should be considered	1

03
SCIENTIFIC BACKGROUND AND THEORETICAL FRAMEWORK

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Based on the assessment of existing tools performed in Section 2, this Section aims to give an overview of the relevant academic discussions relating to resilience theory in order to build the conceptual basis of SHARP. Please see Annex 6 for further information on the SHARP conceptual framework and principles.

3.1 VULNERABILITY AND RESILIENCE

Broadly defined, **vulnerability** is the susceptibility to be harmed (Adger, 2006). Vulnerability is used across a range of disciplines and traditions, from anthropology to engineering, yet it is only in the literature on human-environment interactions, for example natural hazards, that vulnerability has a common understanding and meaning (Adger, 2006). In this document vulnerability is presented as an integrative concept, linking the social and biophysical dimensions of environmental change (O´Brien *et al.* 2007). In the natural hazards literature, vulnerability constitutes exposure and sensitivity to perturbations or external stresses, and the capacity to adapt (Adger, 2006). In line with this, vulnerability to climate change is defined by the IPCC (2007) as a function of exposure, sensitivity and adaptive capacity. Exposure is the degree to which a system experiences external shocks or stresses (Adger, 2006), and includes considerations of their magnitude, frequency, duration and the areal extent of the hazard (Burton *et al.* 1993). Sensitivity is the degree to which a system is affected by the shock or stress and adaptive capacity is the ability of a system to evolve (Adger, 2006). This conceptualization highlights that vulnerability also depends on access to financial, political, and institutional assets rather than solely on exposure to environmental change (Twyman *et al.* 2011).

'Vulnerability led' approaches emphasise the socio-economic and institutional processes that determine the vulnerability of an individual or system (Fraser, 2003, Fraser and Stringer, 2009; Stringer *et al.* 2009; Ford *et al.* 2010). However, while such approaches emphasise 'social vulnerability,' they downplay the importance of 'ecological vulnerability defined as the combination of ecological

exposure, ecological sensitivity, and ecological recovery potential' (Cinner *et al.* 2013). Cinner *et al.* (2013) highlight the importance of links between social and ecological vulnerability and the feedbacks between the two.

To counter the absence of ecology in vulnerability approaches, **resilience** has emerged as a lens for understanding and examining how a social-ecological system (SES) responds to shocks, stress or perturbations such as those linked to climate change. In SES, people and the environment are presented as being part of a single system rather than seeing humans as external to the system. Resilience thinking fosters systems-based approaches to analysing SES, thus recognizing the interconnectedness and interdependency within such systems is important.

In the resilience literature, vulnerability is "the propensity to suffer harm from exposure to external stresses and shocks" (Resilience Alliance, 2010: 52), whereas resilience is defined as "[t]he capacity of a system to absorb disturbances and reorganize while undergoing change so as to retain essentially the same function, structure, identity, and feedbacks." (Resilience Alliance, 2010: 51). In this kind of framing, vulnerability is presented as an antonym of resilience (Folke *et al.* 2002) but is not considered as such within SHARP. However, resilience is only connected to exposure in that exposure can impact resilience; small periodic exposures to shocks are known to often increase resilience, while too little or too much exposure to shocks can reduce one's ability to adapt and thus reduce resilience. One can, for instance be highly or poorly resilient, independent of the level of exposure to a shock.

Resilience is argued to be a fundamental characteristic of both natural and human systems (Holling, 1978; Gunderson and Holling, 2002). Life endures because of its resilience (Friend and Moench, 2013). Yet, resilience is used across different disciplines resulting in multiple conceptualizations. One of the first recorded uses of resilience described old attitudes and resistant frameworks in terms of "dying hard, at times against all logic" (Braudel, 1958). The origins of the term resilience imply strength and resistance, but in its more recent applications in ecology, SES and disaster management, resilience is understood to require flexibility, learning and change (Berkes *et al.* 2003; Adger *et al.* 2005; Twigg, 2007; Prasad *et al.*2008; Miller *et al.* 2010). See Figure 4 for a range of definitions.

Figure 4. **Definitions of resilience**

- **'Ecological' resilience**: the magnitude of disturbance that a system can absorb before it redefines its structure by changing the variables and processes that control behaviour (Walker *et al.* 1969; Holling, 1973).
- **'Engineering' resilience** (Gunderson *et al.* 1997): is a system's ability to return to the steady state after a perturbation (Pimm, 1984; O'Neill *et al.* 1986; Tilman and Downing, 1994).
- **Individual Resilience:** a person's capacity to cope with changes and challenges and to 'bounce back' during difficult times.
- **General Resilience:** refers to resilience of any and/or all parts of a system to all kinds of shocks and stresses (Folke *et al.* 2010)
- **Climate resilience** is the resilience of a system or part of a system to climate-related shocks and stresses. It is the ability to survive, recover from, and even thrive in changing climatic conditions (ACCRN).

Persistence, adaptability, diversity and transformability are presented as critical features of resilience in SES literature (Walker *et al.* 2004; Folke, 2006). In other words, it is the ability of a system to recover, bounce back and evolve. Resilience research across different disciplines demonstrates that historically individuals and systems have the ability to successfully cope with and overcome challenges or adverse events. Based on the notion that human societies have adapted and will continue to adapt to environmental changes, Orlove (2005) recognizes the intrinsic nature of resilience. Central to this theory is the notion that resilience is maintained by disturbing and probing its own boundaries and that all individuals can learn from past exposure (Holling, 1973; 1978; 1986; Walker *et al.* 2006). Therefore, in order to strengthen the resilience of an individual or system, past exposure to shocks and stresses is key (Berkes and Folke, 2002): "every natural system is subject to regular disturbance; those that have survived, indeed must have built up some degree of resilience" (Levin cited by Berkes and Folke, 2002: 121). Engle (2011) argues that there is convergence between vulnerability and resilience through adaptive capacity, where adaptive capacity is more broadly defined as "the ability or potential of a system to respond successfully to climate variability and change" (IPCC, 2007).

Although vulnerability and resilience are rooted in different epistemological traditions in the natural and social sciences, there are overlaps in the theory, methodology, and application of the concepts (Miller *et al.* 2010). Adger (2006) argues that "[t]he points of convergence are more numerous and more fundamental than the points of divergence" (2006: 269). In a comprehensive review of resilience literature, Bahadur *et al.* (2010) classify 16 different conceptualizations of resilience and identify how the interplay with vulnerability is treated. The authors conclude that there are multiple ways in which the relationship between vulnerability and resilience has been conceptualized. It is important to recognize that this complexity exists and try to directly consider the relationship.

O'Brien *et al.* (2007) distinguish between 'vulnerability as outcome' and 'contextual vulnerability' as two opposing research foci and traditions. A 'vulnerability as outcome' approach implies that vulnerability must be understood in relation to something, e.g. a stress or shock. It uses a natural science framing as a way to identify and mitigate biophysical risks. Contextual vulnerability on the other hand emphasises general 'vulnerability to change', including uncertainty, where climate hazards are only part of the range of possible changes (O'Brien *et al.* 2007). A similar distinction could also be made in resilience literature between resilience as an outcome, i.e. something that can be measured and monitored, or resilience as an ongoing process, i.e. the ability of an individual, system or community to absorb disturbances, the capacity of self-organization, and the capacity to adapt to stress and change (IPCC, 2007). There are close, and perhaps complementary, links between these conceptualizations. In both, resilience can be viewed as an intrinsic system property independent of exposure to a shock or stress, unlike vulnerability. The scope of resilience is presented in Figure 5.

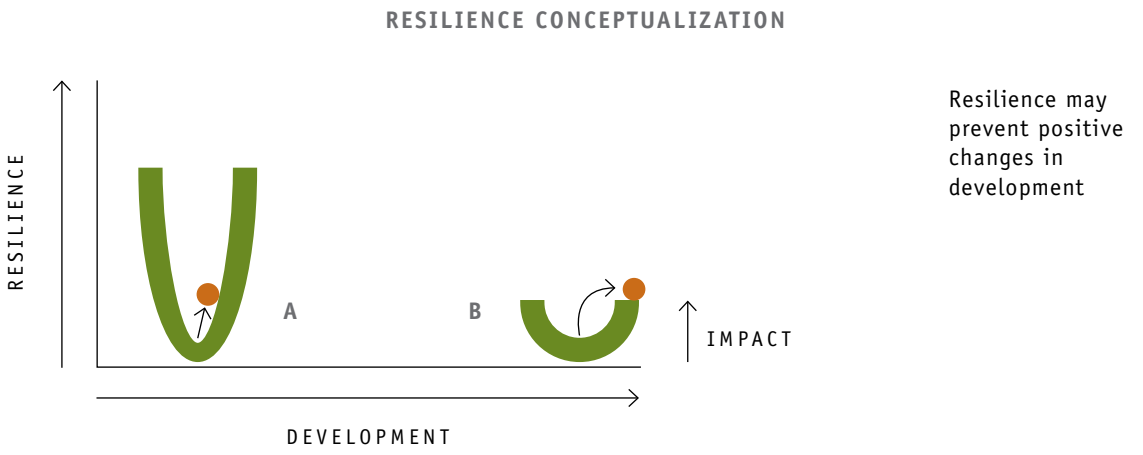
Figure 5. **Scope of resilience**

*We propose narrowing the focus to climate resilience of farming systems, defined here as the resilience of a system or part of a system to climate-related shocks and stresses, i.e. the ability to survive under, recover from, and even thrive in changing climatic condition***s** (ACCRN, online)**.**

Given the uncertainty surrounding future environmental (including climate) changes (Tyler and Moench, 2012), a focus on strengthening the general resilience of farming systems, i.e. the resilience of any and/ or all parts of a system to all kinds of shocks and stresses (Folke *et al.* 2010), is an appropriate goal. Yet, Luther *et al.* (2000) indicate a need for specificity in discussing resilient outcomes, for example educational resilience, emotional resilience and behavioural resilience.

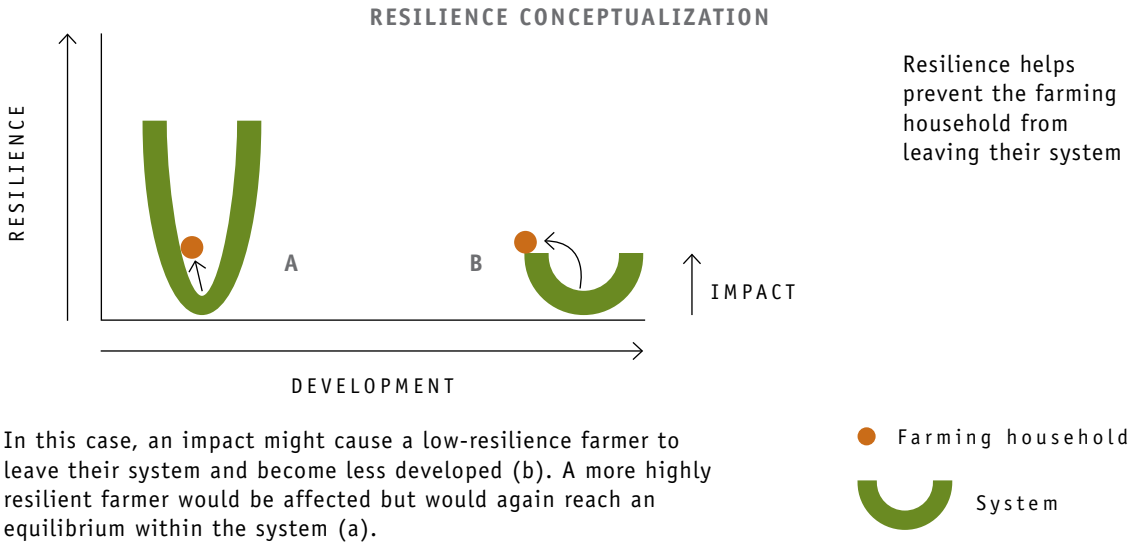
While the benefits of adopting a resilience framework to understand SES are well established in the literature (Carpenter *et al.* 2001; Berkes *et al.* 2003; Walker *et al.* 2006; Bahadur *et al.* 2010), there are also limitations to resilience to consider (see Figures 6, 7 and 8). These three figures present a conceptualization of resilience as an impact. Figure 6 demonstrates that resilience can prevent positive changes from occurring. In colloquial terms this could be said to keep a farmer "stuck in their ways". Figure 7 displays a situation in which strong resilience prevents a shock from moving a system towards a worse state. Figure 8 displays in conceptual terms the goal of SHARP and organizations such as FAO to both increase the resilience and the sustainable development of a farm system.

Figure 6. **Resilience may prevent improvements in farmers' or pastoralists' situations. Examples are shown of two hypothetical farm systems (a and b) with high and low resilience respectively. In the first case (farm system a) the resilient system may actually hinder development. The second case shows a more developed system that is not resilient. The ideal situation shown in Figure 8 would be high development and high resilience.**



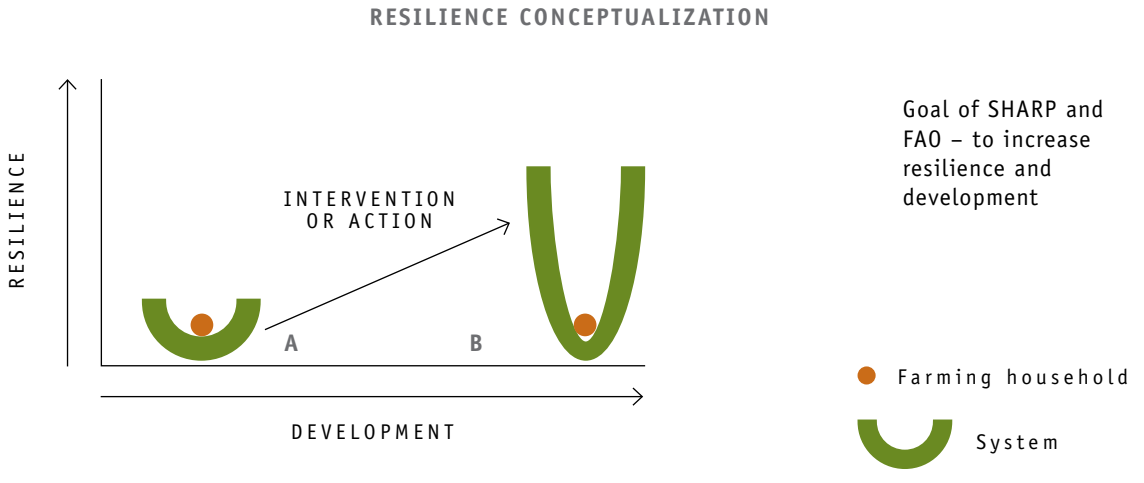
In this case, an impact might cause a low-resilience farmer to leave their system and become more developed (b). A more highly resilient farmer would be affected but would again reach an equilibrium within the system (a).

Figure 7. **Conceptualization of resilience and development. In this visualization an impact would move a farm household upwards along the y axis proportional to its size. In a resilient system, an impact that would in a low resilience system move the farming household out of their 'stable' system not greatly impact the farming household.**



In this case, an impact might cause a low-resilience farmer to leave their system and become less developed (b). A more highly resilient farmer would be affected but would again reach an equilibrium within the system (a).

Figure 8. **Visualization of the goals of SHARP and FAO (among other development organizations) to both increase resilience and development of farmers and pastoralists through moving the system to the right.**



3.2 LIMITATIONS TO RESILIENCE

In current policy and practice, there is a lack of shared understanding about what resilience is, how to build it and, linked to that, how to measure or characterise it. Some academic authors suggest that resilience is not something that can be meaningfully quantified or measured (Cabell and Oelosfe, 2012). Other criticisms stem from it becoming the new buzzword "*replacing sustainability as the ultimate objective of development*" (Béné *et al.* 2012: 8). When terms such as resilience gain popularity, meanings can become blurred and there is a risk of manipulation. For example, it has the potential to be co-opted to serve different interests rather than challenge forms of development (Béné *et al.* 2012). There is also growing concern that framing climate change debates in terms of resilience runs the risk of technical and apolitical solutions that ignore notions of equality and social justice (Miller *et al.* 2010).

In practice, resilience is usually viewed as a positive attribute. Yet this overlooks the idea that resilience can be desirable or undesirable (Carpenter *et al.* 2001; Walker *et al.* 2006). For example, areas depleted of natural resources are extremely resilient to change but may provide little in terms of food or income. Moreover, a system with highly polluted water supplies or governed under a dictatorship may be highly resilient, but undesirable or unjust. Resilience in this sense can act as a barrier to development, while development, depending on the form it takes and whose interests it serves, may also act as a barrier to increasing resilience.

Furthermore, in the same way that vulnerability should not be conflated with poverty (Carter, 2007), resilience does not equal poverty reduction (Béné *et al.* 2012). Resilience is not necessarily correlated with well-being, for example, a household may have managed to strengthen their overall resilience, but at the detriment of an individual's well-being (Béné *et al.* 2012). This highlights the importance of scale in resilience assessments and indicates that there may be 'winners and losers' within a system, often masked when a systems-based approach is used. Moreover, there is a temporal dimension to resilience, where strengthening resilience in the short term may reduce resilience/adaptive capacity in the long term (Cabell and Oelofse, 2012). In the context of climate change, this may be conceptualized as 'mal-adaptation' (Tompkins and Adger, 2003; Suckall *et al.* 2014).

Another limitation to resilience is the difficulty in adequately capturing social dynamics related to issues of power and agency (Leach, 2008). Agency, a term used to describe individuals' abilities to exercise a degree of choice or autonomy over their own lives, is often veiled in resilience debates. Instead, the focus is often on the SES rather than the choices made by individuals operating within a system (Coulthard, 2012).

Attempts have been made to better integrate social dimensions (Adger, 2003; Folke, 2006) into resilience, however, Duit *et al.* argue that "even though some similarities can be identified, societies and ecosystems are fundamentally different in many ways" (2010: 365). Alternatively, resilience may assume that social and ecological components of a system are inextricably linked. In the case of farming systems, the latter conceptualization is perhaps more relevant.

However, despite limitations, the concept of resilience is increasingly recognized as a central development objective alongside poverty reduction and economic growth (Béné *et al.* 2012). To maintain the positive connotations and strengthen resilience there needs to be a clear definition of

what is meant by resilience. Moreover, there should be further discussion and debate surrounding the relationship between resilience, development and other development goals, e.g. poverty reduction or sustainable livelihoods. Pelling (2011) proposes that resilience cannot be defined as buffering alone, as that would reinforce the status quo and existing practices. Our working definition of resilience is shown in Figure 9.

Figure 9. **Working definition of resilience for SHARP**

For the purposes of this work we overcome these negative connotations by including notions of change or transformation as central to our definition of resilience, which we propose as: ***the ability of a system to recover, reorganise and evolve following external stresses and disturbances*** *(based on Adger, 2000; Carpenter et al. 2001; Gunderson and Holling, 2002; Walker et al. 2004).*

In order to assess this ability, certain system properties, including social, ecological and institutional components, are important.

3.3 FARMING SYSTEMS AND RESILIENCE

A focus on farming systems research (FSR) emerged during the late 1960s and early 1970s recognizing that the adoption of research-based recommendations and knowledge exchanges remained low among smallholder farmers and therefore alternative approaches were needed to agricultural research and extension programmes (Collinson, 2000). This research approach recognizes that smallholder farmers do not behave like commercial farmers organized to interact with the wider market economy or articulate themselves politically (Collinson, 2000). Developments since then have included the emergence of FSR as an approach and set of tools to investigate farming systems as linked SES in which natural components refer to biological and biophysical processes linked to climate and soils, while social components underline the rules and institutions that mediate the human use of resources as well as the knowledge and perspectives that interpret natural systems (Berkes and Folke, 1998).

The Food and Agriculture Organization (FAO) has since adopted and built upon an FSR approach to research and extension services. FSR is aimed at first, generating appropriate locally-adapted technologies and solutions and second, involving smallholder farmers in the planning and evaluation process (Maxwell, 1986). Literature also highlights that a farming system is distinct from a farm system. A 'farm system' refers to an individual farm comprised of interrelated and interacting components, including a farm household. The term 'farming system' groups together individual farms that are similarly structured (Dixon *et al.* 2001). In contrast, Sumberg *et al.* (2013) calls for the emphasis to shift away from the homogeneity of farms within a farming system and instead recognize that differences exist. This, he argues, reflects the reality, where a "farm is likely to have links

(flows, synergies, dependencies etc.) to farms with dissimilar structure, as well as to non-agricultural and non-rural parts of the economy" (Sumberg *et al.* 2013). The important difference between farm systems and farming systems is the level of analysis, where farming systems, comprised of multiple interacting individual farm systems, operate at a larger scale than farm systems.

Farm systems are complex systems at the centre of the environmental, social and economic nexus, and are thus situated in both a historical context and wider natural, institutional and socio-economic environment (Darnhofer *et al.* 2013; Dixon *et al.* 2001). They have been exposed to past climatic and non-climatic shocks, trends and seasonality. At the centre of a farm system is a farm household (Darnhofer *et al.* 2013), where roles, history, culture, knowledge and preferences should be considered (Darnhofer *et al.* 2013). The way that the farm household management decisions and resource allocations are made influences the actual strategies and activities undertaken at the farm-scale.

3.4 OPERATIONALIZING RESILIENCE

Conceptualizing resilience as an outcome requires its consideration as not only a theoretical construct, but also as an operational concept, i.e. something that can be defined, characterised or measured. In practice, resilience frameworks and tools have been developed to assess, measure or characterise resilience. However, the implicit assumption that resilience is something that can be quantitatively measured is challenged in the literature (Cabell and Oelesfe, 2012). Therefore, we selected and reviewed three potential frameworks for characterising resilience to be used as a basis for SHARP: Tyler and Moench (2012), Heeks and Ospina (2010) and Cabell and Oelofse (2012). We note that while such frameworks use similar definitions of resilience, they use different approaches, conceptualizations and characteristics/indicators of resilience.

In recognition that few attempts have been made to operationalize resilience, Tyler and Moench (2012) developed a practical conceptual framework for urban climate resilience. They identify three elements of urban resilience: systems, agents and institutions. For each of these elements they propose resilience characteristics, which are then described and examples provided. As this framework was developed for urban systems, the assumption is that first a system is built, i.e. involves some form of physical structure(s), and second, that the three elements can be assessed independently. However, in other SES, e.g. a farming system, the way that agents and institutions interact determines the nature of an intangible, rather than a physical, system.

Based on a review of current resilience literature, Heeks and Ospina (2010) present three foundational sub-properties of resilience and six enabling sub-properties that facilitate the operationalization of the foundational attributes. Again, their focus is on urban areas, thus the applicability to farming systems cannot be assumed and was difficult to operationalize. Moreover, it is not clear to what extent the framework has been peer reviewed or tested in practice.

Cabell and Oelofse (2012) compile 13 behaviour-based indicators of agro-ecosystem resilience from the resilience literature, and include both ecological and social elements. They link the indicators to phases in the adaptive cycle, where absence of the indicators or limited capacity indicates a move away from resilience, thus creating contextual vulnerability. The framework can be

applied at multiple spatial scales and is appropriate for current and future assessments. Although the list of indicators is theoretically grounded, the framework has not been operationalized or tested (Personal communication, 2013). One further limitation of these indicators is that they potentially focus on the system itself rather than the context in which it is embedded. However, there are several advantages of Cabell and Oelofse's approach in relation to the other two approaches, which we have adapted to agro-ecosystem climate resilience:

- it focuses on agro-ecosystem resilience;
- apart from simply identifying indicators it also lays out how these should be operationalized;
- it conceptualizes resilience both as an outcome and as an inherent ability to adapt.

Despite theoretical and conceptual challenges, many practice and policy oriented organizations working on climate change have adopted the terms vulnerability and resilience, resulting in many tools aimed at assessing or measuring these concepts (Béné *et al.* 2012). For resilience in particular, the practical applications and tools do not match some of the conceptualizations and debates in the academic literature, as seen in Section 2. Although many resilience tools have been developed, policies often fail to take resilience into account (IISD, 2013). As a recent IISD (2013) report highlights, "disaster response strategies and policies targeting food security mainly focus on predicting and managing direct impacts of climate events on food production at the local level, and rarely contribute to building long-term resilience, especially among poor communities". This highlights the difference between conceptualizing resilience as an outcome rather than an inherent ability or concept embedded in context. Focussing on resilience as an outcome alone ignores opportunities to strengthen resilience, which we consider as critically important given the uncertainty surrounding future climate change.

Thus, resilience is not only an outcome which can be measured; it is also an ability or process. Concepts, such as social learning and adaptive management are said to be important as processes fostering resilience (Reed *et al.* 2010). Resilience thinking, rooted in the adaptive cycle, can be applied in practice to foster holistic, participatory and learning-based approaches to strengthening resilience. In line with this, resilience thinking is not only a system property or outcome, but can also be used to inform approaches to strengthen resilience. Used in this way, resilience approaches foster learning (Carpenter *et al.* 2001), flexibility (Wardekker *et al.* 2010), participation and empowerment (Tompkins and Adger, 2003; Fazey *et al.* 2007). **We therefore suggest that there are benefits to conceptualizing resilience as both an outcome and an inherent ability to adapt.** Furthermore, we recognize that resilience can be strengthened using an approach informed by elements of resilience thinking: flexibility, learning and participation.

Presenting the conceptual basis for SHARP provides a starting point for developing the SHARP methodology. What follows is a broad overview of SHARP and its history as well as outlining the methodology of operationalizing SHARP.

04

SELF-EVALUATION AND HOLISTIC ASSESSMENT OF CLIMATE RESILIENCE OF FARMERS AND PASTORALISTS (SHARP)

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4.1 SHARP GOALS

Goal of SHARP

During the literature review process, the goal and principles of SHARP were developed. The overall goal of SHARP is **to assess and increase the resilience of farmers and pastoralists to climate change.**

Principles of SHARP

The development of SHARP used the following considerations during its development as a result of lessons learned (Section 2 of this document):

1. A holistic approach to understanding farm system resilience;
2. A farm / farmer centred approach integrated to understanding past and present contexts;

3. General resilience as a system property, while climate resilience as a specific property;
4. A participatory, flexible and knowledge exchange and learning approach to project planning, implementation and monitoring and evaluation;
5. Stakeholder engagement practices, and;
6. That climate resilience does not equal development.

Although the first phase of SHARP (see Section 6 for the description of the phases) is in its simplest form a survey and focused on providing a baseline of current practices, Phases 2 and 3 use the data from Phase 1 and this goal and principles to guide their implementation. The goal and principles provide a process through which measures that contribute to them may be identified. For an in-depth look at the set-up of themes, objects and indicators of SHARP and how SHARP relates to other related tools and frameworks, please see Annex 1.

4.2 EVOLUTION OF SHARP

A workshop was held in Burkina Faso from May 21st to May 23rd 2013 with key partners to develop SHARP (then referred to as **Outil d'évaluation de la résilience des paysans au changement climatique** "FARS") (see Annex 7 for a list of participants). The present document has evolved from the working documents prepared in the workshop and has been revised with internal FAO input as well as through feedback from numerous external partners and a partnership with researchers from the University of Leeds. The original Theme/ Object/ Indicator list, first developed at the workshop, provided the basis of the SHARP survey shown in Section 7. The list has been operationalized and expanded so that farmers or pastoralists and AP/FFS facilitators can answer the survey while still providing robust scientific results linked to Cabell and Oelofse (2012)'s resilience framework through which FAO and other organizations can identify areas of strong climate change resilience and areas that need improvement. Having received feedback from partners inside and outside of FAO, testing missions were carried out in both Uganda and Senegal in September 2013 and again in March 2014 in Uganda and Mali. This enabled SHARP to be tested under different conditions to ensure its adequacy in addressing the resilience of the farming as well as pastoralist systems. The four missions followed the same general schedule outlining the theory of resilience used in SHARP as well as the proposed tool, followed by discussions and feedback, trialling SHARP with farmers and pastoralists, followed by further input and discussions with farmers, pastoralists and local staff. A Letter of Agreement with the University of Leeds, UK, enabled a researcher with experience in agricultural resilience to accompany FAO staff to Uganda and to provide academic support through a literature review, gap analysis and authoring a peer-reviewed article on resilience measurement tools (Dixon and Stringer, 2015). This has ensured that FAO includes the latest thinking in resilience assessments and targets the most effective niche to assess the climate resilience of farmers and pastoralists while avoiding duplicating previous tools and programmes.

SHARP was piloted in Angola in March-April 2015, and will soon be fully implemented in the country. A further pilot implementation is planned for mid-2015 in Niger followed by further implementation.

4.3 WHAT IS SHARP?

SHARP is a climate resilience self-assessment tool for farmers and pastoralists in developing countries. SHARP is conducted predominantly at the individual farmer/ pastoralist level. It assess farmers' and pastoralists' current state of resilience to climate change, while at the same time allowing for reflection on experiences to help tailor actions and interventions aimed at increasing their resilience. It combines a self-assessment with an "academic" assessment of resilience based on Cabell and Oelofse's resilience indicators (2012). It uses a holistic approach to resilience and will allow for locally customized adaptation strategies. Due to its nature as a self-assessment tool, it is not a traditional project monitoring and evaluation tool, but its design and information could be a valuable addition for project monitoring and evaluation as well as project design. Disaster risk reduction assessments have started to be integrated into international non-governmental organization (NGO) operations including vulnerability analyses (Gubbels, 2011). SHARP complements these practices but focuses not only on single crises, but rather on increasing climate resilience in a holistic manner over the long-term that could include multiple crises and continual change. By focusing on long-term changes and impacts, the importance of policies, practices and legal frameworks and institutions to support long-term climate change resilience should be noted. In the context of SHARP we incorporate four assessment areas: governance, environmental, social, and economic themes as well as a fifth general information section.

Figure 10. **The Purpose of SHARP**

Many farmers and pastoralists live in precarious situations where small climatic events can disrupt their practices and result in negative impacts on their already challenging livelihoods (IIED, 2013). The purpose of SHARP is to understand the current level of resilience of farmers and pastoralists while determining how their adaptive capacity can be increased and their vulnerability decreased in order to improve their climate resilience. SHARP goes beyond traditional gap analyses by also identifying options and raising awareness on best practices for farmers and pastoralists to increase their resilience.

4.4 THE PURPOSE OF SHARP

SHARP works to increase resilience to climate variability and the uncertainties associated with future climate change at three levels: local, regional (AP/FFS) and national/international.

1. **Local**: SHARP is designed so that a SHARP assessment can be undertaken by farmers and pastoralists with as little input from experts (e.g. AP/FFS facilitators, or their equivalent who will distribute and collect the assessments, and provide assistance where necessary) as possible. Training sessions will be organized to ensure that the questions are understood in the same way by all facilitators as well as ensuring consistent translation of SHARP into local languages.

Despite potentially large variations in education and awareness, farmers and pastoralists should be able to understand the results of the assessment and use this information to decide on areas for improvement and change their activities and practices accordingly. More difficult changes may be made with the help of facilitators and through future development projects. At the same time, the assessment itself will be a learning experience for farmers and pastoralists helping already to increase participants' resilience.

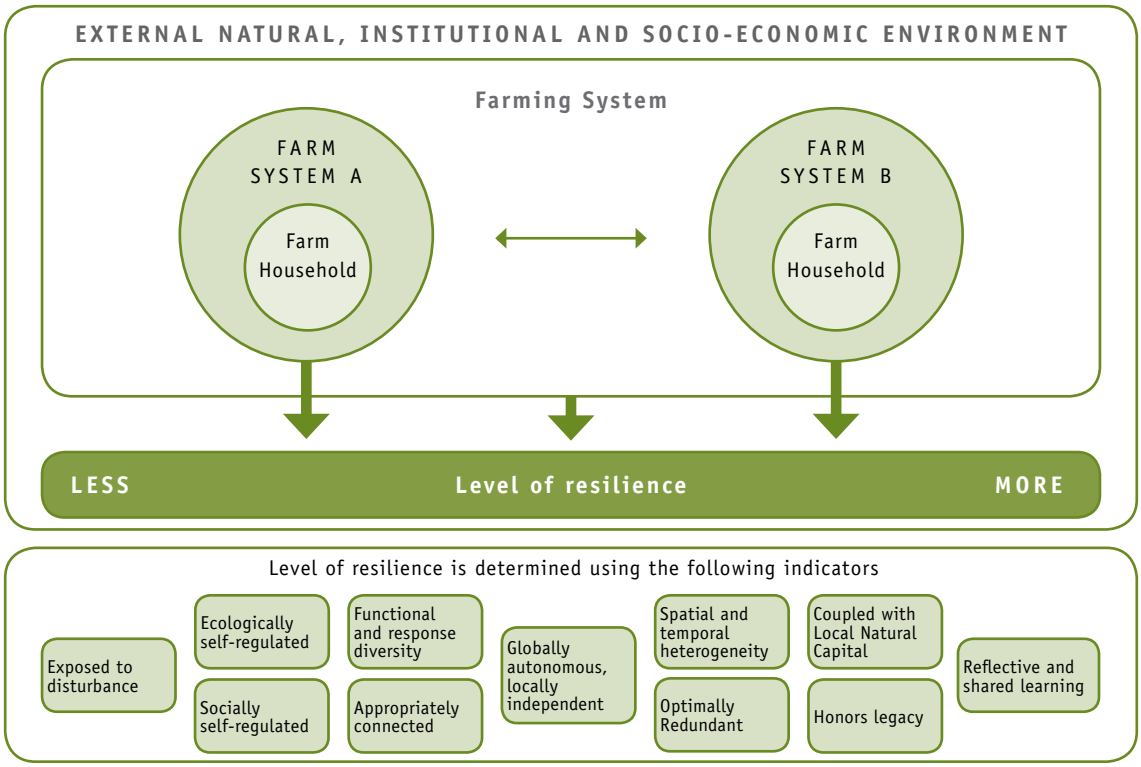
2. **Regional** (AP/FFS): AP/FFS are designed to be specific to the needs of each region (e.g. watershed or community within a country) in which they are held. Results from a SHARP analysis carried out with participants of an AP/FFS can subsequently be used to help inform future AP/FFS curricula in order to incorporate locally-tailored capacity development, leading to greater climate resilience.
3. **National and international**: SHARP will provide a database of anonymised responses from which future projects and programmes will be able to draw on to improve their ability to meet local needs. Successful practices will be more easily shared with other projects. In the greater institutional context, SHARP will contribute to achieve FAO's Strategic Objectives 2,3, and 5 and could potentially be incorporated by GEF and donor countries to assess the effects of their actions on farmers' climate-resilience as a complementary tool to ongoing monitoring and evaluation efforts. This primary dataset of farmers' and pastoralists' opinions will be married with external data (especially climate change models) to create a participatory, integrated (bottom up and top down) approach to developing programmes. Legal frameworks and institutions can also be improved on the regional and national/international levels to increase climate resilience.

The data collected from the farmers and pastoralists will be held confidential and anonymised wherever appropriate. Furthermore, measures will be taken to ensure that farmers can consent or reject to the use of their data in Phases 2 and 3. In order to address the needs of each participant and perform a rapid assessment the data will have to be matched to each participant. However, after the rapid assessment, the data will be made anonymous where the responses will be compared at the aggregate level. At this level, the data will be identified to the community/AP/FFS level to compare curricula and geographic differences.

4.5 THE CONCEPTUAL BASIS

Our integration of farming system and resilience approaches, which is based on the farming system conceptualizations of Dixon *et al.* (2001) and the agro-ecosystems resilience indicators proposed by Cabell and Oelofse (2012), is presented in Figure 11. In any conceptualization of resilience, Carpenter *et al.* (2001) suggest that the boundaries of the system need to be spatially well defined and the time scale specified. Although we focus on strengthening climate resilience, the means through which we achieve it is through a learning based approach, rooted broadly in resilience thinking. In order to recover, reorganise and evolve in an uncertain future, farming systems need certain properties. To assess these properties we use agro-ecosystem indicators proposed by Cabell and Oelofse (2012).

Figure 11. **Conceptualization of farming systems and resilience adapted from Dixon *et al.* (2001) and the agro-ecosystem resilience indicators proposed by Cabell and Oelofse (2012). The figure shows that a farming system is comprised of multiple interacting farm systems, embedded in an external environment. The resilience of both individual farm systems and farming systems could be assessed to determine a level of resilience. The focus of SHARP is individual farm/ pastoral system resilience.**



Based on the literature review presented in Section 3 of this document we propose the following:

Working Definition of Resilience for SHARP:

For the purposes of this work we include notions of change or transformation as central to our definition of resilience, which we propose as: **the ability of a system to recover, reorganise and evolve following external stresses and disturbances** (following: Adger, 2000; Carpenter *et al.* 2001; Gunderson and Holling, 2002; Walker *et al.* 2004).

We therefore suggest that there are benefits to conceptualizing resilience as both an outcome and inherent ability to adapt.

The SHARP indicators (Table 7) come from an extensive review of resilience literature conducted by Cabell and Oelofse (2012) and were selected based on their relevance to agro-ecosystems, i.e. farming system resilience. We argue that these general agro-ecosystem indicators can be used as a basis for strengthening the climate resilience of farming systems. We use these definitions to develop questions that form part of the SHARP assessment methodology.

SHARP is not only an assessment tool, but also a method for developing context-specific, therefore locally relevant, resilience goals, strategies and indicators.

Facilitators and farmers or pastoralists can use resilience indicators (Table 7) to identify relevant goals, strategies and indicators, thus working towards strengthening resilience. Farmers or pastoralists could rank and prioritise goals and actions for themselves, thus empowering farmers to strengthen their own resilience. As farmers or pastoralists would be involved in setting the goals, designing the strategies and developing the indicators, farmers and pastoralists would thus be empowered to measure their own progress, potentially with assistance from FAO and/or other stakeholders. These steps would be part of Phase 2 of SHARP (see Section 6).

4.6 PARTICIPATION

The scientific literature points to a number of benefits for employing participatory approaches in the fields of development, environmental and natural resource management (Stringer *et al.* 2006; Lynam *et al.* 2007; Weaver and Cousins, 2007; Reed, 2009; Reed *et al.* 2010; Chambers, 2014). The case for participation is broadly made by two classes of arguments – instrumental or pragmatic ones, arguing that the outcomes of more participatory processes are better – and normative-political ones, defending participation based on a normative argument for democratic processes and social justice (Lynam *et al.* 2007; Weaver and Cousins, 2007; Reed, 2009). The four typologies of participation outlined by Reed are shown in Table 6.

Table 6. **Typologies of participation (Reed, 2008)**

BASIS OF TYPOLOGY	EXAMPLE
1. Typology based on different degrees of participation on a continuum. Numerous alternative terms suggested for different rungs of the ladder (e.g. Biggs, 1989; Pretty, 1995a; 1995b; Farrington, 1998; Goetz and Gaventa, 2001; Lawrence, 2006).	Arnstein's (1969) ladder of participation. Sometimes presented as a wheel of participation (Davidson, 1998).
2. Typology based on nature of participation according to the direction of communication flows.	Rowe and Frewer, 2000.
3. Typology based on theoretical basis, essentially distinguishing between normative and/or pragmatic participation.	Thomas, 1993; Beierle, 2002.
4. Typology based on the objectives for which participation is used.	Okali *et al.* 1994; Michener, 1998; Warner, 1997; Lynam *et al.* 2007; Tippet *et al.* 2007.

Based on both types of arguments an effort has been made to design both the development and the implementation of SHARP in a participatory manner. Regarding the implementation of SHARP, the fact that it is mostly foreseen to be implemented in the context of Agro-pastoral/ Farmer Field Schools, which ideally use a "participatory-based education (CBE) approach" (Settle *et al.* 2014) should strengthen its participatory aspects.

05 METHODOLOGY

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5.1 INDICATORS

Due to the difficulty in directly measuring resilience (Bennett *et al.* 2005; Cumming *et al.* 2005; Carpenter *et al.* 2006; Fletcher *et al.* 2006; Darnhofer *et al.* 2010a), SHARP uses indicators adapted from Cabell and Oelofse (2012) (see Table 7). These indicators assess components of resilience that when combined give a representation of resilience. An exercise was conducted in which field-tested questions from SHARP were categorized into the 13 indicator groups (Table 8). This enabled us to see how well they fit, which questions were extraneous for assessing resilience and where more or different questions were needed. Significant effort was made to engage with experts in different fields and teams who developed other assessment methods (e.g. The LADA team to support the land degradation component) as well as through e-discussions, interviews and practical testing in the field. This process helped us first develop a list of questions as well as refining the number, type and wording of these questions.

Table 7. **Indicators for assessing the resilience of agro-ecosystems**

INDICATOR (SOURCES)	DEFINITION	IMPLICATIONS	WHAT TO LOOK FOR
1. **Socially self-organized** (Levin, 1999; Holling, 2001; Milestad and Darnhofer, 2003: Atwell *et al.* 2010; McKey *et al.* 2010)	The social components of the Agro-ecosystem are able to form their own configuration based on their needs and desires	Systems that exhibit greater level of self-organization need fewer feedbacks introduced by managers and have greater intrinsic adaptive capacity	Farmers and consumers are able to organize into grassroots networks and institutions such as co-ops, farmer's markets, community sustainability associations, community gardens, and advisory networks

INDICATOR (SOURCES)	DEFINITION	IMPLICATIONS	WHAT TO LOOK FOR
2. **Ecologically self-regulated** (Ewel, 1999: Jackson, 2002; Swift *et al.* 2004; Jacke and Toensmeier, 2005; Sundkvist *et al.* 2005; Glover *et al.* 2010; McKey *et al.* 2010)	Ecological components self-regulate via stabilizing feedback mechanisms that send information back to the controlling elements	A greater degree of ecological self-regulation can reduce the amount of external inputs required to maintain a system, such as nutrients, water, and energy	Farms maintain plant cover and incorporate more perennials, provide habitat for predators and parasitoids, use ecosystem engineers, and align production with local ecological parameters
3. **Appropriately connected** (Axelrod and Cohen, 1999; Holling, 2001; Gunderson and Holling, 2002; Picasso *et al.* 2011)	Connectedness describes the quantity and quality of relationships between system elements	High and weak connectedness imparts diversity and flexibility to the system; low and strong impart dependency and rigidity	Collaborating with multiple suppliers, outlets, and fellow farmers; crops planted in polycultures that encourage symbiosis and mutualism while providing movement corridors.
4. **Functional and response diversity** (Altieri, 1999; Ewel, 1999; Berkes *et al.* 2003; Luck *et al.* 2003; Swift *et al.* 2004; Folke, 2006; Jackson *et al.* 2007; Di Falco and Chavas, 2008; Moonen and Barbieri, 2008; Chapin *et al.* 2009; Darnhofer *et al.* 2010*b;* McIntyre, 2009)	Functional diversity is the variety of ecosystem services that components provide to the system; response diversity is the range of responses of these components to environmental change	Diversity buffers against perturbations (insurance) and provides seeds of renewal following disturbance	Heterogeneity of features within the landscape and on the farm; diversity of inputs, outputs, income sources, markets, pest controls, etc.
5. **Optimally redundant** (Low *et al.* 2003; Sundkvist *et al.* 2005; Darnhofer *et al.* 2010*b;* Walker *et al.* 2010)	Critical components and relationships within the system are duplicated in case of failure	Also called response diversity; redundancy may decrease a system's efficiency, but it gives the system multiple back-ups, Increases buffering capacity, and provides seeds of renewal following disturbance	Planting multiple varieties of crops rather than one, keeping equipment for various crops, getting nutrients from multiple sources, capturing water from multiple sources
6. **Spatial and temporal heterogeneity** (Alcorn and Toledo, 1998; Devictor and Jiguet, 2007; Di Falco and Chavas, 2008)	Patchiness across the landscape and changes through time	Like diversity, spatial heterogeneity provides seeds of renewal following disturbance; through time, it allows patches to recover and restore nutrients	Patchiness on the farm and across the landscape, mosaic pattern of managed and unmanaged land, diverse cultivation practices, crop rotations
7. **Exposed to disturbance** (Gunderson and Holling, 2002; Berkes *et al.* 2003; Folke, 2006)	The system is exposed to discrete, low-level events that cause disruptions without pushing the system beyond a critical threshold	Such frequent, small-scale disturbances can increase system resilience and adaptability in the long term by promoting natural selection and novel configurations during the phase of renewal; described as "creative destruction"	Soil and pest management that allows a certain controlled amount of invasion followed by selection of plants that fared well and exhibit signs of resistance

INDICATOR (SOURCES)	DEFINITION	IMPLICATIONS	WHAT TO LOOK FOR
8. **Coupled with local natural capital** (Ewel, 1999; Milestad and Darnhofer, 2003; Robertson and Swinton, 2005; Naylor, 2009; Darnhofer *et al.* 2010*a,b;* van Apeldoorn *et al.* 2011)	The system functions as much as possible within the means of the bioregionally available natural resource base and ecosystem services	Responsible use of local resources encourages a system to live within its means; this creates an agro-ecosystem that recycles waste, relies on healthy soil, and conserves water	Builds (does not deplete) soil organic matter, trees, recharges water, little need to import nutrients or export waste
9. **Reflective and shared learning** (Berkes *et al.* 2003; Darnhofer *et al.* 2010*b;* Milestad *et al.* 2010; Shava *et al.* 2010)	Individuals and institutions learn from past experiences and present experimentation to anticipate change and create desirable futures	The more people and institutions can learn from the past and from each other, and share that knowledge, the more capable the system is of adaptation and transformation, in other words, more resilient	Extension and advisory services for farmers; collaboration between universities, research centers, and farmers; cooperation and knowledge sharing between farmers; record keeping; baseline knowledge about the state of the agro-ecosystem
10. **Globally autonomous and locally interdependent** (Milestad and Darnhofer, 2003; Walker *et al.* 2010; van Apeldoorn *et al.* 2011)	The system has relative autonomy from exogenous (global) control and influences and exhibits a high level of cooperation between individuals and institutions at the more local level	A system cannot be entirely autonomous but it can strive to be less vulnerable to forces that are outside its control; local interdependence can facilitate this by encouraging collaboration and cooperation rather than competition.	Less reliance on commodity markets and reduced external inputs; more sales to local markets, reliance on local resources; existence of farmer co-ops, close relationships between producer and consumer, and shared resources such as equipment
11. **Honours legacy** (Gunderson and Holling, 2002; Cumming *et al.* 2005; Shava *et al.* 2010; van Apeldoorn *et al.* 2011)	The current configuration and future trajectories of systems are influenced and informed by past conditions and experiences	Also known as path dependency, this relates to the biological and cultural memory embodied in a system and its components	Maintenance of heirloom seeds and breeds and engagement of elders, incorporation of traditional cultivation techniques with modern knowledge
12. **Builds human capital** (Buchmann, 2009; Shava *et al.* 2010; McManus *et al.* 2012)	The system takes advantage of and builds "resources that can be mobilized through social relationships and membership in social networks" (Nahapiet and Ghoshal, 1998)	Human capital includes: constructed (economic activity, technology, infrastructure), cultural (individual skills and abilities), social (social organizations, norms, formal and informal networks)	Investment in infrastructure and institutions for the education of children and adults, support for social events in farming communities, programmes for preservation of local knowledge
13. **Reasonably profitable**	The segments of society involved in agriculture are able to make a livelihood from the work they do without relying too heavily on subsidies or secondary employment	Being reasonably profitable allows participants in the system to invest in the future; this adds buffering capacity, flexibility, and builds wealth that can be tapped into following release	Farmers and farm workers earn a liveable wage; agriculture sector does not rely on distortionary subsidies

Adapted from Cabell and Oelofse, 2012

Table 8. **Table linking the 13 resilience indicators to SHARP indicators, questions, answers/units and preliminary scales. There are other components to the questions that are not shown here that collect relevant information, but are not used to quantify resilience.**

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
1. Socially self-organized Farmers and consumers are able to organize into grassroots networks and institutions such as co-ops, farmer's markets, community sustainability associations, community gardens, and advisory networks	1.1 Group membership	34. Are you a member of any groups, organizations or associations? + for each give provide the name and degree of participation (Leader, Very Active, quite Active, Not active)	# of groups which have at least 'quite active' participation level	# ticked from all options given in table	0= 0, 1= 7, 2+= 10
	1.2 Functions of groups	34. Counted from group membership list	# of different types of groups	E.g. credit, seed bank, insurance common marketing/processing, social insurance scheme, food production, food utilisation	0= 0, 1= 4, 2= 7, 3+= 10
		34. Were any of those groups initiated/started by your community?	Whether any group was initiated by the individual	Yes/ No	Yes= 10, No= 0
	1.3 Access to local farmers markets	39. Do you have access to local farmers' market?	Degree of market access for selling	No access, Intermittent, Sustained access	No access= 0 Intermittent= 4 Sustained access= 10
	1.4 Previous collective action	12. Crop and livestock losses: over the past 10 years have you lost a significantly large portion of your crops/ livestock?	Whether internal coping strategies are used	Yes/ No (N/A if did not experience loss)	Yes= 10, No= 0
		38. When there were common issues in your village or neighbourhood that needed attention during the last year, how often did you join together with others to address them?	Frequency (and presence) of collective action	Never, Rarely, Sometimes, Frequently, or Not applicable	Never= 0, Once= 4, A couple of times= 7, Frequently= 10
	1.5 Access to communal resources	22. Water access: number and type of water source	# of water points that are accessible	# of types; e.g. well, dam, river, lake	0= 0, 1= 2, 2= 6, 3+= 10
		25. Land access: Total accessible agricultural land if applicable (hectares)	Area of community land accessible	# inserted in: 'Community land' column,	0 ha= 0; >0= 10

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
2. Ecologically self-regulated Farms maintain plant cover and incorporate more perennials, provide habitat for predators and parasitoids, use ecosystem engineers, and align production with local ecological parameters	2.1 Perennial crops	5. Do you grow perennial crops (plants that can live several years)?	Whether perennial crops are grown	Yes/ No	Yes= 10, No= 0
	2.2 Origin of species used	10. Approximately what percentage of your crops is a newly-introduced variety?	% of non-local species/ varieties used	Average % given across both crops and animals	0-25%= 10, 25-50%= 6, 50-75%= 3, 75-100%= 1
		10. Approximately what percentage of your animal breeds is newly-introduced?	% of non-local species/ varieties used		
	2.3 Synthetic pesticide use/ disposal	18. Have you used synthetic pesticides over the last cropping season? + Did you look for pests/ diseases on your crops before spraying?	Whether different types of pesticides are used, and whether the farmer looks for pests/diseases before spraying	Yes/ No Yes/ No for different types of pesticide (insecticide, herbicide, fungicide)	Use pesticide: yes + do you look for pest: No= 0; Use of pesticide: Yes+ do you look for pest: Yes= 5; Use of pesticide: No= 10
		18. What do you do with the containers after you have used the products?	Pesticide disposal	Options from list	Taken empty to a hazardous waste collection centre = 10, Thrown in trash = 6, Reused, thrown in river, thrown on ground = 0
	2.4 Use of nitrogen fixing legumes/ plants and natural fertilizers	28. Do you have any leguminous plant growing on your farmland? + If yes, did you plant it?	Presence and use of leguminous plants	Yes/ No answers to the two questions	Yes to first question+ Yes to second question= 10 Yes to first question + No to second question = 5 No to first question + No to second question =0
	2.5 Buffer zones	29. Is your land bordered by wild/ unmanaged land? If so, have you observed many plants and insects on that land?	Existence of buffer zones and observance of wild plant/ insect species	None of it Some of it Most of it All of it	None of it = 0 Some + No = 2 Some + Yes = 5 Most + No =4 Most + Yes = 6 All + No = 7.5 All + Yes = 10
	2.6 Fertilizer use	32. 1) Did you use synthetic inorganic fertilizers this season? 32) If you do use fertilizer, do you check the soil and plants first to see whether they need it?	Type and use of fertilizers	1) Yes/ No 2) Yes/ No	Yes synthetic + Yes organic= 5 Yes synthetic + No organic= 2.5 No synthetic + No organic= 0 No synthetic + Yes organic= 10
		32. Did you use natural fertilizers this season?	Natural fertilizers use	Yes/ No	Yes synthetic + Yes organic= 5 Yes synthetic + No organic= 2.5 No synthetic + No organic= 0 No synthetic + Yes organic= 10

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
2. Ecologically self-regulated Farms maintain plant cover and incorporate more perennials, provide habitat for predators and parasitoids, use ecosystem engineers, and align production with local ecological parameters	2.7 Agroforestry	11. Approximately, how many trees have you planted in your farm system?	# of trees planted on farm	#	0= 0, 1-10%= 2, 11-20%= 7, 21-40%= 10, 41-60%= 7, 60%+= 1
		11. Have you planted more than one specie?	Whether more than one specie was planted	Yes/No	Yes= 10, No= 0
		11. In general what overall percentage of your land is covered by trees – including natural and planted?	% of land covered by trees	#	0%= 0 1-10%= 2 11-25%= 6 >25%= 10
	2.8 Energy sources	30. Which energy sources are used in your farm system?	# of environmentally friendly energy sources used	Environmentally friendly options out of list are: Solar, wind, wood residues, manure, agricultural resides and domestic waste, wind, biogas	0= 0 Solar= 4 Domestic waste= 4 Agricultural residues= 4 Wood residues= 4 Manure= 4 Other options= 3 2+= 10 (maximum of 10)
3. Appropriately connected Collaborating with multiple suppliers, outlets, and fellow farmers; crops planted in polycultures that encourage symbiosis and mutualism	3.1 Seed/breed sources	9. In general which sources do you have access to? (seeds)	# and type of seed sources	# and type	1= 4 (if own production), 2 (if other sources) 2 (of any type)= 6 3+ (of any type)= 10
		9. In general which sources do you have access to? (livestock)	# and type of livestock sources	# and type	1= 4 (if own production), 2 (if other sources) 2(of any type)= 6 3+ (of any type)= 10
	3.2 Intercropping	19. Do you grow two or more crops in association?	Whether intercropping is practiced	Yes/ No	Yes= 10, No= 0
		19. Do you grow plants in association with aquaculture (rice-fish farming)?	Whether plants are grown in association with aquaculture	Yes/ No	Yes= 10, No= 0
	3.3 Access to information	39. How often did you have access to information on market prices over the last season?	Access to market information	Often, sometimes, very rarely/never	Often= 10 Sometimes= 5 Very rarely/never= 0
		15. Do you have access to weather forecast services?	Access to weather forecast services	Yes/ No	Yes= 10, No= 0
		15. Do you have access to information on cropping/livestock practices? If yes, how do you get this information?	Access to and sources of information on cropping/ livestock practices	Yes/ No # of sources	0= 0, 1= 4, 2= 8 3+= 10.
		50. Do you have access to Information and Communication Technologies? (ICTs)	Access to ICTs	# of 'Yes' across ICTs options	0= 0, 1+= 10

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
3. Appropriately connected Collaborating with multiple suppliers, outlets, and fellow farmers; crops planted in polycultures that encourage symbiosis and mutualism	3.4 Veterinary access	37. Do you have access to veterinary services?	Level of access to veterinary services	Yes and it is good quality; Yes but it is problematic; No	No= 0, Yes, but it is problematic (unqualified personnel, expensive, distant, etc.)= 5; Yes, and it is of good quality, affordable and nearby= 10
	3.5 Trust and cooperation	45. In your village/ neighbourhood do you generally trust others in matters of lending and borrowing?	Level of trust in the community	Yes/ No	Yes=10, No=0
		45. Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?	Level of trust in the community	Options: People can be trusted You can't be too careful	People can be trusted= 10 You can't be too careful= 0
		45. If a community project does not directly benefit you but has benefits for many others in the village/neighbourhood, would you contribute time or money to the project?	Level of involvement in communal activities	Options to count from are: Time, Money, None, Other. Number of responses (not including "None")	0= 0 1= 8 2= 10
4. Functional and response diversity Heterogeneity of features within the landscape and on the farm; diversity of inputs, outputs, income sources, markets, pest controls, etc.	4.1. Species diversity	6. Approximately, how many animals do you own? [per category]	# of animals owned per category	Average of scores for #species, #breeds	Species: 1= 0, 2= 4, 3= 7, 4+= 10 Breeds: 1-5= 3, 6-10= 8, 11+= 10
		4 Do you practice aquaculture? If yes, what species do you manage?	Whether they practice aquaculture and # of different managed species	# count from first row of table	1= 0, 2= 4, 3= 7, 4+= 10
		5. Do you have more than one variety of this crop?	Whether more than one crop variety is cultivated	Yes/No	Yes= 10, No= 0
		11. Approximately how many trees have you planted in your farm system? Of which species?	# of different managed species	# count from list	0= 1, 1= 3, 2= 5, 3= 7, 4= 9, 5+= 10
		29. 1) Is your land bordered by wild/ unmanaged land? 2) If so, have you observed many plants and insects on that land?	Combination of different option answers given to these two questions	1) All of it, Most of it, Some of it, None of it 2): Yes/ No	None of it= 0 Some + No= 2 Some + Yes= 5 Most + No= 4 Most + Yes= 6 All + No= 7.5 All + Yes= 10
		33. How many types of invasive weed species have you observed in your field in the past 10 years	# of types of persistent and damaging weeds species	#	0= 10, 1= 8, 2= 6, 3= 4, 4= 2, 5+= 0

[1] Diversity Index based on: # of different managed species (includes all major types) and abundance for each. For more details on the calculation of the index see: www.nuffieldfoundation.org/sites/default/files/19_Ecology.pdf

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
4. Functional and response diversity Heterogeneity of features within the landscape and on the farm; diversity of inputs, outputs, income sources, markets, pest controls, etc.	4.2 Agriculture categories	3. Do you usually carry out any of these activities on your farm?	# of different activities carried out	Livestock, crops, trees, bee keeping, fish pond-aquaculture	1= 0, 2= 5, 3= 7, 4+= 10
	4.3 Income sources	52. How many different income sources did you have over the past year?	# of different income sources	0,1,2,3,4,5,6+ - Agriculture production, labour/daily wages, livestock, petite trade/ shop keeper	1= 0, 2= 5, 3+= 10
	4.4 Types of pest/ animal disease control	16. What types of animal disease control methods do you use?	Different types of control used	# from list	0= 0, 1= 5, 2= 7, 3+= 10
		17. What pest control practices did you use over the last cropping season?	Different types of pest control practices used	# from list	0= 0, 1= 5, 2= 7, 3+= 10
5. Optimally redundant Planting multiple varieties of crops rather than one, keeping equipment for various crops, getting nutrients from multiple sources, capturing water from multiple sources	5.1 Varietal diversity	6. Livestock breeds/varieties: Do you have more than one breed of this specie?	Whether more than one breed per specie is owned	Yes/No	Yes= 10, No= 0
		4. Do you practice aquaculture? If yes, do you manage more than one specie?	Whether more than one specie is managed	Yes/No	Yes= 10, No= 0
		5. Crop varieties/landraces- How many different varieties do you cultivate?	# of crop varieties across crop species	Total number of crop varieties/total number of crop species	1= 0 2= 8 3+= 10
		11. Have you planted different varieties of the same tree species?	# of different managed varieties	Yes/ No	Yes= 10, No= 0
	5.2 Market access - selling	48. Last year, did you sell any of your crops/ livestock/seeds? If yes, which ones?	Whether products were sold and which types	# e.g. sorghum, millet, chickens	0= 0, 1=2, 2= 4, 3= 6, 4+= 10 N/A (if answered 'No' to initial question)
	5.3 Water sources	22. Water sources: types of water source access	# of accessible water sources	# of types; e.g. well, dam, river, lake	0= 0, 1= 2, 2= 6, 3+= 10
	5.4 Energy sources	30. Which energy sources are used in your farm system?	# of energy sources	# count out of all options given in the list	0= 0, 1= 3, 2= 6, 3+= 10

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5. Optimally redundant Planting multiple varieties of crops rather than one, keeping equipment for various crops, getting nutrients from multiple sources, capturing water from multiple sources	5.5 Land management practices	27. Which land management practices do you use?	# of land management practices used	#	0= 0, 1= 3, 2= 6, 3+= 10
	5.6 Sources of fertilizers	32. Where do you source your fertilizers from?	# of different sources	# selected options count from table: Farm; Shop; Aid; Friends. Neighbours; Extension worker; Directly from seller.	1= 0, 2= 5, 3+= 10
	5.7 Major productive assets owned/ accessible	43. Rank by importance the major productive assets that you own (1= most important, 6=less important)	# of productive assets owned	# of productive assets owned Land Livestock Seeds Buildings Equipment Others	1= 4 2= 7 3+ =10
		25. Total area of accessible agricultural land: private plots	Area of private land accessible	# ha inserted in 'Private plots' column, 'Total accessible agricultural land, if applicable (hectares)'row	0= 0 0.1-1= 2 1.1-5= 5 >5= 10
	5.8 Seed/Livestock access	9. In general which sources do you have access to? (seeds)	# of different sources	#of sources selected	1= 0, 2= 5, 3+= 10
		9. In general which sources do you have access to? livestock)	# of different sources	# of sources selected	1= 0, 2= 5, 3+= 10
	5.9 Human nutrition	35. Did anyone in the household eat the food in question over the last day and night?	Household Dietary Diversity Score (HDDS) going from 0 to 12	Yes/ No for each food category in list. There are 12 categories of foods, so HDDS goes from 0 to 12	If HHDS= 1,score= 0; if HHDS= 2,score= 1; HHDS= 3, score= 2 [...] if HHDS= 11+, score= 10.
		35. Number of vegetables, pulses and fruit eaten (inferred from above)	# of vegetables, pulses, fruit	# of times fruits/ vegetables/pulses were eaten during week	1= 0, 2= 3, 3= 6, 4= 8, 5+= 10
		35. At the moment, which are your food stocks? (specify quantity in kg)	Level of food stocks	Quantity in kg	0= 0 >0= 10

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
5. Optimally redundant Planting multiple varieties of crops rather than one, keeping equipment for various crops, getting nutrients from multiple sources, capturing water from multiple sources	5.10 Animal nutrition	8. Do you give food supplements to your animals (such as pods)? If so, which foods?	# of different foods (including grazing) for top three animals	Total # of foods mentioned in the 'If so, which foods' row for all animals/ (total number of animal categories possessed	0= 0 1= 5, 2= 7, 3+= 10
		4. For each aquatic species mentioned do you provide food supplements? If so, which ones?	# of different food supplements across species mentioned	Total # of foods mentioned in the 'If so, which foods' row for all animals (if / total number of animal categories possessed	0= 0, 1= 5, 2= 7, 3+= 10
		8. Do you keep the animals grazing on pasture or agricultural lands during part or throughout the year? (Tick if yes)	Access to vegetation for feed	Yes/ No for each animal category possessed Average points across animals: points for each animal category/ # of animal categories	Yes= 10 No= 0 for each category. Overall score / # of animal categories
	5.11 Cereal bank	14. What kind of infrastructure do you have in your community?	Access to a cereal bank	Yes/ No (cereal bank access)	Yes= 10, No= 0
6. Spatial and temporal heterogeneity Patchiness on the farm and across the landscape, mosaic pattern of managed and unmanaged land, diverse cultivation practices, crop rotations	6.1 Temporal heterogeneity of farm system	27. Which land management practices do you use?	Use of practices which increase temporal and spatial heterogeneity	# of practices used among: crop rotation, Rotational grazing, Fallowing, Zero/ minimum tillage, Wind break/ hedge	0= 0, 1= 3 2= 6, 3+= 10,
	6.2 Trees on farm	11. In general, what overall percentage of your land is covered by trees – including natural and planted?	% of land covered by trees	%: 0, 1-10, 11-20, 21-40, 41-60, 60+	0= 0, 1-10%= 2, 11-20%= 7, 21-40%= 10, 41-60%= 7, 60%+= 1
	6.3 Types of soil	26. How many different types of soil can you observe on your field (approximately)?	# of different types of soil observed	# of types observed: types include sandy, loamy, clay, stony.	1= 0, 2= 5, 3+= 10
	6.4 Land management practices	27. Which land management practices do you use?	# of land improving practices used	#	0= 0, 1= 3, 2= 6, 3+= 10
	6.5 Heterogeneity of farm and landscape	25. Total number of fields you have access to:	# of separate fields accessible (across private, community and government)	# of separate fields for each category	1 field= 0, 2= 7, 3+= 10

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
6. Spatial and temporal heterogeneity Patchiness on the farm and across the landscape, mosaic pattern of managed and unmanaged land, diverse cultivation practices, crop rotations	6.6 Intercropping	19. What percentage of your cultivated crops is intercropped?	% of land intercropped	Score=%/ 10	100%= 10
	6.7 Invasive species	33. Approximately, what percentage of your land is covered by weeds?	Level of invasive weeds	% of cultivated land cover by weeds	100-75%= 0 75-50%= 2 50-25%= 4 25-10%= 6 10-0= 10
	6.8 Perennials	5. Do you grow perennial crops (plants that can live several years)?	Whether perennial crops are grown	Yes/ No	Yes= 10, No=0
7. Exposed to disturbance Pest management that allows a certain controlled amount of invasion followed by selection of plants that fared well and exhibit signs of resistance	7.1 Invasive species	33. How many types of invasive weed species have you observed in your field in the past 10 years?	# of types of persistent and damaging weeds species	#	0= 0, 1= 2, 2= 4, 3= 6, 4= 8, 5+= 10
	7.2 Disturbances	15. Over the last ten years, have you observed any changes relating to the weather? If yes, what changes have you noticed?	# of changes observed	#	0= 0, 1= 8, 2= 10, 3= 6, 4= 4, 5+= 0
		36. What types of disturbances have you experienced in the past 10 years?	# of types of disturbances selected from options + for each disturbance experienced the number of times it was experienced	Number of disturbances. Add together the total number of times a disturbance was experienced (across types).	0= 5, 1= 10, 2= 8, 3= 6, 4= 4, 5+= 0
		12. Over the past 10 years have you lost more than 50% of your crops?	# of severe disturbances	Yes/ No	Yes= 0, No= 10
		12. Over the past 10 years have you lost more than 50% of your livestock?	# of grave disturbances	Yes/ No	Yes= 0, No= 10
	7.3 Breeding for resistance	7. Have you tried breeding to obtain improved animals?	Knowledge on breeding animals	Yes/ No	Yes= 10, No= 0

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
7. Exposed to disturbance Pest management that allows a certain controlled amount of invasion followed by selection of plants that fared well and exhibit signs of resistance	7.4 Buffer zones	29. Is your land bordered by wild/ unmanaged land? If so, have you observed many plants and insects on that land?	Existence of buffer zones	All of it, Most of it, Some of it, None of it	None of it= 0 Some + No= 2 Some + Yes= 5 Most + No= 4 Most + Yes= 6 All + No= 7.5 All + Yes= 10
	7.5 Combination local/exotic species	10. Approximately what percentage of your crops is a newly-introduced variety?	% of non-local species/ varieties used	Average % given across both crops and animals	0%= 0 1-10%= 4, 10-20= 6, 20-30= 8, 30+= 10
		10. Approximately what percentage of your animal breeds is newly-introduced?	% of non-local species/ varieties used		
8. Coupled with local natural capital Builds (does not deplete) soil organic matter, recharges water, little need to import nutrients or export waste	8.1 Land quality	26. On average, how rich in Soil Organic Matter is your soil?	Level of soil quality	Not at all, Very little, average, Quite rich, A lot/ Very, Don't know	Not at all= 0, Very little= 2.5, Average = 5, Quite rich= 7.5, A lot/very= 10, Don't know=5
	8.2 Health of soil/ water quality	26. Have you observed one or several of the following soil degradation these last five years	# of types of land degradation occurring	# of problems options selected from list	0= 10, 1= 7, 2= 4, 3= 1, 4+= 0
		24. Have you encountered any of the following water quality problems:	# of water quality problems observed	# of problems options selected from list	0= 10, 1= 7, 2= 4, 3= 1, 4+= 0
	8.3 Land improving practices	27. Which land management practices do you use?	# of land improving practices in use?	# of practices selected from list	0= 0, 1= 3, 2= 6, 3+= 10
		28. Do you have any leguminous plant growing on your farmland? + If yes, did you plant it?	Presence and use of leguminous plants	Yes/ No answers to the two questions	Yes to first question+ Yes to second question= 10 Yes to first question + No to second question= 5 No to first question + No to second question= 0
		32. Did you use natural fertilizers this season?	Use of natural fertilizers	Yes/ No	Yes synthetic + Yes organic= 5 Yes synthetic + No organic= 2.5 No synthetic + No organic= 0 No synthetic + Yes organic= 10
	8.4 Energy conservation	31. Do you use energy conservation practices to reduce energy cost in the household?	Whether energy conservation practices are used	Yes/ No	No= 0, Yes= 10
		31. Which energy conservation methods do you use?	# of types of energy conservation methods used	#- of practices used from table options	1= 3, 2= 7, 3+= 10
	8.5 Practices for resource recycling	23. In your farming system, do you use techniques and practices for water conservation?	# of practices used	#- of practices used from table options	0=0, 1=2, 2= 7, 3+= 10

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8. Coupled with local natural capital Builds (does not deplete) soil organic matter, recharges water, little need to import nutrients or export waste	8.6 Pesticides use	18. Have you used synthetic pesticides over the last cropping season? + Did you look for pests/diseases on your crops before spraying?	Whether different types of pesticides are used, and whether the farmer looks for pests/diseases before spraying	Yes/ No Yes/ No for different types of pesticide (insecticide, herbicide, fungicide)	Use pesticide: Yes + do you look for pest: No= 0; Use of pesticide: Yes+ do you look for pest: Yes= 5; Use of pesticide: No= 10
		18. What do you do with the containers after you have used the products?	Pesticide disposal	Options from list	10= taken empty to a hazardous waste collection centre, 6= thrown in trash, 0= reused, thrown in river, thrown on ground
	8.7 Planted trees	11. Have you planted any trees on your land?	Yes/ No	Yes/ No	Yes=10, No=0
	8.8 Animal disease control practices	16. What types of animal disease control methods do you use?	# of environmentally friendly disease control measure use	Count # use of: natural remedies, integrated animal health management	0= 0, 1= 5, 2= 7, 3+= 10
9. Reflective and shared learning Extension and advisory services for farmers; collaboration between universities, research centres, and farmers; cooperation and knowledge sharing between farmers; record keeping; baseline knowledge about the state of the agro-ecosystem	9.1 Participation in AP/FFS and other groups	34. Are you a member of any groups, organizations or associations? + for each provide the name and degree of participation (Leader, Very Active, quite Active, Not active)	# of agricultural related groups which have at least 'quite active' participation level	Options considered: Seed bank AP/FFS Listening clubs Traders' association/ business group Farmers'/ fisherfolk group Cooperatives/ producers' organizations Water/waste group Credit/finance group Women's group For those count # excluding those with 'not active' was selected	0= 0, 1= 7, 2+= 10
		34. Degree of participation (in groups)	Degree of participation	% of groups in which you participate where you are: leader, very active or quite active	0= 0, 100%= 10

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
9. Reflective and shared learning Extension and advisory services for farmers; collaboration between universities, research centres, and farmers; cooperation and knowledge sharing between farmers; record keeping; baseline knowledge about the state of the agro-ecosystem	9.2 Trends/ changes in climate	36. Have you modified your habits in response to these disturbances?	Learning based on climatic change	Yes/ No	Yes= 10, No= 0
		15. Over the last 10 years, have you observed any changes relating to the weather?	Awareness of changes	Yes/ No	Yes= 10, No= 0
	9.3 Extension services	15. Do you have access to information on cropping/ livestock practices? + If yes, how do you get this information?	Level of access to cropping/ livestock practices	Options: Extension agent/ FFS/APFS, other # of sources	0= 0, 1= 4, 2= 8, 3+= 10.
	9.4 Record keeping	13. Do you keep records for any of the following:	Knowledge and use of record keeping	# of yes responses across options given for record keeping	0= 0, 1= 7, 2+= 10
	9.5 Knowledge of environment/ agriculture	15. Do you have access to information on cropping/ livestock practices? + If yes, how do you get this information?	Level of access to cropping/ livestock practices	Yes/ No (first part of question) + Different options for access to information # of sources	0= 0, 1= 4, 2= 8, 3+= 10.
10. Globally autonomous and locally interdependent Less reliance on commodity markets and reduced external inputs; more sales to local markets, reliance on local resources; existence of farmer co-ops, close relationships between producer and consumer, and shared resources such as equipment	10.1 Direct selling /trading to consumers	48. Do you sell/trade some of those products directly with consumers?	Whether items are sold/ traded directly to producers	Yes/ No	Yes= 10, No= 0
	10.2 Direct buying /trading with producers	40. Do you buy/trade directly from producers?	Whether items are bought/ traded directly from producers	Yes/ No	Yes= 10, No= 0
	10.3 Local farm inputs	44. Are you at a walking distance from the location of your source of inputs?	Average ease of access for inputs	Yes, easily; Yes, with some difficulty; No; Not applicable (for a given input)	10 for each yes, 5 for each yes with difficulty, 0 for each no and then average across applicable categories
	10.4 Previous collective action	38. When there were common issues in your village or neighbourhood that needed attention during the last year, how often did you join together with others to address them?	Frequency of collective action	Never/ Once/ A couple of times/ Frequently	Never= 0, Rarely= 4, Sometimes= 7, Frequently= 10, N/A= 0

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10. Globally autonomous and locally interdependent Less reliance on commodity markets and reduced external inputs; more sales to local markets, reliance on local resources; existence of farmer co-ops, close relationships between producer and consumer, and shared resources such as equipment	10.5 Ability to breed animals at local level	7. Have you tried breeding to obtain improved animals?	Knowledge on breeding animals	Yes/ No	Yes= 10, No= 0
	10.6 Reliance on local species	10. Do you use newly introduced (varieties/species which have been used in the community for less than 15 years) non-indigenous varieties or species, such as modern cultivars, imported cultivars, High Yield Varieties, private sector seeds, etc.?	Use of newly introduced non-local varieties (both animals and plants)	Average response across two questions (if replied to both) If yes to crop and yes to animal= 0+0/2= 0 If yes to animal, no to crop=(0+10)/2= 5	Yes= 0, No= 10
	10.7 Access to local market	39. Do you have access to local farmers' markets?	No access, Intermittent, Sustained access	No access, Intermittent, Sustained access	No access=0 Intermittent=5 Sustained access =10
	10.8 Reliance on local energy sources	30. Which energy sources are used in your farm system?	How many environmentally friendly energy sources are used	Local energy sources include: Solar, fuel wood, charcoal, domestic waste, agricultural residues, wood residues, manure	0= 0 Solar= 4 Domestic waste= 4 Agricultural residues= 4 Wood residues= 4 Manure= 4 Other options= 3 2+= 10 (maximum of 10)
	10.9 Animal disease control	16. What types of animal disease control methods do you use?	# of disease control types used	# of options from list	0= 0 1= 5 2= 7 3+= 0
	10.10 Pesticide use	18. Did you use synthetic pesticides?	Use of synthetic pesticide	Yes/ No for three different options	If answer Yes (to any type of pesticide)= 0 If answers No= 10
		32. Did you use natural fertilizers this season?	Use of natural fertilizers	Yes/ No	Yes synthetic + Yes organic= 5 Yes synthetic + No organic= 2.5 No synthetic + No organic= 0 No synthetic + Yes organic= 10
11. Honours legacy Maintenance of heirloom seeds and engagement of elders, incorporation of traditional cultivation techniques with modern knowledge	11.1 Elder participation	2. Describe the role that elders play within the community. e.g. caring for smaller children, assisting household or community decisions.	Whether elders play a role in the community	Yes/ No	Yes=10, No=0
	11.2 Agricultural learning	15. Do you have access to information on cropping/livestock practices?	Access to and sources of information on cropping/ livestock practices	Yes/ No plus selection from list # of sources	0= 0, 1= 4, 2= 8, 3+= 10
	11.3 Traditional activities	3. Traditional activity (selected from list)	Number of traditional activities practiced	# from list of activities	0= 0 1= 7 2+= 10

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11. Honours legacy Maintenance of heirloom seeds and engagement of elders, incorporation of traditional cultivation techniques with modern knowledge	11.4 Preservation of traditional knowledge	13. Do you know of any stories, tales or legends about past climate changes?	Whether traditional knowledge related to climate change exists	Yes/ No	Yes= 10, No= 0
	11.5 Tree products	11. What do you use products from these spontaneous/ natural trees for?	Use of natural products from trees	# of uses of tree products for: Natural remedies (animals); Natural remedies (people); Products for the protection of crops (e.g. Neem)	0= 0, 1= 7, 2+= 10
12. Builds human capital Investment in infrastructure and institutions for the education of children and adults, support for social events in farming communities, programs for preservation of local knowledge	12.1 Household health	2. Who is unable to work due to health reasons?	% of the household unable to work	#(people unable to work) across categories/# (total number of people in household)*100	0%= 10, 0-10%= 7, 11-20%= 5, 21-30%= 3, 30%+= 0
		18. Over the past season, how often do you use protective gear?	Frequency of use of protective clothes when applying pesticide	Set of options: never, sometimes, always	Never= 0, sometimes= 5, always= 10
		24. Have you encountered any of the following water quality problems?	Whether water quality problem which can affect the household's health were encountered	Presence/absence of water pollution or organic dumping problems (or other problems reported to affect health)	No= 10, one of those 2 problems= 5, 2+= 0
		35. Did anyone in the household eat the food in question over the last day and night?	Household Dietary Diversity Score (HDDS)	Yes/ No for each food category in list. There are 12 categories of foods, so HDDS goes from 0 to 12	If HHDS= 1,score= 0; if HHDS= 2, score= 1; HHDS= 3, score= 2 [...] if HHDS=11+, score= 10.
	12.2 Knowledge of practices to improve the land	27. Which land improving practices do you use?	# of land improving practices used	Number from provided list	0= 0, 1= 2, 2= 4, 3= 6, 4= 8, 5+= 10
		28. Do you have any leguminous plant growing on your farmland? + If yes, did you plant it?	Presence and use of leguminous plants	Yes/ No answers to the two questions	None of it= 1 Some + No= 2 Some + Yes= 5 Most + No= 4 Most + Yes= 6 All + No= 7.5 All + Yes= 10
		29. Is your land bordered by wild/ unmanaged land? If so, have you observed many plants and insects on that land?	Existence of buffer zones	All of it, Most of it, Some of it, None of it	All of it= 10 Most of it= 7 Some of it= 4 None of it= 0
		32. Do you use natural fertilizers?	Whether natural fertilizers are used	Yes/ No	Yes synthetic + Yes organic= 5 Yes synthetic + No organic= 2.5 No synthetic + No organic= 0 No synthetic + Yes organic= 10

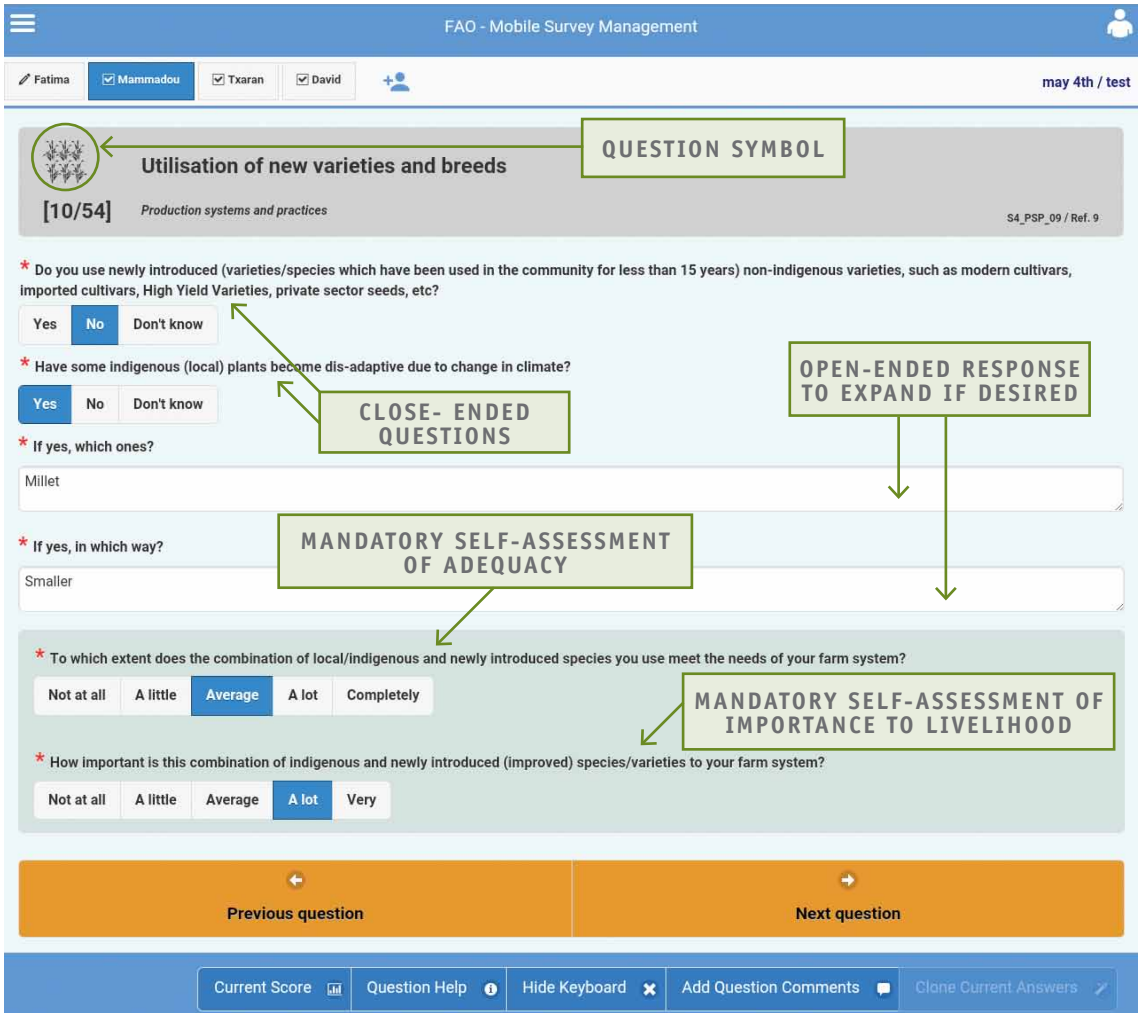
RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
12. Builds human capital Investment in infrastructure and institutions for the education of children and adults, support for social events in farming communities, programs for preservation of local knowledge	12.3 Infrastructure	14. Do you have any of the following buildings in your community?/ Do you have access to any of the following buildings in your community?	# of buildings with access to	Yes/ No for following buildings: Church, community centre, school, health centre	0= 0, 1= 5, 2+= 10
	12.4 Group participation	34. Select the groups of which you are a member	# of groups to which you participate	Number of groups in which at least "quite active" level of participation	0= 0, 1= 4, 2= 8, 3+= 10
		34. Degree of participation in groups	Degree of group participation	Percentage of groups in which participation is at least "quite active"	0= 0, <25= 2.5, <50= 5, <75= 7.5, <100= 10
	12.5 Household equality (gender, most vulnerable members) (power and agency)	2. For each category indicate the number of people in the household involved.	Distribution of tasks across members of the family	Take as reference, number of tasks performed by man= n	If man performs n tasks, women perform between n and 90% of n, children perform [80%of n]= 10; If women do n+10% of n (i.e. 10% than man) OR children do 90% of n (i.e. only 10% less than man)= 6 If women do n+20% OR children do 100% of n,= 3, If both of the above occur (women do n+20% and children do n), or any more unequal distribution =0[2]
		2. Who has completed primary education?	% of household members who completed primary education	# (people who completed primary education) across categories/# (total number of people in household)*100	0-9%= 0 10-24%= 2.5 25-50%= 5 50-74%= 7.5 >75%= 10
		2. Who has completed primary education? (gender)	Ratio of girls (0-15) who complete primary education over boys value	# of girls/# of boys	Score= Ratio*10 If ≥1= 10
		46. Who in your family usually has the final say on the following decisions:	Level of mutual decision making	For each question asked options include: You, your partner, you and your partner jointly, someone else	You= 10 Your partner= 5 You and your partner jointly= 10 Someone else= 0 Final score= average of score for each applicable question

[2] Example: men in household do 10 tasks (n = 10), score would be 10; if woman does 10 too and children do 8, score would be 6; if women perform 11 tasks and children 9, score would be 3; if women do 12 tasks and children do 10 too; it would be zero if both of the above apply (women and children overwork) or are worse (women do 20 things and children 15)

RESILIENCE COMPONENT	SHARP INDICATORS	SHARP QUESTIONS (NUMBER AND TEXT)	MEASUREMENT	ANSWERS/UNITS	SCALE (HIGHER IS MORE RESILIENT/ BETTER)
12. Builds human capital Investment in infrastructure and institutions for the education of children and adults, support for social events in farming communities, programs for preservation of local knowledge	12.6 Investment in human capital	51. Which have been your largest expenditures in the last year?	Rank given to 'education' expenditure item	1,2,3,4,5, none	If rank=1,= 10 rank 2,= 8 ranked 3= 6 ranked 4= 4 ranked 5= 2 If not mentioned= 0
13. Reasonably profitable Farmers and farm workers earn a liveable wage; agriculture sector does not rely on distortionary subsidies	13.1 Financial support	47. Have you needed financial support over the past 5 years?	Financial support	Yes/ No	Yes= 0 No= 10
	13.2 Non-farm income generating activities (IGAs)	53. Do you have any non-farm Income Generating Activities?	Non-farm IGAs	Yes, all year; Yes, seasonally; Yes, occasionally; No	Yes, all year= 10, Yes, seasonally= 7 Yes, occasionally= 3 No= 0
	13.3 Market prices/ costs	49. Describe the most important products you sell	Whether selling prices are too high, too low, stable or unpredictable	Price options for each product sold, # of products sold Options considered: Too high, Fluctuating, Too low and Stable (others do not count)	If Too low= 0 Fluctuating= 2 If too high= 5 If stable=10 Average across the products sold Often= 10 Sometimes= 5 Very rarely/never = 0
		51. Which have been your largest expenditures last year?	What are the major costs to the household	Categorize into capacity expenditures and less worthwhile costs	0= 0, 1= 5, 2= 7, 3+= 10
	13.4 Insurance	42. Are your crops and livestock ensured against loss?	Whether livestock and crops are protected by insurance	Yes/ No (for both livestock and crops)	Yes= 10, No= 0 (average of the two if they have both crops and livestock)
	13.5 Savings	54. Do you have more saving than 5 years ago?	Whether savings have increased	Yes/ No	Yes= 10, No= 0
		54. Do you have savings?	Whether the household has financial savings	Yes/ No	Yes= 10, No= 0
		43. Rank by importance the major productive assets that you own	Existence of accumulated non-financial savings	Land Livestock Seeds Buildings Equipment Others	1= 4 2= 7 3+= 10

adapted from Cabell and Oelofse, 2012

Figure 12. **Sample SHARP question framework showing the general structure of most questions. Emphasis is placed on situations where the response is either "good" or "bad". We want to highlight situations where practices are resilient and to better understand situations where they are not so as to find ways to improve them.**



SHARP uses a multi-criteria additive model to prioritize components of the farm system that could be addressed by farmers/ pastoralists potentially in collaboration with facilitators and NGOs. The way questions are asked varies, however the structure stays the same (see Figure 12). SHARP uses a flow-like approach that is administered to farmers and pastoralists in the same manner. Many questions involve an initial "Yes/ No" (e.g. do you practice intercropping) followed by more in-depth questions if the response is yes. Although there are 54 sets of questions (and more when the secondary in-depth questions are included), not all questions apply to all farmers or pastoralists and thus they will only answer a subset of the questions or move on quickly if they respond "No". There is both a quantitative aspect providing absolute values, and qualitative ones that provide space for

more narrative descriptions. It is recommended that facilitators ask for explanations from the farmers and pastoralists to better understand their responses. The survey does not ask for the adequacy of every source of water, but rather for the farmer's or pastoralist's assessment of whether overall they are adequate. There may be 10 very poor water sources, but as long as there is at least one good source, they may assess the situation as highly adequate. Especially when the adequacy is assessed as low, it is important to tease out the reasons why it is the case.

5.2 SCORING

Although SHARP can be administered with paper surveys, the preferred method is to use computer tablets (e.g. generic android tablets) with a simple application to record responses and produce a rapid report. Tablets are preferred for several reasons including potentially lower costs (due to less materials such as printed paper and significantly less labour), improved data quality and ease and speed of use (King *et al.* 2013; Leisher, 2014; Barrett and Headey, 2014). Many of the questions will be asked at the individual level but in a group setting of approximately five people. This has two purposes: to encourage discussions (in practice we have found that respondents may not think of all answers e.g. sources of seeds or all animals in the household) and to substantially decrease the amount of time required to administer the survey. Sensitive questions (e.g. financial assets and demographics) will however be asked individually when respondents are not in a group.[8] Simple calculations can be made much faster using a computer application to multiply and sum the responses in order to produce an individualized priority ranking in real time (see Figure 13).

Figure 13. **Example of the calculations used to assess the resilience of a farm system component and its relative ranking of importance to address.**

This process incorporates the farmers/ pastoralists' self-assessment of importance, adequacy of the component and the "academic" score as developed during an expert e-discussion and feedback from experts. A lower overall score indicates a higher priority. The scoring of self-assessed importance is on an inverse scale to "academic" score and self-assessment as more importance indicates a higher priority, whereas higher "academic" and self-assessed resilience is "better" and thus less important to address. Relative score = "academic score" + self-assessment of adequacy" + "self assessed importance"

QUESTION	RESPONSE	"ACADEMIC" SCORE (/10)	SELF-ASSESSMENT OF ADEQUACY RESPONSE	SELF-ASSESSMENT OF ADEQUACY (/10)	SELF-ASSESSED IMPORTANCE RESPONSE	SELF-ASSESSED IMPORTANCE (/10)	RELATIVE SCORE	PRIORITY RANKING
e.g.	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Sources of water	3	7	Average	5	A little	7.5	19.5	3
Access to credit	N	0	A little	2.5	Very	0	2.5	1
Locally adapted seeds	Y	10	Completely	10	A lot	2.5	22.5	5
Energy sources	3	6	Not at all	0	Average	5	11	2
Group membership	2	6	A lot	7.5	A little	7.5	21	4

[8] We do recognize the trade-offs with using a group setting and the application allows for questions to be answered in either an individual or group setting.

Each SHARP question will have four aspects to it: first, a question with a relatively simple Yes/ No, selection from a list or number as an answer (e.g. have you received financial support in the past 5 years? How many trees are on your farm?); second, a self-assessment of the adequacy of the aspect is selected from five options (e.g. how adequate was the financial support received: Not at all, A little, Average, A lot, Completely); third to provide a relative importance of that aspect of their farm system (e.g. how important is market access to your livelihood?: Not at all, A little, Average, A lot, Very); finally, subsequent questions may be asked in order for the farmer or pastoralist to elaborate on their response with respect to barriers, problems and ways that the farm system could be improved. The qualitative responses will be essential in understanding the reasons for a high or low resilience.

In order to obtain the best interaction, participation and thus responses from farmers and pastoralists, it is encouraged that the SHARP survey is not the first interaction in which farmers and pastoralists engage. As detailed in the *SHARP guidance document*, we recommend that cropping calendars and community mapping exercises (or other activities to build relationships with the communities) are conducted through existing AP/FFS activities prior to the rest of the survey (Chambers and Conway, 1991). Other activities included in many AP/FFS curricula should also help to familiarize farmers and pastoralists with many of the practices and concepts described in the survey. The methods and values used when asking questions are important due to the 'anchoring' phenomenon (Tversky and Kahneman, 1974). This is similar to "leading" questions, which can influence the responses of interviewees. Questions should be asked in a manner that is as neutral as possible so as to not influence the responses of the farmers and pastoralists. During survey design, questions have been formulated using as neutral a phrasing as possible. Having a consistent survey approach ensures robust comparability among answers to the questions asked in different sites. Facilitators will be free to provide follow-up explanations should participants require clarification on the original question. To this end, help texts explaining the essence of each question, are included in the application. In addition, honest and full responses are encouraged to obtain accurate and full information. A pre-defined scale is used to quantify the responses and coded into a score out of ten.

06
IMPLEMENTING SHARP

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There are multiple uses of the SHARP tool. One is to use SHARP directly at the level of farmers and pastoralists (local level). This would involve writing questions in a manner that farmers/ pastoralists understand and providing a tool, which they can use to explore their current practices and learn how they can adapt and improve where necessary. Questions would predominantly be qualitative and exploratory with no defined "ideal" response in order to avoid absolutes and to take into consideration that each situation may have different "ideal" criteria (e.g. 7 sources of wood for fuel may be ideal in one region whereas 3 sources may be ideal in another, also largely dependent on quality/quantity and addressed through the self-assessment component). Thus there would be no judgement made on responses; they would instead be used to compare with other farmers'/ pastoralists' practices and to better understand their own situation. Another use for SHARP could be to provide a more consistent and statistically oriented set of data by which FAO and other relevant organizations can assess the climate resilience of the systems (higher level). This approach would necessarily be more quantitative and technical, with results potentially less directly useful on the ground to the farmers themselves.

We propose a middle solution where AP/FFS facilitators use current and future curricula and discussions alongside SHARP questions to tease out current practices and better understand the situation of the farmers/ pastoralists, while key quantitative indicators are also used to achieve a better overview of climate resilience at a broader scale. Most questions are structured using a quantitative 'Yes/ No' starting point, or scale to measure change (e.g. level of pesticide use or number of water sources) and then provide a space for elaboration giving more qualitative responses. In addition, farmers and pastoralists will tell facilitators how adequate each component of resilience

is as well as how important that component is to their livelihood. This hybrid approach is aimed at meeting the needs of the farmers/ pastoralists and also to help inform policy makers and curriculum designers who can use the "evidence in their future decisions. These questions should constitute a platform for farmer/pastoralist learning, by triggering discussion, interest, and knowledge exchange on farming practices discussed (e.g. zero-tillage, IPM) between farmers and facilitators and among community members.

There is a concern that the knowledge required by farmers to legitimately evaluate what is meant by certain questions can be too difficult, requiring lengthy explanations, or resulting in data that is of questionable value. However, we believe that farmers and pastoralists are not ignorant to practices and agricultural knowledge. Rather, we recognize that farmers, pastoralists and facilitators as well as FAO staff (or extension workers) can learn from each other to help identify which practices best meet each situation. We recognize that the survey is not flawless and that measuring resilience with 100 percent accuracy is impossible but that we can use it as an approximation of resilience and to open a dialogue about these important issues. We assume that often it is not the lack of knowledge on resilient agricultural practices by farmers, but instead other obstacles, which prevent them from adopting more resilient practices. Another concern is that through adding SHARP to current curricula we risk overloading AP/FFS participants and facilitators, potentially leading to "short cuts" and again, data of questionable value. Minimizing the incremental work required to implement SHARP has been a major focus of the testing missions. Completing the tool gradually throughout the AP/FFS curricula is a way to reduce the overload placed on participants.

SHARP will harmonize as much as possible with existing assessments and tools such as SAFA, LADA, RIMA and Prime during data analysis (Phases 2 and 3), while also integrating and informing AP/FFS facilitators. Through facilitators' involvement in SHARP, their own increased awareness of the importance of resilience to achieve climate adaptation will be reflected in other activities to which facilitators take part (e.g. other projects).

SHARP is designed to be flexible enough to fit within the curriculum of AP/FFS and different projects and thus the order, timing and method of asking questions can be modified. Instead of asking questions in a linear manner, they can be asked according to the topic being taught (e.g. AP/FFS) or in response to project needs. Facilitators will receive training during their AP/FFS training on how to integrate and perform SHARP. Results could be shared at farmers meetings to share possible action opportunities. Moreover, the time period over which they are asked can also vary as some questions would be better asked after some curricula modules are finished.

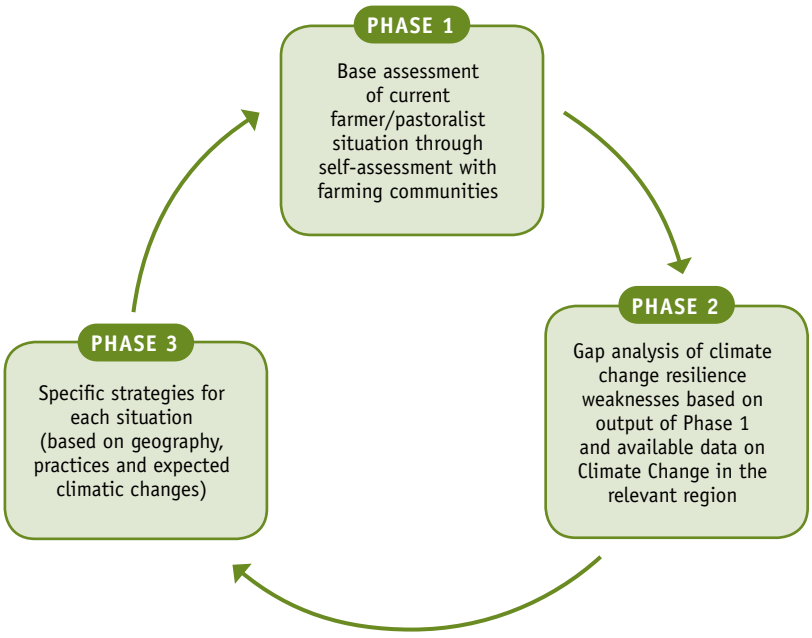
Although SHARP will have all the same questions in each implementation, we are encouraging flexibility and experimentation with the SHARP survey to take into consideration different situations and implementing agencies. Questions could therefore be asked in a different order than those outlined below and not all questions will be relevant in each context. While SHARP is designed to be applicable to a wide variety of settings, initially it will be administered through AP/FFS with questions asked at the individual level in a group setting but aspects (such as community mapping) investigated at group level. Thus, although SHARP could be potentially completed in isolation at the individual level, it will most often involve the facilitation of AP/FFS facilitators with between 20 and 30 farmers or pastoralists. The farmers will be divided in sub-groups where individuals will

run through questions at the same time. Again, although individual responses will be important, aggregating and comparing data from communities will leverage more data to better plan future improvements in policies and curricula and share success stories.

The survey is designed in a linear manner, however questions can be asked in any order and are modified depending on the type of respondent (e.g. farmer versus pastoralist). Although there is one large set of questions in SHARP, questions are disaggregated by gender and can be analysed both on the tablet and in more detail afterwards. Ownership and control of resources and decision making is important to assess how to make changes to increase climate resilience. The economic and political context in which households make decisions over resource use can both enable and constrain access to productive resources (Thulstrup, 2014). Integrating gender sensitive questions has been a major focus of field testing missions and review periods, which involved consultation with staff in the FAO gender division. We have also included "sensitive" questions that should be asked in isolation of the group. These mostly relate to financial issues, gender issues and group interactions.

The implementation of SHARP comprises the three phases shown in Figure 14 below. The process is recommended to be repeated in a cyclical pattern with the self-assessment being conducted periodically (e.g. every year at the beginning of each AP/FFS). Phases 2 and 3 would be reinforced by this information, which would be used to assess weaknesses and strengths in climate change resilience and inform policies and curricula for addressing any issues (and are discussed in more depth in Section 4.4). Phases 2 and 3 will not necessarily be conducted every year or season. Instead, they should be conducted as needed, depending on the specific context of each project.

Figure 14. **Phases of SHARP process**



The following sections outline the different phases of the process from the perspective of a field school facilitator (see Tables 9 and 10). A more thorough *SHARP background document* and practical application user guide *SHARP user manual* are also available.

There are two potential implementation paths for SHARP, depending on when SHARP is integrated into the project/programme.

When SHARP is added to an existing project/programme (assuming that AP/FFS communities are already identified)

Table 9. **Overview of SHARP activities when SHARP is integrated after a project has started**

1	Selection of communities/ AP/FFS.
GROUP (AP/FFS) DEVELOPMENT AND PRE-ASSESSMENT	
2	Training of facilitators and questionnaire appropriation by local staff.
3	Conduct the rapid land tenure analysis, institutional mapping together with completion of some parts of governance section of Sharp.
4	Before the beginning of the season, conduct a pre-assessment of needs and priorities (needs assessment) of the community. Additional optional exercises include: community mapping exercise, cropping calendar, participatory well-being ranking, market system mapping.
5	Modify the AP/FFS curriculum for the upcoming field school as needed.
6	Plan schedule for administration of the SHARP questionnaire throughout the season.
SHARP SURVEY AND RAPID ASSESSMENT	
7	Conduct the SHARP survey in conjunction with the curricula.[1]
8	After the questions are completed, produce the rapid assessment with resilience priority rankings. Raw data is sent to FAO-Rome for cross sectional data analysis.
9	Results discussion at individual level. A record of individual results and completion certificate are given to respondents.
10	Results discussion at collective level
ANALYSIS AND PLANNING	
11	Organise periodic workshops for facilitators and M&E personnel to discuss results and better adapt tool to given context (e.g. 1-2 times per year or following existing M&E structures).
12	Receive feedback from project managers/coordinators/HQs on recommendations and results.
13	Discuss how to improve/modify next season's field school curricula.[1]
14	Repeat process in the following season.

[1] The timing will vary each year depending on the knowledge, practices employed, and curricula. It will be partly up to the facilitator to determine when best to ask the SHARP questions based on enthusiasm, time, farmer/pastoralist knowledge and the focus of the lesson etc. Some questions will be asked in groups (e.g. cropping calendar) and others individually (e.g. personal questions such as those related to assets). All questions involving knowledge that could be impacted by the field school curricula (e.g. are you aware of environmentally friendly pesticides) should be asked at the same time for every farmer/pastoralist when possible. Others (e.g. how long have you been farming/a pastoralist) may be asked at different times during the field school.

If a project has not yet been initiated:[9]

Table 10. **Overview of SHARP activities when SHARP is integrated early in a project**

GROUP (AP/FFS) DEVELOPMENT AND PRE-ASSESSMENT	
1	Early in the project/programme development phase, plan a mission to meet with local staff (AP/FFS or otherwise) to discuss the programme objectives.
2	Project staff perform a SHARP pre-assessment to identify the needs of the community/group. Conduct a community mapping exercise (as described in the SHARP survey) to better understand the local conditions.
3	Revise the project/programme to reflect local conditions and priorities.
4	Concurrently, conduct the rapid land tenure analysis, institutional mapping together with completion of some parts of governance section of Sharp, as to understand how the local legal and regulatory environment related to the project may affect the resilience of the farmers/ pastoralists and obstacles preventing greater resilience.
SHARP SURVEY AND RAPID ASSESSMENT	
5	Conduct the SHARP survey during the project/programme development phase where appropriate and revise project if applicable.[2]
6	After the questions are completed, produce the rapid assessment with resilience priority rankings. Raw data is sent to FAO-Rome for cross sectional data analysis.
7	Results discussion at individual level. A record of individual results and completion certificate are given to respondents.
8	Results discussion at collective level.
ANALYSIS AND PLANNING	
9	Organize periodic workshops for facilitators and M&E personnel to discuss results and better adapt tool to given context (e.g. 1-2 times per year or following existing M&E structures).
10	Receive feedback from project managers/coordinators/HQs on recommendations and results.
11	Discuss how to improve/modify next season's field school curricula.
12	Repeat process in the following season.

[2] The timing will vary each year depending on the knowledge, practices employed, and curricula. It will be partly up to the facilitator to determine when best to ask the SHARP questions based on enthusiasm, time, farmer/pastoralist knowledge and the focus of the lesson etc. Some questions will be asked in groups (e.g. cropping calendar) and others individually (e.g. personal questions such as those related to assets). All questions involving knowledge that could be impacted by the field school curricula (e.g. are you aware of environmentally friendly pesticides) should be asked at the same time for every farmer/pastoralist when possible. Others (e.g. how long have you been farming/a pastoralist) may be asked at different times during the field school.

The typical characteristics of an AP/FFS are shown in Table 11. SHARP questions can be asked throughout the AP/FFS.

[9] E.g. projects with an AP/FFS, club d'écoute, climate change or resilience component

Table 11. **Characteristics of a typical FFS (Settle *et al.* 2014)**[10]

COMPONENT	DESCRIPTION
1	A group of 20–25 farmers, assisted by a project-trained facilitator, prepares two training plots of around 1000 m2 total. The FFS group spends roughly one-half day per week setting up experiments, making observations and jointly managing the two plots, one using local, conventional farming methods and a second plot testing new practices appropriate to the crop and location.
2	Exercises are explicitly designed to introduce topics in synchrony with the specific growth stages of the crop, over the course of a cropping season.
3	Farmers are asked to summarize their observations with depicting the status of the observed plots, including plants, insects, water levels, weeds, etc. Drawings are an effort to engage less literate farmers.
4	Additional 'special topics' are introduced over the course of the season to introduce or reinforce key concepts, e.g. demonstrations of pesticide toxicity, soil water-holding capacities, composting methods, etc.
5	Exercises include agronomic techniques for planting, soil fertility management, and integrated pest management (IPM), varietal comparisons and marketing.
6	At the end of the FFS season an 'open house day' is generally held in which other farmers from the community and from adjacent communities are invited, along with local government personnel and civil society to see presentations by FFS farmers and to discuss their outcomes from the season.
7	The land used is either donated by the community, rented from a local farmer, or seeds, inputs and labour are provided and proceeds from harvest go to the land owner.

6.1 FACILITATED BASELINE SELF-ASSESSMENT (PHASE 1)

Phase 1 of the self-assessment is shown in the paper version of the survey in Section 7 below. The survey is designed to be suitable for farmers and pastoralists of any type and from any location. The process is quantitative where possible and qualitative where further explanation is required. As the self-assessment is intended to be the first step towards climate change resilience it provides a baseline of farmers' and pastoralists' current situation. The first iteration of Phase 1 of SHARP is inherently the most onerous as the questions will all be new, whereas in subsequent years the process will be quicker due to familiarity with the questions and only some questions requiring different responses[11]. The paper version of the survey below was finalized in August 2015 and is likely to evolve during implementation through refinement and improvement. Please contact SHARP@fao.org for the latest version of the survey. Complementary activities such as community mapping exercises, land transects, and reviews of existing policies can be integrated into the SHARP assessment, either prior to or during the assessment.

[10] This overview is focused on Famer Field Schools, Agro-Pastoral Field Schools function in a different way, see e.g. Okoth *et al.* 2013

[11] In parallel to this document outlining SHARP there is a second training document being prepared outlining the process of implementing the SHARP survey in detail.

6.2 PARTICIPATORY GAP ANALYSIS (PHASE 2)

Once the self-assessment survey is completed, Phase 2 is used to determine the areas of strong and weak resilience of farmers or pastoralists to climate change as well as identifying the existing gaps in education, training, and practices. Based on the results of Phase 1, available on the tablet, a gap analysis will be conducted in partnership with farmers or pastoralists, AP/FFS facilitators, stakeholders, FAO and other relevant organizations as the cases warrant on two different levels (a rapid assessment and more thorough top-down cross-sectional assessments).

However, as climate change and its effects are location-specific it will be important to take into account the form of farming (farming system) as well as the expected changes in climatic conditions in the region and the timeframe over which changes are expected. Based on data from available climate scenarios the most important changes in climate in the area – such as changes in rainfall intensity and patterns, changes in temperature and in the intensity and frequency of extreme weather events – are identified and matched with the self-assessment of resilience to be used in Phase 3. Coordinated Regional Climate Downscaling Experiment (CORDEX)[12] and other downscaled freely-accessible climate data can be used to gather past and future climate data for sub-Saharan Africa. Data with a resolution of approximately 50-km may be sufficient for determining resilience priorities in assessed communities. By integrating smallholder level estimates of resilience with downscaled climate projections, SHARP's approach will outline local contextual vulnerability of assessed socio-eco-systems – as opposed to making a top-down assessment of physical climate adaptation capacity.

6.2.1 Rapid assessment

Having obtained the SHARP resilience score for each question asked (through the scoring system developed) an initial set of results will be available of immediate use by farmers/pastoralists through the tablet application. The results will be processed in real time as the survey is being completed (see Table 12).

Results of the rapid assessment include:

- Household level:
  - Priority ranking of questions, e.g. locally adapted seeds, in terms of the household resilience level (a high priority ranking meaning a combination of low resilience, low adequacy and high importance). Questions obtaining high scores will be the focus of the farmer for improvement. The 5 or 10 least and most resilient aspects of the farm systems could be highlighted to the farmer/pastoralist for discussion to determine what actions could be made to improve and what components of the farm system are most resilient, respectively. Data will be recorded electronically in order to allow further analysis (see section 6.2.2) and data availability to interested stakeholders.

[12] http://wcrp-cordex.ipsl.jussieu.fr/

  - Resilience of different components of the farming system. As different questions refer to and can be grouped into different parts of the systems, e.g. natural system, human capital, it might be useful for the farmer to know the relative resilience of each component of the system.
  - Resilience of different indicators (Cabell and Oelofse, 2012), e.g. level of exposure to disturbance. As shown in Table 7, during their formulation, questions have been classified following their contribution to 13 different indicators of resilience as classified by Cabell and Oelofse following an extensive literature review. Using the priority rankings, it will be possible to outline the relative resilience of each indicator for a given farmer. However, this classification is likely to be more relevant to evaluate resilience gaps at regional/ national level.
- Community-level
  - When using a tablet, it will be easy to compare priority scores and rankings obtained by different farmers/pastoralists. Comparing resilience among farmers or pastoralists within a given AP/FS (or other) group or a community (and part of similar farming systems) will be important for triggering group discussions regarding resilience and possible resilience-improving actions (see communication section below).
  - The comparison will be mostly indicative as the farmer or pastoralist may not have the same farm components; and thus they are likely to be responding to a slightly different set of questions. However, their resilience could still be compared at the resilience indicator level. It should be noted that the overall score is also a relative score and not an absolute indication of resilience. Comparisons in resilience levels could be done within and among different farming systems, i.e. the type of farming system assessed might need to be included in the analysis as an independent variable to make comparisons more reliable.
  - Another level of data use would include looking at average resilience levels to identify least resilient aspects at community level (those would also have low standard deviation of mean, e.g. consistently low resilience). Furthermore, areas of high resilience can be identified and could lead to discussion on why resilience is high in these areas. Potentially best practices for resilience could be identified and shared within the group. In order to consider the influence of certain respondent characteristics on self-assessed resilience and understand community-level results better, community level results and averages should be disaggregated according to respondents': a) gender, b) farmer vs. pastoralist, c) age group.

In addition to discussing individual farmers or pastoralists' results orally, providing farmers or pastoralists with a paper report would allow them to keep a record, communicate results to other members of the household, compare results with other farmers or pastoralists and track farm resilience over time (once several reports are accumulated).

Depending on the literacy level of the farmer or pastoralist, a written report could be shared with the farmer. As the survey will be completed in the official country language (French/ English/ Portuguese etc.) by facilitators, the results' report will also be in such language and orally discussed in local languages by facilitators. Alternative options exist to ensure the farmers or pastoralists has access to an actual record of his resilience scores:

- Facilitators could keep farmers or pastoralists' reports in official UN languages (e.g. French/ English) and translate it into local language when necessary.

» Areas of high and low resilience (for instance 3 top and worst) for each individual are written down in local language and given to participants. In the case of limited literacy, areas of strengths and weakness in terms of resilience of the farm system can be drawn by the farmers or pastoralists, while results are discussed with facilitators in group setting (the application already uses icons for each question).

Oral discussion of the aspects scoring the lowest resilience would also be a good preparation for group exercises. For example, results from different households in terms of the most and least resilient aspects of the system could be discussed in a group setting, with the potential for several positive outcomes:

» Validation of self-assessment results, i.e. check whether the ranking makes sense to the group and if not, try to understand and discuss why not, e.g. reduced understanding of the question in the first place, additional information possessed by farmers, trade-offs and synergies in resilience of different farm system components;
» Discussion of existing actions to increase resilience of selected aspects, at the level of individual farmers and community itself (albeit this might be less accurate but common problems can be discussed e.g. everyone has problems with access to credit). Individuals with low resilience in a certain aspect could raise their issue and receive solutions from other individuals. A moderator could also foster discussions on the aspects, which have been found to be least resilient across farm systems in the community;
» Potential matching of people with low resilience in certain areas with those who obtained high scores for it within the same community. For instance, a person with low resilience in energy sources could discuss solutions with someone who obtained a high score, fostering exchanges of information (and possibly build-up of social capital and community resilience).

6.2.2 Cross-sectional regional assessment

The information gathered in the SHARP survey will be sent to regional offices and HQ to be assessed in comparison with other regions where SHARP has been implemented. See section 4.3 of this document for an explanation of how data will be treated with regards to confidentiality, data access and consent issues in line with standard ethical procedures.

FAO HQ-level data analysis

Potential analyses at HQ level:

» Compare resilience scores of individual farms across time. Conduct before/after assessment of resilience before/after the first AP/FFS and between one and the following AP/FFS season. Ideally this would be done at the same time in control groups (if used) so as to allow differences-in-differences analysis of AP/FFS impact on household resilience. Identify components of farming systems/aspects which tend to have consistently lower resilience at different scales (e.g. regional, district, country) and make them priorities for action, additionally overlay results with data on the agro-ecological zones farms are in, in order to identify commonalities and differences in results based on the agro-ecological zone;

- Compare resilience data disaggregated by gender and/or age group within a community, across several communities and/or regions;
- Compare resilience levels across villages and regions – both overall scores and scores by indicators. Identify geographical areas with weakest resilience at different scales. Communicate results to actors at appropriate scale;
- Compare resilience of different farming systems at regional/national level;
- Together with farmers, analyze which aspects are considered to be most relevant for resilience to inform national/international policies on climate change adaptation;
- Compare resilience scores according to the purpose of production of farmers and pastoralists;
- With the availability of more data, analyze the effect of AP/FFS on harvest and livestock losses;
- Analyze trends of resilience and development in different points in time (in different regions/countries), as well as correlation between variables/indicators;
- Comparison of resilience levels among regions/countries depending on the level of governance.

As more data is collected, additional types of data analysis could be carried out, depending on the specific needs of each project by using specialized software (e.g. SPSS, Stata) in order to investigate deeper into correlations between factors.

The key outcome from the analysis of SHARP data will be informing farmers and pastoralists on best practices that can be implemented in order to improve the climate resilience of their pastoral/farm system. While these will vary depending on the specific farming system and climatic conditions, options include:

- Changing sowing date, type of crop, variety of crop (e.g. projected erratic rainfall patterns; lower precipitation; increases in temperature);
- Improving the efficiency of irrigation systems (e.g. drip irrigation) – where these are in place – of water management practices, of rainwater harvest (e.g. projected lower precipitation level, risk of drought);
- Facilitating the adoption or the improvement of soil management practices, including composting and organic matter management, low/no-till (low soil quality; land degradation);
- Diversifying incomes by exploring possibilities for off-farm activities (general strategy);
- Introducing agroforestry, artisanal fisheries, or crop-livestock integration measures that create virtuous cycles between natural resources.

Other outcomes from the analysis include suggesting adaptations to:

- AP/FFS curricula materials;
- Regional/national policy recommendations;
- Mapping of resilience level at regional/national level matched with climate change forecast;
- Feedback on how to improve the SHARP survey.

Table 12. **Example of a rapid assessment priority ranking of SHARP questions**

QUESTION	RESPONSE	SELF-ASSESSMENT	SELF-ASSESSED IMPORTANCE	PRIORITY RANKING	EXAMPLES OF POTENTIAL FARMER/ PASTORALIST ACTIONS	EXAMPLES OF POTENTIAL INTERVENTIONS/ ACTIONS[1]
Access to credit	N	3	2	1	• With the help of AP/FFS facilitators establish a members lending group; • Micro financing;	• FAO directed projects;
Energy sources	3	5	5	2	• Look for alternative sources; • Plant more trees; • More efficient stoves;	• More efficient stoves;
Sources of water	3	5	5	3	• Community water well; • Establish mise en défens areas (Diatta *et al.* 2000); • Change livestock practices;	• Better transport infrastructure; • Help establishing community water well;
Locally adapted seeds	Y	9	4	4	• Encourage continued use; • Test other locally adapted varieties if applicable;	• Establish local seed bank e.g. Navdanya NGO;
Farmers group membership	2	8	8	5	• Discuss pros and cons of farmers' group membership in group setting;	• Share examples from other farmers groups to see if improvements can be made;
Nitrogen fixing legumes	Y	4	3	6	• Plant intercropped with food crops;	• Encourage use of varieties suited to local conditions, if not available experiment with (participatory) breeding of variety;
Tree coverage	30%	8	9	1	• Curtail tree cutting; • Exchange information on tree management practices;	• Improve access to market for timber and Non-timber forest products (NTFP);
Record keeping practices	3	3	8	7	• Discuss most satisfactory ways of keeping record on agricultural practices and other useful information; • Discuss skills needed to improve record;	• Keep regional/ district level archive of relevant information;

[1] To ensure commitment and sustainability of interventions Governments have to be involved as well. This can be facilitated by having legal frameworks present establishing clear roles and responsibilities

6.3 SPECIFIC STRATEGIES (PHASE 3)

The information gathered in the gap analysis can then be used in Phase 3 to provide individualized solutions for farmers and pastoralists to become more resilient to climate change. These should be developed in collaboration with the farmers and pastoralists, but also fit into larger regional plans to encourage synergies.

There are two main impact categories as a result of climate change; immediate changes (such as increased extreme events and variability), and slow onset changes (such as a gradual increase in mean temperatures) (FAO, 2013b). Being prepared for increased variability in the short term is likely to be difficult due to large uncertainties, however becoming more climate resilient will help prepare for long-term gradual changes. Actions that increase resilience regardless of the change have been referred to as "no regret" approaches to reducing vulnerability (HLPE, 2012).

These adaptation measures will of course look different in different locations; however, Nhemachena and Hassan (2008:3) identified certain common measures such as "using different varieties, planting different crops, crop diversification, different planting dates (given the high number of statements that the timing of rains is changing), diversifying from farm to nonfarm activities, increased use of water saving techniques, and increased use of water and soil conservation techniques". This list can be complemented by further practices such as, intercropping, mixing high-yield water sensitive crops with less productive, drought-resistant varieties (Bradshaw *et al.* 2004) agroforestry and forestry practices/activities. Based on the local conditions and the climatic changes that are expected, as well as the farmers' current state of climate-resilience, specific strategies to improve climate resilience will be identified and in collaboration with the AP/FFS' possibilities to include these in the curriculum will be explored. If, for example, SHARP shows that farmers in one area are having water shortage issues which are expected to worsen due to climate change, then it could be proposed to farmers/pastoralists that the next AP/FFS focus on addressing those issues, not through changing rainfall patterns, but by changing practices to use the available water more effectively.

Table 13 displays a sample timeline for the period 2013 to 2017 for the development of SHARP and implementing the three phases. This timeline is expected to change to fit the needs of different field schools, which have different lengths. In many cases carrying out an assessment of laws and policies related to agricultural/pastoral climate resilience would be useful. This could be conducted in concert with the gap analysis or as a separate component to determine whether legal reform or capacity building is required.

6.4 CONSIDERATIONS ON THE DIFFERENT PHASES

Phases 2 and 3 are the phases that are intended to be the least detailed as they will evolve over time and will depend on the needs and capacity of the implementing agency. The initial focus of SHARP will be mainly on the first phase, as the other phases will be based more extensively on collaborations with partner organisations. Although Phase 1 will have standardized aspects in order

to ensure consistency, how the data is collected and used will vary. There will be both a local and national focus and aspect of these two phases.

FAO staff will be involved in expanding the use of SHARP geographically to new regions and with other organizations to use in their programmes. They will also work to revise SHARP, both the concept document and the survey as needed, and as a result of feedback and information collected. FAO staff will also be responsible for training personnel involved in implementing SHARP. Over time, following a 'contextual vulnerability' approach to resilience building, local level SHARP information will be used to help inform climate change resilience policies and climate change projects. Climate change models, such as CORDEX, will be used in conjunction with SHARP data to have farmers and pastoralists opinions and practices to ensure sound science and "buy-in" by participants in programmes. Coupling of resilience priorities as self-assessed by communities with climate forecasts, will provide confirmation of priority areas for resilience improvement at regional and national scales.

At a local level, personnel implementing SHARP (field school facilitators and monitoring and evaluation persons) will review the results of the survey both in terms of their own regional information and in relation to other areas. They will then meet with the pastoralists and farmers to discuss the results and get feedback on how they farmers and pastoralists would like to change field schools (revising curricula, developing new curricula, learning new practices identified within SHARP, etc.). Specific actions should be considered in light of climate change models for the region.

Over time, the network of SHARP results will provide a better understanding of what practices are increasing climate resilience, trends through time and where improvements can be made.

Table 13. **Overview of envisaged SHARP activities**

PHASE	2nd half 2013	1st half 2014	2nd half 2014	1st half 2015	2nd half 2015	1st half 2016	2nd half 2016	1st half 2017
Develop SHARP	→	→	→					
Conduct SHARP/ Phase 1			→	→	→			
Gap analysis/ Phase 2				→	→	→		
Phase 3				→	→	→		
Conduct SHARP/ Phase 1				→	→			
Gap analysis/ Phase 2					→	→		
Phase 3						→	→	→

07

SHARP SELF-ASSESSMENT SURVEY

SHARP SELF-EVALUATION AND HOLISTIC ASSESSMENT OF CLIMATE RESILIENCE FOR FARMERS AND PASTORALISTS

Version 4.0 | August 2015

WELCOME TO THE SELF-EVALUATION AND HOLISTIC ASSESSMENT OF CLIMATE RESILIENCE FOR FARMERS AND PASTORALISTS (SHARP)

Question 1

ID # _____

***Country** _____

Region _____

District _____

Village _____

Agro-pastoral/farmer field school name _____

Latitude _____

Longitude _____ (option to get GPS coordinates)

Data collection initiated on _____

***Data collected by** _____

***Name of respondent (farmer/pastoralist)** _____

***Name of head of household (if different from respondent):** _____

***Relationship of respondent with head of household (circle correct): household head, spouse, parents/parents in law, son/daughter, brother/sister, other family member, other living in household** (specify_____)

***Gender**

○ Male ○ Female

***Age** _____

***Practice**

○ Farmer ○ Pastoralist ○ Agro-pastoralist

This process will be conducted by farmers/pastoralists in collaboration with field school facilitators.

Please answer all questions where appropriate. The SHARP survey has been designed in a flow-chart manner so that some questions can be skipped if they do not apply. Usually there will be a question with a possible "yes/ no" answer. Either the "yes" or the "no" should be circled. If the answer is "no" then the participant may move on to the next question. If the answer is "yes" then usually more information is requested to explain or elaborate.

SHARP is not intended to be completed in one session and will require interactions with facilitators as described below. When an answer is not known, please write "unsure" or an equivalent response.

In order to perform a rapid assessment that covers all aspects of resilience, a minimum of 25 questions are required. These are indicated with an * beside each question. Within each question, required parts of the questions are also indicated with an *. Question numbering is based on the tablet-based application. Questions can be answered in any order.

STEP 1. GOVERNANCE ENVIRONMENT

SHARP ANALYSIS OF THE ENABLING LEGAL AND POLICY ENVIRONMENT FOR CLIMATE RESILIENCE

As a holistic assessment and learning tool, SHARP includes aspects of governance and methods to strengthen the enabling legal and policy environment for climate resilience. This is of relevance, as farmers and pastoralists are affected by the legal environment they function in, for instance through the availability of (financial and other) support and extension services, land tenure or the regulation of certain activities.

Farmers and pastoralists may not understand the laws, policies and regulations under which they are governed themselves, and so we propose that this part of SHARP be implemented at two levels through: (1) an analysis by legal experts, and (2) discussions with farmers and pastoralists on the impact of laws on their lives and livelihoods.

Our proposal is to give partners and implementers of SHARP a general overview of key aspects to consider when performing an analysis of the enabling legal environment for climate resilience on national, regional or local levels. Such an analysis may vary from country to country and from region to region, which is why there is no "one-size fits all" approach.

1. Including this in project activities and choosing adequate consultant(s) for the analysis

As a first step, an analysis of the enabling legal and policy environment for climate resilience is included in project planning, to ensure that adequate funding and time is allocated for such an analysis. This budget should foresee funding for human resources to research local and national policies and laws. A number of organizations use local graduate law students with experience in environmental and/or agricultural laws, to conduct research in collaboration with university professors. It will be important for any analysis to engage with government ministries to gain the most up-to-date information on laws and policies. A legal analysis should not only be a one-way exercise of informing farmers and pastoralists about the existing enabling environment. Rather, farmers and pastoralists' views should also be captured and fed back to policy makers.

2. Desk research (centralized or decentralized)

Desk research of relevant policies and laws at national, regional and local levels should be the first step of the analysis.[13] It should include the following components and activities:

» Research the existing national and sub-national government policies, legislation and bills related to climate resilience, noting their possible and actual impacts on farmers and pastoralists. Policies and legislation from the following key areas at the least should be included:

[13] For example the Legal Preparedness Assessment Report methodology: www.un-redd.org/Newsletter25/Legal_Dimension_of_REDD_Implementation/tabid/78571/Default.aspx

- **Production**
  - Agricultural management practices (livestock, crop production and aquaculture);
  - Access to seeds/breeds;
  - Access to knowledge/information;
  - Use of and access to pesticides, fertilizers and other inputs.
- **Environment**
  - Water rights and management;
  - Land tenure;
  - Land management practices;
  - Electricity and energy;
  - Forest management;
  - Climate change mitigation and adaptation.
- **Social**
  - Group membership, including cooperatives;
  - Food security;
  - Public participation and consultation mechanisms;
  - Labour, skills and education.
- **Economic**
  - Insurance;
  - Access to markets and market information;
  - Access to finance, including microfinance;
  - Fiscal incentives;
  - Investment and tax.
- Such an analysis should not only include an overview of the policies and legislations but also the implementing bodies and how the laws and policies are (meant to be) implemented, in practice.
- Document and assess current customary or traditional systems that exist alongside formal legislation, particularly related to social norms and customary land rights.
- If available, provide a list of Land Committees at all levels (national, regional, local) that are active on issues relevant to agriculture and specifically climate resilience.

3. Validation and implications for climate resilience

Validate the information gained through the desk research by working with a local consultant, in partnership with government ministries and civil society. An important element of validation is understanding the implications of policies and laws in practice, in particular how successfully they have been implemented. This should culminate in drafting a concise report on the existing legal framework and its (potential) effects on farmers and pastoralists.

4. Inform and train relevant project staff

In order to make the analysis useful to farmers and pastoralists, a training module on the legal framework should be included in SHARP or field school training, summarizing the report and explaining to facilitators how this information could best be transmitted to farmers and pastoralists so that they best take advantage of relevant incentives and opportunities existing in the legal and policy framework.

5. Gather information on the usefulness/corrections from the field level

The last part of the governance analysis supports a two-way communication between the field and policy makers. Information from farmers and pastoralists on whether they are aware of laws and policies that affect them, and if so, how laws and policies are implemented in their communities to their benefit, can provide important data to advocate for reform with local and national policy makers (Kurukulasuriya *et al.* 2013).

The below two governance questions are incorporated into the SHARP tablet application to be asked directly to farmers and pastoralists.

QUESTION	RESPONSE				
20.	*** Are you aware of any governmental policies or programmes on climate change and sustainable agriculture that affect you?**				
Yes	No	Not sure			
If yes, please elaborate on what their impact is to you:	None	Direct money/ support	Education/ training	Legal support	Other (please specify)
* How helpful is government support to your livelihood?					
Not at all	A little	Some	Very	Extremely	
* How important is government support to your livelihood?					
Not at all	A little	Some	Very	Extremely	
21.	***Are there customary rules (or land committees) related to climate change and agriculture?**				
Yes	No	Not sure			
Please elaborate					
*Do these rules have a positive impact on your livelihood?					
Not at all	A little	Some	Very	Extremely	
*How important are these rules to your livelihood?					
Not at all	A little	Some	Very	Extremely	

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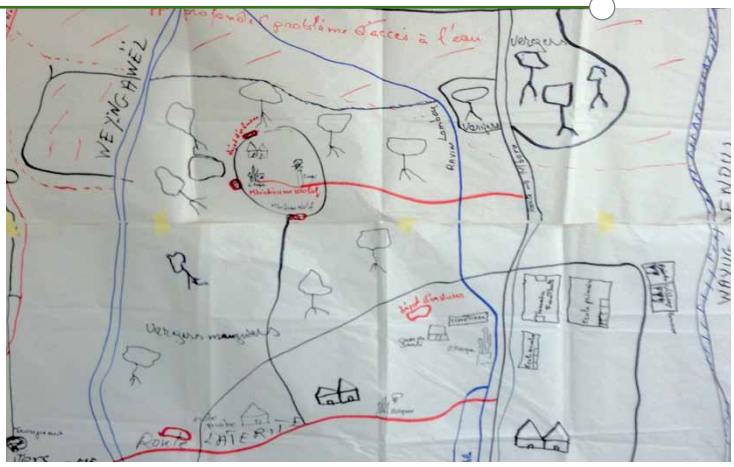

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STEP 2. COMMUNITY RESOURCE MAP

Community mapping can be easily customized to fit both the needs SHARP and those of partners' experience, skills and social practices. This step should both be useful in itself for farmers and pastoralists and as a tool to elicit information used in subsequent sections of SHARP. A large piece of paper (and marker/ pens) should be used to develop the community map and included in the completed SHARP document.

A community map is to be prepared in advance of the AP/FFS by the facilitators and further developed with the farmers/pastoralists during the field school and SHARP evaluation (if this has not already been done as part of the AP/FFS). The pictures below are examples of community maps. The purpose of the exercise is to:

1. Map local natural and physical features in the community and surrounding area;
2. Clarify the area under consideration in the group discussion;
3. Elicit further information by providing a visual tool for discussing SHARP;
4. Help communities identify the areas of importance to SHARP (e.g. degraded land, disputed territory, crops);
5. Provide a baseline by which future SHARP assessments can be compared with.

The map should display (potential or current):

» Key natural resources;
» Hazards and safety concerns;
» Health concerns e.g. malaria;
» Socio-political issues such as land redistribution through outlining resettled areas;
» Environmental threats / areas of environmental concern?;
» Areas prone to flooding / least affected by flooding;
» Areas/land that has changed in the last 10 years?;

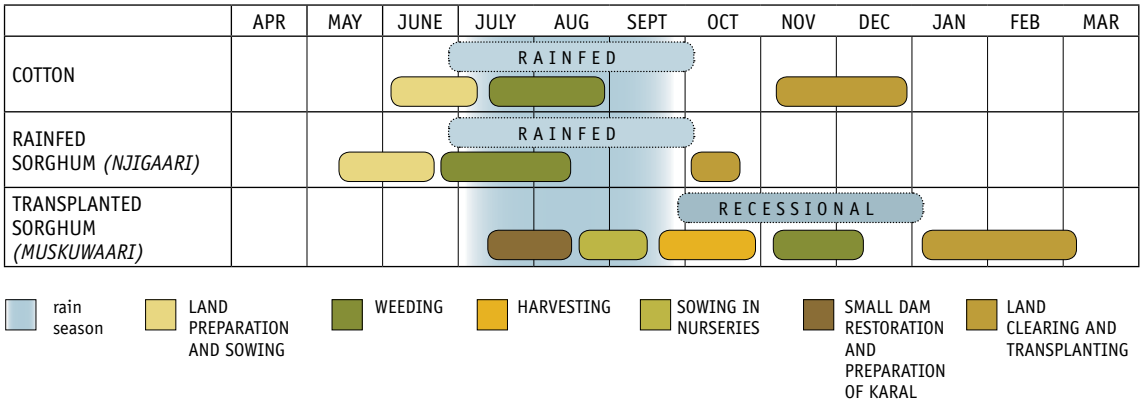
Some general questions that may come out of the discussion include:

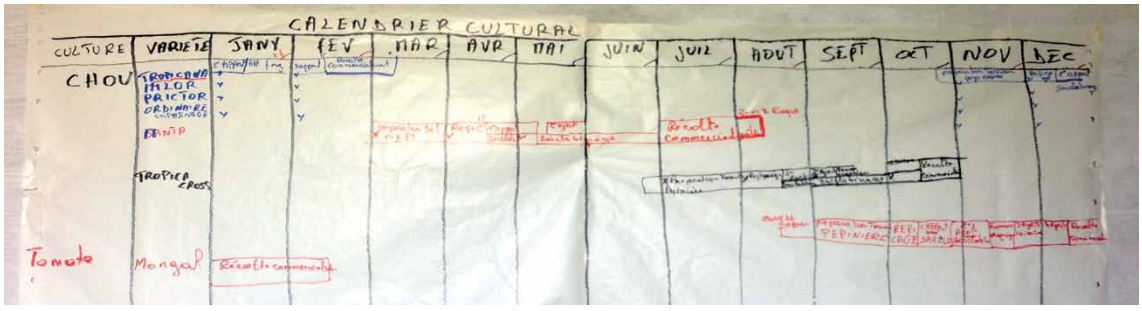
» Are resources in the community used sustainably? How do people in the community survive and recover after disasters?
» Are the current survival and recovery strategies working? Why / why not?
» Are they sustainable, particularly in the face of climate changes?
» What are the roles and responsibilities? Who is responsible for what?
» What can the community change? How can the community influence change with the support of others in the short, medium and long terms?

STEP 3. **CROPPING CALENDAR**

Although aimed at farmers, pastoralists can use calendars for rainy seasons and to better understand periods of hunger and income generation and expenses. Rainfall and crop calendars are often developed in AP/FFS and other programmes to help farmers plan their cropping season (see diagram below). These calendars should be prepared by AP/FFS facilitators and then developed in partnership with each farmer (as each farmer may have different crops the calendars may be different). A crop and rain calendar can be found below (see Figure 15). In addition to the community map, the calendar is another visual tool that can be used to determine periods of increased risk, which can lead to the development of strategies to cope (e.g. planting different crops in order to stagger the harvesting season). This is a powerful tool that can also show climactic changes over time when previous years' calendars are compared. Facilitators will be able to use SHARP to work together with farmers to include information about periods of income generation, 'hunger' seasons together with rainy seasons. AP/FFS facilitators and policy makers can then use this information to better understand what practices may be employed to reduce inter-annual fluctuations in income generation and promote strategies to lessen hunger and drought. The calendar should be developed for a one-year period based on past experiences and looking forward to the upcoming season with best estimates of when different events will occur. Who is responsible/does the work for each component (weeding, harvesting etc.).

Figure 15. **Crop calendar for cotton, rain fed sorghum and transplanted sorghum in Cameroon**





Source: top: Batello *et al.* 2004; bottom: John Choptiany

FAO has developed an interactive tool for developing cropping calendars of many crops based on agro-ecological zones. See Figure 16 and 17 for a sample cropping calendar and community map.

Figure 16. **Sorghum cropping calendar for Senegal indicating sowing/ planting periods and harvesting periods (FAO, 2010)**

http://data.fao.org/database?entryId=2ca1cadd-9ee2-42ee-84d4-34473f2508fa

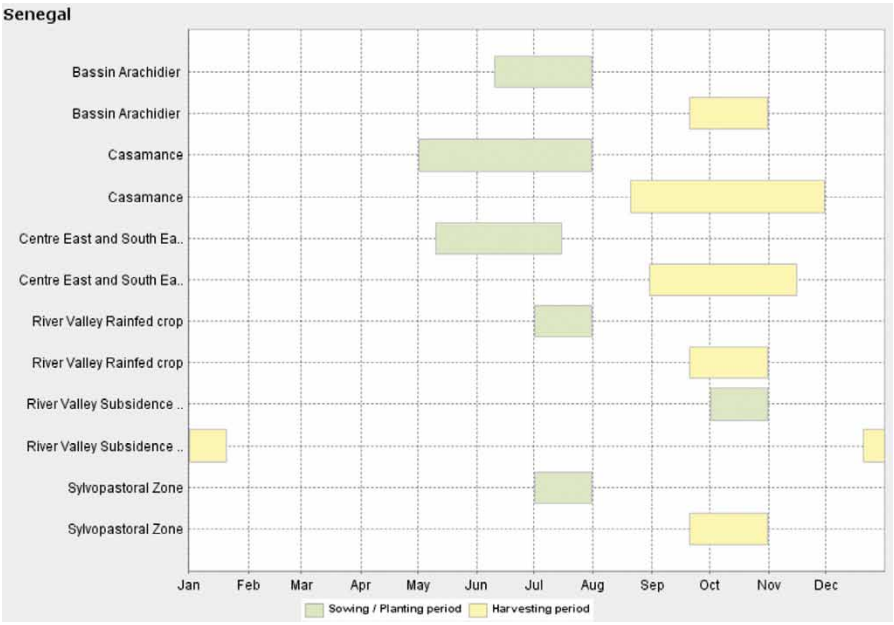
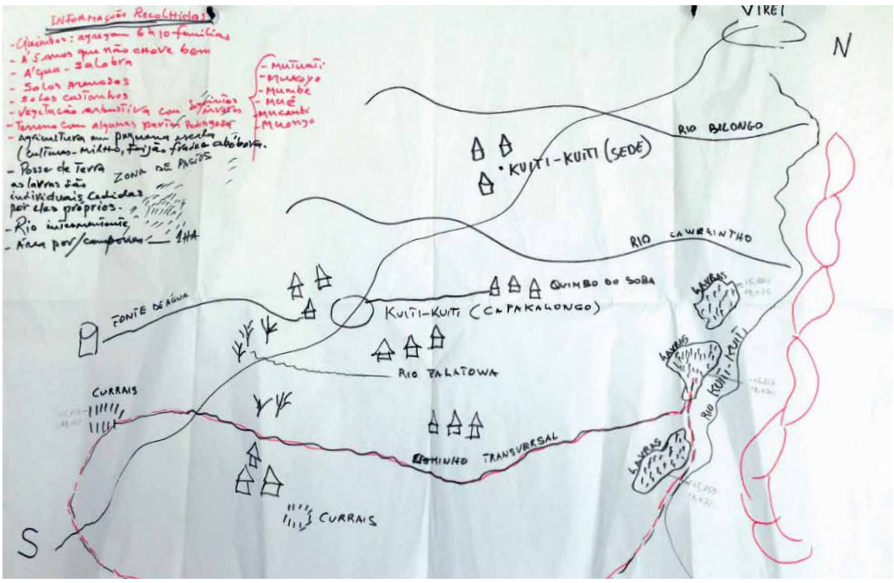


Figure 17. **Sample community map (Bibala, Angola, 2013)**



Source: John Choptiany

STEP 4. GENERAL INFORMATION ABOUT FARMERS/ PASTORALISTS

PLEASE REFER TO THE ANDROID APPLICATION FOR THE LATEST VERSION OF THE SURVEY.

PRODUCTION SYSTEMS AND PRACTICES						
2. Household (11.1, 12.1, 12.5)*						
Question/ person	Men (16-45)	Women (16-45)	Children (0-15)		Women (46+)	Men (46+)
			Boys	Girls		
* For each category, how many people are there in your household?						
* Who is the head of the household *(tick correct category)?*						
For the following questions, indicate for each category the number of people involved/concerned:						
How many participate in the cultivation of crops?						
How many participate in livestock activities?						
How many are involved in other income-generating activities?						
How many are unable to work due to health reasons?						
How many have completed primary education?						
How many have completed secondary education?						
If you practice any additional activity, please describe it here.						
Describe other activities that other members of the household engage in.						
* Do the elders play a role within the community e.g. caring for smaller children, assisting household or community decisions?		* Women			* Men	
		Yes/ No			Yes/ No	
Describe the role that elders play within the community. e.g. caring for smaller children, assisting household or community decisions.						
* To which extent are you satisfied with the role you play within the household?	Not at all	A little	Average		A lot	Completely
* How important do you consider your role within the household?	None	A little	Average		A lot	Very

3. Production types (4.2, 11.3)*						
*** Do you usually carry out any of these activities on your farm?**			Traditional activity	* Main activity	* For how many years have you carried out this activity?	Please elaborate as needed
Crop production (food crops, vegetables, cash crops)?	Yes	No				
Livestock (animal production, feed production, herding, penning, pastoralism etc.)?	Yes	No				
Agroforestry (tree production, assisted natural regeneration, tree planting)?	Yes	No				
Aquaculture (production of fingerlings, fish keeping)?	Yes	No				
Bee keeping?	Yes	No				
Fishing?	Yes	No				
Poultry farming?	Yes	No				
Other activities (*Specify*): _____	Yes	No				
What is the purpose of your agricultural system (*circle options*)?			Market	Agro-business	On-farm consumption	Other (*specify*) _____
Do you practice off farm activities or other natural resource dependent activities?			Charcoal production	Brick making	Pottery	Crafts
			Trade	Tour guide	Remittance payment	Other (*specify*) _____
* To what extent are the activities practiced sufficient for providing income to meet household needs?	Not at all		A little	Average	A lot	Completely
* To what extent is the diversity of activities practiced important to your farm system?	Not at all		A little	Average	A lot	Very

4. Aquaculture (4.1, 5.1, 5.10)*								
* Do you practice aquaculture? *Aquaculture is the breeding of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants. Practicing it implies intervention to improve production: i.e. seeding, feeding, protection against preying, etc. Practicing it also implies individual or shared property of the breeding stock.*							Yes	No
* If yes, what species do you manage? E.g. Shrimp, tilapia	1.	2.	3.	4.	5.	6.	7.	8.
* Do you have more than one breed?								
For each species mentioned do you provide food supplements?								
If so, which ones?								
If so, under which circumstances do you supply food supplements?								

* Does the feed meet the requirements of the species you breed?	Not at all	A little	Average	A lot	Completely
* How important is fish nutrition to your farm system?	Not at all	A little	Average	A lot	Very

5. Crops (annual and perennial) (2.1, 4.1, 5.1)*								
* Do you cultivate any crops?					Yes		No	
If yes, which crops do you cultivate?	1.	2.	3.	4.	5.	6.	7.	8.
* Do you have more than one variety of this crop (please name them if you remember)?								
* Where did you get those varieties of crops from? (e.g. self, store, friend, government, NGO, other)								

Perennial crops				
* Do you grow perennial crops (*plants that can live several years*)?	Yes	No	* If so, which ones?	

* Are the number and variety of crops you cultivate sufficient for your farm system?	Not at all	A little	Average	A lot	Completely
* How important is cultivating a mixture of different crops (including perennials) for your farm system?	Not at all	A little	Average	A lot	Very

6. Livestock practices (4.1, 5.1)*

Do you have any animals (livestock) on your farm?								Yes	No
Practice	Cattle	Goat	Sheep	Buffalos	Pig	Poultry (chickens, turkeys etc.)	Donkey	Horses/ mules	Other (*specify*): _____
* Approximately, how many animals do you own?									
* Do you have more than one variety of this animal?									
Do you tether your animals?									
Do you practice transhumant/ livestock nomadism *(tick when yes)?*									
Do you use paddocks (e.g. pig pens, corrals) to keep your livestock *(tick when yes)?*									

Do you use any other (non-food related) practices to manage your livestock *(if yes, specify which ones and for which animals)?*	Yes	No

* Are the number and variety of livestock sufficient for your farm system?	Not at all	A little	Average	A lot	Completely
* How important is to have a set of different livestock types for your farm system?	Not at all	A little	Average	A lot	Very

7. Animal/livestock breeding (7.3, 10.5)

Practice/ animal	Cattle	Goat	Sheep	Pig	Poultry	Donkey	Dog	
* Have you tried breeding to obtain improved animals *(tick when yes)*?								
If so, following which selection criteria (colour, size, weight, abiotic (e.g. temperature) or biotic (e.g. disease) resistance), milk production?								
* If not, why?								

* How much are you able to improve your animals to meet your farming needs?	Not at all	A little	Average	A lot	Completely
* How important is livestock breeding for your farming system?	Not at all	A little	Average	A lot	Very

8. Animal nutrition (5.10)

	Cattle	Goat	Sheep	Pig	Poultry	Donkey	Dog	Other *specify*
* Do you give food supplements to your animals (such as pods)? *(tick when yes)*								
If so, which foods?								
If so, when do you give these foods? (specific periods/ circumstances)?								
Do you keep the animals grazing on pasture or agricultural lands during part or throughout the year? *(Tick if yes)*								
If so, when are they on pasture land?								

* Is the combination of supplement feed you give your animals and their pasture access sufficient to meet their needs?	Not at all	A little	Average	A lot	Completely
* How important is livestock nutrition to your farm system?	Not at all	A little	Average	A lot	Very

9. Seed/breed sources (3.1, 5.8)*

In general which sources do you have access to?	* Sources of seeds/vegetative material (vines, sticks, etc.)		* Breed sources for livestock (male improver, artificial insemination, etc.)	
Seed Aid	Yes	No	Yes	No
Local shops/ market	Yes	No	Yes	No
Friends/ neighbours/family	Yes	No	Yes	No
Own production (stock)	Yes	No	Yes	No
Dealer (agricultural input traders – suppliers/ stockists)	Yes	No	Yes	No
Seed bank	Yes	No	Yes	No
Seed producers groups or enterprises	Yes	No	Yes	No
Government	Yes	No	Yes	No
Other (*specify*) _____	Yes	No	Yes	No

* To what extent does this combination of seed sources meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is it to have access to several sources of vegetal seeds for your farm system?	Not at all	A little	Average	A lot	Very
* To what extent does this combination of sources of livestock meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is it to have access to several sources of livestock for your farm system?	Not at all	A little	Average	A lot	Very

10. Utilisation of new varieties and breeds (2.2, 7.5, 10.6)

* Do you use newly introduced (*varieties/species which have been used in the community for less than 15 years*) non-indigenous varieties, such as modern cultivars, imported cultivars, High Yield Varieties, private sector seeds, etc?	Yes	No	* If yes, which ones (*give name of variety for each crop and specify crop species*)?			
* Do you use newly introduced (*varieties/species which have been used in the community for less than 30 years*) non-local breeds, such as imported breeds, High Output Breeds, etc?	Yes	No	* If yes, which ones (*give name of breed for each animal and specify animal species*)?			
If you use newly introduced varieties/breeds, why?			Were some of these newly introduced varieties or breeds poorly resistant to local biotic and abiotic stresses?	Yes	No	
			If yes, describe how.			
Approximately what percentage of your crops is a newly-introduced variety?			Approximately what percentage of your animal breeds is newly-introduced?			
* Have some indigenous (local) plants become dis-adaptive due to changes in climate variability?	Yes	No	Don't know	If yes, which ones?	If yes, in which way?	
* Have some local breeds become dis-adaptive due to changes in climate variability?	Yes	No	Don't know	If yes, which ones?	If yes, in which way?	

* To what extent does the combination of local/indigenous and newly introduced species you use meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is this combination of indigenous and newly introduced (improved) species/varieties to your farm system?	Not at all	A little	Average	A lot	Very

11. Trees and Agroforestry (2.7, 4.1, 5.1, 6.2, 8.7, 11.5)*

Planted trees (Agroforestry)

* Have you planted any trees on your land?					Yes	No
* Approximately, how many trees have you planted in your farm system in the past 10 years?			* Of which species?			
Have you planted different varieties of the same tree species in the last 10 years?	Yes	No	For what reasons?			
* For which use have you planted these trees (*circle the uses made*)?	Wood for charcoal	Wood for construction materials	Feed products (animals)	Food products (people)	Fertilizers	Trees for shade
	Natural remedies (animals)		Natural remedies (people)		Products for the protection of crops (e.g. Neem extract)	Other (*specify*): _____

Naturally Occurring Trees (not planted)								
* In general what is the overall percentage of your land covered by trees – including natural and planted?	0%	1-10%	11-20%	* Which species are naturally occurring?				
	21-40%	41-60%	60+%					
* What do you use products from these spontaneous/natural trees for? *(circle the products used)*	I do not use them	Wood for charcoal	Feed products (animals)	Food products (people)	Fertilizers	Natural remedies (animals)	Natural remedies (people)	Trees for shade
	Wood for construction materials		Products for the protection of crops (e.g. Neem extract)	Other (*specify*) _____				
* To what extent does your access to trees (both planted and spontaneous) meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely			
* How important are trees to your farm system?	Not at all	A little	Average	A lot	Very			

12. Crop and livestock losses (1.4, 7.2)

* Over the past 10 years have you lost more than 50% of your crops (pre-harvest loss)?	Yes	No	* From what? *(circle)*?	Predator	Drought	Flood	Straying/ Unfenced animals	Poor quality seeds	Other (*specify*) _____
* Over the last 10 years, have you lost more than 50% of your livestock?	Yes	No	* From what? *(circle)*?	Disease	Drought	Flood	Straying/ Unfenced animals	Theft of animals	Other (*specify*) _____

* How did you cope with this loss?	Crop		Livestock	
	Internal coping capacities/ strategies	External support	Internal coping capacities/ strategies	External support
(*Please describe how*)				

* To what extent were you able to mitigate the negative impacts of these losses?	None	A little	Average	A lot	Completely
* To what extent did these events affect your farm system?	None	A bit	Average	A lot	Very

13. Record keeping (9.4, 11.4)*

* Do you keep records for any of the following:			If yes, how? – If no, why?
Crop yields?	Yes	No	
Rainfall patterns?	Yes	No	
Invasive species?	Yes	No	
Weeding (fight against weeds)?	Yes	No	
Other (*specify*)? _____	Yes	No	

Do you know of any stories, tales or legends about past climate changes?	Yes	No	If yes, how were they passed on to you?			
* Is your record keeping adequate for understanding and observing trends over time?	Not at all		A little	Average	A lot	Completely
* How important is record keeping to your farm system?	Not at all		A little	Average	A lot	Very

14. Infrastructure (5.11, 12.3)

	* Do you have any of the following buildings in your community?		* Do you have access to any of the following buildings in your community?		Please elaborate:
Religious facility (Church, Mosque...)	Yes	No	Yes	No	
Community centre (cultural facility etc.)	Yes	No	Yes	No	
School	Yes	No	Yes	No	
Health centre	Yes	No	Yes	No	
Veterinary clinic	Yes	No	Yes	No	
Input shops	Yes	No	Yes	No	
Cereal bank	Yes	No	Yes	No	
Granary/ storage facilities	Yes	No	Yes	No	
Other (*specify*)? _____	Yes	No	Yes	No	

* To what extent do these buildings fulfil their function?	Not at all	A little	Average	A lot	Completely
* How important are these buildings to your farm system?	Not at all	A little	Average	A lot	Very

15. Access to information on climate change, cropping practices, and meteorological previsions (3.3, 7.2, 9.2, 9.3, 9.5, 11.2)*

Climate Change

* Are you aware of climate change?	Yes	No

* Over the last ten years, have you observed any changes relating to the weather?	* If yes, what changes have you noticed?								
	Increased rainfall	Decreased rainfall	Drought	Increased rainfall variability	Increased temperature	Flooding	Late onset of rainy season	Shorter rainy season	Other (specify)

Yes	No	* If yes, how did these impact your farm system?							
		Crop failure	Unreliable stream flow	Less farm income	Migration/ off farm work	Higher expenses on agricultural inputs	Reduced fodder yields	Water salinity	Other (Please specify)

Climatic information

Do you have means to predict climatic variations?	Yes	No	If yes, how? If no, why?	

* Do you have access to weather forecast services (including preventive information on potential climatic threats e.g. floods droughts, late rains)?	Yes		No		
* To what extent is your access to meteorological information sufficient for your farm system?	Not at all	A little	Average	A lot	Completely
* How important is meteorological information to manage your farm system?	Not at all	A little	Average	A lot	Very

Farming practices

* Do you have access to information on cropping/livestock practices?					Yes		No	
If yes, how do you get this information?	Radio	Newspaper	Television	Extension agent	APFS/FFS	Other farmers/ pastoralists	Internet resources	Other *(specify)*: _____
Please elaborate on limits to your access to this kind of information *(if applicable)*								
* How much has this information been useful for your farm system?	Not at all	A little	Average	A lot	Completely			
* How important is this information in terms of climate change adaptation?	Not at all	A little	Average	A lot	Very			

16. Animal disease control practices (4.4, 8.8)*

* Do you use disease control for your animals/livestock?	Yes		No		
* What types of animal disease control do you use *(Circle the ones you use)*?					
Antibiotics	If yes, what type of antibiotics?				
Vaccines	What dose do you use? (ml/animal)				
Natural remedies	If yes, which ones?				
Treatments against internal and external parasites	If yes, which ones?				
Integrated animal health management (e.g. hygiene, spacing, feed and culling practices)	If yes, which ones?				
Other (please specify) _____	Which ones?				
* To what extent are you able to manage disease in your animals?	Not at all	A little	Average	A lot	Completely
* How important is disease manage to your farm system?	Not at all	A little	Average	A lot	Very

17. Pest management practices (4.4)

* Do you use pest/disease management practices on your crops?	Yes	No
* What pest control practices did you use over the last cropping season (*circle those used*)?		
Natural pesticides (e.g. Neem extract) *If yes, which ones?*	Pest resistant varieties or seeds *If yes, which ones?*	Biological control methods (e.g. parasitoids, ladybugs) *If yes, which ones?*
Synthetic pesticides	Plants thinning	Nursery treatment
Crop rotation to reduce weeds/ pest growth	Manually catching the pests found on crops	Using traps or plant traps
Others (*specify*)		

* What constraints have you encountered when applying pest/disease management practices?					
* To what extent do the practices you use allow for sufficient pest/disease control?	Not at all	A little	Average	A lot	Completely
* How important is pest/disease control for your farm system?	Not at all	A little	Average	A lot	Very

18. Synthetic Pesticide use (2.3, 8.6, 10.10, 12.1)*

Over the last cropping season...

Pesticide	Insecticide		Herbicide		Fungicide	
* Did you use synthetic pesticides?	Yes	No	Yes	No	Yes	No
What brands/label did you use?						
What quantity of pesticide did you use? (L/ha/pesticide used)						
* Did you look for pests/diseases on your crops before spraying?						

* Over the past season, how often did you use protective gear?			* If yes, what kind of protection do you use? (e.g. eye goggles, gloves, mask).				
Always	Sometimes	Never	Eye goggles	Gloves	Mask	Jacket	Other

What do you do with the containers after you have used the products? *(Circle the practices you use)*

Give to collectors (such as recycling facilities)	Thrown away in the trash	Re-used	Throw away on ground Thrown near a water stream	Other (*specify*)____

To which extent did synthetic pesticide use allow you to manage pests effectively?	Not at all	A little	Average	A lot	Completely
How important are synthetic pesticides to your farm system?	Not at all	A little	Average	A lot	Very

19. Intercropping (3.2, 6.6)

* Do you grow two or more crops in association?	Yes	No
Please elaborate:		
* What percentage of your cultivated crops is intercropped?	Yes	No
* Do you grow plants in association with aquaculture (rice-fish farming)?	Yes	No

Please elaborate on how different elements of your farm system are integrated (e.g. livestock, crops, fish, trees)					
* To what extent is the combination of your crops meeting your needs?	Not at all	A little	Average	A lot	Completely
* How important is intercropping to your farm system?	Not at all	A little	Average	A lot	Very

ENVIRONMENT

22. Water access (1.5, 5.3)*

For each water source you have access to, please specify:

Water sources:	* Type of water source: *(choose between: well, dam (water impoundment structure), River/water stream/lake, or other to be specified)*	Distance to the nearest water source from your home (in kilometres):	Time needed to walk and collect water to the nearest collection point (*in minutes*) (*includes the time needed to both walk and collect water*)	Have you seen any changes in water quality or quantity with these sources during the past 5 years? If so please describe.
* 1				
2				
3				
4				
5				

* Is you water access sufficient for the quantitative needs of your farm system and household consumption?	Not at all	A little	Average	A lot	Completely
* How important is it to have access to water sources for your farm system and household consumption?	Not at all	A little	Average	A lot	Very

23. Water conservation techniques and practices (8.5)

* In your farming system and household consumption, do you use techniques and practices for water conservation (*circle the appropriate answers*)?

No	Cisterns (water harvesting tanks)	Irrigation – funnelling water	Planting pits, and semi circular bunds
Water retention ditches, stone bunds, vegetation strips, contour lines and trenches (furrows)	Water early morning or late at night (when the temperature is lower)	Terracing	Mulching (laying a thin layer of vegetal cover on the ground)
Cover crops	Drip irrigation	Graded ditches/waterways (to drain)	Dams
Other *(specify)*:			

* How much do the water conservation practices you use allow you to save water in your farm system and household consumption?	Not at all	A little	Average	A lot	Completely
* How important is water conservation for your farm system and household consumption?	Not at all	A little	Average	A lot	Very

24. Water quality (8.2, 12.1)

* Have you encountered any of the following water quality problems:			*If yes, explain the nature of the problem:*
Pollution from pesticides or other chemicals (oil, industrial by-products)?	Yes	No	
Nutrient runoff (manure or fertilizers)?	Yes	No	
Increased sediments and siltation (mud pollution)?	Yes	No	
Dumping of organic waste (e.g. manure, faecal matters)?	Yes	No	
Pollution of ground water	Yes	No	
Other (*specify*) _____	Yes	No	

* Is the water you have access to suitable for human consumption?	Not at all	A little	Average	A lot	Completely
* Is the water you have access to suitable for animal consumption?	Not at all	A little	Average	A lot	Completely
* Is the water you have access to suitable for agricultural use?	Not at all	A little	Average	A lot	Completely
* How important is water quality to your farm system?	Not at all	A little	Average	A lot	Very

25. Land access (1.5, 5.7, 6.5)*

Type	Private plots (ha.)	Community land (ha.)	Government land (ha.)
* Total accessible agricultural land, if applicable (hectares):			
Total number of fields you have access to			
* Total area of owned land, if applicable			
For each type of land, what do you use the land for (Crops, fruit farming, pasture)?			

* Is your land access adequate for the subsistence of your household?	Not at all	A little	Average	A lot	Completely
What factors limit your access to land?					
* How important is it for your household to have access to communal land?	Not at all	A little	Average	A lot	Very

26. Soil quality and Land degradation (6.3, 8.1, 8.2)

* How many different types of soil can you observe on your field (approximately)?					
Is the soil on your land (circle the appropriate answer):					
Sandy?	Loamy?	Clay?		Stony?	
* On average, how rich in Soil Organic Matter is your soil?	Not at all	Very little	Average	Quite rich	A lot/very
* In general, is your soil fertile?	No	A little	Average	A lot	Fully
* How much does the fertility state of your soil affect your farm system?	Not at all	A little	Average	A lot	Very
* Have you observed one or several of the following types of soil/land degradation these last five years (*circle*)?					
Erosion (from wind) Loss of topsoil	Erosion (from water) Loss of topsoil	Soil salination/ alkalinisation (preventing crops from growing)		Compaction (hard ground)	
Diversity decline in species composition (Shift of flora and invasive species)	Increased pest and weed competition	Deforestation (reduction in trees and shrubs)		Soil pollution (poisoned soil)	
Fertility decline and reduced organic matter content	Grazing area quality degradation	Other: _____		Other: _____	No soil degradation observed
Gully erosion	Landslides	Riverbank erosion		Coastal erosion	Reduction of vegetation cover
Acidification	Sealing and crusting	waterlogging		Subsidence of organic soils	Loss of habitats
Aridification (decreased soil moisture)					
* Is the land you have access to suitable for your farming activities?	No	A little	Average	A lot	Completely

What is the status of the main three types of soil/land degradation on your land?	Type	Extent (% of the land)	Degree (light, moderate, strong, extreme)	Rate (increasing, no change, decreasing)

* How much of an impact does land degradation have on your farm system?	None	A little	Some	A lot	Very

27. Land management practices (5.5, 6.1, 6.4, 8.3, 12.2)*

* Do you use land management practices?	Yes		No
Which land management practices do you use?	* Response		Please elaborate
Liming (i.e. the application of calcium- and magnesium-rich materials to soil to neutralise soil acidity and increase activity of soil bacteria)	Yes	No	

Fallowing/shifting cultivation	Yes	No	
Slash and burn	Yes	No	
Zero/minimum tillage	Yes	No	
Rotational grazing	Yes	No	
Crop rotation	Yes	No	
Wind break/hedge	Yes	No	
Intercropping	Yes	No	
Mulching	Yes	No	
Manuring/composting	Yes	No	
Vegetative strips	Yes	No	
Agroforestry, afforestation, forest protection	Yes	No	
Gully control/rehabilitation	Yes	No	
Terracing	Yes	No	
Other management practices	Yes	No	

What do you think are the main causes of soil/land degradation?		
Cultivation of vulnerable soils	Missing erosion control measures	Heavy machinery
Ploughing	Burning	Inappropriate use of fertilizer, and agro-chemicals
Too short a fallowing period	Over irrigation	Insufficient drainage
Bush encroachment	Spread of weed and invasive species	Commercial forestry
Expansion of settlements	Conversion to agricultural land	Excessive wood harvesting
Excessive number of livestock	Overgrazing	Change in livestock composition
Industrial activities	Over-extraction of ground water	Other (please specify)

* To what extent do the land management practices used improve the quality of your farm land?	Not at all	A little	Average	A lot	Completely
* How important are land management practices to your farm system?	Not at all	A little	Average	A lot	Very

28. Leguminous plants (2.4, 8.3)*

* Do you have any leguminous plants growing on your farmland?	Yes	No	What species/type?

* If yes, did you plant them?	Yes	No	If yes, for what purpose?			
* To what extent did planted leguminous plants affect your farm yield?		Not at all	A little	Average	A lot	Completely
* What is the importance of leguminous plants to your farm system?		Not at all	A little	Average	A lot	Very

29. Buffer zones (unmanaged areas surrounding the field) (2.5, 4.1, 7.4, 12.2)

* Is your land bordered by wild/ unmanaged land?	All of it		Most of it	Some of it	None of it
* If so, have you observed many plants and insects on that land?	Yes	No	Please give evidence on how you can observe it:		
* Does the presence of wild unmanaged areas reduce yield losses caused by pest populations?	Not at all	A little	Average	A lot	Completely
* Is the presence of wild unmanaged areas of land important for your farm system?	Not at all	A little	Average	A lot	Very

30. Energy sources (2.8, 5.4, 10.8)

Which energy sources are used in your farm system (*tick*)?

Energy type	Cooking	Heating	Lighting	Machinery
Solar (including solar driers, solar cookers, solar pumps, solar fridges, solar chillers, solar ice-makers)				
Fuel wood				
Charcoal				
Domestic waste				
Agricultural residues				
Wood residues				
Manure				
Oil, Diesel				
Paraffin				
Gas				

Electricity (public source)					
Other (specify)					
* Are the energy sources used sufficient to meeting the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is access to energy to your farm system (referring to cooking, heating, lighting and machinery)?	Not at all	A little	Average	A lot	Very

31. Energy conservation (8.4)

* Do you use energy conservation practices to reduce energy cost in the household?	Yes	No

* Which methods do you use?		
Energy-saving light bulbs	Recycling (e.g. of fuel wood to make charcoal)	Energy-saving stoves (for cooking)
Others (*specify*)		

* To what extent do these methods allow you to make energy savings?	Not at all	A little	Average	A lot	Completely
* How important is energy saving for your farm system?	Not at all	A little	Average	A lot	Very

32. Fertilizers (2.6, 5.6, 8.3, 10.10, 12.2)*

* Did you use synthetic inorganic fertilisers this season?		Yes		No	
If you do use fertilizer, do you check the soil and plants first to see whether they need it?		Yes		No	
* If you don't use them, why? (*circle option*)					
I don't want to *(please explain why)*		Expensive			
Too far/difficult to access		Lack of knowledge of how to use			
Not available		Other *(specify)*			
* Is your access to inorganic fertilisers sufficient for the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is access to synthetic fertilizer sources to your farm system?	Not at all	A bit	Average	A lot	Very
* Did you use natural organic fertilizers this season?		Yes		No	

* Which ones?	Response		If not, why?	If yes, do you prepare them yourself?
Compost/plant manure	Yes	No		
Animal manure	Yes	No		

* Do you use cover crops	Yes	No		If yes, do you use the cover crops for something else (fodder, wood, food etc.)?
If you use cover crops, which ones?				
Others (*specify*)				

* **In general, where do you source your fertilizer from?**		
From farm	Yes	No
Shop	Yes	No
Aid	Yes	No
Friends/ neighbours	Yes	No
Extension worker	Yes	No
Directly from seller (e.g. meet a person at your farm)	Yes	No
Other	Yes	No

* Is your access to natural fertilisers sufficient for the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is access to natural fertilizer sources to your farm system?	Not at all	A little	Average	A lot	Very

33. Weed species and management (4.1, 6.7, 7.1)

* Approximately, what percentage of your field is covered by weeds?						
* In your field, what weed management practices do you use? *(tick when used)*	Cover crops	Hand weeding	Herbicides	Other crops	Livestock grazing	Other

How many types of invasive weed species (i.*e. common alien species which negatively affect a region economically, environmentally and/ or ecologically*), such as *Striga*, have you observed in your field in the past 10 years?						
* Do these weed species negatively impact your farm system?	Yes	No	* If yes, how (toxicity, out-competition of useful plants, prevent growth, reduce crop growth.)?			
Which species?						
* To what extent are the methods you use effective in curtailing the negative impacts of weeds on your farm system?	Not at all	A little	Average	A lot	Completely	
* To what extent are invasive weed species damaging to your farm system?	Not at all	A little	Average	A lot	Very	

SOCIAL

34. Group membership (1.1, 1.2, 9.1, 12.4)*

* Are you a member of any groups, organizations or association?	Yes	No

** If yes, circle the groups of which you are a member:*

Seed bank	Farmers'/ fisherfolk group	Listening clubs
AP/FFS	Cooperatives/ producers' organizations	Traders' association/ business group
Professional association	Trade union	Credit/finance group
Water/waste group	Neighbourhood/ village association	Civic group
Religious group	Cultural association	Political group
Youth group	Women's group	Parent group / School committee
Health committee	Sports group	Other (*specify*): _____

** For the groups of which you are a member, please describe:*

Name of the group	Type of group	Degree of participation (Leader, Very Active, quite Active, Not active)

Were any of those groups initiated/started by the community?	Yes	No

* In general, to what extent do these groups benefit you?	Not at all	A little	Average	A lot	Completely
* At the level of your farm system, is group membership important?	Not at all	A little	Average	A lot	Very
* To what extent has membership to the groups given you knowledge to improve your farm system?	Not at all	A little	Average	A lot	Completely
* What is the importance of the information received by these groups for your farm system?	Not at all	A little	Average	A lot	Very

35. Meals (5.9, 12.1)*

Now I would like to ask you about the **types of foods that you or anyone else in your household ate yesterday during the day and at night.** *[the facilitator asks the respondent to recall all the foods which were eaten in the household the previous day and lists them. After that he goes over the list with respondent and fills in with information]*

Food type	* Did anyone in the household eat the food in question over the last day and night?		Could you specify the main Food Source for this food type over the past 7 days: *(choose among: own production, hunting/fishing, gathering, borrowed, purchase, exchange labour for food, exchange items for food, gift (food) from family relatives, food aid (NGOs, etc.), other (specify)*
Any [INSERT ANY LOCAL FOODS], bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize, rice, wheat, millet, or [INSERT ANY OTHER LOCALLY AVAILABLE GRAIN]?	Yes	No	
Any potatoes, sweet potatoes, yams, manioc, cassava or any other foods made from roots or tubers?	Yes	No	
Any vegetables?	Yes	No	
Any fruits?	Yes	No	
Any beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meats?	Yes	No	
Any eggs?	Yes	No	
Any fresh or dried fish or shellfish?	Yes	No	
Any foods made from beans, peas, lentils, or nuts?	Yes	No	
Any cheese, yogurt, milk or other milk products?	Yes	No	
Any foods made with oil, fat (animal or vegetable origin), or butter?	Yes	No	
Any sugar or honey?	Yes	No	
Any other foods, such as condiments, coffee, tea?	Yes	No	

At the moment, which are your food stocks? (*specify quantity in kg*)

Cereals:		Tubers:	

Please add any other information on your household's diet.					
* Was the food you had yesterday sufficient to meet your household's needs?	Not at all	A little	Average	A lot	Completely
* How important is the diversity of food for your household's alimentation?	Not at all	A little	Average	A lot	Very

36. Disturbances (7.2, 9.2)

* What types of disturbances have you experienced in the past 10 years? (*circle relevant options*)	Locust/pest outbreak		Fire		Wrong timing of rains	
	Floods	Droughts	Disease (crop, livestock, human)		Livestock raiding	
	Conflict: _____		None		Other (*specify*): _____	
* Have you modified your behaviour in response to these disturbances?	Yes	No	How?			
* Have you modified your habits in response to climatic changes?	Yes	No	How?			
* How adequate were your responses to addressing the disturbances?	Not at all	A little	Average	A lot	Completely	
* To what extent did these disturbances affect your farm system?	Not at all	A little	Average	A lot	Very	

37. Veterinary Access (3.4)*

* Do you have access to veterinary services?	Yes and it is good quality	Yes but it is problematic (unqualified personnel, expensive, distant, etc.)			No
Please describe the services to which you have access and their quality level.					
* Does your access to veterinary services meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is veterinary access to your farming system?	Not at all	A little	Average	A lot	Very

45. Trust and cooperation (3.5) (sensitive question)*

Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?	People can be trusted	You can't be too careful			
* In your village/ neighbourhood do you generally trust others in matters of lending and borrowing?	Yes	No			
Please explain why:					
If a community project does not directly benefit you but has benefits for many others in the village/ neighbourhood, would you contribute time or money to the project? (circle contributions you would make)	Time	Money	None		
* To what extent are trust and cooperation sufficient in your community?	Not at all	A little	Average	A lot	Completely
* How important is trust and cooperation in your community to your farm system?	Not at all	A little	Average	A lot	Very

38. Previous collective action (1.4, 10.4)					
* When there were common issues in your village or neighbourhood that needed attention during the last year, how often did you join together with others to address them? *This would include instances where you have joined to decide together to avoid dumping animal dung in water to ensure its quality, signing up petitions to signal issues to the government, setting up credit/saving groups*	Never	Rarely	Sometimes	Frequently	Not applicable
Please elaborate					
* To what extent have those actions contributed to solving the problem?	Not at all	A little	Average	A lot	Completely
* To what extent are those actions important for your farm system?	Not at all	A little	Average	A lot	Very

46. Household decision-making (12.5) (sensitive question)				
* Who in your family usually has the final say on the following decisions:				
Who usually makes decisions about health care for yourself?	You	your partner	you and your partner jointly	someone else
Who usually makes decisions about making major household purchases?	You	your partner	you and your partner jointly	someone else
Who usually makes decisions about making purchases for daily household needs?	You	your partner	you and your partner jointly	someone else
Who usually makes decisions about making visits to your family or relatives?	You	your partner	you and your partner jointly	someone else

* Regarding financial decisions within the household, who in your family usually has the final say on the following decisions:					
Who usually decides how your partner's earnings will be used?	You	your partner	you and your partner jointly	someone else	Not applicable
Who usually decides how the money you earn will be used?	You	your partner	you and your partner jointly	someone else	Not applicable
* To what extent are you satisfied with the decision-making process in the household?	Not at all	A little	Average	A lot	Completely
* How important is decision-making for your farm system?	Not at all	A little	Average	A lot	Very

ECONOMIC

39. Access to local markets (1.3, 10.7)*

* Do you have access to local farmers' markets?		
No access	**Intermittent access**	**Sustained access**

Please elaborate

* To what extent does access to the market meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* What is the importance of access to a local market for your farm system?	Not at all	A little	Average	A lot	Very

47. Financial support (13.1) (sensitive question)

* Have you needed financial support during the past 5 years?	Yes	No

* If yes, how many times have you received financial support for your agricultural activities in the past 5 years?	0	1	2	3	4	5	6+

If applicable, what was the source of financial support?			Explain (especially problems)
Family	Yes	No	
Friends / neighbours	Yes	No	
Bank	Yes	No	
Cooperative	Yes	No	
Microfinance	Yes	No	
Loan company	Yes	No	
Government programme	Yes	No	
NGO programme	Yes	No	
Remittances	Yes	No	
Other (*specify*): _____	Yes	No	

* Was this support sufficient?	Not at all	A little	Average	A lot	Completely
* How important is external financial support to your farm system?	Not at all	A little	Average	A lot	Very

40. Market access – buying (10.2)*						
* Do you buy directly from producers?	Yes	No	If yes, for which products?			
Do you have any vegetal product, which you can only access from one available seller?	Yes	No	* If yes, which crops?			
Are there animal produces, which you can only access from one available seller?	Yes	No	* If yes, which product?			
Do you have any agreement or binding documents with the seller/provider?	Yes	No	*If yes, describe your contract or agreement with the buyer, e.g. the time the contract is made, how you are paid*			
* Are the number and the quality of sellers sufficient to meet the needs of your farm system?	Not at all		A little	Average	A lot	Completely
* How important to your livelihood is it to have multiple sellers available?	Not at all		A little	Average	A lot	Very

48. Market access – selling (5.2, 10.1) (sensitive question)						
* Last year did you sell any of your crops/ livestock/seeds?	Yes	No	*If yes, which ones? (e.g. chickens, sorghum, millet)*			
* Do you sell/trade some of those products directly to consumers?	Yes	No	*If yes, for which products?*			
* Do you have any product with only one available buyer?	Yes	No	*If yes, which products?*			
* Do you have any agreement or binding documents with the buyer?	Yes	No	*If yes, please elaborate: what kind of agreement?*			
* Is the number of buyers to which you have access enough to meet the needs of your farm system?	Not at all		A little	Average	A lot	Completely
* How important to your livelihood is having multiple buyers available?	Not at all		A little	Average	A lot	Very

49. Market prices (13.3) (sensitive question)

Describe the most important products you sell:	Describe the price of this product				
	High	Fluctuating	Unpredictable	Too low	Other (please specify)
Crop 1 _____					
Crop 2 _____					
Crop 3 _____					
Animal 1 _____					
Animal 2 _____					
Animal 3 _____					
Other products that you sell (*specify*): _____					

* Are the prices high enough (for selling), and constant enough for your livelihood?	Not at all	A little	Average	A lot	Completely
* To what extent do price fluctuations affect your livelihood?	Not at all	A little	Average	A lot	Very

41. Market information access (3.3)*

* How often did you have access to information on market prices over the last season?	Often	Sometimes	Never/ very rarely	If yes, which type of information?	
If the information obtained was not satisfactory, for which reason?					
* To what extent is your access to market information meeting the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* What is the importance of access to market information for your farm system?	Not at all	A little	Average	A lot	Very

50. Information and Communication Technologies (ICTs) (3.3) (sensitive question)

	* Do you use?		* Do you own?		What do you use it for?
A mobile phone?	Yes	No	Yes	No	
Internet connection?	Yes	No	Yes	No	
Television?	Yes	No	Yes	No	
Radio?	Yes	No	Yes	No	

* To what extent does your access to ICTs satisfy the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important are ICTs to your farm system?	Not at all	A little	Average	A lot	Very

42. Insurance (13.4)

* Are your crops and livestock ensured against loss?		Yes	No
Crop/livestock	Response	If yes, what is insured?	If yes, have you ever claimed on the insurance?
1	Yes / No		
2	Yes / No		
3	Yes / No		
4	Yes / No		
5	Yes / No		

* Who is providing the insurance?					
* Is your access to insurance satisfactory?	Not at all	A little	Average	A lot	Completely
* How important is insurance to your farm system?	Not at all	A little	Average	A lot	Very

43. Major productive assets (5.7, 13.5)

* Rank by importance the major productive assets that you own
(*by adding a number from 1 to 6: next to the assets owned in the list*)

Land	Livestock	Seeds	Buildings	Equipment (e.g. tractors)	Others (specify):

* Is this combination of assets adequate to support your farm system?	Not at all	A little	Average	A lot	Completely
* To what extent is diversity of your productive assets important for your farm system?	Not at all	A little	Average	A lot	Very

51. Main Expenditures (12.6, 13.3) (sensitive question)

Which have been your largest expenditures last year?

Ranking from 1 to 5 (1= the most important one, 5= the least important)	* Expenditure item (e.g. education)	Description (e.g. school fees)
*		
*		

*		

52. Income sources (4.3) (sensitive question)*

* How many different income sources did you have over the past year?	*1*	*2*	*3*	*4*	*5*	*6+*
* What are your three main income sources? *[Options include: Agriculture production, labour/daily wages, livestock, petite trade/shop keeper, remittances, employed, handicraft, workmanship – mechanic, carpenter, etc; other (please specify)]*	* 1st source		2nd source		3rd source	

* To what extent does this combination of income sources allow you to meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important do you consider having a diverse set of income sources (without implying an increase in total revenues) for your farm system?	Not at all	A little	Average	A lot	Very

53. Nonfarm Income Generating Activities (IGA)s (13.2) (sensitive question)*

* Do you have any nonfarm IGAs?	Yes	No

Please **rank** the nonfarm IGAs based on their contribution to your income	Rank from 1 to 5 (1= most important activity, 5=least important one)	Specify Income generating activity: *[options from list: brick making, basket/ other weaving, transport (e.g. driver), casual labour, night guard, sculpture making, tour guide, medicine (e.g. doctor, massage), other (specify)]*

* Are your nonfarm IGAs sufficient for your farm system needs?	Not at all	A little	Average	A lot	Completely
* How important are nonfarm IGAs to your livelihood?	Not at all	A little	Average	A lot	Very

44. Local farm inputs (10.3)

* Are you at a walking distance from the location of your source of inputs?				
Seeds	Yes, easily	Yes, with some difficulty	No	Not applicable
Livestock/inseminator	Yes, easily	Yes, with some difficulty	No	Not applicable
Fertilizer	Yes, easily	Yes, with some difficulty	No	Not applicable
Equipment	Yes, easily	Yes, with some difficulty	No	Not applicable
Pesticides	Yes, easily	Yes, with some difficulty	No	Not applicable
Knowledge	Yes, easily	Yes, with some difficulty	No	Not applicable
Veterinary products	Yes, easily	Yes, with some difficulty	No	Not applicable
Labour	Yes, easily	Yes, with some difficulty	No	Not applicable
Capital	Yes, easily	Yes, with some difficulty	No	Not applicable
Other (*please specify)*:	Yes, easily	Yes, with some difficulty	No	Not applicable

* To what extent does access to local farm inputs meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is access to local farm inputs to your farm system?	Not at all	A little	Average	A lot	Very

54. Savings (13.5) (sensitive question)*

* Do you have savings?	Yes	No
* If no, have you ever had savings?	Yes	No
If yes, do you have more savings than 5 years ago?	Yes	No

How do you save money? (*circle answers*)			
Cash at home	Bank	Saving structure/group	Other (*Specify*):_____

* Do your saving methods meet the needs of your farm system?	Not at all	A little	Average	A lot	Completely
* How important is access to saving facilities for your farm system?	Not at all	A little	Average	A lot	Very

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08
SHARP TIMELINE

OUTLINE OF A TYPICAL SHARP ASSESSMENT

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A general timeline for implementation of the SHARP assessment is presented in Table 14, using the 1st field testing mission to Uganda and Senegal as an example.

Table 14. **Timeline for a first cycle of SHARP**

DATE	ACTIVITIES
June – end of August	Draft SHARP document and indicators
	Elicit feedback and contributions from SHARP partners
	Prepare final draft V.2 with an indicative menu of monitoring objects and indicators, and a list of core objects and indicators
	Prepare for field testing
September to end of December	Participatory field test in Uganda and Senegal including training of facilitators and M&E personnel, receiving feedback from farmers and pastoralists
	Revise based on mission
	Partners field test in two further countries
	Revise based on feedback
January – March	Train AP/FFS trainers in Uganda and Senegal on revised SHARP as well as other countries through partners
March – April	Implementation of SHARP Participatory Baseline Self-Assessment in selected countries (Phase 1)
April – June	Gap assessment based on data gathered through SHARP (Phase 2)
July – August	Devise strategies to improve resilience of farmers and pastoralists and implement in AP/FFS as soon as possible (Phase 3)
August – February	Evaluation of SHARP together with partners.
	Identification and definition of further uses of SHARP
	Possible use of SHARP by further entities
Next season	Prepare SHARP Base Assessments again with the same farmers and pastoralists to identify potential changes and introduce SHARP to further communities based on needs

A SHARP assessment should take 3-5 weeks per farmers'/ pastoralists' group to complete with flexibility to adjust as best meets the needs of the farmers and pastoralists.

The following materials are needed:

- Tablet with the SHARP application installed OR set of SHARP notebooks (one for each member of the field school) including pictographic and written guidelines on how to fill in the notebook;
- Writing materials;
- Community map (to be prepared in advance by AP/FFS facilitator);
- Cropping calendar (to be prepared by AP/FFS facilitator with farmers).

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ANNEX 1
COMPARISON OF SHARP WITH OTHER ASSESSMENT METHODS

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EXAMPLES OF EXISTING INSTRUMENTS

In order to ensure that synergies with existing instruments are created and duplications are avoided, this annex outlines an array of different, relevant, and already existing tools on whose experience and work SHARP can build upon. If not otherwise indicated, the main sources of this Annex are presentations given at the International Workshop on SHARP in Burkina Faso (May 21-23, 2013), organized by FAO in collaboration with the University of Leeds and involving participants from major stakeholders and the EU.

SUSTAINABILITY ASSESSMENT OF FOOD AND AGRICULTURE SYSTEMS (SAFA)

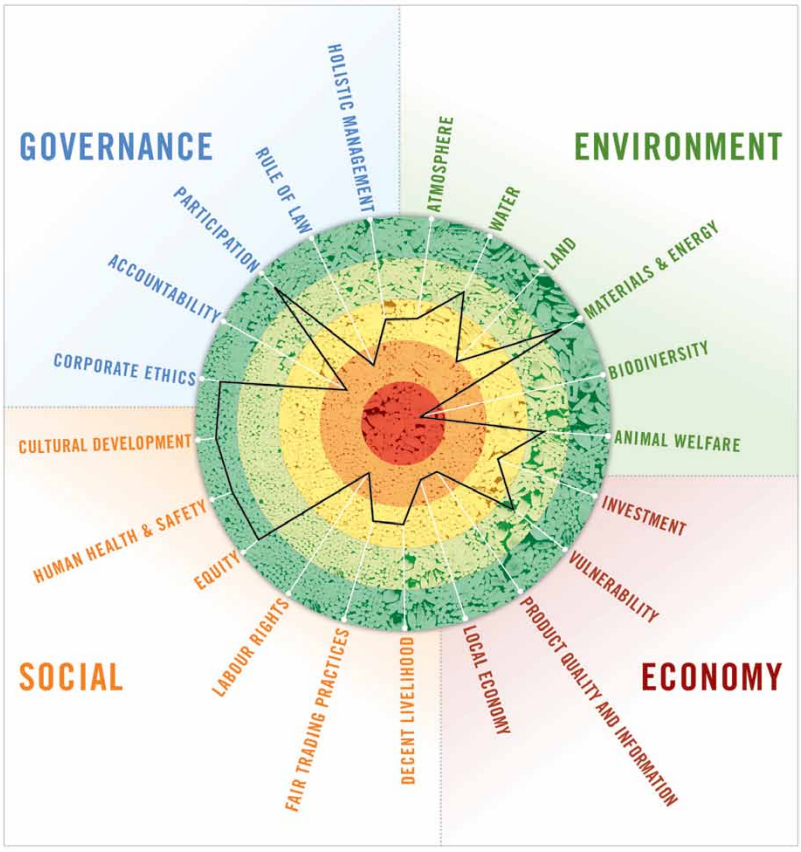
SAFA is a sustainability self-assessment tool developed by FAO in close cooperation with a number of stakeholders and potential users (SAFA, 2015). SAFA has been developed over the last five years and after having gone through field testing is now ready for use. Discussions are ongoing between the authors of SHARP and those developing SAFA to ensure as much integration as possible while avoiding duplication.

SAFA is aimed at producers – farmers, fishers and foresters, food processors and retailers and aims to be scale-independent, thus usable by entities of all different sizes. It holistically looks at all four domains of sustainable development – economic, environmental, social, and governance – and provides various customization options for users. The goal of the Assessment is to enable the people

and companies undertaking the self-assessment to identify areas of high sustainability and areas where action is needed to improve sustainability. The result of the assessment is a multidimensional "spider-diagram" allowing users to easily identify their sustainability on the different axis (see Figure 18).

Wherever possible, SAFA has relied on performance-based indicators. It is important to note here, that SAFA is NOT a sustainability certification. At a higher level the goal of the tool is to do its share of getting the whole sector onto a more sustainable path.

Figure 18. **Sample SAFA spider diagram (El-Hage Scialabba, 2013)**



The tool is currently excel-based, and users should be able to collect data and answer the relevant questions as well as assessing themselves in the different subthemes by themselves and with a reasonable use of time and money. The feedback from field-testing has been that the current tool has not been very user-friendly and time consuming, so this aspect is currently being redefined, merely with more qualitative information and more automation.

Altogether SAFA has four domains, 21 themes, 56 subthemes and 112 core indicators that apply to the macro-level and set the bar for best and unacceptable performance. Intermediate scorings may require customized indicators, depending on location specificities.

The main areas that can be used as inputs and lessons learned that should be taken into account in the design of SHARP are:

- Identifying domains, themes, subthemes and indicators relevant for farmers' and pastoralists' climate-resilient and assess their applicability for SHARP.
- Aiming at using an approach with a number of fixed, "core" indicators applying to all possible users as well as a number of specific indicators, only relevant for certain users.
- Taking into consideration the user-friendliness of any tool.
- Learning from field testing experiences. The field-testing showed that the tool was hard to use for smallholder farmers. This reinforces a point already clear to the authors, namely that any tool should be sufficiently simple to be used in the field, by a facilitator together with a group of smallholder farmers and pastoralists.
- Using flexible indicators to reflect the individual nature of each situation. As performance-based data was deemed too difficult to collect in certain cases, SAFA relies on a three-tier system: Whenever possible performance-based indicators are used. If using performance-based indicators proves too onerous SAFA then relies on practices-based and where this is not possible "target"-indicators are used.

IUCN'S TOP-SECAC

ToP-SECAC is a tool developed by IUCN that aims to "bring coherence to existing programmes, and create a direct link with the management cycle of projects / programmes" in the field of projects and programmes about Climate Change. Rather than being an observatory tool, ToP-SECAC aims to harmonize monitoring and evaluation of projects. It consists of 11 tools (see Table 15).

Table 15. **The ToP-SECAC tools (Somda, 2013)**

TOOLS	TITLE	PARTICIPANTS AND AUDIENCE
Tool 1	Resource mapping, hazard and vulnerability matrix using the AVCA	Project communities
Tool 2	Vulnerability analysis, resources and coping strategies through CRisTAL	Project
Tool 3	Participatory analysis of vulnerabilities to climate hazards	Project communities
Tool 4	Establishing Vision-Action-Partnership	Project communities, technical / administrative services, community
Tool 5	Definition of the aimed at effects	
Tool 6	Defining gradual progress markers	
Tool 7	Elaboration of the results chain	Project

TOOLS	TITLE	PARTICIPANTS AND AUDIENCE
Tool 8	Development of information table for monitoring and evaluation	
Tool 9	Development of operational protocol of monitoring and evaluation	
Tool 10	Developing stories about the most significant changes	Projects, partners, communities
Tool 11	Journal of Development Impact	Project communities, technical / administrative services, communities

The monitoring objectives of ToP-SECAC are as follows:

» "Build the capacity of actors to adapt to Climate Change
» Planning the changes of behaviour, and relationship activities
» Document and learn lessons on building adaptive capacity and project results"

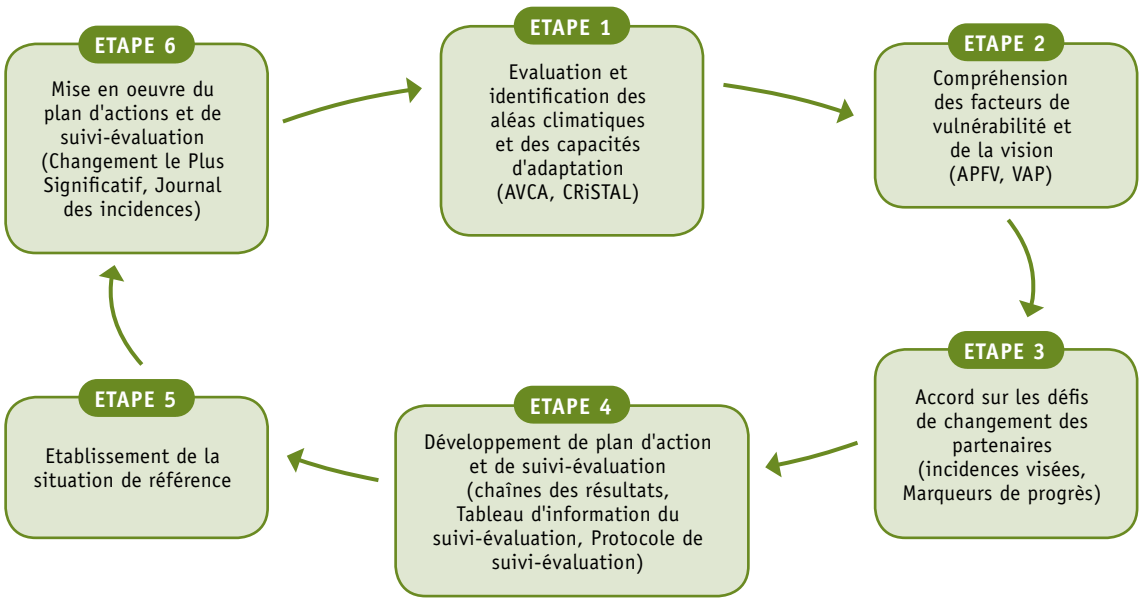
The objectives are quite similar to the objective of SHARP and ToP-SECAC is very relevant for SHARP.

The level of application is the project level - which is different to the scope of SHARP, which is at the household level. Also ToP-SECAC is primarily interested in changes of the state objects.

Tools 10 and 11of ToP-SECAC are particularly interesting for the monitoring and evaluation aspects of SHARP. Furthermore, Tool 9 is especially relevant in the operationalization of protocols and should be taken into account when defining protocols for SHARP.

For the design of SHARP therefore, the steps of ToP-SECAC (see Figure 19) are relevant and must be considered in every step of the development of SHARP.

Figure 19. **The 6 stages of ToP-SECAC (Somda 2013)**



CLIMATE-PROOFING

The Climate-Proofing tool developed by GIZ has been used worldwide, including in a pilot-project by FAO Mali. The tool aims at building climate resilience on the communal policy level. It works in a participative manner with local leaders to identify the major climate change-related issues and policies to overcome these challenges.

It is interesting for the SHARP tool as it:

» Focuses on climate-resilience

» Works in a participatory manner adapted to local contexts

However the main difference lies in the facts that the Climate-Proofing tool works:

» At the level of policy makers and not actually farmers

» Is static insofar as it looks at communities' current issues – with the already ongoing Climate Change – and does not look at the projected changes in climate in the future

For the SHARP formulation the following points to be learned from Climate-Proofing seem valuable:

» Working with local communities and especially local decision makers

» Identifying already existing challenges of Climate Change and potential adaptation strategies – Figure 20 is an example of the result of the Climate-Proofing in Mali)

Figure 20. **Overview of possible policy-solutions to existing climate change-related challenges (Soumaré 2013)**

MANIFESTATIONS OBSERVÉES	EFFET CONSTATÉS	SOLUTIONS	NIVEAU DE PRISE EN CHARGE		
			Faciliteurs/ CEP	Autorités communales	Gouvernement
• Baisse notoire de la pluviométrie, • Parte des repères climatiques, • Hausse de la température, • Vent violent chauds.	• Dégradation des sols de cultures • Fonte des semis • Baisse de la productivité agricole • Baisse de la nappe phréatique • Insuffisance de fourrage • Feux de brousse • Cherté de l'aliment bétail • Baisse de la productivité animale • Disparition des grands arbres • Dégradation du couvert végétal • Erosion éolienne et hydrique • Disparition de la faune sauvage • Baisse des revenues • Exode rural, voir migrations • Tensions sociale	• Promouvoir les semence adaptées (Sorgho amélioré : Diakoumbè, Séguifa…, Variété locale Lakahéri décrue)	X		
		• Promotion des retenues d'eau		X	
		• Aménagement des puits et mares		X	
		• Adopter les bonnes pratiques agricoles (compostage, labour en courbe de niveau, agroforesterie…)	X		
		• Renforcement de capacité des producteurs et services techniques			X
		• Intensification du reboisement		X	
		• Lutte contre les déprédateurs (renforcer les Brigades Villageoises pour la lutte anti aviaire et antiacridienne)	X	X	
		• Promouvoir les AGR (maraichage, embouche, arboriculture)		X	X
		• Promouvoir les cultures fourragères	X		
		• Introduction des races animales améliorées (chèvre guéra, Wassa Chè)		X	X

MASSCOTE: MAPPING SYSTEM AND SERVICES FOR CANAL OPERATION TECHNIQUES

MASSCOTE is a step-wise methodology used to evaluate and analyze different components of irrigation and canal systems. MASSCOTE involves two major phases – first to evaluate current practices and facilities and then second to develop a plan for modernizing the system.

MASSCOTE was developed specifically for irrigation systems and canals. It involves the re-engineering of irrigation systems and tends to be employed on medium and large scale systems. It requires qualified personnel to assess the current situation and recommend modernization improvements.

MASSCOTE is already used in: China, India, Morocco, and Nepal with other areas interested in implementing the methodology (FAO Water Department and Management Unit, 2013). The first phase starts with an evaluation and analysis of the current situation, practices and processes in order to achieve a baseline. The modernization plan in the second part of MASSCOTE consists of physical, institutional, and managerial improvements in different components to improve irrigation effectiveness. MASSCOTE aims to improve resource utilization (labour, water, economic, environmental). The whole process involves 11 steps broadly divided into two phases (see Table 16) (Renault *et al.* 2007).

Many lessons learned and tools used in MASSCOTE (although interesting and relevant in other contexts) were not applicable to developing SHARP. Some of the lessons learned in developing modernization plans may however be applicable when addressing climate resilience deficiencies found during SHARP assessments.

Table 16. **The 11 step process employed by MASSCOTE**

MAPPING	PHASE A – BASELINE INFORMATION
1. The performance (RAP)	Initial rapid system diagnosis and performance assessment through the RAP. The primary objective of the RAP is to allow qualified personnel to determine systematically and quickly key indicators of the system in order to identify and prioritize modernization improvements. The second objective is to start mobilizing the energy of the actors (managers and users) for modernization. The third objective is to generate a baseline assessment, against which progress can be measured.
2. The capacity & sensitivity of the system	The assessment of the physical capacity of irrigation structures to perform their function of conveyance, control, measurement, etc. The assessment of the sensitivity of irrigation structures (off takes and cross-regulators), identification of singular points. Mapping the sensitivity of the system.
3. The perturbations	Perturbations analysis: causes, magnitudes, frequency and options for coping.
4. The networks & water balances	This step consists of assessing the hierarchical structure and the main features of the irrigation and drainage networks, on the basis of which water balances at system and subsystem levels can be determined. Surface water and groundwater mapping of the opportunities and constraints.
5. The cost of O&M	Mapping the costs associated with current operational techniques and resulting services, disaggregating the different cost elements; cost analysis of options for various levels of services with current techniques and with improved techniques.

MAPPING	PHASE B – VISION OF SOM & MODERNIZATION OF CANAL OPERATION
6. The service to users	Mapping and economic analysis of the potential range of services to be provided to users. Mapping a vision of the irrigation scheme.
7. The management units	The irrigation system and the service area should be divided into subunits (subsystems and/or unit areas for service) that are uniform and/or separate from one another with well-defined boundaries.
8. The demand for operation	Assessing the resources, opportunities and demand for improved canal operation. A spatial analysis of the entire service area, with preliminary identification of subsystem units (management, service, O&M, etc.).
9. The options for canal operation improvements / units	Identifying improvement options (service and economic feasibility) for each management unit for: (i) water management, (ii) water control, and (iii) canal operation.
10. The integration of SOM options	Integration of the preferred options at the system level, and functional cohesiveness check. Consolidation and design of an overall information management system for supporting operation.
11. A consolidated vision & a plan for modernization and M&E	Consolidating the vision for the Irrigation scheme. Finalizing a modernization strategy and progressive capacity development. Selecting/ choosing/ deciding/ phasing the options for improvements. A plan for M&E of the project inputs and outcomes.

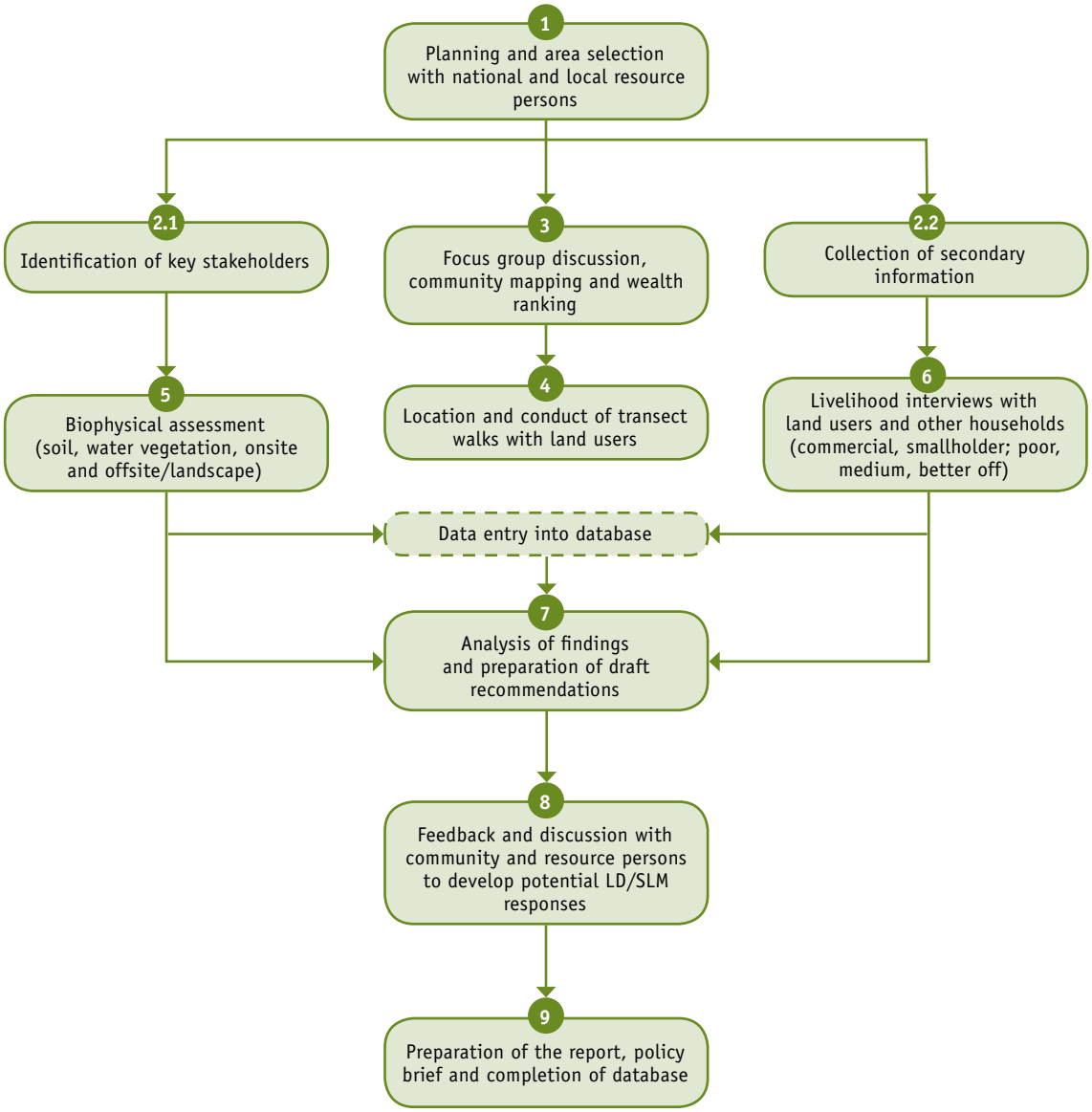
LADA: LAND DEGRADATION ASSESSMENT IN DRYLANDS

LADA is a set of tools and methodologies aimed at assessing land degradation at the sub regional, regional, national, and global scales (see Figure 21). It can be used to establish a baseline in order to assess the impact of events and monitor the success of mitigation actions (and SLM practices) (LADA, 2010). LADA is focused on Drylands due to their vulnerability to climate and human induced changes. LADA aims to use harmonized definitions in order to achieve comparability between assessments. LADA assesses both the biophysical and socio-economic aspects of land degradation. LADA aims to provide a report on the status and trends of land degradation. Other aims include identifying areas that need immediate action, to create a land degradation database and to build capacity in assessing and managing land degradation through training experts at regional training centres (LADA, nd).

LADA uses a large number of indicators that are evolving as the methodology is piloted in different countries and environments. Most indicators are expressed in terms of relative change from the current situation (Bunning *et al.* 2011). LADA-Local is likely to be the most applicable to SHARP owing to its detailed and small-scale focus. LADA aims at going beyond just being an assessment of the extent of degradation to help improve understanding of the drivers of land degradation as a first step towards changing those drivers (Bunning *et al.* 2011).

A typical LADA-Local assessment requires approximately 3-4 weeks to complete the preparation, field work, interviews with land users and households, validation of findings with the community and the preparation of a summary report. LADA uses triangulation of quantitative and qualitative data in order to double and triple check results (Bunning *et al.* 2011). This helps avoid user biases

Figure 21. **Main steps in the LADA Local Assessment**



and errors. It may be useful to use this technique for SHARP whereby some indicators of farmers and pastoralists are compared geographically to avoid errors or to find gaps where improvement is needed. One major difference between LADA and SHARP is that although LADA includes local land users as stakeholders, the assessment is meant to be conducted by trained personnel who do scientific soil sampling (among other activities) and the data is meant to be used at a higher level. In contrast, SHARP is a self-assessment of climate resilience and is meant to both inform the farmers and pastoralists as well as to be used in developing and modifying AP/FFS.

CSA: CLIMATE-SMART AGRICULTURE

CSA is meant to be a new holistic approach instead of a specific set of practices or agricultural system (FAO, 2013b). As such, there are no specific indicators or rules to follow. CSA is similar to sustainable development and sustainable intensification. It is meant to be a way of addressing sustainable development in the context of a changing climate. CSA pulls together many other detailed approaches into an overall framework from which those practicing agriculture can draw upon.

The CSA sourcebook is organized into 17 modules: Managing landscapes for Climate-smart agricultural systems, Water management, Soils and their management for Climate-smart agriculture, Sound management of energy for Climate-smart agriculture, Conservation and sustainable use of genetic resources for food and agriculture, Climate-smart crop production systems, Climate-smart livestock, Climate-smart forestry, Climate-smart fisheries and aquaculture, Developing sustainable and inclusive food value chains for Climate-smart agriculture, Local institutions, Mainstreaming Climate-smart agriculture into national policies and programmes, Financing Climate-smart agriculture, Disaster risk reduction: strengthening livelihood resilience, Making Climate-smart agriculture a work for the most vulnerable: the role of safety nets, Capacity development for Climate-smart agriculture, and Assessment, monitoring and evaluation. This provides a sourcebook of information to be used for making agricultural systems and practices more climate-smart (FAO, 2013b). The objectives of CSA are shown in Table 17 below. The objectives and discussions related to resilience to climate change and variability will be especially relevant to SHARP.

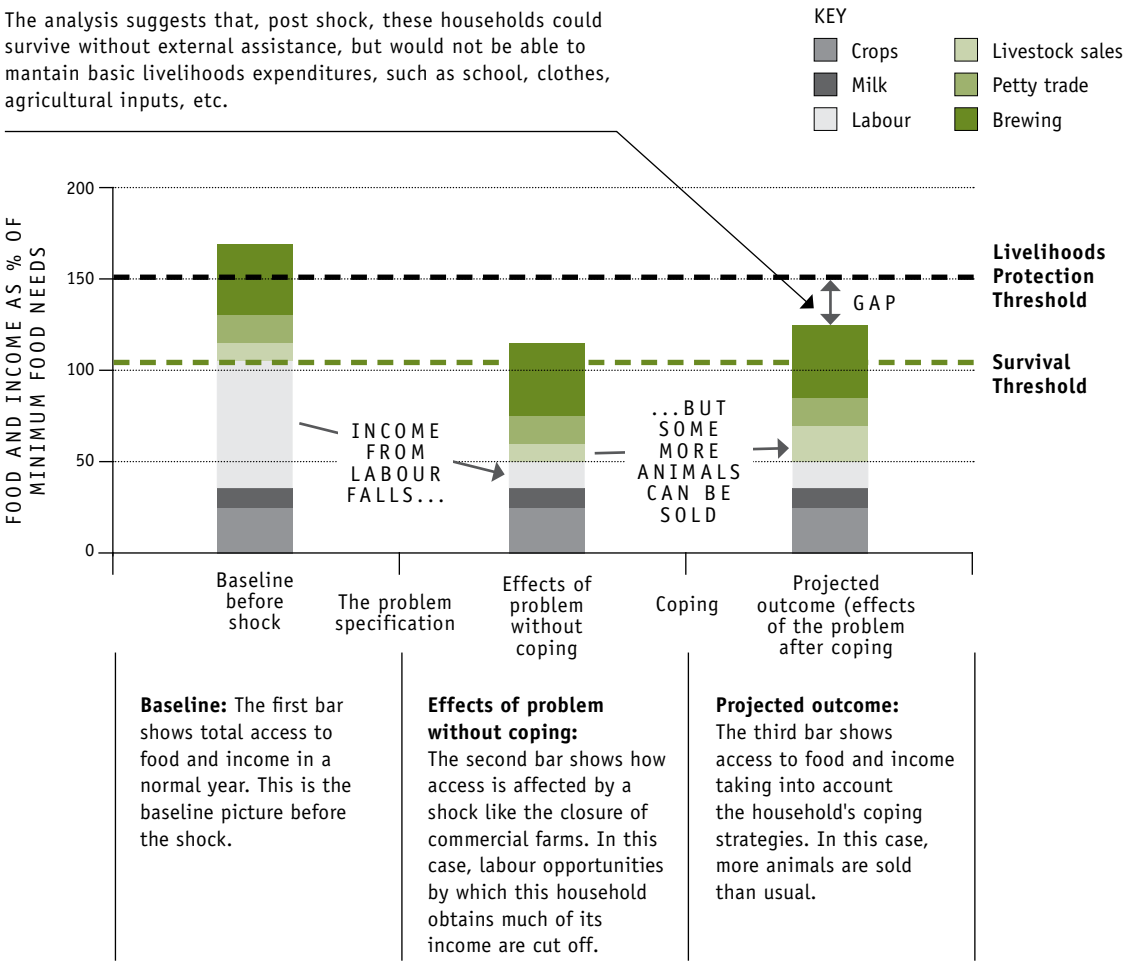
Table 17. **Climate-Smart Agriculture objectives (Adapted from FAO, 2013b)**

CSA OBJECTIVES		
Sustainable increases in productivity and income	**Strengthened resilience to climate change and variability**	**Agriculture's reduced impact on climate change**
General: • Availability of energy for productive use (both for primary production and value-adding processing and reduction of food losses (e.g. through improved processing, packaging and storage) can enable improved use of natural resources and increased productivity and profits. • Provision of modern energy services through renewable forms of energy is likely to lead to sustainable increases in productivity and income (particularly where locally produced), whereas if fossil fuels are used there could be productivity and income benefits together with negative environmental consequences. Trade-offs need to be assessed in the local context and taken into account. • More affordable energy services may be less energy efficient (e.g. cheaper tractors may be less efficient).	**General:** • Increased access to modern energy services enables enhanced adaptive capacity through the ability to increase and diversify income, for example through adding value to primary production, and through enhanced storage of products.	**General:** • Increased access to modern energy services will generally lead to increased energy consumption. This will often lead to increased GHG emissions (although these could be insignificant for some renewable energy sources). However, in the case where access to modern energy services displaces unsustainable use of wood for energy, the resulting reduction in deforestation and forest degradation could lead to reduced GHG emissions. • Increased access to modern energy services may or may not lead to increased energy efficiency – this depends in part on the stage of development and level of energy consumption of a country/ agri-food system. • Bioenergy technologies that retain more nutrients (e.g. anaerobic digestion) versus those that retain less nutrients (e.g. gasification and combustion).

THE HOUSEHOLD ECONOMY APPROACH (HEA/ AEM)

HEA was developed in coordination with Save the Children and the Global Information and Early Warning System and FAO (Save the Children Fund and FEG Consulting, 2008). The goal is to improve the predictive ability of FAO to assess short-term changes in food access. It followed the understanding that hunger is often caused not by a lack in total food but rather in access to this food (Sen, 1981). HEA therefore focuses on how households make a living and predict future needs, while being applied in diverse populations and economies. It specifically analyses how people access the goods and services that they require to survive (Save the Children Fund and FEG Consulting, 2008). HEA is designed as an analytical framework instead of a direct information gathering tool, however the data that is collected can feed into other tools. A simplified illustration of HEA is shown in Figure 22 below.

Figure 22. **A simplified illustration of the HEA analytical framework (Save the Children Fund and FEG Consulting, 2008)**



COMMUNITY-BASED RESILIENCE ANALYSIS (COBRA)

The UNDP Drylands Development Centre initiated the CoBRA project in response to natural disasters and other crises in the Horn of Africa (UNDP, 2014). CoBRA uses a conceptual framework and standardized methodology to quantitatively measure the impact of various sector-based resilience enhancement interventions (see Figure 23). CoBRA examines resilience through five sustainable livelihoods framework categories (physical, human, financial, natural and social) in a participatory and community-led manner. CoBRA has seven steps (Figure 24) used to achieve its four main objectives:

1. Identify the priority characteristics of resilience for a target community;
2. Quantitatively assess the communities' achievement of these characteristics at the time of the assessment and during the last crisis / disaster;
3. Identify the characteristics and strategies of existing resilient households; and
4. Identify the relative impact of local interventions or services in building resilience.

Figure 23. **CoBRA conceptual framework (UNDP, 2014)**

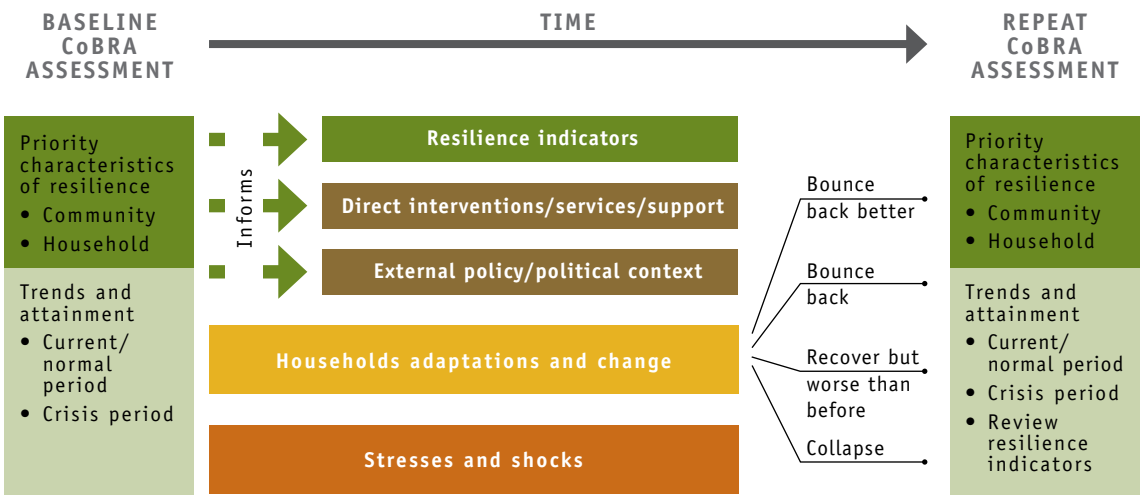


Figure 24. **The seven steps outlined within the CoBRA framework**

PHASE I **Preparation**	Step 1: Identify target area Step 2: Prepare for fieldwork
↓	
PHASE II **Field work:** **Data Collection**	Step 3: Identify and train field staff Step 4: Data collection Step 4a: Focus Group Discussions (FGDs) Step 4b: Key Informant Interviews (KIIs) with Resilient Household
↓	
PHASE III **Data Analysis and** **Reporting**	Step 5: Data analysis Step 6: Presenting and using Findings Step 7: Repeat monitoring of impact and change

The main focus is on adaptive capacity... "specifically, the aim is to measure the ability of households to cope with shocks or stresses by determining and measuring the common characteristics of those households over time and monitor if they are on a resilience pathway or a vulnerability pathway" (UNDP, 2014). CoBRA links the HEA thresholds to resilience thresholds to determine whether a household is resilient (see Figure 25). HEA (and other measures) is used to identify hotspot areas of low resilience as entry points for CoBRA assessments.

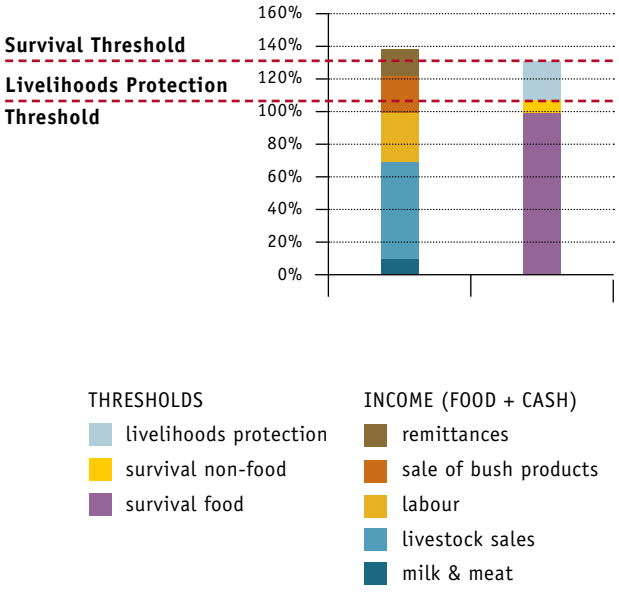
Figure 25. **HEA emergency response thresholds compared to total income levels**

THE SURVIVAL THRESHOLD REPRESENTS THE TOTAL INCOME REQUIRED TO COVER:

- 100% of minimum food energy needs (2 100 kcals per person);
- The costs associated with food preparation and consumption (i.e. salt, soap, kerosene and/or firewood for cooking and basic lighting); and
- Any expenditure on water for human consumption.

THE LIVELIHOODS PROTECTION THRESHOLD REPRESENTS THE TOTAL INCOME REQUIRED TO SUSTAIN LOCAL LIVELIHOODS. THIS MEANS TOTAL EXPENDITURE TO:

- Ensure basic survival (above);
- Maintain access to basic services (e.g. routine medical and schooling expenses);
- Sustain livelihoods in the medium to longer term (e.g. regular purchases of seeds, fertilizer, veterinary drugs, etc.); and
- Achieve a minimum locally acceptable standard of living (e.g. purchase of basic clothing, coffee/tea, etc.).

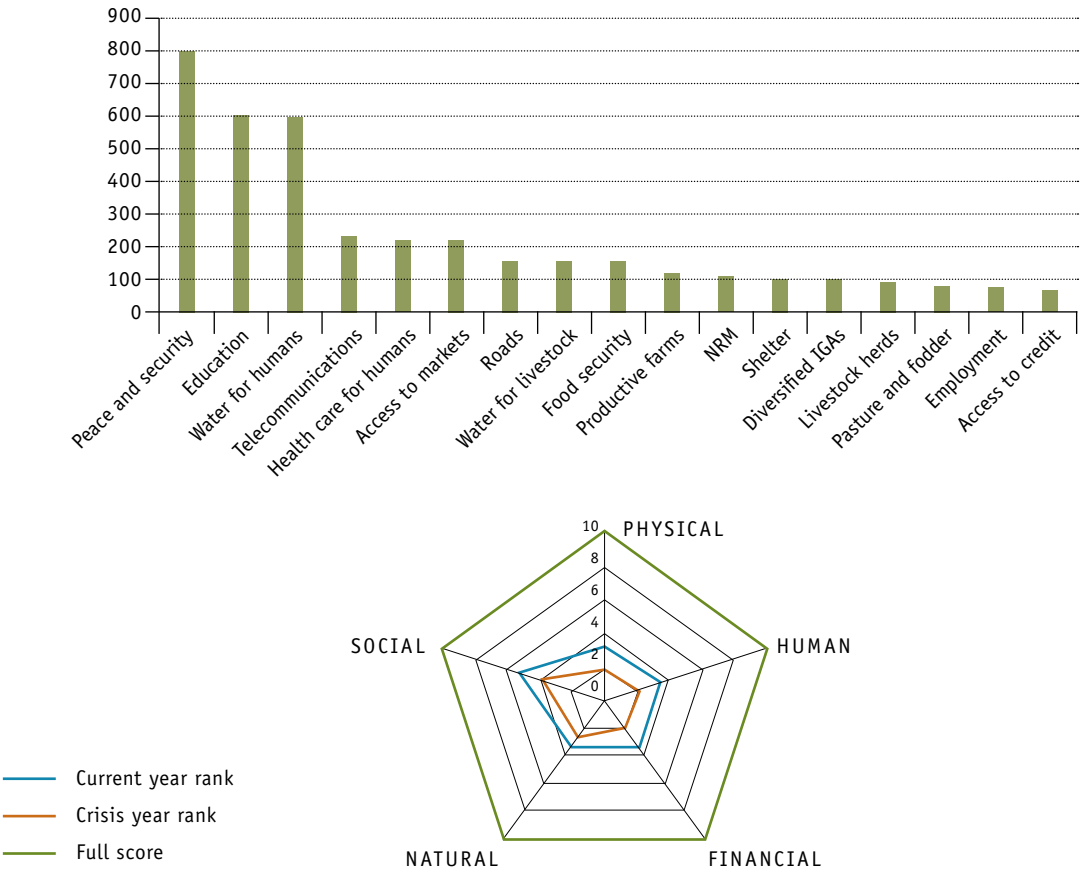


The project was field-piloted in Kenya and Uganda in 2012 and in Ethiopia in 2013. Questions within the focus group discussions and key informant interviews include:

- What [are] the main crises or hazards affecting the communities assessed?
- What are the characteristics of a resilient community in that context?
- To what extent has the community attained those characteristics?
- What does a resilient household look like?
- Which recent/ongoing factors and/or interventions have contributed to improve resilience of some (or all) of the households in the community?
- What additional interventions would further build resilience?

Communities are asked to prioritise resilience characteristics after which they are asked to assess how well the characteristics have been achieved. Results from a field testing mission in Marsabit are shown in Figure 26. The figure shows the five sustainable livelihoods framework categories in the spider diagram and 17 self-defined community resilience characteristics. Responses from the focus group discussions and key informant interviews are mapped into the sustainable livelihoods framework categories. Quantitative responses are also compiled within a spreadsheet.

Figure 26. **Five sustainable livelihoods framework categories and 17 community resilience characteristics**



Similarities from SHARP:

- Resilience assessment;
- Participatory (in the interview process);
- Uses a representative set of resilience characteristics (indicators), recognizing the need for a practical tool;
- Developing country context;
- Similar division of livelihood: financial (economic), human (social), physical (practices and environment) and social (social and government);
- Recognition that context is importance when measuring resilience;
- Can involve subsequent CoBRA analyses of resilience;
- Produces a report showing a spider diagram;
- Uses a similar five- and ten-point scale for self-assessment (in this case, the overall change in the communities attainment of a characteristic and the extent to which their community has achieved their priority characteristic of resilience respectively).

Differences from SHARP:

- Conducted by a 'team,' usually comprised of a team leader, assessment supervisors and facilitators;
- Training requires four days;
- Not specific to agriculture (urban is included);
- Uses focus group discussions (12-20 individuals per group divided into men, women and youth) and key informant interviews to elicit data for a community;
- Uses a control community with which to compare the 'low resilience' community with;
- Considers resilience and vulnerability to be antonyms;
- Specific to drought-prone and poor areas as indicators of low resilience;
- Focus on disasters resilience and coping – not ongoing resilience – especially to climate change;
- Much more open ended (e.g. qualitative responses that are then coded for scoring "Please explain the steps or pathway that your household followed in becoming resilient?"). Very short survey;
- Less participatory "information gathering exercise"– produce a report at the end – not as engaging with community;
- Aimed at understanding what makes communities resilience;
- Not integrated into existing programmes (e.g. FFS) – Involves training and a team entering the community – not done by local facilitators;
- Closely links a resilience threshold to the livelihoods protection threshold in order to determine whether households are resilient or vulnerable;
- Focus is placed on assessing previous interventions and responses to disasters.

www.disasterriskreduction.net/drought-online/cobra/en

ANNEX 2
SUMMARY OF EXISTING TOOLS USED TO INFORM THE DEVELOPMENT OF SHARP

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No.	TOOL NAME	ORGANIZATION(S)	YEAR	AIM / GOAL	SPATIAL SCALE	RELEVANCE FOR SHARP
1	Household Economy Approach (HEA/ AEM)	• Save the Children • Global Information and Early Warning System • FAO	2008	To improve the predictive ability of short-term assessments of changes in food access based on an analysis of peoples' access to the goods and services that they require to survive.	Household	• Looks at households' ability to cope with shocks and stresses. • Applicable to rural context • Integrates approaches - HEA approach with Sustainable Livelihoods Framework • Evidence that tool has been used across different countries by various international organizations
2	Climate-Smart Agriculture (CSA) Sourcebook	• FAO	2013	CSA is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change.	Multiple/ System – can be applied at various system scales	• Focus on agriculture • Provides an approach and principles to guide future actions and interventions • Applicable to different types of farming systems • Concerns about climate resilience are implied • Developed with contributions from various international organizations

No.	TOOL NAME	ORGANIZATION(S)	YEAR	AIM / GOAL	SPATIAL SCALE	RELEVANCE FOR SHARP
3	SAFA, Sustainability Assessment of Food and Agriculture systems (SAFA)	• FAO	~2013	To enable people and companies undertaking the self-assessment to identify areas of high sustainability and areas where action is needed to improve sustainability.	Multiple – can be used by individuals, or organizations of different sizes	• Specifically focuses on agriculture and food systems • Can be applied at multiple scales • Participatory process with input from international experts
4	Trousse à Outils de Planification et Suivi Evaluation des Capacités d'Adaptation au Changement climatique (ToP-SECAC) (Toolkit for planning and monitoring of climate change adaptation capacities)	• International Union for Conservation of Nature (IUCN), Consultative Group on International Agricultural Research (CGIAR), National Agricultural Research Services (NARS) of Burkina Faso, Ghana, Mali, Niger and Senegal, Institute of Environmental and Agricultural Research (INERA) of Burkina Faso, 2011	2011	ToP-SECAC aims to harmonize monitoring and evaluation of climate change adaptation projects. The tool aims to achieve this through a participatory learning process bringing together various rural development actors. In enhancing the actors' knowledge and skills in planning and participatory monitoring/evaluation of adaption capacities, the toolkit enables the user to identify, implement, monitor and evaluate adaptation activities.	Various intervention scales	
5	Climate proofing for Development (CP4Dev)	• GIZ	2011	Make development interventions more efficient and resilient. Provide a methodological approach to analyze development measures with regard to the current and future challenges and opportunities presented by climate change	Multiple levels of decision making - at national, sectoral, local and project level	• Focuses on climate-resilience • Works in a participatory manner adapted to local contexts • Can be applied at different scales • Used by international organizations, e.g. OECD
6	MASSCOTE, MApping System and Services for Canal Operation Techniques	• FAO	2007	To evaluate and analyze different components of irrigation and canal systems in order to develop a modernisation plan.	System scale	• Systems-based approach • Used across India, China, Morocco • Methodology has been adapted to other systems e.g. MASSIF, MASSLISS
7	LADA, Land Degradation Assessment in Drylands	• UNEP/FAO	2006	A set of tools and methodologies aimed at assessing land degradation at the subregional, regional, national and global scales.	Multiple scales	• Provides a current assessment to identify areas that need immediate action • Applicable in different contexts and scales • Used across Argentina, China, Cuba, Senegal, South Africa and Tunisia

No.	TOOL NAME	ORGANIZATION(S)	YEAR	AIM / GOAL	SPATIAL SCALE	RELEVANCE FOR SHARP
8	CRiSTAL, Community-based Risk Screening Tool – Adaptation and Livelihoods	• IISD • IUCN • SEI	2012	CRiSTAL is a project planning tool that helps users systematically assess the impacts of a project on some of the local determinants of vulnerability and exposure, so that project planners and managers can design activities that foster climate adaptation (i.e. adaptation to climate variability and change).	Project	• Collaboration by multiple international organizations • Appropriate for rural communities, and communities characterized by climate-sensitive livelihoods. • Applicable for agriculture as a resource-dependent livelihood
9	CCVA, Climate Vulnerability and Capacity Analysis	• Care International • IISD	2009	Present a new participatory methodology for Climate Vulnerability and Capacity Analysis.	Community	• Focus on climate change vulnerability • Can be applied to different contexts • Used by international organizations
10	CREFSCA, Climate Resilience and Food Security in Central America	• IISD • CDKN	2012	To strengthen the long-term food security of vulnerable populations in Central America by improving the climate resilience of food systems at different spatial and temporal scales.	Community-focus, but allows analysis across spatial scales	• Focus on climate resilience and food security • Applied at multiple scales and used across urban and rural areas in Central America
11	CRAM, Climate Resilient Agriculture Module	• CCAFS • CARE • IFAD	2012	Brings together a group of participatory research tools to support research and development partners in gathering information that will help them design Inclusive and gender sensitive programmes in climate resilient agriculture.	Community	• Focus on climate resilience and agriculture • Promotes understanding of current agricultural practices and their underlying institutional, environmental, climatic, social and economic drivers from a gender perspective.
12	ACCCRN	• Funded by Rockefeller Foundation	2013	To develop, test and demonstrate practical strategies for responding to the impacts of climate change on urban areas. A core objective of ACCCRN is to support interventions that can be replicated in other locations to achieve benefits that reach beyond the 10 core ACCCRN cities.	Multiple scales	• Provides a common framework for climate change resilience strategy development and implementation across four different countries, involving multiple languages, vastly differing political systems, and with an extensive group of stakeholders at the regional, national and local levels. • Supported by a large number of regional, national and local partner organizations across 10 ACCRN cities in Asia

No.	TOOL NAME	ORGANIZATION(S)	YEAR	AIM / GOAL	SPATIAL SCALE	RELEVANCE FOR SHARP
13	iResilience (including other assessment tools & quizzes like this)	• Business psychology organizations	Multiple	i-resilience aims to provide a comprehensive understanding of personal resilience and give examples of how this could impact on users responses to demanding work situations.	Individual / business	• Self-assessment tools provide a quick and easy way to identify gaps
14	LG_SAT, UN-ISDR , International Strategy for Disaster Reduction	• IISD • World Bank's Global Facility for Disaster Risk Reduction (DRR) • European Commission's Humanitarian Aid branch (ECHO)	2011	To assist disaster reduction efforts by cities and local governments that have signed up to the global "Making Cities Resilient" Campaign.	Cities	• Links with climate and DRR • Self-assessments were undertaken at the city level with the involvement of the community stakeholders • Comparison of multiple sites - 23 cities from 16 countries provided data on 43 key indicators to measure the progress of local governments
15	Climate Resilient Cities	• World Bank	2008	This Primer is a tool for city governments in the East Asia Region to understand better how to plan for climate change impacts and impending natural disasters through sound urban planning to reduce vulnerabilities.	Cities / communities	• Focus on climate resilience • Self-assessment tool used to provide local governments with information to enable them to identify priority areas and actively engage in programmes
16	A Self-Assessment To Address Climate Change Readiness in Your Community	• Illinois, mid-west, USA • TBC	TBC	Climate change readiness index	Community	• Focus on climate change • Self-assessment tool where results are obtained immediately
17	ADAPT	• World Bank	2008	A screening tool designed to bring together climate databases and expert assessment of the threats and opportunities arising from climate variability and change.	Project	• Currently being tested in South Asia, soon expanding to a focus on sub-Saharan Africa. • Screening for risks posed by climate change and variability.
18	Rapid Assessment	• FAOIC	2013	To assist investment project formulation practitioners in incorporating climate change considerations into agricultural investment projects and programmes	Project / programme	• Specific tool for agricultural investment and programmes • Compiled by international experts • Acknowledges synergies and manage trade-offs among the objectives of adaptation, mitigation, food security and sustainable development

No.	TOOL NAME	ORGANIZATION(S)	YEAR	AIM / GOAL	SPATIAL SCALE	RELEVANCE FOR SHARP
19	Resilience Assessment Workbook: Assessing Resilience in Social-Ecological Systems	• Resilience Alliance	2010	Provide a step-by-step approach to assessing resilience of a social-ecological system with the long term goal of sustainable delivery of environmental benefits linked to human well-being.	System	• Aimed at assessing social and ecological systems • Relevant to different types of system • Focuses on general resilience • Developed and written by international academics.
20	Social-Ecological Inventory	• Resilience Alliance	2011	To identify existing knowledge and activities already underway in an area or sector, as well as the key actors involved with particular issues.	Geographic region – exact scale to be decided.	• Uses a systematic approach to participation and stakeholder engagement • Provides a starting point for strengthening resilience in a particular geographical region or sector. • Uses a participatory approach to evaluation
21	PMERL (Participatory Monitoring, Evaluation, Reflection and Learning for Community-based Adaptation)	• Care International • IIED	2012	Build the resilience of vulnerable individuals, households, communities and societies from the ground up.	Community	• Contributions from participants for various international organization, e.g. IISD, ODI, Oxfam.

ANNEX 3
ANALYSIS OF EXISTING TOOLS, INCLUDING LESSONS LEARNED, TO INFORM THE DEVELOPMENT OF SHARP

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TOOL	STRENGTHS	WEAKNESSES	LESSONS FOR SHARP
1	• Predictive tool can help with planning interventions • Aims to build capacity of NGO staff/ practitioners	• Quantitative modelling could lead to oversimplifications • Complex process of data collection, compilation and analysis	• Element of capacity building • Focuses on translating outcomes to actions • Possibilities to adapt the tool to suit different contexts
2	• Holistic • Ex ante framework • Provides a sourcebook of information to be used for making agricultural systems and practices more climate-smart	• Resilience conceptualised as the increase in adaptive capacity achieved through the ability to increase and diversify income	• Sourcebook of information useful for covering technical aspects of resilience • It takes into account the need for site-specific assessments to identify suitable agricultural production technologies and practices. • Proposes building resilience to every type of risk to be prepared for uncertainty and change • It is an approach rather than a new system or set of practices

TOOL	STRENGTHS	WEAKNESSES	LESSONS FOR SHARP

3	• Uses performance based indicators
	• Uses spider diagrams to facilitate communication
	• Applied at a range of spatial scales
	• Holistically examines all four domains of sustainable development – economic, environmental, social, and governance
	• Used an iterative participatory process through expert meetings and E-forums
	• It provides a universal framework for Sustainability Assessment of Food and Agriculture systems (SAFA) will be established.
		• Quantitative assessment, that doesn't allow for in depth analysis
		• May oversimplify relationships
		• Data is not centrally compiled or analyzed
		• Requires a lot of data and time to compile and analyze
		• Expert knowledge required
			• Identify domains, themes, subthemes and indicators relevant for farmers' and pastoralists' climate-resilience
			• Aiming at using an approach with a number of fixed, "core" indicators applying to all possible users as well as a number of specific indicators, only relevant for certain users.
			• Take into consideration the user-friendliness of any tool.
			• Learning from field testing experiences. The field-testing showed that the tool was hard to use for smallholder farmers. This reinforces a point already clear to the authors, namely that any scheme should be sufficiently simple to be used in the field by a facilitator together with a group of smallholder farmers and pastoralists.
			• Using flexible indicators to reflect the individual nature of each situation. As performance-based data was deemed too difficult to collect in certain cases, SAFA relies on a three-tier system:
			  • Whenever possible performance-based indicators are used. If using performance-based indicators proves too onerous SAFA then relies on practices-based and where this is not possible "target"-indicators are used.
			  • Need for some form of qualitative assessment

4	• Rather than being an observatory tool it brings coherence to existing programmes, and creates a direct link with the management cycle of projects / programmes in the field of projects and programmes about Climate Change.	• TBD	
5	• It works in a participatory manner with local leaders to identify the major climate change-related issues and policies to overcome these challenges	• At the level of policy makers and not actually farmers • Provides a static - it looks at communities' current issues already on-going and does not account for projected changes in climate in the future • Implies protection rather than empowerment	• Importance of working with local communities and especially local decision makers • Identifies existing challenges related to climate change and potential actions, e.g. adaptation strategies
6	• It involves the re-engineering of irrigation systems • Tends to be employed on medium and large scale systems. • MASSCOTE is already used in: China, India, Morocco, and Nepal with other areas interested in implementing the methodology	• Specifically designed for irrigation systems and canals. • Focuses on of physical, institutional, and managerial improvements in different components to improve irrigation effectiveness. • Requires qualified personnel to assess the current situation and recommend modernization improvements.	• It was developed to analyze a specific system, though transferability to SHARP is unclear • It is focussed on a specific goal • It provides a specific vision and action planning across different time scales.

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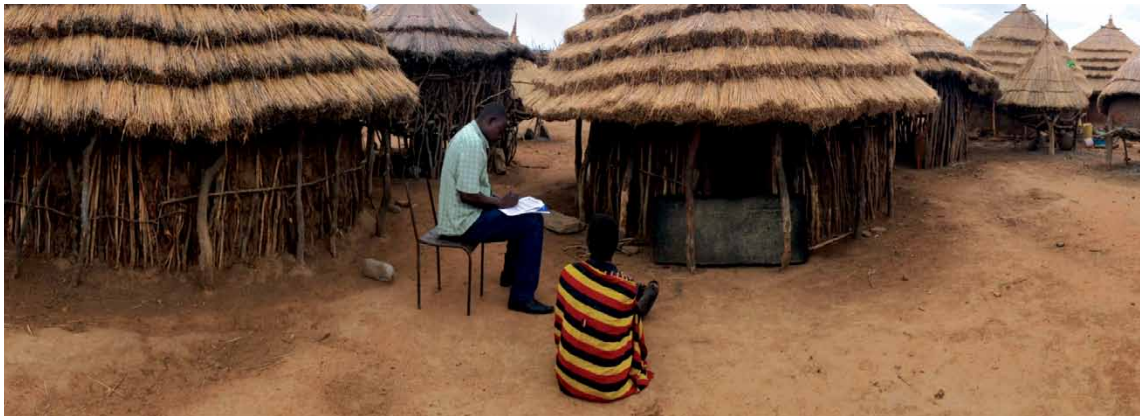
TOOL	STRENGTHS	WEAKNESSES	LESSONS FOR SHARP
7	• Builds capacity in assessing and managing land degradation through training experts at regional training centres • Uses harmonized definitions in order to achieve comparability between assessments. • Assesses both the biophysical and socio-economic aspects of land degradation. • Provides a report on the status and trends of land degradation. • Indicators are evolving • Goes beyond being an assessment degradation to helping improve understanding of the drivers of land degradation • Developing standardized and improved methods for dryland degradation assessment, with guidelines for their implementation in a range of scales. • Using these methods, it assesses the regional and global baseline condition of land degradation with the view to highlighting the areas at greatest risk.	• LADA is focused on Drylands due to their vulnerability to climate and human induced changes. • Focuses on identifying areas for action, rather than implementing solutions • Complex • The assessment is meant to be conducted by trained personnel who do scientific soil sampling (among other activities) and the data is meant to be used at a higher level i.e. too difficult for farmers and pastoralists to conduct.	• Practical approach • Short time frame - A typical LADA-Local assessment requires approximately 3-4 weeks to complete the preparation, field work, interviews with land users and households • Promotes validation of findings with the community and the preparation of a summary report to avoid error and bias • LADA uses triangulation of quantitative and qualitative data in order to double and triple check results • Uses ICT to collate data from a combination of tools • Multi-step process • Identifies effective and sustainable response strategies, including the livelihood resources needed to implement them • Produces a summary report
8	• Understands past and present vulnerabilities and identifies future risks • User-friendly interface to collect data • Flexible system – has been updated to incorporate its users' needs and priorities as well as the latest thinking in the field of climate change adaptation. The current and completely revised version of CRiSTAL was developed between 2010 and 2012 based on extensive user experience and feedback. • Used by multiple stakeholders - CRiSTAL was developed and tested during the period 2004–2006. As such, it was one of the first community-based climate risk screening tools. From 2007 until 2012, CRiSTAL has been applied in over 20 countries in Asia, Africa and Latin America by various institutions and development professionals.	• Technology requirements - access to a computer, the internet, potentially a printer needed • Time consuming - lengthy process to collect data • Participation could be limited to a few "experts" • Risk-based approach • Targeted at organizations, rather than a self-assessment	• Demand-driven: CRiSTAL was developed in response to the outcomes of the first phase of the Livelihoods and Climate Change Initiative. Recognizing potential, project planners and managers began asking how they could systematically integrate risk reduction and climate change adaptation into their work. CRiSTAL was developed to respond to this need. • Partnership-driven: CRiSTAL was developed by four international non-governmental organizations • (NGOs): International Union for the Conservation of Nature, International Institute for Sustainable Development, Stockholm Environment Institute and Helvetas Swiss Intercooperation. • The CRiSTAL revisions based on partnerships continue fostering knowledge exchange, creativity and learning.

TOOL	STRENGTHS	WEAKNESSES	LESSONS FOR SHARP
9	• Participatory approach fosters empowerment • Handbook is clear and practical • Focus on climate change: uses a bottom up approach to understand how climate change will affect the lives and livelihoods of target populations. • It examines hazards, vulnerability to climate change and adaptive capacity with a view to building resilience for the future. • Uses tools that are tried-and-true Participatory Learning for Action (PLA) tools, but with a climate "lens". • Emphasis on multi-stakeholder analysis, collaborative learning and dialogue:	• Views vulnerability as the opposite of resilience • Difficult to record data to allow for cross-comparisons	• Participation and empowerment is important • A practical and clear handbook is important for facilitators to refer to • Use of a bottom-up approach • Recording tools need to be designed to allow for comparison between individuals / sites • Vulnerability is part of resilience • Use and adapt existing tools • Stresses that communities are not homogeneous • Underlines the need to pay special attention to those, especially women and the marginalised, who are more at risk and less able to adapt • Participatory – facilitates analysis of vulnerability and adaptive capacity by members of communities themselves
10	• Approach used to develop indicators • The framework provides broad direction and normative criteria, but details come from the local context • Theoretical grounding and integrated conceptual approach	• Specific to food systems – potential to adapt? • Complex concepts and language in the resilience assessment • Provides a past/present assessment, but little focus on how to strengthen resilience	• Indicators may vary for different contexts and scales, therefore testing project tools through participatory processes with communities and policy-makers in each country is important. • Guidance tools can help communities develop resilience indicators and also provide important information for policy-makers and planners at different levels. • Possible to conduct analysis across multiple spatial scales. • Potential to adapt such a system to assess climate resilience of farm system. • Potential to integrate such a tool/approach with gap analysis and project planning.
11	• Potential to apply to a system level • CRAM can be used to identify opportunities for enhancing climate change adaptation for women and vulnerable groups. • Provides a step-by-step guide on how to use tools, with key questions to ask • Fosters participation • Addresses institutions - issues of decision making, access, gender etc.	• Potentially time consuming • Some activities limit participation – few experts needed • Training facilitators would be needed • Potential difficulties comparing data across multiple sites	• Potential to understand past vulnerability as a means to strengthen resilience • Potential to use / adapt some of the tools to understand vulnerabilities within the community – not just those involved in SHARP • Approach to recording qualitative and participatory assessments – potential for comparison across multiple sites
12	• The framework has distinct and well defined elements, but it is also flexible enough to facilitate local implementation which reflects different national and city contexts and expertise. • Allows for analysis of factors across multiple scales	• Doesn't account for interactions between agents, systems & institutions • Defines systems as 'built' or natural systems	• Useful approach if historical data is lacking / difficult to collect • Brings together assessment and action planning approaches
13	• Provides a starting point for developing individual resilience • Reflective, person-centred approach • Quick and easy to administer • Potential to compare results across • A form of participatory GAP analysis	• Applied in a different context • Difficult to verify answers • Assessments of resilience based on perception of self • Potential to be superficial	• The personal i-resilience report allows users to build on existing areas of strength and also allows them to manage any potential areas of risk • The i-resilience portal then allows users to develop their resilience in line with the results of their report • Tool / portal available online

TOOL	STRENGTHS	WEAKNESSES	LESSONS FOR SHARP
14	• Key questions and measurements against the "Ten Essentials" criteria	• Time taken to develop "ten essentials" criteria • Risk based approach – DDR • Focus on infrastructure and urban environments	• Stakeholder approach to self-assessment • Simple, easy to administer and understand • Helps local governments engage with different stakeholders to map and understand existing gaps and challenges
15	• Self-assessment • Easy to administer	• Only a climate risk approach • Useful for urban environments, focus on infrastructure • Conceptualisation of resilience as antonym of vulnerability • Risk based approach – not holistic	• Self-assessment tools should be easy to administer and provide results that make sense to stakeholders • Comparison of data between sites is possible using a self-assessment tool • Empowers local governments to actively engage in building resilience
16	• Self-assessment can be conducted by anyone • Easy to follow	• A resilience score is provided, but no follow-up or guidance • Assesses vulnerability to climate trends • Lack of theoretical grounding • Focus on infrastructure	• An assessment tool alone does not equal strengthening resilience. Awareness is only one step in the process towards change. • Potential to develop a climate resilience index
17	• Integrates climate model data with project planning • Uses a simple risk index • Provides potential solutions / advice	• Need access to technology • Technical expertise needed • Lack of information about how the model works • Weak theoretical grounding	• Qualitative assessment of risk coded into five categories • A report generator delivers the results and relevant documents to the user • Easy for non-climate change experts to use
18	• Participatory • Rapid assessment • Brings together past and present issues with future climate issues	• Requires an expert to collect, input & analyze the data • Top-down approach to assessing impacts – little consideration of adaptive capacity	• Way to integrate past and present issues with future climate risks
19	• Captures cross scale issues • Basis for understanding some social-ecological dynamics	• Assumes a certain level of resilience knowledge • Relies on a 'expert' to conduct the assessment • Long, complex process • Difficult to compare findings across sites	• It takes a step by step approach to defining the systems, framing issues and identifying key thresholds • Considers both social and ecological elements across different scales
20	• Systematic way to map actors, their values, motives, knowledge, experiences and networks. • Provides a basis for a participatory monitoring and evaluation • Potential to compare studies • Basis for understanding some social-ecological dynamics • Considers issues of power, resources and knowledge	• Requires an expert to lead / facilitate the process • Doesn't focus on the system itself, but rather strengthening relationships between other stakeholders	• Could be useful exercise to conduct in Phase I of SHARP or be included at a later stage – e.g. provide some supplementary material
21	• Participatory • Builds adaptive capacity • Grounded in development practice • Includes consideration of social vulnerability and institutional factors	• Focus is on Monitoring and Evaluation • Focus is on social factors, little consideration of ecological factors	• Uses participatory processes to build adaptive capacity • Provides a manual and toolkit to increase wider uptake • Mix of qualitative and quantitative methods

ANNEX 4
DIFFERENCE BETWEEN CLASSICAL PROJECT M&E AND OBSERVATORY MONITORING



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The term follow-up or "monitoring" is used more frequently and in fact tends to cover different realities. We can roughly distinguish two main types of monitoring systems:

a. monitoring systems associated with a process "monitoring and evaluation, M&E", commonly used in projects or programmes and results-oriented (logical Products - Direct Effects - Impacts);

b. monitoring systems that are part of an "observatory" kind of process (IFAD *et al.* 1999).

In the first case, monitoring is clearly connected to a series of pre-defined objectives and results with which to assess the level of attainment or achievement. In the second case, it is mainly to quantify the changes that take place in a geographical area within a predetermined (time-and space boundaries) duration.

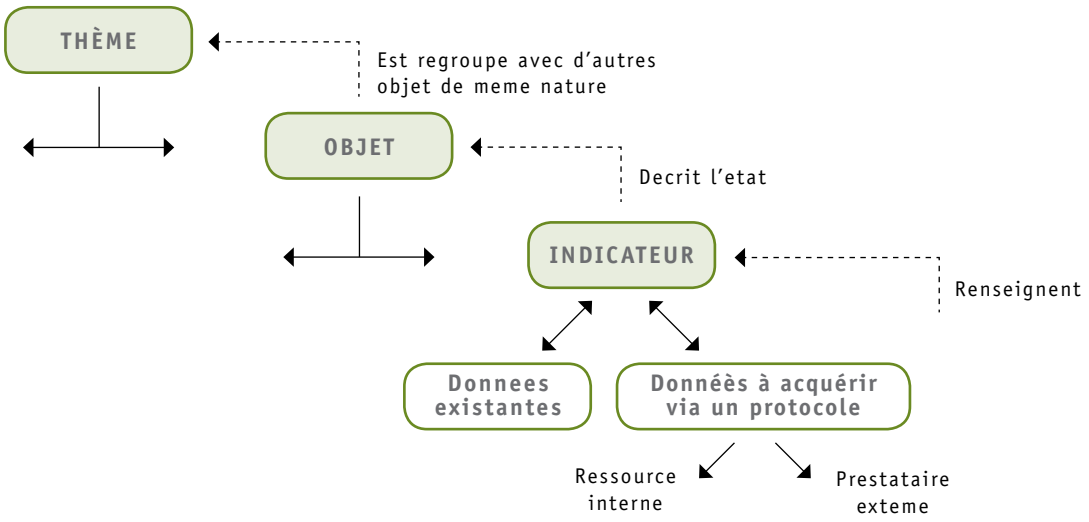
"Monitoring" means to accumulate data (generate, process, organize, store) to attain the information to measure changes in a reference space for objectives determined in advance (understand, compare, evaluate, plan, plan, etc.).

The assessment is facilitated by the availability of data generated by the monitoring reports of an analytical approach and critical reflection on the state of a system, its evolution and future prospects.

» A monitoring system can therefore comprise three or four hierarchical levels in a top-down approach (see Figure 27):
» Level 1: The domain which includes similar themes and allows for complex systems
» Level 2: The theme includes several objects of the same type
» Level 3: The object that is the monitoring unit (what is being followed)
» Level 4: The indicator/ question, which is a measurable quantity that describes the state of the object from the collection and analysis of data implemented by a defined protocol.

Figure 27. **Overview of three hierarchical levels of a monitoring system.**

English translation: *Thème* - Theme. *Objet* - Object. *Indicateur* - Indicator. *Donnéès à acquérir via un protocole* - acquire data via a protocol. *Donnees existantes* – existing data. *Est regroupe avec d'autres objet de meme nature* – is grouped with similar objects. *Decrit l'etat* – describe the state. *Ressource interne* – internal resource. *Prestataire exteme* – externally provided. *Renseignent* – inform.



EXAMPLES OF HIERARCHICAL ORDERS FOR "DOMAIN, THEMES, OBJECTS, INDICATOR"

The following example is based on the framework of the monitoring tool, SAFA (FAO, 2012), and shows how a quantifiable indicator (entered via a simple protocol) is used to describe the state of an object (stability of agricultural production). This object supports the understanding of a key theme (Vulnerability), linked to the field of economics (or "Economic Resilience").

- Level 1: The domain, which includes similar themes and allows for complex systems
- Domain: ECONOMIC (1/4)
- Level 2: The theme includes several objects of the same type
- THEME: VULNERABILITY (1/4)
- Level 3: The object that is the monitoring unit (what is being followed)
- OBJECT: PRODUCTION STABILITY (1/5)
- Level 4: The indicator/ question which is a measurable quantity that describes the state of the object from the collection and analysis of data implemented by a defined protocol.
- INDICATOR: Degree of dependence on a single species or variety (1/6)
- PROTOCOL (simplified): Information by the farmer, the farmer or group of farmers: (a) the number of species or varieties used in the year, and / or (b) the number of producers that are using only one variety or species.

ANNEX 5
SCOPE OF CLIMATE RESILIENCE

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Climate resilience in the SHARP context is related to any activity that is impacted by the climate (see Figure 28 for an example of potential impacts from climate change). As this could conceivably be almost any action, we are focusing on improving the resilience of farmers and pastoralists to the following potential direct and indirect climate impacts (FAO, 2013b):

- Market variability (e.g. costs, prices, availability)
- Social uncertainty (e.g. increased populations/ migration)
- Changing rainfall patterns
  - Increased rainfall
  - Decreased rainfall
- Weather variability
  - Changes in weather event intensity
  - Changes in weather pattern timing
- Sea level rise
  - Storm surges
  - Flooding
- Temperature increases
- Increased salinity in soils (i.e. through increased evaporation)
- Crop pollination timing and pest and natural enemy/control dynamics
- Soil erosion

Figure 28. **Potential events and impacts from climate change on crop production (IPCC, 2007; FAO, 2008a; FAO, 2013b)**

EVENT	POTENTIAL IMPACT
Cold periods becoming warmer and shorter; over most land arears, days and nights becoming hotter (*virtually certain*)	Increased yields in cold environments; decreased yields in warmer environments; increased outbreaks of new insect pests and pathogens; potential impacts on crop production
Heavy precipitation events increasing in frequency over most areas (*very likely*)	Damage crops; soil erosion; inability to cultivate land owing to water logging of soils
Drought-affected areas increased (*likely*)	Land degradation and soil erosion; lower yields from crop damage and failure; loss of arable land
Intense tropical cyclone activity increases (*likely*)	Damage to crops
Extremely high sea levels increase in incidence (excludes tsunamis) (*likely*)	Salinization of irrigation water, estuaries and freshwater systems; loss of arable land

Based on this, the specific vision for climate resilience in the context of SHARP for smallholder farmers and pastoralists both individually and as communities is as follows:

> *Climate resilience is an evolving term used to describe the ability of farmers or pastoralists to adapt to change with minimal negative impacts. It includes the ability to change and choose different options. The farmer/pastoralist should therefore be flexible, striving towards having many options. Climate is not a steady system state and thus approaches to achieving resilience must also change with time so that farmers/ pastoralists are be able to adapt in many situations and environments. A farmer or pastoralist therefore should be knowledgeable enough to recognize changes and to adapt accordingly by changing practices, choosing different suppliers, selling to different markets or planting different crops. The goal is not necessarily to achieve maximized yields or income under specific circumstances. SHARP, therefore intends to help increase the capacity of farmers and pastoralists to survive and thrive under external change.*

As this scope is very difficult to define, SHARP will be assessing, "general resilience" or resilience to many possibilities[14] through the lens of climate resilience.

The boundary of the farming system and the potential impacts therefore are based on a general idea of both what currently impacts a farming system, *and* what could potentially impact the farming system through climate change.

[14] This could be compared to an athlete who exercises for a sport by increasing their general fitness. They would be more resilient to many activities that could occur during a match. They would be more resilient to impacts from other activities. For example, improving the social capacity/ structure of a community to address a climate disaster would potentially increase their resilience to other external shocks.

ANNEX 6
SHARP CONCEPTUAL FRAMEWORK PRINCIPLES

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Based on the theoretical understanding of resilience outlined in the literature review and the gaps and lessons learned described in Sections 2 and 3 above, the proposed conceptual framework for SHARP is based on the principles of:

» *Moving beyond understanding climate risks towards a holistic approach to understanding farm systems and their resilience*. While understanding future climate risks is important, the uncertainty around future climate change requires alternative approaches (Tyler and Moench, 2012). Integrating farming system and resilience approaches provides such an alternative. Resilience is conceptualized as an intrinsic farm system property. The farming system approach recognizes that individual farm systems are made up of biophysical and human components that interact across temporal and spatial scales (Keating and McCowan, 2001). The climate resilience framework will ensure that social, environmental, institutional and economic factors are considered when undertaking the climate resilience assessment.

» *A farm / farmer centred approach is integral to the process*. The framework proposes that farmers are the experts when it comes to managing their farm system (Chambers and Ghildyal, 1984). Where possible, farmer experiences and knowledge will be used to assess their own resilience and further built upon to strengthen the resilience of the farm system.

- *General resilience is a system property, while climate resilience is a specific, desirable property* (Resilience Alliance, 2010). Although strengthening climate resilience, defined as the ability to survive, recover from, and even thrive in changing climatic conditions (ACCRN, online), is the goal of SHARP, general resilience is also important. General resilience can exist without knowledge of what the perturbation may be; which is useful given the future uncertainties associated with future changes, including climate change (Tyler and Moench, 2012). While SHARP will strengthen general resilience, we recognize that this may also act as a barrier to change (Carpenter *et al.* 2001; Walker *et al.* 2006), therefore we focus on the climate resilience of farm systems as a desirable system property in the face the uncertainty associated with future climate change. The boundary of the farming system and the potential impacts therefore are based on a general idea of both what currently impacts a farming system, *and* what could potentially impact the farming system through climate change.
- *A participatory, flexible and learning approach to project planning, implementation and monitoring & evaluation is required to strengthen resilience*. The adoption of this principle ensures that resilience can be strengthened through active farmer participation and learning (Carpenter *et al.* 2001; Tompkins and Adger, 2003; Fazey *et al.* 2007; Wardekker *et al.* 2007). SHARP – in its development and its future implementation – has and will aim for a high level of participation from farmers and pastoralists. The assessment process of SHARP will also emphasise farmer participation as a starting point to strengthen resilience (Fazey *et al.* 2007). The learning process which informs the project cycle in SHARP should also be flexible so that it can be adapted to different contexts and respond to ongoing developments (Wardekker *et al.* 2007).
- *Stakeholder Engagement* as a means to address the "healthy tension[s] between bottom-up/ qualitative/place-based approaches and top-down/quantitative/ generalizable approaches" (Twyman *et al.* 2011). The adoption of a resilience assessment framework should also recognize the roles and responsibilities of multiple actors, organizations and institutions in strengthening resilience throughout various stages of the project cycle.
- *Climate resilience does not equal development or poverty reduction*. Farm systems are embedded in a wider context. Strengthening resilience at the farm scale should not assume that poverty is reduced or that farm systems are progressing in other ways (Carter, 2007; Bene *et al.* 2012). Resilience is assumed to be a baseline condition required for farm systems to function.

ANNEX 7
LIST OF WORKSHOP PARTICIPANTS

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This publication presents the scientific background of the SHARP tool. The Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) tool was developed over two years with the participation of over 150 academics, practitioners and civil society. SHARP was also field tested in Angola, Burkina Faso, Mali, Senegal and Uganda with farmers and pastoralists. It has been recognized that there is a need to both provide a rigorous assessment of the resilience of farmers and pastoralists, while also incorporating the views and needs of those people. SHARP assesses resilience through a participatory survey to both measure resilience and to engender discussions on how to increase farmers' and pastoralists' resilience. Please see **www.fao.org/climate-change/programmes-and-projects/detail/en/c/328911** for more information.

The development of SHARP has received funding from the European Union through the "**Improved Global Governance for Hunger Reduction Programme.**" The views expressed herein can in no way be taken to reflect the official opinion of the European Union or the Food and Agriculture Organization of the United Nations.




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I4495E/1/09.15