



CROP DIVERSITY

Local Indicators of Climate Change Impacts

Crop Diversity Trends Manual

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LICCI

Local Indicators of Climate Change Impacts

Definitions

Farmer: people who consider that his/her main activity is farming and identify him/herself as a farmer. Ensure that this people is cultivating by himself/herself.

Young Adult: It is the first age class after childhood where people are involved actively in farming. This should be assessed locally and the local word should be used in each context.

Crop: a plant purposively planted, cultivated for self-sufficiency or commercialization, either perennial or annual. Crop thus include plants cultivated for fiber (e.g. cotton) or for spice (e.g. clove tree), fodder or other uses.

Species: as defined by the botanical classification and identified with their Latin name. Mismatch with local taxonomies are frequent, and researcher should adapt the survey protocol to make sure that they record the different botanical species. It is frequent that several botanical species bear the same vernacular name in local taxonomies, and reversely that one botanical species includes two local species.

Staple: crop that people consume every day during the major part of the year and that are grown in the village.

Main staple: the most consumed staple.

Farmer variety: variants within species as locally identified and named by farmers. It includes local landraces as well as introduced modern varieties released by official channels.

Perennial crop: Perennial crops are crops that can survive without replanting for more than two growing seasons, which means they can be harvested several times before replanting is needed.

Non-perennial crops: plants that do not last for more than two growing seasons. In this protocol, for simplicity purpose, we will refer to non-perennial crops as *Annual crops*.

Field types: the different categories of fields or cropping systems that people distinguish locally, used for communication, and identified using distinct vernacular terms.

Cropping system: refers to the crops, crop sequences and management techniques used on a particular agricultural field over a period of years. It includes all spatial and temporal aspects of managing an agricultural system. It especially encompasses: i. Crop choice (species and varieties), ii. Crop spatial organization, rotation or succession, iii. Tillage, iv. Organic matter management, v. Burning, vi. Water management, vii. Pests, disease and weeds control, viii. Fertilization.

Cropping system descriptors:

- ✓ *Rainfed*: relying only on rainfall.
- ✓ *Irrigated*: application of controlled amounts of water to plants at needed intervals.
- ✓ *Flood-recession*: crops are cultivated after the recession of water on riverbanks or near any water bodies.
- ✓ *Shifting cultivation*: plots of land are cultivated temporarily, then abandoned and allowed to revert to their natural vegetation while the cultivator moves on to another plot.
- ✓ *Permanent cultivation*: plots are cultivated each year (absence of fallow).
- ✓ *Horticultural*: vegetables cultivation, mainly for commercial purpose.
- ✓ *Agroforestry*: woody perennials (trees, shrubs, palms, bamboos, etc.) are mixed with agricultural crops.
- ✓ *Homegarden*: an area of land surrounding a house and planted with a mixture of perennials and annuals.

Farming systems (FAO): a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints. Their description is based on the following criteria: i. available natural resource base, including water, land, grazing areas and forest; climate, of which altitude is one important determinant; landscape, including slope; farm size, tenure and organization; and ii. dominant pattern of farm activities and household livelihoods, including field crops, livestock, trees, aquaculture, hunting and gathering, processing and off-farm activities; and taking into account the main technologies used, which determine the intensity of production and integration of crops, livestock and other activities.

Crop succession or rotation: Crop succession and rotation are the practices of growing a series of different crops in the same area in sequenced seasons. Crop rotation refers to a pattern crops series that is repeated regularly (e.g: alternating finger millet and groundnut repeatedly), while crop succession is a series that is not repeated over time (e.g. growing rice, then cassava, and then planting mango tree.).

Seed relief: actions intended by governments or NGOs to deliver direct forms of seed aid to respond to acute, emergency stresses, i.e aiming at procuring, transporting and distributing seed.

Food / seed self-sufficiency: capacity of the household to produce its own food /seed for the year.

The crop diversity trends protocol is an add-in of LICCI protocol ¹ and was designed to be integrated in that data collection flow (Figure 1).

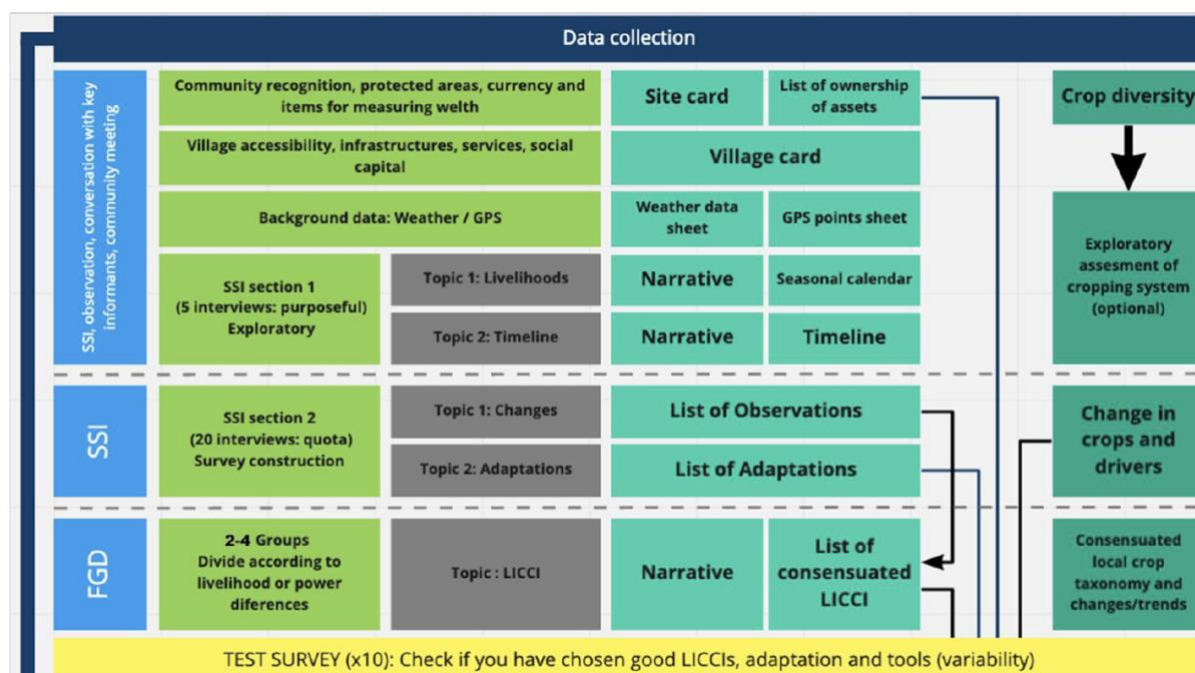


Figure 1. Scheme of how the crop diversity trends data collection flow is integrated in the LICCI protocol.

¹ <https://doi.org/10.6084/m9.figshare.11842566.v5>

Crop diversity trends protocol

Goal: i. To obtain an assessment of cropping systems and crops cultivated in the field site, ii. to document changes in crop species and farmer varieties (see definition), iii. to identify the main factors driving these changes, iii. to assess the perceived impact of climate changes on agroecosystems and associated livelihoods.

The crop diversity protocol follows the same methods and sampling design as described in for the core LICCI protocol (i.e. semi-structured interviews, FGDs, and surveys) and should be conducted as an “extension” of the LICCI protocol, with the same interview partners for the household survey.

Specifically, the crop diversity protocol expands the content of the LICCI methods as follows:

(A) At the **village level**, group interviews aim at **assessing the current diversity of crop** species and of farmer varieties for the main staple, and to **document the local observations of changes in crops** over time and their drivers. A description of the cropping system should also be provided at this level.

(B) At the **household level**, surveys are conducted to assess crop species and farmer varieties currently grown, and record individual farmers’ observations concerning changes in crop and climate change impacts on crop productivity, food sovereignty and income.

Before starting conducting the interviews you should make sure you have clarified a “glossary” with the interview terminology. If possible, run 3-5 pilot interviews to check how the concepts work and train your translator. Examples of tricky concepts are “crop”, “species”, “variety”.

Material needed: A booklet with the picture and the Latin name of all the botanical species of crop expected to be grown in the study area should be printed before going on the field. This booklet will be a reference for the village and individual survey, and will be adapted by adding species that were not included initially or by removing species that are not cultivated. The picture should be clear and display the whole plant in the field, as well as details of its aerial and edible parts. When possible, choosing picture representing the diversity of the variants observed in the area is recommended. During the training workshop in Barcelona, examples of the booklet will be shown.

I. Village level, group interviews

Depending on their knowledge of the study site, the researcher may be able to address part of the points listed below. In this case, researcher don’t need to go through all the following questions during interviews and group discussions and they can choose to target some specific questions for which they need complements.

Approximate time: 45 minutes

Sampling recommendations: at least one group interview should be conducted in each village. Each group should include between **5 and 10 people**. The procedure for sampling will be the

same as for the Focus Group Discussion in the main LICCI protocol, but targeting only people that do farming as main livelihood activity. We will use quota-sampling to capture the variability within the local communities in terms of gender and age. If the partners feel that power relationship may impede some specific group to express their viewpoint freely, they should implement different group interviews. Informants selected for the crop trends protocol can be selected independently from those selected for the core LICCI FGD if needed. Partners can choose to do these group interviews together with the FGD conducted in the core protocol or independently.

Content: In the group interviews we will explore two main topics: (1) assess the diversity of local crops species and that of the farmer varieties for the main staple crop; (2) document peoples' observations concerning changes in crop and their main drivers, focusing specifically on the impacts of climate change.

Expected Outputs:

Researchers should not submit raw data, but should keep it for a period of 3 years, as it might be required for clarifications. Raw data includes transcripts or recordings of the interviews, field notes, etc. Researchers should produce and submit the following documents summarizing results from these:

1. **A list the crop species currently grown** for food and income in the village (*refer to the Output manual [village FGD, part 1]*). Fill the output table by establishing a list with the correspondence between the vernacular species name and the Latin name of the botanical species (Use the species pictures booklet as a reference. Refer to the following sites for the botanical identification: <http://www.theplantlist.org> and <https://www.tropicos.org>).

Indicate:

- What are the three main staple crops in the village, i.e. the crop species consumed the most frequently and grown in the village (up to three, ranked by decreasing order of importance regarding their contribution to food in quantity).
- What are the three main cash crops in the village, i.e. the crop species that contribute most to income (up to three, rank by decreasing order of importance regarding their contribution to income in amount of money).
- Precise if, in the village, each species is cultivated by: i. many people or few people, and ii. if it represents a small or a large part of the cultivated area ("four cells analysis"). Limit to the 15 main species.

2. **A list of the farmer varieties currently grown in the village for the main staple**, based on the vernacular names used by farmer to identify them (*refer to the Output manual [village FGD, part 2]*). Indicate for each farmer variety:
 - If it has other names locally (synonyms). In cases where farmer varieties identification is non-consensual in the village, partners are advised to identify who are the experts/ most knowledgeable people for the cultivation of the main staple crop in the village and invite them to either collective or individual interviews aiming at establishing a consensual list of farmer varieties names and their

synonyms. A unique ID will be attributed to each locally-named farmer varieties or variety and will be used as a reference for the individual surveys.

- Their origin, i.e. if people consider that it is: i. a local farmer variety (it has always been grown in the village as long as they can remember), ii. a farmer variety introduced from another village, or iii. a modern variety disseminated by a project, an NGO or any official organization.
- Their rank according to the area they represent in the village.

3. **A description of the different types of cropping systems or fields** and their characteristics. It can be done only once at the site level if little differences exist among villages, or in each village if significant differences exist at this level. The output table may be filled directly by the researcher and its field assistant if they have has a sufficient knowledge concerning the different types of cropping systems in the study area. Alternatively, interviews should be conducted with key knowledgeable informants.

- a. Partners should *fill the table* (*refer to the output manual [village FGD, part 3]*) as following: Establish the **list the different types of cropping systems** or fields that people distinguish and name using vernacular names. If different types of cropping systems exist in each category, detail them by indicating the main crops. Provide: i. a brief description of the **biophysical characteristics** of each cropping system type (e.g. topography, soil characteristics, proximity to water bodies, to houses), ii. the **main crop** in these systems and if they are usually associated to non-crop plant species (e.g. shade trees), and iii. **how they are managed** (crop successions and associations, fertilization, irrigation, pests, disease and weed control, tillage). Indicate for each cropping system to **which category** it belongs in the following list:
 1. *Non-perennial grain or tuber crop fields (other than specifically horticultural or homegardens);*
 2. *Perennial monoculture fields (e.g. apple orchards, vineyards);*
 3. *Horticultural fields, (i.e. dedicated to vegetables cultivation, other than homegardens);*
 4. *Agroforestry, (i.e. woody perennials mixed with non-perennial crops; other than homegardens);*
 5. *Homegarden (area of land surrounding a house and planted with a mixture of annual crop, sometimes with perennials);*
 6. *Cultivated grassland.*
 Refer to definitions abovementioned.
- b. Provide a *brief narrative* to provide a general description of agriculture in the area and provide any useful complementary information about the cropping systems, especially concerning their respective importance in livelihood strategies, their spatial imprint, or their temporal dynamics. If not described in the LICCI core protocol livelihoods narrative, explain what are the main agricultural activities, is agriculture rather subsistence-oriented or marked oriented, what are the main value chains, what are the main constraints, and what have been the major changes that farming systems experimented in the area.

4. **A description of the crop diversity trends**, i.e. changes in crops over time in the village. Partners are expected to provide:

- a. **A list of the local observation of crop changes and their drivers.** Ask people what changes they observed since they started farming concerning: i. crop species

and ii. the farmer varieties for the main staple (*refer to the Output manual [village FGD, part 4]*). To obtain this information use a benchmark (since you were a young adult). Be careful to not use the term climate change. **Explore the causes/drivers of changes noticed.** Note down causal relations noticed by people (i.e., driver of change, consequence of change, cascading effect). Specify in the dedicated columns those changes/impacts that people or you consider directly or indirectly associated to climatic factors. Notice that not all these changes will be classified as LICCI (i.e. climate related).

- b. A **short narrative** that goes together with the change table, detailing the timing and drivers of these changes and their consequences on people livelihoods in the village.

II- Household level survey

Approximate time: about 30 minutes.

Goal: The aim of the survey is to collect information at the household level on changes in crop species and farmer varieties observed by the household heads since they started farming by their own (i.e. do their own choice for crop), and their perceptions of LICCI related to crop and cropping systems. The survey will include questions regarding: the current agroecosystem and crop cultivated, and changes in crop species and farmer varieties for the main staple.

Household sampling: Each researcher should conduct a minimum of **60 surveys** at the site level. Households should be selected among those surveyed for the core LICCI protocol, following simple random selection as specified in this core protocol.

Individual sampling: Within each household, this survey should be conducted preferentially with both household heads (men and women). When not possible, it can also be conducted only with one of them if his/her knowledge of the crops cultivated in the household is enough. The crop trends survey is expected to last about 30 minutes, and it can be conducted during a second visit if the researcher feels that doing it together with the core LICCI survey is not convenient.

Protocol: The survey takes the form of a close-ended questionnaire including three main components: 1) Cropping systems assessment; 2) Crop species and farmer varieties trends; 3) Sources of planting material or seeds used by farmers to get new crop in relation to change in climate; 4) Climate change impacts on agricultural production, self-sufficiency and income. The recommendations for the individual survey in the main protocol should be applied here.

Expected outcomes: a minimum of 60 surveys completed.

The survey includes the following sections, detailed in the *Output Manual*:

1. Interviewee identity

Basic information to identify the interviewee, to be reported from the core survey if they were already collected with the same interviewee.

2. Cropping system assessment

List the different fields of the household and the crop planted on each of it over the last cropping year. If there are two cropping season, list the crop planted during each. Indicate if chemical or organic pesticides and fertilizers were used in the farm of the last year.

3. Trends in crop species and farmer varieties for the main staple

List the changes the interviewees observed since they started farming concerning: i. crop species and ii. the farmer varieties for the main staple. Follow the same procedure as for the group interview at the village level: list the drivers either LICCI (i.e. climate related) or not.

4. Seed/propagules sources

For the species and farmer varieties of the main staple that were adopted by the household along time, indicate where the household get planting material for the first time (precise the nature and the origin of the source).

5. Climate change impacts on farming systems

Explore the impact of climate change on the productivity of crop and household livelihood, if this was not already explored in the LICCI core survey. Ask the interviewee whether he/she consider that the best option to adapt to the changes experiment is crop diversification or specialization.

Crop Diversity Trends Survey Output Manual February 2020

Preliminary Note

This Output Manual serves as a data collection tool for background and qualitative data and as an alternative in case you cannot use the App to conduct the surveys in the field. Note that the App is not meant to be used as an “on the go” data collection tool for the SSI or FGD, but rather as a tool to transfer the synthesized outputs of the exploratory and qualitative data collection.

All data collected should be systematically submitted either via the App or via the excel files (for those who cannot use the App for a justified reason). Data will be then sent to the data repository (check technical manual).

List of outputs

App exports:

Village FGD (First checkpoint):

- List and description of the cropping system in the village
- List of the crop species in the village
- List of the farmer varieties for the main staple species in the village
- List of the changes in crop species and associated LICCIIs at the village level
- List of the changes in the farmer varieties of the main staple and associated LICCIIs at the village level

Household surveys (second checkpoint):

- List of the plots cultivated by the household and their description
- List of the changes in crop species and associated LICCIIs
- List of the changes in the farmer varieties of the main staple and associated LICCIIs
- Seed sources
- Consequences of the changes on agroecosystems and livelihoods

Word documents (sent via ProjectSend):

- Narrative describing the farming and cropping systems in the study site.

1. Village focus group discussion

village level						
Part 1: list of crop species						
What are the crop species people grow in the village ?						
Vernacular name	Common english name	Latin name	Rank_staple	Rank_cash	Abundance_farms	Abundance_area
Indicate the local name of the crop species (local language)	Indicate the corresponding common english name	Indicate the corresponding latin name / botanical classification	Is this species among the three main staple crop for people in the village? If yes, indicate its rank, 1 being the most important staple species in the village.	Is this species among the three main cash crop for people in the village? If yes, indicate its rank, 1 being the most important cash crop species in the village.	Is this crop species cultivated by many or few households in the village?	Does this crop species covers a small or a large area in the village?
Text	Select from the list	Select from the list	select: 1, 2, 3	select: 1, 2, 3	Select: few/many	select: small/large

village level				
Part 2: list of landraces/varieties for the main staple				
What are the variety or landrace people grow in the village for the main staple ?				
Species name	Vernacular name	Synonyms	Origin	Rank_area
Indicate the latin name of the species	Indicate the local name of the landrace or variety	Indicate if this landrace/variety has other names	Indicate if it is considered as local (always grown in the village) or introduced by a farmer or by a project/NGO/government	Rank landraces according to the area they occupy in the village. For those that occupy very small areas compared to others, code as 100
Select	Text	Text	Select: local_landrace, introduced_landrace, introduced_variety, unknown	integer (1: the largest area to 100: very small area)

village level						
Part 3: field types / cropping systems						
What are the different types of field in the village ?						
Cropping system _ vernacular name	Location / topography	Soil description	Main crops	Non-crop plants	Number of cropping seasons in a year	Rotation or succession
Enter the local name people use to identify this type of cropping system	Describe where this type of field is usually located in the landscape, if relevant. Mention especially its location on the topographic gradient, proximity to water bodies, to households.	Indicate if this type of field presents particular soil characteristics (fertility, color, texture, humidity). You can indicate the general soil category it belongs to if you have this information.	List the main crop(s) cultivated in this type of field	Indicate if there are usually any other plants of agronomic interest that are not crop (e.g. shade trees)	Indicated how many cropping seasons are performed in the same plot during a year.	If crop rotation or successions are performed, indicate the usual pattern.
Text	Text	Text	list: text	list: text	Integer	Text

Fertilization	Soil management	Weed and pest control	Water management	Shifting cultivation	Type
Indicate if this type of field is usually fertilized, and what kind of fertilizer is used (organic or chemical).	Indicate how soil is prepared (e.g. burning, plowing by hand, with work animals)	Indicate how weed and pest control is usually done: none, manually, using chemical or organic pesticides.	Indicate how water is managed: rainfed, irrigated, flooded, flood-recession (e.g. river banks ..)	Is shifting cultivation performed ? Describe how if needed (slash and burn, slash and mulch ..)	Indicate to which category this field type belongs to among the categories listed below.
Text	Text	Text	Text	Text	Select from the list:
					1. Non-perennial grain or tuber crop
					2. Perennial monospecific
					3. Horticultural
					4. Agroforestry
					5. Homegarden
					6. Cultivated grassland

village level													
Part 4: crop trends													
Since you started getting involved in decision making concerning crop choice in the household, what are the changes in the abundance of crop species , and of varieties or landraces of the main staple ?													
Species	Landrace or variety (for the main staple)	Trend	Perceived as climate-related	Drivers if climate related	Other drivers non-climate related	Consensus appreciation	Crop characteristics relevant for its climatic adaptation						
The name of the species experimenting the change	The name of the landrace experimenting the change - only for the main staple.	The trend that the crop experimented	Precise if this change is related to climate according to people, to the researcher, or not.	Precise the drivers of this change, select in the list of LICCI.	Indicate if other non-climatic drivers are involved in these changes	Indicate if people agree or not concerning the observation of crop change; after debate or not	Indicate if the crop presents characteristics favorable/defavorable for its adaptation to climate change (e.g. short VS long cycle)						
		select: adoption or increase abundance, abandon or decrease abundance, change in cultivation place.	0: not climate-related; 1: people related it to climate; 2: researcher see a relation to climate, not clearly stated by informants	Select multiple: LICCI (0 in this table correspond to "not LICCI")	Select multiple - ranked: 1: Changes in market and value chain, 2: changes in inputs availability and access, 3: changes in biophysical conditions, 4: Changes in food habits, 5: Societal changes, 6: Other.	Select: 1: disagreed; 2: disagreed after debate; 3: agreed after debate; 4: fully agreed.	Text						
select from the list	Text												

2. Household surveys

household level				
Part 1: interviewees information				
List the people who participated in the household interview (people involved in decision-making concerning crop choice)				
Was this / these person already interviewed for the individual LICCI survey in this household?	Report the ID id he /she was already interviewed	Biological sex	Biological age	Age accuracy
Yes, No	ID	M,F, other	Integer	The person knows; estimated

[illegible]

household level	
Part 3: crop trends and seed sources	

List the changes in crop observed by the interviewee (s) in the household since they started to be actively involved in taking decision about crop choices, and changes in landraces or varieties for the main staple species

[illegible]

LICCI Project Survey : Crop trends				
household level				
Part 4: climate change impacts and adaptation				
Question	Code	Answer	Drivers	Answer
Since you started cultivating, have you noticed changes in subsistence crops productivity?	1: increase; 0: no change; -1: decrease.		List the drivers of these changes (LICCI + Others)	
Have you noticed changes in the quality of the edible part of subsistence crop?	1: increase; 0: no change; -1: decrease.			
Changes in the food self-sufficiency of the household : When you started cultivating, how many months could you eat from your own harvest? Nowadays, how many months can you eat from your own harvest?	1: increase; 0: no change; -1: decrease.			
Changes in the seed self-sufficiency of the household: When you started cultivating, did you typically had enough seeds at seeding time? Nowadays, do you have enough seeds at seeding time?	1: increase; 0: no change; -1: decrease.			
Changes in the agricultural income that the household gets from crops: Compared to when you started farming, the money you get from selling your harvest is more/the same/less ?	1: increase; 0: no change; -1: decrease.			
According to you, what is the best option to ensure your household has enough food: 1) to plant only one crop, 2) to cultivate several different crops, 3) I do not know	1: focusing on cultivating only one/a few crops or 2: cultivating several different crops, 3: I don't know.			
Explain why you think this option is the best one.	Text			