CGIAR SUSTAINABLE FARMING

LCAS-APT Protocol

Landscape Crop Assessment Survey and Agronomy Prioritization Tool Version 1

December 2025



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Background

The Landscape Crop Assessment Survey (LCAS) and Agronomy Prioritization Tool (APT) is an agricultural data collection and analytics tools that use a lean data approach, focusing on recurrently collecting essential data on crop production practices to drive impactful decision-making in smallholder farming systems, enhance agricultural practices, and tackle productivity and sustainability challenges in diverse farming landscapes.

Using mobile technology and geospatial tools, LCAS-APT gathers high-quality, representative data on crop yields, crop management practices, environmental conditions and socio-economic factors, in an efficient and cost-effective manner. This is achieved through a streamlined 30-minute survey and readily available data cleaning and analytics pipelines.

LCAS-APT consists of several components, including:

1. The core component is a modular and lean survey that is available in ODK format (i.e. XLS Form) for ready deployment and customization.
    a. This survey tool consists of both (i) core / mandatory modules and (ii) a collection of optional modules that may be deployed as follow up or for a subset of farmers depending on financial resource availability and secondary survey purposes.
2. Cleaning and data curation scripts.
3. Descriptive analytics platform for quick initial insights and automated reporting.
4. Connectivity to deeper analytics such as yield gaps analyses.

This LCAS-APT Protocol v1.0 is an updated version of LCAS-APT Protocol v0.1. It provides core modules and optional modules of the survey system.

LCAS-APT Approach

Goals

Purpose: Recurrent collection of production practices across space and time resulting in large-n data stacks for characterizing and analyzing the sustainability of specific crop production systems, with a focus on smallholder agriculture.

Use: The primary use of LCAS-APT core modules is to provide researchers and policy makers with up-to-date evidence on current production practices and productivity levels in support of evidence-based decision making and programming on agronomy research and development.

Quality assurance: One of the largest challenges is to identify the plots and mark them for follow up. For this, we use a corner collection for the plot GPS (i.e., all four corners) and geo-fencing for starting the interview in the case of follow ups. The interview thus cannot start until the four corners of the plot location have been collected (first round) or until the enumerator is near the plot. This is done to ensure adequate recall and reference to the plot in question.

Benchmarks and development process

The core modules should all be collected through an average of 30min interview and a maximum of 45 minutes interview.

The addition of modules and questions will need to be clearly evaluated based on what additional analytics these questions inform. Changing socio-economic, climatic, and agricultural conditions will require an upgrade of LCAS-APT. However, improving surveys often leads to adding questions. Thus, any modification will require clear articulation of what analytical power it 'adds' while maintaining within the 30-45min deployment benchmark. The analytical power will also include assessment of actually using the data for analysis. Complicated relational tables are difficult to process and analyze and often do not generate analytical insights. Speed of analytics will thus also factor into the assessment as the goal is to provide timely guidance for R&D programming.

Localization strategy

While we can provide a standardized global format, some small adjustments will need to be made for deploying the survey for different crops and in different countries. This is especially true for the crop and plot specific modules.

As we develop LCAS-APT, we will thus generate localized sets of crop and geography specific ODK forms for lean surveys. These localizations will be thoroughly assessed against the benchmarks mentioned above. In principle, these could all be included as conditional formatting in one very large ODK tool. But to reduce complexity we will keep a separate version for the Global and each country-crop tool. This will help light deployment and adding optional modules for deployment waves as needed.

This localization work will then result in a library of standard, lean surveys that include, for example, the following sets of modules:

MODULE	LOCALIZATION
Demographics	Global
Farming system	Global
Land characteristics	Global
Crop production practices	Global
Crop production practices	Rice-India
Crop production practices	Rice-Cambodia
Crop production practices	Wheat-Ethiopia
Crop production practices	Maize-Zimbabwe
Markets	Global

Lean survey problems and solutions

Several common issues occur in surveys that lead to very long questionnaires and interviews as well as complicated data tables that can be difficult and time consuming to analyze. Here we list several of these challenges and how we handle these in LCAS.

LEAN SURVEY PROBLEM	LCAS-APT SOLUTION	NOTES
Plot rosters. Researchers often collect information for all plots a household farms or cultivate to cover variation between plots and calculate complete household statistics	Largest plot. We only survey the largest plot of the crop(s) of interest. We assume that it is more important to sample more farmers rather than getting complete information about all plots on a farm.	Researchers interested in full farm systems data may refer to existing surveys with such an interest like LSMS. To our knowledge, limited studies exist that compare variation across plots in a farm with variation of production practices of largest plots across farms.
Household rosters. Many surveys collect information on every person in the household and often interview both family heads in the household. But this takes substantial time.	Interview the main decision-maker of the largest plot to be surveyed. We are mainly interested in production practices and assume that socially situating the main decision-maker and the household in general suffices to control for and identify major inclusiveness criteria in our analytics.	If specific dynamics (e.g., female headed households, education levels etc.) emerge as crucial, these can be followed up on with targeted surveys.
Adoption tracking and economics. Many surveys often collect detailed economic information as well as very detailed information on a large set of general practices that farmers perform across their farm.	Short section for binary yes/no questions for landscape characterization of e.g. technology use at district level and focus on prices of major inputs and outputs (fertilizer, irrigation, farm gate price). Complete cost and profit data, especially when including labor, are not necessary to assess key variation and impact of key input costs on production practices.	For detailed socio-economic studies, RHOMIS or LSMS modules can be deployed but will require much larger financial resources or need to sacrifice on sample size.
Delineating farm typologies. Minimum set of questions for farm characterization and segmentation.	Detailed data on cultivated land and livestock ownership coupled with a set of farm(er) characteristics (incl. market orientation) and agronomic management for the main crop.	No detailed labour calendar nor intra-husehod decision making on resource allocation. Limited food consumption calendar and other farm level aspects included in e.g., RhOMIS.

Existing LCAS-APT survey datasets

The table below provides an overview of previous and ongoing data collection efforts. LCAS-APT development draw on the experience gathered during these exercises and has already started assessing the effectiveness of different modules for various localizations.

#ID	CROP	GEOGRAPHY	YEAR	SAMPLE SIZE	PUBLISHED
001	Rice, Maize, Cassava	Nigeria	2022, 2023	1,113	No
002	Wheat, sorghum, teff	Ethiopia	2022, 2023	886	No
003	Maize	Ghana	2024	1,034	No
004	Rice	Nigeria	2023	1,440	No
005	Potato, rice	Rwanda	2023	1820	No
006	Coffee	DRCongo	2023, 2024	503	No
007	Maize, soy	Malawi, Mozambique, Tanzania	2023	987	No
008	Potato	Nigeria	2023	305	No
009	Cocoa	Ghana	2023	321	No
010	Rice	India	2018,2019	15,212	Yes
011	Wheat	India	2017	7,648	Yes
012	Rice	Nepal	2018,2019	5,032	Yes
013	Wheat	Nepal	2019,2019,2020,2021	4,765	Yes
014	Rice	India, Bangladesh	2018,2019,2020	26,162	Yes
015	Rice	Vietnam	2024	10,000 (ongoing)	No
016	Rice	Cambodia	2022,2023	~2026	No
017	Cotton-Wheat	India	2022	TBD	No
018	Rice-Wheat	India	2022	TBD	No
019	Pearl Millet - Mustard	India	2022	TBD	No
020	Pulses	India	2023,2024	20,000 (ongoing)	No

Core module description

The first three modules (demographics, farm, transitions) and the last module (markets) cover general farm(er) characteristics and socio-economic conditions. All other modules (4-10) focus only on the largest plot of the survey crop. The crop cut module is semi-compulsory and time-sensitive since it needs to be deployed at harvest time.

Module 1 – Demographics

This module aims to capture the most important demographic information. We only interview the main decision-maker in agriculture. We do not generate a household roster.

MODULE	QUESTION	VARIABLE NAME
demographic	Name of farmer	name
demographic	Gender of farmer (household head)	gender
demographic	Marital status	marital_status
demographic	Education level of farmer	edu
demographic	Mobile number of farmer	mobile_number
demographic	Number of household members (adult and children)	hh_mem
demographic	Number of adult (>15 years of age) household members	hh_mem_adult
demographic	Number of female household members	Hh_mem_female

Module 2 – Farm system and farm size

This module aims to capture the most important information about the farm and its landholding. For more complete farm system modules, RHoMIS and LSMS surveys can provide further guidance. Still, for lean agronomy prioritization surveys some additional fine tuning on the ideal set of farm system questions including crops cultivated, livestock, and aquaculture will be required.

Local land units (LLU) can vary from place to place. If this is not the case in a given geography, this can be pre-fixed. If not, to avoid ad-hoc calculations we record the name and conversion factors for LLUs for every interview.

Key calculated variables: basis for yield and any input rates (plot).

Average time to deploy: TBC

Key analytics: Yield gap, crop type mapping, phenology mapping, planting date adjustment flexibility

MODULE	QUESTION	VARIABLE NAME	NOTES
farm_system	Local Land unit (LLU) name	llu	
farm_system	Standard Land unit name?	slu	
farm_system	How many LLU is one ha?	llu_to_slu	
farm_system	How much land do you cultivate this season?	cultivated_cropland	
farm_system	How much land of $survey_crop do you cultivate this season?	crop_cultivated_cropland	
farm_system	Total leased/rented areas this season?	leased_in_cropland	
farm_system	Total leased/rented areas this season?	leased_out_cropland	
farm_system	How much cropland do you own?	owned_cropland	
farm_system	How many plots (geographically different areas of cultivation) does your household cultivate?	plot_number	Need clear training of definition of ‘plot’.
farm_system	What crops did you grow this season?	crops_cultivated	
farm	How many head of cattle/buffalo does your household own?	Cattle_headcount	Need to localize.
farm	How many head of sheep does your household own?	Sheep_headcount	
farm	How many head of goats does your household own?	Goat_headcount	

farm	How many head of pigs does your household own?	Pig_headcount
farm	How many head of chicken does your household own?	Chicked_heacount
farm	How many ${eia_addon_livestock_label} does your household use for draught power?	Draught_headount
farm	Do you have fish ponds for aquaculture?	Aquaculture

Module 3 – Transition tracking

This module keep a space to record a few additional Yes/No questions to elucidate basic information for characterizing and tracking ongoing sustainability transitions at landscape level. The idea is to use a few targeted questions that can then allow for detailed studies (e.g. through FGDs or interviews or more targeted in-depth [phone] survey follow up) in key hotspot areas. This is also the place for small 'additions' during deployment that can, e.g. elucidate some additional adaptation information in the case of a drought year. There is a large list of possible candidates and these need to be balanced and finalized.

This list is an initial illustrative set of question that needs to be validated:

MODULE	QUESTION	VARIABLE NAME
Transitions	Is anyone from the household a member of any group, association, organization, committee or network?	Group_member
transitions	Have you or members of your household participated in any agricultural trainings or an adult learning group related to agriculture in the last 1 year?	Training_participate
transitions	Do you use mobile phones for accessing farm advisories?	Mobile_advisory
TBD		
TBD		

Module 4 – Location

This module records the GPS location at the center and all four corners of the largest plot. For cross-checking purposes we also ask the enumerator to enter the administrative units.

MODULE	QUESTION	VARIABLE NAME
location	Geolocation of largest plot (corners)	plot_polygon
location	Latidude of largest plot (center)	latitude
location	Longitude of largest plot (center	longitude
location	Country	ADM0
location	State/Province	ADM1
location	District	ADM2
location	Village	ADM3

Module 5 – Crop cut

The crop cut module is a special module. It needs to be deployed at harvest time. Ideally the survey should be conducted at the same time the crop cut is conducted. For rice and wheat in India, we used three quadrants (specific instructions available). Clear instructions and manuals are required for each crop and geography to be developed together with SOPs.

Key calculated variables: yield

Average time to deploy: TBC

Key analytics: Yield gap, recall accuracy and bias assessment, within-field variability

MODULE	QUESTION	VARIABLE NAME
crop_cut	Biomass of 1st crop cut quadrant	tagb_quad_1
crop_cut	Grain weight of 1st crop cut quadrant	grain_weight_quad_1
crop_cut	Soil moisture % of 1st crop cut quadrant	moist_quad_1
crop_cut	Number of plants in quadrant 1	plant_n_quad_1
crop_cut	Biomass of 2nd crop cut quadrant	tagb_quad_2
crop_cut	Grain weight of 2nd crop cut quadrant	grain_weight_quad_2
crop_cut	Soil moisture % of 2nd crop cut quadrant	moist_quad_2
crop_cut	Biomass of 3rd crop cut quadrant	tagb_quad_3
crop_cut	Grain weight of 3rd crop cut quadrant	grain_weight_quad_3
crop_cut	Soil moisture % of 3rd crop cut quadrant	moist_quad_3

Module 6 – Plot Characteristics

This module is a crucial module as it assesses the plot conditions and thus the environment for the crop production. It also contains information on the crop rotation being grown on the plot in the case of multi-cropping systems and information on the fallow period for cropping systems with cropping intensity below 1. Some fine tuning is needed by testing it in different cropping systems. Some additional work on solidifying what identification crop rotations beyond 'previous crop' is needed.

Key calculated variables: basis for yield and any input rates (plot).

Average time to deploy: TBC

Key analytics: Yield gap, crop type mapping, phenology mapping, planting date adjustment flexibility

MODULE	QUESTION	VARIABLE NAME	NOTES
plot_characteristics	Area of the largest plot (llu)	lp_area	
plot_characteristics	Ownership of the largest plot	lp_ownership	
plot_characteristics	In the last cropping season, who worked on this plot?	lp_worker	
plot_characteristics	When decisions are made regarding the agricultural management of this plot, who is it that makes the decisions?	Lp_dec_maker	
plot_characteristics	Among those people, who would you say is the main decision-maker on this plot?	Lp_main_dec_decision	
plot_characteristics	How far is this field from the farmer's homestead (in minutes walking distance)?	lp_walkdistance	
plot_characteristics	Soil texture	lp_soil_texture	
plot_characteristics	Soil quality perception	lp_soil_quality	
plot_characteristics	Drainage class of plot	lp_drainage_class	
plot_characteristics	How many cropping seasons do your grow per year? (cropping intensity)	lp_crop_number	
plot_characteristics	Crops grown in the season before the survey crop? (cropping sequence)	lp_prev_crop	

plot_characteristics	Were other crops grown with the main crop as intercrop in this plot during the last cropping season? (survey season crop, intercrop yes/no)	lp_Intercrop	
plot_characteristics	What was the fallow duration between the last cropping season and the season before the last cropping season (two cropping seasons ago)?	fallow_duration	Single cropping systems ONLY
plot_characteristics	How were residues managed during the fallow period?		
plot_characteristics	Harvest date of the crop grown in the season before the survey crop?	lp_prev_crop_hd	MONTH-WEEK. Multi-crop ONLY
plot_characteristics	Previous crop tillage method?	lp_prev_crop_tillage	Multi-crop ONLY
plot_characteristics	What crop do you plan to grow next on this plot?	lp_next_crop	Multi-crop ONLY
plot_characteristics	After the wet season, when is this plot typically dry enough for harvesting/establishing next crop?	plot_avg_drytime	MONTH-WEEK. Multi-crop ONLY
plot_characteristics	After the dry season, when is this plot typically wet enough for planting the wet season crop?		MONTH-WEEK. Multi-crop ONLY

Module 7 – Crop establishment

Crop establishment is a crucial activity and includes land preparation and crop planting. During crop establishment, several key variables are fixed including varieties used, the season and planting date, and seed quality, quantity and cost, and planting method. All of which can have strong implications on yields and profits. Some variables like line_distance, or ce_method may be omitted in some contexts and the choices (dropdown options), will need to be revised for each crop-geography deployment to not overwhelm enumerators and give sensible options to farmers. Variety names and other character variables need to be prefilled for the most common ones to ease cleaning and curation.

Key calculated variables: seed rate (with crop characteristics module), crop duration (with harvest module), seed cost

Average time to deploy: TBC

Key analytics: Yield gap, major input costs, variety tracking, mechanization tracking

MODULE	QUESTION	VARIABLE NAME	NOTES
crop_establishment	What was the planting material?	Planting_material	
crop_establishment	How many varieties did you sow?	variety_number	
crop_establishment	Main variety name of planted crop?	variety_name	
crop_establishment	Variety type of planted crop?	variety_type	
crop_establishment	Crop establishment method?	ce_method	
crop_establishment	Planting date?	planting_date	
crop_establishment	If planting was delayed, why?	planting_delay_reason	
crop_establishment	How much seed did you use (kg)?	seed_amount	
crop_establishment	Where did you purchase the seed?	seed_source	
crop_establishment	How much was the price of your seed?	seed_price	Need to localize unit of seed price (e.g. 50kg bags, per kg? Etc.)
crop_establishment	What was the distance in centimeters between rows/lines?	line_distance	Line crops only.

Module 8 – Inorganic fertilizer

Fertilizer is a crucial input for agricultural systems. Many fertilizers exist, but most farmers only apply a few. We first ask about the number of fertilizer applications and then the names of the fertilizers applied. Mostly farmers apply not more than two different fertilizers. The crucial agronomic variable are fertilizer rates – such as N rate. To avoid errors when calculating we ask for each applied fertilizer for basal and top dressings, when it has been applied (for top dressing) and how much kg was applied. For NPK we also ask for the fertilizer grading. And since fertilizers fluctuate strongly and these prices are key to calculate the profitability – we ask for the price that the farmers paid for each applied fertilizer. Lastly, we ask for timely availability and average delays to estimate the role of input market constraints.

Key calculated variables: Fertilizer rates (N rate, P rate, K rate, lime rate)

Average time to deploy: TBC

Key analytics: Yield gap, N Surplus/NUE

MODULE	QUESTION	VARIABLE NAME
fertilizer	How many times did you apply inorganic fertilizer?	Fert_app_number
fertilizer	Which mineral fertilizers did you apply?	fertilizer_names
fertilizer	DAP at planting (basal) in kg in the largest plot	dap_basal
fertilizer	NPK product (mixture fertilizer)at planting (basal) in kg in the largest plot	npk_basal
fertilizer	Urea at planting (basal) in kg in the largest plot	urea_basal
fertilizer	NPKS at planting (basal) in kg in the largest plot	npks_basal
fertilizer	MoP at planting (basal) in kg in the largest plot	mop_basal
fertilizer	SSP at planting (basal) in kg in the largest plot	ssp_basal
fertilizer	TSP at planting (basal) in kg in the largest plot	tsp_basal
fertilizer	Zinc Sulphate at planting (basal) in kg in the largest plot	zinc_basal
fertilizer	Gypsum at planting (basal) in kg in the largest plot	gypsum_basal
fertilizer	DAP at first top dressing (td1) in kg in the largest plot	dap_td1
fertilizer	NPK product (mixture fertilizer)at first top dressing (td1) in kg in the largest plot	npk_td1
fertilizer	Urea at first top dressing (td1) in kg in the largest plot	urea_td1

fertilizer	NPKS at first top dressing (td1) in kg in the largest plot	npks_td1
fertilizer	MoP at first top dressing (td1) in kg in the largest plot	mop_td1
fertilizer	SSP at first top dressing (td1) in kg in the largest plot	ssp_td1
fertilizer	TSP at first top dressing (td1) in kg in the largest plot	tsp_td1
fertilizer	Zinc Sulphate at first top dressing (td1) in kg in the largest plot	zinc_td1
fertilizer	Gypsum at first top dressing (td1) in kg in the largest plot	gypsum_td1
fertilizer	DAP at second top dressing (td2) in kg in the largest plot	dap_td2
fertilizer	NPK product (mixture fertilizer)at second top dressing (td2) in kg in the largest plot	npk_td2
fertilizer	Urea at second top dressing (td2) in kg in the largest plot	urea_td2
fertilizer	NPKS at second top dressing (td2) in kg in the largest plot	npks_td2
fertilizer	MoP at second top dressing (td2) in kg in the largest plot	mop_td2
fertilizer	SSP at second top dressing (td2) in kg in the largest plot	ssp_td2
fertilizer	TSP at second top dressing (td2) in kg in the largest plot	tsp_td2
fertilizer	Zinc Sulphate at second top dressing (td2) in kg in the largest plot	zinc_td2
fertilizer	Gypsum at second top dressing (td2) in kg in the largest plot	gypsum_td2
fertilizer	DAP at third top dressing (td3) in kg in the largest plot	dap_td3
fertilizer	NPK product (mixture fertilizer)at third top dressing (td3) in kg in the largest plot	npk_td3
fertilizer	Urea at third top dressing (td3) in kg in the largest plot	urea_td3
fertilizer	NPKS at third top dressing (td3) in kg in the largest plot	npks_td3
fertilizer	MoP at third top dressing (td3) in kg in the largest plot	mop_td3
fertilizer	SSP at third top dressing (td3) in kg in the largest plot	ssp_td3
fertilizer	TSP at third top dressing (td3) in kg in the largest plot	tsp_td3
fertilizer	Zinc Sulphate at third top dressing (td3) in kg in the largest plot	zinc_td3

fertilizer	Gypsum at third top dressing (td3) in kg in the largest plot	gypsum_td3	
fertilizer	Select the grade of Nitrogen in NPK/NPKS mixture applied in plot in KG	grade_N	
fertilizer	Select the grade of Phosphorous in NPK/NPKS mixture applied in plot in KG	grade_P	
fertilizer	Select the grade of Potassium in NPK/NPKS mixture applied in plot in KG	grade_K	
fertilizer	Select the grade of Sulphur in NPK/NPKS mixture applied in plot in KG	grade_S	
fertilizer	Price of DAP per 50kg bag	price_dap	
fertilizer	Price of NPK per 50kg bag	price_npk	
fertilizer	Price of Urea per 50kg bag	price_urea	
fertilizer	Price of NPKS per 50kg bag	price_npks	
fertilizer	Price of MoP per 50kg bag	price_mop	
fertilizer	Price of SSP per 50kg bag	price_ssp	
fertilizer	Price of TSP per 50kg bag	price_tsp	
fertilizer	Price of Zinc per 50kg bag	price_zinc	
fertilizer	Price of Gypsum per 50kg bag	price_gypsum	
fertilizer	When did you perform inorganic fertilizer application # ${eia_addon_inorganic_index}?		Need to add dasy after sowing (DAS) question for each application
fertilizer	Is fertilizer available on time?	fert_timely_available	
fertilizer	Average delay in weeks for fertilizer?	avg_fert_delay	

Module 9 – Organic fertilizer

In addition to mineral fertilizers, many smallholder farmers also use organic fertilizer, includingfarm yard manure (FYM). Estimating the quantities of FYM applied can be difficult. We therefore only ask for whether FYM was applied, if not why not, and if yes, how many times it was applied.

Average time to deploy: TBC

Key analytics: Yield gap, N Surplus/NUE

MODULE	QUESTION	VARIABLE NAME
ORGANIC_INPUTS	Did you apply farm yard manure (FYM)?	fym_applied
ORGANIC_INPUTS	If no, why not?	fym_reason_no
ORGANIC_INPUTS	How many times did you apply FYM?	fym_number

Module 10 – Irrigation

Next to fertilizer and seed, irrigation is one of the most crucial inputs for cropping systems. And when available can stabilize and increase yields. In fully rainfed systems, this module will be very short. But a lot of farmers use supplementary irrigation in areas that are often designated 'rainfed'. Limited data on supplemental irrigation, how much farmers pay for it and how much they actually use is a crucial data gap and filling it can substantially improve sustainable intensification programs. In areas where irrigation is used commonly, the cost of pumping and type of irrigation systems can have a large bearing on constraints to sustainable intensification as well as environmental impacts. We thus ask for basic information on pump and energy use, costs, and water use patterns.

Average time to deploy: TBC

Key analytics: Yield gap, water abstraction, GHG emissions

MODULE	QUESTION	VARIABLE NAME
irrigation	Was any irrigation applied?	irr_applied
irrigation	Source of irrigation for this crop?	irr_source
irrigation	Is the irrigation facility available year-round?	irr_season
irrigation	Number of irrigations?	irr_number
irrigation	Did you use a pump?	pump_use
irrigation	What was the energy source for the pump?	pump_energy
irrigation	What was the HP of the pump	pump_hp
irrigation	If pump, was the pump rented/service?	well_depth
irrigation	If tubewell, how deep is your well (m)?	well_depth
irrigation	How many hours did you typically irrigate the plot for a single irrigation?	irrig_time
irrigation	What is the typical cost structure for an irrigation?	irr_cost_type
irrigation	What is the typical cost (per ha, per h)?	irr_cost

Module 11 – Weed and pest control

Managing biotic stresses are a crucial factor and often not well captured in surveys. We ask simple questions about the intensity of management (herbicide, pesticide, weeding etc.) practices. In labor scarce regions, weeding labor can be substantial limitation for productivity and the value of one or two lean questions to collect this information will still need to be evaluated. Average time to deploy: TBC

Key analytics: Yield gap, environmental pollution

MODULE	QUESTION	VARIABLE NAME
weed_pest_control	How many times did you apply herbicide?	herb_number
weed_pest_control	Name of herbicide 1?	herb1_name
weed_pest_control	Timing of herbicide 1 (days after sowing)?	herb1_das
weed_pest_control	Name of herbicide 2?	herb2_name
weed_pest_control	Timing of herbicide 2 (days after sowing)?	herb2_das
weed_pest_control	Name of herbicide 3?	herb_name3
weed_pest_control	Timing of herbicide 3 (days after sowing)?	herb3_das
weed_pest_control	How many times did you perform manual weeding?	weeding_number
weed_pest_control	Timing of first manual weeding?	man_weeding1_das
weed_pest_control	Timing of second manual weeding?	man_weeding2_das
weed_pest_control	Timing of third manual weeding?	man_weeding3_das
weed_pest_control	How many times did you perform insect pest control?	Pest_ctrl_number
weed_pest_control	What technique did you use at insect pest control # ${eia_addon_insect_ids}?	Pest_ctrl_type
weed_pest_control	Did you apply insecticide?	insecticide_apply
weed_pest_control	Name of insecticide?	insecticide_name
weed_pest_control	How many times did you perform disease control?	Disease_ctrl_number

weed_pest_control	What technique did you use at disease control # ${eia_addon_disease_ids}?	Disease_ctrl_type
weed_pest_control	Did you apply pesticide?	pesticide_apply
weed_pest_control	Name of pesticide?	pesticide_name

Module 12 – Production constraints

This module helps to get a brief assessment of the subjective impact of different biotic and abiotic stresses on crop production during the surveyed cropping season. This will help to understand prevalence of these stresses across landscapes and help estimate their impacts on yields. Importantly, this module allows for geographically targeted follow ups in case new and major stresses emerge.

Average time to deploy: TBC

Key analytics: Yield gap, pest and disease surveillance

MODULE	QUESTION	VARIABLE NAME
production_constraint	What level of drought severity did you face?	drought_severity
production_constraint	What level of flood severity did you face?	flood_severity
production_constraint	What level of insect damage severity did you face?	insect_severity
production_constraint	What level of disease severity did you face?	disease_severity
production_constraint	What level of pest severity did you face?	pest_severity
production_constraint	Percentage of crop that lodged?	lodging_perc
production_constraint	What level of heat stress did you face?	heat_severity

Module 13 – Harvest

This module is crucial as it is required to collect production information to calculate yield and revenue as well as tracking mechanization status and calculating crop durations.

Key calculated variables: crop duration (with crop establishment module), yield (with plot characteristics module),

Average time to deploy: TBC

Key analytics: Yield gap, mechanization tracking

MODULE	QUESTION	VARIABLE NAME	NOTES
harvest	What date did you harvest?	harvest_date	
harvest	What method did you harvest with?	harvest_method	
harvest	How did you manage the residue?	crop_residue	
harvest	How did you thresh your crop?	threshing_method	
harvest	How much grain did you harvest from your largest plot (kg) ?	lp_production	Need to add localization for unit.
harvest	How did your production compare across the last 5 years?	yield_5year_compare	

Module 14 – Market

This module is the last module. Here, we stop asking about the largest plot and about the whole farm again. Since these questions relate to harvesting and crop sales, it is positioned at the end for better interview flow.

Key calculated variables: total farm income from crop (with farm_system module), revenue from crop and largest plot,

Average time to deploy: TBC

Key analytics: Farm income and profitability estimates, commercialization tracking

MODULE	QUESTION	VARIABLE NAME
market	How much kg of surveyCrop did you produce on all of your cultivated land?	total_crop_production
marke	How much % of your income comes from agriculture?	ag_income_share
market	How much % of your ag income comes from the survey crop?	crop_income_share
market	Distance to nearest market (in km)?	market_distance
Market	What was the farm gate price for your crop (in local currency)?	farm_gate_price
market	What are the top three off-farm income sources	Off_farm_income_sources

Optional module description

The modules below are to be used depending on the objective/focus of the data collection. Users can pick single or multiple modules.

Optional module 1 - Household Assets

This module collects information on assets owned by the household to obtain a proxy of wealth, which can help us understand the farmer's financial ability to invest or purchase inputs. The shortest version of this module consists of a list of yes/no questions regarding whether the household owns specific assets.

MODULE	QUESTION	VARIABLE NAME
assets	Which of these assets does the household own?	asset_ownership

Optional module 2 - Food security

Food security is measured using the standard Food Insecurity Experience (FIES) Module – it contains 8 yes/no questions

MODULE	QUESTION	VARIABLE NAME
food_security	During the last 12 months, was there a time when you or others in your household worried about not having enough food to eat because of a lack of money or other resources?	FIES_1
food_security	Still thinking about the last 12 months, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	FIES_2
food_security	During the last 12 months, was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?	FIES_3
food_security	During the last 12 months, was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?	FIES_4
food_security	Still thinking about the last 12 months, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	FIES_5
food_security	During the last 12 months, was there a time when your household ran out of food stock because of a lack of money or other resources?	FIES_6
food_security	Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	FIES_7
food_security	During the last 12 months, was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	FIES_8

Optional module 3 - Water Security

Water security is also a key outcome to be monitored. IWMI has developed a short module to measure water insecurity experience while considering both domestic and productive uses of water. The module below has 13 yes/no questions.

MODULE	QUESTION	VARIABLE NAME
water_security	During the last 12 months, was there a time when you or others in your household were worried you would not have enough water (in quantity and quality) for all your household domestic needs (drinking, cooking, cleaning, washing, bathing, etc.)?	water_sec_1
water_security	In the past 12 months, was there a time when you or others in your household were thirsty but did not drink because of a problem with water (unavailable, too far, dirty, unsafe, expensive)?	water_sec_2
water_security	In the past 12 months, was there a time when you or others in your household had to restrict the use of water for cooking (cleaning of vegetables, soaking of rice, ect.) because of a problem with water (unavailable, too far, dirty, unsafe, expensive)?	water_sec_3
water_security	In the past 12 months, was there a time when you or others in your household had to go without washing their hands, faces, or bodies because of a problem with water (unavailable, too far, dirty, unsafe, expensive)?	water_sec_4
water_security	In the past 12 months, was there a time when you or others in your household had to go without cleaning (floor, dishes, clothes, household linen, etc.) because of a problem with water (unavailable, too far, dirty, unsafe, expensive)?	water_sec_5
water_security	In the past 12 months, have you or anyone in your household worried that you would not have enough water (in quantity and quality) for all your household productive needs (crop farming, fishing farming, livestock keeping, agricultural processing, other businesses)?	water_sec_6
water_security	In the past 12 months, has your household's agricultural (crop or livestock) production suffered because of problems with water (unavailable, too far, dirty, unsafe, expensive)?	water_sec_7
water_security	In the past 12 months, has your household's non-agricultural economic activity suffered because of problems with water?	water_sec_8
water_security	In the past 12 months, has anyone in your household had to temporarily migrate to another region or place because of a lack of water (e.g., dry season migration)?	water_sec_9

water_security	In the past 12 months, were your household's decisions with respect to agriculture (type of crop, area) and livestock (type of animal, number of head) restricted by problems with water (unavailable, too far, dirty, unsafe, expensive)?	water_sec_10
water_security	In the past 12 months, did you or others in your household have any conflict or feel social relations were deteriorating with neighbors or community members because of problems with water related to domestic or productive uses?	water_sec_11
water_security	In the past 12 months, have you or anyone in your household felt excluded from decisions related to water access for domestic or productive use?	water_sec_12
water_security	In the past 12 months, have you or anyone in your household worried about climatic events (drought, floods, cyclone, heat wave, etc.) impacting your access to water (in quantity and quality) for domestic or productive use?	water_sec_13

Optional module 4 - Climate risk and perception

This module asks about climate change awareness, perceptions, and self-efficacy related to adaptation.

Risk perception

This next section is about agricultural risks. Respondents will tell how often they worry about the following.

MODULE	QUESTION	VARIABLE NAME
risk_perception	Bad quality of seeds	worry_seed_quality
risk_perception	Bad quality of fertilizers	worry_fert_quality
risk_perception	Seeds not available on time	worry_seeds_availability
risk_perception	Fertilizers not available on time	worry_fert_availability
risk_perception	Sickness of people who work on the farm	worry_sickness_people
risk_perception	Sickness of animals	worry_sickness_animals
risk_perception	Late onset of seasonal rainfall	worry_late_onset_rainfall
risk_perception	Too little rainfall	worry_little_rainfall
risk_perception	Too much rainfall	worry_much_rainfall
risk_perception	Dry spells	worry_dry_spells
risk_perception	Water source for irrigation drying up	worry_irrigation_shortage
risk_perception	High price of irrigation equipment	worry_irrigation_equipment
risk_perception	Soil erosion	worry_soil_erosion
risk_perception	Crop loss due to diseases	worry_diseases
risk_perception	Crop loss due to pests	worry_pests
risk_perception	Crop loss due to damage from grazing animals	worry_damage_grazing
risk_perception	Theft of crop produce in the field	worry_theft
risk_perception	High prices of inputs	worry_input_prices
risk_perception	Low market prices for crop produce	worry_produce_prices

risk_perception	Post harvest losses during storage	worry_postharvest_loss

Climate change awareness, perceptions, and self-efficacy

In this section, respondents will tell if they Strongly agree, Agree, Disagree or Strongly disagree with the following statements.

MODULE	QUESTION	VARIABLE NAME
climate_perception	I believe that climate change is real	climate_real
climate_perception	Climate change will bring about serious negative consequences	climate_negative_impact
climate_perception	My local area will be influenced by climate change	climate_local_impact
climate_perception	It will be a long time before the consequences of climate change are felt	climate_long_time
climate_perception	I believe that the climate in my local area has changed in recent years	climate_local_change
climate_perception	Rainfall patterns have become more unpredictable in recent years	climate_rain_unpredictable
climate_perception	Droughts are happening more often than they did in the past	climate_drought_often
climate_perception	Dry spells during the rainy seasons are now more common	climate_dry_spells
climate_perception	Floods have become more frequent in recent years	climate_floods_frequent
climate_perception	I believe it is possible to take action to reduce the impact of climate change on farms like mine	climate_action_possible
climate_perception	I am willing to try new ways of farming to adapt to the changing climate	climate_adapt_willing
climate_perception	I have the ability to try new ways of farming that reduce the impact of climate change on my farm	climate_adapt_ability

Optional module 5 - Gender and youth diagnostic survey

Gender and youth modules are designed in a separate ODK form to undertake deeper studies on gender and youth. The survey is divided into two sections. The first part asks the household head or his/her representative to capture household roster and land use. The second part is individual interviews with identified primary male and female decision makers (separately). It asks questions about agricultural extension, digital access, Use Case technology, access to capital, access to credit, group membership and attitudes.

The ODK form is provided here: Gender_youth module_0702NM.xlsx along with STATA do-file to run the analysis: Gender_youth_analysis_template.do.

Way forward

The next year, 2026, will be critical for solidifying and rolling out LCAS-APT. Important next steps will include (i) revision of the protocol by core partners to release a solidified version of the protocol for the core modules, (ii) localizing the protocol for new crop x geographies especially for Sub-Saharan Africa, (iii) strengthening and revising the optional modules, (iv) large-scale deployment at scale in new countries and for new crops, and (v) strengthening the automated reporting, visualization, and analytics pipelines of LCAS-APT including linkage with Carob.

An initial ODK form has been prepared based on LCAS-APT v1 and can be downloaded here for review: EiA_APT LCAS_survey_core modules_ODK.xlsx.

Citation:

Urfels, A., Assefa, B., Silva, JV, Aubert, C, Samaddar, A., Ajay, A., Schmitter, P., Senthilkumar, K., Kumar, V., Ragasa, C., Andrew J. McDonald, AJ., Vanlauwe, B. 2025. *LCAS-APT Protocol- Landscape Crop Assessment Survey and Agronomy Prioritization Tool Version 1*, New Delhi, India. International Rice Research Institute (IRRI), CGIAR Sustainable Farming Program.

Acknowledgements

This work was carried out under the CGIAR Sustainable Farming Program. We would like to thank all funders who supported this research through their contributions to the CGIAR Trust Fund (www.cgiar.org/funders).

About CGIAR Sustainable Farming Science Program

The CGIAR Sustainable Farming Science Program will address key challenges in agrifood systems by fostering efficient production of nutritious foods and safeguarding the environment to create fair employment opportunities, as we simultaneously tackle climate change, soil degradation, pests, diseases, and desertification.

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