KINGDOM OF CAMBODIA

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Cambodia Agriculture Survey 2023 Report 1: Methodological Reference Document

Foreword

The report on agriculture survey 2023 provides data source for the assessment of agricultural productivity in Cambodia and presents statistical data on crops, livestock, aquaculture, fisheries and other relevant activities that are useful for reflecting on the situation of agriculture, environment, economy, society and food security of Cambodian agricultural families. Furthermore, this report serves as an input into the strategic planning of the agriculture sector development 2023-2028, as well as poverty reduction, calculation of national economic growth and other related development programs.

The Cambodia Agriculture Survey 2023 will help advance the agriculture sector's objectives with a focus on sustainable development by 2030, aiming to achieve three main goals:

- Goal 1. No poverty: End poverty in all its forms every where
- Goal 2. Zero hunger: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
- Goal 5. Gender equality: Achieve gender equality and empower all women and girls.

The Cambodia Agriculture Survey 2023 will be provided to all ministries, national institutions, development partners, national organizations, international organizations, research institutions, the private sector and the general public who can use these findings for their own needs. The data will serve as a basis for monitoring and evaluating social, economic and environmental development policies to achieve Cambodia's vision for 2050, which considers agricultural development as a core pillar of the "Pentagonal Strategy."

Finally, I wish to express my thank to the Royal Government of Cambodia (RGC), the Ministry of Economy and Finance, the Ministry of Agriculture, Forestry and Fisheries, the Food and Agriculture Organization of the *United* Nations (FAO) and the 50x2030 Initiative for both financial and technical support. I would also like to thank all the relevant leadership, the management, and technical teams, enumerators, supervisors who made strong efforts to accomplish their work and citizens who took valuable time to respond to the questionnaires. Ultimately, these contributions lead to the great success of CAS2023.

Bin Troachhey
Minister
Ministry of Planning

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Preface

The National Institute of Statistics, Ministry of Planning, is pleased to present the latest analysis of the Cambodia Agricultural Survey 2023 obtained from a sample of approximately 16,000 agricultural households in 25 provinces across Cambodia. The Cambodia Agricultural Survey 2023 is the fifth annual survey in a series of surveys (from 2019, 2020, 2021, 2022 and 2023). The report analyses the results of the survey conducted by the National Institute of Statistics, Ministry of Planning and cooperation between the Ministry of Agriculture, Forestry and Fisheries, and the Food and Agriculture Organization of the United Nations. The Cambodia Agriculture Survey 2023 has received financial and technical support from the Royal Government of Cambodia, FAO Development Partners and the 50 x 2030 Initiative.

The Cambodia Agricultural Survey 2023 was implemented in accordance with the agreement between the Ministry of Planning, Food and Agriculture Organization of the United Nations (FAO) in Cambodia on September 18, 2018. The Cambodia Agricultural Survey 2023 was conducted with computer-assisted personal interviews (CAPIs) using the World Bank's Survey Solution program for recording interviews and data management. Data collected from agricultural households were included in the final analysis report of this survey: Crop production, livestock production, aquaculture production and fisheries to update the annual agricultural statistics data to meet the needs of policymakers, Agricultural Development Goals, Environment and Sustainable Development Goals Indicators 2030 Of the Royal Government of Cambodia or the United Nations, researchers and other stakeholders.

The Cambodia Agricultural Survey Report 2023 is an important input in developing a more effective agricultural policy development program and supporting target indicators towards the first phase of the Royal Government's "Pentagon Strategy" to achieve the expected goals in "Cambodia Vision 2050."

The above agricultural survey report is open for discussion as well as receiving any comments or recommendations to improve the report or provide a better analysis of the results of future Cambodian agricultural survey data.

I would like to express my sincere gratitude to Excellencies, Lok Chumteavs, Ladies and Gentlemen, Representatives of Ministries, Institutions, Technical Committee of Cambodia Agricultural Survey, Cambodia Agricultural Survey Technical Working Group 2023, Food and Agriculture Organization of the United Nations, and Excellencies, Ladies and Gentlemen, Participate in the implementation of the Cambodia Agricultural Survey 2023 to achieve success with quality and efficiency.

Try Ritthea
Director General,
National Institute of Statistics

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Acronyms and Abbreviations

CAS	Cambodia Agriculture Survey
CIAS	Cambodia Inter-Censal Agriculture Survey
CSES	Cambodia Socio-Economic Survey
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
Ha	Hectare
Kg	Kilograms
MAFF	Ministry of Agriculture, Forestry and Fisheries
MOP	Ministry of Planning
NIS	National Institute of Statistics
PPS	Probability Proportional to Size
RGC	Royal Government of Cambodia
TC	Technical Committee
USD	United States Dollar

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Note on Report Structure

The Cambodia Agriculture Survey 2023 analysis and reporting is split into 4 published written reports and additional statistical materials covering different aspects of the results as follows:

1. Report 1: Methodological Reference Document

This report covers the background information of the survey. It includes the foreword and preface notes; the technical committee involved in the survey; acronyms and abbreviations used in the reports; an executive summary of the analysis from all reports; the scope, coverage and sample design of the data collection.

2. Report 2: Crop Production

This report covers crop production in Cambodia by household holdings and includes information related to the number of holdings involved in both temporary and permanent crop production; land under agricultural usage; the area of planted and harvested crops; the yield of crops; use of fertilizers, chemicals and irrigation; types of seeds/plant varieties grown; and the value of crop sales.

3. Report 3: Livestock and Poultry Raising

This report covers household holdings involved in the raising of livestock and poultry. Included within the report are the number of holdings engaged in raising livestock and poultry; the total number of animals in Cambodia; the average number of animals per holding; the purpose of raising animals; the value of sales from animals and the related input costs.

4. Report 4: Aquaculture and Capture Fishing

This report covers household holdings involved in aquaculture and capture fishing activities. Included within the report is the number of holdings engaged in different types of aquacultures; the total area devoted to aquaculture; species raised by aquaculture and the volume of them produced; households engaged in fishing activities by water type; species fished; and total catch volume.

All 4 reports are available for download from the NIS website (available at: http://www.nis.gov.kh/index.php/km). These reports aim to provide an overview of the data included within the CAS 2023. They, however, are not fully comprehensive and some questions are not analysed within the scope of these documents. The information is analysed and presented, in most cases, at the national or regional level. Data users are encouraged to explore and conduct their own analysis using the full data tabulations disseminated on the NIS website (available at: http://www.nis.gov.kh/index.php/km/), the CAMSAT data tables (available at: https://camstat.nis.gov.kh/) and the full anonymized microdata (available at: https://microdata.nis.gov.kh/).

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Executive Summary

Brief Overview of Survey Methodology

The Cambodia Agriculture Survey (CAS) of the Kingdom of Cambodia, conducted in 2023 was a comprehensive statistical undertaking for the collection and compilation of information on crop cultivation, raising livestock and poultry, and aquaculture and capture fishing operations. The data collected and generated from this survey will be useful in the formulation of plans, policies and programs for the development and improvement of the agriculture and fisheries sectors in the Royal Government of Cambodia (RGC).

The National Institute of Statistics (NIS) of the Ministry of Planning (MOP), and the Ministry of Agriculture, Forestry and Fisheries (MAFF), were the responsible government ministries authorized to undertake the CAS 2023. While NIS had the census and survey mandate, the MAFF will be the primary user of the data produced from the survey.

The main objective of the annual agricultural survey is to provide data on the temporal agricultural situation in the Kingdom of Cambodia to be utilized by planners and policymakers. After the CIAS 2019 and 2020 shared a sampling frame, CAS 2021 undertook a screening exercise to create a new sample for that survey. The CAS 2021 used statistical methods to select a representative sample of Enumeration Areas (EA) throughout Cambodia from the 2019 General Population Census of Cambodia Sampling Frame. Households within these EAs were screened for any agricultural activity. Using this basic information, the agricultural households were stratified and sampled for additional data collection. The CAS 2022 and this CAS 2023 used this same sample for its data collection.

Data collection for this survey was conducted via Computer Assisted Personal Interview (CAPI) techniques. The survey questionnaires were created in the World Bank's Survey Solutions application. The use of CAPI for data collection offered many benefits, including a reduction in printing costs, elimination of the need for key entry of data, and allowed for rapid and improved quality control and data analysis.

Sampled households were located throughout the country, except in six districts within Phnom Penh, one district in Preah Sihanouk, and one district in Siem Reap which were known to be core urban areas. The total sample for CAS 2023 consisted of 15,323 households. For CAS 2023, due to being a year with an agricultural census, data collection from juridical holdings was excluded so as to not be overbearing for juridical respondents.

Additional details on the sampling procedure, survey methodology, and field operations for the CAS 2023 can be found in Chapter 1 – Scope, Coverage and Sample Design. Household agricultural interviews took place from November to December 2023. The reference period for the survey was the 12-month period from 1 July 2022 through 30 June 2023. A total of 337 enumerator staff were involved in the data collection effort, hired from existing staff from province and district level staff of both NIS and MAFF. There were 46 Data Supervisors responsible for conducting data quality control checks, while 46 Field Supervisors were responsible for assisting with enumerator issues in the field, encouraging good relationships

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with village contacts and promoting cooperation from agricultural household respondents. As much as possible fieldwork enumerators and supervisors remained the same as in previous years to build upon the experiences and knowledge acquired.

The CAS utilized the definition of an "agricultural holding" as defined by the World Programme for the Census of Agriculture 2020 (WCA 2020) and the Global Strategy to Improve Agricultural and Rural Statistics (GSARS). An agricultural holding is defined as an economic unit of agricultural production under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title, legal form or size. Single management may be exercised by an individual or household, jointly by two or more individuals or households, by a clan or tribe, or by a juridical person such as a corporation, cooperative, or government agency. The holding's land may consist of one or more parcels, located in one or more separate areas or one or more territorial or administrative divisions, providing the parcels share the same production means, such as labour, farm buildings, machinery or draught animals. The scope of agricultural activity includes the growing of perennial or non-perennial crops, plant propagation, animal production, or mixed farming. Other non-farm economic activities, such as fishery, forestry and aquaculture are considered diversification activities of the holding. Unlike the Census of Agriculture Cambodia (2013 and 2023), there was no minimum threshold for agricultural activities.

In CAS 2023, as with all sample surveys, there are limitations to the data produced and its interpretability or comparability to alternate data sources. Readers can reference the full CAS Limitation section in Chapter 1. In general, readers should be aware of the limitations of self-reported survey data, limited coverage of the juridical holdings in Cambodia, and the limitations of survey questionnaires and interview procedures.

Summary Indicators

The CAS 2023 utilized one main agricultural household questionnaire. This form consisted of 13 main sections:

1. Respondent's identification and informed consent
2. Holding characteristics
3. Land tenure and Agricultural Practices
4. Crop Production
5. Seeds, Agricultural Practices and Inputs
6. Livestock Production
7. Poultry Production
8. Aquaculture and/or Capture Fishing
9. Economy
10. Climate or Environmental Shocks and Adaptation Strategies
11. Household members
12. Household referenced food insecurity experience scale
13. End of the survey

Some of the key estimates obtained from the CAS 2023 are presented below for the country as a whole as well as the Plain Zone, Tonle Sap Lake Zone, Coastal Zone, and the Plateau and Mountainous Zone.

Table 1.1: Summary indicators, household agricultural holdings

Household Agricultural Holdings					
	Cambodia	Plain Zone	Tonle Sap Lake Zone	Coastal Zone	Plateau and Mountainous Zone
Number of household agricultural holdings (in thousands)	1,864	743	710	124	287
Percentage of household agricultural holdings producing agricultural products for:					
Mainly for home consumption	57%	56%	52%	82%	61%
Mainly for sale	43%	44%	48%	18%	39%
Percentage of holdings with a homelot only	12%	10%	15%	13%	9%

Source: CAS 2023, Report 2 Crop Production

Table 1.2: Summary indicators, crop production activity

Crop Production Activity					
	Cambodia	Plain Zone	Tonle Sap Lake Zone	Coastal Zone	Plateau and Mountainous Zone
Number of household holdings growing crops (in thousands)	1,742	692	663	114	273
Percent of household holdings growing crops	93%	93%	93%	92%	95%

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	1. Non-aromatic paddy	1. Non-aromatic paddy	1. Non-aromatic paddy	1. Non-aromatic paddy	1. Non-aromatic paddy
Four most popular crops grown, by number of holdings reporting	2. Banana	2. Banana	2. Banana	2. Coconut	2. Mango
	3. Mango	3. Mango	3. Mango	3. Banana	3. Banana
	4. Coconut	4. Coconut	4. Coconut	4. Mango	4. Cashew

Source: CAS 2023, Report 2 Crop Production

Table 1.3: Summary indicators, livestock and poultry activity

Livestock and Poultry Activity					
	Cambodia	Plain Zone	Tonle Sap Lake Zone	Coastal Zone	Plateau and Mountainous Zone
Number of agricultural households keeping or raising livestock, poultry and/or insects at any time during the reference year (in thousands)	1,405	553	533	108	211
Percentage of agricultural households keeping or raising livestock, poultry or insects at any time during the reference year	75%	74%	75%	87%	73%
Number of agricultural households with cattle presence during previous 12 months (in thousands)	696	305	236	56	105
Average number of cattle per farm	4.6	4.2	5.0	3.0	5.6

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| Number of agricultural households with chicken presence during previous 12 months (in thousands) | 1,223 | 437 | 421 | 102 | 162 |
| Average number of chickens per farm | 26 | 25 | 24 | 32 | 24 |

Source: CAS 2023, Report 3 Livestock and Poultry Raising

Table 1.4: Summary indicators, aquaculture and capture fishing activity

Aquaculture and Capture Fishing Activity					
	Cambodia	Plain Zone	Tonle Sap Lake Zone	Coastal Zone	Plateau and Mountainous Zone
Number of households engaged in aquaculture (in thousands)	62	49	8	2	2
Percentage of households engaged in aquaculture	3%	7%	1%	2%	1%
Number of households engaged in capture fishing (in thousands)	444	115	199	36	93
Percentage of households engaged in capture fishing	24%	16%	28%	29%	33%

Source: CAS 2023: Report 4 Aquaculture and Capture Raising

Table 1.5: Summary indicators, economy

Economy					
	Cambodia	Plain Zone	Tonle Sap Lake Zone	Coastal Zone	Plateau and Mountainous Zone
Percent of household agricultural holdings, household income accounted for completely by agricultural income	5.4%	5.5%	6.5%	4.5%	2.8%
Contribution of agricultural income to household's total income, compared to previous year:					

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Percent of holdings reporting <u>lower share of income from agricultural activities</u>	21%	19%	23%	26%	16%
Percent of holdings reporting <u>similar share of income from agricultural activities</u>	70%	71%	67%	65%	78%
Percent of holdings reporting <u>higher share of income from agricultural activities</u>	9%	10%	9%	9%	6%

Source: CAS 2023

From the General Population Census of the Kingdom of Cambodia 2019, there were an estimated 3,553,021 households in Cambodia in 2019[1]; the CAS 2023 reports an estimated 1,863,830 households engaged in agriculture. Therefore, an estimated 52% of all households in Cambodia were involved in agricultural production. An estimated 12% of household agricultural holdings report agricultural activity on their homelot only. The average number of parcels per holding is estimated at 1.6 parcels per holding according to the CAS 2023.

Crop activity was reported in 93% of all household agricultural holdings in Cambodia. The major crops grown in the country were (1) non-aromatic paddy, (2) banana, (3) mango, and (4) coconut. 75% of all household agricultural holdings reported raising livestock, poultry, or insects. Cattle was the main livestock raised with 696,000 household agricultural holdings reporting the animal's presence in the last 12 months. Chicken was the main poultry animal raised with approximately 1.2 million household agricultural holdings reporting the animal in the past 12 months. The CAS 2023 estimates that 3% of households were engaged in aquaculture activities and 24% were engaged in capture fishing activities.

The CAS asked many economic questions to the survey respondents. Household agricultural holders were asked to estimate the share of their total household income that was accounted for by their agricultural income. An estimated 5.4% of all household agricultural holdings reported that all of their total household income was accounted for by agricultural income.

Additionally, respondents were asked to compare their agricultural income during the reference period to their agricultural income during the previous year. The CAS 2023 estimates that 21% of household agricultural holdings reported an agricultural income lower than the previous year, 70% reported an agricultural income similar to the previous year, and 9% reported an agricultural income greater than the previous year.

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[1] Number of households based on the 2019 General Population Census of Cambodia. Available at: http://www.nis.gov.kh/nis/Census2019/Final%20General%20Population%20Census%202019-English.pdf

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Scope, coverage and sample design

The Cambodia Agriculture Survey (CAS) 2023 of the Kingdom of Cambodia, conducted in 2023 was a comprehensive statistical undertaking for the collection and compilation of information on crop cultivation, raising livestock and poultry, and aquaculture and capture fishing operations. The data collected and generated from this survey will be useful in the formulation of plans, policies and programs for the development and improvement of the agriculture and fisheries sectors in the Royal Government of Cambodia (RGC). The CAS 2023 was the fifth annual survey conducted since the 2013 Cambodia Agriculture Census (2019, 2020, 2021 and 2022).

The National Institute of Statistics (NIS) of the Ministry of Planning (MOP), and the Ministry of Agriculture, Forestry and Fisheries (MAFF), were the responsible government ministries authorized to undertake the CAS 2023. While NIS had the census and survey mandate, the MAFF will be the primary user of the data produced from the survey.

Objective

The main objective of the CAS is to provide data on the temporal agricultural situation in the Kingdom of Cambodia to be utilized by planners and policymakers. Specifically, the survey data will be useful in:

1. Providing an updated sampling frame in the conduct of agricultural surveys.
2. Providing data at the country and regional level, with some items available at the province level.
3. Providing data on the current structure of the country's agricultural holdings, including cropping, raising livestock and poultry, and aquaculture and capture fishing activities.

The full coverage of the survey can be examined in the detail of the questionnaire available online at (https://www.nis.gov.kh). These data create the potential for a wide range of analyses to be conducted that are well beyond the scope of this report. Note, that the set of published reports in English and Khmer include data at the national and regional levels, with data at the province level available in table form on the NIS website or for any person's analysis via the public use microdata file available at (https://microdata.nis.gov.kh/index.php).

Approach

CIAS 2019 and CAS 2020 used the same sample using a panel approach. Similarly, CAS 2021, CAS 2022 and CAS 2023 have used a panel approach. For CAS 2021 a screening activity was conducted. The method for CAS 2021 involved the selection of a representative sample of Enumeration Areas (EA) throughout Cambodia from the 2019 General Population Census Sampling Frame. Households within these EAs were screened for any agricultural activity. Using this basic information, the agricultural households were stratified and sampled for additional data collection. CAS 2022 and CAS 2023 used this same panel as in 2021 with a minimal attrition rate of survey respondents.

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Enumerators along with field and data supervisors were mobilized in all provinces and trained for this undertaking. All enumerators and supervisors were existing staff of NIS or MAFF. The collaborative effort between these two ministries was consistent throughout the CAS project, with staff from both organizations contributing to the design of the survey through data collection and analysis.

Data collection for this survey was conducted via the Computer Assisted Personal Interview (CAPI) mode. The questionnaire used was created in the World Bank's Survey Solutions application. The use of CAPI for data collection offered many benefits, including a reduction in printing costs, elimination of the need for key entry of data, and allowed for rapid and improved quality control and data analysis.

Survey scope

The questionnaire collected data on several aspects of the agricultural holding, including demographic information about the holder, any co-holders and all household members, crop production activity, raising livestock, raising poultry, aquaculture activity, capture fishing activity, economy, labour used by the holding, and information on the household dwelling and assets. For CAS 2023, was no rotating module. This was due to the survey being undertaken during a census year in consideration of MAFF and NIS staff time availability and the respondent burden of two data collections within one year.

Geographical coverage

All households in the country, except those households located in six districts within Phnom Penh, one district in Preah Sihanouk, and one district in Siem Reap that were known to be core urban areas, had the potential to be selected in the sample of the CAS 2023, as in the CIAS 2019, CAS 2020, CAS 2021 and CAS 2022 before it. The sample for the CAS 2023 consisted of 15,323 agricultural households.

Unlike in previous years, there was no juridical holding data collection within CAS 2023. Juridical holdings were collected as part of the Census of Agriculture Cambodia 2023 and therefore were not collected within CAS 2023 to minimise the effect of respondent burden on the companies involved.

CAS 2023 questionnaire

The CAS 2023 was conducted via Computer Assisted Personal Interviews, the questionnaire shared on the NIS website (http://www.nis.gov.kh/index.php/km/) in English and Khmer is an export from this software. The system used was the World Bank's Survey Solutions software.

Survey timing and reference period

The CAS 2023 was undertaken in November and December 2023.

The 12-month period prior to 1 July 2023 (i.e., from 1 July 2022 to 30 June 2023) was used as the reference period for the data collection effort. However, the reference period for some of the items was different from the time period specified and is thus indicated separately for data

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items as needed. For example, for some livestock items, the number of animals on a holding is collected with the day of 1 July 2023 as the reference date.

Sampling Frame

For the CAS 2021, CAS 2022 and CAS 2023, the 2019 General Population Census Sampling Frame was utilized. This frame consisted of around 14,500 villages and 38,000 Enumeration Areas (EAs). For each village, the following information was available: province, district, commune, type (rural/urban), number of EAs and number of households. The target population comprised the households that were engaged in agriculture, fishery and/or aquaculture. Given their low number of rural villages, the following districts were excluded from the frame:

- o Province Preah Sihanouk, District Krong Preah Sihanouk
- o Province Siemreap, District Krong Siem Reab
- o Province Phnom Penh, District Chamkar Mon
- o Province Phnom Penh, District Doun Penh
- o Province Phnom Penh, District Prampir Meakkakra
- o Province Phnom Penh, District Tuol Kouk
- o Province Phnom Penh, District Ruessei Kaev
- o Province Phnom Penh, District Chhbar Ampov

Since the number of rural households per EA was not known from the 2019 census, to calculate the number of rural households in each province, the sum of the households in the villages that were classified as rural was computed. The listing operation in each sampled EA was conducted for the CAS 2021 to identify the target population, i.e., the households engaged in agricultural activities.

For this survey, there was no minimum threshold set to determine a household's engagement in agricultural activities. This differs from the procedures used during the 2013 Agriculture Census (and that would be used in the 2023 Agriculture Census later), in which households were eligible for the survey if they grew crops on at least 0.03 hectares and/or had a minimum of 2 large livestock and/or 3 small livestock and/or 25 poultry. The procedure used in the CAS, which had no minimum land area, or a minimum livestock or poultry inventory allowed for smaller household agricultural holdings to be selected for the survey. However, based on the sampling procedure detailed below, household agricultural holdings with larger land areas or more livestock or poultry were identified and associated with different sampling strata to ensure the selection of some of them.

Sampling Procedure

The CAS 2023 used a two-stage stratified sampling procedure, with EAs as primary units and households engaged in agriculture as secondary units. In the CAS 2021, 1,381 EAs and 12 agricultural households for each EA were selected, for a total planned sample size of 16,572 households whilst finally in 2023 using the same sample, after attrition, 15,323 successful agricultural household holdings were interviewed. The 1,381 EAs were allocated to the provinces (statistical domains) proportionally to the number of rural households. Table 1 below

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shows sample allocations for the CAS 2021 and the final number completed in 2023. To select the EAs within each province, the villages were ordered by district, commune, and then by type of village (Rural-Urban). Systematic sampling was then performed, with probability proportional to size (number of households).

Table 1.6: Sample allocations

Province	Total # Rural/Agricultural Households from 2013 Agriculture Census	Number of EA sampled (PSUs) for CAS 2021	Number of Agricultural Households sampled for CAS 2021	Number of Agricultural Households with completed interviews for CAS 2023
Plain Zone	1,252,491	577	6,959	6,472
Phnom Penh	Estimated 60,000	23	312	274
Prey Veng	268,473	127	1,524	1378
Svay Rieng	124,656	59	708	665
Takeo	206,084	98	1,175	1108
Tboung Khmum	167,628	79	948	888
Kandal	205,812	98	1,176	1110
Kampong Cham	219,838	93	1,116	1049
Tonle Sap Lake Zone	916,840	458	5,489	4,939
Pailin	7,575	25	300	295
Banteay Meanchey	122,230	58	696	623
Battambang	209,719	99	1185	1029
Otdar Meanchey	43,614	21	252	193
Siemreap	163,620	78	936	877
Kampong Chhnang	119,924	58	693	632
Kampong Thom	153,243	73	875	797
Pursat	96,915	46	552	493
Coastal Zone	178,760	132	1,595	1,531
Kampot	135,273	78	948	922

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Kep	4,316	13	156	153
Koh Kong	17,483	25	299	283
Preah Sihanouk	21,688	16	192	173
Plateau and Mountainous Zone	372,578	209	2,520	2,381
Kampong Speu	164,840	77	936	909
Kratie	79,043	38	456	420
Mondul Kiri	16,413	17	204	183
Preah Vihear	49,075	35	420	385
Ratanak Kiri	36,904	25	300	293
Stung Treng	26,303	17	204	191
TOTAL	2,720,669	1,376	16,563	15,323

Weighting and Estimation procedure

The sample design and stratification procedures detailed above resulted in agricultural households having different probabilities of selection. With this under consideration, a sampling weight was calculated for each agricultural household in the sample and applied to that record's reported data. The CAS 2023 weights were then corrected for non-response and attrition and calibrated using the number of agricultural households by province obtained through the Census of Agriculture Cambodia 2023 (CAC 2023). Finally, this reported data was summed at the provincial, regional and national levels. The CAC 2023 is the most up to date and detailed agricultural statistics project in Cambodia, the final results are due to be released shortly following the release of this CAS 2023 report. The authors of CAS 2023 had early access to some data points in order to create the weighting calibration for the study.

The CAS 2022 and CAS 2023 methods were different in calibration from the CIAS 2019, CAS 2020 and CAS 2021 which were calibrated using the Census of Agriculture 2013 (CIAS 2019) and General Population Census 2019 (CAS 2020 and CAS 2021) respectively. The different methods used in weight calibration result in changes in results between the years of the study.

Between CIAS 2019, CAS 2020, CAS 2021 compared to CAS 2022 and CAS 2023 there is a substantial reduction in household agricultural holdings. As noted above, the reduction in holdings in CAS 2022 and CAS 2023 is the most up to date and accurate finding after calibration to the yet to be released CAC 2023. The reduction in the number of holdings is justified as CAS 2020 and CAS 2021 were weighted with the assumption that an increase in population led to an increase in agricultural holdings. The new findings suggest that whilst the relationship may not be causal, an inverse correlation appears to be true. Possible factors for the reduction in holdings, which require further investigation beyond the confines of these report, include:

- Urbanisation
- Land consolidation into juridical holdings or sale into real estate
- Economic diversification
- Technological advancements
- Changing society and desires of youth to enter into agriculture.

Survey procedure

All data in the CAS 2023 were collected via Computer Assisted Personal Interviews by a group of trained enumerators and supervisors directly interviewing knowledgeable respondents on agricultural holdings. The respondents could be any adult household member knowledgeable of the agricultural holding's activities. The most qualified respondent was the agriculture holder. However, in his or her absence, the spouse or another knowledgeable household member could also act as the respondent. It was instructed that no neighbour or other household was interviewed or asked for information on the holding being surveyed.

Data in the survey were collected using a questionnaire guided by the *CAS Enumerator Manual*, which provided detailed concepts, definitions and procedures to be followed for collection of each item. The draft questionnaires and instructions manual were prepared based on MAFF data needs and the 50x2030 Initiative to Close the Agricultural Data Gap methodology. The CAS questionnaire and enumeration manuals were revised and finalized based on the results and experiences gained during two rounds of field-testing exercises. The *CAS Enumerator Manual* was supplemented by a set of checks on the consistency of data carried out remotely by the Data Supervisors and in the subsequent data validation processes.

All collected data was stored on an Amazon Web Services cloud-based server. This data could be downloaded in various formats by the server administrator at any time during data collection, and until May 2023 when the server was shut down.

Advocacy plan

Before fieldwork commenced, letters of support from MOP and MAFF leadership were obtained to share with local officials and respondents as needed, to gain the support and cooperation of all households and non-households engaged in agricultural activities in the country.

Field operations

All data in the CAS were collected by trained enumerators who were selected among existing National and Provincial staff of NIS and MAFF based on qualifying tests. Field operations included training of all supervisors and enumerators, data collection and supervision. Central and field staff from the NIS and MAFF were trained before they undertook the data collection and supervision process. Since the CAS consisted of both household data collection and juridical holding data collection efforts, training activities were conducted to cover each of these components. There were two levels of training, conducted separately including (a) training of trainers, with NIS and MAFF central office staff serving as data supervisors, field

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supervisors, and enumerators for the juridical holdings' data collection; and (b) training of household data collection enumerators. All field officials including supervisors at all levels were trained extensively in concepts, definitions and procedures for data collection.

Data Supervisors were responsible for conducting data quality control checks. There were 46 data supervisors for the project, all were staff members from NIS. Field Supervisors were responsible for assisting with enumerator issues in the field, encouraging good relationships with village contacts and promoting cooperation from agricultural household respondents. There were 46 field supervisors for the project, with 24 hired from MAFF and 22 hired from NIS. Enumerator staff included 337 staff, among these were 197 from NIS and 140 from MAFF from province and district level staff. Including field and data supervisors, a total of 429 staff were involved in the data collection effort, although additional staff were trained and maintained as reserve staff for the project not included in these totals. Additionally, 11 NIS staff in Phnom Penh were trained in the Headquarters Tools of Survey Solutions, carrying out the final approval process for the submitted interviews.

The accuracy of the final output of the CAS depended on the quality of the data collection from the households and juridical holdings enumerated. Despite proper conduct of training and the efficient development of data processing, the absence of effective quality controls during the data collection process would still result in poor quality of the final data. There were several levels of supervision and channels of communication in the CAS, as detailed in the *CAS Enumerator Manual*. This hierarchy of supervision and communication, along with comprehensive guidelines – highlighting different activities and quality control procedures – was prepared to properly monitor the progress of the enumeration of the CAS, and for early detection of any problem of data collection. The innovative use of CAPI for data collection allowed for timely monitoring of the data flow and data quality.

Data processing

Once the enumerators collected the survey data for an agricultural household, they submitted the completed questionnaires via Survey Solutions to their Data Supervisors who, in turn, carried out scrutiny checks. If there were errors or suspicious data detected, Data Supervisors would return the record to the enumerator to address the issues with the respondent if needed, and the corrected record would be re-submitted to the Data Supervisor. Once the records were validated by Data Supervisors, they would approve them for final review by headquarters staff.

At the survey headquarters, the completed questionnaires were received after being approved by Data Supervisors. If any issues or suspicious data were discovered during the headquarters review, the records could be returned to the enumerator for verification or correction if needed. Documentation on how to review questionnaire data for suspicious items or outliers was provided to Data Supervisors and Headquarters staff.

The data review and calculation of the survey estimates was undertaken using the RStudio software tool. Validation of the data began even when the questionnaires were being designed in the CAPI tool, as Survey Solutions allows for consistency checks to be built into the data

collection tool. As soon as completed records were returned during the data collection stage additional consistency checks were completed, in comparing reports to previous census data, evaluating ranges of reasonableness for certain items, and verifying any outlier records with the enumerator and/or respondent. Moreover, when the data was cleaned, another step was conducted to impute the missing values coming from item non-response.

Publication standards

In the development of this publication, standards were established for the development of the data tables provided in Excel online on the NIS website (http://www.nis.gov.kh/index.php/km/). These standards include the following:

- All data values relating to the number of households were rounded to the nearest thousand households.
- Computed percentages are always based on the original data, however, due to rounding, some tables with percentages may not sum up to exactly 100%.
- An empty cell is provided where few observations were obtained, the number of households did not round to a minimum of 1,000 households, or there was a large Coefficient of Variation (CV) (a CV value of 35 or higher). Also, some fields may be empty as a secondary disclosure. In these cases, the data does not fail the primary disclosure rules (minimum number of households or high CV) but when combined with other data would permit the identification of a primary disclosure field.

The above standards limit the release of lower-quality data due to a small number of observations in a particular province or zone and follow NIS reporting standards.

CAS Limitations

In the CAS, as with all sample surveys, there are limitations to the data produced and its interpretability or comparability to alternate data sources. As readers utilize the data provided in this report, it is important to keep in mind the following limitations:

- Self-reported data: Qualified respondents were sought out to provide information about the agricultural holdings. This information could be impacted by the respondent's memory of the reference period, which for many items on the questionnaire was a 12-month period.
- Recall period: Self-reported data could additionally be impacted by the length of time between the reference period itself and the data collection period. Due to timeline constraints, the data collection fell several months after the reference period.
- Questionnaires and interview procedures: In the CAS, every effort was made to train enumerators and supervisors to collect data with a consistent and systematic process. Question phrasing and interview interactions were to be conducted uniformly, however, any personal modifications to these standards could impact a survey response and influence the final results.

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As can be seen in all of the data points within this report, the published CAS 2023 results focus on national and zone/regional level data only, to shorten the preparation time and length of these reports. Province-level data is provided in a data tabulation file available on the NIS website or through the public use microdata file also available online.