Food and Agriculture Organization
of the United Nations

NATIONAL SOIL INFORMATION AND LAND SUITABILITY EVALUATION SYSTEM FOR CAMBODIA

November 2019

SDGs:	2 ZERO HUNGER, 15 LIFE ON LAND
Countries:	Cambodia
Project Codes:	TCP/CMB/3602
FAO Contribution:	USD 297 000
Duration:	1 June 2016 - 31 May 2019
Contact Info:	FAO Representation in Cambodia FAO-KH@fao.org

Implementing Partners

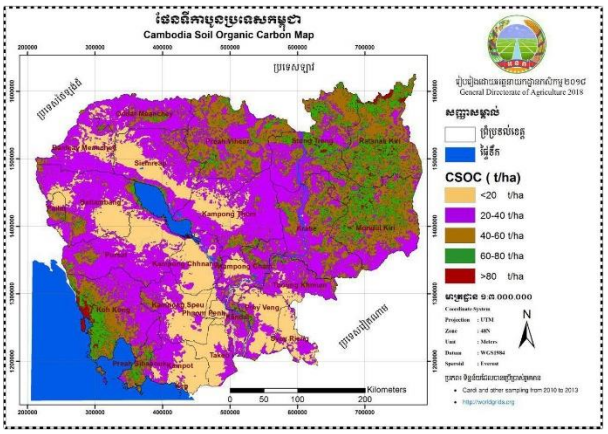
The General Directorate of Agriculture (GDA), Ministry of Agriculture, Forestry and Fisheries (MAFF).

Beneficiaries

Staff members from various government agencies, including the MAFF and its General Directorate of Agriculture, the GDA's Department of Agricultural Land Resources Management (DALRM); the Cambodian Agricultural Research and Development Institute (CARDI); the Forestry Administration; the Ministry of Environment (MoE); the Royal University of Agriculture (RUA); NGOs; Farmers; Investors; Funding agencies; Development projects; Civil society organizations; Environmental modellers; Consumers; Citizens.

Country Programming Framework

Output 2.1: Increased capacity of targeted stakeholders to carry out inventories and assessments of natural resources, the impact of climate change and to monitor and report.



Background

Agriculture is of key importance in Cambodia, owing to the fact that it is a major source of employment, and therefore supports the livelihoods of many people. Despite this, it is widely acknowledged that a large part of Cambodia's agriculture sector could be more profitable. Low productivity, the low level of diversification and inappropriate land management all contribute to low profits in the sector. A lack of knowledge of the natural resource base, particularly of soils, and also a lack of knowledge regarding the matching of natural resources, i.e. pairing soils with different land uses, are contributing factors to this poor land management.

There is a lack of accurate and current soil and soil suitability information in Cambodia. Data regarding different soil types and their properties are either out of date or have not been compiled into one place. The primary sources for national soil information are a soil map developed by Charles D. Crocker in 1962, and a database of field observations and laboratory analyses at the Cambodian Agricultural Research Institute (CARDI), which mostly contains data on a very small part of the country. This makes it nearly impossible to find modern, reliable soil information and to generate land suitability assessments for different crops.

The primary need of stakeholders in this area of the agricultural sector is to have access to information on land suitability for determining land use, with management options included. This requires: (i) research that matches potential land uses and related management options to available land resources, and (ii) information on these resources (mainly soil, water and climate conditions) that are accurate and accessible to all. Meeting these conditions requires the proper methods, training and equipment.

In order to improve the area of soil management in Cambodia, this Technical Cooperation Programme (TCP) was formulated. It involved the above provision of training, methods and equipment to capacitate government actors to create, develop, manage, utilize and maintain a National Soil Information and Land Suitability Evaluation System for Cambodia (CAMSIS). This system is expected to serve as a fundamental tool for making sustainable soil management decisions in Cambodia.

Impact

This project was designed to strengthen the national capacity to first establish, and then continuously develop, enlarge and improve CAMSIS, thereby increasing the amount of available information on Cambodia's soil resources and their suitability for selected land use. The system is therefore expected to facilitate better and easier decision-making on land management in Cambodia.

Achievement of results

The project supported the design and development of the information technology infrastructure necessary for CAMSIS, it built national capacity in digital soil mapping, database management, data harmonization and land suitability, and it trained national experts on well-developed modern methods for digital soil mapping (DSM), soil database design, land suitability evaluation and information delivery via the web to multiple stakeholders.

The server was set up, along with a self-sustaining web infrastructure to allow for the visualization of information in the form of maps and statistical charts in an interactive way. The staff of the host institution, which was the Department of Land Resources Management (DALRM) of the General Directorate of Agriculture (GDA) within the Ministry of Agriculture, Forestry and Fisheries (MAFF), was equipped with the capacity and associated technical skills to update the information on the system as needed.

The project also provided a series of training sessions on DSM, including soil sampling design, producing soil properties maps, and how to use DSM to produce a soil class map. As a result, several maps were produced: Cambodia's Soil Organic Carbon map, which was submitted to the Global Soil Partnership (GSP) as a contribution to the Global Soil Organic Carbon Map (GSOCmap), as well as land suitability maps for mangoes, cassava and cashew nuts.

To achieve the desired Outcome of having a core group of government experts be trained to deliver primary and interpreted soil information, four indicators were laid out. These included the actual training of the staff, the organization of communication channels between involved institutions, the establishment of a single point of access and the documentation of procedures for a follow-up project. Participation in the training sessions was limited to ten people, although the original target was higher. The trainers recommended this limit, owing to the technical nature of DSM. All of the other indicators were achieved.

The achievement of Output 1 began with an inception workshop, where stakeholders received information about the project and validated its priorities. The project Outputs were shared at a subsequent workshop and conference through poster presentations, the dissemination of leaflets and the sharing of information with stakeholders involved in the sector, for instance the Australian Centre for International Agricultural Research (ACIAR) and CARDI. A follow-up project concept note was formulated on national soil information and agricultural land zoning in Cambodia. The MAFF submitted the proposal to the Russian Government, and FAO and the MAFF are committed to mobilizing resources for the project.

An end-of-project workshop was also held for 57 participants. Results and lessons learned were disseminated, and experiences were shared. The workshop provided an opportunity for knowledge to be exchanged among stakeholders and key experts in the sector.

Under this Output, progress reports were meant to be produced every six months; however, they were replaced by two project progress reviews. The first of these took place in mid-2017, and the other took place in early 2018. A soil information expert from the Land and Water Division at FAO headquarters carried out the second review and developed a new timetable to deliver the remaining Outputs.

Output 2 involved the creation of the CAMSIS digital infrastructure and the training of government staff to maintain the system. The first step in this process was determining the location for the CAMSIS server. The GDA was chosen as the server site, and all of the necessary equipment was purchased and installed. A central repository was created in a web-based Geographical Information System (WebGIS). In addition to that, software was also installed in the agricultural zoning office in the DALRM. This department is responsible for the WebGIS and mapping activities for the MAFF.

All of the necessary hardware and software for developing the CAMSIS platform through WebGIS were procured and installed in the GDA, and the data for CAMSIS was uploaded. The WebGIS interface for CAMSIS was designed and tested. In March 2019, at the end-of-project workshop, a demonstration of the interface was conducted so that stakeholders could understand how to access and use it. Training sessions were conducted in the GDA on how to upload, edit, manage, and maintain the WebGIS platform for ensured sustainability. The system is online, and was switched from its original physical server to a cloud server. It will be updated as more data and information become available.

This Output also originally included the use of a mobile phone application for field use, but this activity was cancelled in agreement with the Lead Technical Officer (LTO), owing to timing and to the fact that other priorities took precedence.

By harmonizing and improving the general soil map and profile database by trained national staff, Output 3 saw the development of a soil organic carbon map, which was the first gridded soil property map developed as a part of this project. Land suitability maps for cashews, cassava and mango were also developed using the FAO land evaluation framework. Additional maps were produced, including slope maps and soil type maps.

The achievement of this Output began with the compilation and uploading of digital information and metadata. This included information on soil property data and related information, such as the Digital Elevation Model (DEM,) administrative boundaries, soil type, land use and land suitability. Data from the CARDI database, academic institutions, research articles and national laboratories were compiled and uploaded into a database for the DALRM. Supported by the international consultant, the project team successfully updated Crocker's 1962 soil map using DSM and land use information.

Under Output 3, additional soil profiles and samplings were meant to be taken to fill in existing gaps in data. This required a large amount of resources; therefore, this activity and the subsequent laboratory analysis were not carried out under this project. The international consultant trained DALRM staff to carry out field soil surveys and testing. Thanks to this training, the DALRM team was able to conduct soil surveys, collecting more than 200 soil samples from three different provinces in Cambodia. This surveying and sampling was supported by the Climate Resilient Rice Commercialization Sector Development Program (Rice-SDP) project, which is funded by the Asian Development Bank (ADB). The information gathered through this sampling will be useful for updating data on soil in the country. Originally, additional sampling was meant to be carried out under this project to fill the gaps in the existing data. However, given that this would have required significant resources, this activity and the sample analysis were not carried out.

Output 4 involved the generation of a modern soil type map for Cambodia, which, as mentioned above, had first been developed in 1962 and required updating. To begin, the project team collected, compiled and converted the CARDI profile database to a DSM format. Covariates were then identified and collected, and a 30-metre soil grid was generated using Crocker's soil map, as the CARDI soil map primarily covered rice crops.

The soil organic carbon map and the soil type maps were then evaluated and adjusted by an expert trainer in mapping. Several different maps, including the two mentioned above, along with the land, land use, administrative boundary and land suitability maps, were uploaded into the CAMSIS central repository. Finally, three training courses were conducted in the GDA, which focused on the WebGIS and its related software, soil mapping and soil organic carbon mapping.

Land suitability evaluations and the training of national staff to conduct them were the focus of Output 5. This started with the selection of different land utilization types (LUTs), including mango, cashew nut and cassava. Literature reviews took place, and an expert on these LUTs was identified. Land suitability models were then generated using a computer program for land evaluation, and these map units were then entered into the computer program. Land characteristics, such as land form, slope and use were analysed and put into a format that is compatible with the WebGIS modelling for land evaluation. The land evaluation on cashews, cassava and mango was then carried out.

These suitability maps were then added to the CAMSIS central repository.

Implementation of work plan

Overall, the budget was efficiently and effectively used thanks to a budget reallocation, which facilitated the effective delivery of the Outputs. The project experienced some delays in activity implementation, both because of the technical nature of the project, and also because of a lack of availability of experts in the field. Two no-cost extensions were granted, and they allowed for the completion of activities.

The risks defined in the project document, including the possibility of insufficient funding, technical difficulties with equipment and/or the WebGIS, poor weather conditions and a lack of training to ensure sustainability were all mitigated successfully. The technical difficulties were mitigated through technical support from the team at headquarters and through the provision of hands-on training to a limited number of people within the GDA. Poor weather conditions failed to materialize, while budget funding was reallocated to different lines.

Two activities were partially achieved under Output 4. The first was the selection of DSM methods and a target resolution for the production of soil property maps. Data was collected for this purpose, but much of it had not been georeferenced and therefore could not be used. The R programme, which performs DSM based on different variables, such as land use, physical characteristics and climate data, was selected to update the DSM.

The other partially achieved activity was the application of a series of DSM techniques to produce soil property maps, including uncertainty maps. Although the soil property maps were not produced due to the lack of georeferenced data, the soil map was updated, while the national soil organic carbon map was developed with existing data.

Follow-up for government attention

The technical team within DARLM has the technical capacity to continue the work started under this project; however, they would benefit from external support, especially related to database optimisation, server side caching, and other topics.

A concept note was drawn up for a related follow-up project, with the MAFF and FAO both committed to mobilizing resources to implement it. The MAFF also shared the concept note with the Russian Government. The follow-up concept note should be presented to other potential donors to seek their support on national soil information and agricultural land use zoning in Cambodia. A similar project proposal was submitted to the Government of Korea and was approved. Implementation was expected to begin shortly after the time of this report.

Sustainability

1. Capacity development

The GDA staff is equipped with the capacity and associated technical skills to update and maintain the information in the system. The data was successfully migrated to the cloud server, therefore, the cost of maintenance and operations of the physical server will not be required. The DARLM is committed to using government funding to pay for the cloud server upon the expiration of the current subscription, which is valid for two years after project completion. As was mentioned above, a concept note for a follow-up project was drafted. FAO and the GDA are committed to joint resource mobilization to implement this project. The MAFF has also submitted this follow-up project concept note to the Russian Government for their bilateral cooperation program.

2. Gender equality

Ten women attended the workshop on National Soil Information and Land Suitability Evaluation System for Cambodia, representing the GDA, CARDI, the Royal University of Agriculture (RUA), the Prek Leap National School of Agriculture (PNSA) and Murdoch University. Representatives from CARDI and Murdoch University made presentations at the workshop, sharing experience and results from the ACIAR-funded project on land suitability assessment and site-specific soil management for Cambodian uplands. The presentations included Soil survey in Kampong Speu and Tbaung Khmum and community soil activity, and Rapid Soil Analysis by Mid-Infrared Spectroscopy.

3. Environmental sustainability

Understanding the status of a given soil, including its properties and functions, and relating this information to the ecosystem services that the soil provides is a mandatory step that must be taken before making decisions on how to manage a soil sustainably. To achieve this, the availability and use of soil data and information is fundamental in soil management decisions. Establishing a national soil information system is therefore a crucial step in sustainable soil management.

4. Human Rights-based Approach (HRBA) – in particular Right to Food and Decent Work

The National Soil Information and Land Suitability Evaluation System for Cambodia (CAMSIS) serves as a fundamental tool for making sustainable soil management decisions in Cambodia. Sustainable soil management is key to ensuring sustainable food production, which directly contributes to ensuring the right to food.

5. Technological sustainability

The migration of data from a physical server to the cloud reduced costs, especially for maintenance and operations. In addition, the software introduced by the project is mostly from open sources.

The project built national capacity in digital soil mapping, database management, data harmonization and land suitability. It also trained national experts on well-developed modern methods for digital soil mapping, soil database design, land suitability evaluation and information delivery via the web to multiple stakeholders. The trainees were also provided with the technical skills required to update and maintain the information in the system. The technical team within DARLM is equipped with the technical capacity to carry the work forward.

6. Economic sustainability

FAO and the GDA are committed to mobilizing resources from partners to implement follow-up projects. The cost of the cloud server is far cheaper than running the physical server. The DARLM could afford this within their regular budget.

Documents and outreach products

- CAMSIS website: http://camsis.info/gda
- Poster. Koy et al. 2018. Soil Organic Carbon Stock Map of Cambodia.
- Land suitability maps for three main crops: cassava, cashew nut and mango. GDA. 2019.

Achievement of results - Logical framework

Expected Impact	**National capacity to extend and improve a publically accessible information system on the soil resources of Cambodia and knowledge of their suitability for selected land uses**	
Outcome	Core government experts as direct beneficiaries are trained and motivated and continue working at their organizations to deliver primary and interpreted soil information; information is publically accessible	
	Indicator	– Trained national staff in digital soil mapping, field sampling, database management, data harmonization, and land suitability evaluation. – Well-organized communication with other institutions concerning the supply of soil and land suitability information that they can use in their work. – Single point of access for soil survey and land suitability. – Procedures adequately documented for follow-up project.
	Baseline	– 0 – 0 – 0 – 0
	End Target	– 25 – 30 – 1 – 1 – 1
	Comments and follow-up action to be taken	– The project achieved all the indicators except for the number of staff trained. The training on digital soil mapping is very technical in nature, and it was recommended that the number of participants be less than ten if the training was to be hands-on. – In addition to the above achievement, the GDA technical team were also able to develop a soil organic carbon map, which was submitted to the Global Soil Partnership to contribute to their global soil organic carbon mapping. – It is recommended that a follow-up proposal be formulated with the goal of mobilizing resources to develop and complete a comprehensive national soil information system.

Output 1	Project administration, lessons learned and preparation for follow-up project		
	Indicators	Target	Achieved
			Yes
Baseline			
Comments			
Activity 1.1	Inception workshop		
	Achieved	Yes	
	Comments	An inception workshop was organized to launch the project, inform stakeholders and validate implementation priorities by seeking collaboration from stakeholders and partners of all levels throughout project implementation.	
Activity 1.2	Six-monthly progress reports		
	Achieved	No	
	Comments	Progress reports were not prepared every six months, but instead conducted project progress reviews twice, once in mid-2017 and another one in early 2018. The progress review in 2018 was conducted by a technical expert on soil information from FAO's Land and Water Division to review overall progress, expected outputs, deviations and develop a new timetable to deliver the remaining outputs.	
Activity 1.3	Publicize project results		
	Achieved	Yes	
	Comments	The project outputs were disseminated in various ways, including poster presentations at workshop/conference, the distribution of leaflets to stakeholders, and sharing information with stakeholders working in the sector, e.g. ACIAR/CARDI.	
Activity 1.4	Final reporting		
	Achieved	Yes	
	Comments		

Activity 1.5	Writing a project proposal	
	Achieved	Yes
	Comments	A follow-up proposal on national soil information and agricultural land use zoning in Cambodia was developed. MAFF submitted the proposal to the bilateral partnership with the Russian Government. MAFF and FAO are committed to joint resource mobilization from several donors. A similar project was also submitted to the Government of Korea. The proposal was approved, and implementation was expected to begin shortly after the time of this report.
Activity 1.6	End-of-project workshop to disseminate project outputs and demonstrate potential use and benefits	
	Achieved	Yes
	Comments	The workshop on the CAMSIS was organized on 6 March 2019 with 57 participants. Attendees included ten women from MAFF (GDA, all ten departments), as well as participants from the Department of Planning and Statistics, the Secretariat for Economic Land Concession (ELC), the Department of Agro-Industry, the General Directorate of Rubber, the Forestry Administration, CARDI, RUA, the PNSA, the Kampong Cham National School of Agriculture, the University of Battambang, the Royal University of Phnom Penh (RUPP), the Ministry of Environment (MoE), FAO, ACIAR, development partners and Non-government Organizations (NGOs). The workshop provided a good opportunity and platform to disseminate results, lessons learned and experiences in building the CAMSIS. It also promoted knowledge exchange and experience sharing among stakeholders and key national experts working in the sector.
Output 2	Cambodian Soil Information System (CAMSIS) digital infrastructure, with trained national staff to maintain it	
	Indicators	Target / Achieved
		Yes
Baseline		
Comments		
Activity 2.1	Determining location of CAMSIS server	
	Achieved	Yes
	Comments	The GDA of the MAFF was chosen as the site of the CAMSIS server. All equipment was procured and installed on the premises of the GDA.
Activity 2.2	Establishment of a central repository for digital information	
	Achieved	Yes
	Comments	A database management system was installed in WebGIS. Software was also installed in the agricultural zoning office of the DALRM, which is responsible for GIS and mapping activities for MAFF.
Activity 2.3	Selection of WebGIS computer programme.	
	Achieved	Yes
	Comments	The CAMSIS web platform was developed using WebGIS tools and is able to store, manage and visualize geo-information in the form of interactive maps on the web. The CAMSIS is online and running on a cloud server. It will be updated when more data and information are available.
Activity 2.4	Procurement, installation and testing of WebGIS hardware and programme	
	Achieved	Yes
	Comments	All equipment, such as computer hardware and software, were procured by FAO and installed in the GDA.
Activity 2.5	Identification of WebGIS components	
	Achieved	Yes
	Comments	This was successfully achieved with all components in place within the GDA. All data was uploaded for the CAMSIS.
Activity 2.6	Design and testing of WebGIS interface	
	Achieved	Yes
	Comments	The WebGIS interface was designed and tested. The result was also demonstrated in the dissemination workshop in March 2019 so that all participants could access and make use of the information generated by the project.
Activity 2.7	Implementation of CAMSIS	
	Achieved	Yes
	Comments	Data was uploaded and displayed with the WebGIS interface so that stakeholders could benefit from this information.

Activity 2.8	Mobile phone application for field use	
	Achieved	No
	Comments	During the review by the LTO, it was agreed that this activity would be cancelled owing to other priorities and timing issues.
Activity 2.9	Training in WebGIS installation and administration	
	Achieved	Yes
	Comments	Trainings were conducted in the GDA by an international expert on how to upload, edit, manage and sustain the WebGIS platform after the project ended.

Output 3	Harmonized and improved general soil map and profile database, with trained national staff to produce these		
	Indicators	Target	Achieved
			Yes
Baseline			
Comments	A soil organic carbon map, which was the first gridded soil property map, was developed under this project. Furthermore, land suitability maps for selected crops were generated using the FAO land evaluation framework. These maps include land suitability maps for cashews, cassava, rice and mangoes. Furthermore, many other maps were generated, such as slope and soil maps.		

Activity 3.1	Compilation of all existing digital information, with metadata	
	Achieved	Yes
	Comments	Digital data such as administrative boundaries, soil type, land use, and land suitability for selected crops with the respective metadata were uploaded into the system.
Activity 3.2	Addition of records to CARDI database	
	Achieved	Yes
	Comments	Data from different sources including academic institutions, research articles, and national laboratories were compiled into one database for DALRM to further analyse for the benefit of all stakeholders.
Activity 3.3	Collection of soil-related themes	
	Achieved	Yes
	Comments	All soil property data and relevant information, such as DEM and land use, were compiled from different sources and uploaded into the WebGIS database.
Activity 3.4	Geometric correction and disaggregation of Crocker and rice soils maps with DSM methods	
	Achieved	Yes
	Comments	With the support from the international consultant, the project team updated the soil map that was developed by Crocker in 1962. The update was made using DSM and land use information.
Activity 3.5	Field profile description and soil sampling	
	Achieved	No
	Comments	The project did not take additional soil profiles and soil samplings. Initially, this was planned to fill the gaps in the existing soil data. Despite the collection and compilation of the existing data, major gaps remained. Filling these gaps would require a significant amount of resources. Support from another project allowed for the compilation of more than 200 new samples from three provinces in Cambodia. This data is expected to be useful for updating soil information in Cambodia in the future.
Activity 3.6	Laboratory analysis	
	Achieved	No
	Comments	No soil sampling was done; therefore, no analysis was required.
Activity 3.7	Addition of new information to CARDI database	
	Achieved	Yes
	Comments	Soil sample data from field sampling and new soil data from existing sources were combined and integrated into the CARDI soil database and kept in DALRM for uploading into WebGIS.
Activity 3.8	Training on above	
	Achieved	Yes
	Comments	An international consultant trained DALRM staff to carry out field soil surveys and testing. The DALRM technical team was thus equipped with the knowledge and skills to conduct these activities. Together with the soil sampling equipment supported by the project, the DARLM technical team was able to conduct soil surveys and collected more than 200 soil samples from three provinces in Cambodia. This soil survey was supported by the ADB-funded Rice-SDP project.

Output 4	Initial version of gridded digital soil property maps, with trained national staff to produce these		
	Indicators	Target	Achieved
			Yes
Baseline			
Comments	The first updated soil type map and national soil organic carbon map were produced using available data such as land uses, other biophysical data and soil organic carbon.		
Activity 4.1	Conversion of CARDI profile database to format suitable for DSM		
	Achieved	Yes	
	Comments	The project team collected, combined, compiled and converted the CARDI profile database to DSM.	
Activity 4.2	Identification and collection of covariates		
	Achieved	Yes	
	Comments	A soil grid of 30m was generated using Crocker's soil map that was produced in 1962. This is because this map shows nationwide coverage, unlike CARDI's soil map, which mostly covered rice crops.	
Activity 4.3	Selection of DSM methods and target resolution		
	Achieved	Partially	
	Comments	Data have been collected but not yet georeferenced. A program was selected for updating DSM. This program is used based on different variables such as land use, physical characteristics and climate data.	
Activity 4.4	Application of DSM techniques to produce of soil property maps, including uncertainty maps		
	Achieved	Partially	
	Comments	Only the soil type map was updated. However, the soil organic carbon map was developed with existing data.	
Activity 4.5	Evaluation and adjustment		
	Achieved	Yes	
	Comments	The soil organic carbon map and soil type map were confirmed by the trainer who is an expert on this mapping. However, this map will be validated with field data from the Rice SDP project.	
Activity 4.6	Addition of maps to central repository (CAMSIS)		
	Achieved	Yes	
	Comments	Different maps have been uploaded to the CAMSIS. These include land maps, soil type maps, land use maps, administrative boundary maps, soil organic carbon maps, land suitability maps for some crops, etc.	
Activity 4.7	Training in DSM		
	Achieved	Yes	
	Comments	Three training courses were conducted in the GDA. The training focused mainly on WebGIS and related software use, soil mapping and soil organic carbon mapping.	

Output 5	Selected land suitability evaluations, with trained national staff able to conduct these		
	Indicators	Target	Achieved
			Yes
Baseline			
Comments			
Activity 5.1	Selection of representative Land Utilization Types (LUT)		
	Achieved	Yes	
	Comments	Different land use types were selected, including mango, cashew nut and cassava crops. The selection was based on their priority.	
Activity 5.2	Literature review and identification of experts in these LUT		
	Achieved	Yes	
	Comments	Different literature was reviewed, especially the FAO document on land evaluation and documents from other countries, such as Thailand and Bangladesh. Different experts within the MAFF were consulted for the identification of land evaluation. Different data sets were used, including biophysical data to overlay, classify, and provide the score for suitability classes.	
Activity 5.3	Construction of land suitability models in land evaluation computer programme		
	Achieved	Yes	
	Comments	The model (overlaying, reclassifying, and scoring) for land evaluation was selected and developed based on existing data available in Cambodia.	
Activity 5.4	Entry of map units into land evaluation computer programme		
	Achieved	Yes	
	Comments	This activity was completed based on the model that was developed.	
Activity 5.5	Land characteristics transferred to land evaluation computer programme		
	Achieved	Yes	
	Comments	Land characteristics such as land forms, slopes and land uses were evaluated and put in the format that can be used in WebGIS modelling for land evaluation.	
Activity 5.6	Run land evaluation models, show results as gridded maps		
	Achieved	Yes	
	Comments	The land evaluation model (overlaying, reclassifying, and scoring) was carried out based on three main selected crops, cashew nuts, cassava, and mangoes.	
Activity 5.7	Evaluate and adjust models		
	Achieved	Yes	
	Comments	The evaluation was made based on consultation with stakeholders within the GDA and other relevant stakeholders, such as those working at research institutions and universities. No adjustments were made.	
Activity 5.8	Addition of suitability maps to central repository (CAMSIS)		
	Achieved	Yes	
	Comments	The results of land evaluation on the three main crops were uploaded onto the website that was developed through the project.	
Activity 5.9	Training in FAO-style land suitability evaluation		
	Achieved	Yes	
	Comments	The team from DALRM of GDA attended on the job training on how to conduct land suitability mapping based on the FAO land evaluation framework.	

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CA9024EN/1/05.20