

*Please fill in the form in the grey spaces, by following the instructions in italic.*

<b>Requesting country:</b>	Thailand
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<b>Request title:</b>	Capacity Building on Technology Development for Efficient Use of Resources in Agriculture Sector
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<b>Contact information:</b>		
<i>{Please fill in the table below with the requested information. The request proponent is the organization that the request originates from, if different from the National Designated Entity (NDE).}</i>		
	<b>National Designated Entity</b>	<b>Request Applicant</b>
Contact person:	Mr. Surachai Sathitkunarut	Ms. Siriporn Wattanasrirungkul
Position:	Director of Energy and Environment Department	Assistant Program Director, Cluster & Program Management Division Cluster & Program Management
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<b>Technology Needs Assessment (TNA):</b>
<i>{Select one of the three boxes below:}</i>
<input checked="" type="checkbox"/> <i>The requesting country has conducted a TNA <b>in 2012</b></i>
<input type="checkbox"/> <i>The requesting country is currently conducting a TNA</i>
<input type="checkbox"/> <i>The requesting country has never conducted a TNA</i>
<i>{If the requesting country has completed a TNA, please indicate what climate technology priority this request directly relates to. Please indicate reference in TNA/TAP/Project Ideas.}</i>
TNA Adaptation : Precision farming

<b>CTCN Request Incubator Programme:</b>
<i>{Please indicate if this request was developed with support from the Request Incubator Programme:}</i>
<input type="checkbox"/> Yes
<input checked="" type="checkbox"/> No

**Geographical focus:**

*{Select below the most relevant geographical level for this request:}*

- Community-based
- Sub-national
- National
- Multi-country

*{If the request is related to the sub-national or multi-country level, please indicate here the areas concerned (provinces, states, countries, regions, etc.)}*

**Theme:**

*{Select below the most relevant theme(s) for this request:}*

- Adaptation to climate change
- Mitigation to climate change
- Combination of adaptation and mitigation to climate change

**Sectors:**

*{Please indicate here the main sectors related to the request. e.g. energy, industry, transport, waste, agriculture/fisheries, forestry, water, ecosystem/biodiversity, coastal zones, health, education, infrastructure/human settlement, tourism, businesses, early warning/disaster reduction, institutional design and mandates, cross-sectorial}*

Agriculture

**Problem statement (up to one page):**

*{Please describe here the difficulties and specific gaps of the country in relation to climate change, for which the country is seeking support from the CTCN. Please only provide information directly relevant to this request, and that justifies the need for CTCN technical assistance.}*

Agriculture plays an important role in Thailand. More than 40% of the labor force (39 million people) is engaged with agricultural sector. As of 2014, agriculture has 11.6% share on the national GDP (or 47,000 million US\$). Naturally, Thailand's agricultural production depends on the natural cycle. Therefore, climate change has some effects to agriculture in several ways. To minimize the impact of climate change, several crop varieties with greater tolerance to biotic and abiotic stresses are developed and introduced to the farmers. Rice with flash flooding tolerance and rice with blast and pest stress are good examples. In addition, agricultural practices, such as integrated pest control, irrigation system, and fertilization management, are applied to increase the efficiency of management. Looking forward to the future, crop production will face extreme weather, resource scarcity and environmental degradation. Existing applied technologies will not be good enough for the changes. Thus, technology development and technology transfer on the efficient use of resources are necessary to for the agricultural sector to cope with climate change, to increase productivity, as well as to meet the sustainable productivity goal of the country.

Precision farming or site-specific agricultural management is an in-field technology based system that optimizes input resources and overall farming practices. Currently, it has been developed and introduced to Thai's farmers with a key objective to reduce inputs, while maintaining maximum productivity with less effects on the environment. Customized fertilizer and drip irrigation have been promoted to increase yields and profits to farmers. For example, the cassava productivity has increased from 22 ton per hectare in average to around 50-62.5 ton per hectare by using the drip irrigation system and customized fertilizer, resulting in higher income. However, the precision farming in Thailand is still in an early stage of development. Major barrier is a lack of within-field data on water, soil and crop needed for precise evaluation on appropriate fertilizer and water management. Nowadays, most techniques and practices used for data collection in Thailand are spot measurement.

As a result, it cannot be applied in broad cultivation areas. Furthermore, knowledge related to plant phenotyping and physiology is limited. The knowledge will help researchers understand key mechanisms of plant structure, function, and relation between plant growth and its environment. Since several within-field parameters affect crop growth in precision farming, cost-effective technologies and equipment are needed to collect key data. Examples of major technologies include hyper-spectral and multi-spectral thermal imaging equipment, real-time sensor suit, unmanned aerial vehicle (UAV), and GIS & GPS technology. Nowadays, these technologies have created possibilities to assess crop stresses (e.g. water stress, drought stress, nutrient stress), photosynthetic efficiency, soil characterization (e.g. nutrient, moisture), and pest & disease outbreak monitoring. A wide range of applications have been introduced with obvious benefits including accuracy, consistency, rapid assessment. To create agricultural management plan, these collected data will be transformed into maps (e.g. water map, nitrogen map) that will help government officers and agriculture extension officers make accurate decision on appropriate fertilizer and water management for farmers. In addition to the physical environment, precision farming applies plant phenotyping and plant physiology technology to see how plants react to the environment. This is a new paradigm for the efficient use of resources in agriculture.

In conclusion, Thailand is in the beginning stage of using technologies for efficient use of resources. However, skills and knowledge on advantageous technologies are limited. Therefore, Thailand is seeking assistance from CTCN for capacity building on precision farming technologies.

**Past and ongoing efforts (up to half a page):**

*{Please describe here past and on-going processes, projects and initiatives implemented in the country to tackle the difficulties and gaps explained above. Explain why CTCN technical assistance is needed to complement these efforts, and how the assistance can link or build on this previous work.}*

A few research projects on advanced precision farming have been conducted by government research agencies and universities in Thailand. Nevertheless, the projects are still in the initial stage.

Some previous examples include:

- Research project to study water stress and nitrogen content in leaf and canopy of cassava using spectral reflectance and thermal sensing
- Development of site specific nitrogen, phosphorus, and potassium fertilizer application rates for cassava production systems
- Soil, water and nutrient management for cassava production
- Sensor technology for water application in cassava production
- Software development of watering process system for cassava field based on irrigation system modeling
- Wireless sensor networks for irrigation system modeling in cassava field
- Physiological responses in relation to water and fertilizer management for increasing cassava productivity

In addition to the research projects, a government research institute has conducted an international cooperation on training courses, aiming to build research capacity of Thai researchers in both government and private sectors.

Some of the past and ongoing training courses include:

**Short-term training program**

- Thai and German researchers joined forces towards innovative research for a sustainable bioeconomy and plant sciences, by National Science and Technology Development Agency (NSTDA) and Research Center Jülich (Germany)
  - Cassava roots in soil; non-invasive MRI analysis and field analysis to improve understanding of cassava root development
  - Analysis of cassava cultivars; improved performance of cassava plant establishment in the field
  - Plant analysis with smart phone; technology development to help scientists and farmers in plant performance analysis

- Plant Phenotyping: High Throughput Root Phenotyping, by National Science and Technology Development Agency (NSTDA) and Research Center Jülich (Germany)
- Thai-Israel short-term training program (consisting of a series of lectures and field practices) on "Smart Irrigation & Fertigation, and Precision Agriculture Technology", by National Science and Technology Development Agency (NSTDA), in collaboration with Kasetsart University (Thailand), Maejo University (Thailand), Agricultural Research Organization - the Volcani Center, Ben-Gurion (Israel) University of the Negav (Israel), and the Hebrew University of Jerusalem (Israel)
  - Irrigation and Fertigation (30 April - 4 May 2012)
  - Precision Agriculture Technology (20 - 21 March 2013)
  - Irrigation and Fertigation (30 September - 3 October 2013)
- Thai-Israel short-term training workshop on "Optimizing Crop Water and Nutrient Management" (16 -17 December 2014), by National Science and Technology Development Agency (NSTDA), in collaboration with Suranaree University of Technology (Thailand), the Hebrew University of Jerusalem (Israel) and Agricultural Research Organization (Israel)
- Thai-Israel collaborative research project and human resource development program on "Fertilizer Technology and Plant Nutrition", by National Science and Technology Development Agency (NSTDA), and Center for Fertilization and Plant Nutrition (Israel)

**Assistance requested (up to one page):**

*{Please describe here the scope and nature of the technical assistance requested from the CTCN and how this could help address the problem stated above and add value vis-à-vis the past and on-going efforts. Please note that the CTCN facilitates technical assistance and is not a project financing mechanism.}*

The requests for CTCN technical assistance for this project include:

**Capacity Building on precision farming to support resource utilization in agriculture**

The project requests the CTCN assistance on creating skill & knowledge on precision farming both in theoretical and practical implications. The training workshop will be suitable for academic, research institute, and private sectors. The workshop will include not only lectures, but also field practices on the application of technologies & tools are used within the series of workshops

Interested areas for capacity building include (but not limit to) :

- Plant phenotyping and physiology
- Hyper-spectral imaging technology
- Multi-spectral imaging technology
- Thermal imaging technology
- Sensor technology
- Geoinformatics
- Smart irrigation and fertigation

**Expected benefits (up to half a page):**

*{Please outline here the medium and long-term impacts that will result from the CTCN technical assistance, including how the assistance will contribute to mitigate and/or adapt to climate change.}*

Medium-term impacts:

- Increase the number of skilled researchers and experts on advanced precision farming technologies for adaptation to climate change
- Create with-in field resources maps (e.g. water map, nitrogen map) for agricultural relevant agencies to enhance implementation of advanced precision farming

**Long-term impacts:**

- Create a new paradigm on efficient use of resource in Thai agriculture
- Increase yields and profits for Thai farmers, resulting to the increase of agroindustry competitiveness

**Post-technical assistance plans (up to half a page):**

*{Please describe here how the results of the CTCN technical assistance will be concretely used by the applicant and national stakeholders, to pursue their efforts of resolving the problems stated above after the completion of the CTCN intervention (list specific follow-up actions that will be undertaken).}*

- A success case of pilot project and/or a full scale project that shows the impact of technological use in field.
- Decision making tools, such as water map and nitrogen map, used by related agencies for resource utilization
- Collaboration among government agencies such as Ministry of Agriculture and Cooperatives and other relevant organizations to ensure the use of advanced precision farming technology in field
- A research network of researchers/experts/practitioners in advanced precision farming technology to generate knowledge and share experiences in technology development

**Key stakeholders:**

*{Please list in the table below the main stakeholders who will be involved in the implementation of the requested CTCN technical assistance, and what their role will be in supporting the assistance (for example, government agencies and ministries, academic institutions and universities, private sector, community organizations, civil society, etc.). Please indicate what organization(s) will be the main/lead counterpart(s) of CTCN experts at national level, in addition to the NDE.}*

<b>Stakeholder</b>	<b>Role to support the implementation of the assistance</b>
National Science and Technology Development Agency, Ministry of Science and Technology (Government agency)	Implementing agency (making arrangements for training)
National Science Technology and Innovation Policy Office, Ministry of Science and Technology (Government agency)	Implementing agency (making arrangements for training) as NDE
Geo-Informatics and Space Technology Development Agency (Public organization), Ministry of Science and Technology (Government agency)	Participate, and contribute, in the training workshop
Hydro and Agro Informatics Institute, Ministry of Science and Technology (Government agency)	Participate, and contribute, in the training workshop
Land Development Department, Ministry of Agriculture and Cooperatives (Government agencies)	Participate, and contribute, in the training workshop
King Mongkut's University of Technology Thonburi (Academic Institution)	Participate, and contribute, in the training workshop
Khon Kaen University (Academic Institution)	Participate, and contribute, in the training workshop

Department of Agriculture, Ministry of Agriculture and Cooperatives (Government agencies)	Participate in the training as beneficiaries.
The Royal Irrigation Department, Ministry of Agriculture and Cooperatives (Government agencies)	Participate in the training as beneficiaries.
Kasetsart University (Academic Institution)	Participate in the training as beneficiaries.
Department of Water Resources, Ministry of Natural Resources and Environment (Government agencies)	Participate in the training as beneficiaries.
Department of Agricultural Extension	Participate in the training as beneficiaries.
Private Sector eg. farmer, SMEs	Participate in the training as beneficiaries.
University	Participate in the training as beneficiaries.

**Alignment with national priorities (up to half a page):**

*{Please demonstrate here that the technical assistance requested is consistent with documented national priorities (examples of relevant national priorities include: national development plans, poverty reduction plans, technology needs assessments (TNAs), LEDS, NAMAs, TAPs, NAPs, sectorial strategies and plans, etc.). For each document mentioned, please indicate where the priorities specifically relevant to this request can be found (chapter, page number, etc.)}*

During recent years, Thailand has concerned the impact of 'climate change' and has included related issues into key policies. The examples include:

- The 1st National Science Technology and Innovation Policy and Plan 2012 – 2021 (Ministry of Science and Technology) [Thai version]
- The 2nd National Strategy on Climate Change Management 2014 – 2018 (Ministry of Natural Resources and Environment) [Thai version]
- Climate Change Master Plan 2015 – 2050 (Ministry of Natural Resources and Environment) [Thai version]
- Research Strategy on Climate Change 2013 – 2016 (National Research Council of Thailand) [Thai Version]
- Agriculture Strategic Plan on Climate Change 2013-2016 (Ministry of Agriculture and Cooperatives) [Thai Version]

Besides the policy on climate change, Thailand has identified precision farming in agricultural sector as one of intention technologies.

- Thailand Technology Needs Assessments for Climate Change: Adaptation, 2012
- Thailand Submission to the Subsidiary Body for Scientific and Technological Advice (SBSTA) Views on Climate Change Adaptation for Agriculture, 2013
- Thailand INDC, 2015

**Development of the request (up to half a page):**

*{Please explain here how the request was developed at the national level and the process used by the NDE to approve the request before submitting it (who initiated the process, who were the stakeholders involved and what were their roles, and describe any consultations or other meetings that took place to develop and select this request, etc.)}*

The proposal is developed by National Science and Technology Development Agency (NSTDA) based on a project idea from TNA in agricultural sector, the precision farming agriculture technology. The stakeholders involved are Ministry of Agriculture and Cooperatives, and several academic

institutions. The development of this proposal was supported by the National Science Technology and Innovation Policy Office (STI) as Thailand's NDE.

**Expected timeframe:**

*{Please propose here a duration period for the assistance requested.}*

12 months

**Background documents:**

*{Please list here relevant documents that will help the CTCN understand the context of the request and national priorities. For each document, provide weblinks if available, to attach to the submission form while submitting the request. Please note that all documents listed/provided should be mentioned in this request in the relevant question(s), and that their linkages with the request should be clearly indicated.}*

- Thailand Technology Needs Assessments for Climate Change: Adaptation, 2012  
<http://unfccc.int/ttclear/templates/render cms page?TNR cre>
- Thailand Submission to the Subsidiary Body for Scientific and Technological Advice (SBSTA) Views on Climate Change Adaptation for Agriculture, 2013  
[https://unfccc.int/files/land\\_use\\_and\\_climate\\_change/redd/submissions/application/pdf/20131001\\_subm\\_thailand\\_agriculture\\_sbsta39.pdf](https://unfccc.int/files/land_use_and_climate_change/redd/submissions/application/pdf/20131001_subm_thailand_agriculture_sbsta39.pdf)

**Monitoring and impact of the assistance:**

*{Read carefully and tick the boxes below.}*

By signing this request, I affirm that processes are in place in the country to monitor and evaluate the assistance provided by the CTCN. I understand that these processes will be explicitly identified in the Response Plan in collaboration with the CTC, and that they will be used in the country to monitor the implementation of the CTCN assistance.

I understand that, after the completion of the requested assistance, I shall support CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

**Signature:**

NDE name: Mr. Surachai Sathitkunararat

Date: Nov 25, 2015

Signature: 

**THE COMPLETED FORM SHALL BE SENT TO THE [CTCN@UNEP.ORG](mailto:CTCN@UNEP.ORG)**

*Need help? The CTCN team is available to answer questions and guide you through the process of submitting a request. The CTCN team welcomes suggestions to improve this form.*

*>>> Contact the CTCN team at [ctcn@unep.org](mailto:ctcn@unep.org)*

