Introduction of Remote Sensing Solutions

—Field of Agriculture, Forestry and Fisheries —

一般財団法人リモート・センシング技術センター
Remote Sensing Technology Center of Japan

Under editing

This document lists up the solutions that Remote Sensing Technology Center is expected to be able to provide for social practice in the field of agriculture, forestry and fisheries, based on the analysis business conducted so far.

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1.Diagnosis for rice cultivation support

For Large-scale farmers, Agricultural Corporative, Agricultural extension, Local government

Service overview

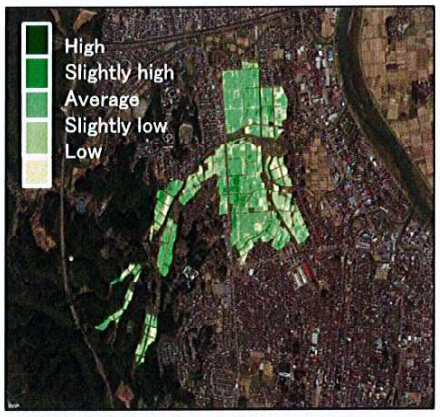
It will clarify algorithms of soil productivity, plant height, grass color, harvest season, ingredient content by optical analysis of satellite image. And it will assess comprehensively growing condition of rice field, condition of fertilizer, harvesting period, taste etc. This diagnosis information is provided in a wide area at low cost compared to diagnosis using drone. Moreover, original diagnosis with high precision is also possible by model analysis combining field survey and drone analysis.

Available Service

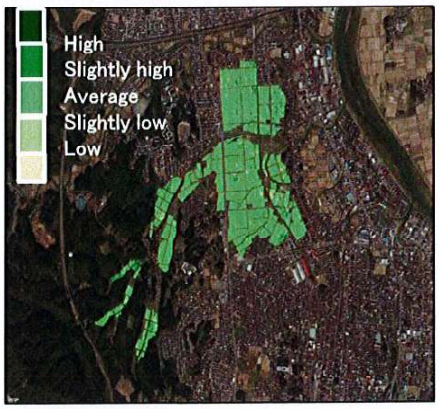
Diagnosis of soil productivity, Ear manuring, Growth diagnosis(plant height・number of stem・grass color), Yield diagnosis (diagnosis of grain weight and granulating rate), Diagnosis of proper harvesting time, Taste diagnosis (protein content)

Analysis Example

Soil diagnosis (corrosion content)



Protein content diagnosis



Standard reference price for service provision

Analysis by satellite image（No teacher data）	Calculating /1㎢
Analysis by satellite image（With teacher data）	Calculating /1㎢
Analysis by drone image（With teacher data）	Calculating /1㎢

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2.Projection of rice yield

For Agricultural extension, Statistics agency, Local government

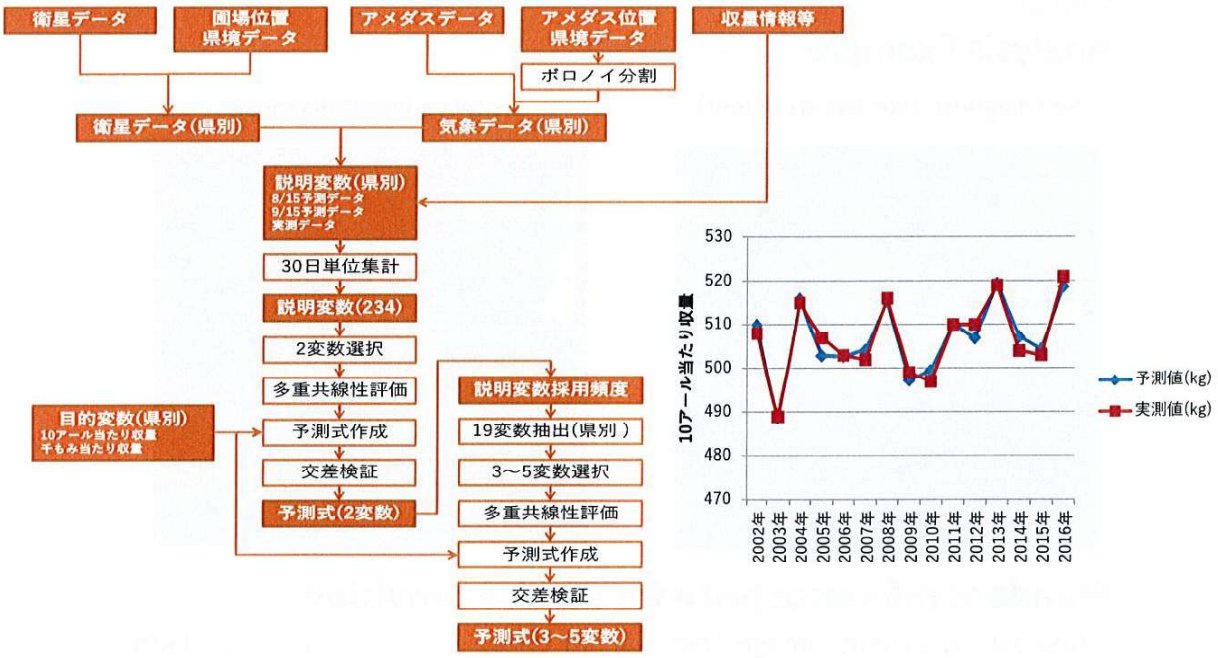
Service overview

This service estimates yield of paddy rice during growing by machine learning using satellite meteorological data. The yield is estimated by prefecture unit, and it is a pre-condition of service provision that past yield data (yield per 10a) is prepared

Available Service

The expected yield as of July 15, August 15, September 15, and Harvesting time.

Analysis Method



Standard reference price for service provision

Appointed date	Calculating	/1 prefecture
All growing period and harvesting time	Calculating	/1 prefecture

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3.Estimation of rice planted area

For Statistics agency, Local government

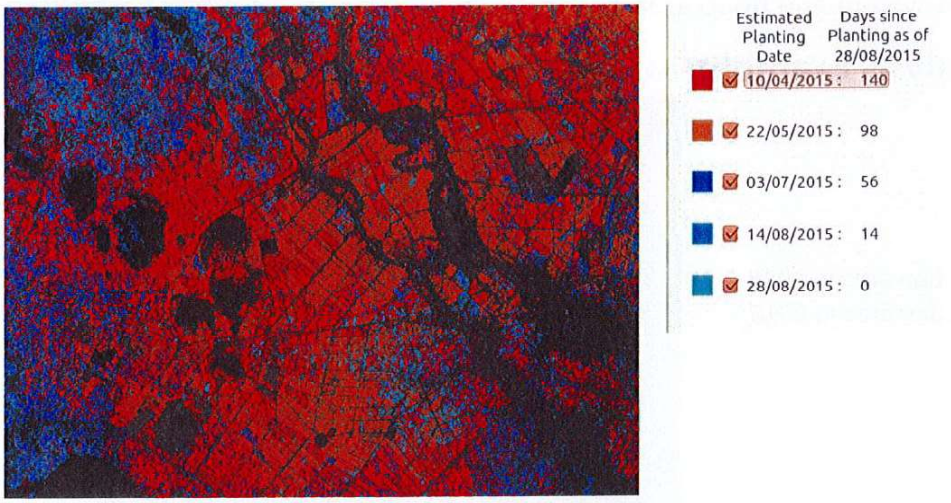
Service overview

The planting area of paddy rice is estimated by satellite image radar analysis. It also provides the rice planting map that overlays the globe system and planting field. The estimation unit is municipalities. It is also possible to estimate by different planted time like early or late planting.
Although the analysis of other crops out of paddy can also be made, the estimation accuracy is lower than that of paddy rice.

Available Service

Planted area and planting map of paddy rice by municipalities

Analysis Example



Standard reference price for service provision

Planted area and planting map　　Calculating　/1 municipality

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4. Assessment of Irrigation Project

For Land improvement office, Local government, Overseas

Service overview

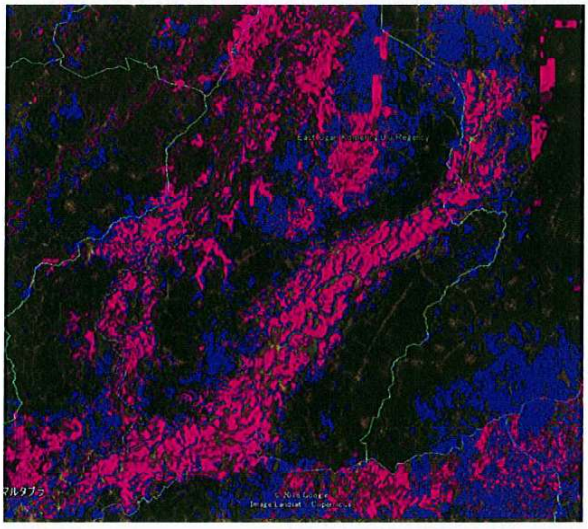
When irrigation facilities become obsolete, various troubles occur, and water will not go to the terminal canal and it will be less than the planned irrigation area. By analyzing the satellite image from the past, it becomes clear whether irrigation works well, or where the area is not functioning, and maintenance of irrigation facilities etc. can be done efficiently. Since it is done by radar analysis, it will be an evaluation of the irrigation project for paddy fields.

Available Service

The provision of irrigation map and estimated irrigation area value overlaying globe system and flood area.

Analysis Example (Indonesia Sumatra Comelin Irrigation project)

Blue Irrigation area in 2008
Pink Irrigation area in 2016



Standard reference price for service provision

Analysis by satellite image (single year) Calculating /10km²

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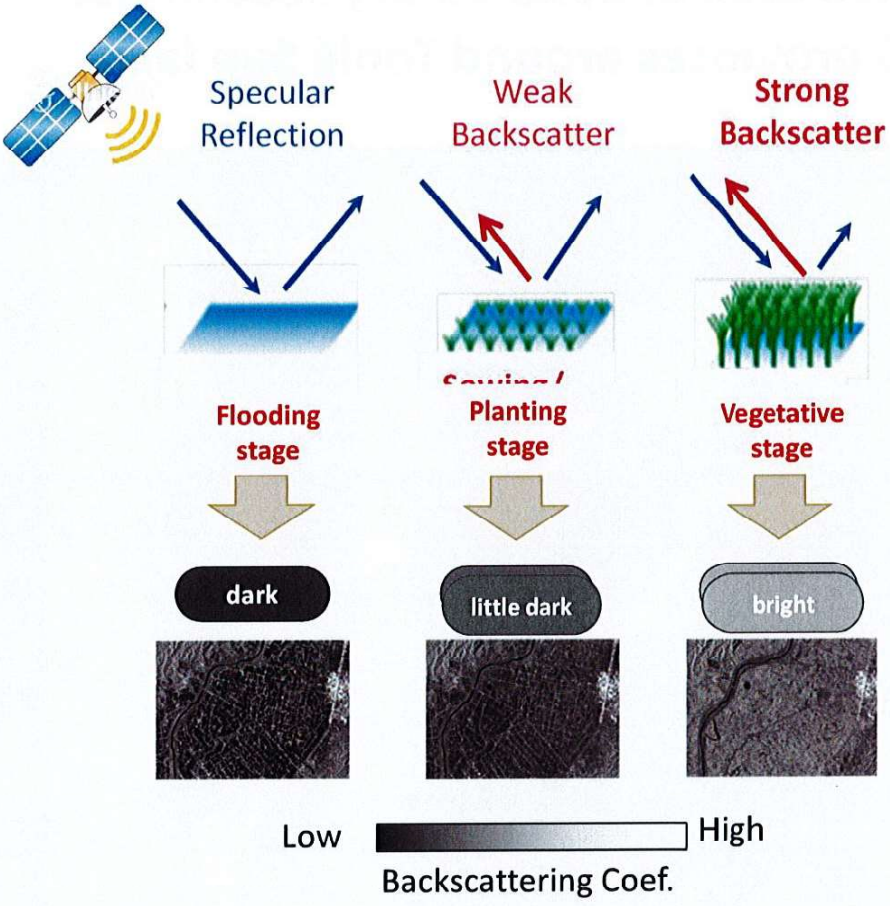
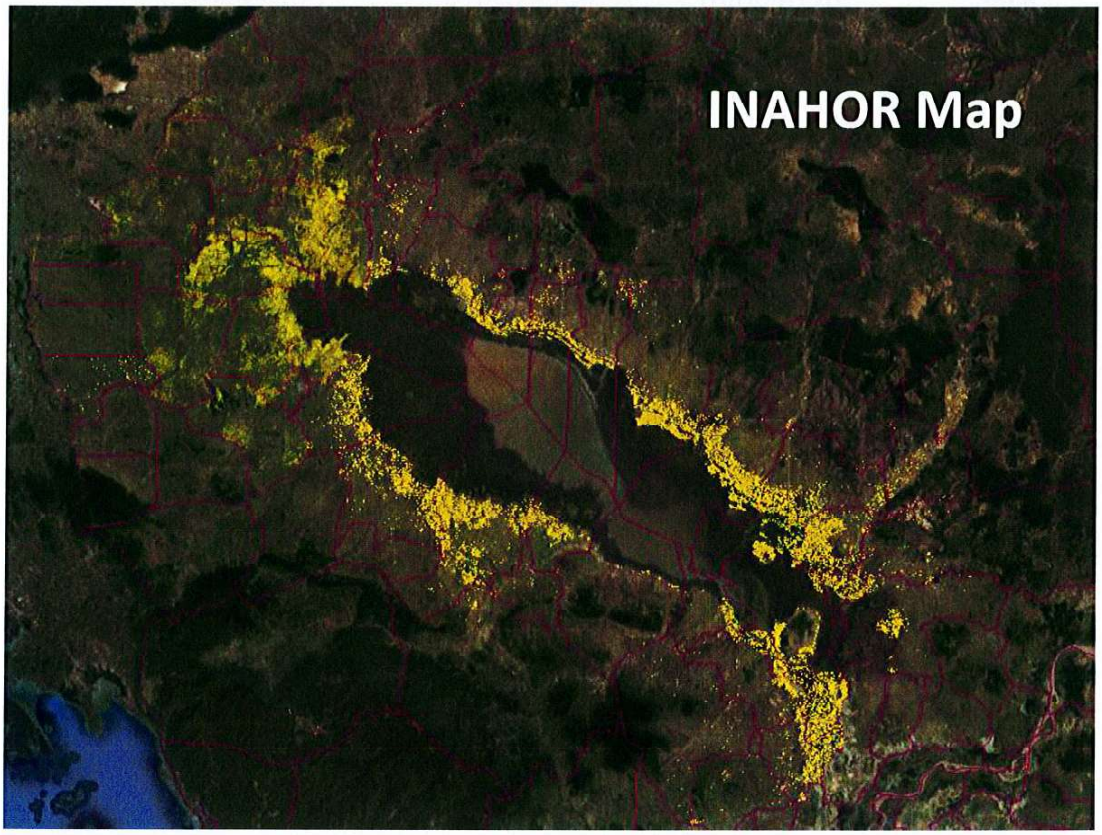
(Reference). INAHOR system

Backscatter on rice paddy

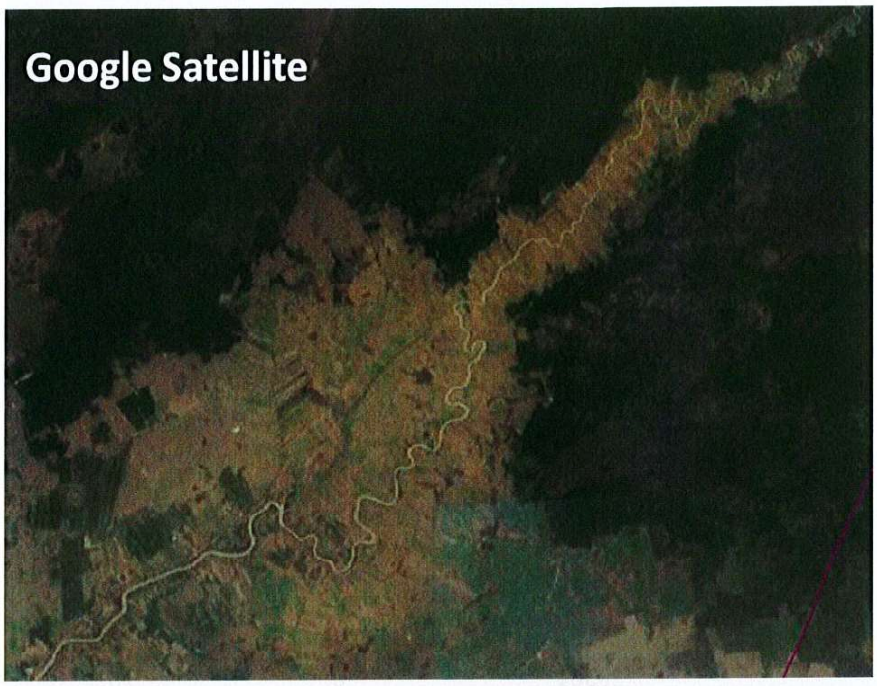


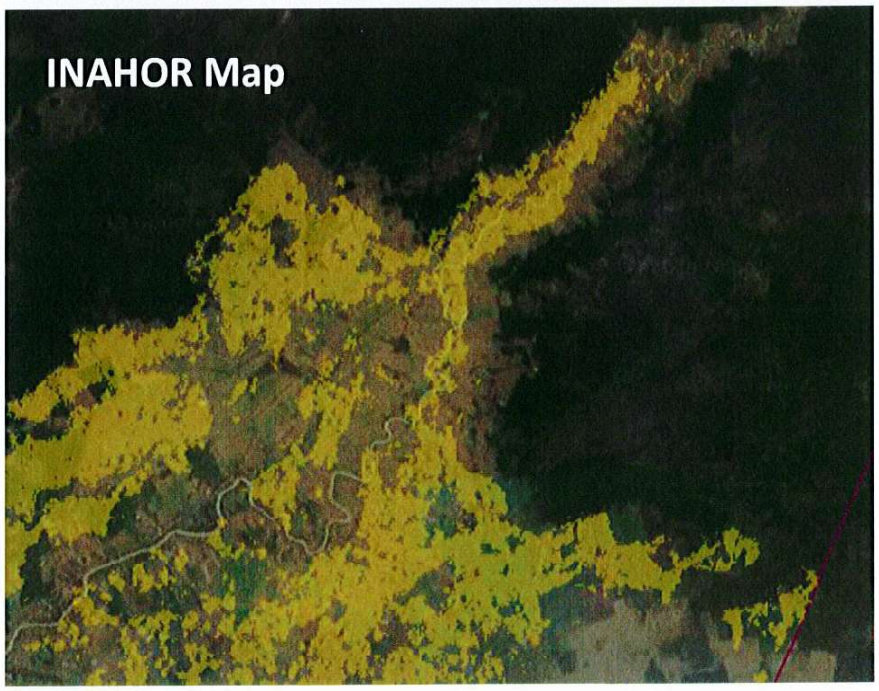
(Reference). INAHOR system

Planted area of 2018-19 dry season rice in 6 provinces around Tonlé Sap lake



(Reference). INAHOR system





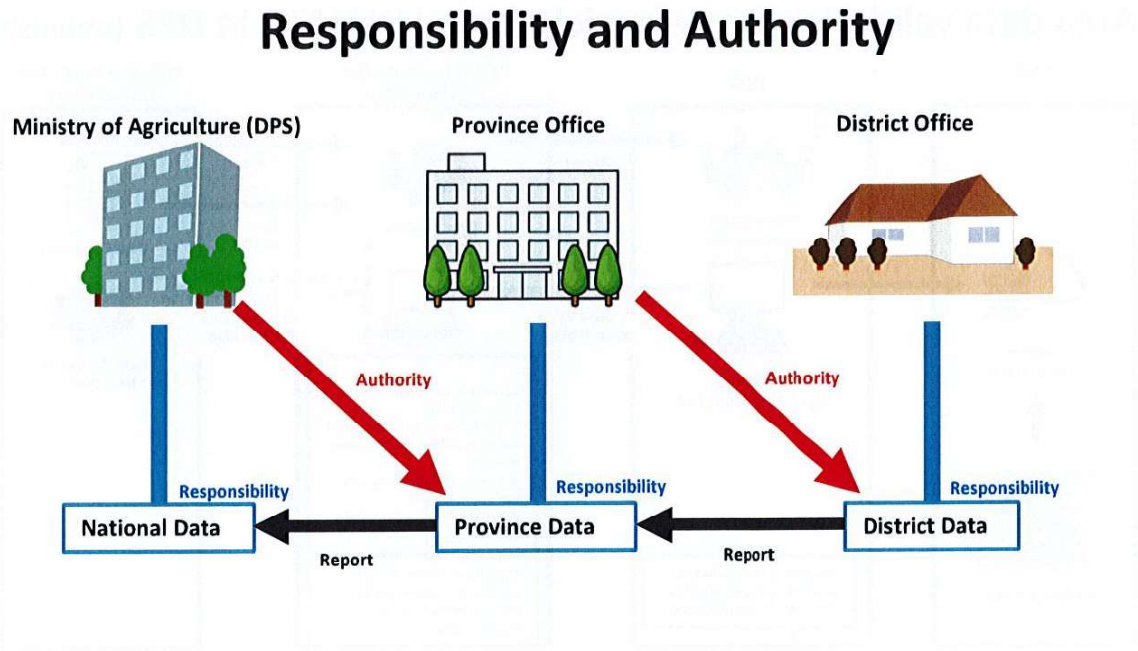
(Reference). INAHOR system

Comparison of reported value and INAHOR value
- Banteay Meanchey province -

Dist_Name	Total area (ha)	Reported Area (ha)	INAHOR Area (ha)	Reported/ INAHOR
Mongkol Borei	114254	19975	14792	1.35
Phnum Srok	125105	5810	5757	1.01
Preah Netr Preah	164640	17803	21297	0.84
Ou Chrov	135064	340	1169	0.29
Serei Saophoan	75131	2674	3028	0.88
Thma Puok	228381	0	576	-
Svay Chek	143117	723	1168	0.62
Malai	132717	100	185	0.54
Paoy Paet		200		-
Total	1118409	47625	47972	0.99

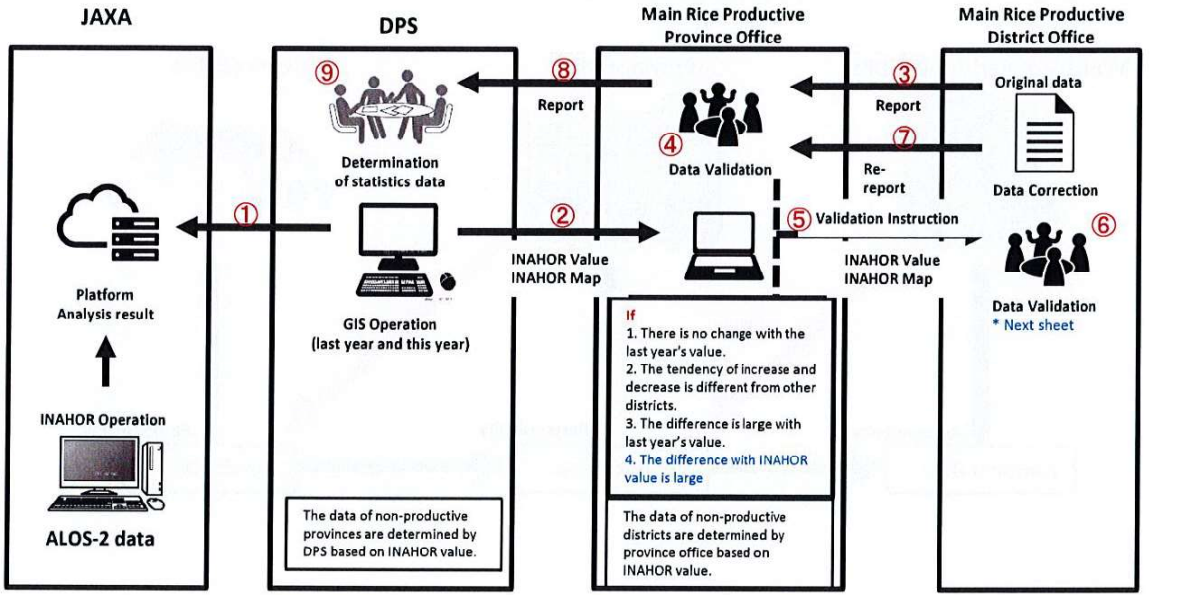
Note: Total area is estimated by INAHOR

(Reference). INAHOR system



(Reference). INAHOR system

Area data validation framework by using INAHOR in DPS (unfinished)



5.Judgment of devastation field

For Land management bureau, Agricultural extension, Local government

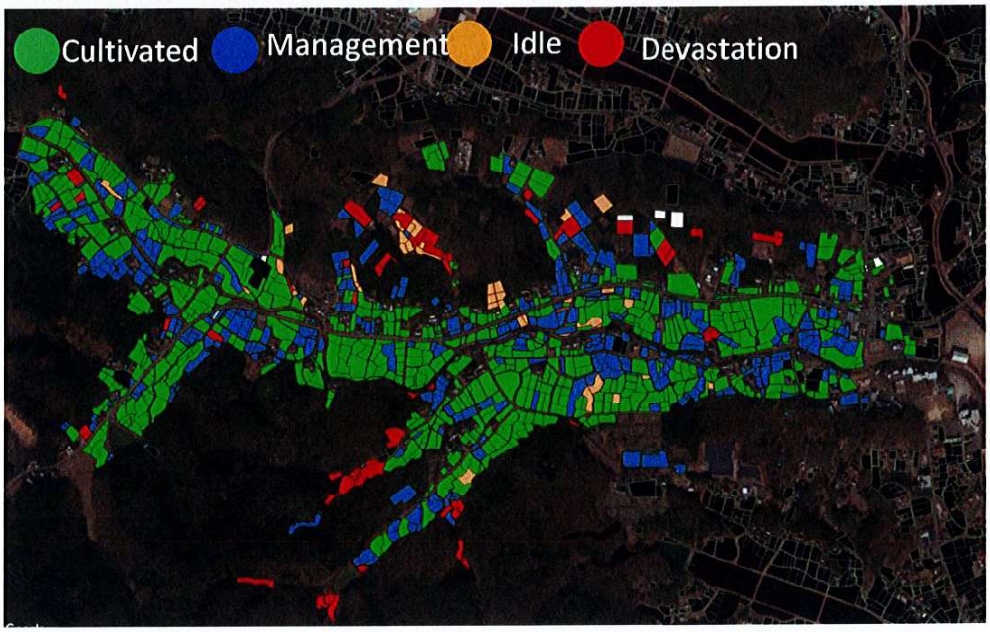
Service overview

This service observes the cropping condition of agricultural field by using satellite image. And it judges cultivated field, devastation field, idle field, etc. by each field by using optical analysis. Analysis is done by municipal units.

Available Service

It provides the result of judging of land use condition such as cultivated field, devastation field, idle field, etc. by lot number. Moreover, it will provide the land use condition map.

Analysis Example



Standard reference price for service provision

Calculating /1municipality

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6. Diagnosis for plum growing（Concavity disease）

For Large-scale farmers, Agricultural Corporative, Agricultural extension

Service overview

This service provides thermal infrared sensing of plum forests using drones and grasps fruit temperature at harvest time to prevent the inclusion of “concavity disease” fruit, which is a physiological disorder of plum

Available Service

This service provides a field thermal infrared map by time of harvest and estimates the appropriate harvest time depending on the field environment and the direction of plum trees. The harvesting can be done while preventing the occurrence of “concavity disease” by using this service.

Analysis Example

Standard reference price for service provision

Calculating /10a

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7. Diagnosis for Plum Pox Virus

For Large-scale farmers, Agricultural Corporative, Agricultural extension, Local government

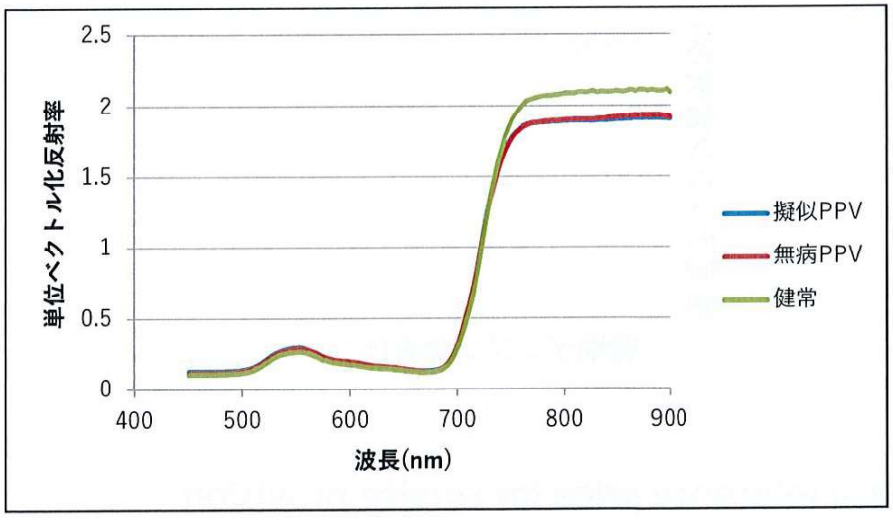
Service overview

The spread of plum pox virus (PPV) is a serious disease that leads to wide-area logging of plum trees. In addition, the loss of tourism resources such as the Ume Festival gives a serious impact for the local economy. This service provides near-infrared sensing of plum forests using drones and enables early detection of plum trees which suspected of being infected by using PPV diagnostic algorithm based on spectrum measurement and analysis of PPV.
This service supports the production activities of plum farmers and reduces the burden of surveillance surveys by local government staffs

Available Service

Identify plum trees which suspected of being infected and provide a plum forest diagnostic map.

Analysis Example



Standard reference price for service provision

Calculating /10a

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8.Diagnosis of sweet potato growing

For Large-scale farmers, Agricultural corporative, Agricultural extension

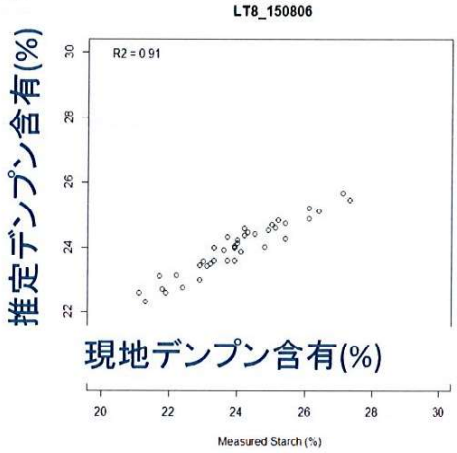
Service overview

The growth of sweet potato roots is related to the growth of above-ground parts (stems and leaves). By using spectroscopic analysis of stem and leaf growth using remote sensing technology, the starch content of each field can be estimated before the harvesting. Therefore, it is possible to improve starch content by estimating the corrosive content of the field and taking measures to improve soil capabilities strength. This service supports the improvement of quality of sweet potatoes by performing growth diagnosis such as image analysis and spectral analysis using satellites and drones.

Available Service

Providing results table and field map estimating starch content and corrosion content

Analysis Example



Standard reference price for service provision

Analysis by satellite image（No teacher data）	Calculating /10a
Analysis by satellite image（With teacher data）	Calculating /10a
Analysis by drone image（With teacher data）	Calculating /10a

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9.Agricultural meteorological information by satellite

For Statistics agency, Agricultural extension, Local government, Research Institution, Overseas

Service overview

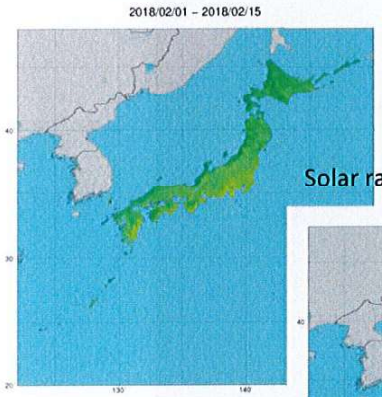
This service provides precipitation, solar radiation, surface temperature, soil moisture, water index, and vegetation index by prefecture which observed by various satellite (by state in overseas). In addition, it is possible to customize it by municipality. The data is updated twice per month.

Available Service

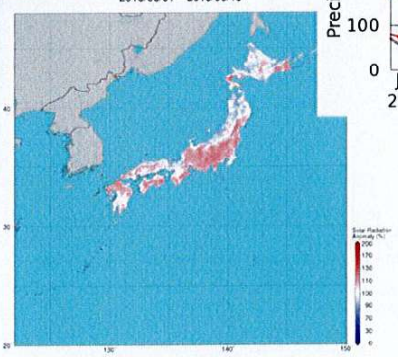
Current map and Anomaly map, Time series graph, past data (2002 -) of each weather index

Analysis Example

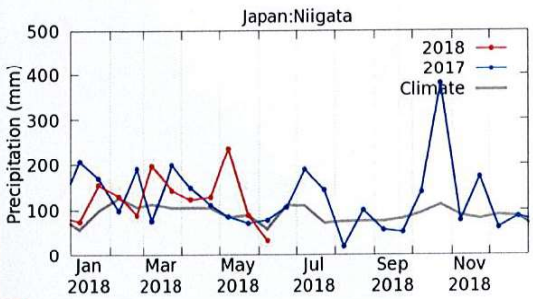
Solar radiation current map



Solar radiation anomaly map



Precipitation graph



Standard reference price for service provision

Calculating /1prefecture (state)

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10.Support of Forest management plan preparation

For Forest owner, Forest corporative, Local Government, Overseas

Service overview

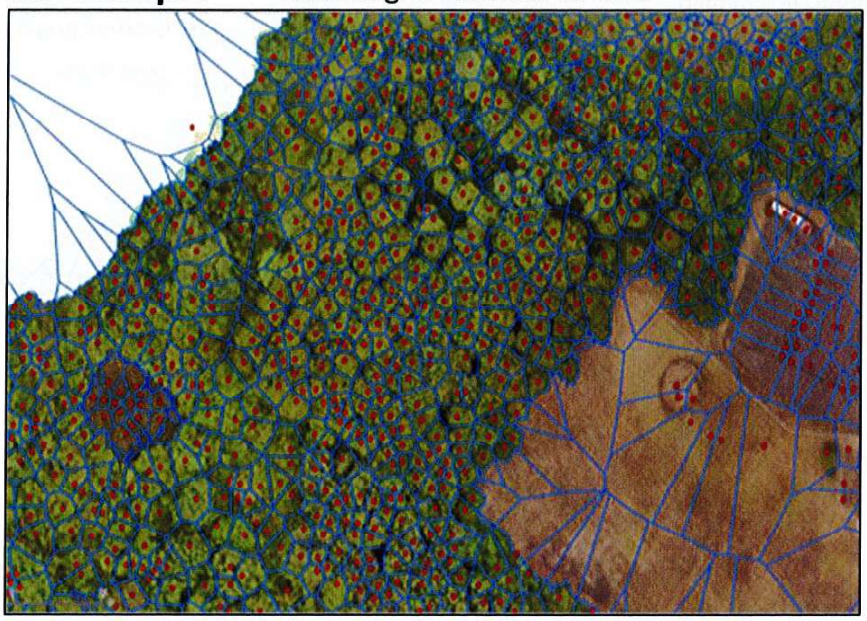
Field survey and standing tree survey are essential work for forest planning. For the purpose of labor reduction of these surveys, it will conduct forest vegetation analysis using drone sensing.

Available Service

Provision of forest map judging number of tree and tree species

Analysis Example

Counting of number of tree



Standard reference price for service provision

Optical analysis by drone radar Calculating /1ha

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11.Mesurement of Forest floor biomass

For Forest corporative, Local Government

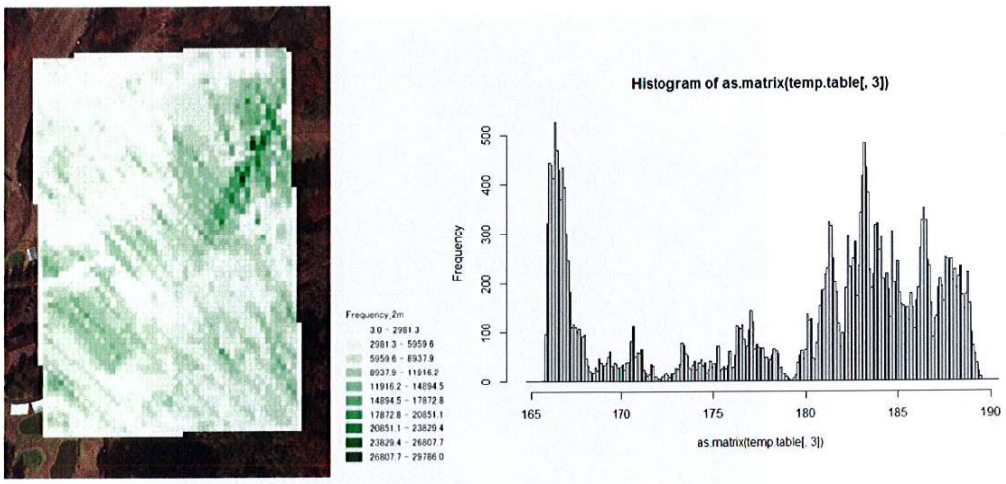
Service overview

From the viewpoint of natural vegetation, forest floor biomass is important and also it has the function of protecting the surface soil and water retention in forest. Although it has been said that it is difficult to do remote sensing the situation in the forest which there are leaves, the measurement of forest floor biomass in the forest can become doing by performing close observation by drone-mounted radar.

Available Service

Forest floor biomass image pictures and measurement results

Analysis Example



Standard reference price for service provision

Radar analysis by drone Calculating /1ha

12.Distribution analysis of marine forest and tideland

For Fisheries corporative, Local Government

Service overview

In recent years, the importance of the functions of marine forest and tidelands for marine conservation has been recognized, and there is a social demand for the active conservation and creation of marine forests. This service classifies the ocean floor using optical sensor data from satellite images and provides a distribution map of marine forests and tidelands.

Available Service

Marine forests / tidelands distribution map with overlay of globe system

Analysis Example

Standard reference price for service provision

Analysis by satellite image（No teacher data）	Calculating / 1㎢
Analysis by satellite image（With teacher data）	Calculating / 1㎢

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13.Distribution analysis of coral reef

For Environmental NPO, Business Operator, Local Government

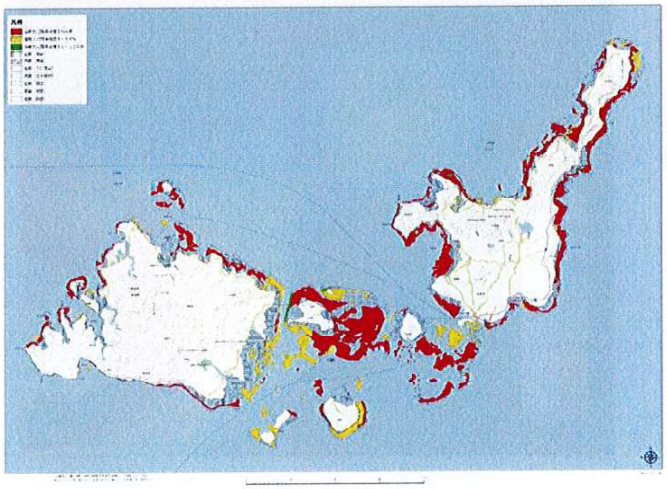
Service overview

Coral reefs are called “sea tropical forests” and “ocean oasis” and provide a home for various creatures and spawning grounds and play an important role in marine ecosystems. In recent years, the disappearance of coral reefs is concerned due to the effects of climate change and the occurrence of giant starfish. This service contributes to the ocean conservation activities by analyzing the distribution of existing coral reefs by performing satellite image analysis and spectral analysis.

Available Service

Provision of coral reef maps.

Analysis Example



Standard reference price for service provision

Analysis by satellite image（No teacher data）	Calculating / 1km²
Analysis by satellite image（With teacher data）	Calculating / 1km²

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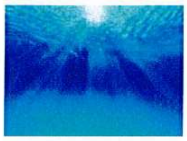
14.Analysis of water depth



For Business Operator, Local Government

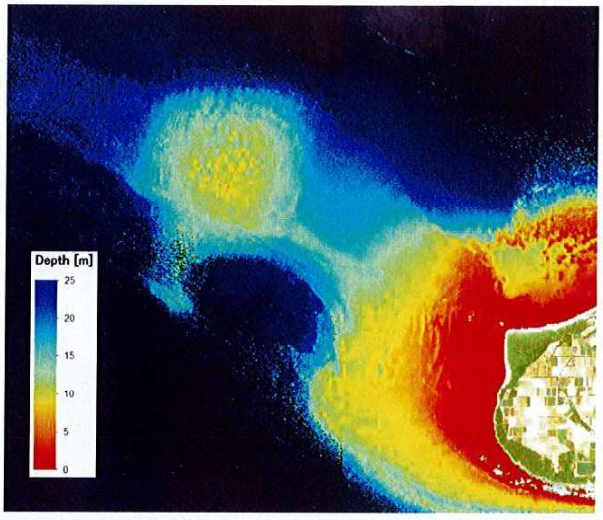
Service overview

Estimate water depth using the difference in radiance of light in water.
Estimated water depth using satellite images can be expected to be used for academic surveys such as surveys of obstructions at the time of disasters such as earthquake, reference maps according to nautical charts, creation of contour maps of areas without nautical charts, and tsunami simulations.

Available Service

Provision of satellite image estimated water depth (SDB) map

Analysis Example



Standard reference price for service provision

Analysis by satellite image（No teacher data）	Calculating / 1 km²
Analysis by satellite image（With teacher data）	Calculating / 1 km²

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