Research Topics

1. A Soil Extraction Method that Can Predict the Concentration of Residual Dieldrin in Cucumbers

Abstract

The concentration of soil dieldrin obtained by extraction with 50% methanol/water (the percentage of methanol in water by volume) is capable of predicting residual dieldrin in the cucumber plant body regardless of the soil type.

Background and Purpose

In recent years dieldrin in cucumbers has been detected at concentrations above the residual pesticide standard, and producing areas have been forced into responses that include voluntary production curbs. We therefore investigated the relationship between dieldrin concentrations in field soil and in cucumber plant bodies, and examined methods of extraction from soil that can, before cultivation, predict the cucumber dieldrin concentration.

Description

We grew cucumbers (cultivar: Sharp 1) in pots containing various soils whose dieldrin concentration and total carbon (T-C) varied. We investigated the relationship between T-C and the rate of transfer of dieldrin to stems and foliage and found a negative correlation, which suggested that in soil with high T-C, dieldrin is strongly adsorbed and is transferred to cucumbers with difficulty (Fig. 1). Accordingly, to predict residual dieldrin concentration in cucumbers, we explored methods that can obtain dieldrin extraction rates corresponding to soil T-C.

We performed extractions on the aforementioned soil using various ratios of methanol/water mixtures (0–100% methanol by volume) and found a negative correlation between the dieldrin extraction rate and T-C (Fig. 2).

The regression lines obtained from the concentration of soil dieldrin extracted with each of the methanol/water mixtures of various ratios and the concentrations of residual dieldrin in cucumber stems and foliage (cultivar: Sharp 1) showed that extraction with 50% methanol/water was the extraction method capable of optimally predicting the residual dieldrin concentration in plant bodies no matter what type of cultivation soil was used (Table 1, Fig. 3).

So that this method will be used to judge whether soil is suitable for growing cucumbers, we are currently carrying out verification experiments jointly with regional agricultural research institutions on the method's applicability for predicting the residual dieldrin concentration in cucumber fruit.

Part of this research is from a Ministry of Agriculture, Forestry and Fisheries' commissioned research project: "Research project for ensuring food safety (Development of risk mitigation technologies of POPs in vegetables)"

Research project name: Organic Chemicals Risk Assessment RP

Researchers: Organochemicals Division, N. Seike,T.

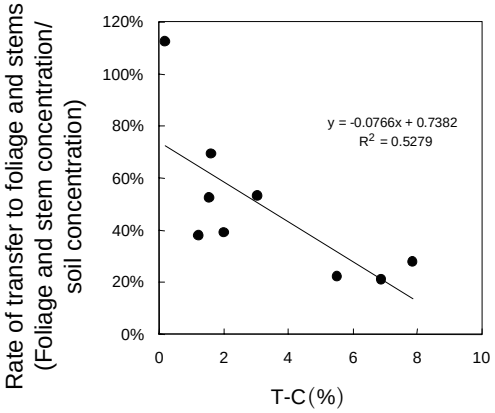


Fig. 1 Relationship between rate of dieldrin transfer from soil to cucumber stems and foliage (soil–cucumber dieldrin concentration ratio) and soil TC.

Transfer rate of dieldrin to the aboveground parts differs according to soil TC. We found that the higher the soil TC, the more difficult it is for the dieldrin to be transferred to the aboveground parts.

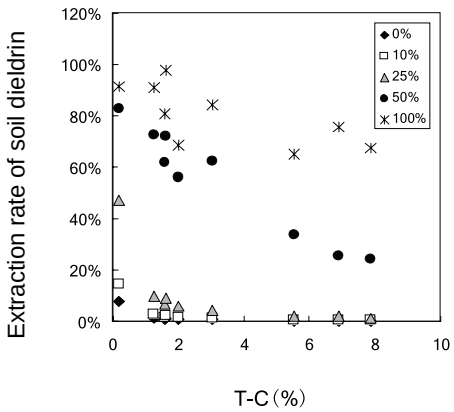


Fig. 2 Relationship between the soil dieldrin extraction rate using various methanol/water mixtures and T-C.

We extracted dieldrin from soil with methanol/water mixtures (methanol percentages of 0%, 10%, 25%, 50%, and 100% by volume). By doing so we discovered that there is a negative correlation between the extraction rate and soil TC, and that the higher the soil TC, the more difficult it is to extract dieldrin.

Table 1 Relationship between the concentration of soil dieldrin extracted with different solvents and the concentration of residual dieldrin in cucumber stems and foliage.

Solution	Percentage (%)	Slope	Intercept	r^2	Pvalue
Methanol	0	13	0.050	0.123	0.355
Methanol	10	7.7	0.470	0.166	0.277
Methanol	25	3.0	0.038	0.321	0.112
Methanol	50	0.62	0.015	0.918	0.0001
Methanol	100	0.31	0.020	0.719	0.004
Acetone	100	0.21	0.024	0.735	0.003

The soil dieldrin concentration obtained by extraction with a 50% methanol/water mixture best expresses the differences in cucumber dieldrin concentration. By applying this to find the soil concentration before cultivation, one can judge the soil's suitability for cultivation. We have applied for a patent on this technology.

Otani, M. Sakai, H. Murano

Published article: Seike N., et al., Patent application filing number 2008-199462

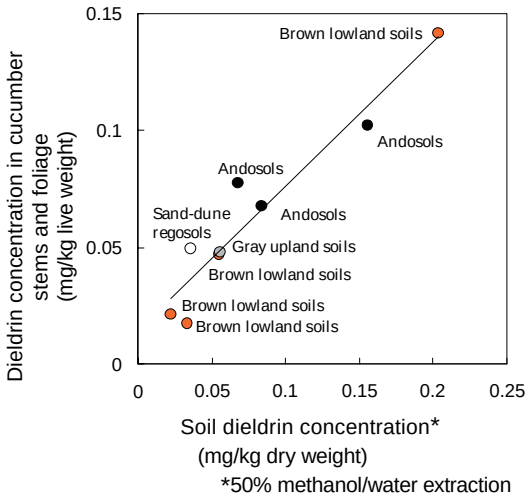


Fig. 3 Relationship between soil dieldrin extracted with 50% methanol/water and residual dieldrin concentration in cucumbers.

This method can be used no matter what the soil type. Because residual dieldrin concentration differs according to the rootstock cultivar, when predicting concentration it is necessary to prepare a regression formula for each rootstock cultivar.

2. A mold isolated from plant leaf powerfully decomposes biodegradable plastic

Abstract

We found that molds (filamentous fungi) that live on the leaf surfaces of Gramineae crops have an activity to decompose biodegradable plastic. A mold selected in this research showed high capability to decompose biodegradable plastic. To take advantage of its characteristics, there are expectations for the development of technologies to accelerate the degradation of used plastics.

Background and Purpose

To reduce the labor costs and energy consumption amount for collecting and disposing of plastic waste, which exhausted from various industries including agriculture, efforts are being made to introduce biodegradable plastic. However, the used biodegradable plastic is often decomposed slowly than expected. Owing to such problems, farmers have required to develop new techniques to expedite the decomposition of biodegradable plastic materials. We focused on the fact that the chemical structures of biodegradable plastic resemble the structure of the substrates which covers the surface of plant leaves. In this study, we tried to isolate molds living on the surface of plant leaves that were highly capable of decomposing biodegradable plastic.

Description

From plant leaves we succeeded in isolating molds with the powerful ability to decompose biodegradable plastic using a special screening method for biodegradable plastic degraders. In the isolation method, at first, we prepared an agar medium which contained biodegradable plastic emulsion as a sole carbon source. Next, we washed leaves and poured the washing fluid onto the agar medium. After incubation for several days, we isolated the mold strains from the colonies surrounded by the transparent areas where the milky white biodegradable plastic emulsion had been degraded (Fig. 1). Using this method, we selected various mold strains with the ability to decompose biodegradable plastic from the leaves of Gramineae crops.

Among these molds, we found one strain (strain 47-9) that showed particularly strong degradation activity for biodegradable plastic. This mold powerfully decomposed biodegradable plastic films for agricultural applications which were made from polybutylene succinate (PBS) or poly(butylene succinate-*co*-butylene adipate)(PBSA) (Fig. 2). Of all the microorganisms screened by this method, this mold has a particularly great decomposition ability, and an excellent characteristic; in liquid culture media it can produce large amount of a degradation enzyme for biodegradable plastic in high purity.

We sprayed the enzyme fluid of this mold over the biodegradable plastic film (PBSA) that had been placed over commercially available potting soil. Six days after

treatment, 91.2% of the plastic (by weight) had been decomposed (Fig. 3). There are expectations that application of this mold and enzyme will lead to the development of a new technology that will expedite the decomposition of used biodegradable plastic products. Specifically, we are going to work on the development of a technology to decompose plastic mulch film in controlled greenhouse environments without having to remove the film.

Research project name: Semiochemicals Ecological Functions RP

Researchers: Environmental Biofunction Division, M. Koitabashi, H. Kitamoto, T. Fujii, S. Tsushima, Biodiversity Division, K. Suzuki

Published article: Koitabashi, M. et al., Patent application filing number 2008-250869 (2008)

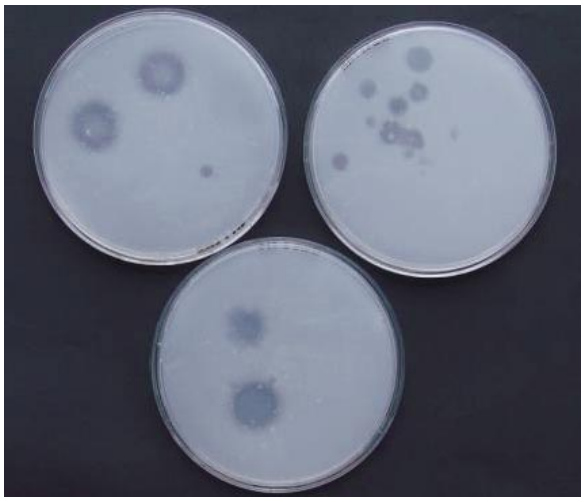


Fig. 1 Selection of molds that decompose biodegradable plastic.
Colonies of molds that decompose biodegradable plastic are surrounded by the transparent area .

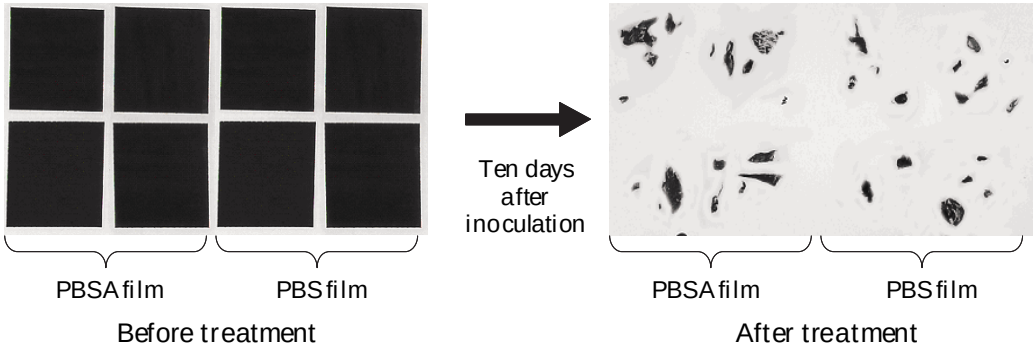


Fig. 2 Decomposition of PBSA or PBS films by strain 47–9 applied on agar medium.
The biodegradable plastic film has been decomposed by the mold, and hardly any of it remains.

Fig. 3 Decomposition of biodegradable plastic film (PBSA) placed over potting soil by application of the enzyme produced by strain 47–9.
Left: Ten days later, with no application.
Center: Six days after application.
Right: Ten days after application.

3. Development of an Automatic Greenhouse Gas Sampling system

Abstract

We developed an automatic sampling system for greenhouse gases emitted from farmland. This device will be of service in more accurately estimating flux of greenhouse gases emitting from farmland, and in developing ways to reduce emissions.

Background and Purpose

Because there is great seasonal change in the flux of greenhouse gases emitting from farmland, it must be measured very frequently throughout the year to accurately quantify it. But the large amount of labor required by the manual sampling methods primarily used until now made it difficult to perform measurements with sufficient frequency and over sufficiently long time periods. Although the NIAES greenhouse gas emissions control facility is capable of making very frequent measurements throughout the year, its large size and stationary nature mean it cannot be moved to other fields. Our aim was therefore to develop a portable automatic sampler.

Description

With the manual closed-chamber method,* people perform all the operations from installing the chamber to sampling gases, which makes the operation labor-intensive. By contrast, our newly developed sampler can sample gases at preset times in the automatically opening and closing chamber installed in a field, and automatically inject samples into evacuated vials, thereby considerably reducing the labor required. With manual sampling, for example, taking samples once a day with six chambers would require a total of at least 10 h during 10 days, whereas with automatic sampling the required time would be only about 1 h for loading and collecting the vials. Therefore, less than one-tenth the time is needed. Tests with reference gases confirmed that our sampler's precision is equivalent to that of manual sampling (carbon dioxide, r^2=0.998; methane, r^2=0.999; nitrous oxide, r^2=1.00). With our sampler, the flux of greenhouse gases emitted from farmland can be measured very frequently and throughout the year.

Further, combining this sampler with the automated analyzer for three greenhouse gases (*NIAES Research Executive Summary for 2007*, p. 16-17) makes possible more efficient monitoring of greenhouse gas flux. And because this sampler is portable (390 mm × 590 mm × 870 mm in height including the installation platform and sun shield; total weight about 50 kg), it can be installed in many different kinds of fields. There are expectations that this will bring substantial progress in research on ways to reduce greenhouse gas emissions from farmland.

* Closed-chamber method: A widely used method for measuring flux of greenhouse gas from farmland. The method entails placing a chamber (a bottomless container) in a field, sampling the air inside the chamber at regular intervals, and quantifying flux by analyzing the greenhouse gas concentrations of the samples.

Research project name: Greenhouse Gas Mitigation RP
Researchers: Carbon and Nutrient Cycles Division, H.

Photo 1 Researcher performing manual sampling. The manual sampling method, which has been used primarily until now, requires that people do everything from installing the chamber to taking samples, and therefore was labor-intensive.

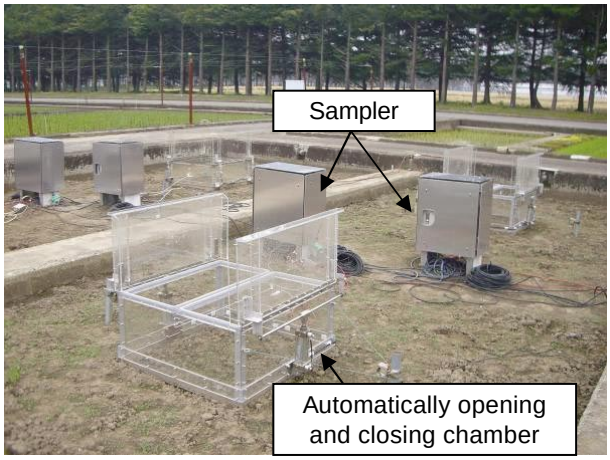


Photo 2 Automatic sampling system

- Developing a device that automatically takes samples at preset times substantially improved efficiency. It requires less than one-tenth the time needed for manual sampling.
- The device is used in combination with an automatically opening and closing chamber.

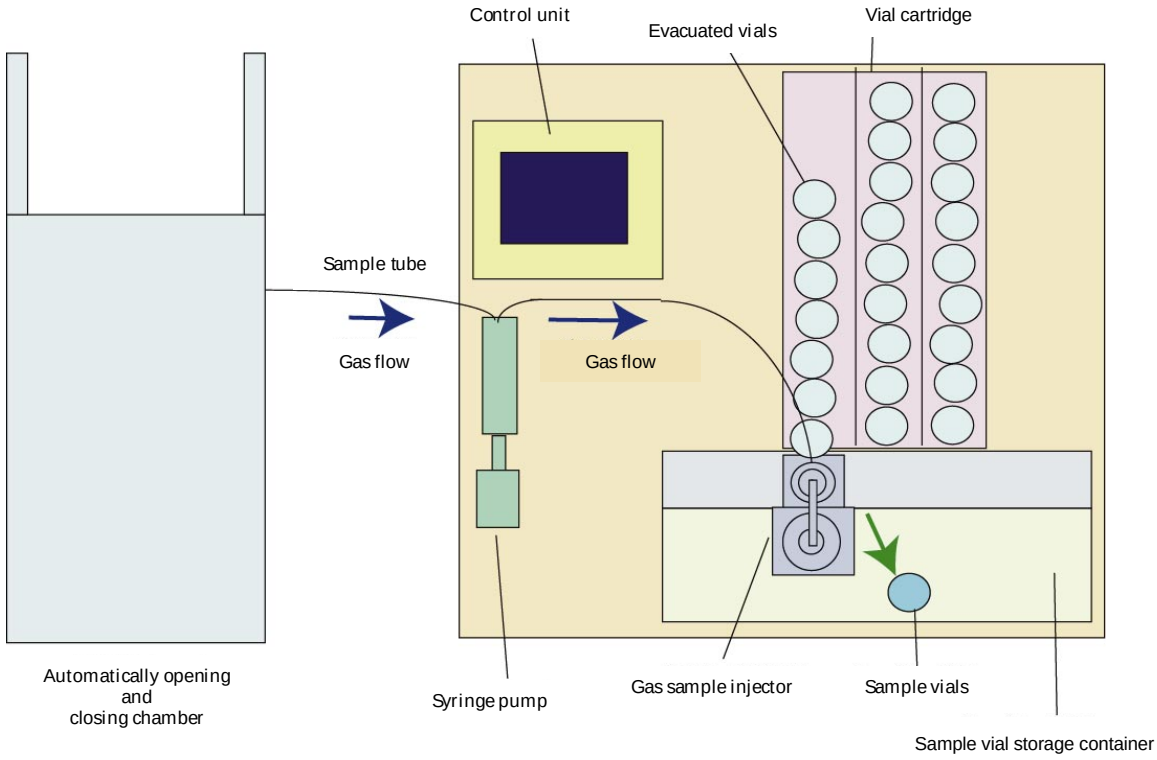


Fig. 1 Schematic diagram of automatic greenhouse gas sampler (patent pending).

• At a preset time, a syringe pump takes a gas sample from the chamber, which opens and closes automatically, and automatically injects it into an evacuated vial.

• The vial with sample drops into a vial storage container below the gas sample injector. Sample vials are periodically collected and used for analysis.

Akiyama, S. Sudo, T. Tanonaka (Green Blue Co., Ltd.), A. Hayakawa, K. Yagi

Published article: Akiyama H., et al., Patent application filing number 2008-011540

4. Development of an Internet System for Viewing Land Use around the Kanto Region in the Early Meiji Era

Abstract

We developed a way to computerize the "Rapid Survey Maps," which are maps made about 120 years ago in the early Meiji Era, and used open-source Web GIS software to publicly release the "Historical Agro-Environmental Browsing System" (HABS) for the purpose of viewing and using the maps on the internet.

Background and Purpose

The "Rapid Survey Maps" are maps surveyed in the early Meiji Era. Those maps made of the Kanto region in particular use color to differentiate land use categories, and they also note tree species. They are therefore valuable documents for learning the land uses and landscapes of 120 years ago (Fig. 1). These maps can be used as basic source materials for research on agriculture and farming villages, and in guiding activities for the

Fig. 1 The Rapid Survey Map of the Ushiku pond area of Ushiku City, Ibaraki Prefecture. The "rapid survey" in the name of the maps derives from the "rapid survey map method," which means that the surveying was done quickly.
(from the collection of the Geographical Survey Institute; prepared from the 1:20,000 Rapid Survey Map original).

preservation of community-based "*Satoyama*" woodland. For that reason we decided to develop a system that allows these Rapid Survey Maps to be widely used by the public.

Description

The Rapid Survey Maps made of the Kanto Plain are printed on paper, and in all come to about 900 sheets. We first developed a method of merging those maps and created one large composite image that joins them all. We then used Geographic Information System (GIS) software to add geographical coordinates and make the composite into a computerize map. Although some places on this computerize map do not coincide with present day maps, they are sufficiently accurate to see the changes in regional land use. For viewing this computerize map on the internet, we then used open-source Web-GIS software, which is free and can be improved, to create the Historical Agro-Environmental Browsing System (HABS). Anyone with an internet connection can use this system. To do so, use a search engine with the search term "Historical Agro-Environmental Browsing System," or enter the URL "http://habs.dc.affrc.go.jp/index_e.html" to directly access the website. Fig. 2 shows the HABS top page. HABS enables users to compare geographical positions and land use of 120 years ago with that of the present by only using a browser. In Fig. 3 the city of Tsuchiura is displayed. Users can also display the Rapid Survey Maps with GoogleEarth™, making possible more detailed land use comparisons. Because this system is built with open-source software, it may be redistributed and can be used for other purposes. Up to now, these maps have been used for clarification of land use changes. There are expectations for the use of these maps in research on the relationship between past land use and present biodiversity, and as basic source materials for assessing the characteristics of traditional Japanese farmland.

Research project name: Agricultural Spatial Information RP

Researchers: Ecosystem Informatics Division, N. Iwasaki, D. Sprague

Published articles:

1) Iwasaki N., et al., *Theory and Applications of GIS*,

Fig. 2 Top page of the Historical Agro-Environmental Browsing System (HABS) (http://habs.dc.affrc.go.jp). With a web browser, users can view the Rapid Survey Maps and make comparisons with current land use. Information on the displayed maps is in the "Historical Agro-Environmental Browsing System FAQ."

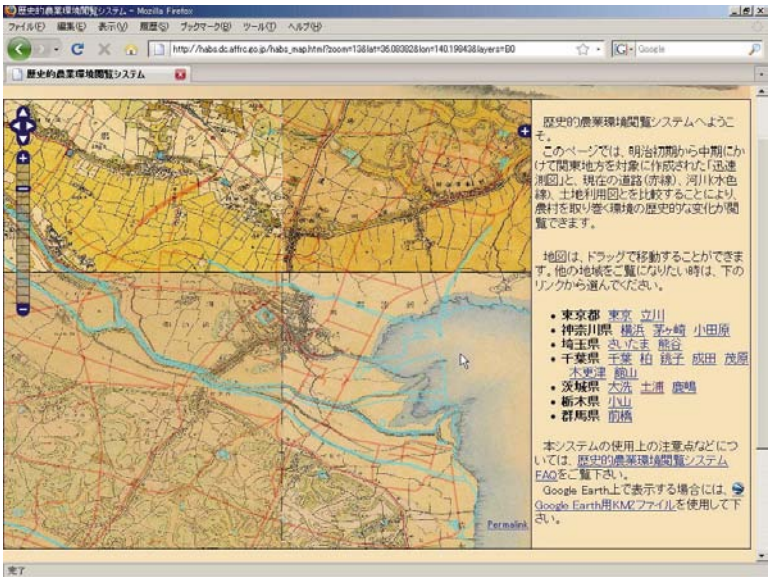


Fig.3 Here the Historical Agro-Environmental Browsing System is displaying the Tsuchiura City area of Ibaraki Prefecture. To enable comparisons with present-day positions, present-day roads are shown as red lines, and present-day shorelines are shown as light blue lines.

17:83–92 (2009)
2) Iwasaki N., et al., NIAES Press Release (released on April 16, 2008)
3) Sprague D., et al., *Int. J. Geogr. Inf. Sci.*, 21:83–95 (2007)

5. A New Insect Pest Appearing across a Broad Area of Hokkaido Turns Out to Be the beet webworm *Margaritia sticticalis* (Linnaeus)

Abstract

In the summer of 2008, an outbreak of an unknown lepidopteran larva occurred across a broad swath of Hokkaido and damaged many kinds of crops including soybeans and carrots. When emerging adults were checked in detail, the insect was found to be *Margaritia sticticalis* (Linnaeus), which has no previous record as an insect pest in Japan.

Background and Purpose

From mid-August through September 2008, damage to many kinds of crops by a lepidopteran larva, outbreaks of which had not previously been observed, was confirmed in the districts of Ishikari, Sorachi, Shiribeshi, Kamikawa, Rumoi, Abashiri, and Soya (Fig. 1). Because the outbreak was widespread and seriously damaged many fields, it was necessary to identify the species immediately. But because identification in the larval stage is difficult, larvae were collected and raised in captivity, and the species was identified when the adults emerged.

Description

In late August 2008, the Hokkaido Central Agricultural Experiment Station (Yubari County, Naganuma Town) collected larvae that were damaging crops (Fig. 2). These were raised, and in mid-September of that year five adults emerged successfully. A detailed examination of these adults enabled them to be identified as *Margaritia sticticalis* (Linnaeus), a member of the family Crambidae. Additional all 530 specimens captured and killed August 4–30 with a light trap installed outdoors in the same location were found to be *Margaritia sticticalis*. Larvae of the same morphology confirmed in other geographical areas are also presumably the same species.

This species is a migrant insect pest distributed widely in Europe, Russia, China, the US, Canada, and other countries, and it is reported that it damages many kinds of crops. In Japan there had been only the collection records of the adult form, and there had been no instances of larval outbreaks or crop damage. In Japan this was the first instance in which damage by larvae was confirmed for crops including soybeans, carrots, adzuki, sugar beets, squash, white clover, and alfalfa.

Fig. 1 Damage to soybean field by *Margaritia sticticalis* (Linnaeus).
The whitened parts on the field's edge are damaged plants. Damaged plants appear white because the larvae eat the mesophyll and leave the leaf veins.

Fig. 2 Larvae of *Margaritia sticticalis* (Linnaeus).
When the larvae mature they attain a length of 25 mm. Usually their heads are blackish brown and their bodies are black with a wide milk-white stripe along each side. There are also a small number of larvae with light colored bodies.

Fig. 3 Adults of *Margaritia sticticalis* (Linnaeus).
Wings are overall brown, with yellow spots along the outer edge of the forewing from front to rear.
Left: Adult raised from larva in 2008 (Naganuma Town, Hokkaido).
Right: Adult collected at Shiretoko, Hokkaido in 1982.

This large outbreak is attributed to the proliferation of later generations of adults that flew to Hokkaido from the Eurasian Continent starting in spring 2008. Because this species hibernates by making cocoons in the soil, that possibly leads to outbreaks beginning the following spring. Since the adults have also been collected in Honshu and Kyushu, due attention is needed to outbreaks of this species in regions other than Hokkaido near feature.

Research project name: Environmental Resources Information RP

Researchers: Natural Resources Inventory Center , S. Yoshimatsu, A. Iwasaki (Hokkaido Central Agricultural Experiment Station)

Published article: Hokkaido Plant Protection Office, 2008 *Hokkaido Plant Disease and Pest Forecast Information*, No.18, Special Report No. 1 (2008)

6. Taking Advantage of the Differences between Rice Cultivars to Reduce Cadmium Contamination in Brown Rice

Abstract

We found that the concentrations of cadmium in brown rice differed between cultivars by factors of 2 to 10. Further, by using cultivars that accumulated low concentrations of cadmium in their brown rice as the breeding material, we developed new lines whose brown rice cadmium concentrations are about half those of generally used cultivars.

Background and Purpose

If people continue to ingest cadmium (Cd) via food over a certain amount for many years, the cadmium might have damaging effects on their health. It was for this reason that an international Cd standard was set (0.4 mg kg^{-1} for polished rice). Countermeasures that have been used to reduce Cd uptake by rice plants include soil dressing and managing water levels, but because the range of application is limited in view of cost and effectiveness, new techniques for lessening contamination are needed. Accordingly, we found the genotypic differences in brown rice Cd concentrations of cultivars, and used the findings to consider the development of lines with low Cd uptake.

Description

We cultivated many rice cultivars in Cd-contaminated

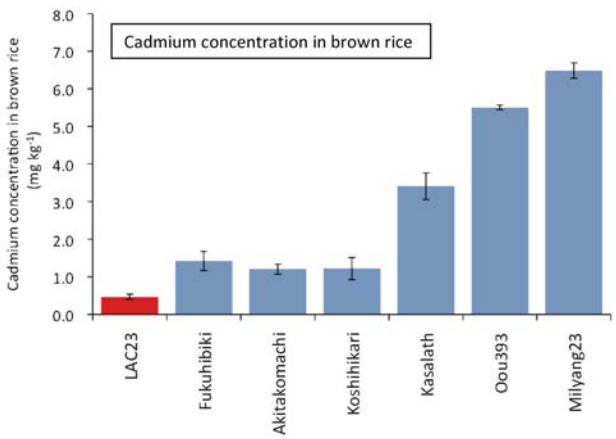


Fig. 1 Inter-cultivar differences in brown rice cadmium concentration.
Cultivation test in pots with Cd-contaminated soil found approximately 2- to 10-fold differences in brown rice Cd concentrations. The brown rice Cd concentration of “LAC23” was about half that of Koshihikari and other major cultivars.

soil and investigated the varietal differences in brown rice Cd concentrations. We found genotypic differences in Cd concentrations of at least 2-fold to 10-fold (Fig. 1). In particular, the tropical Japonica variety “LAC23” had a brown rice Cd concentration that was about half that of “Koshihikari” and other varieties primarily grown in Japan.

Because LAC23 heads late, and has long culms, long grains, and low yields, it is not suited to practical cultivation in Japan, so we crossed it with the “Fukuhibiki” cultivar, which has a good plant form and offers stable high yields, thereby developing lines with low Cd concentrations but also with improved cultivation characteristics. By analyses across three to five self-fertilized generations (F3–F5), we were able to select out five lines which, in comparison with “Fukuhibiki” and “Hitomebore,” had brown rice Cd concentrations about 40–50% lower, headed sooner than LAC23, and whose plant height had become comparatively shorter (Fig. 2, Photo 1). We assigned to these five lines the line numbers “Ukei 1118” through “Ukei 1122” of the place where they were raised (National Agricultural Research Center for Tohoku Region).

We compared the five selected lines with “Fukuhibiki” and “Hitomebore” in terms of the trace

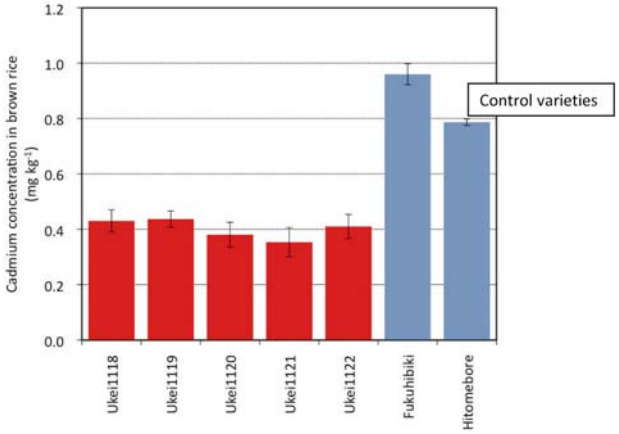


Fig. 2 Brown rice Cd concentrations of newly developed lines.
Results of growing lines on site in contaminated soil for three years. The newly developed lines shown in red had a Cd concentrations of about half that of “Hitomebore” and other cultivars. These lines were developed at the National Agricultural Research Center for Tohoku Region, and were assigned the local numbers “Ukei 1118” through “Ukei 1122” for the place where they were raised.

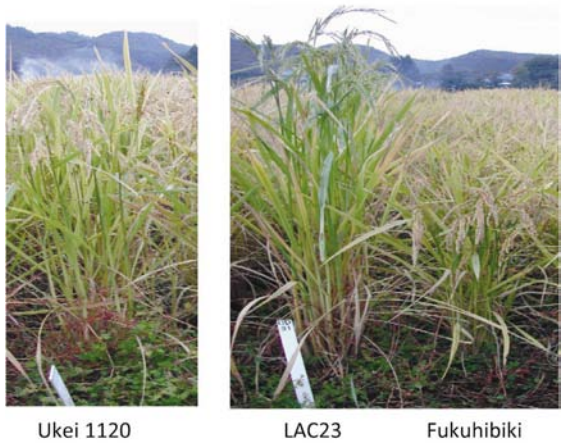


Photo 1 Plant shapes of low-Cd lines and parent cultivars.
“Ukei 1120” (one of the newly developed low-Cd strains) ripens sooner than “LAC23” and is shorter.

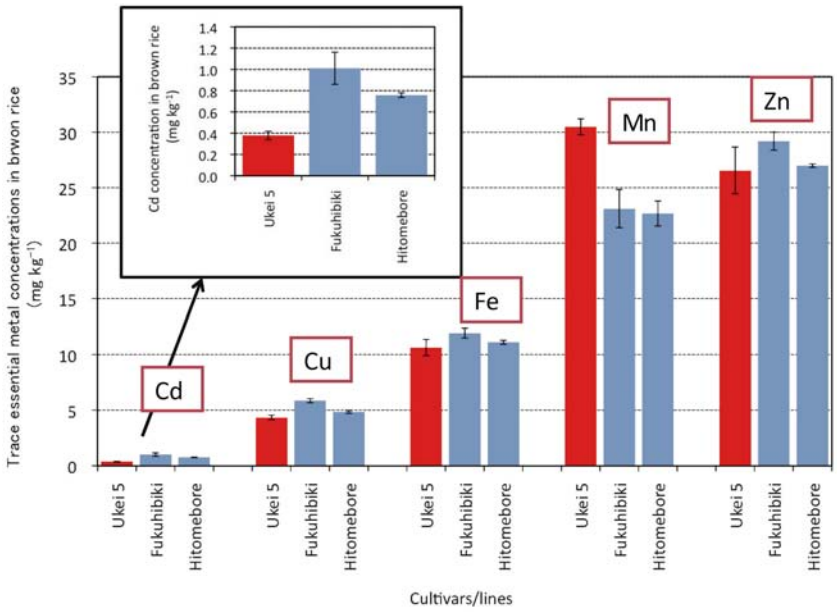


Fig. 3 Brown rice heavy metal concentrations of five Ukei lines (average values).
The brown rice concentrations of trace essential metals other than Cd in the five Ukei lines had no large decreases in comparison with “Hitomebore” and other cultivars. In these lines only Cd decreased.

metal minerals humans need to maintain health (copper, iron, manganese, and zinc), and found that there was no large decrease in heavy metals other than Cd. We were therefore able to develop lines in which only the concentration of Cd was reduced in the brown rice (Fig. 3).

There are expectations that these lines can be used to develop practical low-Cd cultivars.

These research results are from a Ministry of Agriculture, Forestry and Fisheries' commissioned research project: "Development of Comprehensive Management Techniques for Hazardous Chemicals in Agricultural, Forest, and Marine Ecosystems."

Research project name: Heavy Metals Risk Management RP

Researchers: Soil Environment Division, S. Ishikawa, T. Arao, M. Yamaguchi (National Agriculture and Food Research Organization, National Agricultural Research Center for Tohoku Region)

Published articles:

1) Arao T. and N. Ae, *Soil Sci. Plant Nutr.*, 49: 473–479 (2002)
2) Ishikawa S. et al., *Soil Sci. Plant Nutr.*, 51: 101–108 (2005)
3) Yamaguchi, M., *Research Journal of Food and Agriculture*, 29: 11–14 (2006)

7. Invasion of Exotic Plants Is Related to Soil pH and Available Phosphate

Abstract

In the herbaceous plant communities around farmland in the northern Kanto region, exotic plant habitat invade places where the surface soil has a high pH and a high available phosphate level. Farmland in the vicinity of our study plots has an increasing available phosphate level and a rising soil pH, and it appears that this promotes the spread of exotic plants near farmland and on abandoned farmland.

Background and Purpose

There are concerns that the spread of exotic plants in recent years will deprive native plant habitat and damage Japan's unique ecosystem. Even on farmland and surrounding land, the ecosystems having been maintained since long ago are changing rapidly. In the view of this situation, we studied the relationship between the spread of exotic plants and the chemical characteristics of soils under the herbaceous communities established near farmlands, mainly in the Andosol area in northern Kanto.

Description

We conducted a vegetation study covering 122 plots (upland field) including rice paddy dikes, abandoned farmlands, and fodder grasslands, which are mainly categorized as Andosols that are common in northern Kanto. The herbaceous communities were classified into two types. Type I communities are those in which many exotic plants have appeared, and which are characterized by plants such as *Solidago altissima* and *Erigeron philadelphicus*. Type II communities are those where few exotic plants have appeared, and which are characterized by plants such as *Pleioblastus chino*, *Thalictrum minus* var. hypoleucum, *Sanguisorba officinalis*, and *Adenophora triphylla* var. japonica (Table 1).

Eighty-seven percent of Type I plots had established on the soils with pH of 5.7 or higher or soils whose available phosphate (Bray II) were at least 20 mg P_2O_5 100 g^{-1} dry soil. Such soil characteristics differed greatly from the typical chemical characteristics found in the surface horizons of natural Andosols common in this

Table 1 Two Plant Community Types Appearing in Upland Grassland Vegetation in Northern Kanto Region [1)]

	Main plants appearing	Exotic plants (%) [2)]
Type I	*Solidago altissima**, *Pueraria lobata*, *Digitaria ciliaris*, *Miscanthus sinensis*, *Oxalis corniculata*, *Galinsoga ciliata**, *Erigeron philadelphicus**	26.9
Type II	*Miscanthus sinensis*, *Pleioblastus chino*, *Sanguisorba officinalis*, *Adenophora triphylla* var. japonica, *Thalictrum minus* var. hypoleucum, *Solidago virga-aurea*	2.7

* Alien plant species.

1) Results from 122 grassland vegetation plots such as rice paddy dikes, abandoned farmlands, and fodder grasslands. Type I: 79 plots; Type II: 43 plots.

2) Alien plants percentage calculated on the basis of vegetation coverage.

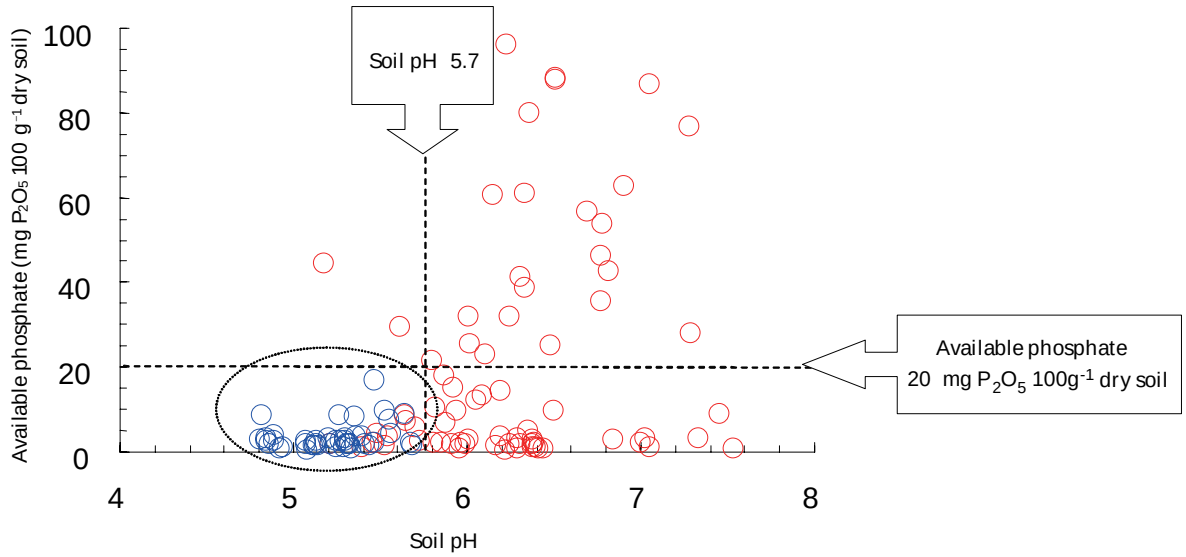
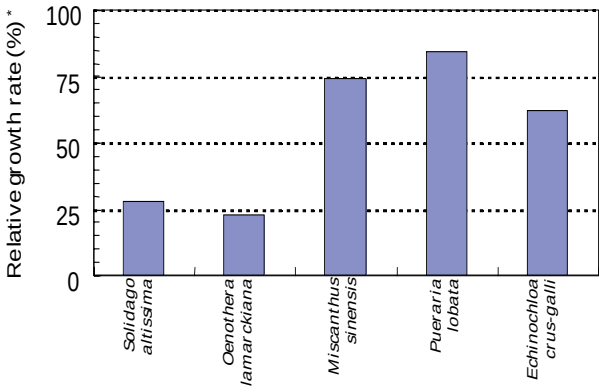


Fig. 1 The relationship between the invasion of exotic plants and soil chemical characteristics in the northern Kanto region.
It is evident that exotic plants hardly appear in soils where pH and available phosphate are both low as shown in the area encircled by the dotted line in this Figure. Such soil characteristics are arguably within the range of typical chemical characteristics of natural surface soils in this region.

○ Type I vegetation (Many exotic plants appear)
○ Type II vegetation (Hardly any exotic plants appear)

region. On the other hand, Type II vegetation had appeared in places where traditional soil characteristics have been maintained (soil pH below 5.7 and soil available phosphate less than 20 mg P_2O_5 100 g^{-1} dry soil) (Fig. 1).

Additionally, laboratory growth experiments showed that although the growth of the exotic plants *Solidago altissima* and *Oenothera lamarckiana* is severely restricted in an acidic soil, the growth of the native plants *Miscanthus sinensis*, *Pueraria lobata*, and *Echinochloa crus-galli* are affected little by the soil acidity (Fig. 2).



* Relative growth rate of root in a strongly acidic non-allophanic Andosol (pH 4.4) as opposed to slightly acidic allophanic Andosol (pH 5.9).

Fig. 2 Plant growth in a strongly acidic soil.
The root growth of exotic plants like *Solidago altissima* and *Oenothera lamarckiana* is very poor in a strongly acidic soil. On the other hand, native plants like *Miscanthus sinensis*, *Pueraria lobata*, and *Echinochloa crus-galli* are better adapted to the strongly acidic soil.

It appears that Type II plant communities appear in places where the chemical characteristics of traditional natural soil have been maintained, but when soil chemical characteristics are greatly changed by human activities such as fertilization and/or agricultural infrastructure development, Type I plant communities readily appear. Phosphate accumulation and rising soil pH are occurring in farmlands in the vicinity of our study plots, and it seems that this promotes the spread of exotic plants near farmlands and on abandoned farmlands.

This research is partly supported by a Research and Development Program for Resolving Critical Issues funded by Japan Science and Technology Agency: “Risk Assessment of Alien Plants and their Control in the Field.”

Research project name: Invasive Alien Species Impact Assessment RP

Researchers: Biodiversity Division, S. Hiradate, Y. Kusumoto, S. Morita

Published articles:

1) S. Hiradate, *Hojyo to Dojyo*, 39: 30–38 (2007)
2) S. Hiradate et al., *Kanto Zasso Kenkyukai-ho*, 19: 23–33 (2008)

8. A Vegetation Index Data Set for the Wide-Area Determination of Temporal Change in Land Cover and Land Use in East Asia

Abstract

To determine the changes in land cover and land use over a wide area in East Asia, we prepared a time-series data set having various indicators which can attenuate the influence of clouds and determine the state of vegetation and other land attributes from 2004 to 2007.

Background and Purpose

It is important to determine temporal and spatial changes in land cover and land use for the purpose of assessing food production and water supply and demand. Various kinds of satellite data have been used to accomplish this, but they have not necessarily had adequate observation frequency and resolution. We therefore used MODIS data from satellites that make very frequent observations, in an attempt to create a vegetation index data set for the purpose of determining changes in land cover and land use.

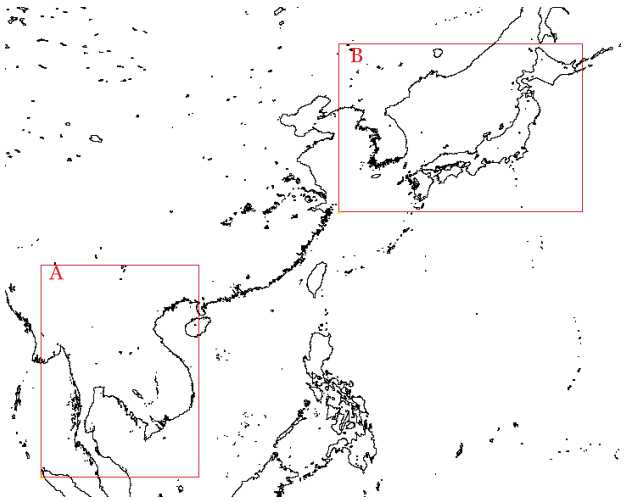


Fig. 1 Areas covered by the data set
A: Indochinese Peninsula region (5–25° N, 95–110° E)
B: Japan and Korean Peninsula region (30–46° N, 123–146° E)

Description

To determine the temporal change in East Asian land cover and land use over a wide area, we prepared a data set of several kinds of vegetation indices from MODIS images, which are from observations made two or three times daily. The data set covered the Indochinese Peninsula region (5–25° N, 95–110° E) and the Japan and Korean Peninsula region (30–46° N, 123–146° E) from 2004 to 2007 (Fig. 1).

Vegetation indices such as the Normalized Difference Vegetation Index (NDVI) and the Enhanced Vegetation Index (EVI), which can show the changes in vegetation activity and amount, are indispensable information for finding the changes in land cover and land use. After calculating the vegetation index for each pixel, we prepared a vegetation index data set by using places with little cloud influence over each several-day period as representative values, and then smoothing the time-series data. Fig. 2 shows the data for January 1–6, which are part of the EVI time-series data prepared every six days.

Creating time-series data sets that have hardly any cloud influence in this way makes it possible to determine continuous change in land cover, whose indicator is plant coverage, and in land use. Fig. 3 is an example of land use classification which focuses on paddy rice cropping on the Indochinese Peninsular and which uses a self-organizing classification system called ISODATA. It more accurately mirrors the actual state of land use than existing land use classification maps.

As our data set is offered free of charge, those wanting to use it should directly ask the administrator.

Part of these research results is from a Ministry of Agriculture, Forestry and Fisheries' commissioned

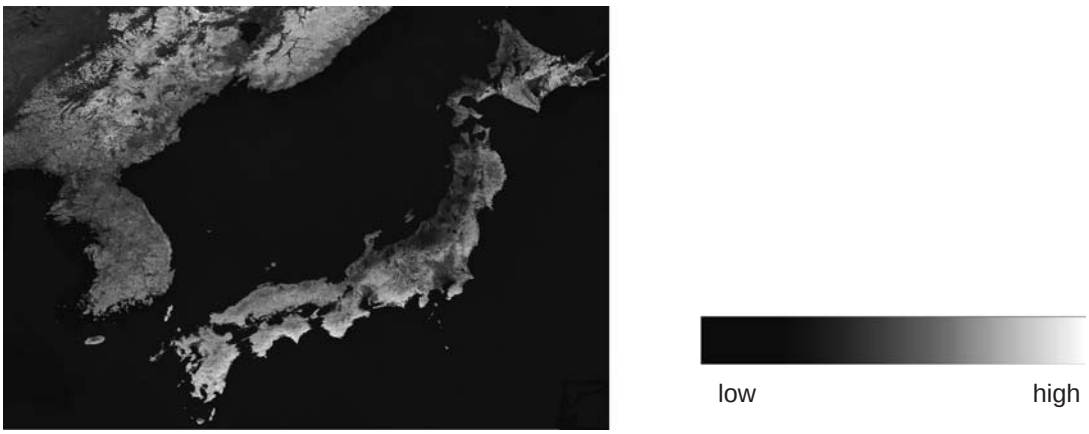


Fig. 2 Data set example
This map is the vegetation index (EVI, Enhanced Vegetation Index) for January 1–6.
The lighter the shade on land part, the higher the plant activity and the larger the amount.

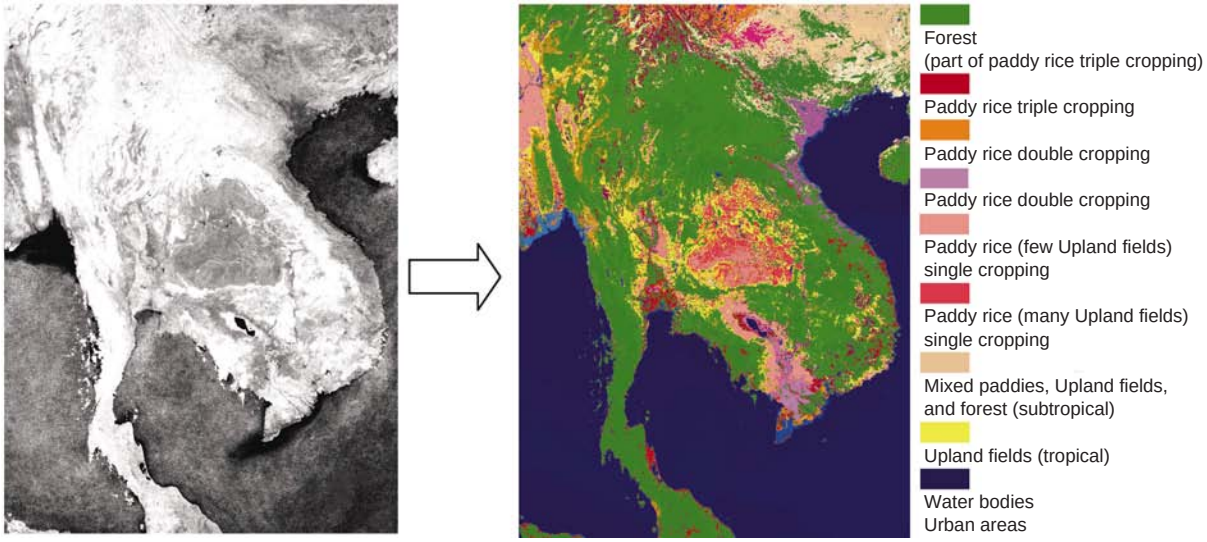


Fig. 3 Paddy rice cropping classification prepared from the data set (an example of data set application). Using this data set makes it possible to create a classification based on the temporal change in plants over a wide area. This classification is the result of a focus on rice paddies in Southeast Asia. It enables one to see the wide area distribution of paddy rice cropping patterns from seasonal changes.

research project: "Assessing the Impacts on Food Production of Changes in the Global Water Cycle, and Preparing Counteraction Scenarios," and from a National Institute for Agro-Environmental Science grant project: "Building a Response Model for Rice Paddy Ecosystems to Climate Change, and Assessing Risks to Rice Production."

Research project name: Agriculture Spatial Information RP

Researchers: Ecosystem Informatics Division, N. Ishitsuka, T. Sakamoto, H. Ohno (currently at the National Agriculture and Food Research Organization, National Agricultural Research Center)

9.Public Access to Nematological Literature of Japan

Abstract

We gave the public access to a database of nematology-related literature published in Japan from 1997 to 2006. The database also includes literature by Japanese researchers published in overseas journals, and makes it possible to view almost all information on literature relating to Japanese nematology from this time period.

Background and Purpose

Nematodes are the most numerous and diverse multicellular organisms in the soil. Some are useful as environmental indicators and model organisms, and for controlling insect pests, while others are major crop pests themselves. The National Institute for Agro-Environmental Sciences (NIAES) has played the leading role in building a catalog of literature on this subject, and to make it useful in the advancement of Japan's nematode research we databased the catalog and made it available to the public.

Description

Nematological Literature of Japan catalogue contains 4,902 items as of March 2009, including nematode-related articles published in academic journals and other Japanese publications, nematode-related articles written by Japanese that appeared in foreign academic journals and other publications, and research on nematodes obtained in Japan. Also included are books, and lecture abstracts of some academic societies.

All types of nematodes are intended for inclusion, including soil nematodes and plant parasitic nematodes, as well as the nematode species *Caenorhabditis elegans*, which is used as a model organism in the fields of biochemistry and genetics, animal parasitic nematodes, and marine nematodes. Regarding animal parasitic nematodes, the catalog emphasizes literature that tends to be overlooked, such as reports issued by universities and prefectures.

This catalog can be accessed from the NIAES website (http://nemadata.niaes.affrc.go.jp/list/menu.php; Fig. 1). Searches are possible by author name, publication year, title, journal or book name, volume/number, and page, as well as by keywords. The database also allows simultaneous searches with multiple terms (Fig. 2).

Fig. 1 A search done using the Nematological Literature of Japan catalog (simple search).

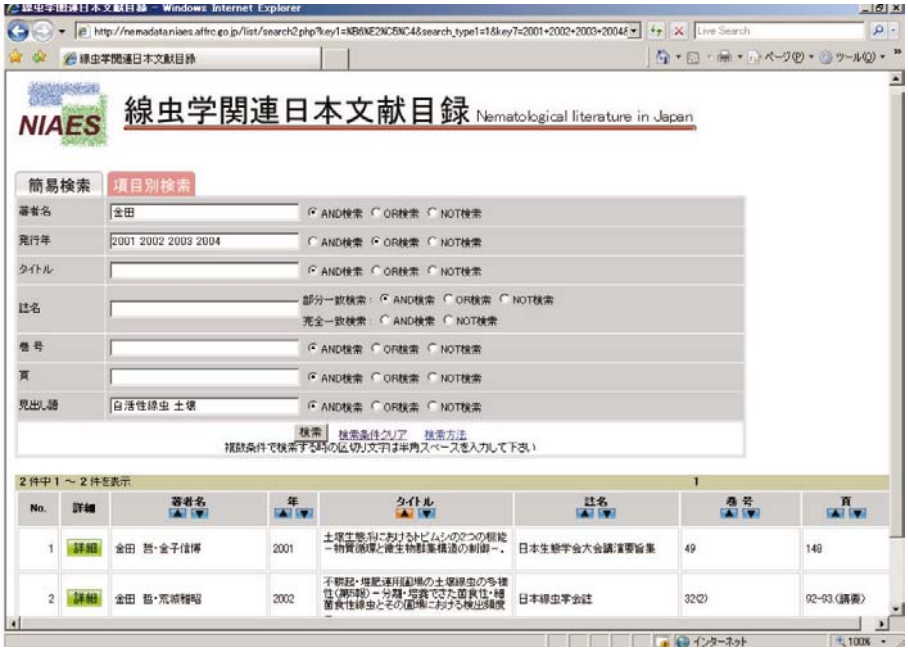


Fig. 2 A search done using the Nematological Literature of Japan catalog (multiple-term search).

Helpful hints on doing searches are given on the catalog's web page.

New data are added to this database every year. The latest data at this point are the approximately 600 items published in 2006. There is sometimes a delay of about a year in discovering and adding literature that has appeared in academic journals published in other countries. Literature such as this, and also literature that has escaped listing can be found, and are gradually added. There are plans to add literature previous to 1996. This catalog is useful for efficiently surveying past research in Japan.

Research project name: Environmental Resources Information RP

Researchers: Environmental Biofunction Division, M. Araki, H. Kosaka, N. Maebara (Forestry and Forest Products Research Institute)

Published articles:

1) Araki, et al., *Japanese Journal of Nematology*, 36: 39–72 (2006)
2) M. Araki, H. Kosaka, *Japanese Journal of Nematology*, 37: 121–150 (2007)
3) M. Araki, H. Kosaka, *Japanese Journal of Nematology*, 38: 119–149 (2008)

Major Symposia and Seminars

1. 30th Symposium on Agro-Enviromental Science, "How Can Greenhouse Gas Emissions Be Reduced? — Measures to Combat Global Warming in Agriculture, Forestry, and Fisheries"

On Wednesday, May 14, 2008 we held the 30th Symposium on Agro-Enviromental Science with the theme "How Can Greenhouse Gas Emissions Be Reduced? — Measures to Combat Global Warming in Agriculture, Forestry, and Fisheries" at the Shinjuku Meiji-Yasuda Life Hall in Tokyo. The previous year the Intergovernmental Panel on Climate Change (IPCC) had released its Fourth Assessment Report, which says that the increase in greenhouse gases due to human activities is unequivocally causing global warming. And 2008 was the first year of the first commitment period under the Kyoto Protocol, whose aim is to reduce greenhouse gas emissions. Japan's target for this period is to reduce its emissions 6% from the 1990 level, but as of 2006 Japan's emissions had instead increased 6.4%. Against this backdrop, the symposium attempted to promote broad public understanding among the public about what measures could conceivably be taken in agriculture, forestry, and fisheries. We had the participation of 294 people from outside NIAES including the general public, people in public administration, the private sector, universities, public institutions, and other research institutes, and 34 NIAES people, for a total of 328.

NIAES President Yohei Sato kicked off the symposium with his welcoming remarks, which were followed by a keynote speech titled "Expectations for Global Warming Mitigation by Agriculture and Forestry" by Prof. Ryusuke Hatano of Hokkaido University. Lectures began with a report by Moriyoshi Ishizuka, research coordinator at the Forestry and Forest Products Research Institute, on the carbon cycle in the forest sector, the Kyoto Protocol's method of calculating carbon dioxide uptake amount, and initiatives aimed at increasing the carbon sequestration capacity of forests. This was followed by lectures on the agriculture sector, first by Yasuhito Shirato, chief researcher of the Natural Resources Inventory Center, who said that while the ability of farmland soil to store carbon is larger than the abilities of vegetation and the atmosphere, it requires the appropriate application of organic material. Next, Senior Researcher Kazuyuki Yagi of the Carbon and Nutrient Cycles Division used specific experimental results to describe effective techniques for managing organic matter, water, fertilization, and other factors to limit emissions of carbon dioxide, methane, and nitrous oxide from farmland. In the livestock sector, Chief Researcher Takashi Osada of the National Institute of Livestock and Grassland Science described the latest measures for reducing the methane and nitrous oxide emitted from livestock enteric fermentation and waste, and stated that it is not easy to reduce nitrous oxide in the process of managing livestock waste. Finally, Shusaku Katayama, director of the Biomass Research Center at the National Agriculture and Food Research Organization, delivered a report on biomass energy, which people hope will replace the fossil fuels that are the main cause of global warming, covering areas including types of biomass, conversion methods, and efficiency.

In response to these lectures, there were questions from the floor on subjects including the tradeoff between carbon accumulation by accumulation in forest soil and by applying organic matter to farmland on the one hand and the generation of greenhouse gases on the other hand, the impacts of using chemical fertilizers, and the possibility of participation by agriculture in emissions trading. It was also observed that, whatever problem we are dealing with, from now on it will be essential to perform LCAs when considering the introduction of future technologies.

Questionnaires given to participants elicited 141 responses, many of which made favorable remarks such as "The content was substantial" and "It was easy to understand even for a non-specialist." Together with the symposium on global warming adaptation strategies held last December, we have expectations as the sponsor that participants' interest in and understanding of global warming have increased, even if only by a small measure.

Hokkaido University Prof. Ryusuke Hatano delivering the keynote speech

2. Research Presentation 2008, "Linking the Safety of Agriculture and the Environment to the Future"

On November 28, 2008 we held the above research presentation at Shinjuku Meiji Yasuda Seimei Hall in Tokyo. Such presentations have been held every two years since NIAES became an independent administrative institution, and this one was the fourth. There were 207 participants including 42 from the general public and 91 from the private sector and organizations.

After opening remarks from NIAES President Yohei Sato and from Research and Development Officer Takeshi Arai of the Agriculture, Forestry and Fisheries Research Council Secretariat, Professor Tetsukazu Yahara of Kyushu University Graduate School delivered a special lecture titled "Biodiversity Conservation and Our Future." He first described the state of biodiversity loss in Japan and around the world, and then used the biodiversity conservation project conducted when the Kyushu University campus relocated as an example to show the possibilities for reconciling conservation with development, and raised questions about issues such as the role of science in doing so, and the importance of values in building a future vision. Next came presentations on NIAES research: The impact of global warming on rice yields (Agro-Meteorology Division, Masayuki Yokozawa), an "Historical Agro-Environmental Browsing System" enabling comparison of maps of agricultural use in the Kanto region 120 years ago and at present (Ecosystem Informatics Division, Nobusuke Iwasaki), impacts on Japan's natural environment by the spread of exotic plants (Biodiversity Division, Hiroaki Ikeda), the discovery and use of molds which live on plant leaf surfaces and can decompose biodegradable plastic (Environmental Biofunction Division, Hiroko Kitamoto), and soil environment remediation using the power of plants (Organochemicals Division, Takashi Otani). There were many questions and opinions, and there was animated discussion on topics such as introducing economic principles into *satoyama* conservation and the problem of exotic plants on farmland.

A ceremony was held during the break period to present three young NIAES researchers with encouragement awards. Each researcher received an award certificate and a supplementary prize (see page 10 for details). Posters on display in the lobby described 18 research challenges, including those of the awarded researchers.

For detailed information on the lectures, see National Institute for Agro-Environmental Sciences, Research Presentation 2008, Lecture Summaries (http://www.niaes.affrc.go.jp/sinfo/sympo/h20/1128/proceeding.html).

3. Open Seminar on Agro-Environmental Technology in Fukushima

The "Open Seminar on Agro-Environmental Technology in Fukushima" was held at the Fukushima Agricultural Technology Centre (Fukushima Prefecture, Koriyama City) on Thursday, September 18, 2008, jointly sponsored by the National Institute for Agro-Environmental Sciences (NIAES) and the Fukushima Agricultural Technology Centre. The purpose of these open seminars is to expand the relationships of collaboration, interchange, and cooperation between NIAES and prefectures and municipalities. On this occasion about 100 people attended, including officials from Fukushima Prefecture and municipalities, people in agriculture, and members of the public.

Lectures and posters at the seminar described the achievements of the most recent research on agro-environmental problems. Lectures delivered by NIAES researchers in the multipurpose hall covered several subjects: "Impacts of Global Warming on Crop Production" (Mayumi Yoshimoto), "Exotic Plants and Agricultural Ecosystems: Functions and Uses of Allelopathy" (Yoshiharu Fujii), and "The Quest for Safer Soil Disinfection Methods" (Yuso Kobara). In addition, Fukushima Agricultural Technology Centre personnel described their research on "Managing Water to Reduce the Generation of Methane by Rice Paddies" (Takashi Saito, Assistant-Chief Researcher, Agro-environment Department) and "Expanding Fukushima-Style Organic Cultivation" (Kazuo Ozawa, Director, Organic Farming Promotion Office).

In the research presentation room adjoining the multipurpose hall there was a poster display in which the National Institute for Agro-Environmental Sciences and the Fukushima Agricultural Technology Centre presented their representative research for 2007. In the lecture and poster display venues, participants engaged in enthusiastic discussion on the lectures and presentations.

4. MARCO Workshop, "A New Soil Information System Initiative for Natural Resource Management in Asia"

Soil Information System (SIS) not only provides soil information for crop production but also provides information of value for environmental impact

assessments, environmental conservation, and solving problems related to wildlife habitat, global warming, and energy. In the United States and Europe, SIS use is encouraged in particular from an environmental perspective; however, in Asia, it is limited to SIS development and use in a handful of countries mainly for digitizing soil maps and databasing soil data.

On October 14 and 15, we held a workshop at the Tsukuba International Congress Center to discuss building a common SIS platform for East and Southeast Asia and to share information with researchers in Western countries, East Asia, and Southeast Asia on the research and development of SIS use for crop production and environmental conservation, and its dissemination in production venues. The workshop was co-hosted by the Food and Fertilizer Technology Center for the Asian and Pacific Region (FFTC), and sponsored by entities including the Ministry of Agriculture, Forestry and Fisheries Agricultural Production Bureau.

There were 14 speakers hailing from the United States, Korea, Taiwan, the Philippines, Vietnam, Thailand, Malaysia, and Japan, and there were 11 poster presentations. The workshop had 81 participants from Japan and abroad.

Lectures and poster sessions covered subjects including various countries' soil classification systems, the state of soil maps and soil data compilation, application of soil data to land productivity assessments and environmental assessments, and the state of public access to methods applying models to forecast soil characteristics, and access to soil information systems. Speakers reported on the problems in each of these subject areas and how they will be addressed. The general discussion covered matters associated with building an Asian soil information system, including purpose, the soil classification system, reduction scale, format, and a review of the items included and the analysis methods.

MARCO stands for Monsoon Asia Agro-Environmental Research Consortium, which is an organization created by the National Institute for Agro-Environmental Sciences in 2006 for the advancement of agro-environmental research in Asia. MARCO's activities include information exchange, such as by holding international symposia, and technology transfer, such as by publication on websites and by inviting and sending researchers.

Research Collaborations

1. Activities of the Research Consortium, MARCO

The Monsoon Asia Agro-Environmental Research Consortium (MARCO) was established in 2006 to foster international research collaboration in Monsoon Asia. In 2008 the following activities were conducted under the auspices of MARCO.

- One symposium was held in 2008. The MARCO Workshop, entitled A New Approach to Soil Information Systems for Natural Resources Management in Asian Countries, was held from 14 to 15 October 2008 in Tsukuba. For details: http://www.niaes.affrc.go.jp/marco/2008workshop/index.html
- An ecological science researcher was invited from China for a 1-month stay.

MARCO's website contains consortium information. For details:

http://www.niaes.affrc.go.jp/marco/index.html

2. International Seminar in Collaboration with FFTC and Taiwan

From 10 to 14 November 2008, an International Seminar on Management of Major Emerging Plant Pests in Agriculture in the Asian and Pacific Region was held at Taipei, Taiwan, in collaboration with the Food and Fertilizer Technology Center (FFTC), Taiwan Forestry Research Institute (TFRI), Taiwanese Bureau of Animal and Plant Health Inspection and Quarantine (BAPHIQ), and NIAES. For details:

http://www.agnet.org/activities/sw/2008/674201955/

Visitors

1. Open Day 2008

On Friday and Saturday, April 18 and 19, research institutes associated with the Ministry of Agriculture, Forestry and Fisheries in the Tsukuba Agriculture & Forestry Research Complex held an open house. This event is held every year during Science and Technology Week.

On the 18th, the National Institute for Agro-Environmental Sciences was the venue for displays, demonstrations, and mini-lectures; on the 19th, a program exhibit and quiz were held in the Tsukuba Agriculture Research Gallery, an exhibit facility in the Tsukuba Agriculture & Forestry Research Complex. Although the weather was unfortunately bad on the 18th, about 600 visitors enthusiastically participated in the demonstrations and activities (Photo 1).

2. Summer Science Camp 2008

Science Camp 2008 was a "residential experience program for science and technology" hosted by the Japan Science and Technology Agency (JST), in which cooperating research institutions throughout Japan accept students of high school and college of technology, who conduct experiments and receive training under the guidance of researchers and experts in a variety of scientific and technological fields. The program's aim is to have participants discover the "wonder" in everyday life and bring science and technology close to them by having them see how research is actually done and investigate things familiar to themselves using the latest research equipment.

Science Camp 2008 at the National Institute for Agro-Environmental Sciences had two courses. A: "Let's experience the wonder of soil!" and B: "Let's investigate the interaction of plants through allelopathy." The eight participants, four in each course, experienced how researchers investigate the agro-environment and work toward solutions to problems (Photos 2 and 3).

Photo 1 Visitors used the Historical Agro-Environmental Browsing System (HABS) to compare land-usage maps of the Kanto region made 120 years ago with those of the present.

Photo 2 Participants went into the field and studied soil profiles and physical properties, which are important to food production.

Photo 3 Participants observed the phenomenon of allelopathy outdoors, and gathered plants to measure allelochemicals in the laboratory.

Advisory Council 2008

The Advisory Council 2008 met on 19 March 2009 at NIAES to provide outside opinions and recommendations on the management of NIAES. The members of the council are external experts and include a professor, a consumer representative, and the directors of other independent administrative institutions (see Appendix).

The following comments were made:

1) There are multiple research projects of a high level and which can be considered at the world's top level. NIAES should back this research officially.

2) NIAES needs integrated project research, as well as people who can work in crossover research fields, for major purposes such as raising the food self-sufficiency rate and performing comprehensive analyses that include farmland and forest land. NIAES should put its shoulder into such personnel development and project facilitation.

3) It is important that independent administrative institutions benefit society with the products of their research. It is hoped that the orientation of research will be more clearly defined in preparation for the integration to come in two years.

4) As the situation becomes increasingly harsh owing to reduced grants and other factors, it is praiseworthy how NIAES has been conducting research by obtaining outside funding. It is hoped that the institute can maintain the conditions making it possible to continue important research.

5) In the second research period the institute is carrying out research with the focus on risk research, but from now on what will be increasingly important is agriculture that raises productivity while decreasing the environmental burden, and agriculture that values biodiversity.

6) Evaluation documents on research sector were difficult to understand.

7) The institute holds many symposia, research presentations, and other events, and they are easy to understand. Their web magazine *Nogyo to Kankyo* is well done, and does an excellent job of public communication and providing information.

Academic Prizes and Awards

1. Commendation by the Minister of Education, Culture, Sports, Science and Technology Awarded for Soil Monolith Work

Five researchers in the Natural Resources Inventory Center, Makoto Nakai, Tadao Hamasaki (currently at Kagoshima University), Toshiaki Ohkura, Takeshi Ota (currently at the National Agriculture and Food Research Organization), and Hiroshi Obara, were awarded a Commendation by the Minister of Education, Culture, Sports, Science and Technology (Public Understanding Promotion Category) for "Promoting Public Understanding of Soil Using Soil Monoliths."

The recipients developed a way to make "soil monoliths" (soil profile specimens) in which resin is used to fix soil profiles from depths of 1 m or greater, which are ordinarily not visible because of being underground. For 30 years after developing the method they provided guidance in using it to experts at research institutes and museums, and facilitated the wider use of soil monoliths, thereby furthering understanding by a broad range of people about crop production and the relationship between environmental conservation and soil morphology and function.

As part of their efforts, the five broadly disseminated information on soil monoliths by opening a soil monolith museum at NIAES which has had over 30,000 visitors, and by creating a soil monolith website. In addition, they have used soil monoliths in programs and events for young people, such as "science camps," and have loaned soil monoliths to special exhibits by museums and universities, offered them for photographs and filming by broadcast media and publishing companies, and have otherwise provided information in many ways. Further, they have made a contribution internationally by lending guidance in the method of preparing soil monoliths to experts such as at agricultural experiment stations and universities throughout Asia and South America so that those experts can, for example, make and display soil monoliths of soils in their own countries.

Recipients: From left, Toshiaki Ohkura, Tadao Hamasaki, Takeshi Ota, Makoto Nakai, and Hiroshi Obara

2. The BSJ Award 2008 for Outstanding Scientific Contribution

At the annual meeting of the Biometric Society of Japan (BSJ), held on 5 June at the University of Tsukuba, Dr. Tetsuhisa Miwa, Head of the Ecosystem Informatics Division, received the BSJ Award 2008 for Outstanding Scientific Contribution. The BSJ is a regional section of the International Biometric Society (IBS). The IBS was established by Sir Ronald Aylmer Fisher and promotes the development and application of statistical methods in biological science. The BSJ Award was given to Dr. Miwa for his substantial contributions to statistical theory and application in agricultural and environmental science. Dr. Miwa has also served the BSJ as an executive committee member, council member, and trustee.

Dr. Miwa has worked at a number of agricultural institutes for a total of more than 30 years. During the intervening years, he has been involved in research, education, and supervisory work. Dr. Miwa has performed wide-ranging research on agricultural statistics and has recently been working in the field of multiple comparison procedures.

The multivariate normal distribution plays a fundamental role in statistical applications, but before Dr. Miwa published a paper in the *Journal of the Royal Statistical Society* in 2003 there had been no practical methods for calculating its probabilities. He proposed a very efficient procedure for evaluating multivariate normal probabilities accurately.

Dr. Miwa solved the long-standing problem of calculating level probabilities in the unbalanced analysis of variance models. The results were published in a paper in *Computational Statistics and Data Analysis*. They enable us to use Bartholomew's test, which is very powerful for comparing ordered treatments, even in unbalanced cases.

Dr. Miwa also provides a practical procedure that combines the advantages of one-sided and two-sided test procedures for comparing ordered treatment effects. The

proposed procedure provides two-sided confidence intervals but maintains the sensitivity of the one-sided test in detecting real differences in ordered treatment effects. This result was published in a paper in the *Journal of the American Statistical Association* in 1999.

All these achievements are not only theoretically innovative but also practically very important.

3. 2008 (First) NIAES Young Researcher Encouragement Awards, "Three Young Researchers Presented with Awards"

During the NIAES research presentation held on November 28 at Shinjuku Meiji Yasuda Seimei Hall, three researchers were given the 2008 (First) NIAES Young Researcher Encouragement Awards. NIAES President Yohei Sato presented each recipient with a certificate and a commemorative gift. Posters displayed in the lobby described the recipients' research achievements.

Following are the recipients and their achievements.

• Staff Researchers

"Research on Determining the Dynamics of Persistent Organic Pollutants"

Senior Researcher Nobuyasu Seike, Organochemicals Division (Photo 1)

Seike found that dioxins in rice paddy soil were derived from certain herbicides used in the past and that rice plants did not absorb them from the soil. He also predicted that residual dioxins in rice paddy soil would decrease in the future. Additionally, Seike developed a method to predict the concentrations of residual dieldrin and heptachlors in Cucurbitaceae by measuring concentrations in soil before cultivation, and selected low-absorption cultivars.

"Analysis of the Impact of Soil Fumigation on Community Structure of Soil Microorganisms Using Molecular Biological Methods"

Senior Researcher Yuko Hoshino (Takada), Environmental Biofunction Division (Photo 2)

Hoshino created a method that analyzes DNA directly extracted from soil, and determined the impact of methyl bromide substitute chemicals for soil fumigation (chloropicrin or 1,3-dichloropropene) on microbial communities, including microorganisms that are hard to culture.

She also wrote a manual for a method to analyze soil microorganisms and nematodes by using DNA extracted from soil. Many data are now being accumulated by people involved in the research.

• Research Fellow

"Climate Scenario Downscaling and Its Application to Assessing the Impacts of Global Warming on Agricultural Crops"

Toshichika Iizumi, NIAES Research Fellow, Agro-Meteorology Division (Photo 3)

Iizumi downscaled global warming predictions obtained from a global climate model and prepared climate change scenarios for Japan. He also assessed the impact on paddy rice yields from socioeconomic scenarios and climate change scenarios. Additionally, he is currently building a model to assess impacts for crop insurance to prepare for extreme weather events, which are feared to occur more frequently owing to global

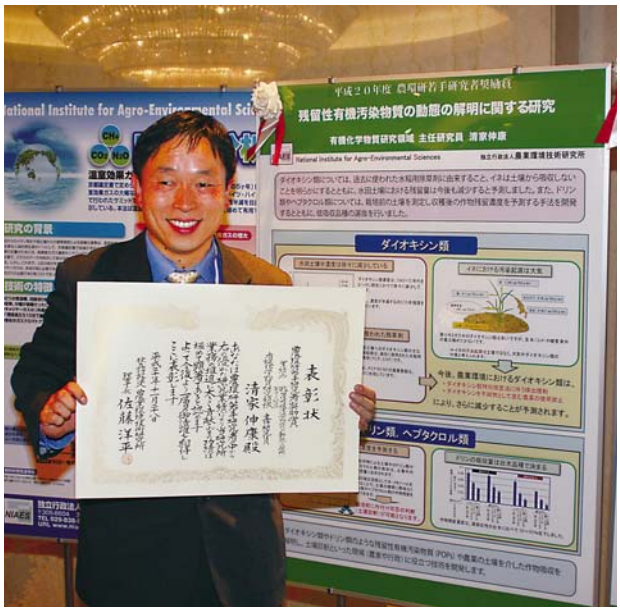


Photo 1 Nobuyasu Seike

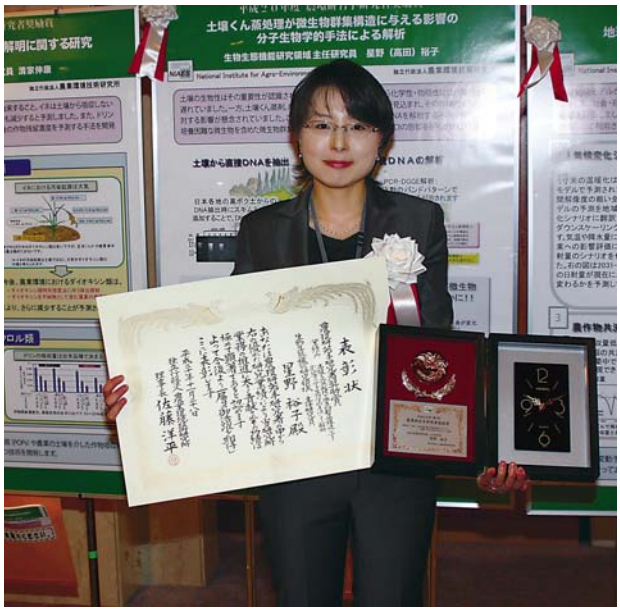


Photo 2 Yuko Hoshino (Takada)

warming.

Every year this award program will commend those NIAES staff researchers under age 40, or NIAES research fellows — so-called post-doctoral researchers — who have especially good research achievements in order to energize young researchers at the institute. This was the first year, and the next presentation is scheduled for next autumn.

Photo 3 Toshichika Iizumi