

Here we report our restoration activity called “The Tohoku Green Renaissance Projects.” The projects contain multiple restoration projects sharing the same basic concept and belief that restoration with care to biodiversity would lead to development of a sustainable livelihood of the affected communities and a suitable recovery of local biodiversity, which underpins the ecosystem services of satoyama.

Typical Satoyama in Tohoku



THIS, is what we were supposed to see in satoyama of Tohoku last fall. It's a beautiful mosaic of rice paddies, forests, houses, and others.



But *THIS*, was what we actually saw. The tsunami has destroyed everything, and brought almost anything you can imagine, rocks, ships, cars, and even houses. It also brought such a great amount of salt to farm fields that no crops could be cultivated without desalination.



At coast, many dikes have collapsed, and also due to subsidence by 1-2 meters, some areas get submerged at high tides. Also, we see severe damage to marine and coastal ecosystems. The tsunami wiped out the original substrate and brought another. For example, muddy substrate was replaced with sand, and that has caused massive deaths of benthic organisms.



Coastal forests functioned as a buffer against the tsunami, but they were also severely damaged. Although most of them are artificial forests, they have provided several ecosystem services, including acting as a tidal and sand barrier.

How shall we rebuild them?

- Devastated societies are heavily dependent on ecosystem services.
- Without restoration of ecosystems, rebuilding of society and livelihoods will not proceed.
- Caring for ecosystems is the key to sustainable rebuilding.
- Rebuilding by caring for the surrounding ecosystem will lead to restoration of ecosystems and development of a sustainable society.



How shall we rebuild these communities? How shall we rebuild these satoyama. What we consider as the key is biodiversity and ecosystem services. The affected local communities have been strongly dependent on ecosystem services for its industry, such as agriculture, fisheries and forestry. Therefore, recovery of ecosystems is necessary for rebuilding of communities and people's livelihood. This could be a turning point to accelerate the progress toward sustainable societies.

The Tohoku Green Renaissance Project

We believe ecosystem services – connecting the ocean, forests and rice paddies with human well-being – are essential to rebuilding the Tohoku region.

The massive earthquake and tsunamis of 11th March 2011 caused catastrophic damage to our homes in the Tohoku region. Rebuilding society and the economy of this region is a priority for the whole of Japan and of pressing interest to the international community. The area devastated was a harmonious natural mixture of riparian land, forest and ocean, and historically the population of the area has optimized its ecosystem services for their livelihoods.

Rapid re-development of this area, without conducting an environmental impact assessment and giving adequate thought to the biodiversity of its rivers, rice paddies and ocean, may not only fail to repair the natural damage, but compound the losses already suffered. For this reason we believe a renaissance, or rebirth, of the area is necessary via "Green Rebuilding" to enrich the ecosystems and nurture biodiversity.

We affirm as citizens of the region that green rebuilding is necessary to regain and secure regional well being and to strengthen our harmonious relationship with nature.

22nd May 2011
(World Biodiversity Day)



We appeal that ecosystem services, through the connectivity between ocean, forest, rice paddies and human well-being, are essential for rebuilding.



海と田んぼからの
グリーン復興宣言



生態系からの恵みを受けて
人・海・田んぼそして森のつながりから復興をめぐる

（宣言文）

（参加団体）

（連絡先）

Based on these considerations and ideas, we have released our proclamation to make actions for green rebuilding, which aims to restore not only community but also biodiversity, and create better relationship between them. We call it “the Tohoku Green Renaissance Projects”.

The Tohoku Green Renaissance Projects

Affiliated Bodies

- Tohoku University, Ecosystem Adaptability GCOE
- Tambo (Rice Paddies Network Japan)
- Moriwa-Umino-Koibito
- Tohoku Chamber of Environment
- Sustainable Solutions

Supporters

- Institute for Global Environmental Strategies (IGES)
- Ramsar Network Japan
- Environment Outreach Centre (GEOC)
- MUDEF
- United Nations University Institute for Sustainability and Peace (UNU-ISP)
- United Nations University Institute of Advanced Studies Operating Unit Ishikawa/Kanazawa (UNU-IAS/OUIK)
- Think the Earth
- CEPA JAPAN
- Earth Day Everyday
- Japan Business Initiative for Biodiversity (JBIB) Tohoku Taskforce
- Nikkei BP Eco Management Forum Tohoku Taskforce
- EarthWatch Institute Japan
- Regional Environmental Planning Inc.
- Geocological Conservation Network
- Eagao-Tsunagete
- United Nations University Institute of Advanced Studies Secretariat for the International Partnership for Satoyama Initiative (UNU-IAS/IPSI)

In the projects, we have formed a sort of a consortium, consisting of various kinds of organizations, including university, NPOs/NGOs, creators, media, business, and governmental and intergovernmental bodies. We think involvement of many different stakeholders is critical to tackle issues like rebuilding from disaster.

Goals of the Green Renaissance

1. Land use that mitigates disaster risk through ecosystem services

- Restore coastal rice paddies. Land capability will be rejuvenated by the functions of wetlands. Other usage, including as a tidal flat or coastal wetland, would be considered for areas that are difficult to be restored (e.g., areas below sea level).
- Mitigate disaster risk with floodplain, retarding basin, or coastal belt zone for wetland ('Sato'-wetland).
- Financial support mechanism for land use that mitigates disaster, including offset, tax benefit (e.g., conservation easement), and insurance.

2. Careful disaster prevention that does not reduce ecosystem services

- Recovery of ecosystem with local vegetation.
- Land development with appropriate forest management and reduced sediment discharge, for conservation of marine ecosystems and securement of water quality.
- Construction with care for marine biological resources and passages of animals. Mitigates tsunami or flood by smart construction including move ability of constructions and buildings that parry water flow.

3. Sustainable activities with ecosystem services and their resilience

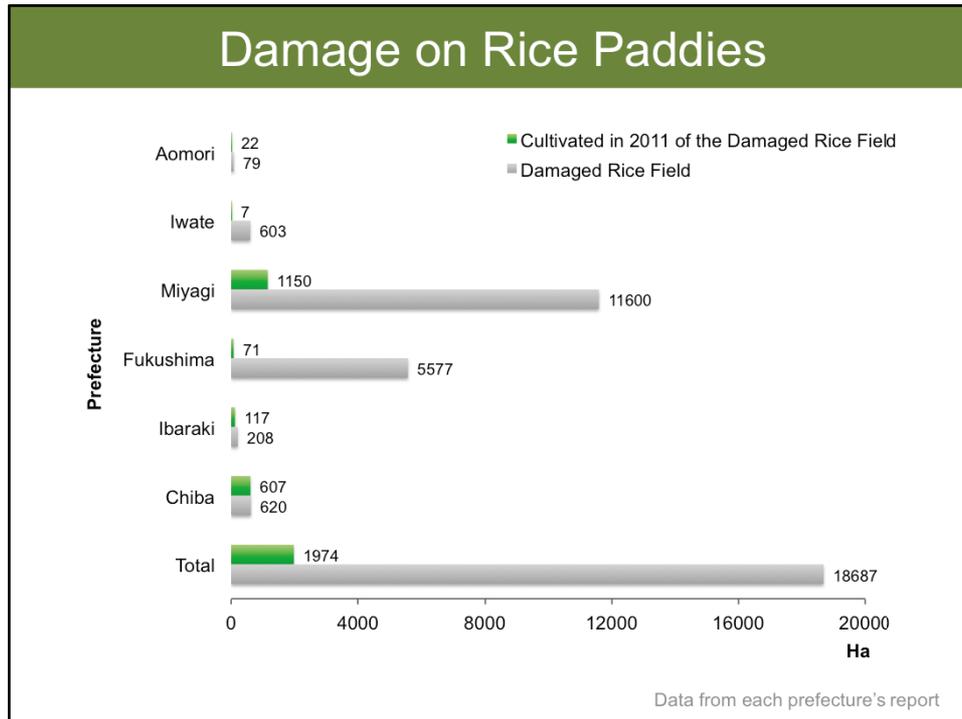
- When designing local industrial plans (agriculture, fishery, forestry, tourism, education), local culture and ecological resilience will be integrated into activities and shared with residents for consensus formation.
- The values of beauty of ecological landscapes and local cultures.
- Small-scale natural energy including biomass and small-scale hydroelectric power would be used to achieve energy self-sufficiency. Use of geothermal power will also be promoted.
- Financial support mechanisms will be developed. This includes long-term pre-order or investment supporting both rebuilding and biodiversity via rich food cultures and local resources in Tohoku.

The goals of the Green Renaissance are the followings:

We aim to restore traditional farmlands, such as rice paddies. When it is difficult, other land uses may be considered. For example, subsidized rice paddies may be restored back to the original ecosystem, such as coastal wetlands.

We also aim to develop disaster buffer zones with coastal forests and wetlands, where ecosystem services are better provided.

We would provide inputs to governments' rebuilding plans to make progress in developing sustainable societies.



In total, nearly 19,000 ha of rice fields was affected by the tsunami of the Great East Japan Earthquake. In only about 10% of them, rice was grown in 2011. Limitation of resources and the Fukushima nuclear plant accident have prevented from restoring these rice paddies.



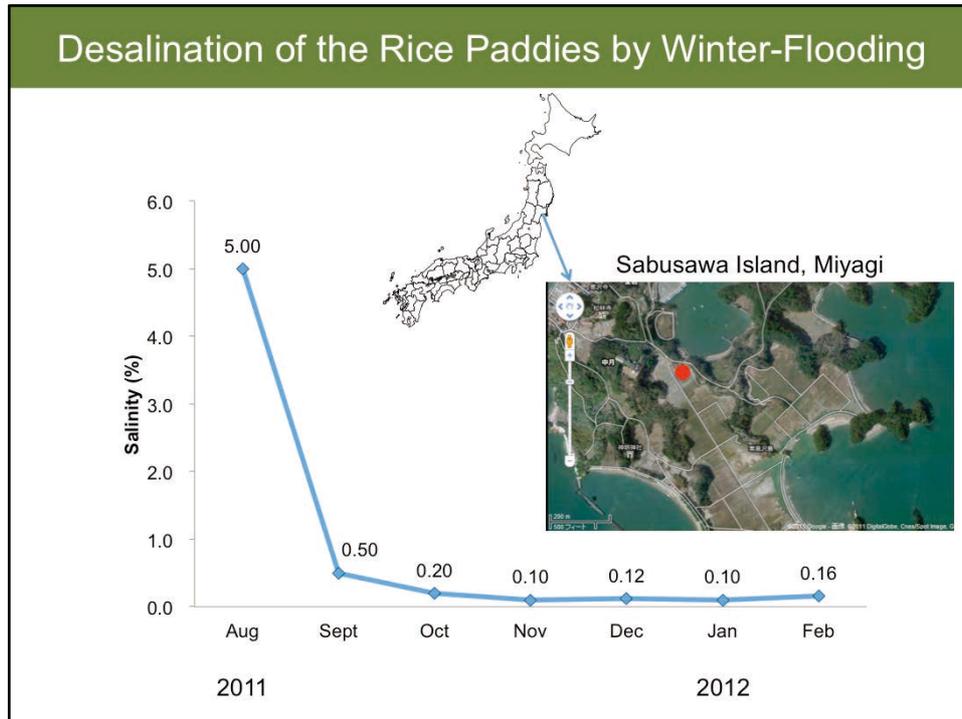
We have successfully restored some of them, as some of the rare successful cases. And the yield was as high as or even higher than the previous year.



One of the big problems in damaged rice paddies was the rubble brought by the tsunami. This house in the upper left photo was brought up here from 2km downstream. We removed all rubble only by human power. The volunteers in the lower left photo are looking for not gold or diamonds, but pieces of glass and other artificial materials.



We even pulled out a car from a rice paddy by human power. We did not use heavy machinery, because it can harm the layer structure of valuable soil and thus restructuring would be necessary.



The other big problem was salt. But we have also succeeded to decrease salinity to the level low enough for rice. We did this just by flooding these rice paddies. By flooding, water would dilute salt and also push down the heavier salty water below the plow layer.

Flooding as Method for Desalination



In fact, flooding of rice paddies has history as a method for desalination. In delta areas of Europe, such as Camargue Delta in France and Ebro Delta in Spain, farmers have been fighting against salt. They do winter-flooding in these delta areas to decrease salinity, they even cultivate rice right next to salt farm.

Also in Thailand after the Sumatra earthquake when many rice fields were damaged by the tsunami, a rich amount of rain had helped enough to reduce the salinity to a normal level.

Flooded Rice Paddies in Minami-Sanriku (Jan 12, 2012)



This is the flooded rice paddies in Minami-Sanriku in last winter. Desalination and removal of rubble had been completed in 2011, and we have already planted rice this spring.



Citizen-Involved Ecosystem Monitoring

While proceeding restoration, we have also conducted ecosystem monitoring with citizen volunteers. Because we want to keep watching ecosystems for a long term, like ten years, it is important to develop an easy and efficient monitoring method. We have adopted the method that involves many amateur volunteers to collect scientific data.

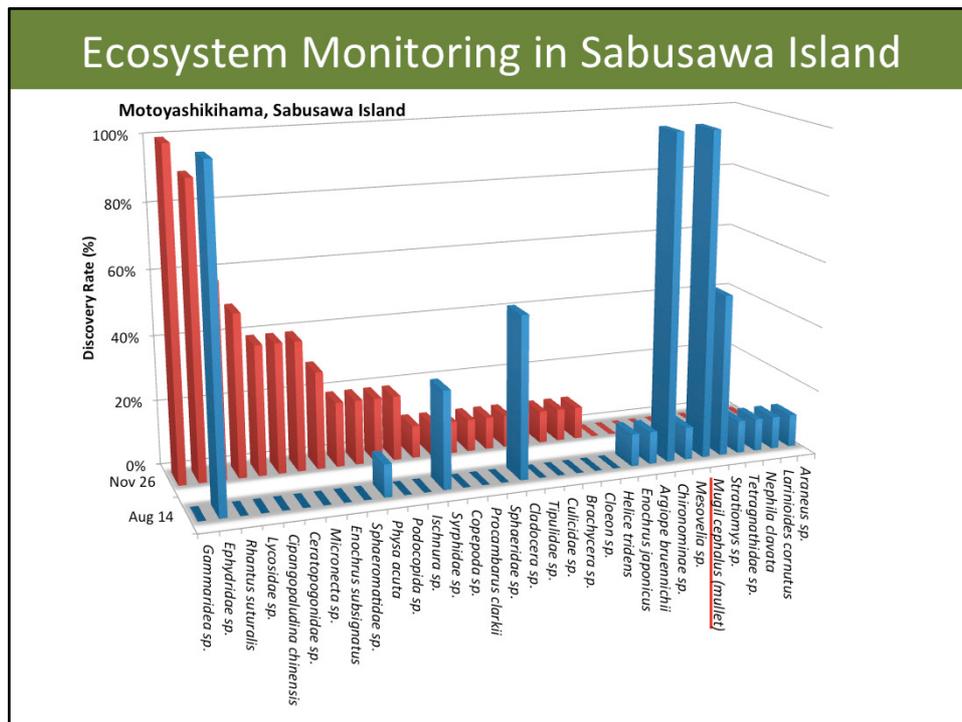
Ecosystem Monitoring at Kesenuma, Miyagi

表2 気仙沼本吉町大谷で観察された水生昆虫

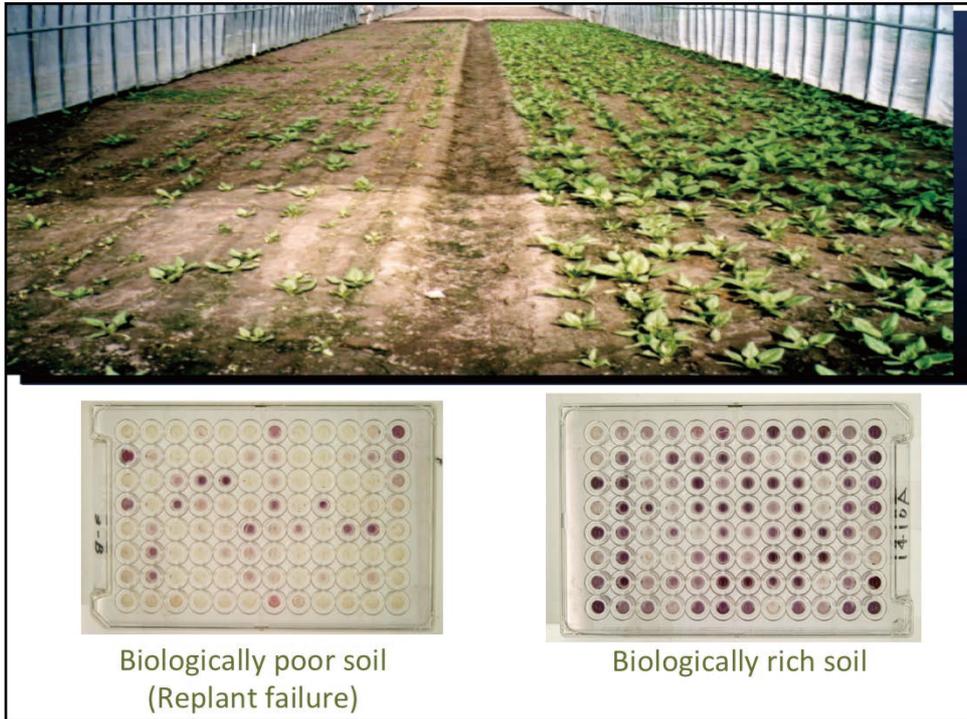
門	綱	目	種	Species Name	Apr 26	May 16	Jun 21	Jun 29		
節足動物門	昆虫綱	甲虫目	チビゲンゴロウ	<i>Hydroglyphus japonicus</i>	○	○	○	○		
			コミズムシ	<i>Sigara substriata</i>			○	○		
			イネクビホソハマシ(イネド)					○		
			ロオイムシの幼虫	<i>Oulema oryzae</i>				○		
			イネミスジウムシ	<i>Lissorhaptus oryzophilus</i>				○		
			ヒメガムシ	<i>Sternolophus rufipes</i>			○			
			ゴマフガムシ	<i>Berosus punctipennis</i>				○		
			カメムシ目	アメンボ	<i>Aquarius paludum</i>	○	○		○	
				ヒメアメンボ	<i>Gerris laticollis</i>		○	○	○	
				マツモムシ	<i>Notonecta triguttata</i>		○	○	○	
				ミズカマキリ	<i>Ranatra chinensis</i>				○	
				コオイムシ	<i>Appasus japonicus</i>				○	
				トンボ目	オツネントンボ	<i>Sympetrum paedisca</i>		○		○
					アキアカネ	<i>Sympetrum frequens</i>			○	○
				カゲロウ目	カゲロウ類の幼虫	Ephemeroptera sp.				○
				ハエ目	ミキワバエ科sp.	Ephydriidae sp.	○	○	○	
					ニクバエ科 sp.	<i>Sarcophagidae sp.</i>				○
					キリウジガガンボ	<i>Tipula (Yamatotipula) aino</i>		○	○	
					ヒラタアブ sp.	<i>Syrphinae sp.</i>			○	
					ミスアブ科sp.	<i>Stratiomys sp.</i>		○	○	
		ユスリカ亜科sp.	<i>Chironominae sp.</i>			○	○			
Total Number of Species Found					3	8	11	15		



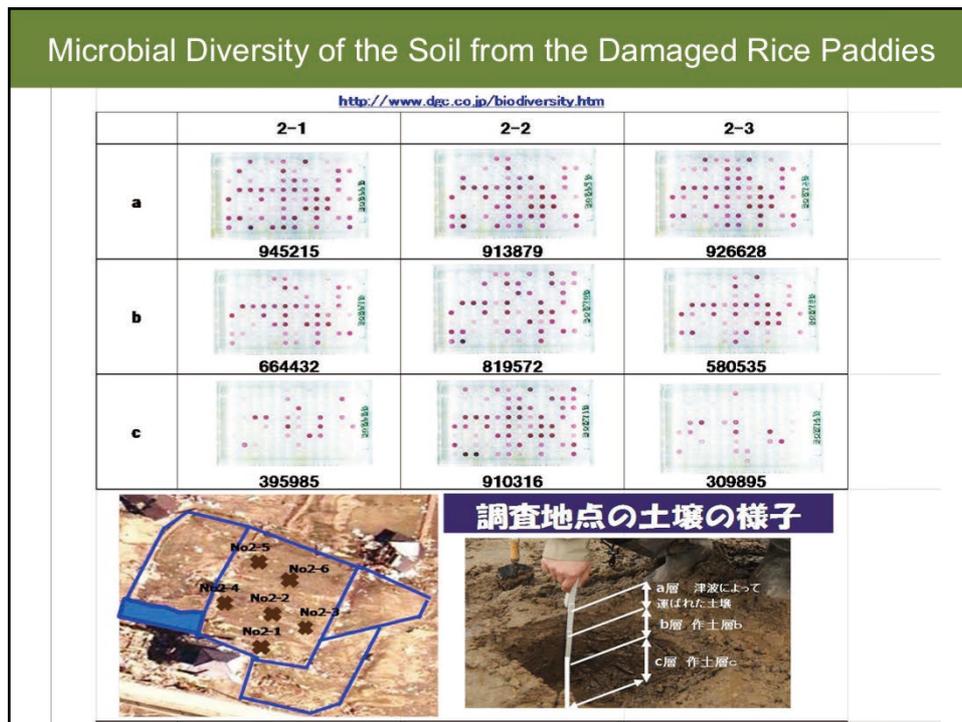
As the restoration proceeds, we have seen organisms coming back to rice paddies. Here you can see only three insect species in April, but the number increased up to 15 by the end of June.



This figure shows the result of the survey by 10 citizens including farmers, and business workers. The discovery rate provides a rough estimate of relative abundance of each species. You can see that marine organisms such as mullet were abundant in August, before desalination. But in November, species composition has drastically changed, and many freshwater organisms were found.



This experiment showed that soil biodiversity was highly associated with plant production. The soil from the field with replant failure has lower diversity than the healthy soil does.



We investigated the soil from the rice paddies damaged by the tsunami. It showed that the mud brought by the tsunami was the highest in the diversity score. Historically, farmers have inherited the traditional knowledge that tsunami can increase crop yield. Indeed, we saw such an increase in Kesenuma. Similar cases were observed in rice paddies in Sumatra after the earthquake. They call it “the tsunami bonus”. In many other restoration activities, the mud brought by the tsunami is being removed to remove rubble and salt, with a lot of money. Some people think that it is important to get back to what it was before, but it may be better when we can best utilize even tsunamis with much less money.



Some members of our projects are active in economic support through sales of what's called "Renaissance Rice", which contains rice cropped in winter-flooded rice paddies. A part of the sales is donated to the affected farmers. We are going to sell it again this year. Also, we are planning to promote green tourism in Tohoku. Thus, ecosystem recovery with local vegetation is strongly desired.

Summary

- Winter-flooded rice paddy, which nurtures biodiversity, was indeed effective for rebuilding from the disaster.
- Many volunteers are eager to participate.
- Citizen-involved ecosystem monitoring seems to be effective in...
 - Assessing the influence of the disaster and dynamics of ecosystems since then.
 - Promoting environmental literacy.
- Rebuilding with full respect for independence of local communities
- Need to involve other stakeholders and be more involved in developing rebuilding designs

As a summary, flooding of rice paddies was effective not only for biodiversity but also for rebuilding from disaster. We deeply appreciate a lot of volunteers. They have been eager in monitoring and restoring rice paddies and others.

Citizen-involved monitoring seems to be effective in collecting scientific data and promoting environmental literacy.

Most importantly, what we can do is to help the devastated communities with full respect for their independence and decision. It is important to achieve consensus among all stakeholders on the rebuilding design.

We have also provided input to the public comments for the rebuilding plans, or had talks with local government staff, including a mayor. But we think we need to be more involved in designing rebuilding plans.

We will continue our activities to make the devastated people happier, and to make progress toward sustainable societies.



Volunteers in November 2011