

Mitsui & Co. Environment Fund FY2019 Research Grants List

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a · Resource circulation	<u>Constructing a system that combines aquaculture and agriculture using three stages of groundwater with high concentrations of salt in arid land</u>	<u>Tottori University</u>	14
C. Ecosystems and the symbiotic society	<u>Ecologically studying the conservation and sustainable consumption of green turtles in an era of climate change</u>	<u>Everlasting Nature of Asia</u>	15
	<u>Elucidation of the natural healing mechanism of bark that has been extensively annellated by deer and proposal for a damage control method based on this mechanism</u>	<u>Kyushu University</u>	16
D · Relationships between people and society	<u>Applying international legal standards to realize the sustainable use of Arctic resources</u>	<u>Kobe University</u>	17
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Constructing a system that combines aquaculture and agriculture using three stages of groundwater with high concentrations of salt in arid land

Grant recipient: Tottori University / Period: 3 years

Value: ¥11 million / Main research location: Tottori Prefecture and Mexico

Project overview

This research project aims to develop a food production system that effectively uses groundwater containing high concentrations of salt in dry fields in Japan and Mexico. Specifically, water and soil resources will be conserved by reusing water and removing salt through crops using a system that combines aquaculture, hydroponics, and open field cultivation

Social issues to be solved

As the global population rapidly increases, the effects of climate change are becoming more severe, and the development of sustainable agriculture practices under tough environments is an urgent matter. Water resources in arid land contain a large amount of salt, and a method that produces marine and agricultural products while effectively using groundwater containing salt is essential. In this project, existing research results will be applied while developing a food production system that combines aquaculture and agriculture and effectively uses water containing high concentrations of salt, and then a proof-of-concept will be conducted.



Contribution to solving social issues

- Through this project, sustainable food production in arid land can be actualized by establishing a system of aquaculture, hydroponics, and open field cultivation that effectively uses water with high concentrations of salt.
- The established food production system will lead to water and soil resource conservation by reusing water and by the removal of salt through crops.
- As mentioned above, this project will contribute to the stabilization of food production and implementation of circulating regional resources by establishing a food production system that effectively uses water with high salt concentrations (SDG Goals 12 and 2). The developed system will reuse water and remove salt, which will contribute to the conservation of water and soil resources (SDG Goals 6 and 15).



Ecologically studying the conservation and sustainable consumption of green turtles in an era of climate change

Grant recipient: Everlasting Nature of Asia / Period: 3 Years
Value: ¥13 million / Main research area: Ogasawara Islands

Project outline

This study focuses on determining the optimum number of sea turtles that can be safely harvested while achieving the dual goals of preserving traditional Ogasawara Island food culture and ensuring sufficient protection of this endangered animal. An ecological survey and prediction of sex ratio dynamics of green turtles will be conducted, a resource dynamics model will be created based on the findings, and the number of green turtle catches will be set with residents to establish a resource management system.

Social issues to be resolved

Appropriate use of marine organisms such as sea turtles, which face extinction or whose populations have declined as the result of human activity, requires us to elucidate their ecology and devise conservation measures the application of which can increase and maintain their populations. However, temperature rise due to climate change is having a significant impact on the survival of sea turtles, whose sex is determined by the temperature during incubation. In this study, the ecology will be elucidated for the purpose of setting up a resource management system to make the fishing culture sustainable for green turtles – which have a critical role to play in the agriculture/fisheries and tourism sectors (Ogasawara Islands’ main industries).



Contribution to resolving social issues

- This study will complete the green turtle resource dynamics model for the Ogasawara Islands, and build a foundation for ecology and resource management there.
- In addition, this research will be a model case for the use of marine biological resources (including sea turtles) in other regions on the basis of scientifically verified conservation measures as part of the continuing effort to achieve harmony between endangered marine organisms and human activity.
- As noted above, this study is focused on developing a sustainable fishing culture for green turtles despite rising temperatures caused by climate change (SDG Goals 13 and 14).



Elucidation of the natural healing mechanism of bark that has been extensively annellated by deer and proposal for a damage control method based on this mechanism

Grant recipient: Kyushu University / Period: 3 years

Value: ¥4 million / Main research area: Yatsugatake Plateau

Project outline

This study proposes a symbiotic method for mitigating deer damage (bark stripping) and making use of a natural bark repair mechanism to prevent tree mortality, thereby reducing the impact on the ecosystem and forestry. Identifying the time when tree bark is likely to peel and the specific repair mechanism of the bark will make it possible to limit the countermeasure period (i.e. application of deer repellent) to the shortest possible duration, prevent the death of *Enkianthus campanulatus* growing in the Yatsugatake Plateau and achieve symbiotic coexistence with deer.

Social issues to be resolved

Deer can be found in 20% of all forests in Japan. Bark peeling by deer is the cause of a recent spate of tree deaths in a century-old colony of *Enkianthus campanulatus* in the Yatsugatake Plateau. Typical countermeasures include population management (hunting) and protective fences, but neither is an optimal solution given the limited hunting area, declining number of hunters and high cost of installing protective fences. In this study, we propose a symbiotic deer damage prevention method based on the trees' natural bark repair mechanism.



Contribution to resolving social issues

- The symbiotic deer damage prevention method proposed in this study will make it possible to simultaneously prevent further decline of the Yatsugatake Plateau *Enkianthus campanulatus* colony and promote coexistence with the local deer population.
- In addition, by exploring the application of the damage prevention method to *Enkianthus campanulatus* and other tree species outside of Yatsugatake Plateau, it will be possible to expand the area in which trees can safely coexist with deer.
- As mentioned above, this research contributes to the conservation of forest resources by preventing tree death (SDG Goal 15). In addition, by reducing the duration of deer countermeasures, this research contributes to promoting coexistence with deer populations (SDG Goal 15).



Applying international legal standards to realize the sustainable use of Arctic resources

Grant recipient: Kobe University / Period: 2 years
 Value: ¥6 million / Main research area: Arctic Region

Project outline

This project entails assessing three specific natural resource development operations in the Arctic—the fishing industry, LNG development in the Yamalo-Nenets Autonomous Okrug, and shipping in the Northwest Passage—to analyze the applicable international law and propose methods with which to achieve sustainability.

Social issues to be resolved

Against a background of climate change on a regional scale, there is increasing interest in developing natural resources in the Arctic. However, inappropriate development has the potential to negatively impact the fragile Arctic environment and the lifestyles of the local population. Although there are existing international laws pertaining to the use of natural resources in the region, there is an urgent need to determine whether these laws can be used to achieve sustainability for Arctic resources. This research will analyze the implementation of the relevant law and propose methods to enable sustainability.



Contribution to resolving social issues

- This research will provide findings and information on sustainable resource development from an international law perspective to local governments and private sector firms and other stakeholders connected with Arctic resource development.
- The research should facilitate the protection and sustainable use of resources while protecting the lifestyles of local populations by influencing the content and application of international law by different nations and the development of resources by the private sector.
- Through the above, the research will contribute to the sustainable use of Arctic resources (SDG Goals 14 and 12). It will also support the development of international laws to increase sustainability in society (SDG Goal 16) and based on that increase public/private sector partnership (SDG Goal 17).



Undertaking research on water resources to enable stable energy supply methods that reflect traditional agricultural village practices

Grant recipient: Chitose Institute of Science and Technology / Period: 3 years
Value: ¥12 million / Main research location: Indonesia

Project outline

This project will use ICT technology to investigate water resources and social conditions in Indonesia to clarify the conditions necessary for the operation of micro hydroelectric power plants (MHPP) in regions with a high incidence of natural disasters. Based on the village of Ciptagelar, the research will use an interdisciplinary approach to cover hydrological surveying to assess risks of damage to MHPP, the demand for power, regional resources and local practices, water management systems and other social assessments.

Social issues to be resolved

To address economic disparities between different regions in Indonesia, MHPPs are being installed in parts of the country that are difficult to access. However, damage from local environmental conditions means that many of these plants have become un-operational. Ciptagelar village is one such example. Its economy is based on traditional methods of rice cultivation, and restoration of the MHPP has not progressed because rather than simply requiring funding, restoration requires external support, which is hard to deliver in the rugged terrain. This research aims to clarify the conditions necessary to enable sustainable operation of MHPP in areas susceptible to natural disasters, and in doing so establish a protocol that can be used when investigating other regions.

Contribution to resolving social issues

- This research will clarify the conditions necessary for sustainable power supply in Ciptagelar village, supporting the sustainable availability of power to the village.
- By using the research protocol developed in this project, the conditions required for MHPP in other regions of Indonesia can be determined, leading to the use adoption of renewable energy in areas subject to natural disasters.
- These two elements will lead to the sustainable use of renewable energy in natural disaster-prone regions (SDG Goal 7). In addition, as the impact of climate change is predicted to increase the prevalence of extreme rainfall, flooding and other such natural disasters, this will support the development of power generation methods that are adapted for these conditions (SDG Goal 13).