

## 1. Overview

### (1) Background and features of the practice

Agriculture, forestry, and fishery are essential industries for the survival of humans. Increased production in these industries has greatly contributed to the welfare of humans. Since the mid 20<sup>th</sup> century, the introduction of scientific technologies (such as high-yielding plant varieties and chemical fertilizers) along with the expansion of the scale of operation has been promoted around the world to accommodate the needs of a rapidly growing population. The productivity of these industries has drastically increased as a result.

Areas that have improperly employed modern practices have faced problems such as reduced fertility in farmland, a spread of disease and damage from insects, and a depletion of fishery resources. These problems have decreased long-term productivity and had great impact on socioeconomic problems such as poverty.

Based on such problems, conversion from conventional practices to new practices that consider the conservation of organisms and ecosystem functions have been promoted around the world with the purpose of maintaining and improving long-term productivity.

### (2) Details of the practices and their applicability

There is a wide variety of ways to practice agriculture, forestry, and fishery that consider the conservation of organisms and ecosystem functions. Optimal practices and technologies are employed based on natural conditions, socioeconomic conditions, and problems associated with the agriculture, forestry, and fishery of a given area.

Four representative examples of such practices are described below.

#### **1) Organic farming, low-input farming**

- i. Details of the practice
  - This practice reduces artificial inputs such as agricultural chemicals and chemical fertilizers to reduce pollution of soil and water, which are the foundation of agriculture, forestry, and fisheries, and to stabilize long-term productivity while maintaining the fertility of the soil.
- ii. Range of application
  - This practice may be applicable to farmland around the world.
- iii. Implementing bodies
  - Farm owners implement this practice.

#### **[Cases]**

Around the world No.5: Land use and natural resource utilization and management in Kampong Cham, Cambodia

Around the world No.23: Agriculture in harmony with nature in the state of Queensland, Australia

#### **2) Permaculture**

- i. Details of the practice

- Permaculture is a coined word that combines the words permanent, agriculture, and culture. This is an agricultural system that allocates vegetation, animals, buildings, and infrastructures into one space to create an ecologically healthy and economically viable mechanism while avoiding environmental pollution and the exploitation of land and natural resources.
- ii. Range of application
    - It is possible to apply this practice in farmland around the world.
  - iii. Implementing bodies
    - Farm owners implement this practice.

### **3) Ecosystem-friendly farming and forestry**

- i. Details of the practice
  - This practice facilitates coexistence with organisms that inhabit areas in and around agricultural or forestry zones and sustains agriculture and forestry while reducing their impact on habitats and ecosystems.
  - Details of the practice include the introduction of an operation schedule that accommodates reproduction or other cycles of organisms and the installation of biotopes in some parts of agricultural or forestry zones. Organic farming or low-input farming described in (1) are often incorporated as technologies to reduce the impact on organisms.
- ii. Range of application
  - This practice may be applied to agricultural land and forests around the world.
- iii. Implementing bodies
  - Farmers and foresters implement this practice.

#### **[Cases]**

In Japan No.2: Agriculture coexisting with crested ibises in Niigata Prefecture, Japan

In Japan No.3: Agriculture aiming for coexistence with white storks in Toyooka City, Hyogo Prefecture, Japan

Around the world No.13: Landscape management in Germany

Around the world No.17: The sustainable use and biodiversity of paddies, fields, and secondary forests in Louisiana

\* *These three cases incorporate organic farming and low-input farming described in (1) as technologies to reduce the impact on organisms.*

### **4) Resource managing fishery**

- i. Details of the practice
  - This practice sustains the fishery industry without depleting resources by controlling the amount of catches within the resilience of fishery resources and making efforts to maintain and improve this resilience.
- ii. Range of application
  - This practice may be applicable to oceanic areas around the world.
- iii. Implementing bodies
  - Fishermen implement this practice.

#### **[Cases]**

Around the world No. 4: The community fishery of Tonle Sap, Cambodia

## **2. Effects obtained from these Cases regarding the sustainable use and management of natural resources**

Implementation of the practices in this category is associated with the following effects in the sustainable use and management of natural resources and the maintenance of a healthy secondary nature.

### **(1) Effects in the sustainable use and management of natural resources (socioeconomic effects)**

- The long-term productivity of food, fuel, and materials can be maintained or improved by returning to the original principles of agriculture, forestry, and fishery to harvest within the resilience of animals and vegetation.
- In addition to provisional services, the stabilization or improvement of various functions such as regulatory services (including disaster prevention and climate regulation functions), supporting services (circulation of nutrient salts and the prevention and removal of diseases and pests), and cultural services (including succession of local culture and supply of ecotourism sites), can be expected, which brings various benefits to local residents.

### **(2) Effects on health of the secondary nature (effects on the ecosystem and biodiversity)**

- The improved health of agricultural land, forests, and coastal regions where agriculture, forestry, and fishery are conducted can be expected through the above effects.
- An improvement in the biodiversity of areas such as agricultural land, forests, and coastal regions can be expected from the reduction in operations and inputs that impede the inhabitation of wild organisms.

### 3. Toward the implementation of this practice : Points of planning and examples of action items based on the “Five Perspectives” of the SATOYAMA Initiative

Points of planning and action items for planning the employment of practices in this category are as follows.

Table: Points of planning and action items based on the “Five Perspectives” of the *Satoyama* Initiative

“Five Perspectives” of the Satoyama Initiative	Points of planning	Action items
(1) Resource use within the carrying capacity and resilience of the environment	<ul style="list-style-type: none"> <li>• It is necessary to analyze agricultural, forestry, and fishery yields, along with the carrying capacity and resilience of the environment using scientific methods.</li> <li>• Based on the above findings, it is necessary to select the best practices and technologies to optimize the residence and carrying capacity of the environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Analyze data on the carrying capacity and resilience of the environment.</li> <li>• Select new practices and technologies.</li> </ul>
(2) Cyclic use of natural resources	<ul style="list-style-type: none"> <li>• It is necessary to maintain the balance between material inputs and outputs in agriculture, forestry, and fishery and the circulation of local natural resources.</li> </ul>	<ul style="list-style-type: none"> <li>• Plan cyclic use of natural resources.</li> </ul>
(3) Recognition of the value and importance of local traditions and cultures	<ul style="list-style-type: none"> <li>• It is necessary to compare traditional agricultural, forestry, and fishery practices with the new plan to make sure that the plan is in harmony with local natural conditions.</li> <li>• Rather than simply reapplying traditional knowledge, it is necessary to maintain harmony with modern socioeconomic conditions (such as market needs) by integrating modern scientific technologies.</li> </ul>	<ul style="list-style-type: none"> <li>• Reevaluate traditional practices and reflect them in the plan.</li> </ul>
(4) Natural resource management by various participating and cooperating entities	<ul style="list-style-type: none"> <li>• It is necessary to establish support systems involving public body and scientists and community-based cooperating systems when necessary.</li> </ul>	<ul style="list-style-type: none"> <li>• Establish support and cooperating systems.</li> </ul>
(5) Contributions to local socio-economies	<ul style="list-style-type: none"> <li>• It is necessary to have socioeconomic support toward the establishment of a market for sustainable agriculture, forestry, and fishery.</li> <li>• It is important to implement systematic education, human resources development, and capacity building to ensure proper and wide-range promulgation.</li> </ul>	<ul style="list-style-type: none"> <li>• Plan socioeconomic support.</li> <li>• Plan education, human resources development, and capacity building.</li> </ul>

## (1) Resource use within the carrying capacity and resilience of the environment

<b>Points of planning</b>	<ul style="list-style-type: none"> <li>• It is necessary to analyze agricultural, forestry, and fishery yields, along with the carrying capacity and resilience of the environment using scientific methods.</li> <li>• Based on the above findings, it is necessary to select the best practices and technologies to optimize the resilience and carrying capacity of the environment.</li> </ul>
<b>Action items</b>	<ul style="list-style-type: none"> <li>• Analyze data on the carrying capacity and resilience of the environment.</li> <li>• Select new practices and technologies.</li> </ul>

Primary industries such as agriculture, forestry, and fishery directly receive provisional services from natural resources. Such industries depend on the resilience of cultivated plants, trees, fish and shellfish to be produced. Although it is possible to increase this productivity through artificial means such as fertilizers, the range of the increase is limited by the environmental carrying capacity (capacity to decompose and purify pollutants) of the soil or sea areas.

If problems such as reduced productivity or a depletion of resources is being experienced in areas where agriculture, forestry, or fishery is the main industry, it is likely that the production activities are exceeding the resilience and carrying capacity of the environment.

When establishing a plan to introduce a practice, it is necessary to first analyze various data on the carrying capacity and resilience of the environment to identify the status of the excessive activities described above. Then, based on the analytical findings, it is necessary to select the best practices and technologies that can optimize the resilience and carrying capacity of the environment.

Utilization of scientific data is important when conducting these operations. Examples of such data include the crop yield trends, the amount of inputs associated with production activities, values that indicate the health status of the soil or ocean, and the inhabitation status of organisms (see the table below). Of these data, it is especially effective to carry out continuous monitoring of the items that are strongly associated with productivity even after introducing the practice and utilize the outcome in adaptive management.

Table: Examples of items to check regarding carrying capacity and resilience of the environment

Category	Contents to check
<b>i. Crop yields</b>	<ul style="list-style-type: none"> <li>• Is the practice able to sustain stable crop yields?</li> </ul>
<b>ii. The amount of input through production activities</b>	<ul style="list-style-type: none"> <li>• Are excessive amounts of fertilizers or agricultural chemicals applied to agricultural land?</li> <li>• Is the agricultural land experiencing excessive irrigation or a water shortage?</li> <li>• Is water pollution occurring in groundwater and nearby rivers due to the influences of excessive amounts of fertilizers or agricultural chemicals?</li> <li>• Is water pollution occurring in fisheries due to overfeeding?</li> </ul>
<b>iii. Values that indicate the health of the soil or ocean</b>	<ul style="list-style-type: none"> <li>• Is surface erosion occurring in agricultural land or forests?</li> <li>• Is replanting failure occurring in agricultural land?</li> <li>• Is the amount of plankton decreasing in the ocean?</li> </ul>
<b>iv. Inhabitation status of organisms</b>	<ul style="list-style-type: none"> <li>• Are there any changes in the number of species or the composition of organisms that inhabit in the area of production?</li> <li>• Is there a decrease in the number of individuals of native or rare species that inhabit in the area of production?</li> <li>• Are there a large amount of bycatches in the fishery?</li> </ul>
<b>v. Correlation of the above categories</b>	<ul style="list-style-type: none"> <li>• Are there any correlations among the items [i] to [iv]? (In particular, does the change in crop yields in item [i.] correlate with the changes in items [ii.] to [iv.]?)</li> </ul>

## (2) Cyclic use of natural resources

<b>Points of planning</b>	<ul style="list-style-type: none"> <li>It is necessary to maintain the balance between material inputs and outputs in agriculture, forestry, and fishery and the circulation of local natural resources.</li> </ul>
<b>Action items</b>	<ul style="list-style-type: none"> <li>Plan cyclic use of natural resources.</li> </ul>

Material circulations in agriculture, forestry, and fishery are not contained within the area where these industries are conducted. Rather, they form complex relationships with surrounding ecosystems through the circulation of materials such as organic matter, nitrogen, and nutrient salts. For example, the nutrients required to grow agricultural products must be supplied from outside, and some materials such as wastes from agricultural, forestry, and fishery operations are transported outside from the areas of production.

In order to maximize the effects of introducing this practice, it is essential to build good relationships between the areas of agricultural, forestry, and fishery operations and their surroundings. To do so, it is necessary to check the inputs (e.g. fertilizers and agricultural chemicals) from outside into agricultural, forestry, and fishery operations as well as outputs (e.g. wastes) of these operations to the outside, and then make efforts to establish good relationships with surrounding land use and the activities of the people.

Table: Examples of efforts to establish good natural resource circulations

Category	Examples of inputs and outputs		Examples of efforts to establish good natural resource circulations
Agriculture	Input	Fertilizers, compost	<ul style="list-style-type: none"> <li>Acquisition of organic fertilizers and compost in cooperation with nearby livestock industries, forestry, and fishery operations.</li> </ul>
		Agricultural chemicals	<ul style="list-style-type: none"> <li>Use of organisms that predate on pests (e.g. an agricultural practice using the crossbreed between the mallard and the domestic duck)</li> </ul>
		Pollinators	<ul style="list-style-type: none"> <li>Introduction of native species and species that are known to be safe</li> </ul>
	Output	Wastes (inedible parts of agricultural crops, etc.)	<ul style="list-style-type: none"> <li>Application to agricultural land as soil improvement materials or compost</li> <li>Utilization as energy sources or material in the lives of the people who live nearby (biomass utilization)</li> </ul>
		Effluents of fertilizer ingredients	<ul style="list-style-type: none"> <li>Installation of control basin</li> </ul>
Forestry	Input	-	-
	Output	Wastes (logging residue, mowed grass, etc.)	<ul style="list-style-type: none"> <li>Utilization as energy sources or materials in the lives of the people who live nearby (biomass utilization)</li> </ul>
Fishery	Input	-	-
	Output	Wastes (carcasses, processing residue, etc.)	<ul style="list-style-type: none"> <li>Application to agricultural land as soil improvement materials or compost</li> <li>Utilization as energy sources or material in the lives of the people who live nearby (biomass utilization)</li> </ul>

### (3) Recognition of the value and importance of local traditions and cultures

<b>Points of planning</b>	<ul style="list-style-type: none"><li>• It is necessary to compare traditional agricultural, forestry, and fishery practices with the new plan to make sure that the plan is in harmony with local natural conditions.</li><li>• Rather than simply reapplying traditional knowledge, it is necessary to maintain harmony with modern socioeconomic conditions (such as market needs) by integrating modern scientific technologies.</li></ul>
<b>Action items</b>	<ul style="list-style-type: none"><li>• Reevaluate traditional practices and reflect them in the plan.</li></ul>

The wisdom of functional material circulation and selection of crops and livestock that suit the area's natural conditions as well as the knowledge of useful organisms have been fostered over centuries of experience in agricultural, forestry, and fishery practices in many areas. They often provide valuable clues to make sure that a new practice is in harmony with the area's natural environment.

On the other hand, since the socioeconomic conditions have been drastically changing in many areas, it is possible that a simple reapplication of traditional knowledge will not result in sufficient outcomes.

Therefore, when introducing a practice, it is necessary to maintain harmony with present socioeconomic conditions using modern scientific technologies, while making sure that the practice is in harmony with local natural conditions by comparing it with traditional knowledge.

For example, a bonito fishery company in Japan obtained the international certification of the MSC (Marine Stewardship Council) by scientifically proving that the traditional "single-rod fishing" is a sustainable fishing method. This company is attracting the needs of consumers who consider about the environment.

### (4) Natural resource management by various participating and cooperating entities

<b>Points of planning</b>	<ul style="list-style-type: none"><li>• It is necessary to establish support systems involving public body and scientists and community-based cooperating systems when necessary.</li></ul>
<b>Action items</b>	<ul style="list-style-type: none"><li>• Establish support and cooperating systems.</li></ul>

If land owners who wish to employ this practice do not have sufficient information or skills, it is important that government organizations, international organizations, NPO/NGOs, researchers, or other people who have the information and skills support such land owners.

Rather than introducing this practice to each individual land owner, it is more effective to facilitate synergy effects and consensus building by creating a community-based effort in which multiple land owners and residents cooperate and work on this practice as they share their knowledge and experience.

## (5) Contributions to local socio-economies

<b>Points of planning</b>	<ul style="list-style-type: none"><li>• It is necessary to have socioeconomic support toward the establishment of a market for sustainable agriculture, forestry, and fishery.</li><li>• It is important to implement systematic education, human resources development, and capacity building to ensure proper and wide-range promulgation.</li></ul>
<b>Action items</b>	<ul style="list-style-type: none"><li>• Plan socioeconomic support.</li><li>• Plan education, human resources development, and capacity building.</li></ul>

Agricultural, forestry, and fishery products obtained through sustainable production methods require more labor and costs than conventional products; thus, their sales prices in the market tend to be higher than the prices of conventional products.

In order to alleviate such economic barriers, it is effective to regard the increase in price as the value of social benefits of ecosystem services and biodiversity and seek social understanding or the acceptance of the burdens associated with these benefits. Specific examples of such efforts include the certification of farmers, foresters, and fishermen or their products (certificates of organic products in individual countries, FSC certification, and MSC fishery certification) to promote selective purchasing by consumers.

In order to ensure proper promulgation of the practice, it is effective that public entities such as government organizations, international organizations, and NPO/NGOs implement systematic education, human resources training, and capacity building programs targeting local residents.