

Research Article

Consumers' Attitudes towards Edible Wild Plants: A Case Study of Noto Peninsula, Ishikawa Prefecture, Japan

Bixia Chen¹ and Zhenmian Qiu^{1,2}

¹*Institute of Advanced Studies Operating Unit, United Nations University, Ishikawa/Kanazawa Hirosaka 2-1-1, Kanazawa, Ishikawa 920-0962, Japan*

²*The School of the Economics, Fujian Normal University, Qishan Campus, Minhou County, Fuzhou 350108, China*

Correspondence should be addressed to Zhenmian Qiu, qiuzhenmian@gmail.com

Received 14 July 2011; Revised 16 November 2011; Accepted 19 December 2011

Academic Editor: Hubert Sterba

Copyright © 2012 B. Chen and Z. Qiu. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

This study explored the rural revitalizing strategy in FAO's Globally Important Agricultural Heritage System (GIAHS) site in Noto Peninsula, Ishikawa Prefecture of Japan, using a case study of edible wild plants. This study assessed the current and possible future utilization of edible wild plants as one important NTFP by clarifying the attitudes of consumers and exploring the challenges of harvesting edible wild plants. Traditional ecological knowledge associated with edible wild plants and the related attitudes of consumers towards wild plants was documented. A questionnaire survey found that a majority of the respondents held positive attitude towards edible wild plants as being healthy, safe food, part of traditional dietary culture. Increasing demand of edible wild plants from urban residents aroused conflicts with local residents' interest given that around 86% of the forested hills are private in Noto Region. Non timber forest products (NTFP) extraction can be seen as a tool for creating socioeconomic relationships that are dependent on healthy, biodiverse ecosystems. It was suggested that Japanese Agricultural Cooperatives (JA) and Forestry Cooperatives (FCA) could be involved with GIAHS process. As important traditional dietary and ecological system, edible wild plants should be a part of GIAHS project for rural revitalization.

1. Introduction

As a hilly and mountainous country, throughout history the people of Japan have developed integrated management knowledge related to forested mountains, in particular, those low hills adjacent to human settlements. *Satoyama* in Japan has been shaped to a great extent by centuries of management of coppice woodlands on hillside landscapes [1]. A *satoyama* landscape is an agricultural land use system comprised of secondary forest, farmlands, settlements, and reservoirs [1]. The ecosystems of the secondary woodlands have provided critical services, which benefit human well-being, as well as rich biodiversity [2]. People have lived on the wild plants harvested from the hills and developed rich knowledge related to the uses of wild plants [3]. Some species of wild edible plants, mushrooms, and seaweeds are crucial in various fields of life (e.g., traditional diet system).

Coppice woodlands are managed for the production of wood or charcoal and are cut regularly for this purpose. With the depopulation, migration, and change of life styles

after the rapid urbanization in the 1960s, similar to the other parts in the world, however, the forested mountain and traditional knowledge related to it have been degrading [1]. Conversion to coniferous tree plantation to produce timbers has also dramatically changed coppice forest. As a result, the undermanaged forests have threatened the diversity of biology and cultures [4, 5]. Since the 1980s, the national initiatives have been launched to conserve *satoyama* landscapes, local and regional initiatives have also increased.

Environmental conservation in *satoyama* has been the focus of academic and policy-making efforts in Japan recently. Substantial research papers report the concerns of environmental conservation both in Japanese and English [6, 7]. Since the 1980s, laws were stipulated to regulate *satoyama* landscape mainly by setting limitation to residential and commercial land development. Recent laws relevant to *satoyama* have been implemented in Japan, including the Act on the Promotion of Nature Restoration (2002), Landscapes Act (2004), and Act on Promotion of Ecotourism (2007) [2].

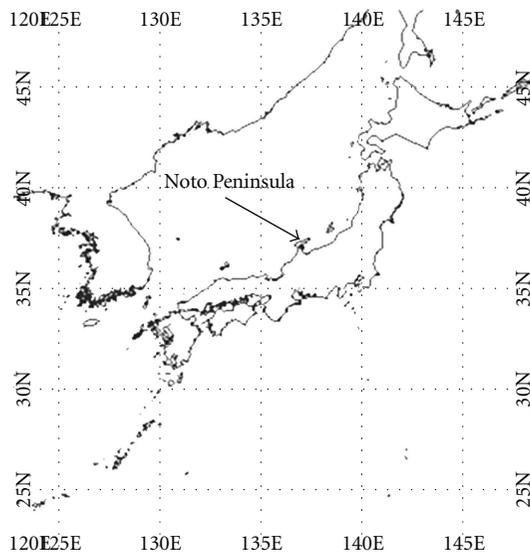


FIGURE 1: Location of Noto Peninsula

How to conserve the biodiversity in *satoyama* and revitalize the rural areas has been one of key issues for policy makers at all levels from national government to municipalities. Ecological functions in spite of coppice or timber production become considered as the major purposes of *satoyama*. In comparison to the substantial efforts of environmental conservation in Japan, uses of natural resources, in particular, non timber forest products (NTFPs) were much less discussed.

The Noto Region in Ishikawa Prefecture (Figure 1), as a microcosm of *satoyama*, has been designated as a Globally Important Agricultural Heritage Systems (GIAHS) site in June, 2011. GIAHS was defined as “Remarkable land use systems and landscapes which are rich in globally significant biological diversity evolving from the co-adaptation of a community with its environment and its needs and aspirations for sustainable development.” [11] As a GIAHS site, it is urgent and vital to develop strategies for dynamic conservation and adaptive management of local agricultural biodiversity, knowledge systems, food and livelihood security, and cultures.

Humans have inhabited the Noto Region for more than one thousand years by utilizing the natural resources both from the hills and the sea. *Satoyama* in the Noto Region in Japan has abundant species of wild plants which people have utilized for more than one thousand years.

Since 2008, output value from non timber forest product has grown to account for more than half of the gross output from forests in Japan [12]. In contrast to its increasing importance in forestry, studies relevant to wild edible plants are still sporadic. Some early researches mentioned the liking [13] and utilization of edible wild plants [14, 15]. There exists a rising demand of edible wild plants; however, big stores in metropolis were reluctant to sell wild plants due to its small amount of potential customers [16]. Consumers’ attitude towards edible wild plants is still little known.

Ishikawa Prefecture can serve as an appropriate survey site for possessing rich plant species and being the center of Hokuriku Area in Japan.

It is expected that results of this study will contribute to the strategies of revitalizing the managed secondary forest ecosystem by promoting recreational use of forest resources. The primary goal of this study is to explore the potential use of natural resources in a sustainable way in the managed secondary forests, which have greatly degraded without thinning in Japan. This study was designed to assess the current and possible future utilization of edible wild plants as one important NTFP by clarifying the attitudes of consumers and exploring the challenges of harvesting edible wild plants. In this study, the effect of demographic characteristic of consumers towards wild plant consumption was also discussed. *Sansai* is commonly used in Japanese, here it was used to be equivalent to edible wild plants. *Sansai* also includes various mushrooms besides edible wild plants; however, edible mushrooms are only harvested in autumn, and it needs much related knowledge to tell mushrooms from edible or poisonous. Thus, we only limit *sansai* to edible wild plants in this study.

Some of the objectives of the study are the documentation of traditional ecological knowledge associated with edible wild plants and the related attitudes of consumers towards wild plants. Specially, the objectives of this study include the following.

- (1) Document the species of edible wild plants and the traditional uses of the wild plants, their uses as food or medicine, and their habitat.
- (2) Record the traditional knowledge associated with harvest to ensure no harm to natural regeneration.
- (3) Survey the attitudes of consumers, including local people, towards edible wild plants. Compare the attitude of residents in remote mountainous areas and urban areas. How demographic characteristics (gender, age, and education) of consumers affect their frequency of purchasing, eating, or harvesting edible wild plants.
- (4) Discuss the challenges to the harvest and consumption of edible wild plant. The conflicts of interest of these stakeholders will be discussed and the potential policy implication is also tentatively brought forward.

2. Survey Sites and Method

The hilly Noto Peninsula, also usually called the Noto region, is located in the north of Ishikawa Prefecture, which juts out into the Sea of Japan. As a narrow long peninsula extending from the south to the north, the area is characterized by a configuration of closely knit together *satoyama* and *satoumi* landscapes, with their associated land uses, diversified livelihoods based on agriculture, forestry and fisheries, lifestyles and customs, and biodiversity. The earliest archaeological evidence of rice cultivation in the region dates back to the mid-Yayoi period (300BC–250AD).

Two survey sites were selected to interview the respondents, Oozora Farmers' Market and Uchinada Farmers' Market. The former is located in the town of Anamizu in the centre of Noto Peninsula, nearby the entrance to express way. The latter is located in Kanazawa City, the capital city of Ishikawa Prefecture and also the central city in the Hokuriku Region in Japan. These two sites were selected to represent the market in the production place of edible wild plants among the hilly areas and the other one in the urban area as the market center in Ishikawa Prefecture, respectively. These stores are managed as retail store of Agriculture Association Group. They help to sell farmers' product and charge a commission of around 15% of the total sales.

A combination of qualitative and quantitative data collection methods was used depending on study purposes in this study. The questionnaire survey was conducted in May, 2011, when many species of wild edible plants were collected and sold in the market. During a long vacation at the beginning of May, usually called the Golden Week, warm days in spring have attracted people, not only local residents, but also those from nearby cities to travel. Farmers' market is among one of best popular sites for visitors. Visitors in this season can represent a wide variety besides local residents.

In depth interviews were conducted with multistakeholders relevant to the utilization of wild edible plants: collectors, consumers, and specialists of wild edible plants, forest owners, Forest Cooperation Association in Noto, and municipalities. Interviews lasted around an hour at average. We communicated in Japanese and notes were also taken in Japanese. Then interviews were translated into English. Consumers were briefly interviewed after a questionnaire sheet completed when time allowed to grasp additional consumers' attitudes toward wild edible plants.

A list of edible wild plants was compiled after consulting with local experts of vegetation. First, we obtained a list of edible wild plants from the Ishikawa Prefecture office. The list was revised and extensively recompiled by deleting extinct species and wrong data and adding missing data. In order to identify plant species and habitat and obtain relevant ecological knowledge, we have visited the forest to pick up edible wild plants with Ms. Fujiko Taniguchi, who is a registered edible plant cooking adviser with vegetation identification experience of around 50 yrs., to collect edible plants during the three months of April–June, 2011. We also have spent several months to collect basic ecological knowledge by learning cooking and preservation skills of edible wild plants. Ecological knowledge of plant habitats and different ways of use were documented in detail.

A questionnaire survey was designed to clarify the species and frequency of wild edible plants have been widely collected, purchased or eaten. The respondents were split into three groups according to their residence, residents in Noto Region (also refer to group I in this paper), in Ishikawa Prefecture except Noto Region (group II), and outside Ishikawa Prefecture (group III).

The questionnaire survey is comprised of four different sections. The first section contained the personal profile

of the respondents, including questions related to ages, education, and their residence. The second section includes the frequency and items of edible plants that they harvest, purchase, or eat. The third section includes questions of their attitudes toward edible wild plants. Respondents were asked to comment on their perceived factors of being delicious, healthy, cheap at price, easy to buy, safe food without the use of pesticides, environmental friendly without the input of chemical fertilizers. A five-point Likert scale ranging from "strongly agree (=5), agree (=4), no idea (=3), disagree (=2), highly disagree (=1)" was used to get the respondent's opinion on edible wild plants. In the last section of the open question, the respondent was asked to freely write down their opinions related to harvest, purchase, and cooking of edible wild plants.

A total number of 208 copies of questionnaires were collected and completed without missing values in the two survey sites: 106 copies in Anamizu Farmers' Market and 102 copies in Uchinada Farmers' Market. About 43 respondents in Anamizu and 35 in Uchinada refused to answer the questionnaire. Each copy was checked and the respondent was asked to complete if any missing values found. All completed questionnaire sheets collected from the two survey sites were split into three groups by respondents' residence, Noto Region (group I), Ishikawa Prefecture other than Noto Region (group II), outside Ishikawa Prefecture (group III). In this study, we adopted the definition of Noto Region according to GIAHS site project as four cities and four towns in the Noto Peninsula on the Japan Sea side of Japan's main island, Honshu: Nanao City, Wajima City, Suzu City, Hakui City, Shika Town, Nakanoto Town, Anamizu Town, and Noto Town. The respondents of group II can be described as urban residents who are majorly from Kanazawa and its neighboring areas to the south of Noto Region. Group III consists of residents from metropolis of Tokyo, Kyoto, and Osaka and other mountainous areas.

The descriptive profile of respondents is listed in Table 1. Since the number of the results of group III is much less than groups I and II, this study will be discussed based on the comparison between groups I and II, while using group III as reference, moreover, respondents of group III are a mix of rural and urban residents. The results had a good balance of male and female respondents with female respondents being slightly more than male ones. Respondents from group I are a little older than group II, which is consistent with the current population situation with the increasing ageing people in the rural areas.

The collected data were further calculated to analyze whether the factors of respondents' profile: the age, city of residence, education, and even different survey sites affected the frequency that they bought, harvested, or ate edible wild plants. Two categories of respondents' behavior were classified: high frequency referred to those who purchased, harvested, or ate more than once a week; low frequency referred to those who never purchased, harvested, or ate wild edible plants or only a few times a year. Because these two categories were unordered, binary logistic model were used for analysis. SPSS 16.0 was used to estimate the binary logistic model.

TABLE 1: A full list of wild plants used as food and medicine.

Species	Family	Plant parts used for food	Plant parts used for medicine	Habitat
<i>Acanthopanax sciadophylloides</i>	<i>Eleutherococcus</i>	Sprout		Rice paddy, wetland
<i>Actinidia arguta</i>	<i>Actinidiaceae</i>	Fruit	Gall	Mountain
<i>Actinidia polygama</i>	<i>Actinidiaceae</i>	Seed		Forest fringe, mountain forest
<i>Adenophora remotiflora</i>	<i>Campanulaceae</i>	Sprout		Hill and mountain, forest fringe, Valley, bank
<i>Adenophora triphylla</i>	<i>Campanulaceae</i>	Young leaf		Hill and mountain
<i>Aesculus hippocastanum</i>	<i>Hippocastanaceae</i>	Seed	The whole grass	Open space, road side
<i>Akebia quinata</i>	<i>Akebia</i>	Sprout, vine, fruit		Coast, bank, mountain
<i>Allium grayi</i>	<i>Liliaceae</i>	Young leaf, root	Leaf	Wetland, stone fence, rock, garden
<i>Allium schoenoprasum</i>	<i>Liliaceae</i>	Scaly root-stalk, Young leaf		Coast, mountain, bank side
<i>Allium victorialis</i> var. <i>platyphyllum</i>	<i>Liliaceae</i>	Young leaf	Root, stem	Valley, nearby the spring
<i>Amana edulis</i> (Miq.) Honda	<i>Liliaceae</i>	Scaly root-stalk, Sprout		Grassland
<i>Amaranthus lividus</i>	<i>Amaranthaceae</i>	Sprout		River bank, roadside, coast
<i>Amaranthus lividus</i> Loisel.	<i>Amaranthaceae</i>	Young leaf, leaf, Top of the stem		Forest, grassland
<i>Anemone flaccida</i>	<i>Ranunculaceae</i>	Sprout, flower	Root	Grassland
<i>Angelica pubescens</i>	<i>Apiaceae</i>	Sprout	Root, the whole Plant	Road side, open field
<i>Anthriscus sylvestris</i>	<i>Apiaceae</i>	Sprout, young Leaf		Coppice, beech forest
<i>Apios fortunei</i>	<i>Fabaceae</i>	Tuberous root	The whole grass	Sunny wetland, abandoned field, at the foot of a mountain
<i>Aralia cordata</i>	<i>Eleutherococcus</i>	Sprout	The whole grass	Field, road side, grassland, garden
<i>Aralia elata</i>	<i>Eleutherococcus</i>	Sprout	Bulb, flower	Hill and mountain, coast
<i>Artemisia princeps</i>	<i>Asteraceae</i>	Young leaf		Hill and mountain
<i>Aruncus dioicus</i> var. <i>tenuifolius</i>	<i>Rosaceae</i>	Sprout		Open field, road side
<i>Asparagus schoberioides</i>	<i>Liliaceae</i>	Sprout		Forest in the mountain, forest fringe
<i>Aster glehni</i> var. <i>hondoensis</i>	<i>Asteraceae</i>	Young leaf		Forest fringe, mountain road side, grassland
<i>Aster leiophyllus</i>	<i>Asteraceae</i>	Sprout		Mountain forest, wetland in the plain
<i>Aster scaber</i>	<i>Asteraceae</i>	Sprout		Coppice, mountain forest
<i>Aster yomena</i>	<i>Asteraceae</i>	Young leaf		Coast, hill and mountain, field
<i>Astilbe thunbergii</i> var. <i>congesta</i>	<i>Saxifragaceae</i>	Sprout		Mountain forest
<i>Atractylodes japonica</i>	<i>Asteraceae</i>	Sprout	Pericarp	Hill and mountain, bush
<i>Begonia grandis</i>	<i>Begoniaceae</i>	Flower	Root stem, root, leaf	Bank of field
<i>Benthamidia japonica</i>	<i>Cornaceae</i>	Flower	Fatty oil of seed	Coast, low hill
<i>Brasenia schreberi</i>	<i>Nymphaeaceae</i>	Sprout		Mountain forest
<i>Broussonetia kazinoki</i>	<i>Moraceae</i>	Fruit		Forest mountain
<i>Buckleya lanceolata</i>	<i>Santalaceae</i>	Young seed		Coast, sandy land
<i>Calystegia japonica</i>	<i>Convolvulaceae</i>	Young leaf, underground stem, top of the vine		Coast, sandy land

TABLE 1: Continued.

Species	Family	Plant parts used for food	Plant parts used for medicine	Habitat
<i>Calystegia soldanella</i> (L.) Roem. et Schult.	Convolvulaceae	Flower		Forest, grassland
<i>Camellia japonica</i>	Theaceae	Flower, seed		River bank, forest fringe
<i>Camellia sinensis</i>	Theaceae	Sprout, flower		Sandy coast
<i>Campanula punctata</i> Lam.	Campanulaceae	Sprout		Forest
Caprifoliaceae	Fagaceae	Fruit		Abandoned land in <i>satoyama</i>
<i>Capsella bursa-pastoris</i>	Brassicaceae	Young sprout	Root stem	Road side, plain, bank, open field
<i>Cardamine flexuosa</i>	Brassicaceae	Sprout, young leaf		Hill and mountain
<i>Cardamine leucantha</i>	Brassicaceae	Leaf, stem	Seed	Street side, park, temple
<i>Cardiocrinum cordatum</i>	Liliaceae	Scaly root-stalk, young leaf, stem	Scaly root-stalk	Roadside in the mountain, somber forest
<i>Castanea crenata</i>	Fagaceae	Seed		Forest
<i>Castanea crenata</i>	Fagaceae	Seed		Grassland, forest fringe
<i>Cayratia japonica</i>	Vitaceae	Sprout		Open field, road side, abandoned land, bank
<i>Chenopodium album</i> var. <i>centrorubrum</i>	Chenopodiaceae	Sprout	Leaf, stem, utricle	Field, road side
<i>Cirsium nipponicum</i>	Asteraceae	Sprout, stem, root		Forest, forest fringe, grassland
<i>Cirsium yezoense</i>	Asteraceae	Sprout, young stem, root		Grassland, road side, riverside
<i>Clerodendron trichotomum</i>	Verbenaceae	Young leaf	Leaf, phyllary, astringent skin	Coppice, hill and mountain
<i>Clethra barbinervis</i>	Clethraceae	Sprout		Flatland, coppice
<i>Codonopsis lanceolata</i>	Campanulaceae	Sprout	Fruit, root bark, leaf	Open field, bank, forest,
<i>Commelina communis</i>	Commelinaceae	Young leaf, stem	Root	Grassland, forest, forest fringe
<i>Corylus sieboldiana</i> Blume	Betulaceae		Endodermis	Bright forest
<i>Crassocephalum crepidioides</i>	Asteraceae	Young leaf	Parts above the ground	Hill and mountain
<i>Cuculus poliocephalus</i>	Liliaceae	Young sprout		Forest fringe, grassland
<i>Cymbidium goeringii</i>	Orchidaceae	Flower, stem		Swamp, filed
<i>Dioscorea japonica</i>	Dioscoreaceae	Root		High mountain, forest fringe
<i>Diospyros kaki</i> var. <i>sylvestris</i> Makino	Ebenaceae	Fruit, leaf		Mountain, plain, Forest
<i>Diplazium squamigerum</i>	Woodsiaceae	Sprout		Sunny hillside
<i>Elaeagnus umbellata</i>	Elaeagnaceae	Fruit		Riverside and roadside in the mountain
<i>Elatostema laetevirens</i>	Urticaceae	Leaf, stem	Leaf, fruit	Hill and mountain, forest fringe
<i>Elatostema umbellatum</i> var. <i>majus</i>	Urticaceae	Sprout, stem, seed	The whole grass, seed	Road side, open space
<i>Eleutherococcus Maxim.</i>	Eleutherococcus	Sprout		Wetland, mountain forest, forest fringe

TABLE 1: Continued.

Species	Family	Plant parts used for food	Plant parts used for medicine	Habitat
<i>Epimedium grandiflorum</i>	Berberidaceae	Young leaf	Root	Open field
<i>Equisetum arvense</i>	Equisetaceae	Bud	The whole grass	Wet road side, open space, north of the house
<i>Equisetum arvense</i>	Equisetaceae	The whole plant		Forest, riverside
<i>Erigeron annuus</i>	Asteraceae	Young leaf, stem		Hill and mountain, forest fringe
<i>Erigeron philadelphicus</i>	Asteraceae		Root, flower	Hill and mountain, sunny place
<i>Euonymus sieboldianus</i>	Celastraceae	Sprout		Open field, forest fringe
<i>Eutrema japonica</i>	Brassicaceae	Root, flower, stem	Underground stem	Mountain forest
<i>Eutrema tenuis</i>	Brassicaceae	Leaf, stem, flower		Grassland
<i>Fagopyrum cymosum</i>	Polygonaceae	Above ground sprout		Open field, bank
<i>Fagus crenata</i>	Fagaceae	Sprout, seed		Mountain
<i>Farfugium japonicum</i>	Asteraceae	Bud, sprout		Fallow field, wetland
<i>Gamblea innovans</i>	Eleutherococcus	Sprout		Sunny hillside
<i>Geranium thunbergii</i>	Geraniaceae	Young leaf		Pond
<i>Gesneriaceae Dumortier nom. cons.</i>	Gesneriaceae	Leaf		Sandy coast
<i>Ginkgo biloba</i>	Ginkgoaceae	Seed		Coppice, beech forest
<i>Glechoma hederacea</i>	Lamiaceae	Sprout, stem	Leaf, bud	Grassland, open space, forest fringe
<i>Glehnia littoralis</i>	Apiaceae	Sprout		Coppice, beech forest
<i>Gnaphalium affine</i>	Asteraceae	Sprout		Paddy field, fallow field
<i>Helianthus tuberosus</i>	Asteraceae	Tuberous root		Wetland in the mountain, riverside, fallow land
<i>Helwingia japonica</i>	Cornaceae	Sprout, fruit	Seed	Abandoned land, mountain
<i>Hemerocallis fulva</i> var. <i>kwanso</i>	Liliaceae	Young leaf, bud, flower	Root, stem	Hill and mountain, grassland, garden
<i>Hosta albo-marginata</i>	Liliaceae	Sprout, leaf stalk	Leaf, trichome, and fimbriae on the leaf	Open field, roadside
<i>Hosta montana</i>	Liliaceae	Sprout, leaf stalk		Wet place in the mountain, cultivated nearby settlement
<i>Houttuynia cordata</i>	Saururaceae	Sprout, root	Root stem	Wetland in the mountain
<i>Hovenia dulcis</i>	Rhamnaceae	Fruit		Garden
<i>Hydrangea petiolaris</i>	Hydrangeaceae	Young leaf	Stem, root	Mountain forest
<i>Imperata cylindrica</i> L.	Poaceae	Flower		Mountain forest
<i>Juglans mandshurica</i> var. <i>sachalinensis</i>	Juglandaceae	Seed	Parts above ground, root stem	Field, nearby human settlement
<i>Kalimeris pinnatifida</i>	Asteraceae	Sprout	Leaf, bark	Hill and mountain
<i>Kalopanax septemlobus</i>	Eleutherococcus	Sprout		Grassland, forest fringe
<i>Laportea macrostachya</i>	Urticaceae	Sprout, flower		Mountain forest, wetland on the cliff
<i>Lapsana apogonoides</i>	Asteraceae	Young leaf		Mountain forest, riverside

TABLE 1: Continued.

Species	Family	Plant parts used for food	Plant parts used for medicine	Habitat
<i>Lathyrus japonicus</i>	<i>Fabaceae</i>			Mountain, garden
<i>Lilium auratum</i>	<i>Liliaceae</i>	Root		Forest fringe, mountain
<i>Lilium lancifolium</i> Thunb.	<i>Liliaceae</i>	Scaly root-stalk	Scaly root-stalk	
<i>Lilium leichtlinii</i> var. <i>tigrinum</i>	<i>Liliaceae</i>	Root		Forest
<i>Lonicera japonica</i>	<i>Caprifoliaceae</i>	Sprout		Edge of the mountain
<i>Lycium rhombifolium</i>	<i>Solanaceae</i>	Young leaf, fruit		Coppice, low hill
<i>Lythrum anceps</i>	<i>Lythraceae</i>			Forest
<i>Magnolia kobus</i>	<i>Magnoliaceae</i>	Flower, seed		Riverside, wetland in the forest
<i>Magnolia obovata</i>	<i>Magnoliaceae</i>	Young leaf, fallen leaf		Forest
<i>Malus toringo</i>	<i>Rosaceae</i>	Fruit	Seed	Cultivated in a swamp or river
<i>Matteuccia struthiopteris</i>	<i>Dryopteridaceae</i>	Sprout		Open field, bank, road side, plateau
<i>Metaplexis japonica</i>	<i>Asclepiadaceae</i>			Abandoned land, bank, field
<i>Moraceae bombycis</i>	<i>Moraceae</i>	Young leaf, fruit		Swamp
<i>Nasturtium officinale</i>	<i>Brassicaceae</i>	Sprout, young stem, young leaf		Road side field, grass land, ridge between rice fields
<i>Nelumbo nucifera</i>	<i>Nelumbonaceae</i>	Root, fruit, receptacle		Forest, riverside
<i>Oenanthe javanica</i>	<i>Apiaceae</i>	Young leaf		Paddy field, wetland
<i>Osmunda japonica</i>	<i>Osmundaceae</i>	Sprout	Root stem	Riverside, open field, sandy land, hill, and mountain
<i>Padus grayana</i>	<i>Rosaceae</i>	Young flower, young fruit, red fruit		Sandy coast, rock
<i>Parasenecio delphinifolius</i>	<i>Asteraceae</i>	Sprout, stem	Root, bark, stem, fruit	Forest fringe, field, mountain
<i>Patrinia villosa</i>	<i>Valerianaceae</i>	Young leaf		Hill and mountain
<i>Petasites japonicus</i>	<i>Asteraceae</i>	Flower, leaf stalk, leaf	Vine fruit	Forest, park
<i>Phellodendron amurense</i>	<i>Rutaceae</i>		Root stem, root leaf	Abandoned land, bush, roadside
<i>Phyllostachys heterocycla</i> f. <i>pubescens</i>	<i>Poaceae</i>	Root, sprout, balk		Coppice
<i>Phyllostachys nigra</i> var. <i>henonis</i>	<i>Poaceae</i>	Above ground sprout	Root stem	Hill slope, bank
<i>Phytolacca esculenta</i> V	<i>Phytolaccaceae</i>	Root, leaf		Forest
<i>Picris hieracioides</i> subsp. <i>japonica</i>	<i>Asteraceae</i>	Young leaf		Wetland in the mountain, riverside, fallow land
<i>Plantago asiatica</i>	<i>Plantaginaceae</i>	Young leaf		Sunny grassland, road side
<i>Platycodon grandiflorus</i>	<i>Campanulaceae</i>			River inside the remote mountain, forest
<i>Polygonatum odoratum</i>	<i>Liliaceae</i>	Sprout		Forest fringe, grassland
<i>Polystichum triperon</i>	<i>Polypodiaceae</i>	Sprout	Seed	Mountain forest, shrine
<i>Polygonatum falcatum</i>	<i>Fabaceae</i>	Sprout		Forest
<i>Polygonum hydropiper</i> L.	<i>Polygonaceae</i>	Young leaf		Forest, open field, coppice
<i>Polygonum thunbergii</i>	<i>Polygonaceae</i>	Sprout, young leaf	Young leaf	Field, coppice, an afforested area
<i>Portulaca oleracea</i>	<i>Portulacaceae</i>	Leaf, stem		Wetland, wet plain

TABLE 1: Continued.

Species	Family	Plant parts used for food	Plant parts used for medicine	Habitat
<i>Prunella vulgaris</i> subsp. <i>Asiatica</i>	<i>Lamiaceae</i>			Grassland, forest fringe
<i>Pteridium</i> <i>aquilinum</i>	<i>Dennstaedtiaceae</i>	Sprout, stem		Coppice, deciduous forest
<i>Pueraria lobata</i>	<i>Fabaceae</i>	Flower, vine sprout, root, bud		Forest fridge in the warm place
<i>Raphanus sativus</i>	<i>Brassicaceae</i>	Sprout, root, fruit	Stem, leaf	Hill and mountain
<i>Reynoutria</i> <i>japonica</i>	<i>Polygonaceae</i>	Sprout		Coppice
<i>Rhododendron</i> <i>kaempferi</i>	<i>Ericaceae</i>	Flower		Forest fringe, coppice
<i>Robinia</i> <i>pseudo-acacia</i>	<i>Fabaceae</i>	Sprout, flower		Forest floor, riverside
<i>Rorippa indica</i>	<i>Brassicaceae</i>	Sprout		Field
<i>Rosa rugosa</i>	<i>Rosaceae</i>	Fruit		Grassland, bank, field
<i>Rubus crataegifolius</i>	<i>Rosaceae</i>	Fruit		Cultivated in <i>satoyama</i>
<i>Rubus hirsutus</i>	<i>Rosaceae</i>	Fruit		Forest fringe, riverside
<i>Rubus palmatus</i> var. <i>coptophyllus</i>	<i>Rosaceae</i>	Fruit	The whole grass	Sunny roadside, field, garden
<i>Rubus parvifolius</i>	<i>Liliaceae</i>	Fruit		Valley, wetland in the mountain, shady forest
<i>Rumex acetosa</i>	<i>Polygonaceae</i>	Sprout		Wetland, ridge of field
<i>Salsola komarovii</i>	<i>Chenopodiaceae</i>	Sprout, leaf		Field, open space
<i>Sambucus</i> <i>sieboldiana</i>	<i>Caprifoliaceae</i>	Sprout	Parts above ground	Open field, plain
<i>Sanguisorba</i> <i>officinalis</i> L.	<i>Rosaceae</i>	Sprout	Stem, leaf	Sunny side of the hill and mountain
<i>Sasa palmata</i>	<i>Poaceae</i>	Young leaf	Bulb	Somber forest, fringe of the mountain road
<i>Saxifraga fortunei</i> var. <i>incisolobata</i>	<i>Saxifragaceae</i>	Leaf, stem		Coast, forest, forest fringe
<i>Saxifraga</i> <i>stolonifera</i>	<i>Saxifragaceae</i>	Leaf, stem		Mountain forest, bush
<i>Schisandra</i> <i>nigra</i> / <i>Schisandra</i> <i>repanda</i>	<i>Schisandraceae</i>	Fruit	Vine	Mountain
<i>Senecia pierotii</i>	<i>Asteraceae</i>	Sprout, young stem, flower		Riverside
<i>Senecio</i> <i>cannabifolius</i>	<i>Asteraceae</i>	Sprout		Sunny grassland, bank
<i>Smilax china</i>	<i>Smilacaceae</i>	Sprout, leaf, fruit		Grassland, forest fringe
<i>Smilax riparia</i>	<i>Liliaceae</i>	Sprout		Grassland, road side, open space, field
<i>Sonchus oleraceus</i>	<i>Asteraceae</i>	Sprout		Rocky coast
<i>Sorbus commixta</i>	<i>Rosaceae</i>	Fruit	Parts above ground	Open field, field
<i>Staphylea bumalda</i>	<i>Staphyleaceae</i>	Sprout, flower		Forest
<i>Stauntonia</i> <i>hexaphylla</i>	<i>Akebia</i>	Fruit, sprout	Vine in autumn	Mountain, garden
<i>Stellaria aquaticum</i>	<i>Caryophyllaceae</i>	Young leaf, the whole grass		Forest fringe, roadside
<i>Stellaria media</i> (L.) Villars	<i>Caryophyllaceae</i>			Forest
<i>Stellaria neglecta</i>	<i>Caryophyllaceae</i>			Forest
<i>Syneilesis palmata</i>	<i>Asteraceae</i>	Sprout, stem	Peel of fruit, seed	Fringe of a swamp in the mountain

TABLE 1: Continued.

Species	Family	Plant parts used for food	Plant parts used for medicine	Habitat
<i>Synurus pungens</i>	Asteraceae	Sprout		Forest on the hill and mountain, edge of the forest
<i>Taraxacum officinale</i>	Asteraceae	Leaf, stem		Coppice, beech forest
<i>Tetragonia tetragonioides</i>	Tetragoniaceae	Young leaf	Stem, leaf, root stem	Shady place nearby the sea
<i>Torreya nucifera</i>	Taxaceae	Seed	Leaf	Cliff inside the mountain
<i>Trapa japonica</i>	Trapaceae	Fruit	Flower, fruit	Coast, sandy land
<i>Vaccinium oldhamii</i>	Ericaceae	Fruit	The whole grass	Abandoned land, road side, field
<i>Vaccinium hirtum</i> var. <i>pubescens</i>	Ericaceae	Fruit	Root	Sunny side of hill and mountain
<i>Viburnum dilatatum</i>	Caprifoliaceae	Fruit		Forest floor
<i>Viburnum furcatum</i>	Caprifoliaceae	Fruit		Forest, park
<i>Vicia sepium</i>	Fabaceae	Young leaf, flower, young fruit		Cultivated in <i>satoyama</i> , forest
<i>Vicia unijuga</i>	Fabaceae	Young leaf		<i>Satoyama</i> forest, field
<i>Vigna angularis</i> var. <i>nipponensis</i>	Fabaceae	seed		Wetland, dike
<i>Viola mandshurica</i>	Violaceae	Flower, leaf		Rocky side of swamp
<i>Viola vaginata</i>	Violaceae	Flower, root, young leaf		Forest fringe, grassland
<i>Vitis coignetiae</i>	Vitaceae	Sprout, fruit		Open field
<i>Vitis ficifolia</i>	Vitaceae	Fruit, sprout, young leaf		Forest fringe, open field
<i>Vitis flexuosa</i>	Vitaceae	Fruit, sprout, young leaf	Bud	Hill, flat land, forest, field
<i>Wisteria floribunda</i>	Fabaceae	Flower, young leaf, seed		Wetland, riverside
<i>Zanthoxylum piperitum</i>	Rutaceae	Young fruit, young leaf, ripened fruit		Ridge of fields
<i>Zanthoxylum piperitum</i> (L.) DC	Rutaceae			Riverside, wetland in the forest
<i>Zingiber mioga</i>	Zingiberaceae	Sprout, flower, stem	The whole plant	Grassland, field, garden

TABLE 2: The number of species of wild plants used as food and medicine.

	Total	Food	Medicine
Number			
Family	67	65	36
Species	184	176	60
Parts to be used	Sprout, flowers, soft stem, root, seed, bark, and fruit		
Habitat	Open field, the border of the forest, rivers, paddy fields, forest, and shoreline		

Note: this table was summarized under the instruction of Ms. Fujiko Taniguchi, with a reference to the books as follows: *Flora in Kaga and Noto* [8]; *Best Guide to Wild Edible Plants* [9]; *Dictionary of Trees and Herbs Used as Medicine* [10].

3. Results and Discussion

3.1. Documentation of Use of Edible Wild Plants. The edible wild plants were compiled with the help of a local vegetation specialist named Fujiko Taniguchi and the reference to some flora books [8–10]. The detail of their habitat, uses as food or medicine, and which part of the plant could be used were

tallied. We got a result of around 184 species, belonging to 67 families, which can be used as food both/or medicine in Noto Region (Table 2). Among them, around 176 species belonging to 65 families are edible; around 60 species belonging to 36 families can be used as medicine (Table 3). Almost all parts of the plants can be used, including the sprouts, flowers, fruits, seeds, soft stems, and roots.

TABLE 3: Profile of respondents.

Gender	Total		Noto Peninsula (group I)		Ishikawa Prefecture except Noto (group II)		Outside Ishikawa Prefecture (group III)	
	Number	Frequency	Number	Frequency	Number	Frequency	Number	Frequency
Male	93	44.7%	32	42.1%	47	43.5%	14	58.3%
Female	115	55.3%	44	57.9%	61	56.5%	10	41.7%
Total	208	100.0%	76	100.0%	108	100.0%	24	100.0%
Age								
19	1	0.5%	0	0.0%	1	0.9%	0	0.0%
2029	32	15.4%	6	7.9%	22	20.4%	4	16.7%
3039	37	17.8%	5	6.6%	24	22.2%	8	33.3%
4049	36	17.3%	10	13.2%	22	20.4%	4	16.7%
5059	42	20.2%	18	23.7%	19	17.6%	5	20.8%
6069	43	20.7%	24	31.6%	16	14.8%	3	12.5%
7079	15	7.2%	12	15.8%	3	2.8%	0	0.0%
80	2	1.0%	1	1.3%	1	0.9%	0	0.0%
Total	208	100.0%	76	100.0%	108	100.0%	24	100.0%
Education								
Basic	20	9.6%	12	15.8%	8	7.4%	0	0.0%
High school	74	35.6%	30	39.5%	38	35.2%	6	25.0%
College	49	23.6%	15	19.7%	27	25.0%	7	29.2%
University	61	29.3%	18	23.7%	34	31.5%	9	37.5%
Others	4	1.9%	1	1.3%	1	0.9%	2	8.3%
Total	208	100.0%	76	100.0%	108	100.0%	24	100.0%

3.2. Attitude toward Edible Wild Plants

3.2.1. *Preferences of Edible Wild Plants.* In the second part of the questionnaire sheet, the interviewees were asked how frequently they purchase, eat, and collect edible wild plants during the harvest season of edible wild plants from January to June. The results were listed in Table 4. From Table 4, we can see that more than 40% of the respondents from the three groups take *sansai* more than once a week.

Respondents from group I not only eat and harvest edible wild plants, they also purchased more often than the other two groups. The respondents of group I from Noto Region use and harvest wild edible plants much more often than group II and group III. A big difference was in the frequency of taking and collecting edible plant. Around 78% of the respondents from Group I take *sansai* more than once a week, comparing to only 42% of respondents from Group II. Around 48% of respondents from group I collect *sansai* more than once a week, comparing to only 12.9% of respondents from group II. Around 87% of respondents from group II answered that they have only a few or no experience of *sansai* harvesting. Respondents from group I buy *sansai* slightly more often than those from group II.

Difference was also found in the results of where to buy *sansai* (Table 6). About 61 respondents from group I answered this question, among which 62.3% usually buy from a farmers' market, and 34.4% usually buy from a

supermarket. Among the total 77 respondents from group II, around 28.6% of which usually buy from a farmers' market, and around two-thirds of them usually buy from a supermarket.

Respondents were also asked to select the edible wild plant species of three sources; buying, harvesting, and receiving from their relatives. In this question (multiple choice question), around 12 kinds of wild plants, which are commonly used in Ishikawa Prefecture, were listed: *Petasites japonicus*, *Allium schoenoprasum*, *Aralia elata*, *Aralia cordata*, *Allium victorialis* var. *platyphyllum*, *Matteuccia struthiopteris*, *Pteridium aquilinum* var. *latiusculum*, *Petasites japonicus*, *Elatostema umbellatum* var. *majus*, *Oenanthe javanica*, *Osmunda japonica*, and bamboo shoot sprout. The result of this question is closely correlated to that of the previous question of frequency. The result shows that more than one-fourth of the respondents harvest 7 kinds of *Petasites japonicus* and its bud, *Aralia elata*, *Aralia cordata*, *Matteuccia struthiopteris*, *Pteridium aquilinum* var. *latiusculum*, and *Elatostema umbellatum* var. *majus*. More than one-fourth of the respondents from group I buy *Aralia cordata*, *Pteridium aquilinum*, and *Petasites japonicus*; more than one-fourth of the respondents from groups II and III buy *Aralia elata* and *Pteridium aquilinum* var. *latiusculum*. The result of this question reveals that *Aralia elata*, *Aralia cordata*, and *Pteridium aquilinum* var. *latiusculum* are among the best popular edible wild plants.

TABLE 4: Frequency of purchase, eating, and harvest edible wild plants.

Frequency	Group I		Group II		Group III	
	Number	Percentage	Number	Percentage	Number	Percentage
Frequency of purchase						
>3 times/week	8	10.5%	3	2.8%	1	4.2%
1–3 times/week	21	27.6%	21	19.4%	5	20.8%
Several times in a year	22	28.9%	44	40.7%	12	50.0%
Never	25	32.9%	40	37.0%	6	25.0%
No response	0		0		0	
Total	76	108.0%	108	24.0%	24	
Frequency of eating						
>3 times/week	28	36.8%	11	10.2%	4	16.7%
1–3 times/week	31	40.8%	34	31.5%	6	25.0%
Several times in a year	16	21.1%	59	54.6%	13	54.2%
Never	1	1.3%	4	3.7%	1	4.2%
No response	0		0		0	
Frequency of harvest						
>3 times/week	15	19.7%	4	3.7%	0	0.0%
1–3 times/week	21	27.6%	10	9.3%	2	8.3%
Several times in a year	26	34.2%	35	32.4%	7	29.2%
Never	13	17.1%	59	54.6%	15	62.5%
No response	1	1.3%	0	0.0%	0	0.0%
Total	76	108.0%	108	24.0%	24	100.0%

3.2.2. *Binary Logistic Model: Effects of Age, Education, and City of Residence on Behavior of Purchasing, Collecting, and Eating Edible Wild Plants.* We use the binary logistic regression (BLR) to identify relationship of frequency of purchasing, eating, and harvesting and the characterize of respondents. The general form of binary logistic regression is as follows:

$$\text{Probability}(y) = \frac{1}{1 + \left(\text{Exp}^{-(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \dots + b_nx_n)}\right)}. \quad (1)$$

Three models are used, where y_1 , y_2 , and y_3 are dependent variables and all are binary response variables (0 or 1). $y_1 = 1$ means the higher frequency of purchasing (more than 1 time one week), $y_1 = 0$ means others; $y_2 = 1$ means the higher frequency of eating (more than 1 time one week), $y_2 = 0$ means others; $y_3 = 1$ means the higher frequency of harvesting (more than 1 time one week), $y_3 = 0$ means others. Age, gender, education, the birthplace of the respondents, and the survey site are included in the models.

The results of the regression are showed in Table 5. Our two models based on binary logistic regression showed significant influence of respondents' demographic characteristics on their behaviors of purchase, harvesting, or eating edible wild plants (Table 5). Preference differences were found in the respondents with difference in residence of city, age, and education. Respondents from Noto Peninsula had a higher frequency of harvesting and eating edible wild plants than those from Kanazawa City and the other areas. Younger respondents, whose ages were less than 39, were much less involved with edible wild plants. The young group

ate, harvested, or bought at a lower frequency than the group older than 40 yrs. Middle-aged group who were in their 40s and 50s harvested less than the respondents older than 60. Respondents with higher education harvested edible wild plants less than those whose education was basic education or lower than basic education.

3.2.3. *Attitude toward Edible Wild Plants.* The result of mean points of a Likert scale was calculated as Table 7. In this section of the questionnaire, the respondents were asked to check one choice with a number from 1 to 5, which could best represent their attitudes towards the statement. Compare the results of group I and group II, it was found that the respondents from the two groups had little difference of the opinions on the five statements among the total 9 statements. Both the groups strongly agree or agree that *sansai* is delicious, healthy, and safe food, are one of representative traditional food culture, and environmental friendly without input of chemical fertilizers. Concerning the statements of being cheap, easy to cook, and easy to buy, group I held a more positive attitude toward them than group II.

3.2.4. *Respondents' Concern towards Edible Wild Plants.* In the last part of the questionnaire sheet, respondents were encouraged to write down any comments related to the harvest, consumption of wild edible plants. We got a total number of 64 results: among them 21 were from group I of Noto Region, 34 from group II, and 9 from group III. The results of this part were summarized in Table 8. After reading all data, data of open-ended question were categorized into

TABLE 5: Binary logistic model: effects of age, education, and city of residence on behavior of purchasing, collecting, and eating edible wild plants.

Parameter (std.error)	Model 1	Model 2	Model 3
	Model 1 (frequency of purchase)	Model 2 (frequency of eating)	Model 3 (frequency of harvest)
Survey site	0.6033 (0.4353)	0.5379 (0.4067)	0.6798 (0.5234)
Gender	-0.1663 (0.3303)	0.4281 (0.3307)	0.4883 (0.3844)
Residence	0.0438 (0.4347)	0.9926** (0.4517)	1.2659** (0.4935)
Age (20–39)	-1.2682** (0.5270)	-1.8635*** (0.5015)	-1.3372** (0.5510)
Age (40–59)	0.1085 (0.4082)	-0.7708 (0.4709)	-1.0882** (0.4640)
Education (~basic)	-0.0406 (0.5870)	-0.4123 (0.6900)	-1.2198** (0.6200)
Education (high school)	0.2133 (0.5829)	0.2898 (0.7101)	-0.0713 (0.6098)
Constant	-1.0360* (0.5864)	0.3330 (0.6541)	-1.2007* (0.6246)
-2 log likelihood	226.2082	231.4197	180.0617
Nagelkerke R square	0.1322	0.3090	0.3379

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

TABLE 6: Where do you buy the edible wild plants from?

	Total		Noto Peninsula		Ishikawa Prefecture except Noto Peninsula		Outside Ishikawa Prefecture	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Farmers' market	68	0	38	1	22	0	8	0
Supermarket	83	1	21	0	52	1	10	1
Others	7	0	4	0	3	0	0	0
No answer	1	0	0	0	0	0	1	0
Total	157	1	61	1	77	1	19	1

TABLE 7: Respondents' attitude toward edible wild plants.

	Group I	Group II	Group III
Delicious	4.6	4.5	4.6
Healthy	4.5	4.3	4.6
Cheap	3.8	3.1	3.6
Easy to cook	3.9	3.1	3.3
Availability	4.4	3.6	3.7
Safe food	4.6	4.0	4.3
Representing traditional food culture	4.5	4.1	4.3
Environmental friendly	4.5	4.1	4.3

Note: the numbers of mean attitudes of each group were calculated based on the 5-point Likert scale. A point of 5 refers to strongly agree; 1 point refers to strongly disagree.

three groups: consumption, harvesting, and others. This part is strongly relevant to the third part of the questionnaire of respondents' attitude towards wild edible plants.

Regarding the availability, respondents from group I were satisfied of being accessible to edible wild plants in the forest and in the market. They expressed their contentment of being at the production site and harvesting the fresh wild edible plants of rich species. In contrast, respondents from

both group II and III expressed difficulty in availability of wild edible plants.

Consistent to the above part of questionnaire survey results, respondents emphasized their liking of wild edible plants of being delicious, safe, and healthy. However, about 4 respondents from group II mentioned the difficulty of cooking.

Regarding the harvest of wild edible plants, three of the respondents complained about the harvest by outsiders. Six respondents concerned about the sustainable harvest of wild edible plants. The respondents from group II expressed their desire to be accessible to the forested mountain and fresh wild edible plants.

3.3. Commercial Harvests and the Attitudes of Forest Owners towards Edible Wild Plants Harvest. Based on the results of questionnaire survey, in-depth interviews were conducted to clarify the attitudes of forest owners and forest managers. Commercial harvesters who might also collect wild edible plants from others' private forest were reluctant to cooperate with the survey. There is a difficulty of collecting the data of the residents involved with commercial harvest. Japan Agricultural Cooperatives (JA) in Noto Region launched a project to market edible wild plants to the central market in Kanazawa, the capital city of Ishikawa Prefecture. According

TABLE 8: Summary of respondents' concern towards consumption and harvest of edible wild plants.

Categories	Group I		Group II		Group III	
	Subcategories	Number	Subcategories	Number	Subcategories	Number
Consumption/consumers	Easy to buy	2	Difficulty in availability	8	Difficulty in availability	2
	Delicious and fresh to be in the production sites	7	Somewhat prepared or cooked for sales due to the difficulty of cooking	4	We like wild edible plants for they are natural food	5
	Sometimes expensive	1	Receive a lot from relatives or friends	4		
	Safe food	1	We like wild edible plants and hope to maintain the production	3		
			Do not eat	2		
			Variety became less	1	Receive a lot from relatives or friends	4
Harvest /collectors	Enjoy collecting	1	Wish to harvest and cook by himself, however, lacks information of growth of wild edible plant	2	Construction of golf courses and houses should be limited in the forested mountains	1
	The number is decreasing with a lot of outsiders	4	Access to the mountain should be legally supported	3	Properly manage the forest in order to get access to it	1
	Should be easier to sell harvested wild edible plant	3	Should be collected in a sustainable way	6		
Others	Food bank for emergency, for example, starvation or wars	1	Should be reevaluated as part of traditional culture and passed down to next generation	1		
	Use abandoned field to cultivate wild edible plant	1				
		21		34		9

to the data provided by Anamizu Town Office, JA helped the harvesters from Anamizu Town to sell around 11 species of edible wild plants since 2008. The total sales ranged from JPY 2 million to 8 million (see Table 9) during the past three years.

Noto Forestry Cooperative (FCA), which is an organization of forest owners in charge of forest management in Oku Noto at the north part of Noto Peninsula, was interviewed to explore into forest owners' attitudes toward edible wild plants collecting by recreational visitors and commercial harvesters. Head and counselor of FCA were interviewed, respectively. Three forest owners, Mr. and Mrs. Sakamoto and Mr. Kobayashi, were interviewed. Problems listed by FCA and interviewed forest owners include several aspects. First, garbage disposal was listed as the major factor. Secondly, some forest owners partly rely on the edible wild plants for livelihood. The recreational visitors and outside commercial harvesters threaten the benefits of this group. In particular, the prices of edible fungi of high value, for

example, *matsutake*, have multiplied with the increasing demand of fungi in the market. Thirdly, the improper ways of collecting are concerned. Both forest owners and local harvesters mentioned that it will hurt the regeneration in the next year if the roots of wild plants were hurt or taken. *Osmunda japonica*, a dioecious species, is also a poplar fern sprout. There exists a tradition in Noto Region that only new sprouts of female *O. japonica* are harvested, while male *O. japonica* are left. The new sprouts of some tree species are also edible. For some species such as *Aralia elata* and *Acanthopanax sciadophylloides* are not allowed to pick all new leaves, otherwise, the bare tree would wither.

In the Noto Region, about 70% of the land is covered with forests, among which private forest consists of 87% of the total forest area (Table 10). Our interview with the owners of the private forest found that they generally accept that their friends or residents from the same community to collect wild edible plants from their forested mountain. At the same time, the majority of them are strongly against the

TABLE 9: Forest area by ownership in the Noto Region.

	Land area (ha)	Total	Forest area (ha)				1**	2***
			National forest	Public forest owned by local authorities and corporate*	Private forest			
Nanao City	31796	20433	53	1702	18678	91.4%	64.3%	
Wajima City	42625	32735	47	5759	26929	82.3%	76.8%	
Suzu City	24720	18699	43	3541	15115	80.8%	75.6%	
Hakui City	8196	2919	4	480	2435	83.4%	35.6%	
Shika Town	24655	16225	69	1846	14310	88.2%	65.8%	
Nakanoto Town	8936	5113	5	789	4319	84.5%	57.2%	
Anamizu Town	18324	13548	30	1401	12117	89.4%	73.9%	
Noto Town	27346	20773	57	2775	17941	86.4%	76.0%	
Total	186598	130445	308	18293	111844	85.7%	69.9%	

Note: data in this table was calculated based on Annual Report of statistics of Agriculture, Forestry, and Fisheries in Ishikawa Prefecture (year 2007-2008).

*The number is the combination of public forest owned by local authorities and Green Resource Public Corporation.

1** refers to the percentage of private forest to the total forest area.

2** refers to the percentage of forested area to the total land area.

TABLE 10: The total amount and sales of edible wild plants sold by JA to the central market, Kanazawa, of Ishikawa Prefecture.

	Amount (kg)	Sales (JPY)
2008	1,332.15	2,060,288
2009	9,953.45	8,149,535
2010	5,209.45	3,287,458

Data source: the number is provided by Anamizu Town Office.

intrusion by outsiders from other community, in particular from other prefecture, including the forest recreationists from the urban area. In order to prevent outsiders from entering the forests, access to the forests is prohibited. According to Counselor of Noto FCA, Mr. Yosaburou Yachi, around 60% of the forest was set up with a keep-out sign. Harvesters outside of the community and commercial harvesters are in general prohibited to enter the forest.

4. Discussion

4.1. Edible Wild Plants as Traditional Food Culture. It was found that there exist abundant edible wild plants in Noto Region, in consistency with some previous studies in other parts of Japan [13–15]. About 200 species can be used as food or medicine, the majority of which were in the forest. Noto Region is a treasure box full of natural and healthy food. A total amount of edible wild plants was estimated to be around 200 species in other parts of Japan. Only about 15% of them were eaten by local residents [17, 18].

This study revealed that people living in Noto Region, as well as those in nearby urban areas have very close connection to edible wild plants as that a majority of the respondents have eaten, bought, and harvested them very often during the harvest season of edible wild plants.

Respondents surveyed had a positive attitude towards edible wild plants. Edible wild plants were labeled by a majority of respondents from remote mountainous areas as well as from urban areas as being tasty, healthy, and safe food. Edible wild plants are considered to be representative traditional food related to local culture.

Some early researches [13] also reported that the people of Japan have considered edible wild plants as tasty food [14, 15]. It was also reported that Japanese consumers considered edible wild plants as expensive, while, this survey found that consumers in Noto Region considered the prices as reasonable. Comparing with reports in other areas or in previous year, respondents in this survey had a more positive assessment of edible wild plants.

Survey also found Farmers' Market as an important marketing channel of wild edible plants, in particular in Noto Peninsula. In contrast, around two-thirds of consumers in metropolitan city bought from a supermarket or a vegetable store [16].

With the ageing and depopulation in rural areas, the traditional knowledge related to edible wild plants is facing the threat of degradation. The loss of traditional ecological knowledge associated with wild plants negatively affects the lives and health of traditionally living rural communities [19]. Although numerous previous studies report that traditional knowledge related to wild edible plants has greatly declined in Africa [19] and Japan [4], due to the impacts of the drivers of ageing and migration. Findings in this study revealed that residents from not only the mountainous areas and urban areas hold very positive attitude towards edible plants and their lives are closely related to wild plants. A majority of respondents agreed that edible wild plants are important part of their traditional diet. Traditional knowledge related to eating and harvesting edible wild plants are still passed on, while at some extent declining.

How to maintain and disseminate the traditional knowledge related to wild edible plants must be considered as part of revitalization of rural area in Japan. Young generations must be the foci of education of traditional ecological knowledge. Urban residents from the nearby cities should be included as potential recreationists from the aspects of dynamically conserving traditional culture, in particular endemic dietary and revitalizing rural areas by enhancing the attractions of forest and nature to increase visitors to remote areas.

4.2. Challenges to Develop the Recreational Uses of Edible Wild Plants. Abundant species of edible wild plants and being able to access low hills (*satoyama*) without wild boars or bears in Noto Peninsula have attracted not only local residents but also urban residents from Ishikawa Prefecture and even other prefectures to harvest *sansai*. It was found in this study that private forest owners do not consider these outsiders desirable.

Many studies [20] found the importance of continued public ownership and of continued (and enhanced) multi-use management strategies. Thus, we assume that private ownership of forest resources is a major impediment to recreational use of nature resource. In Japan, private forests hardly participate in providing recreational activities, and researches related to recreational activities on private land or by privately funds are very rare [21].

Recreational use of forests must be reevaluated since forests are considered to be multifunctional. Forest and Forestry Basic Act was radically revised based on Basic Forestry Law (1964) and enacted in 2001. It designates the basic principles for forest policies in the 21st century. In this act, it places the sustainable development of multi-functions of the forest as the basic ideology. Among the multi-functions of the forest mentioned in this new Forest and Forestry Basic Act, recreational function of the forest as to enhance public health was evaluated the same as other forest products.

Maintaining NTFP resources was less critical for the subsistence needs of the majority of the public and therefore did not rank high as a management priority. The emphasis may have shifted from subsistence to commercial and recreational pursuits, harvesting [22]. Commercial harvesting and marketing of edible wild plants in Noto Region are still far from being successful given the small amount and unsteady growth of the total amount and price (Table 8).

5. Conclusion

With the rapid urbanization, increase of abandoned farmlands and undermanaged forests in the past decades, the changing rural landscape has posed threats towards the loss of biodiversity and associated environmental services. It is evident that interest has been given to biomass production and restoration of ancient woods in the coppice woodlands, while little attention so far has been paid to the social dimension. There is a danger of neglecting the potential for coppices as socially important woodland types. Traditional knowledge has been emphasized as the most promising cognitive response to the balance of protection of

satoyama landscape and other traditionally managed forest [23] and sustainable use of natural resources. A FAO's Globally Important Agricultural Heritage System (GIAHS) pilot site in the Noto Peninsula was designated to foster dynamic conservation and sustainable use of local natural resources.

Our survey in Ishikawa Prefecture found that there exist abundant species of edible wild plants in *satoyama*, and local people not only from remote areas but also from urban areas have highly positive attitude towards edible wild plants. Developing the sustainable use of natural resources in *satoyama* by promoting the harvest and consumption of edible wild plants could be considered as an important means of rural vitalization. It was found that farmers' market of Japan Agricultural Cooperatives (JA) has played a vital role in marketing edible wild plants. Young respondents had a low frequency of consuming edible wild plants. One of our findings is consistent with previous studies [17, 18] that it is an urgent issue to educate young people with traditional knowledge in order to prevent from the loss of relevant traditional culture.

NTFP extraction does not have to be seen as a threat to biodiversity, but rather can be seen as a tool for creating socioeconomic relationships that are dependent on healthy, biodiverse ecosystems. It has been argued that anthropogenic disturbance of intermediate impact has developed rich biodiversity in the secondary forest [24]. Some local residents considered that edible wild plants collectors from other communities including urban residents will threaten their interest.

An early report recommended having forest recreationists pay a right of access to harvesting wild edible plants [25]. Japan *Satoyama Satoumi* Assessment [2] recommends the idea of the "new commons" to create a new management system by local government and NPOs and NGOs [2]. In particular, we argue that "new commons" should include urban residents to access the forests for nontimber forest product, for example, edible wild plants. In Nordic European countries, there is the traditional right of "Everyman's right," which includes berry picking, mushroom collecting, and free access for all recreation and sports activities [26]. It is obvious that, in Japan, the customary law with limiting the access of residents from other communities, and the current private ownership have excluded the urban residents to access the forested hills. It is suggested that those private forests which were abandoned in terms of management in remote region could be accessible to urban residents for obtaining wellbeing of forest resources through the administrative supports at some extent. JA and Forestry Cooperatives (FCA) should play an important role in achieving the GIAHS goal of dynamic conservation and sustainable management in the Noto Peninsula.

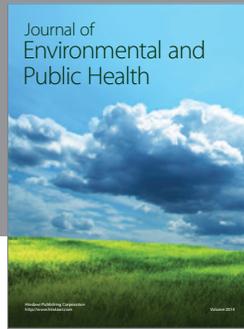
Acknowledgments

The authors wish to thank Ms. Fujiko Taniguchi and numerous local people for their sincere cooperation during the field surveys and for providing local knowledge for this research. Thanks also go to Ms. Anne McDonald and

Dr. Raquel Moreno-Penaranda for their invaluable comments. The authors owe sincere thanks to Ms. Atsuko Hasegawa for her help with proofreading the questionnaire sheet in Japanese. Thanks also go to the Editor-in-Chief and the two anonymous reviewers for their invaluable comments.

References

- [1] K. Takeuchi, "The nature of satoyama landscape," in *Satoyama the Traditional Rural Landscape of Japan*, K. Takeuchi, R. D. Brown, I. Washitani, A. Tsunekawa, and M. Yokohari, Eds., Springer, Tokyo, Japan, 2001.
- [2] A. K. Duraiappah, K. Nakamura, K. Takeuchi, and M. Nishi, "Satoyama—Satoumi Ecosystems and Human Well-Being: Assessing Trends to Rethink a Sustainable Future," *Policy Brief*, vol. 2010, no. 7, 2010.
- [3] Japan, Ministry of Agriculture, Forestry and Fisheries, Forestry Agency, Forestry Management Improvement Division, Special Forest Products Office For promotion edible wild plant culture and industry to revitalize mountainous villages. Sanrin, 1450: 40–45, 2005 (in Japanese).
- [4] G. Cetinkaya, "Challenges for the maintenance of traditional knowledge in the Satoyama and Satoumi ecosystems, Noto Peninsula, Japan," *Human Ecology Review*, vol. 16, no. 1, pp. 27–40, 2009.
- [5] United Nations University-Institute of Advanced Studies (UNU-IAS), "Japan's Satoyama Satoumi Assessment: Social-ecological Productive Landscape in Japan, Experiences and Lessons from Hokushinetsu Cluster," United Nations University, Tokyo, Japan, 2010, (in Japanese).
- [6] I. Washitani, "Traditional sustainable ecosystem "SATOYAMA" and biodiversity crisis in Japan: conservation ecological perspectives," *Global Environmental Research*, vol. 5, pp. 119–133, 2001.
- [7] H. Kobori, "Current trends in conservation education in Japan," *Biological Conservation*, vol. 142, no. 9, pp. 1950–1957, 2009.
- [8] S. Komaki, *Flora in Kaga and Noto (Kaga Noto Noto Shokubutsu Zufu)*, Society of Flora in Kaga and Noto, Noto Province, Japan, 1987, (in Japanese).
- [9] K. Imai and M. Imai, *Best Guide to Wild Edible Plants (Yoku Wakaru Sansai Daizukan)*, Nagaoka Shoten, Tokyo, Japan, 2007, (in Japanese).
- [10] M. Osuga, *Dictionary of Trees and Herbs Used as Medicine (Yakuboku Yakus Jiten)*, Rekishi Shunju Publishing Co., Ltd., 1997, (in Japanese).
- [11] Food and Agriculture Organization of the United Nations (FAO), 2002, <http://www.fao.org/nr/giahs/whataregiahs/definition/en/>.
- [12] Japan, Ministry of Agriculture, Forestry and Fisheries (MAFF), Statistics of Forestry Income in 2001, (in Japanese), 2003, http://www.maff.go.jp/j/tokei/kouhyou/ringyou_san-syutu/index.html.
- [13] T. Sugiura and K. Kishimoto, "On the liking of wild vegetables and mushrooms by consumers," *Journal of the Japanese Forestry Society*, no. 1, pp. 31–38, 1989 (Japanese).
- [14] M. Ono, Y. Shinoda, H. Minami, S. Jyo, T. Sato, and K. Kawakami, "Investigation on the state of utilization of wild plants in Hida District (Part I)," *Journal of the Nagoya Women's College*, vol. 14, pp. 31–45, 1968 (Japanese).
- [15] M. Ono, Y. Shinoda, H. Minami, S. Jyo, T. Sato, and K. Kawakami, "Investigation on the state of utilization of wild plants in Hida District (Part II)," *Journal of the Nagoya Women's College*, vol. 15, pp. 59b–68b, 1968 (Japanese).
- [16] T. Sugiura and H. Uchiyama, "The understanding of wild vegetables and mushrooms by supermarkets and superstores," *Journal Agricultural Science Tokyo Nogyo Daigaku*, vol. 42, no. 3, pp. 210–220, 1997.
- [17] T. Sugiura, "Present situation of use of edible wild plants in our country and its possibilities in the future," *Tokusan Joho*, vol. 23, no. 8, pp. 22–25, 2002 (Japanese).
- [18] T. Sugiura, "Present situation of use of edible wild plants in our country and its possibilities in the future," *Tokusan Joho*, vol. 28, no. 9, pp. 28–31, 2007 (Japanese).
- [19] T. P. Dweba and M. A. Mearns, "Conserving indigenous knowledge as the key to the current and future use of traditional vegetables," *International Journal of Information Management*, vol. 31, no. 6, pp. 564–571, 2011.
- [20] P. J. Smailes and D. L. Smith, "The growing recreational use of state forest lands in the Adelaide hills," *Land Use Policy*, vol. 18, no. 2, pp. 137–152, 2001.
- [21] T. Ito, "A comparative review of forest recreation studies in Japan and the United States," *Journal of the Japanese Forestry Society*, vol. 85, no. 1, pp. 33–46, 2003 (Japanese).
- [22] E. T. Jones and K. A. Lynch, "Nontimber forest products and biodiversity management in the Pacific Northwest," *Forest Ecology and Management*, vol. 246, no. 1, pp. 29–37, 2007.
- [23] Y. W. Chun and K. I. Tak, "Songgye, a traditional knowledge system for sustainable forest management in Choson Dynasty of Korea," *Forest Ecology and Management*, vol. 257, no. 10, pp. 2022–2026, 2009.
- [24] K. Katoh, S. Sakai, and T. Takahashi, "Factors maintaining species diversity in satoyama, a traditional agricultural landscape of Japan," *Biological Conservation*, vol. 142, no. 9, pp. 1930–1936, 2009.
- [25] F. Ueno, "An essay on the native vegetables and the right of access in the mountain areas in relation to land resource management and recreational activity," *Komazawa Geography*, vol. 11, pp. 91–96, 1975.
- [26] T. Sievänen, E. Pouta, and M. Neuvonen, "Participation in mushroom picking in Finland," in *Social Roles of Forests for Urban Population*, T. Ito and T. Nobuhiko, Eds., Japan Society of Forestry Planning Press; University of Tokyo, Tokyo, Japan, 2004.



Hindawi

Submit your manuscripts at
<http://www.hindawi.com>

