

ECOLOGICAL AWARENESS MAPPING BY COMMUNITY PARTICIPATION

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ABSTRACT:

Agricultural fields in suburban area are decreasing and the environmental degradation including ecological diversity are damaged. Not only the new residents in the region but also the farmers on the land do not understand the current ecological status of the region. The authors provided an opportunity for the residents to make an ecological awareness map by using simple equipments such as a handy GPS, a digital camera and a free mapping software. The participants went around the area and take photos at points where he/she thinks environmental problems exist. After making the ecological awareness map, the ecological awareness to the region were improved, and the outcome is helpful to make land use guidelines by administration.

1. INTRODUCTION

Tools for gathering spatial information such as GPS and Digital Cameras become popular, and people can utilize them for environmental assessment and safety life establishment. However, if people try to process the information about the regional environment by combining with maps, very high resolution satellite images, complicated methods are required. Even though machines and tools are popular, the information utilization are limited. In this study, a comprehensive method to observe and measure the ecological and agricultural environment due to land use change is proposed considering residents participation for gathering the information using these spatial information tools for a region where urbanization is in progress in the southern part of Kyoto, Japan.

2. STUDY SITE

Oguraike is a drained farmland with 1,310 hectares area locating in parts of cities of Kyoto, Uji, and Kumiyama, Japan(Figure 1). There are various kinds of farming due to their locations in suburb. The farmland locates on the land with 9 to 13 m altitude and with fertile soil of alluvium on flat plain(less than 0.1%). At the lowland locating in the center of the area, rice paddy is dominant, however crop farming and vegetable farming using green houses are increasing because the water supply system as well as the waste water system have been developed by projects for water quality improvement and farmland disaster mitigation. On the other hand, a lot of farmlands have changed to residential area and commercial area because the area includes convenient transport accessibility such as railway, highway and national road.

Because the land uses have changed rapidly, the risk for floods,

the water pollution and the damage of underground water are proceeding. The local government encourage the community to preserve the landscape of the area, however there seems no end of illegal dumping along the roads and the cannels. Most of the dumping were carried from the outside of the region, and the residents do not have responsibilities for cleaning and the local government expect the community effort to clean them(Figure 2).

The channels are maintained and managed by the land development district of the region. The water supplying channels are well maintained because its maintenance influences the water management of the area directly. On the other hand, the waste water channels are not maintained so much. So that the water quality and river environment is not clean and disturbed(Figure 3).

From the ecological view point, the supply water channels are covered with concrete structure and have high water velocity and no vegetation in or along the channels because the farmers

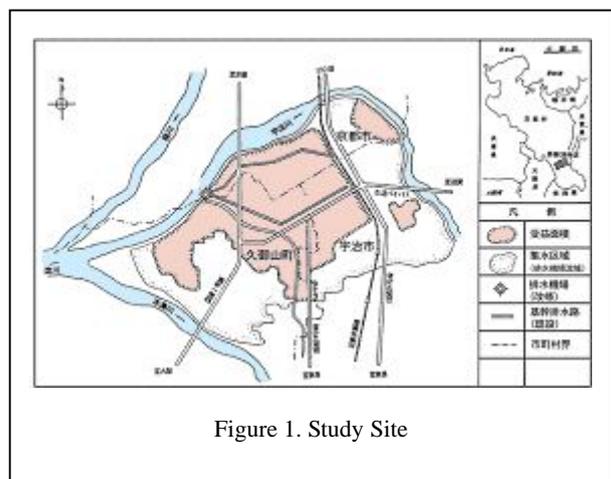


Figure 1. Study Site

make them clean for their farmland. by weeding so on. Moreover water does not flow in some periods in a year for saving the water consumption. So there are few living thing in the channel. For waste water channels, even though the water quality is not so good, there are a lot of vegetation in or along the channel and various kinds of animals such as fish, frog, fresh-water snail and turtle and birds to catch these small animals. The paddy fields and its waste water channels form a few levels of food chained ecosystem in this area.



Figure 2. Dumping along road



Figure 3. Dumping in the river



Figure 4. Community activity for cleaning

3. LAND USE CLASSIFICATION

3.1 Data

In order to make land use classification, IKONOS image of pan-sharpen image was used. In this study the data was captured on 21 of June, 2005. Fig.2 shows the false-color images of the study area. The image include most parts of the study area except a part of Kumiyama city and surrounding area of urbanized area within the Oguraike farmland. The northern area than Uji river which is shown as main river in the images is out of the Oguraike claimed farmland.



Figure 5. IKONOS pansharpen image of the study area

3.2 Land Use Classification

The land use classes are defined as (1)Paddy field, (2)Crop/Vegetable field, (3) Urban, (4) Road, (5)Rivers and water, and the classification was made by visual interpretation and ground investigation. There are four main waste water cannels in the area, and farmland blocks for each waste water canal are easily delineated and distinguished each other. The land use for each farmland blocks is summarized as Table.1.

4. ENVIRONMENTAL CONSCIOUSNESS

4.1 Objectives

The Oguraike farmland was originally water area where Uji, Kizu and Katsura rivers meet together. The area had functioned as flood control pond as well as the fishing place. There were many flood disasters on the area and the pond was separated from the rivers by flood mitigation projects in Meiji era. However the area was suffered with floods and water pollution, the government started to reclaim the pond in 1933 and completed the drained farmland in 1941. The land is now not only the field of agricultural production but also the field growing ecological diversity. Recently, the urbanization of the area has changed the hydrological balance in the area and there

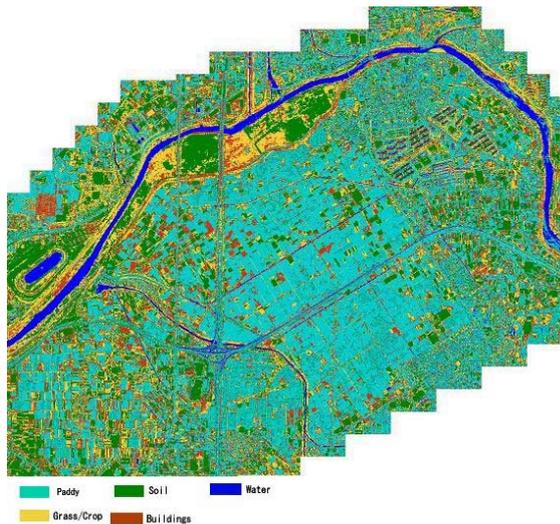


Figure 6. Land Use Classification Map

happened serious agricultural damages due to the inundation by floods. The government have restructured the water supply and drainage system from 2005.

But the chucked garbage and illegal dumping to the cannels makes trouble for agricultural activities and facilities maintenance. The area will be maintained as the field of agricultural production as well as the community field for ecological understanding and environmental education for the people. So, the consciousness of the residents who live in the area was surveyed to clarify the needs of the farmland in suburb and the idea to create ecological community field.

4.2 Method

Field surveys were made at the community events on both 23 of November, 2005 and 8 of April, 2006. A questionnaires survey was made on 23 Nov. 2005 and about 200 answers were collected. Ecological mapping using GPS and digital cameras was carried out by some participants on 8 of April, 2005. By synchronizing the time of digital cameras with the time of GPS, the location of a picture by the digital cameras can be set by picking up the location information of corresponding time. The participants carried a pair of GPS and digital camera for a group



Figure 7. GPS and Digital Camera



Figure 8. Field Investigation

and investigated the field to record their ecological or environmental awareness(Figure 8).

4.3 Results

Following items are analyzed from the questionnaires survey.

(1) Current status of the area

The main purpose of the area is agricultural production field, however various activities such as fishing, some festivals, lightning bug watching in summer, bird watching and flower observational learning are promoted in the area. Most farmers who own the farmland the area is private land and they do not like other people to come in their farmland and walk around the area during their cultivating season. Non-farmers residents understand that the area are owned by farmers, however, the landscape is public properties and they like to share the space with farmers.

2) Functions of the farmland

Many non-farmers group expect the farmland and cannels to function as buffer area for disaster and water management. They think the farmland the channels are important for the ecosystem of the area, and for refreshing people around the area. Not many farmers answered it has functions for ecological conservation and water clarification, however most of them understand that there should be more animals such as frog and fishes except harmful insects.

3) Current evaluation to the area

a) About the farmland: Many people answered the farmland is familiar in their life, and give good impression to the people. Many people think that the landscape of the area is disturbed by dumping and unplanned land development, and expect the local government to control the land use of the area. In order to conserve the farmland, the government should control the agricultural activities not only for the area but also for the country.

b) About the cannels: Most of the residents recognize that the cannels are not clean and are disturbed by dumping. Many people think the situation should be improved by the local government policy. The water quality of the waste water

channel should be improved by the government control.

4) The future farmland development

a) About the farmland: Almost half of the people answered to conserve it as it is, and 1/4 of the residents want to enhance the public facilities such as park and artificial river terrace to enjoy the rivers environment. Many people eager to participate the community activities for mowing and cleaning of the area and canals to improve the landscape of the area.

b) About the canals: 1/3 of the people want to keep the surface of the canals as they are, 1/3 of the people want to develop a biotope in the channels, and 5% of the people want to have canals with concrete structures to prevent soil erosion and weed.

5) Ecological awareness mapping was made using freeware(Figure 9). The software to combine digital camera images with GPS location information was provided within this study. Not only the participants of the mapping survey but also other residents easily to notice the ecological awareness points from this map and everybody can participated the mapping program when digital camera image with GPS location are joined.



Figure 9 Ecological Map of the study area

5. DISCUSSIONS

The ecological consciousness to the suburb farmland of the residents in the area was analyzed by this survey. The purposes of utilization of the farmland are limited for agricultural production and enjoying the cool evening breeze as community event. There is some gap between the farmers and non-farmers living in the area. The farmers have difficulties to continue the agricultural activities in this area due to urbanization, aging of farmers and lack of successors. If non-farmers can participate some agricultural activities, the situation can be improved in community scale. We found that the ecological awareness map can help farmers to understand that there is rich ecosystem in the farmland. And at the same

time, the map help non-farmers to understand there is many ecological disturbed points in the area and they should be recovered to conserve the ecosystem in the area.

The willingness for environmental conservation for the area and citizens participation for that were strong among the residents. However not a few people did not pay any attention to the ecological environment to the area. And many people do not understand the ecological functions of the canals in the farmland. Many residents are interested in environmental conservation and ecology in the area by making field investigation using spatial information tools, however analytical software with easy handling are necessary to promote residents consciousness for the ecological conservation.

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