THE ROLE OF HUMAN ACTIVITIES FOR THE WETLAND ECOSYSTEM AND WATER QUOLITIES, IN CASE OF JAPANESE WETLAND

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Abstract: Wetland ecosystems and water quality are largely changing due to human activities. A large amount of nutrients are accumulated in wetland ecosystem in a lake, due to activities such as land reclamations, intensive agriculture and eutrophication. Some areas around the Biwa Lake (the biggest lake in Japan), are covered by snow in winter but many alien species including water hyacinth and water lettuce can survive, due to increasing temperature (average temperature increase about 2˚c). In the recent 20 years, it was concerned about global warming for vegetation. Japanese farmers, until today, control the nature by cutting grass and tree, burning, and collect water plants for fertilizing. During last 5 years, Japanese farmer's population has been decreased by 20 % and the farmer's average age was about 66 years old. Now, the same condition happens in the field of fishery and forestry. In near future, the lake area will become marsh, and wetland will become swamp forest and consequently, evaporation range will be increased. Thus we can not keep more water in small ponds and wetlands.

Keywords: land reclamation, eutrophication, global warming, Fushin system, Satoyama

1 Introduction

One of the Japanese mission in the twentieth century was to expand the paddy field for keep food production, like land reclamation of wetland. For example, at the largest Lake Biwa, the wetland surrounding the lake was decreased by 85%, and at the second largest Hachirou-Gata lagoon lake, about 88% of the water area was changed to the paddy field.

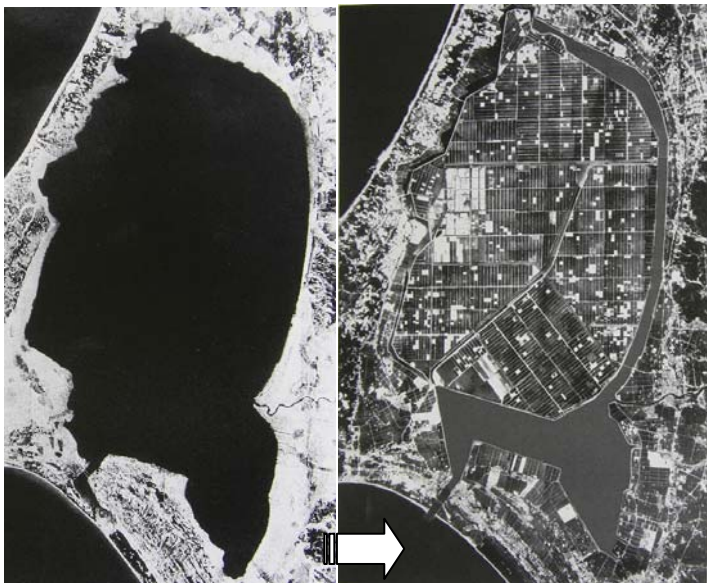

Figure 1: *Land reclamation of wetland at second large Hachirou –Gata lagoon lake,where Changed to paddy field about 88% (Akita,Japan)*

2 Japanese agricultural system

Japanese farmers were producing their own main crops and same times were using natural resources well. They also managed and controlled the nature to keep sustainable productions, like harvesting grasses, cutting trees for fire, burning, and collecting water plants for fertilizing, under some traditional rules.

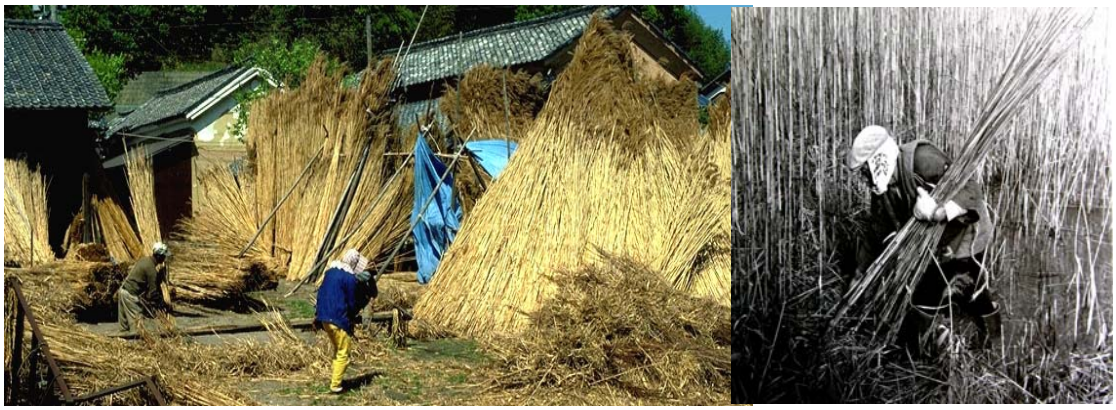

Figure 2: *One of the Traditional utilization of common reed surrounds the Lake Biwa (Ohmi-Hachiman, Shiga).*

3 Japanese traditional civil engineering construction system "Fushin"

Japanese people had a traditional civil engineering construction and maintenance system, called "Fusin".or "Bushin", because there were minimum institutions and facilities for the save of agricultural production to keep their life. Fusin was a traditional community work system of the local people's cooperated.The "Fusin" system had many varieties such as the river Fushin , canal Fushin , lake, pond or lagoon lake Fushin and also road Fushin, and bridge Fushin. The local people constructed irrigation canals, and bridges and maintained them in every years due to the Fushin system.

Figure 3: *Picture of canal Fushin (Left) and river Fushin (Right), worked community peoples cooperated (Sudou, 2004)*

4. Japanese traditional mutual support system

In the past, Japanese farmers had a large number of family mebers about 10 people including children. Even every family members worked, sometimes it needed more man power, specially when harvesting, constricting own houses, thatching new roofs etc. In that time, the community people supported each other. Such mutual support system was also called as "Fusin", for example, thatched roof Fushin, disaster Fushin, tempel or shrein Fushin, and sometimes employment opportunity Fushin.

Each families and communities were working long time by such human activities. In the farms in mountain areas and fishing villages were set up beautiful and functional landscape in harmony, called “Satoyama”.

Figure 4: *Picture of thatched roof Fushin,worked community peoples cooperated. (Sudou, 2004)*

Figure 5: *Picture of harvesting Fushin,worked community peoples cooperated (Sudou, 2004)*

5 Structural change of Japanese agricultural society

After the Second World War, the Japanese society changed remarkably with the advance of Japanese economy. Especially in recent time, Japanese farmer’s society is changed largely. The farmer’s population was decreased by 20% in last 5 years. There will not be any Japanese farmer by 2035 if similar conditions continue. And also, the average age of Japanese farmers is about 66 years old now, the 1% number of village has gone in last 7 years. Japanese traditional agriculture will be broken more quickly. Such decreasing of the farmer population means that nobody will manage and control their field and wetland further. By the last national census, the population of Japanese forester was decreased by 90% in recent 45 years. A similar condition happened in the field of Japanese fishery. Those are examples of advanced nation.

6 The change of the environmental conditions

Due to the intensive agriculture, the wetlands subjected to the conditions of eutrophication, and in the recent 20 years, vegetation influenced to the global warming effect largely.

6-1 Water quality

Water quality of the Lake Biwa was checked at 47 points in every months. Compared with 1979, the transparency and the suspended solids of the water was changed for the better. T-N and T-P was decreased little. But, COD rate is increased now It is about 2.7 mg/l in north part of lake) and 3.4 mg/l.in south part of the lake. On the other hand, yearly average temperature is increased by 1.2 ℃ and water surface temperature is going up about 1.0 ℃.

6-2 The expand of alien species

Some areas around the Lake Biwa (the biggest lake in Japan) are covered by snow in winter but many alien species including water hyacinth and water lettuce can survive, because of increasing temperature (average temperature and water temperature increase 2˚c). In the recent 20 years, it is concerned about global warming for the vegetation. Many alien species from North and South America, from tropical Asia are as follows,

Floating aquatics; *Echhornia crassipes(*water hyacinth), *Pitia stratiote*(water lettuce), *Azolla cristata*
Emergent aquatics; *Alternanthera nodifera Paspalum distichum*
Submerged aquatics; *Elodea nuttallii, Myriophyllum brasilens, Egeria densa*
Terrestrial plants;

Graminae, *Poa, Festuca,Bromus vena, Briza, Eragrostis Paspalum, Sorghum, Vulpia, Lolium, Aira, Andropogon*

Compositae; *Bidens, Eclipta, Taraxacum Gnaphalium, Conyza, Sonchus Helianthus,Erigeron, Solidago Lactuca, Senecio, Galinsogo Stenactis, Aster, Crossocephalum*

7 Conference of the Parties; COP10 in Nagoya, Nagoya Protocol 2010 can assist us ?

The main theme of the conference “the saving efficiency and utilization of genetic resources” is very important. However, in the same time almost local people of the world need general resources of nature sustainably, especially for local peoples depend on the natural resources in the developing countries.

Since techniques and funds for saving natural resources is incompleted, international protocols like Ramsar convention, World Heritage convention, or Biological Diversity convention can not assist such urgent tasks now.

The destruction of the farmer society and creation of aging society means that nobody will take care and control the nature. If Trans Pacific Partnership (TPP) will start, Japanese agriculture will be broken soon probably. In near future, the lake area will be changed to marsh and wetland will be changed swamp forest. Consequently, the evaporation rate will be increased and therefore we can not keep more water in small ponds and wetlands.

Figure 6: *Even Ramsar site ,it can not keep and control wetland condition, full covers aquatiplants,*

8 New Cooperation Work for keeping our Life and Bio-Diversity

After losing the traditional community works, a problem to be solved is that who controls the nature to keep biological diversity and to keep human life in harmony into the future. The alternative works include public office works and volunteer activities.

8-1 : Volunteer activity

Volunteer activities are very important, but the number of volunteer and the groups that interested in nature are still limited in Japan. They don't have enough powers for control the nature and don't have sustainability.

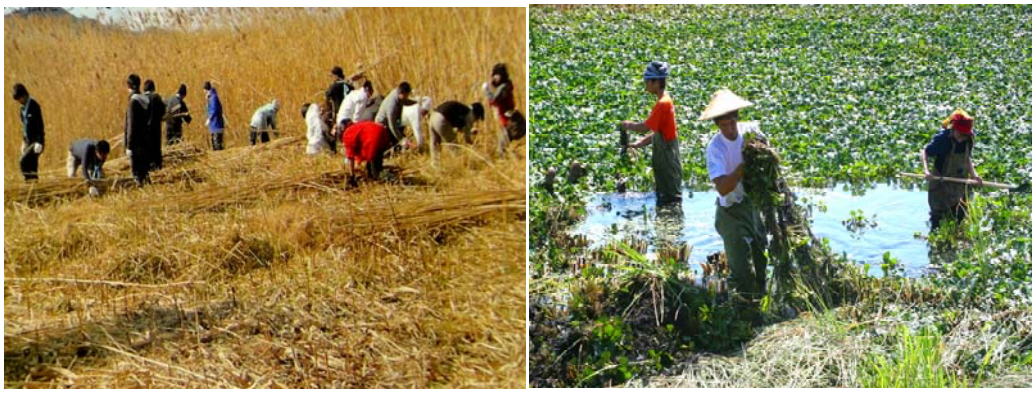

Figure 7: *Volunteer activity of harvesting common reed and picked out over grow aquatic plants (Lake Biwa in Sjiga and Sakata lagoon lake in Niigata)*

8-2. Public office work

Public office works are always depended on the budget. Therefore it is not sustainable. And sometimes it has missed the good opportunity of actions by the officials.

Figure 8: *Works of the public office for harvesting of over grow, aquatic plants, (Lake Biwa)*

9 Conclusions

Importance of maintaining the nature is the sustainability. Therefore the leading actor should be the local people who live in this region for managing and controlling the nature in each area, in any case. The government or some non government organizations (NGO) have to support them.

References

1. Sudou, I., "Votive Picture of Horse, Photostory, No.1. Four Seasons of Rice Farming *Society of Farm, Mountain and Fishing village Japan*, 2009 , pp 173.
2. Sudou, I., "Life of Showa Period, Photostory,No.1.Farm village" *Society of Farm, Mountain and Fishing village Japan*, 2004 , pp 238.
3. Sudou, I., "Life of Showa Period, Photostory,No.2.Mountain village" *Society of Farm, Mountain and Fishing village Japan*, 2004 , pp 238..
4. Sudou, I., "Life of Showa Period, Photostory,No.3. Fishing village and Island" *Society of Farm, Mountain and Fishing village Japan*, 2004 , pp 238..
5. Sudou, I., "Life of Showa Period, Photostory,No.5. River and Lake" *Society of Farm, Mountain and Fishing village Japan*, 2004 , pp 238.
6. S.K.Weragoda, Tanaka N., K.B.S.N.Jinadasa and Sasaki Y., Impact of influent inorganic nitrogen on nitrate removal efficiency of submerged plant microcosms, Chemistry and Ecology,2009.Vol.25, No.3, pp.179-188.
7. Gunarantne Delkandura Arachchige Gayan Lakendra, Restoration of Koggala Lagoon, Sri Lanka: An investigation of physical processes and morphometric parameters using field data and numerical models and proposing management alternatives. 2010.
8. www.pref.shiga.jp/biwako/koai/hakusyo22/honpen22.html. visited on 20th Oct, 2010
9. http://www.lberi.jp/root/jp/62pick/bkjhindex.htm. visited on 20th Oct, 2010

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