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Present Situation of Japanese Wildlife Reviewed from Economic Backgrounds: An Introduction for Young Students

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I. Introduction

Damage to crops by wild animals (crop-raiding) is one of the biggest wildlife conservation problems in Japan. Many animals have been killed as pests to cope with crop-raiding. There are two main forces that caused animals to damage crops. One is the intensive habitat disturbance by forest logging and the plantation of coniferous trees. The other is a decline in agriculture, leading to a decrease in the number of farmers but an increase in their ages. In fact, both of these forces are closely related to the economic development of Japan. In this paper, the relationship between economic growth and the wildlife situation in Japan will be discussed.

II. Why does wildlife begin to damage crops ?

A recent concern of Japanese ecologists is crop-raiding of agricultural products by wild animals and the use of pest control to try to cope with the problem. Why do animals damage crops ? Of course, habitat disturbance is the most important cause. But concerning wildlife management and conservation, such an answer is not enough. We should consider the phenomena from a sociological point of view.

Figure 1 shows the history of crop-raiding by wildlife in Japan. After the 1970's, damage to crops and forestry increased rapidly. The main crops damaged were grass for cattle, rice, vegetables, fruits,

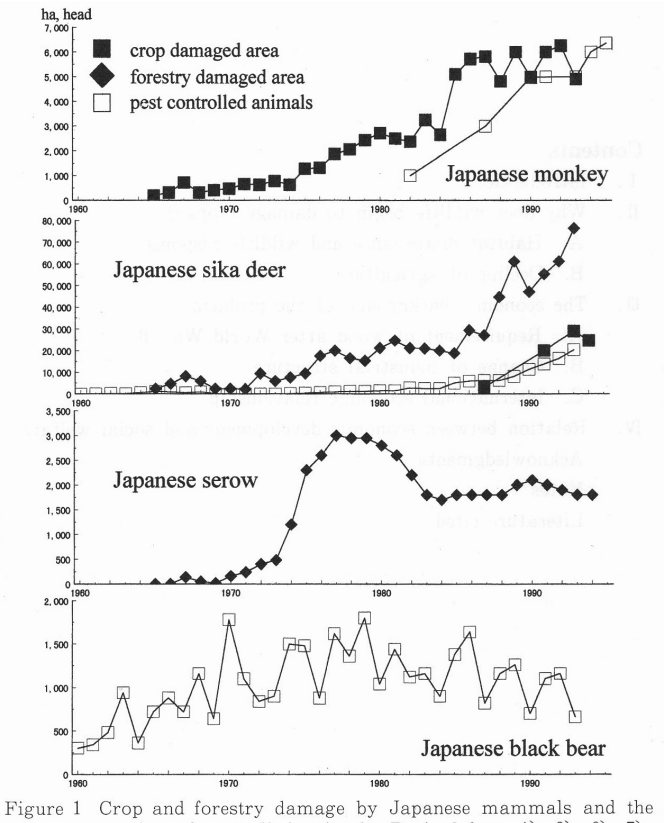

Figure 1 Crop and forestry damage by Japanese mammals and the number of controlled animals. Revised from 1), 2), 6), 7).

etc. As for forestry, the damage included feeding on buds, sprouts and the bark of planted coniferous trees. Around 1990, the annual damage to crops by monkeys amounted to about 1.4 billion yen [1]. Moreover, the damage by deer amounted to about 2 billion yen in 1995 only on Hokkaido island in the northern part of Japan [2]. Deer inhabiting other parts of Japan must surely be damaging many crops also.

To cope with crop-raiding, many animals have been killed as pests (Figure 1). The number of controlled (i.e. killed) animals is increasing. But pest control has actually not had much effect on saving crops, as shown in Figure 1. The more animals are controlled, the greater the amount of damage to crops becomes. In this paper, we will first discuss the mechanism by which wildlife becomes a crop-damaging pest.

A. Habitat disturbance and wildlife response

One of the main reasons for crop-raiding is the intensive habitat destruction by logging of natural forests and the planting of coniferous trees. Logging of the forests rapidly increased after World War II (Figure 2). After clear cutting the forests, coniferous trees were planted. One of the main planted species was SUGI (Japanese cedar: *Cryptomeria japonica*). SUGI grows fast and is very useful for building Japanese style houses. But, this species needs various kinds of artificial treatment to grow well and produce good timber. Today, about 40% of Japanese forests has been transformed into such mono-culture conifer plantations [3]. We can see the plantations everywhere in rural areas of Japan.

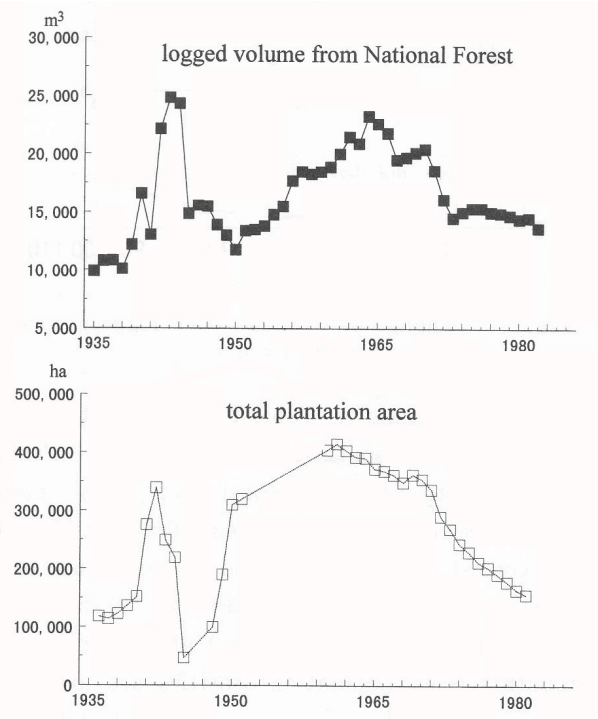

Figure 2 Logging volume and plantation area in National Forests. Revised from 3).

The impact to the ecology of wildlife changes as time passes following logging and plantation. Figure 3 shows food availability for herbivorous animals in a logged area. Soon after logging, herbs and grasses sprout. Then, bushes and shrubs become established, as vegetation progresses. Food availability for herbivore animals increases rapidly during the first several years after logging, but 15 to 25 years later, the food supply

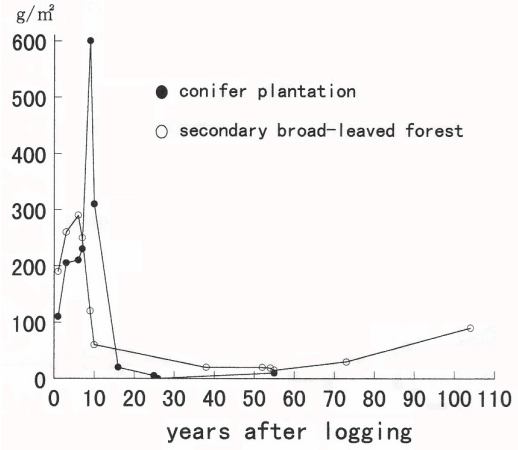

Figure 3 Change of biomass after logging forests. Revised from 7).

greatly decreases. This occurs especially in mature conifer plantations, often over 30 years-old, because they do not supply food, shelter, nor nests for many animals [4]. Table 1 shows vegetation (woody species) of several parts of Yakushima Island, in the southwest part of Japan. Primary forests (a, b, c in Table 1) and old secondary forests (d, e, f) consist of many species supplying food for Yakushima monkeys (*Macaca fuscata yakui*) and Yaku sika deer (*Cervus nippon yakushimae*). However, SUGI plantations consist only of SUGI, and are of no use to wildlife. Therefore, in a mature conifer plantation, it is difficult for wild animals to survive. Figure 4 indicates the relation between the area of logging (within 25 years) and the density of both monkeys and deer in Yakushima. For both species, population densities are lower where there has been a large plantation area.

Table 1 Plant composition of natural forests, secondary forests and conifer plantations in Yakushima

plant type	natural			forest type secondary			plantation
	a	b	c	d	e	f	
food species for monkey	7	0	0	12	1	0	0
food species for deer	25	53	22	27	41	55	0
food species for monkey & deer	34	32	42	17	38	25	0
non-food species	33	12	31	45	19	20	100

Three sites for natural forests (a, b, c), three sites for secondary forests (d, e, f) and one site for conifer plantation were reserched. Figures show % of basal area to total basal area of each site. Data taken from 8).

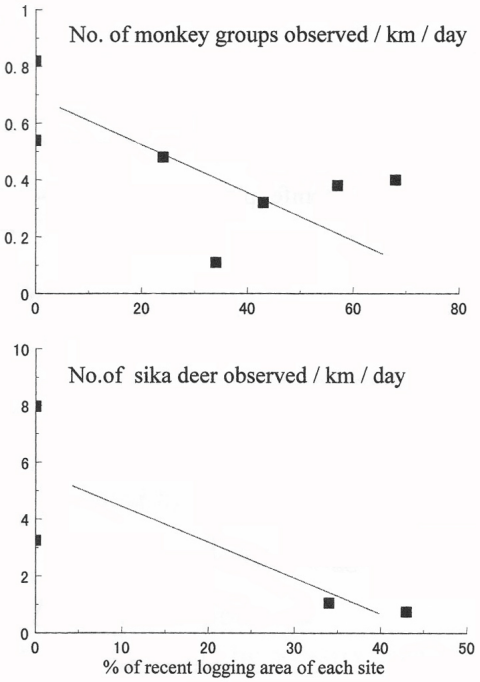

Figure 4 Relation between population densities of mammals and coverage of logging area in the habitats in Yakushima Island. Data taken from 8), 9).

Figure 5a indicates the volume of logging, plantation area, damages of crops and forestry by Ezo sika deer (*Cervus nippon yesoensis*), and the number of deer killed by hunting and pest control each year on Hokkaido. Figure 5b gives figures for Japanese sika deer (*C. n. centralis*) in Iwate Prefecture in the northeast part of Japan. Figure 5c gives figures for Yakushima monkeys

(*Macaca fuscata yakui*) on Yakushima island; about 15 to 25 years after intensive logging and plantation, they began to damage crops and forestry. Remember that 15-20 years is just the time when the food supply decreases in logged areas (Figure 3). These facts show clearly that intensive logging and the mono-cultural plantation of coniferous trees is a major cause of crop-raiding by wild animals.

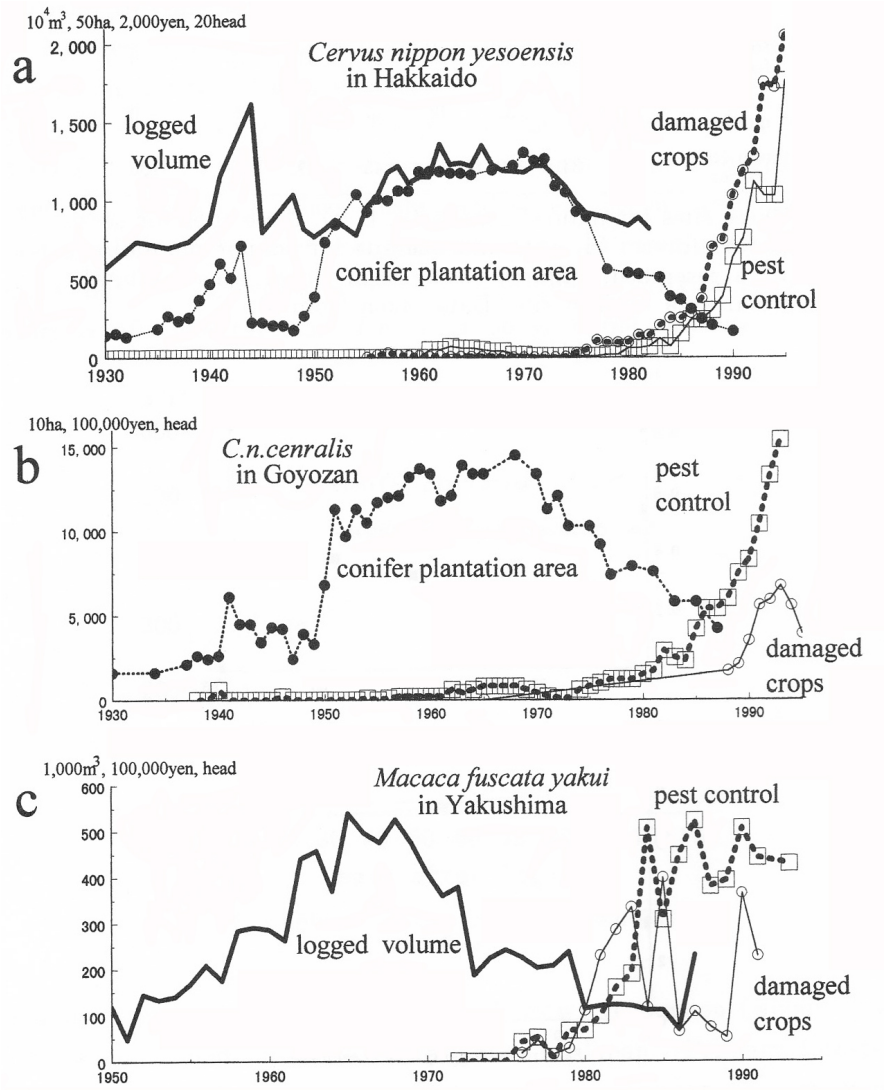

Figure 5 Histories of logging, plantation, crop damage and pest control in 3 mammals. Revised from 2), 7), 10), 11).

B. Decline of agriculture

The other cause of crop-raiding is the decline of agriculture. The number of farmers is decreasing (Figure 6) and the age of farmers is increasing. About 30% of the farmers in Japan are 65 years old or older. A similar case also exists in forestry. Figure 7 shows the number of people engaged in the forest industry and the percentage of those people whose age is 50 years or older. On the other hand, newly cultivated areas have increased yearly from the late 1960's to the 1970's (Figure 6). This means that some wildlife habitats were converted to farmland during this period. Why did the cultivated area increase in spite of the decline in farming activity? One of the reasons

is the mechanization of farming. Mechanization compensated for the decrease in workers' activities. But, a much more important reason is grant-in-aids from central and local governments for agriculture. The cultivation of new areas is founded on such public grants.

However agriculture has been protected politically, productivity in agriculture has been decreasing. Today, the management of most farms is not good condition. So when wild animals damage crops, farmers are unable to compensate for it by themselves (i.e. they cannot pay out money to protect against crop-raiding). The farmers are too old to correspond to the problem in a flexible way. Crop-raiding by wild animals can thus not be stopped, and only becomes worse and worse.

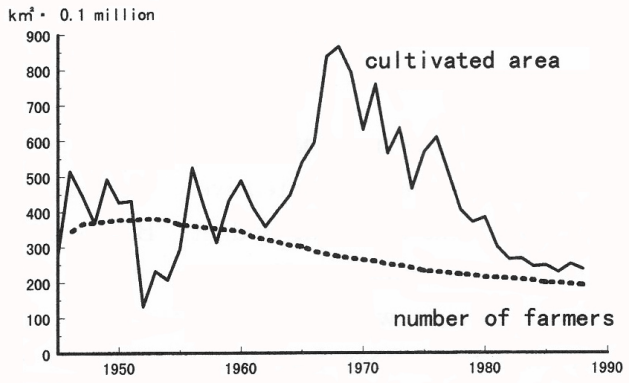

Figure 6 Number of farmers and cultivated area in Japan. Data taken from 12).

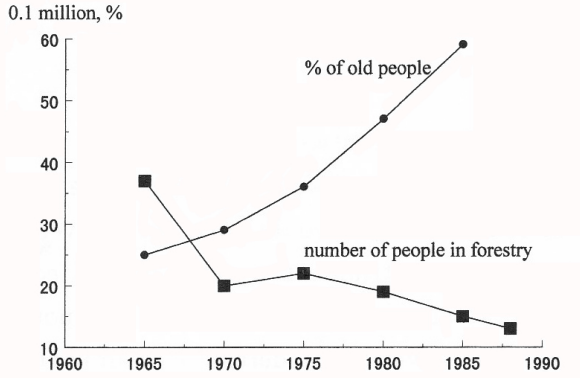

Figure 7 Number of people engaging in forestry and percent of people 50 years old or older. Data taken from 3).

III. The economic background of the problem

Two main factors, the habitat destruction by forestry, and the decrease of agricultural activity, are responsible for the increase in crop-raiding by wildlife. Both factor are closely related to the development of the Japanese economy after World War II.

A. Requirement for wood after World War II

The demand for wood increased as reconstruction of the war-damaged country took place. For that reconstruction, about half of the Japanese forests were logged. After the logging, coniferous trees were planted. This process has already been shown in Figure 2. Such demand made the price of wood higher. The price of wood doubled, though the

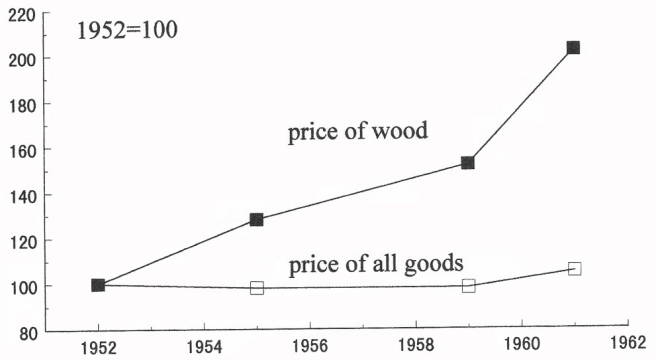

Figure 8 Price of wood from 1952 to 1961. Data taken from 3).

commodity prices increased little between 1952 and 1961 (Figure 8). Therefore, the more the forests were logged, the more money forestry gained. National Forests were also logged intensively, because the National Forestry could earn their revenue independently of the National Budget. Before 1961, international trade of wood was limited by the Japanese government. However, other industries pressured the government to import much cheaper foreign wood. Then, after 1961, the Japanese government deregulated imported wood. At this time cheap foreign wood entered the Japanese wood market in great quantities. Figure 9 indicates the changes in the amount of imported wood. During this 30-year period about 10 times more wood was imported than before. As a result, naturally, self-sufficiency in wood decreased (Figure 9). The price of wood also decreased as shown in Figure 10.

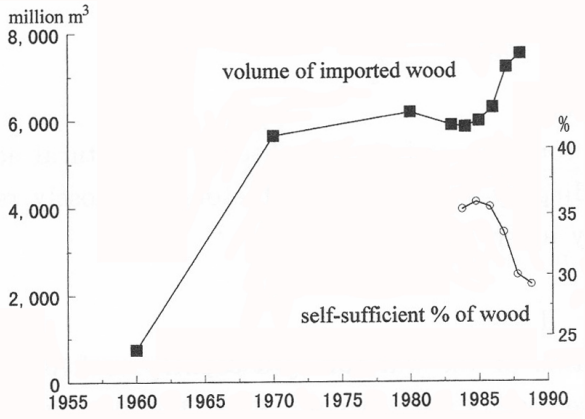

Figure 9 Amount of imported wood and percent of self-sufficient wood in Japan. Data taken from 3).

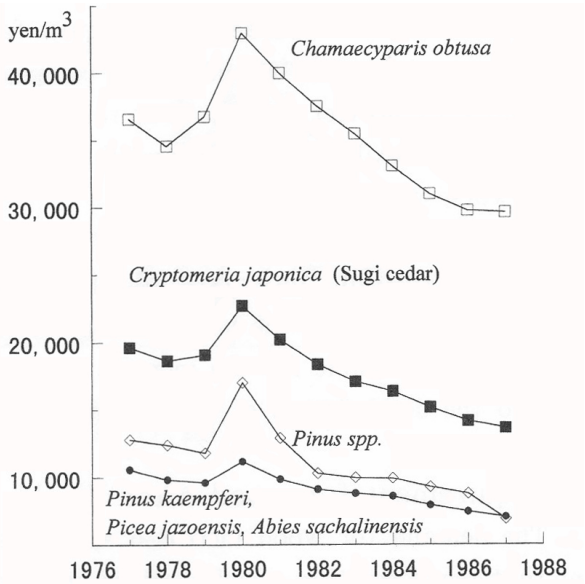

Figure 10 Prices of major Japanese conifer woods after 1977. Data taken from 3).

On the other hand, the cost of forestry management increased. Figure 11 shows the increasing costs of forestry management in Japan. It was led by the increase in prices of various goods as well as personnel expenditures as a result of economic development. Thus, forestry in Japan could not be managed in a normal fashion. The cumulated amount of debt of the National Forestry, which is under the control of the Agency of Agriculture, was up to 350 billion yen in 1997. Treatment of forest plantations is not yet adequate, and more and more plantations have been abandoned. Such untreated and abandoned plantations have little economic value. Therefore, at this time, a great number of the forests in Japan do not have economic value. And they do not have any value for wildlife either.

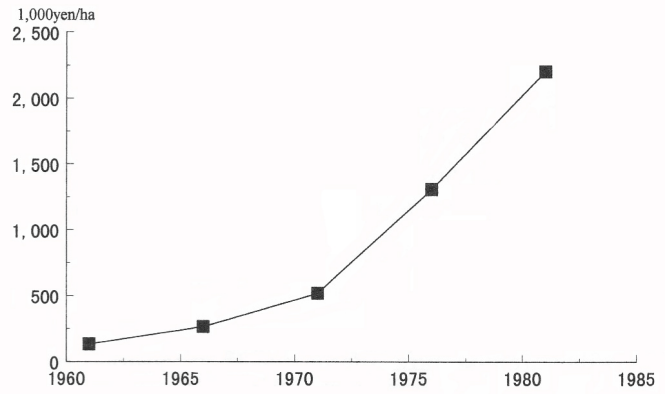

Figure 11 Cost of managing forestry in Japan. Data taken from 3).

B. Change of industrial structure

To develop the economy of a country, industrialization is inevitable. The main industry tends to shift from primary to secondary, and finally to tertiary industries as a national economy grows. It is easy to understand how productivity in agriculture is physically limited by the farming area. On the other hand, productivity in a factory can be raised by the innovation of technology**. So, productivity in industry increases higher than agriculture. In general, productivity in the factory is much higher than that of farming. Then, with the development of a national economy, the number of people engaged in primary industries decreases. Figure 12 shows the number of people engaged in primary industries (such as agriculture, forestry and fishing), secondary industries (manufacturing) and tertiary industries (services) in Japan. Most countries that have a large economy today are classified into the same types as those in Japan. Thus, economic development naturally leads to a decline in agriculture to some extent. Industry needs many workers, so people move from rural areas to factories in order to get higher salaries than agriculture provides. The population shifts to urban areas, thus decreasing the number of farmers.

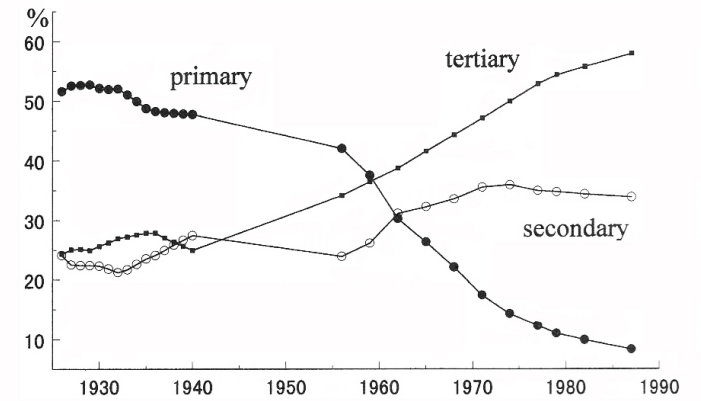

Figure 12 Number of people engaging in each industry in Japan. Data taken from 12).

C. International economic relationship

The development of the Japanese economy has been supported by the export of industrial products. In other words, industrial products must be exported to foreign countries for the development of the Japanese economy. But the number of exported goods needs to balance with

the number of imported goods; Japan has been importing many agricultural products and wood.

Figure 13 shows the export and import products of Japan. Japan exports the products of heavy industry and imports material to make industrial products. At the same time, Japan also imports agricultural products and wood for balancing international trade. The domestic products of agriculture and forestry then have to compete with cheap foreign foods and wood. As a result, domestic products lose their market. Figure 14 shows the percentages of self-sufficiency of foods in Japan. One-third of foods are imported from foreign countries. The influence of international trade is ruining agriculture and forestry in Japan.

The difficulties of Japanese agriculture are called a “constructive problem”. But, in general, this problem is inevitable to some extent if we want to develop the economy. An international division of labor could change the situation, however.

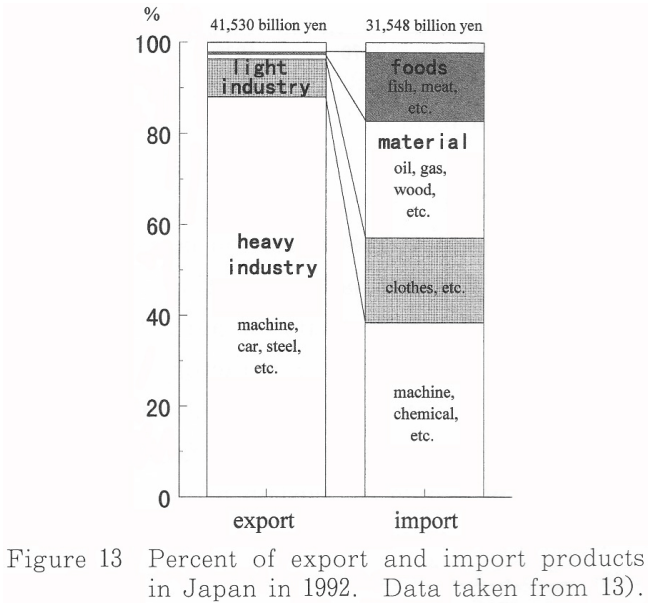

Figure 13 Percent of export and import products in Japan in 1992. Data taken from 13).

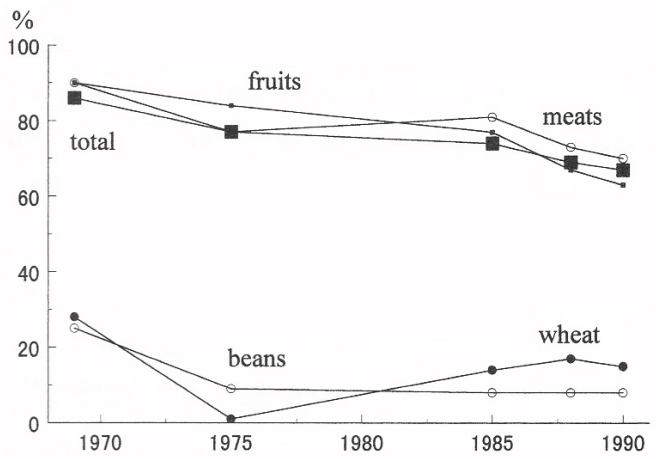

Figure 14 Percent of self-sufficient agriculture products of Japan. Data taken from 14).

IV. Relation between economic development and social welfare

Indeed, the Japanese economy developed so well as to become the 2nd strongest economy in the world. But, our quality of life has not improved to reflect that success. Because there are many costs in economic development (such as pollution, artificial disasters, and deterioration of nature), crop-raiding by wildlife must be considered one of the costs of economic development. Since the 1970’s, some economists has come to reconsider what the development of a country means [5)]. What is true “development” for human life ? Humans desire a safe, peaceful, and satisfied life. Improving such qualities of life, in other words “social welfare”, should be considered true development. Of course, economic development is one of the major factors which

improves social welfare. Economic development supplies many products, services and conveniences for us. But, there are always side effects, and all things have two aspects. All benefits will require some cost. This is a “trade off” relationship. Because the natural environment provides us with such wonderful resources as safe water and air, fertile soil, climatic condition, and wildlife, we must remember that economic development has a great impact and damages the natural environment, leading to a decrease in social welfare. Natural environmental factors improve our quality of life and are very useful for our social welfare. So, when we consider true development, we should compensate economic development with economic costs. Figure 15 indicates the relationship between economic development, which is expressed by Gross National Product (GNP), and Net Social Welfare (NSW) .

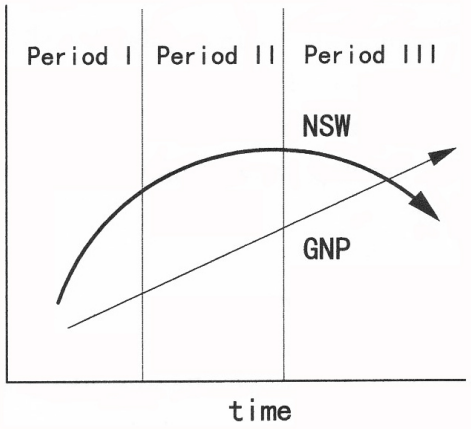

Figure 15 Relation between net social welfare (NSW) and net national product (GNP). Revised from 5).

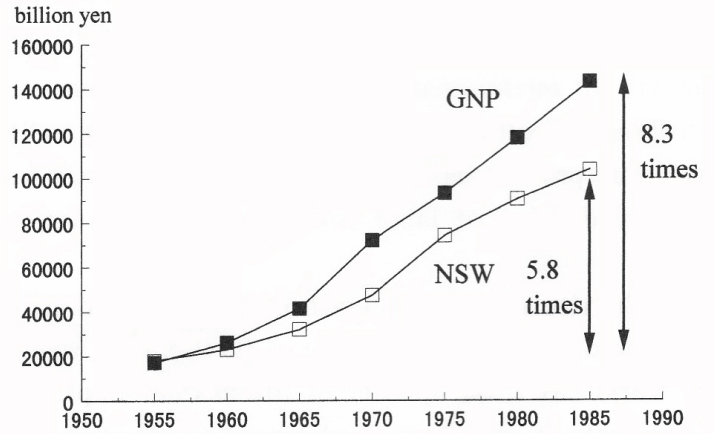

Figure 16 GNP and NSW of Japan. Data taken from 15).

When the economy of a country is small, NSW increases more rapidly than the GNP does (Period I in Figure 15). But, after the GNP grows to a certain level, NSW does not increase as much as GNP (Period II). This is because the deterioration of the environment by economic development increases much faster. In the last stage (Period III), NSW will not increase, but will decrease, as GNP increases. We become poorer and poorer, if we develop the economy any more after this point. Japan has probably reached Period II. Figure 16 shows the NSW of Japan. The Japanese GNP increased 8.3 times from 1955 to 1985, although the NSW only increased 5.8 times. Thus, the NSW will not increase as much as the GNP. In this calculation pollution and urbanization are thought to be the only negative factors in economic development. But many negative factors do exist, and listing them all is technically impossible. Therefore, we should note that the real NSW tends to be lower than the estimated value.

The crop-raiding problem must be thought of as one of the negative factors of economic development. If we are interested in wildlife management, we should pay great attention to such economic backgrounds as those discussed in this study. When we want to conserve wildlife, we

need to consider the problem from an economic view point. In some cases we are required to conserve wildlife in relation to harsh economic conditions. All ecologists should know at least the outline of the economic movements of their own country. The issues I have presented should become common knowledge for ecologists.

Acknowledgments

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Notes

* This is possible because members of the Diet are elected more from rural areas than urban areas in the Japanese election system. The members from rural areas pressure the government to aid agriculture and give money (grant-in-aid) to farmers to reduce momentarily their complaints to society.

** Of course, innovation of technology will also make the productivity of agriculture rise. But, such improvement has a limit compared with industrial development.

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