PROMOTING SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT

Akira Tabayashi
Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Japan

Keywords: Abandoned cultivable land, Agenda 21, aging of agricultural labor, Agricultural Basic Law, agricultural cooperative, agricultural mechanization, agricultural modernization, agricultural organization, agricultural service business, agricultural technology, Asian Monsoon Zone, baby-boomer generation, barnyard manure, BSE, chemical fertilizer, chemicalization, chisanchiso, commercial farm household, communal principle, community activity, community agreement, community farming, conservation oriented agriculture, cropping system, cultivation abandonment, depopulation, Earth Summit, eco-farmer, environmental conservation, environmental degradation, environment pollution, farmland consolidation, flat agricultural area, food consumption, full-time farm household, greenhouse, green manure, herbicides, hilly and mountainous area, labor productivity, land improvement, land-use type agriculture, low-input agriculture, manure application, multiple functions of agriculture, natural cyclical system, non-agricultural income, non-mechanized agriculture, Organic Agriculture Office, part-time farm household, pest control, pesticides, Recycling-Based Society, rural area, rural landscape, rural villages, safe food, rice paddy, rotation farming, selective expansion, self-sufficiency rate, shokuiku, soil improvement, stable food supply, sustainable agriculture, Sustainable Agriculture Office, viable farm, un-cultivated land, urban area, urban lifestyle, WTO

Contents

1. Introduction
2. Modernization of Agriculture and its Problems
   2.1. Overview of Japanese Agriculture
   2.2. Traditional Agricultural System in Japan
   2.3. Modernization of Japanese Agriculture
      2.3.1. Agricultural Land Infrastructure Development and Modernization of Agriculture
      2.3.2. Transition of Productivity Enhancement and Management in Agriculture
2.4. Agricultural Modernization and Issues in Agriculture and Rural Areas
3. Promotion of Sustainable Agriculture in Japan
   3.1. Development of Measures for Sustainable Agriculture in Japan
   3.2. Conservation Oriented Agriculture in Japan
      3.2.1. Technical Aspects of Conservation Oriented Agriculture
      3.2.2. Economic and Social Aspects of Conservation Oriented Agriculture
   3.3. State of Implementation of Conservation Oriented Agriculture in Japan
4. Characteristics of Conservation Oriented Agriculture
   4.1. Typology of Conservation Oriented Agriculture
   4.2. The Case of Conservation Oriented Agriculture
      4.2.1. Agricultural Productivity as a Motivating Factor - The Case of Miura City, Kanagawa Prefecture-
      4.2.2. Degradation of the Local Environment as a Motivating Factor – The Case of
Kagamihara City, Gifu Prefecture

4.2.3. Responding to Consumers and Markets – The Case of Sasakami Village, Niigata Prefecture

5. Promotion of Rural Areas in Japan

5.1. Fostering of Future Farmers

5.2. Application of Agricultural Multiple Functions

5.3. Conservation of Local Resources and Reviving of Rural Communities

5.4. Conservation of Hilly and Mountainous Areas

6. Advantages and Problems of Sustainable Agriculture and Development of Rural Areas in Japan

7. Conclusion

Glossary

Bibliography

Biographical Sketch

Summary

Since the beginning of the 1990s the Japanese national government, along with local governments and agriculturally related organizations have strived for realization of sustainable agriculture and rural development. In this chapter, characteristics of sustainable agriculture in Japan, and results of sustainable agriculture as promoted by all levels of government and various organizations, as well as feedback and problems were examined based on transition from and characteristics of previous agriculture in Japan. Characteristics of sustainable agriculture in Japan emphasize the relationship between agricultural production and the natural environment utilizing environmentally friendly agricultural technology. Strong interest is put on conservation oriented agriculture which is only a part of sustainable agriculture. It centers on agricultural technologies, supply and production of safe food, increased organic manure and less agrichemical use, damage by continuous cropping, maintenance of soil fertility, conservation of the environmental and protection of water resources. At present Japanese agriculture is supported by a preponderance of part-time farm households and aging and female farmers. However, in the future it will be supported by management entities strongly motivated toward agricultural management including business farm households, agricultural production corporations, and community farming with centralization of management and a corporate status. Japan should strive to establish sustainable agriculture economically, socially, and culturally from a comprehensive viewpoint rather than from narrowly-defined sustainable conservation oriented agriculture. Laws and systems concerning food, agriculture, and rural villages in Japan were improved from 1999 to 2005 and these measures have been promoted strongly. The importance of sustainable agriculture and sustainable development of rural villages has become apparent across the national and positive results are expected.

1. Introduction

Various issues as symbolized by environment pollution have emerged with the advancement and rationalization of agricultural mechanization and increased chemical use in industrialized countries of the world. In western countries since the 1980s it has been asserted that the main emphasis in agriculture should be shifted from the pursuit of
productivity, increased income, and degree of cost control to environmental concerns. Doing so requires agriculture which meets the long term needs of producers and consumers simultaneously utilizing resources for producing food and fabric without destruction of the environment. This is called sustainable agriculture and the definition is generally concerned with decreasing permanent natural destruction, maintaining agricultural productivity, being economically viable, and keeping a high quality of rural life. Particularly in Japan, viability of sustainable agriculture has been sought since the late 1980s. A wide range of methods such as follows has been attempted: low use of chemical and organic fertilizers, low use of agrichemicals, and rotation farming.

At the 1992 United Nations Conference on Environment and Development (Earth Summit), the action planning, “Agenda 21” was adopted aiming at sustainable human enterprise in harmony with the environment. Based on this, the Japanese national government, together with local governments and agricultural related organizations has strived for realization of sustainable agriculture and rural development. Basic Law for Food, Agriculture, and Rural Areas was enacted in July 1997. Based on this law, enforcement of the policy for promotion of organized, sustainable agriculture and rural development was adopted. Consumers across the nation are now strongly interested in acquiring safe food and environmental conservation. It is essential to advance preparation toward construction of a new agricultural system since healthy Japanese agriculture must be maintained. This paper will examine the following matters on the basis of transition and characteristics of previous Japanese agriculture: background of sustainable agriculture in Japan, its characteristics, details of sustainable agriculture promoted by government and organizations, and feedback and problems.

2. Modernization of Agriculture and its Problems

2.1. Overview of Japanese Agriculture

As of 2000 the total cultivated acreage in Japan was 4,830,000 ha. This amounts to 13.1% of the entire Japanese land mass. Housing sites and roads account for 8% of the land. The rest of the land is covered by wooded mountainous and hilly terrain. 54.7% of cultivated land was rice paddies and irrigated rice was the most important crop. Around 1960 half of the total production of agriculture was from rice, however, this amount had decreased to 25.4% by 2000. Contrary to this, vegetable and stock farm products as part of the total agriculture production increased to 23.2 % and 26.9% respectively (Table 1).

<table>
<thead>
<tr>
<th>Indices</th>
<th>1960</th>
<th>1980</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cultivated land (1000ha)</td>
<td>607.1</td>
<td>546.1</td>
<td>483.0</td>
</tr>
<tr>
<td>Paddy filed</td>
<td>338.1</td>
<td>305.5</td>
<td>264.1</td>
</tr>
<tr>
<td>Dry field (including orchard and fodder field)</td>
<td>269.0</td>
<td>240.6</td>
<td>218.9</td>
</tr>
</tbody>
</table>

©Encyclopedia of Life Support Systems (EOLSS)
Table 1: Overview of Japanese agriculture

As of 2000 the number of farm households was 3,120,000, which is 51.5% of the number in 1960. 25.1% of the farm households, 783 thousand, either have operating cultivated land less than 0.3 ha or are noncommercial farm households which earn less than 500 thousand yen a year from farm produce. The rest, 2,337,000, are commercial farm households. The average acreage of land under cultivation is only 1.79 ha. Practically speaking, it is impossible for farmers to subsist on such a small plots; therefore, they strongly depend on non-agricultural income. According to the Farm Management Statistical Survey performed by the Ministry of Agriculture, Forestry and Fisheries in 2000, the national average number of family members in each commercial farm household was 3.98, and of these members only 1.12 were engaged in farming.
The average annual income was 8.28 million yen. Agricultural income accounted for only 13.1% of it with the remainder coming from non-agricultural work and pensions. The recent trend of pension income increasing reflects the aging of the population and it accounted for 26.8% of the total farm household income in 2000.

Cultivated land in Japan decreased by 20% over the 40 years from 1960 to 2000 and the number of farm households and farming population decreased by more than 60%. The self-sufficiency rate of edible crops in Japan has decreased year after year due to the decline of agriculture nationwide and has spurred the recent increase of imported farm produce. In 1970 the self-sufficiency rate of grain was 46%, vegetables 99%, and meat 89%; however by 2004 they had decreased to 28%, 82%, and 52% respectively.

2.2. Traditional Agricultural System in Japan

Traditional agriculture in Japan was characterized as self-sufficient, small farm management with family labor centering on rice paddy cultivation. Until the 1950s the bulk of agriculture was done by traditional labor and was land intensive without machinery. Productivity of rice paddy cultivation in Japan, with its hot and humid weather, is higher than that of field cropping in western countries. This was one of the reasons which made it possible for many people to live in such a small country. In addition, paddy agriculture has several sustainable features. Firstly, the level of soil fertility doesn’t degrade very quickly. In summer the flooded fields inhibit the diffusion of oxygen to the subsurface lowering the redox potential. Under such condition, degradation of soil organic matter proceeds slowly, unlike an oxic field environment, helping to retain soil fertility. Secondly, the pH of the soil is nearly neutralized by the accumulation of ferrous iron (Fe2+) from the reduction of ferric iron (Fe3+). Phosphoric acid combines with the ferrous iron creating nutrition for plant life. Lastly, a considerable amount of mineral nutrition is directly supplied by irrigation water.

Paddy rice grown in the above mentioned paddy field is an excellent crop. The rice is easy to cook, delicious, and rich in nutrients. It is the only cereal grain which can be grown utilizing basin irrigation. The productivity is high and stable. Paddy rice can sustain unlimited continuous cropping since harmful microorganism and nematodes diminish under water and toxic substances are washed away.

Traditional Japanese agriculture was ecologically sustainable centering on the growing of paddy rice combined with upland cropping and forest farming. Over time it evolved into diversified family run farming. The definition of diversified farming here is that various crops and livestock are grown or raised at the same time and are combined systematically. This was the most practical agricultural management style which optimized the use of land and people in Japan, which lies at the northern edge of the Asian Monsoon Zone with hot and humid weather in summer. Many rural villages were closely knit deriving cohesion from communal aspects such as joint forest land, pasture, crop irrigation, or coastal fishing ground. Residents gave close attention to their resources and the environment.

Paddy fields and other fields belonging to villages and farm households in the Abukuma Highlands stretched continuously on the elevated peneplains at altitudes between 400
and 700 m above sea level and spread arborescently on the alluvial plains along rivers and streams. Small farm households succeeded by utilizing the combination of paddy fields, fields, and forested mountains. They grew paddy rice and field crops such as wheat, coarse cereal, and pulse crops as well as silk cultivation, horse raising and charcoal making. They produced green manure for paddy and dry fields by collecting deciduous leaves in the mountains. Such diversified farming made the best use of various land resources and had strong self-sufficient characteristics. Moreover, it combined low-productive stock-holding agriculture with the collecting and processing of mountain resources.

Paddy farming villages, where land resources are relatively scarce, had many characteristics similar to traditional upland rural villages. On the Toyama plain, where agricultural work was restricted due to heavy snowfall in winter, they grew wheat, coarse cereal, tuber crops, and pulse crops. Astragalus was grown as green manure during the off-season instead of paddy rice. For example, around 1950 the land use rate on the Kurobe alluvial fan in Toyama prefecture was 159%. Tulip bulbs, vegetable, tobacco, watermelons were cultivated until the 1960s in addition to paddy rice cropping. Swine, poultry, and dairy husbandry were also attempted. Moreover, in the period when agricultural work was minimal, farmers did construction work as day workers. They made the best use of their farmland and workforce year-round and to make a living. As an alternative to fuelwood, branches and deciduous leaves were used. Astragalus was tilled under and human waste was used for manure. In order to maintain agriculture and rural villages, it was essential to work together on the maintenance of irrigation facilities and agricultural roads.

As stated above, traditional Japanese rural villages consisted of a residential area, kitchen gardens, fields, paddy fields, and forests. These elements maintained a distinct balance interacting with one another centering on their residents (Figure 1). Limited land resources were utilized to their fullest and maximum productivity was attempted in each village. Resources were also maintained on a community basis and utilized efficiently for stable use. Communal principles were for group coexistence rather than personal gain. The traditional rural village was surely sustainable from an ecological point of view; however, its economic level was very low and it contained irrational elements with its traditional agricultural production system and social and cultural dependence on family relations; therefore, it is not necessarily the case that the traditional rural village is sustainable.
Figure 1: Land use pattern of traditional rural village in Japan

Bibliography

Brklacich, M, Bryant, C. and Smit, B. (1990). Review and appraisal of concepts of sustainable food production systems. Environment Management, Vol. 16, 1-14. [This reviews previous studies on sustainable agriculture in the developed countries and appraises their concepts]

Central Union of Agricultural Cooperatives and National Federation of Agricultural Cooperative Association eds. (1997). Conservation Oriented Agriculture and Revitalization of Rural Areas. 239pp. Ieno Hikari Kyokai, Tokyo, Japan. (in Japanese) [This shows examples of rural communities revitalized by the introduction of environmental friendly farming in Japan]

Central Union of Agricultural Cooperatives and National Federation of Agricultural Cooperative Association eds. (1999). Roles of Agriculture, Forestry and Fisheries to Preserve Environment. 214pp. Ieno Hikari Kyokai, Tokyo, Japan. (in Japanese) [This shows examples rural economic activities to preserve rural environment in Japan]


Kada, R.(1990). Environmental Conservation and Sustainable Agriculture. 262pp. Ienohikari Kyokai, Tokyo, Japan (in Japanese) [This is one of the first textbooks on Conservation oriented agriculture in Japan]


Kankyo Hozenngata Nogyo Gijutsu Shishin Kento Iinkai (1997). Introduction to Agricultural Techniques for Conservation Oriented Agriculture. 156pp. Ieno Hikari Kyokai, Tokyo, Japan. (in Japanese) [This is a good introduction of agricultural techniques for Conservation oriented agriculture in Japan]


Statistics Department, Ministry of Agriculture, Forestry and Fisherie of Japan (1997). Results of the
Research on Conservation Oriented Agriculture. 25pp. Ministry of Agriculture, Forestry and Fisheries of Japan, Tokyo, Japan. (in Japanese) [This is the results of the first systematic research on conservation oriented agriculture in Japan]

Tabayashi, A. and Iguchi, A. (2005). Changing agriculture and farm successors in Japan. Studies in Human Geography, No.29, 85-134. (in Japanese with English abstract) [This paper analyzes the evolutionary processes of agriculture over the half century from 1950 to 2000 and evaluates the sustainability of the present agricultural activities]

Tabayashi, A. (1997). Transformation of Japan’s rural landscape and economy: The case of a rice growing village in central Japan. Geographical Bulletin, Vo.39, 98-112. [This paper depicts the evolutionary processes of rural regions from 1960 to the middle of the 1990s, through a case study of a typical rice growing village in the central Japan facing the Sea of Japan]


Biographical Sketch

Dr. Akira Tabayashi is professor of geography at the University of Tsukuba, in Japan. He received his master's and doctoral degrees in geography at Tokyo University of Education, Japan. He joined Tokyo University of Education in 1975 as a research associate in geography. He moved to the University of Tsukuba in 1977 as a research associate in geography, becoming an associate professor in 1988, and then professor in 1997. Professor Tabayashi specializes in agricultural and rural geography and geography of Canada. He is the author of Spatial Structure of Irrigation Systems (1990), Changing Rural Communities on Alluvial Fan Areas (1991), Foundation of Sustainable Rural Communities (2000) and Changes in Agriculture in the Hokuriku District (2003). He has been one of the members of the Executive Committee of the Association of Japanese Geographers.