

Cultivation of Rice in Japan: an analysis for its application in Darjeeling and Sikkim Himalayas

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Eighty percent of the land area of Japan is mountainous. River in Japan tend to be short and rapid with small basins. Due to frequently occurring problem of flood and drought, the effective control of river water have been important for which dams have been constructed to store water, control flooding, generate electricity, and irrigation canals have been build to supply water to the farmlands. The limited available Plain lands has been intensively developed for farming, transportation, commerce, and manufacturing. Climate of Japan is temperate and subarctic with average 1,700 mm annual precipitation. Rain starts from mid June to July that continues up to October. It is blessed with abundant forest resources due to its temperature and rainy climate and mountainous topography. With approximately 67% of its land area covered with forest. Rice cultivation became possible in Eastern Japan due to the development of agricultural technology and improvements in rice varieties. However, cold summers often cause crop damage.

Rice Farming in Japan

It the beginning of 19th century, attempts were made to raise rice in Northern Japan, which has a cooler climate. Government supported rice farming in a variety of ways. During Shogūnate period, rice played a dominant role in the economic structure of the country and in 20th centaury, government controlled production and marketing of rice. Following the World War II, the national government, based on the staple food control system, protected rice growers by purchasing rice at a prescribed price which stabilized the income of rice growers. New developments in the rice farming techniques, improvement in land conditions, development of cold resistant varieties, and increased use of chemical fertilizers and pesticides all combined to increase rice yield. The agricultural land reform after World War II contributed to an increase in the number of owner farmers and to the modernization of farming communities and farm mechanization made rice less and less labour intensive. In one hand, rice productivity increased but on the other hand, Japanese food habit started changing because of improvement in living standard. During 1970s, Japanese government changed its staple food policy to cut the rice surplus, setting low price, restricting acreage, and promoting conversion of paddy fields to other crops. The Staple Food Control Act, which puts rice and wheat under government control, was abolished in 1995 and new law relaxed government regulation on rice, only import and storage of rice were controlled by the national government. Despite of declining staple food status, rice still occupies 39% of cultivated land and accounts for a quarter of the total sales of agricultural products. Rice is also an important raw material for brewing sake (local wine).

Farms and Farmers

Majority of farmers were tenants prior to World War II. Due to agrarian reforms of 1946, the majority of tenant farmers were able to title to land. Following this reform, the national government promoted measures to improve soil, consolidate farm land, and improve irrigation and drainage. Agricultural techniques developed, mechanization proceeded, and crop varieties were improved. The living conditions in the rural areas improved substantially. There are now 22,91,000 farming households engaged in commercial farming. These are family farms based on family labour. The average size of farm is 1.3 hectare and the farms cultivating less than 1 hectare accounts for 2/3 of all farms. The number of farms has been decreasing as urbanization and industrialization proceed. Full-time farmers now accounts for only 16% of total farming households.

Research on rice breeding

The Research Institute for Paddy Farming Saitama Prefecture in Kamagaya has been working on rice breeding for the past 108 years and have released 60 varieties so far which has greatly contributed towards increasing rice yield and improvement in rice quality in Japan. The Institute has bred a variety “Musashikogane” resistant to rice strip virus with short height and high yield. Institute achieved another milestone in 1995 by releasing another variety named “Sai-no-Yuma” which is the Japan’s First variety with multiple Resistances to Diseases (rice Strip Virus) and pests (Green Rice Leaf Hopper). “Konihikari Saitama SLB” - another variety having high palatability was bred within short period having resistance to diseases and pests. No pesticide was used except against damping off of seedlings in nursery bed. Seeds were treated before sowing with hot water at 60⁰C for 10–15 minutes for rice blast, bakanae (*Gibberella fujikuroi*), bacterial grain rot, and *Aphelenchoides besseiji*. The silicate materials (energy) was applied in seedling stage for panicle blast disease.

Agriculture Cooperative for organic rice production

Usuda Organic Rice Association in Saku city works on organic rice production which was started in collaboration among Saku Central Hospital, Saku Town; Agriculture Cooperative, and Usuda Organic Rice Association. Rice area has gone up with this by 2.5 times to reach 9 ha while the number of producers remained twenty. The interesting part of this activity is that even the young people are joining this activity from other prefectures which is very important because in Japan, general age of the farmers is above 60 years. The organic rice produced is labeled and sold to wholesalers in Nagano Prefecture and in Kansai region. For organic rice production, they first select the seeds and are soak in a salt solution followed by Hot Water Treatment at 60⁰C for 10 minutes. The seeds are then soaked in 28-30⁰C for hastening of germination giving an accumulated temperature of 100⁰C where seeds grow up to 0.5 – 1mm in length. These seeds are sown in boxes in the nursery where poultry manure, rice bran, rap seed meal etc is applied. When the crop is in the filed, weeding is the most difficult challenge and it is done by hand weeder, deep water management, rice bran, and whatever is left is weeded manually. Harvesting is done 40 –45 days after head spout. The association is trying to get JAS certificate for their organic products. “Organic Village” certification is done by Usuda Certification Committee for special cultivation after consultation, laboratory examination of the produce.

Terrace farming and soil erosion

The Terraced Paddy Fields and Meigetsu-kai at Chikuma city has beautiful terrace farming is so with trains running at upper part of the hill slope with well managed terraces and irrigation water coming from upper most part of the slope where naturally springs water is collected in lakes which are maintained one after another step by step. They have a thanks giving ceremony every year to “Mother Nature” for giving them water for irrigation. In the terraces, irrigation water comes down from terrace after terrace through the pipe laid underground (Fig. 1). This system of irrigation saves soil from being eroded where running water does not come in contact with soil. The application of similar technology in Darjeeling and Sikkim Himalayan region having similar agro-ecological situation in India could benefit hundreds of farmers involved in paddy farming. The agro-ecological situation of this region is similar to Chikuma and there is a serious problem of soil erosion while cultivating rice. The terrace bunds are kept bigger in Japan where one can easily walk for any interculture operations compared to the ones which we have here which are narrow and on top of these bunds, beans like rice bean, black gram etc. are sown to get maximum return from the land. All bunds and terrace walls are scrapped using spade to remove weeds making the land vulnerable to soil erosion by heavy rainfall. But it is found in Japan that such bunds are well protected by hard and soft poly sheets (Fig. 2) so that there is no water pressure on the bunds that saves soil from being eroded. This type of structures for soil conservation using simple and cheaper materials to save precious soil and its nutrients from being eroded is not practiced in our region. The excess water or the water overflow also goes out of the terrace through poly pipe and the author was wandering for technology and techniques followed in advanced countries in checking soil erosion from paddy farming got the answer here because the soil erosion is a big problem in our region and in reporter’s small family farm, paddy cultivation in terraces was stopped 23 years back only to save soil from being eroded and land getting sink due to excess use of water.

Comparative rice productivity

The rice yield grown organically in Japan is very high. We have a notion that organically grown crops yield less than the crops that are grown using chemical fertilizers. But Japan is producing over 60q/ha organically whereas our national production is only 30q/ha using fertilizers and pesticide. The rice production in Darjeeling Hills which is by default organic in nature is only 9q/ha. The reporter came to a conclusion on the low yield of rice in our region is due to soil depletion and hardly anything is added into it but we keep on cultivating crops year after year. Nothing is done to regain and improve the nutritional status of the soil. The soil of Japanese agricultural fields is very good and well taken care off. The natural predators of insects and pests are preserved and are available in plenty in the rice fields. But in this region, predators like owl, jackals, snakes, birds, etc. are hunted and killed resulting in ecological imbalance. Mechanization of agricultural production system is another reason of higher production in Japan which even we can achieve.





Fig. 1: Underground irrigation system



Fig. 2: Poly sheets spread on the bunds to check soil erosion