

Commodification of Rural Space and Changes in the Main Varieties of Paddy Rice in the Tohoku Region

NIHEI Takaaki

Graduate School of Letters, Hokkaido University; Sapporo 060-0810, Japan.
E-mail: nihei@let.hokudai.ac.jp

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Abstract This study examines the mechanism of commodification in regional paddy rice production by focusing on the development and adoption of new varieties of rice. By presenting cases of the Tohoku region—one of the main paddy rice-producing regions in Japan—the spatial distribution of new rice varieties after the 1990s is recapitulated as follows: (1) at the regional level, distinct regional differentiation appeared with the emergence of main rice varieties in each prefecture; (2) at the prefecture level, planted areas of paddy rice decreased and the percentage of the main rice variety increased; and (3) throughout the regional and prefectural levels, the naming of new rice varieties was simplified and generalized. In the process of development and distribution of the new varieties of paddy rice, some conditions are considered as the commodification of the paddy rice-producing centers: (1) corresponding with recent market demands, new varieties with good flavor were constantly bred and spread; (2) values of some of the new varieties increased by being designated as “regional brand-name varieties”; and (3) the primary new rice varieties were introduced simultaneously by individual farms according to marketing strategies developed by prefectural and municipal administrations and agricultural cooperatives. As for future proposals, the regional rice-producing centers will have to cooperate with small and medium-size enterprises that have the singular technology to produce new varieties. Agricultural subsidies to address the aging of farmers and increasing idle farmland are also needed.

Key words paddy rice, variety, commodification, food supply, Tohoku region

Introduction

Paddy rice has been produced in large areas in Japan for centuries. Paddy rice is regarded as the staple food of the Japanese because it supplies inexpensive food in bulk. In recent years in Japan, the self-sufficiency rate of food based on energy value has hovered around 40%, but domestic rice meets more than 90% of the country's demand. For decades, production and distribution of paddy rice in Japan have been regulated by the Food Control Law (the shokkan-hou) enacted in 1942.

The first major turning point in the production of paddy rice in Japan occurred in the mid-1960s. During that high-growth period of the Japanese economy, paddy rice production was modernized by the introduction of industrial goods such as chemical fertilizers and agricultural machinery. At the same time, the Japanese adopted many Western cuisines and the import of wheat, soybeans, corn, and cornstarch, which provide high-calorie food value, increased in this period (Yamamoto et al. 1997). Because of changes that occurred in the structure of food supply and demand, the Japanese government accumulated a large amount of surplus rice.

Consequently, the policy of “reduction in area of paddy rice under cultivation” was introduced in the early 1970s.

The second turning point of Japanese paddy rice production took place in the mid-1990s. The Act on Stabilization of Supply, Demand and Prices of Staple Food (the shokuryo-hou) was promulgated in 1994 and the Food Control Law was repealed in 1995. In implementation of the new law, the government moderated restrictions on (deregulated) the distribution of paddy rice except for government-stored rice. The amount of imported rice per year also rose, ranging from 40,000 to 90,000 tons per year in the early 1990s. However, this amount increased to around 800,000 tons per year after the Japanese government agreed to minimum-access import levels in the late 1990s.

The repeal of the Food Control Law can be attributed to a severe crop failure caused by the cold weather of 1993. The crop index of paddy rice in that year scored a mere 74—the worst record after 1945. Indeed, the crop indices of paddy rice declined to less than 40 in the Pacific coastal area of the Tohoku region and Hokkaido, which are the main paddy rice-producing centers in Japan (Misawa 1996). The Japanese government had to

revise its protective policy for domestic rice under the Food Control Law to commence the emergency import of rice. The amount of imported rice increased temporarily to 1.049 million tons in 1993 and 1.835 million tons in 1994. The crop failure due to the cold weather and the confusion in the Japanese rice markets resulted in the “rice riots of the Heisei period.”

It is true that the main purpose of paddy rice production had been to provide a staple food supply, but its function of producing a cash crop was reinforced after governmental constraint was weakened by enforcement of the new law. This change can be regarded as the commodification of paddy rice, and this process of commodification can be observed in various sectors from production to distribution, such as (1) diffusion of new varieties of paddy rice that were bred for good quality in terms of fragrance and taste (Motoki 1999); (2) emergence of large-scale rice-growing farms that cultivate more than 15 ha of paddy fields (Saito 2006, 2007; Tabayashi 2007); and (3) extending farm management to distribution and selling sectors (Hatakeyama 2006).

This study focuses on the development and diffusion of new varieties of paddy rice since the commodification process has continued to change the characteristics of regional agriculture, namely, that most farms in agricultural communities are adopting new, leading varieties of paddy rice under the leadership of regional agricultural cooperatives and agricultural extension centers. The other processes of commodification (i.e., the emergence of large-scale farms and the diversification of farm management) are currently practiced by only a few farms and will not immediately influence regional paddy rice production.

Regarding the diffusion of new varieties of paddy rice, Motoki (1999) examined the changing emphasis on nonglutinous (uruchi) varieties through cases in the Tohoku and Hokkaido regions. That study noted 3 main points: (1) the main varieties of paddy rice were drastically changed in the 1990s; (2) the main cause of the change was attributed to selling strategies by regional organizations in response to consumer demand for delicious rice; and (3) paddy rice-producing centers in the regions were exposed to intense market competition. Hayashi (1998) analyzed the diffusion process of the specific varieties of paddy rice bred in the 1990s. Those results illustrate that there were significant regional differences in the diffusion of the main varieties. The diffusion of new varieties at the farm level was primarily regulated by the intentions of prefectural government, as the main varieties were officially designated as

“recommended varieties (shourei hinsyu) of rice by the prefecture.”

In this manner, until the mid-1990s, agricultural policies implemented by national and prefectural administrations impacted the development and spread of the new varieties of paddy rice. After this, the importance of quality was much emphasized in the development and production of paddy rice to correspond with the sturdy demands of the market in the early and mid-2000s (Koganezawa 2007). Reevaluating this process as the commodification of agriculture and rural space in terms of paddy rice production, the sheer mass and low cost of the food supply system in Japan can be regarded as one of the apposite topics for today’s agricultural geography. This study examines the changes in the paddy rice production at the regional level, focusing on the development and adoption process of the new varieties of paddy rice through the case of the Tohoku region.

Paddy Rice-producing Centers in the Tohoku Region

According to the Statistics on Crop (Sakumotsu Toukei), the amount of rice produced in the Tohoku region reached 2.4 million tons in 2007, accounting for 28% of the total rice production in Japan. According to the 2005 Census of Agriculture and Forestry, production area of paddy rice per farm was 1.2 ha in the Tohoku region. Excluding the Hokkaido region, the average was 0.4 ha larger than the country’s average. The percentages of family agricultural labor by age group were 43% for over 60 years of age, 39% for 40–59 years of age, and 16% for 20–39 years of age. Although the 60 years and older category of laborers was 7% lower than the national average, aging of farmers continues to occur in the Tohoku region.

Figure 1 shows the spatial distribution of planted areas, percentages, and the quality of paddy rice produced in the Tohoku region. This study defines “large-scale producing centers of paddy rice” as those contiguous municipalities whose planted area of paddy rice exceed 10,000 ha collectively. By using the data of the 2000 Census of Agriculture and Forestry, 14 such large-scale producing centers are designated. In descending order of agglomerated planted areas of paddy rice, they are the Senpoku Plain, Yokote Basin, Shonai Plain, Tsugaru Plain, Kitakami Basin, Hachirogata reclaimed land, Koriyama Basin, Aizu Basin, Sanbongihara Plateau, Shinjou Basin, Noshiro Plain, Yonezawa Basin, Hamadori area, and Akita Plain.

Among the large-scale producing centers of paddy rice, a “single cropping center of paddy rice” is supplementarily

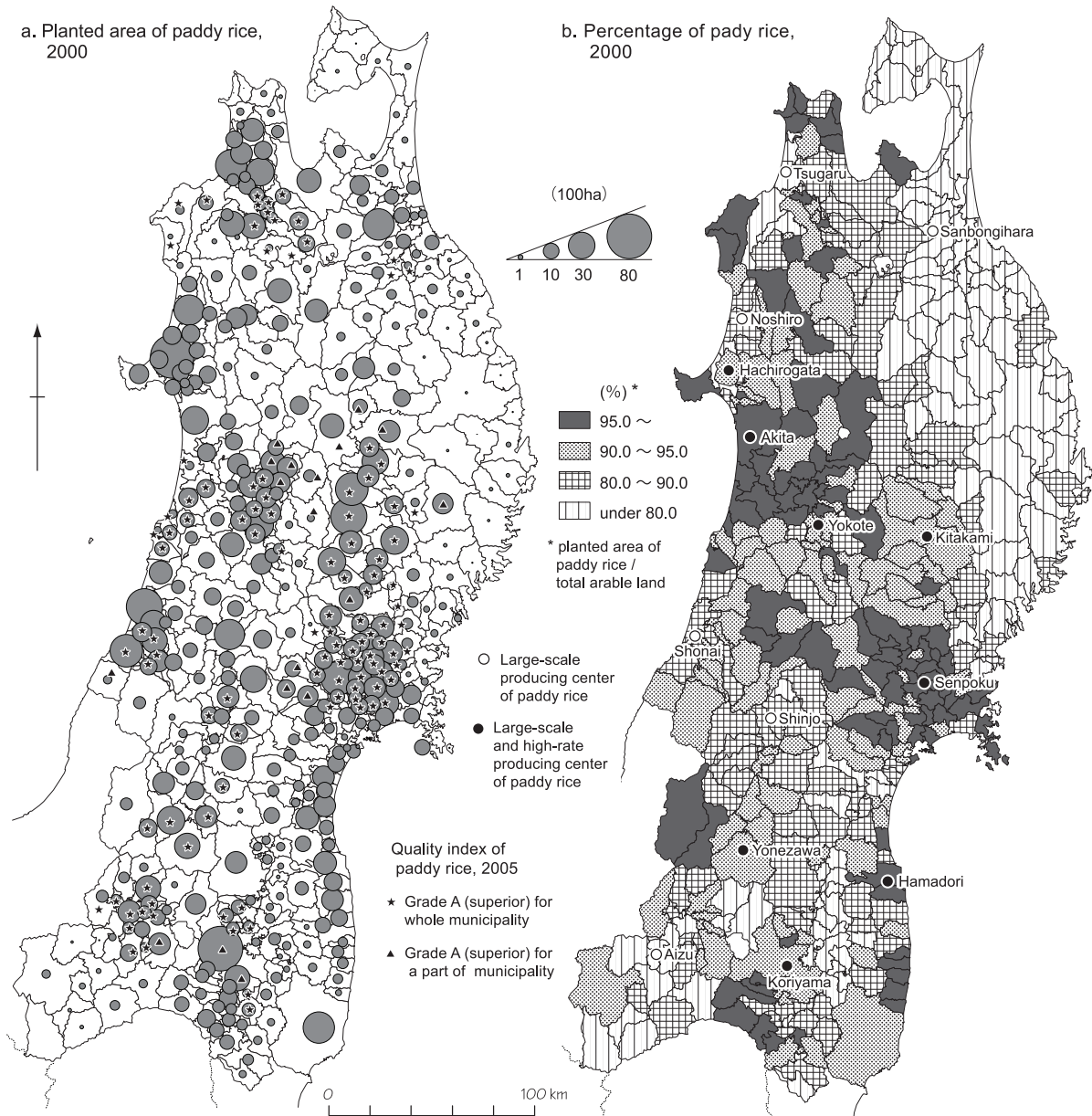


Figure 1. Paddy rice-producing centers in the Tohoku region.

Source: Census of Agriculture and Forestry and Rice Databank Co., Ltd.

defined for those municipalities in which the percentage of paddy rice among the total farmland occupies more than 90%. Eight large-scale producing centers were defined as single cropping centers: the Senpoku Plain, Yokote Basin, Kitakami Basin, Hachirogata reclaimed land, Koriyama Basin, Yonezawa Basin, Hamadori area, and Akita Plain. The differences in the percentage of paddy rice reflect regional conditions for agricultural production, such as percentage of flatlands and paddy fields among total farmland; quality of paddy rice produced; existence of cash crops other than paddy rice; history of agricultural development; subsidies from the government; and accessibility to large cities. The percentage of paddy rice tends to be high in the municipalities where farms produce quality paddy rice and the percentage of paddy

fields in total farmland is high.

Regarding the quality of paddy rice among the large-scale producing centers, according to an investigation by Rice Databank Co., Ltd., the municipalities producing grade A paddy rice (the highest grade in the Tohoku region) were distributed predominantly in the Yokote Basin, Kitakami Basin, Senpoku Plain, Shonai Plain, Yonezawa Basin, and Aizu Basin. The natural conditions required to produce high-quality paddy rice include wide variation in daily temperatures during the ripening season, abundant irrigation water and its quick circulation, and paddy soil that contains suitable minerals for the rice plant. Where all of these conditions exist, high-quality rice can be produced at the rural community level. However, the number of municipalities that can

produce grade A paddy rice is limited.

According to spatial analyses of planted areas, planted percentage, and quality of paddy rice, the Senpoku Plain in Miyagi Prefecture can be regarded as the prominent paddy rice-producing center in the Tohoku region. The paddy rice of the Senpoku Plain has been revered in the history of Japanese rice production. For instance, a large quantity of paddy rice produced in the Senpoku Plain was shipped to Edo from the Ishinomaki port in the early modern period, accounting for about 50% of rice consumption in the capital. The paddy rice produced especially in the Osaki area in the central part of the Senpoku Plain was called *Hongokumai* (“standard rice”) and was very popular due to its high quality.

Changes in Paddy Rice Varieties

With reference to the database of the National Agriculture and Food Research Organization, some 12,000 varieties of rice are maintained in Japan. Among them, no less than 8,800 are nonglutinous varieties. However, the number of varieties actually cultivated by farmers is limited. According to the “Report on the Planted Area of Nonglutinous Paddy Rice by Varieties in 2008” published by the Ministry of Agriculture and Forestry and Fisheries, only 20 varieties occupy 90% of the total planted areas of paddy rice in Japan. The top 3 varieties are *Koshihikari* (percentage of planted areas: 37.7%), *Hitomebore* (10.6%), and *Hinohikari* (10.3%); all of them are nonglutinous varieties. These 3 varieties have their main producing regions; *Koshihikari* is dominant in the Kanto, Hokuriku, and Chubu regions, *Hitomebore* in the Tohoku region, and *Hinohikari* in the Chugoku and Shikoku regions.

To elucidate the long-term change in paddy rice varieties, we examined the characteristics of the new varieties at the prefectural level. Figure 2 shows the planted areas of the top 3 varieties produced in each prefecture for about the last half century. In the past, numerous varieties of paddy rice were constantly developed and the main regional varieties were alternated one after another. As the new varieties spread after the 1990s, their 3 primary characteristics came to be as follows: (1) at the regional level, the main varieties were diversified; (2) at the prefecture level, specialization of the main varieties occurred; and (3) in general, new varieties were named simply and easily so as to be known widely by the public.

Concerning the diversification of the varieties of paddy rice, there used to be dominant varieties that recorded

the largest production area in three or more prefectures: *Sasashigure*, *Sasanishiki*, *Fujiminori*, *Toyonishiki*, and *Kiyonishiki*. However, the dominant varieties disappeared and specific varieties by prefecture emerged after the 1990s: *Tsugaru roman* of Aomori Prefecture, *Akitakomachi* of Akita Prefecture, and *Haenuki* of Yamagata Prefecture.

The producing centers of the new varieties became clearly differentiated by prefecture as marketing organizations such as regional agricultural cooperatives began to promote the marketability of paddy rice by the strategy of distinction. This trend led to the branding strategy of paddy rice. The qualities of the new varieties were also diversified by regions. For instance, *Haenuki* of Yamagata Prefecture is used commonly for the lunch boxes and rice balls sold by convenience stores since that particular variety maintains a good flavor even after being chilled.

As for the specialization of the new varieties, even though areas of paddy-rice production have decreased continuously since the 1970s, the planted percentage of the main variety of prefecture has kept rising in the Tohoku region. Formerly, several varieties were produced at the prefecture level to prevent crop failures caused by cold weather. The number of crop failures decreased because of advances in disease and insect control, the mechanization of agriculture, the implementation of land readjustment programs (*kukaku seiri jigyou*), and appropriate guidance on production techniques by regional agricultural cooperatives and municipal administrations. Consequently, the paddy rice farmers in the Tohoku region became specialized in the major variety that has the highest marketability.

Popularization is enhanced by the naming of new varieties. The former varieties that were developed in the 1950s and 1960s reflected the code of regional agricultural experiment stations and the order of development, e.g., *Fujisaka No. 5* and *Ouu No. 132*. The main varieties of the 1970s and 1980s were named after the parental varieties, e.g., *Sasanishiki* (the parental variety of which is *Sasashigure*), *Kiyonishiki* (*Yamasenishiki*), and *Toyonishiki* (*Sasanishiki*). After the 1990s, the names of the main varieties became simpler so they could be remembered by consumers who did not have special knowledge in paddy rice production. The varieties reflected place names, historical facts, and aspects of daily life, e.g., *Akitakomachi* (“Akita beauty”), *Hitomebore* (“fall in love at first sight”), *Tsugaru roman* (“Aomori romance”), and *Haenuki* (“born and bred in the place”).

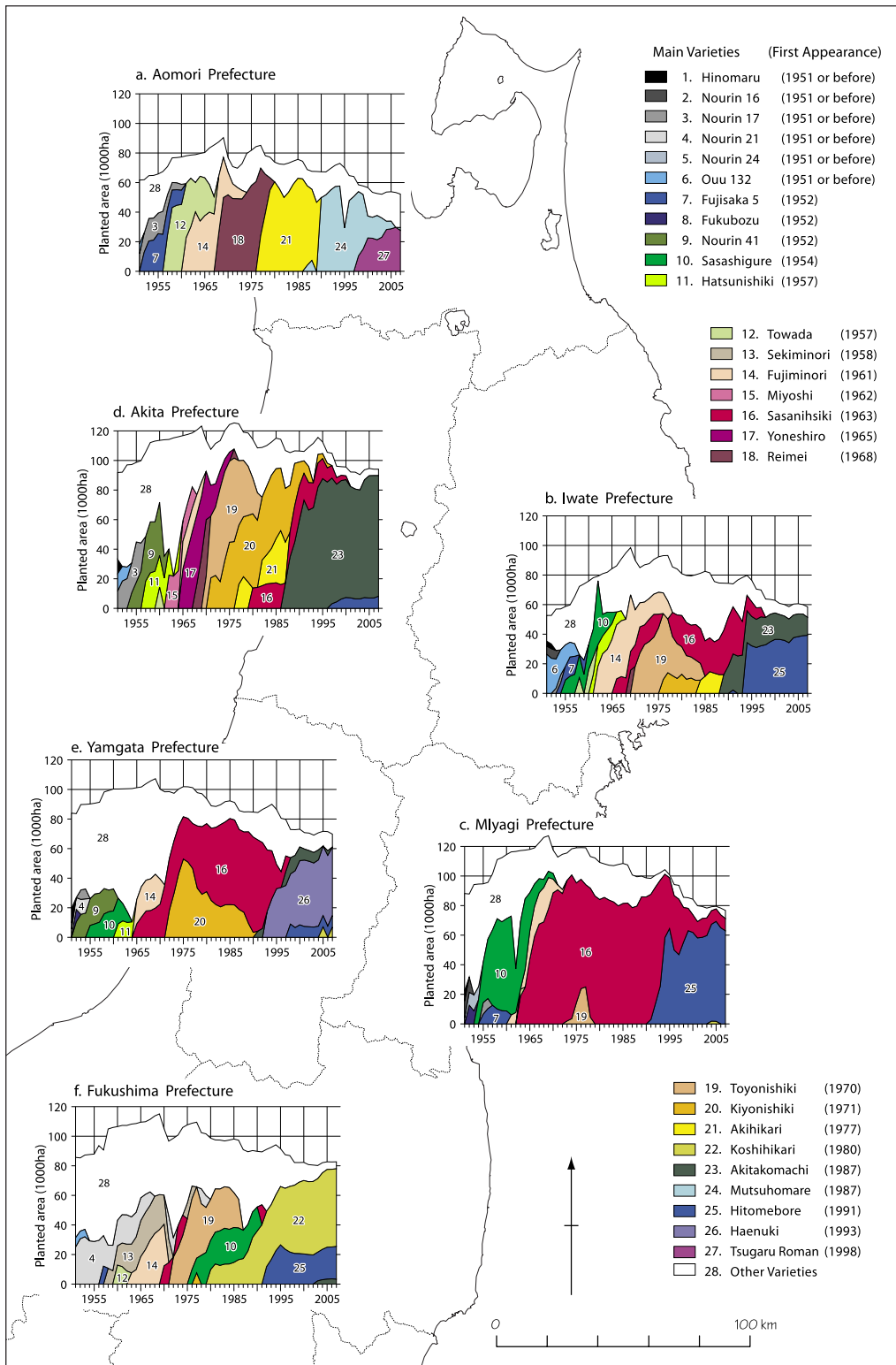


Figure 2. Changes in the main varieties of paddy rice in the Tohoku region, 1951–2007.

Source: Shokuryo Toukei Nenpou (Statistical Yearbook of Food).

Recent Extension of Brand-name Varieties of Paddy Rice

The former varieties of paddy rice that were produced extensively in Japan before the 1980s had specific characteristics in terms of productivity (Tabayashi 1984);

they were developed in accordance with regional natural environments such as climate, geomorphology, and soil conditions. For instance, on the Pacific coast in the central to northern Tohoku region, where paddy rice production was often damaged by *Yamase* (cold northeasterly wind), farmers mainly produced *Sasanishiki* until the 1980s

since that variety had considerable resistance to the cold wind, being able to maintain good yields and fine quality (Tabayashi 1983).

Recently, however, the varieties of paddy rice that have excellent quality in flavor and stickiness have been gaining market value. Corresponding with recent economic conditions, *chiiki brand-mai* (“regional brand-name rice”) rose in popularity. For instance, *Uonuma Koshihikari* produced in Niigata Prefecture is one of the

most famous regional brand-name rice varieties and its average price is the highest in Japan (Morozumi et al. 2009). Some regional brand names of rice are registered by the Trademark Law, such as *Hojo-mai* of Tsukuba City (Nihei 2009). It is said that the primary factor that influences the quality of paddy rice is the variety, followed by the other factors such as the year of production, the season of harvest, soil conditions, and cultivation methods, including the amount of nitrogen and the

Table 1. Regional brand-name varieties of paddy rice in Miyagi Prefecture, 2007

No.	Name	Regional Number (Line Names)	First Year of Breeding	Registered Year ^{a)}	Breeding Institute		Planted Percentage ^{b)}
					Name	Location	
1	Hitomebore	Tohoku 143	1982	1992	Miyagi Prefectural Furukawa Agricultural Experiment Station	Miyagi	82.1
2	Sasanishiki	Tohoku 78	1960 ^{c)}	1963	Furukawa Branch, Miyagi Prefecture Agricultural Experiment Station ^{e)}	Miyagi	10.7
3	Manamusume	Tohoku 152	1988	2000	Miyagi Prefectural Furukawa Agricultural Experiment Station	Miyagi	4.1
4	Koshihikari	Etsunan 17	1953 ^{c)}	1956	Fukui Agricultural Experiment Station	Fukui	1.9
5	Takitata	Tohoku 172	1992	2004	Miyagi Prefectural Furukawa Agricultural Experiment Station	Miyagi	0.2
6	Toyonishiki	Ouu 269	1966 ^{c)}	1969	National Agricultural Research Center for Tohoku Region	Akita	Under 0.2
7	Akitakomachi	Akita 31	1975	1984	Akita Agricultural Experiment Station	Akita	Under 0.2
8	Kinuhikari	Hokuriku 122	1975	1989	Hokuriku National Agricultural Experiment Station ^{f)}	Niigata	Under 0.2
9	Yamauta	Fukei 143	1979	1992	Fujisaka Branch, Aomori Agricultural Experiment Station	Aomori	Under 0.2
10	Haginokaori	Tohoku 144	1981	1992	Miyagi Prefectural Furukawa Agricultural Experiment Station	Miyagi	Under 0.2
11	Kokoromachi	Tohoku 141	1982	1995	Miyagi Prefectural Furukawa Agricultural Experiment Station	Miyagi	Under 0.2
12	Okiniiri	Ouu 346	1984	2000	National Agricultural Research Center for Tohoku Region	Akita	Under 0.2
13	Milky Queen	Kanto 168	1985	1998	National Agriculture Research Center ^{g)}	Ibaraki	Under 0.2
14	Yumemusubi	Tohoku 150	1985	2000	Miyagi Prefectural Furukawa Agricultural Experiment Station	Miyagi	Under 0.2
15	Yumegogochi	—	1986	1992	Plantech Research Institute	Kanagawa	Under 0.2
16	Hanakirari	—	1988	2000	Saitama Branch, Plantech Research Institute	Saitama	Under 0.2
17	Koimusubi	Tohoku 160	1989	2002	Miyagi Prefectural Furukawa Agricultural Experiment Station	Miyagai	Under 0.2
18	Shunyou	Hokuriku 183	1991	2004	Hokuriku Research Center, National Agricultural Research Center	Niigata	Under 0.2
19	Kaguyahime	—	1993 ^{d)}	1999	Onodera, S. ^{h)}	Miyagi	Under 0.2

^{a)} Registered by “Plant Variety Protection and Seed Act,” or “Ministry of Agriculture, Forestry and Fisheries.”

^{b)} Percentage of planted area among total paddy rice production.

^{c)} First year of distribution.

^{d)} Year of discovery.

^{e)} Presently “Miyagi Prefectural Furukawa Agricultural Experiment Station.”

^{f)} Presently “Hokuriku Research Center, National Agricultural Research Center.”

^{g)} Presently “National Agriculture and Food Research Organization.”

^{h)} Paddy rice-growing farmer.

Sources: Agricultural Production Bureau, Ministry of Agriculture, Forestry and Fisheries; Tohoku Regional Agricultural Administration Office; and National Institute of Crop Science.

control of insect pests.

Establishing regional brand-name rice is the marketing strategy of prefectures. From 2000 onward, *sanchi hinsyu meigara* (“regional brand-name varieties”) have been designated by the regional organizations of food supply such as prefectural offices, farmers’ organizations, agricultural cooperatives, and food agency offices. In the market, regional brand-name varieties are sold with the advertising logos of the variety and place names, e.g., *Hitomebore* of Miyagi, *Akitakomachi* of Akita, and *Haenuki* of Yamagata Prefectures. Regional brand-name varieties are chosen from the recommended varieties of rice that are selected by the prefecture. Therefore, in most cases, the regional brand-name varieties are already widely produced under the guidance of the local agricultural extension centers and agricultural cooperatives. Regional brand-name varieties are approved and amended by notification of the Ministry of Agriculture and Forestry every year. The ones that are not approved as regional brand-name varieties are designated *zatsu meigara* (“out-of-brand”) and are sold at lower prices.

Table 1 shows the regional brand-name varieties produced in Miyagi Prefecture in 2007. Every year after 2004, 19–21 varieties of nonglutinous paddy rice were registered as regional brand-name varieties by the prefecture. Concerning the planted percentage of the varieties, *Hitomebore* accounted for 82.1% of the total paddy rice produced in Miyagi Prefecture. It is the most important variety in the marketing strategy of the prefecture. The varieties bred by the Miyagi Prefectural Furukawa Agricultural Experiment Station are included in the list of the brand-name varieties, such as *Sasanishiki* and *Manamusume*. Other than the main varieties, those bred by the prefectural or national experiment stations near Miyagi Prefecture, and by the administrative corporations in the Kanto region, were also selected.

There are some regional brand-name varieties whose regional numbers are omitted. Some of them were bred by the research divisions of business enterprises that can make use of the latest biotechnologies, e.g., protoplast culture and methylnitrosourea treatment. One of them was discovered and registered by a private farm. In this way, after the legal deregulation of the distribution and production of paddy rice in the mid 1990s, new varieties bred in distant places or discovered by individual farms were adopted as regional brand-name varieties, although the percentage of planted areas has been negligible until recently. Furthermore, the planted areas of the brand-name varieties of rice that are produced by reducing the application of pesticides and chemical fertilizers recently



Figure 3. Paddy field of environmental preservation rice in the Osaki area in the Senpoku Plain.

A red banner shows the rice cultivated by reducing pesticide and chemical fertilizers.

Taken by the author, October 2008.

increased in Miyagi Prefecture (Figure 3).

Regional Mechanism of Adopting of New Varieties

Figure 4 illustrates the mechanism of the diffusion process of the new varieties of paddy rice through various cases, especially of Miyagi Prefecture. The process was simple until the 1980s because distribution of new varieties was regulated by the Food Control Law. Breeding of new varieties was mainly engaged by prefectural and national agricultural experiment stations in the Tohoku region. A new variety would be planted experimentally in sample paddy fields, and if it produced excellent results in terms of yield and quality, regional organizations designated it as one of the recommended varieties. Then the new variety would be dispersed to regional paddy rice-growing farms under guidance from the regional agricultural cooperatives and agricultural experiment centers.

The diffusion process of the new varieties of paddy rice became diversified after the enforcement of the Act on Stabilization of Supply and Demand and Prices of Staple Food in the mid 1990s (Figure 4). In addition to the prefectural and national experiment stations in the region, research institutions and agribusiness firms located in distant places participated in the breeding sectors of paddy rice. Successful new varieties that were discovered, bred, and registered by individual farms were also taken into the diffusion. Some of the new varieties developed in distant places and discovered by individual farms were designated as recommended varieties of rice by

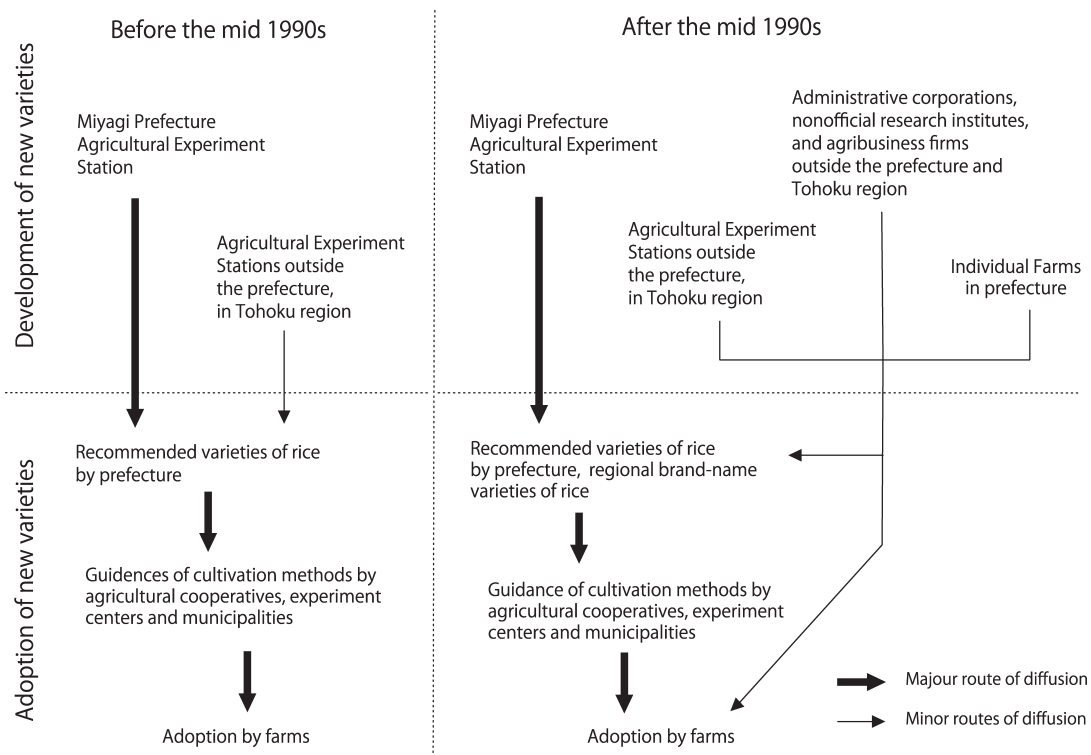


Figure 4. Changes in the diffusion process of new varieties of paddy rice in Miyagi Prefecture.

the prefecture; they could become regional brand-name varieties after approval by the government. Subsequently, paddy rice-growing farms became able to adopt new varieties of paddy rice more freely than before.

The routes of the spread of the new varieties diversified institutionally after the deregulation, though there were no significant changes in the principal route from breeding to adoption. For instance, the main organizations that breed prolific new varieties were still the agricultural experiment centers located near or within the producing centers of paddy rice.

Figure 5 shows the Miyagi Prefecture Agricultural Experiment Station located at the center of the Osaki area (Osaki City) in the Senpoku Plain. This research and educational institution has bred the main varieties of Miyagi Prefecture, including *Sasanishiki*, which were formerly cultivated extensively in Tohoku region. The experiment station also bred the *Hitomebore* that is presently the main variety in Miyagi and Iwate Prefectures. Besides these 2 famed varieties, the experiment station in its half-century history of rice breeding also developed well-known varieties such as *Manamusume*, *Takitata*, *Yumemusubi*, and *Kokoromachi*. Regional experiment stations play a significant role in breeding new varieties of paddy rice because they accumulate experience in techniques and knowledge for regional agricultural production.

As an example case of the adoption of a new variety



Figure 5. Miyagi Prefecture Agricultural Experiment Station.

Taken by the author, October 2008.

of paddy rice at the rural community level, Farm A is considered here, which cultivates paddy fields in the Osaki area of the Senpoku Plain. The farm is a typical paddy rice-growing farm in the region in terms of its area of farmland and number of agricultural family laborers.

Farm A cultivates 5 ha of farmland in total. It owns 3 ha, of which 1 ha is planted to paddy rice and 2 ha to soybeans. In the Osaki area, soybean became the recommended alternative crop for paddy rice by the Policy of Reducing Rice Acreage, and its planted area increased after the mid 1990s. Besides the owned land,



Figure 6. Buildings of Furukawa agricultural cooperative in the Osaki area in the Senpoku Plain.

The largest building at the right end is the seed supply center for paddy rice.

Taken by the author, October 2008.



Figure 7. Harvesting of paddy rice by an elderly family farmer in the Osaki area in the Senpoku Plain.

Taken by the author, October 2008.

the farm cultivates 2 ha of paddy rice in fields rented from a neighboring farm whose owner quit paddy rice farming due to aging.

Farm A produces only *Hitomebore*, whose seed was bought from the regional agricultural cooperative (Figure 6). The farm converted its main variety from *Sasanishiki* to *Hitomebore* around 1995, following guidance from the regional agricultural cooperative. The householder of the farm intends to keep cultivating *Hitomebore* since the agricultural cooperative has put emphasis on the production and sales of this variety.

In the crop year of 2008, the farm planted paddy rice in mid-May and harvested it in early October (Figure 7). This cropping calendar was about a week delayed compared to a normal crop year because it was cold during the planting season. To determine the best times to plant and harvest, the farm follows the guidance of the regional agricultural cooperative. The householder of the farm mentioned that the later the harvest, the higher the quality would be and thus could be sold as the highest rank in the year. The farm sells all of its paddy rice to the regional agricultural cooperative, except for domestic consumption and presents for relatives.

The family labor of Farm A is a couple in their mid-60s. They do not employ outside agricultural labor. The younger generation of the family work off the farm and seldom help in paddy rice production, since they are busy even in the holidays. However, today even aging farmers can cultivate around 5 ha of paddy fields with the use of agricultural implements such as rice-planting machines, tractors, and combines. To support the mechanization of regional agriculture, the government has implemented land readjustment programs for effective use of combine

harvesters. The program was completed in the late 1990s in the rural community where the farm is located. Nevertheless, the householder of the farm has said that he has no confidence in being able to continue paddy rice production for the next decade.

Spread of New Varieties of Paddy Rice and Commodification of Rural Space

Paddy rice is regarded as the staple food of the Japanese people because it supplied inexpensive food in bulk. The commodification of paddy rice production was initiated by the Act on Stabilization of Supply, Demand and Prices of Staple Foods, which was promulgated in 1994. Before that, the main purpose of paddy rice production was to supply provisions for the nation. However, the value of paddy rice production shifted to its production as a cash crop after the government deregulated rice production and distribution. These 2 actions commodified the production of paddy rice rural space, especially in large-scale paddy rice-producing centers in the Tohoku region.

From the cases examined in the spread and adoption of the new varieties of paddy rice, the characteristics of the commodification accomplished in recent years can be summarized as follows: (1) development of new varieties by diverse organizations, including agribusiness firms; (2) creation of high-value-added varieties by designating regional brand-name varieties; and (3) simultaneous adoptions of new varieties and the enlargement of paddy areas at the farm level. These processes were supported by the strategies of distribution and selling by regional agricultural cooperatives and prefectural governments,

and also by the adoption of innovative technologies such as mechanization and biotechnology in agriculture. In recent years, the former main varieties have begun to be cultivated as environmental preservation rice.

In these processes of the commodification of paddy rice production, certain production and distribution issues remain that the regional structure of agriculture must cope with. Regional agricultural experiment stations still exert quite a large influence on the development of new rice varieties. The number of new varieties developed by outside organizations such as Independent Administrative Institutions and agribusiness firms has increased recently. Also, new varieties discovered by individual farms have been registered as regional brand-name varieties. However, the proportions of land planted with these new varieties are minute, and it is necessary to develop new systems to supply the various new varieties in sufficient quantity and quality. This can be accomplished through cooperation with the firms that can produce new varieties by means of the latest biotechnology, even if they are small-scale and located at considerable distance.

Regarding the creation of regional brand-name varieties, a registration system was established and is controlled by large organizations such as agricultural cooperatives and agricultural divisions of national and prefectural administrations. At present, the participation of small organizations such as individual farms and retail stores in the distribution sectors for the brand-name varieties is required. This is the peculiar situation of paddy rice production as compared to expensive horticultural crops such as organic vegetables and fruits. The quality and taste of paddy rice also differ depending on regional conditions such as paddy field soils, water, climate, and farmers' cultivation skills. It is necessary to improve the regional agricultural system by emphasizing higher-quality rice and diversified varieties, and also to apply new marketing strategies by making full use of the names of places and farms.

Concerning farm management changes at the rural community level, the adoption of new varieties of paddy rice has been achieved by accepting guidance from regional agricultural cooperatives. Increasing the planted areas of paddy rice at the farm level has been achieved by the mechanization of agriculture and by utilizing tenant farmland. It still remains necessary to cope with the aging of farmers. For instance, in rural communities heavily involved in paddy rice production, the typical agricultural laborer is more than 60 years old.

Regarding the enlargement of areas planted with paddy rice, the number of middle-scale tenant farms

that cultivate around 5 ha is expected to increase in the near term, as compared with the number of the large-scale tenant farms with more than 15 ha. In order to keep producing paddy rice of high quality, large-scale producing centers in the Tohoku region have to take actions in order to mobilize farmland and agricultural labor, e.g., initiate policies to promote the effective use of idle farmlands and to introduce a system of increasing the availability of agricultural labor.

Concluding Remarks

After the promulgation of the Act on Stabilization of Supply, Demand and Prices of Staple Food in 1994, paddy rice production in Japan changed dramatically in response to government deregulation. Paddy rice became one of the main cash crops as well as being a primary food-supplying crop. The process of commodifying paddy rice was accompanied by changes in the main varieties of nonglutinous paddy rice. This study examined the mechanism of commodification of regional paddy rice production by focusing on the development and adoption of new rice varieties in the Tohoku region.

The Tohoku region is one of the main paddy rice-producing centers in Japan, accounting for about 30% of the total paddy rice produced in Japan. The middle part of the region, including the Senpoku Plain and the Kitakami and Yokote Basins, is known for its large planted areas of paddy rice and high percentage of paddy fields among its total farmland. The region is also known for its high-quality rice.

The features of the spatial distribution of the new varieties of paddy rice in the Tohoku region after the mid-1990s are recapitulated as follows. (1) At the region level, varieties of paddy rice diversified and regional differentiation appeared. (2) At the prefectural level, planted area of paddy rice decreased and the percentage of the main variety increased. (3) Throughout the region and prefecture levels, the naming of the new varieties of paddy rice was simplified and generalized.

In recent years, the consumers in Japan prefer delicious rice all the more. To correspond with the demands of the current market, production centers of paddy rice began to sell value-added paddy rice by the name of "regional brand-name varieties" from 2000. The brand-name varieties are selected by prefectural offices, farmers' organizations, agricultural cooperatives, and food agency offices, and are registered officially by the Ministry of Agriculture, Forestry and Fisheries. The brand-name varieties had been developed mainly by agricultural

experiment centers located in or near the producing centers. Nevertheless, the new varieties which were developed by research centers and private companies located outside the region and those discovered by individual farms have also been registered as brand-name varieties in recent years. Moreover, the area of brand-name varieties cultivated as environmental preservation rice has also been increasing recently.

In the process of development and distribution of the new varieties of paddy rice, some conditions are considered as the commodification of paddy rice production. (A) New varieties of paddy rice with good taste and flavor were constantly bred and spread corresponding with recent market demands. (B) Some of the new varieties were added more values by being designated as regional brand-name varieties. (C) Main varieties were introduced by individual farms simultaneously according to the marketing strategies of prefectural and municipal administrations and agricultural cooperatives. The reasons why the new varieties did not diversify at farm management level can be ascribed not only to the marketing strategies by the regional organizations but also to the aging of farmers.

As proposals for the future, it is necessary that the producing centers cooperate with the small and medium size enterprises that have exclusive technology to produce new varieties. The agricultural subsidies to cope with the aging of farmers and increased idle farmland will also be needed. Many individual farms and small companies such as rice retailers should participate in the distribution sectors. The organizations that participated in breeding paddy rice in recent years tend to regard the pursuit of marketability as the main goal of developing of new varieties; however, it is necessary to reevaluate the previous guideline which intended to develop strong and prolific varieties adapted to the regional natural environment.

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