



The Erosion of Japan's Traditional Seed Sector Through Misguided Policy

An analysis and impact assessment of Japanese seed policies

INYAKU Tomoya



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Foreword by APBREBES

For many years, the Association for Plant Breeding for the Benefit of Society (APBREBES) has worked to challenge the dominant assumption that ever-stronger plant variety protection automatically benefits agriculture. We have consistently argued that seed laws must do more than protect breeders' interests: they must respect farmers' rights, safeguard agrobiodiversity, and contribute to truly sustainable food systems. One of the most effective ways to assess whether these goals are being met is to examine the real-world impacts of existing plant variety protection regimes on national seed systems.

Japan provides a particularly revealing — and troubling — example. At the international level, Japan is one of the strongest proponents of a rigid plant variety protection model. In international negotiations, it has repeatedly taken an uncompromising position in favor of expanding breeders' rights while resisting any meaningful recognition of farmers' rights.

This stance has been evident across multiple policy arenas. Within the International Union for the Protection of New Varieties of Plants (UPOV), when proposals were discussed to interpret “private and non-commercial use” in a way that would allow smallholder farmers, even to a limited extent, to reproduce, exchange, or sell protected seeds, Japan made it clear from the outset that it would not tolerate any perceived weakening of breeders' rights. Similarly, during negotiations under the Food and Agriculture Organization of the United Nations (FAO) International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), Japan consistently opposed policy work on farmers' rights whenever such discussions might constrain breeders' interests. Beyond these forums, Japan has played a leading role in the East Asia Plant Variety Protection Forum, which actively promotes accession to UPOV among countries in the region, often without adequate consideration of national contexts or farmers' realities.

This international pressure is not an abstract policy position; it mirrors Japan's own national seed laws. No other country has gone as far in

reinforcing breeders' rights while simultaneously eroding farmers' rights — particularly the rights to save, exchange, and sell seed. The Japanese case demonstrates what happens when plant variety protection is pursued as an end in itself, rather than as a tool to serve broader public interests.

It is precisely for this reason that we believe the international community must closely examine the consequences of such a model. Together with the OK Seed Project, we have therefore decided to make this study available in English. The report builds on research¹ originally published by Tomoya Inyaku two years ago and has been revised and updated to reach a wider international audience.

The findings fundamentally challenge the narrative promoted by proponents of the 1991 UPOV Convention (UPOV 1991). Japan's experience shows that extremely strict plant variety protection along the lines of UPOV 1991 does not necessarily stimulate innovation, increase the number of new varieties, or strengthen the seed sector. On the contrary, Japan has witnessed one of the steepest declines in newly protected plant varieties over the past two decades, alongside the closure of numerous breeding companies. This report documents these developments in detail and demonstrates that the vitality of a seed system depends on a complex interaction of social, economic, and policy factors — not on legal protection alone.

This case study should serve as a clear warning to policymakers who are being told that adopting UPOV 1991 is a shortcut to innovation and agricultural development. Japan's experience suggests that such expectations may not only be unrealistic, but also harmful. If seed laws are to genuinely support national agriculture and strengthen both farmer-managed and formal seed systems, they must be grounded in national realities and shaped through the meaningful participation of all stakeholders, especially farmers. Blindly replicating UPOV 1991, without critical assessment or adaptation, risks undermining the very goals it claims to advance.

Summary

This report, *The Erosion of Japan's Traditional Seed Sector Through Misguided Policy*, provides an analysis and impact assessment of Japanese seed policies since the mid-20th century. It argues that Japan's increasing reliance on strict intellectual property regimes — combined with the weakening of public seed institutions and the promotion of biotechnology-driven breeding — has undermined traditional seed systems, farmers' rights, and long-term seed sovereignty.

SEED SECTORS AND STRUCTURAL CHANGE

The Japanese seed system consists of four sectors: the traditional seed sector, the local seed company sector, the public seed sector, and the chemical/biotechnological and multinational seed sector. Historically, the first three sectors played a central role in maintaining agrobiodiversity, locally adapted varieties, and breeding knowledge. However, post-war agricultural modernization and recent policy reforms have disproportionately strengthened the chem/biotech sector, while marginalizing farmer-led and public seed systems.

UPOV, THE PVP ACT AND THE STRENGTHENING OF BREEDERS' RIGHTS

Japan's seed policy is strongly shaped by international agreements, especially the International Convention for the Protection of New Varieties of Plants (UPOV Convention). Japan ratified the 1991 Act of the Convention (UPOV 1991) in 1998 through the Plant Variety Protection and Seed Act (PVP Act) and subsequently strengthened breeders' rights even beyond UPOV requirements. The 2020 revision of the PVP Act introduced a full propagation licensing system for protected varieties, prohibited farm-saved seed without breeders' permission, enabled territorial restrictions on seed use, and strengthened enforcement mechanisms.

Unlike with most member states of the 1991 UPOV Convention, the current Japanese PVP Act does not provide for a "farmer's privilege" as defined in Article 15.2 of UPOV 1991. As a result, Japan is widely regarded as having the strictest plant variety protection regime in the world. The Japanese government plans to introduce another far-reaching tightening of seed

legislation in 2026. Particularly concerning are the drastic extension of protection periods, new surveillance and enforcement mechanisms, and the privatization of public breeding infrastructure, all of which threaten traditional breeding practices and regional seed diversity.

DECLINE IN PLANT VARIETY PROTECTION ACTIVITY

The report reveals a major contradiction in Japan's intellectual property strategy. Despite its exceptionally strict PVP regime, the number of new grants of plant variety rights has sharply declined.

The number of applications for plant breeders' rights fell from 1,406 in 2007 to 599 in 2024. The number of rights grants declined from 1,011 in 2001 to 497 in 2023, reaching a historic low. Although grants increased again in 2024, the number of applications does not indicate a structural recovery. This decline affects both domestic and foreign breeders and is particularly severe in the public seed sector and among local seed company sector breeders.

These trends contradict the assumption, promoted by the Ministry of Agriculture, Forestry and Fisheries (MAFF), that stronger intellectual property protection automatically stimulates innovation. Instead, excessive restrictions have coincided with declining breeding capacity, loss of human resources, and reduced diversity of new varieties.

ABOLITION OF THE MAIN CROP SEEDS ACT AND MARKET FAILURES

The abolition of the Main Crop Seeds Act in 2018 further weakened the public seed sector. The Act had ensured stable public responsibility for seed production of staple crops such as rice, wheat, and soybeans. Its repeal shifted responsibility toward the private sector, despite repeated evidence that private companies have failed to ensure stable, diverse, and affordable seed supply — particularly for rice.

At the same time, the number of local seed companies has declined significantly, while Japan has become increasingly dependent on overseas seed production, raising concerns about long-term food security and resilience.



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PATENTS, GENOME EDITING AND HEAVY ION BEAM RADIATION BREEDING

The second part of the report examines the growing importance of patents, genome-edited crops, and heavy ion beam radiation breeding. Unlike plant variety protection, patents do not include a breeders' exemption, meaning patented traits cannot be freely used for further breeding. This fundamentally alters breeding practices and accelerates concentration in the seed sector.

Japan allows the commercialization of genome-edited crops without prior safety assessment or labeling. Genome-edited varieties are protected simultaneously by the PVP Act and by patent law, creating particularly strong intellectual property control. Genome-editing research has been supported by public funding, yet benefits have largely accrued to private companies, while farmers and public breeders face new restrictions.

A central case study is Koshihikari Kan No. 1, a rice variety developed using heavy ion beam radiation breeding and patented for its low-cadmium-absorption trait. Several prefectures—most notably Akita—plan to replace conventional rice varieties almost entirely with varieties derived from Koshihikari Kan No. 1. This would result in a situation where a staple food crop is effectively dominated by patented traits, restricting farmers' ability to save seed and conduct independent breeding.

The report highlights scientific uncertainties, agronomic

risks, and the lack of public consultation surrounding this technological shift. It argues that the widespread, near-mandatory introduction of patented varieties violates fundamental principles of seed sovereignty and farmers' rights, as recognized in the International Treaty on Plant Genetic Resources for Food and Agriculture and the UN Declaration on the Rights of Peasants and Other People Working in Rural Areas.

FUTURE OUTLOOK AND POLICY PROPOSALS

The report concludes that Japan's current trajectory risks long-term loss of breeding capacity, agrobiodiversity, and democratic control over seeds. It calls for a rebalancing of breeders' rights and farmers' rights, renewed support for the public seed sector, greater transparency and public participation in seed policy decisions, and the establishment of regional food and seed councils.

The report argues for policies that, instead of relying on increasingly restrictive intellectual property regimes and high-risk biotechnological approaches, strengthen conventional breeding, farmer-led innovation, and collaboration between public institutions, local seed companies, and the traditional seed sector. Such a shift is presented as essential for achieving seed sovereignty, food security, and an agroecological transition in Japan.

SECTION 1

Introduction and Seed Sectors in Japan

Our world faces multiple ongoing crises — two of which, climate change and mass biological extinction, have arguably been made worse by the spread of industrial agriculture across the globe. As an ideology and a set of practices for growing food on a large scale, this type of agriculture was first introduced as a “Green Revolution”. Methods for growing within this system are generally dependent on 1) chemical fertilizers, 2) pesticides, and 3) hybridized or genetically modified seeds. The rise of industrial agriculture has also coincided with farmers losing autonomy and control over the food supply chain in many countries across the world. Impacts on land ownership, access to common land, local economies, and social relations have led to increasing awareness of the need to uphold “food sovereignty”, which is defined as “the right of nations and peoples to control their own food systems, including their own markets, production modes, food cultures and environments”.² Seed sovereignty is a subset of this idea and movement. Seed sovereignty in Japan (i.e., rights around seed selection, propagation and sales) is the focus of this report. It examines various seed-related policies passed in Japan since the mid-20th century and covers some of the impacts these policies appear to have had on traditional seed practices in Japan.

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) recognizes the enormous contribution that farmers have made and will continue to make to the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world. The United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas also recognizes peasants' rights to seeds. As this report will lay out, seed sovereignty and farmers' rights do not necessarily contradict breeders' rights. It is possible for both to simultaneously coexist and for the rights of each to be mutually respected. However, seed sovereignty cannot be ensured under a monopolistic market (i.e., when one company controls all market share, output and prices) and when the activities of local seed companies and/or farmers are restricted to the point where their rights are eroded.

This report examines the institutionalization of an industrial agricultural approach in Japan through various policies introduced since the middle of the last century. It presents:

1. An overview of international agreements and specific Acts which have impacted the seed market and traditional seed practices in Japan;
2. An assessment of various impacts these policies have had on farmers and seed diversity; and
3. Conclusions and suggested solutions for the future of the seed industry in Japan.

To begin with, the four seed sectors within the country are introduced. Following this, a history of agreements and policies related to seeds in Japan since the mid-20th century is summarized. A selection of impacts arguably caused by these policies is then presented, followed by some suggested solutions and concluding thoughts on the future of the traditional Japanese seed sector.

SEED SECTORS IN JAPAN

Seeds are defined and treated differently amongst various sectors in Japan. It is necessary therefore to consider the role and perspectives of all sectors in order to grasp the entire situation. Within this report, the Japanese seed industry is divided into four sectors: 1) the traditional, farmer-led seed sector, 2) the local seed company sector, 3) the public seed sector, and 4) the chemical/biotechnological seed sector (chem/biotech sector). A description of each is presented below.

1 Traditional Seed Sector

Farmers lead this sector and seed sales are conducted by family-owned businesses. In many cases, these businesses are directly involved in seed propagation and may also handle farmer varieties. An example of this is the Noguchi Seed Shop.³ This sector generally handles seeds based on regional and historical social networks which are usually geographically distinct. Often, seeds are not valued as mere financial commodities but are closely linked to local livelihoods and cultural values.

2 Local Seed Company Sector

Geographically, Japan has a large north-south extension and high proportion of mountainous areas which create varying micro-climates across regions. The need for seeds that are locally adapted to specific and varying climatic conditions resulted in the creation of small-scale seed companies across the country. To this day, seed breeding and crop selection choices are influenced by local food cultures.

While they may take the legal form of a “stock company” or a “limited liability company”, almost all local seed companies

are privately held and their shares are not publicly traded. They generally source and sell F1 seed varieties⁴ and focus on particular regions of Japan.

3 Public Seed Sector

Local governments (also known as prefectures) are responsible for seed breeding programs, as well as producing and maintaining varieties and germplasm for crops such as rice, wheat, and soybeans. These local government entities also provide seeds to contracted farmers for seed multiplication.

4 Chemical/Biotechnological and Multinational Seed Sector (Chem/Biotech Sector)

This sector includes branches of international firms such as Bayer, Corteva, and Syngenta. In Japan, this sector includes (but is not limited to) companies such as Sumitomo Chemical (which signed a technology partnership with Monsanto [now Bayer]), Mitsui Chemicals, Takii, Sakata, and Sanatech Seed Science (whose parent company was formerly U.S. Pioneer [now Corteva]). These companies focus on the development of genetically modified seeds, proprietary seed, and the chemical management of plants after seed growth.

INTERACTION BETWEEN SECTORS

All four sectors have been impacted by the growth of industrial agriculture — some have flourished while others, such as the traditional seed and local seed company sectors, have struggled to survive. The traditional seed, local seed company, and public seed sectors each have different roles, strengths, and weaknesses. In Japan, these sectors have contributed to maintaining agricultural biodiversity and genetic diversity in various ways. All sectors have the potential to serve ecologically sustainable agricultural production, but all can also theoretically contribute to unsustainable practices.

This report argues that a sustainable agroecological transition in Japan is possible if local governments adopt appropriate seed regulations and the public seed sector successfully collaborates with the traditional seed sector and local seed companies. As it stands today, the chem/biotech sector is not able to contribute to an agroecological transition in Japan. There is no single remedy for the current issues around seeds in Japan. It appears necessary to bring together actors from different fields to work together. In the end, this report proposes a policy plan for the creation of regional food councils to facilitate collaboration among the various sectors.



SECTION 2

Policy Analysis: the Japanese Seed Sector

GLOBAL CONTEXT: INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS (UPOV)

Domestic seed policy in Japan has been heavily influenced by external policy commitments. It is necessary to note this wider policy context before examining particular Japanese policies and national laws.

The International Union for the Protection of New Varieties of Plants (UPOV) is an international organization based in Switzerland operating independently from the United Nations. Founded by European governments with significant involvement of breeding associations to define basic principles for plant variety protection,⁵ UPOV was established in 1961 by the UPOV Convention, which was subsequently revised in 1972, 1978, and 1991. In 1990, its influence was relatively minor with only 20 member states, but membership expanded after the 1991 revision and the adoption of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) within the World Trade Organization (WTO) framework in 1994. Today, 16 states are party to the UPOV Act of 1978, and 62 states and two organizations are party to the Act of 1991.

The 1991 revision of the UPOV Convention strengthened the intellectual property rights of plant breeders. Countries that ratify UPOV 1991 are obligated to modify their national legislation to comply with the UPOV requirements. Under UPOV 1991, breeders' intellectual property rights for protected varieties are guaranteed for a minimum of 20 years and 25 years (for trees and vines). Under these rules, farmers are not allowed to sell or exchange seeds of protected varieties and propagation of these varieties (provided that the states allow exceptions to the breeders' right in the first place) is restricted.

Japan became a member of UPOV in 1982, and it was one of the first countries to ratify UPOV 1991 when it passed the Plant Variety Protection and Seed Act (PVP Act) in 1998 in order to comply with UPOV 1991.

THE UPOV REGIME IN ASIA

Since becoming a member of the UPOV regime, the Japanese government has exerted pressure on other Asian countries to ratify the 1991 Convention of UPOV. In particular, Japan is promoting a project called e-PVP Asia, which is part of UPOV's on-

line plant variety registration system (UPOV PRISMA), to simplify the registration procedure. Toward this end, Japan has lobbied other countries intensively, under the umbrella of the East Asia Plant Variety Protection Forum (EAPVP Forum). This lobbying appears to be done by Japan's Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Japan International Cooperation Agency (JICA) as well as being outsourced to the Japan Association for Techno-innovation in Agriculture, Forestry and Fisheries (JATAFF). JATAFF hosts the office of the EAPVP Forum and carries out the actual projects related to EAPVP under government subsidies, on behalf of MAFF.

In response to these efforts by the Japanese government, there have been protests in many Asian countries claiming that their farmers' rights are being threatened. When the OK Seed Project interviewed the MAFF personnel in charge of EAPVP, they had little awareness of the opposing voices. The members of JATAFF include some of Japan's leading private agribusiness companies, such as Sumitomo Chemical, Mitsui Chemicals, and Ajinomoto. Since the projects are in the hands of these private companies, it is natural to assume the projects would benefit the private sector. JATAFF also includes agricultural cooperatives as members, but it is questionable whether they actually support farmers' interests or have any influence on the protection of farmers' rights in this project. The Japanese government has thus created an international partnership to strengthen breeders' rights through JATAFF and the EAPVP Forum. This partnership is questionable because it is arguably the responsibility of MAFF to ensure that JATAFF complies with UN Conventions when it is carrying out projects, yet this does not appear to be the case.

GLOBAL EXPANSION OF THE UPOV REGIME AND RISING OPPOSITION

Within the Regional Comprehensive Economic Partnership Agreement, the Japanese government initially insisted that participating countries should have to ratify the UPOV Convention. Vietnam is often referred to as a successful case as its production of rice, maize, and sweet potato increased after joining UPOV. However, no sweet potato variety has been registered⁶ with the Plant Variety Protection Office in Vietnam.⁷

The EAPVP Forum, led by the Japanese government, has been the main promoter of UPOV in the Asian region. Currently,

Myanmar and Malaysia are moving toward UPOV membership with the support of the Japanese government. There are different national positions on the UPOV Convention in the Asian region. China has been a member of UPOV since 1999, but did not accede to the 1991 UPOV Convention. India has also distanced itself from the UPOV regime, partly as a result of powerful farmers' movements in the country. The Philippines, Thailand, Indonesia, Nepal, Pakistan, Bangladesh, Cambodia and Sri Lanka are also not parties to UPOV and some of them have developed their own *sui generis* PVP laws. Meanwhile, Japan and South Korea have been strong supporters of UPOV.

The Asian countries mentioned above are skeptical about UPOV partly because they have a strong base of farmers who grow and rely on indigenous and public plant varieties. In 2023, the UN Special Rapporteur on the Right to Food, Michael Fakhri, sent an open letter to the Indonesian government inquiring about the government's position on ratifying the UPOV Convention. The letter discussed the possible danger of UPOV threatening the right to food of Indonesian farmers. In response, the Indonesian government made it clear that it did not intend to join UPOV in order to preserve the policy space needed to protect farmers' seed systems and plant genetic resources.⁸

Even as the UPOV regime expanded internationally, farmers' rights gained attention and were emphasized in UN Conventions and declarations. These efforts culminated in the 2018 United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP). However, at the UN Working Group on UNDROP, the Japanese government expressed doubts about the concept of smallholders' rights, and it abstained from voting in support of the Declaration at the UN Human Rights Council and the UN General Assembly. States' obligations to ensure the consistency of their national laws and policies with UNDROP are grounded in the primacy to be given to human rights norms in international and national law. This is valid for all states, independently of the positions that they took when UNDROP was adopted.⁹ It is unclear whether the Japanese government's stance was simply based on a lack of understanding of the international debate on farmers' rights and on the farmers' right to seeds.

UNDROP was influenced by diverse treaties and declarations. However, the Japanese government paid little attention to the global trend of acknowledging farmers' rights. It took a very passive stance toward the UN discussion of UNDROP, abstaining from the vote on the matter, on the grounds that the concept of peasant rights is not recognized as a human right. Although the ITPGRFA clearly stipulates the rights of farmers in its preamble and Article 9, the Japanese government's focus on the treaty centres solely on the treaty's benefits for the development of new varieties, and it has become clear during questioning in the Japanese parliament (the Diet) that the government has no intention of reflecting the treaty-recognized rights of farmers in its policies.¹⁰

Nevertheless, as seen in other Asian countries and different parts of the world, there have been strong opposing forces against the UPOV regime. In recent years, more farmers' and civil society movements from different countries have formed alliances to create international solidarity movements against UPOV.¹¹

WHY DOES THE JAPANESE GOVERNMENT PROMOTE UPOV 1991?

The UPOV regime has not necessarily been favourable for Japan either. Japan's seed sector declined after joining UPOV, with some exceptions in the form of domestic seed companies that became transnational corporations. The revision of the PVP Act in 2020 restricted domestic seed sales to some extent, rather than promoting offshore sales. It is doubtful whether UPOV is really an effective treaty to support the Japanese seed market. While it has benefited a limited number of transnational seed companies, such as Takii or Sakata, UPOV has led to setbacks in other seed sectors.

Furthermore, not all Japanese seed policies after the ratification of UPOV 1991 have been UPOV-oriented. Masao Okawa, a former senior researcher at the National Institute of Agrobiological Sciences' Gene Bank, is a prominent supporter of farmers' rights and biodiversity. He published multiple papers emphasizing the importance of protecting farmers' rights and agricultural biodiversity, and supported the realization of agrobiodiversity-related policies. Based on the efforts of Okawa and others, the Japanese government ratified the ITPGRFA in October 2013. While MAFF gradually strengthened breeders' rights after the UPOV 1991 ratification in 1998, there were also people within MAFF who did not necessarily resonate with the UPOV regime and supported farmers' rights instead.

However, the situation changed when the second Abe administration (2012–2020) pushed the slogan “Make Japan the country where private companies can best thrive”. The Abe administration implemented policies to support private companies' activities in different fields. In addition, JATAFF started to draft and promote policy plans for MAFF under the Innovation Strategy (2013–) and the Bio Strategy (2019–) ordered by the Cabinet Office (see also page 36). Under such an organizational structure, we imagine it has become difficult for officers like Okawa who support farmers' rights to exert their influence.

PLANT VARIETY PROTECTION AND SEED ACT (PVP ACT)

Before Japan's ratification of UPOV 1991 and adoption of the PVP Act in 1998,¹² breeders' rights did not lead to restriction of propagation activities, even for protected varieties. Since then, as part of a gradual transition toward compliance with the UPOV 1991 requirements, MAFF has prohibited certain specified plant species (limited to those cultivated through vegetative propagation) from being reproduced by farmers. This list of restricted plant species has grown over time (see Figure 1). MAFF also formed several study groups to examine the possible impact of a licensing system for plant propagation.

It was thus no surprise when, in 2019, one such study group published a proposal to create a full licensing system for plant propagation. Despite multiple objections, this led to a revision of the PVP Act in 2020. This revision further protects the rights of breeders and prohibits the self-propagation of *all* protected varieties without the permission of the breeder. Effectively, Ja-

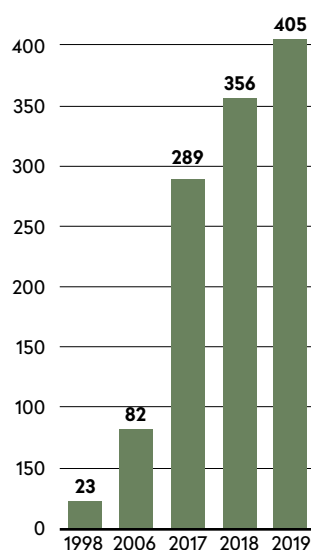


Figure 1: Number of plant species for which self-propagation is prohibited by ordinance of the Ministry of Agriculture, Forestry and Fisheries

pan went a step further than required by UPOV (as Article 15.2 of UPOV 1991 provides for an “optional exception” allowing member states to permit farmers to reproduce a limited amount of seed).

Japan's revised PVP Act is considered to impose some of the strictest PVP rules globally. The main features of the revised Act are as follows:

- Requires licensing for propagation of protected varieties (with no exceptions; see page 12 f.).
- Prohibits use of protected varieties outside designated areas (see page 13).
- Allows breeders to use traits of protected varieties as proof of rights infringement (see page 14).
- Obligates producers to label protected varieties with the “PVP” logo (see page 14).
- Improves consistency with patent law.

The 2020 amendments to the PVP Act focused on preventing the outflow of propagating material of protected varieties to other countries, rather than promoting seed sales overseas, and have therefore not contributed to Japanese seed companies' expansion into overseas markets. Meanwhile, the number of private seed companies in Japan has continued to decline during this period. Overall, the amendments do not appear to have brought about any positive results.

PRESSURE ON NEIGHBORING COUNTRIES TO REVISE PVP LAWS

The Japanese seed policy under the PVP Act amended in 2020 renders the domestic seed sector “closed” rather than “expansionistic” in relation to the international market. This does not support domestic seed companies as the domestic seed market is declining. Two factors appear to have shaped this policy direction. One is MAFF's concern that infringements of the PVP

Act may increase if Japan increased seed exports while many neighboring countries have not yet ratified UPOV 1991. The other reason is that MAFF may view seed exports as hindering the export of Japanese agricultural products.

The promotion of agricultural exports is at the heart of Japan's current agricultural policy. In the immediate post-World War II period, many countries imported agricultural products from the US as an emergency measure to overcome domestic food shortages. Many of these countries subsequently worked to reduce their food dependence during the post-war reconstruction phase. Japan however increased its dependence on the US and worked to integrate its food system with that of the US. The main crops that Japan imported from the US were soybeans, corn and wheat, which were used for animal feed and processed foods. Japan's active subordination to the US in both the food and military sectors was at the centre of its post-war national security framework.

Given the reliance on imported foods from the US, Japanese food policy paid little attention to increasing agricultural production for domestic consumption. Instead, policy measures to support domestic producers have been directed toward increasing agricultural exports. In order to promote the export of its agricultural products, Japan has restricted the export of its seeds, as this could eventually lead to foreign competition.

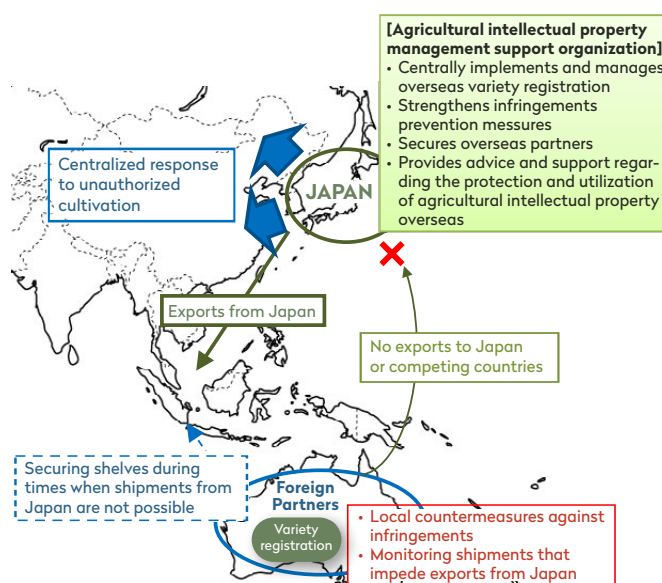


Figure 2: The role of intellectual property rights on plant varieties in international agricultural trade from Japan's perspective

Source: MAFF, Food Industry Affairs Bureau, Intellectual Property Division, www.maff.go.jp/j/kanbo/tizai/brand/kentoukai/attach/pdf/5siryou-6.pdf

Accordingly, Japan has sought to: 1) pressure neighboring countries to revise their PVP laws to bring them in line with UPOV 1991; and 2) promote seed exports based on special cultivation

contracts. These contracts would prohibit use of the seeds for production during the Japanese agricultural export season, in order to prevent competition.¹³ Japan has been setting aside budgets for the implementation of these plans since the revision of the PVP Act. It has also been conducting research on this topic since 2021 (see Figure 2).

Japanese pressure on other countries to introduce PVP laws in line with UPOV 1991 is primarily exerted through the EAPVP Forum (see page 9). Japan's "Individual Implementing Strategy" (2018–2027),¹⁴ presented at the 11th annual meeting of the Forum in 2018, highlights several of its motivations, i.e., stagnation in the number of applications for PVP in Japan, concern over the use of its varieties in foreign markets as well as loss of competitiveness in such markets. Hence, to strengthen Japan's international competitiveness in the agricultural and food industry, the implementing strategy sets out its objective to "improve the protection of PBR [plant breeders' rights] in the third [foreign] countries in order to provide breeders effective and efficient PVP system as well as to enhance Japan's innovation".¹⁵

There are several flaws in this strategy. One issue is that the Japanese government has no legal authority to intervene directly when the breeders' rights of Japanese seed companies are violated in foreign countries. To address this challenge, MAFF is conducting research on potential partnerships with private organizations to establish an international network for monitoring violations of Japanese breeders' rights overseas. However, depending on the scope and nature of such activities, questions

could arise regarding their compatibility with the legal frameworks and sovereign authority of the countries concerned.

Another plan, as mentioned above, is to draw up agreements with producers in other countries to allow the production of crops only when it does not compete with the timing of Japanese agricultural exports. MAFF's strategy¹⁶ is to allow the production of crops only during times when these crops cannot be shipped from Japan, and also to restrict exports from those countries so that Japan's share in third-country markets is secured. This plan may work under contract farming arrangements, but it is not feasible in the open market.

All these measures — promotion of the UPOV regime, creation of an international monitoring system, and the enforcement of contract farming — would have a major impact on farmers' rights and agricultural policies in other countries.

PROPAGATION LICENSING SYSTEM FOR PROTECTED VARIETIES

Restrictions on the propagation, exchange and sale of protected seeds exist in many other countries, but arguably nowhere to the same extent as in Japan. Here, the propagation of protected seeds by a farmer without the breeder's permission is considered an infringement of breeders' rights in all cases.

However, this is a very one-sided view of intellectual property rights. A balanced view seeks to establish "fair use" of intel-



lectual property rights. For instance, reading a book from a library without purchasing is considered fair use. In the case of seeds, they have a historical/cultural aspect to their use and propagation as they have been developed over decades by countless farmers. Therefore, farmers have rights to seeds. It also cannot be forgotten that the business of breeders is dependent on farmers. Hence, it is crucial to secure farmers' rights and profits. The breeders' rights and the farmers' rights are two wheels on a single cart that need to be balanced.

The 1991 UPOV Convention allows exceptions to the breeder's right in order to ensure what UPOV calls the "farmer's privilege" (Article 15.2). Most UPOV 1991 countries have introduced exceptions to allow for the farmer's privilege. For example, in the European Union (which has a highly regulated seed sector), small farmers¹⁷ are exempt from paying licensing fees for saving seeds/propagating material for propagating on their own holdings, forage crops, cereals, potatoes, oilseeds, and fiber crops. In the United States, the Plant Variety Protection Act has a specific section on the right to save seed (Section 113). In Australia, farm-saved seed is permitted for all crops.¹⁸ In Japan, however, there is no such exception for propagation in the revised PVP Act (Table 1).

Country/ region	Exceptions to the breeder's right (UPOV 1991, Article 15) for farm-saved seed for the following crops:
EU	Fodder crops, cereals, potatoes, oil and fiber plants
Switzerland	Fodder crops, cereals, potatoes, oil and fiber plants
United Kingdom	Fodder crops, cereals, potatoes, oil and fiber plants
United States of America	Sexually reproduced plants (by seed) and some tuber-propagated plants
Japan	No exceptions
Australia	All crops

Table 1: Exception granted for propagation of protected seeds in several countries

USAGE OF PROTECTED VARIETIES OUTSIDE DESIGNATED AREAS

Japan's revised PVP Act allows breeders to designate areas where the use of their seed is prohibited. This is one of the preventative measures to control offshore cultivation of Japan's protected varieties. MAFF had explained the rationale for revising the PVP Act as follows: "Under the current PVP Act, Japanese crops may end up abroad, which may affect Japan's export opportunities and the continuous supply of high-quality crop varieties." Based

on this logic,¹⁹ the revised PVP Act aimed to prevent the outflow of plant varieties to foreign countries and to strengthen breeders' rights.

Before the PVP Act was revised, several media reports about high-quality Japanese plant varieties being "stolen" by foreign countries appeared. They argued that these activities were leading to a loss of Japanese market share for those seeds in those countries. One example was the Shine Muscat grape variety bred by Japan's National Agricultural Research Organization (NARO) in 2006. It was very popular as it was seedless, had edible skin, and grew relatively easily. According to the Japanese media, Shine Muscat was being grown by farmers in China and exported to other countries without permission. The media reported that this caused severe damage to Japanese agricultural exports and that it was necessary to restrict crop propagation to stop the damage. However, to regulate the cultivation of a crop variety in China, it would be necessary to protect and register the variety in China, which, in the case of fruit trees (including grapes), had to be done within six years of the domestic registration. NARO had not obtained plant breeders' rights for that variety in China by the deadline of 2012. Therefore, the cultivation of Shine Muscat in China was not illegal. This type of situation was addressed within the revised PVP Act.

The amended Act included a new provision that allowed breeders to place restrictions on the areas to which a variety could be exported or in which it could be cultivated. In other words, breeders could specify the areas in which their varieties are meant to be grown. If a breeder restricts the offshore use of a particular variety, then that variety will only be available within Japan. If they restrict cultivation outside a particular prefecture (e.g., Tokyo Prefecture), the seed can only be legally grown within the prefecture.

This feature of the PVP Act also allows local governments to restrict the use of varieties that were developed with local budgetary resources. Although it may be rational for a local government to limit the use of varieties developed with its budget to farmers in that locality, since the presumed purpose of the local government's investment is to promote agriculture in that area, territorial prohibitions on new varieties contradict the basic idea of plant variety protection, which is to make new varieties available to society in general and to farmers in particular.

Nevertheless, the restriction of seed exports was successfully realized under the revised PVP Act. Currently, Japan is collaborating with other countries' governments and private organizations to establish an international network to secure breeders' rights and intellectual property rights for the international market. This would allow more seeds to be exported in the next amendment stage of the PVP Act. However, as it stands now, the current PVP Act as revised in 2020 has, in practice, led to restrictions on the exports of some seeds by their breeders.

SIMPLIFIED PROCEDURES FOR PROVING INFRINGEMENTS OF RIGHTS

Previously in cases of suspected infringement of a breeder's right, the right holder was required to conduct side-by-side cul-

tivation tests, growing both the suspected crop and the protected variety under identical conditions to prove their equivalence. However, because plant characteristics fluctuate depending on environmental factors, establishing absolute identity was extremely difficult.

Following the 2020 amendment to the PVP Act, right holders are now permitted to utilize the “Characteristics Table”, compiled during the initial variety registration, as the evidentiary standard for determining identity, which effectively replaces the need for cultivation comparisons.

Prior to the amendment, the burden of proof rested entirely on the breeder to definitively demonstrate that the suspected variety was identical to their protected variety. The amended law now introduces a presumption clause: if the right holder can demonstrate that all critical characteristics listed in the Characteristics Table match, the varieties are legally presumed to be identical. Consequently, the substantive burden of proof shifts to the defendant. Unless the defendant can affirmatively prove that their crop is a distinct variety developed through independent cross-breeding, they will be held liable for violating the Act.

Furthermore, the amended Act enables the court to commission the Minister of Agriculture, Forestry and Fisheries to conduct expert appraisals of plant characteristics. In response, the Ministry utilizes objective data, such as comparisons against the Characteristics Table and DNA marker analysis. This approach significantly reduces or entirely bypasses the need for the traditional, time-consuming cultivation tests, allowing the Ministry to promptly provide an expert opinion as to whether infringement occurred.

A comparable appraisal mechanism is also applicable outside of judicial proceedings. Right holders can obtain an official “test report” for a fee through the National Center for Seeds and Seedlings (NCSS). This report serves as compelling objective evidence, enabling right holders to urge suspected violators to cease sales or to negotiate pre-trial settlements before formal litigation is initiated.

Finally, regarding border enforcement measures, if a breeder has imposed export restrictions on a specific variety, the Director General of Customs may now request the Minister's opinion on suspected infringements. If the Ministry's assessment confirms infringement, the customs authorities are empowered to issue on-the-spot administrative dispositions — such as import/export injunctions, confiscation, or destruction of the goods — without the need for judicial proceedings.

OBLIGATION TO LABEL PROTECTED VARIETIES

Under the revised Act, protected varieties are mandated to be marked with the “PVP” logo. This would indicate that propagation of the marked products is prohibited. This applies only to commercial production, not to non-commercial production (such as home gardens) or research purposes.

THE IMPACT OF THE NEW RULES ON THE GROUND

In general, the revised PVP Act has created a large divide between official legal rules around seeds and actual practices on the ground. Local prefectures in Japan still grant permission to local farmers to propagate protected, prefecture-owned varieties without additional licensing. Hence, the number of Japanese farmers who perceive the PVP Act revision to have an immense impact on them may so far be relatively low.

Moreover, the demand for specific vegetable and grain varieties in Japanese regions with their own micro-climates has hindered the introduction of global varieties to some regional markets. Many established seed companies have strong ties with other seed companies through family relationships, and many seed companies themselves are family-owned. This context has protected some in Japan's local seed company sector from acquisition by the multinationals.



Examples of the new mandatory labeling

Variety name: Nourin Yellow
This seed is a registered variety.
Do not take it overseas, can only be cultivated in Tokyo
(see the Ministry of Agriculture, Forestry and Fisheries website for public notice)

Variety name: Nourin Yellow This variety is registered.
Variety registration number: 999999
Can only be exported to the United States

Variety name: Nourin Yellow
Do not take it overseas
Public notice by the Minister of Agriculture, Forestry and Fisheries



This seed is a registered variety. (Valid Until July 14th, 2013)
Variety name: Nourin Yellow

THE MAIN CROP SEEDS ACT AND NOUGYOUKYODOUKUMIAI

Turning to Japan's own internal policy history, it was in 1952, when Japan enacted the Main Crop Seeds Act, that a new division of labour within the Japanese seed system emerged. This law stipulated that it was the responsibility of the public seed sector to ensure the production of high-quality seeds by the local regions (i.e., prefectures). The term “main crop” refers to staple grains such as rice, wheat, and soybeans. The Main Crop Seeds Act supported local governments in producing seeds and supplying quality local varieties at a low price, and effectively established the public seed sector in Japan. Core to the logic behind its introduction was the idea that it could safeguard Japan's staple crops in case of future food crises.

However, the public seed sector's development of rice varieties integrated the use of chemical fertilizers and pesticides. In

addition, it focused on developing varieties that were resistant to cold as well as dwarf varieties with short stature (that could withstand high amounts of fertilizer inputs). During this period, there was also a massive restructuring of the system for agricultural product distribution in Japan. A national network of *nougyoukyoudoukumiai* (agricultural cooperatives) was formed, with branch offices in each region. Responsible for the collection and distribution of agricultural products, these cooperatives advised farmers to buy seeds from the public seed and local seed company sectors instead of sourcing seeds from the traditional seed sector. This laid the foundations for Japan's own post-war "Green Revolution". It was not until the 1970s that the traditional seed sector drew attention with the rise of the organic farming movement. However, recognition of the ecological and cultural importance of this sector has not led to a reduction in the dominance of other sectors.

At the same time, many in the local seed company sector have had a strong interest in supporting traditional farming activities and local food cultures. The partnerships they form with those in the traditional seed sector have helped them to overcome unfavorable economies of scale and procure enough seeds to become financially viable. At times, these companies have sold local crop varieties even if those varieties were not profitable to produce. Consequently, despite not customarily receiving any government assistance, these two sectors working together have protected some measure of genetic diversity in the past.

In 2017, the Japanese parliament approved a bill to repeal the Main Crop Seeds Act. It was argued that no seed shortages were anticipated in the future and that the rules unnecessarily restricted the activities of the private sector (becoming an impediment to the Japanese seed market). In fact, history has shown that seed shortages cannot be discounted. In 1993, due to cold weather, Iwate Prefecture failed to secure enough rice seeds for the following year. A crisis was avoided only because the Main Crop Seeds Act enabled Ishigaki Island in Okinawa Prefecture (where rice is produced during winter) to produce more seeds for Iwate Prefecture. If more unanticipated severe weather events occur, then the need for seed security in the event of seed shortages remains.

After the eventual repeal of the Main Crop Seeds Act in 2018, local prefectures made efforts to save public seed programs from discontinuation. Thirty-five out of the 47 prefectures in Japan enacted local ordinances, and others created special guidelines to sustain the local public seed programs. Most of the prefectures have continued to make a list of promoted varieties and local varieties and to produce them.²⁰ Some of the prefectures continue breeding new varieties. However, it is important to investigate the decision-making process regarding these varieties. The accessibility of this information varies among regions. In some prefectures, minutes of meetings are open to the public and show who participated in the meetings or what kind of discussions took place. Other prefectures do not publish these minutes even when a prefectural assembly member requests disclosure. This lack of public disclosure does not support the goal of achieving seed sovereignty.

The removal of the Main Crop Seeds Act appears to facilitate the transfer of a public service into the hands of the private sec-

tor as it reduces the role and importance of the public seed sector. Furthermore, around the same time as the abolition of the Main Crop Seeds Act, the Agricultural Competitiveness Enhancement Support Act²¹ was passed. This Act explicitly states that governmental institutes are expected to pass their agricultural knowledge to the private sector. Article 8.4 of the Act states that "governmental research institutes and local governments are encouraged to pass down the knowledge of seed production to private sectors".²² Thus, this policy development further entrusts seed security in Japan to private companies, as does MAFF's most recent Intellectual Property Strategy, published in 2015.

MAFF'S INTELLECTUAL PROPERTY STRATEGY 2020

In its 2006 "Summary of the Report of the Study Group on Strengthening the Protection and Promoting the Utilization of New Plant Varieties",²³ MAFF set a goal of exceeding 2,000 new variety registration applications per year by 2010. However, this target was not met. In 2015, MAFF issued its "Intellectual Property Strategy 2020" to strengthen intellectual property rights. This set a target of 1,000 new crop variety registrations per year by 2020. The strategy argues that "the number of newly developed crop varieties is directly linked to the innovation of Japanese agriculture" and that "a decrease in the number of protected varieties will affect the competitiveness of Japanese agriculture".²⁴ However, this target was also unmet. Instead, the total number of applications for plant breeders' rights fell from 1,406 in 2007 to 599 in 2024. Notably, the number of applications for new varieties bred domestically decreased from 1,016 to 391 over the same period.²⁵

MAFF's policy focused on the prevention of infringement of breeders' rights, including strengthening the penalties for infringement, the development of DNA identification technology to examine suspected cases of infringement, and considerations for restricting seed saving. It failed to increase measures to strengthen the breeding system and did not provide additional funds for development of breeding technology, nor did it raise the number of farmers involved in breeding. MAFF has also criticized how breeders from the local seed company and public seed sectors have shared their agricultural knowledge with the public, and advocated for restricting such knowledge sharing under intellectual property laws. Active sharing of seed-breeding knowledge leads to the development of new technologies and productivity. Restricting this exchange may simply lead to stagnation in Japanese seed-breeding activities.

REVISION OF THE PVP ACT AND INTRODUCTION OF THE BILL FOR THE PROMOTION OF BREEDING IMPORTANT VARIETIES AND PRODUCING THEIR PROPAGATING MATERIAL IN 2026

In early 2026 the Japanese Cabinet approved further revision of the PVP Act and a new Act on the Promotion of Breeding and Seedling Production of Important Varieties (commonly known



as the Climate Change Adaptive Variety Act). At the time of writing, the relevant bills proposed by the government have not yet been passed by the Diet.

The government argues that these measures are necessary to help agriculture adapt to climate change and to strengthen intellectual property rights over seeds. However, they threaten to dismantle the public seed programs historically led by local governments, which have long formed the foundation of Japan's seed supply system, while opening the door to greater corporate control and monopolization of seeds.

CRITICAL THREATS POSED BY THE BILLS

1. Abnormal extension of monopoly duration to 35–40 years (PVP Act revision)

The proposed revision would extend the duration of breeders' rights from the current 25 years to 35 years, and up to 40 years for trees. This greatly exceeds the minimum protection period established under the UPOV Convention (20 years) and even surpasses the standard duration of patent protection (20 years). No other country currently provides breeders' rights for such an extended period.

This excessive expansion of intellectual property rights risks undermining farmers' rights, accelerating seed monopolization, and concentrating control within a small number of corporations. It may also discourage innovation by restricting access to genetic

resources, ultimately hindering the development of new varieties and weakening the long-term vitality of the seed sector itself.

2. Pre-emptive injunctions at the application stage (PVP Act revision)

The revision introduces a draconian right allowing companies to demand the suspension of cultivation and the destruction of crops while a variety is still merely "under application" (before protection is granted). By simply claiming a crop is "not clearly distinguishable", companies can paralyze farmers with legal risks, creating a chilling effect that will discourage even the cultivation of traditional and public varieties.

3. Negative effects of the existing "presumption by name" and strengthening of the monitoring system (synergistic effect of both bills)

The 2020 revision of the PVP Act introduced a provision that transfers the burden of proof from the breeder to the farmer in cases involving alleged violations of the Act (Article 35, Paragraph 3). With the proposed new amendment, the exclusivity period will be extended to 35 or 40 years, leaving farmers exposed to the threat of this "presumption" for a long time. Further, with the proposed Act on the Promotion of Breeding and Seedling Production of Important Varieties promoting mass registration of "important varieties" as a national policy, even farmers who just happen to be handling native varieties with similar names may be put at risk.

4. Privatization of public assets and infrastructure (Act on the Promotion of Breeding and Seedling Production of Important Varieties)

Under the proposed new regime, if private companies submit a “Business Plan for Breeding Important Varieties” in line with government policy and it is approved, local publicly funded agricultural experiment stations are mandated to cooperate with the corporate breeding and multiplication programs. The public seed programs of local municipalities, which have been the backbone of Japan's seed supply, will effectively be repurposed as infrastructure for private corporations. Although varieties developed using public assets should remain public property, the Industrial Competitiveness Enhancement Act allows them to be monopolized by private companies. This is a blatant privatization of public assets: the costs are socialized (borne by taxpayers and municipalities) while the profits are privatized.

5. Hasty expansion of new genomic technologies and the risk of losing traditional breeding techniques (Bill for the Promotion of Breeding Important Varieties and Producing their Propagating Material).

Under this top-down breeding regime dictated by the state, the development of diverse varieties suited to regional needs will be abandoned in favor of the efficient development of highly profitable varieties for broad distribution. This approach may heavily rely on artificial mutations using genome editing and heavy ion beams, or AI-driven breeding based on big data. However, there is no guarantee that such varieties can adapt to rapidly changing environmental conditions or are safe for human health. Furthermore, participation in this state-led breeding regime is limited to a select few private corporations. This will intensify seed monopolies, drive small regional seed companies out of business, and risk the loss of Japan's world-renowned traditional breeding techniques.

6. Global exploitation via “strategic overseas licensing” (PVP Act revision)

“Overseas licensing guidelines” were established in December 2023 for implementing strategic overseas licensing in a manner consistent with Japan's export policies, while also aiming to deter unauthorized cultivation and distribution overseas. Furthermore, in order to strengthen the protection of varieties, the PVP Act amended in 2020 established an institutional framework that makes it easier for breeders to manage their rights, such as by restricting the export of varieties and requiring permission for self-propagation. However, the agricultural management and operation methods had not been sufficiently established, so in July 2025, the government formulated “Guidelines on the Protection and Utilization of Superior Varieties” regarding the domestic management of varieties.²⁶ While framed as protecting Japanese agricultural brands, the system combines trademark and breeders' rights to extract multi-layered royalties from farmers both domestically and internationally. Ultimately, only very few corporations will profit, while farmers will be left exposed to severe global competition.

TIMELINE OF POLICY DEVELOPMENTS

A comprehensive timeline of the regulations related to self-propagation is presented in Table 2, while specific impacts of these policies are explored in the following section.

Before 1998	No restrictions on self-propagation (farm-saved seed or propagation material)
	Plant Variety Protection and Seed Act (PVP Act) adopted + UPOV 1991 ratified.
1998	Self-propagation is allowed in principle but can be restricted by ministerial decrees and contracts; under such a decree, 23 species are prohibited from self-propagation.
2004	Study group report that self-propagation should be banned in principle in the future. For the time being, it is decided to gradually add to the list of plants for which self-propagation is not permitted.
2006	Revision of the enforcement regulations of the PVP Act, banning the self-propagation of 82 species as designated by a ministerial ordinance.
2015	MAFF issues its Intellectual Property Strategy 2020 which aims to “steadily promote the examination of more than 1,000 variety registrations per year”. The study group on self-propagation agrees on criteria for plants for which self-propagation is permitted.
2017	Decision to repeal the Main Crop Seeds Act. A ministerial order bans the self-propagation of 289 designated species.
2018	Main Crop Seeds Act repealed. A ministerial order bans the self-propagation of 356 designated species.
2019	405 species designated by ministerial ordinance banning self-propagation.
2020	The PVP Act is revised to prohibit the self-propagation of all protected varieties without the breeder's permission.
2026	Further revision of the PVP Act and introduction of the Act on the Promotion of Breeding and Seedling Production of Important Varieties proposed to enforce plant breeders' rights even more rigorously.

Table 2: Timeline of policy developments on regulation related to self-propagation

SECTION 3

Impact Assessment: Data on Seed Sector Development

Together, the ratification of the 1991 UPOV Convention in 1998, the passing of the PVP Act in 1998, the removal of the Main Crop Seeds Act in 2018, policy changes within MAFF and changes within the seed sector over the last decades in Japan have dramatically altered how Japanese farmers can legally cultivate and distribute seed. To gauge the possible impacts of these developments, the following trends are described in this section:

- 1 Decrease in the number of private seed companies,
- 2 Decrease in Japanese breeding expertise and protected varieties of seed,
- 3 High proportion of protected varieties,
- 4 Policy support for the chemical/biotech sector,
- 5 The case of the Sicilian Rouge High Gamma-Aminobutyric Acid (GABA) tomato variety,
- 6 Erosion of Genetic Diversity,
- 7 Failures in the private seed market.

DECREASE IN THE NUMBER OF PRIVATE SEED COMPANIES

Japanese private seed companies have diverged in two directions since the PVP Act was adopted in 1998. Some companies transformed into multinational corporations and ventured into international production, while other companies continued to focus on domestic production. The former set of companies grew, while the latter had to face the shrinking domestic market—some even went out of business. The number of seed companies registered by the Japan Seed Trade Association decreased

from 1,371 in 2008 to 922 in 2023 (Figure 3).²⁷ This is the period during which the government abolished the Main Crop Seeds Act and revised the PVP Act. Thus, it appears that the local seed company sector did not benefit from these policy changes.

In regard to the main crops (rice, wheat, and soybeans), the public seed sector still dominates market share (with 99% of rice seeds originating from this sector).²⁸ Very few national seed companies, and no foreign companies, are involved, but this may change in the near future.

With the exception of a few international companies such as Sakata, Kaneko, Takii and a few biotechnology start-ups, domestic seed companies continue to shrink. Globalized companies like Sakata have adopted a strategy of producing seeds cheaply overseas. This has brought about a significant decline in domestic seed production, especially for vegetables, leading to a reliance on seeds grown in other countries by Japanese companies. If seed trade were to be halted or interrupted in the future for some reason (such as an extreme weather event or international conflict), it could affect Japan's food production capacity and lead to a food crisis.

DECREASE IN JAPANESE BREEDING EXPERTISE AND PROTECTED SEED VARIETIES

Historically, Japan has had a high level of expertise in breeding new seed varieties. According to UPOV statistics, it once had the second highest number of new varieties developed per year worldwide. However, this rate, and breeding knowledge in general, has declined in the decades since Japan adopted the UPOV regime (see Figure 4). These changes appear to be the result of new legislation and policies, as well as the loss of human resources and a diverse breeding environment—both of which were at the heart of the Japanese breeding sector.

Seed breeding requires commitment and research efforts over a long period of time (as a new variety takes many years to develop). Training seed breeders with the requisite knowledge requires long-term policies and sustainable financial resources. Often, small private companies do not have enough capacity to train such personnel, while local governments lack the financial resources to hire such staff.

The passing of the PVP Act in 1998 marked a major turning point for the seed sector in Japan. Since then, local governments have developed only half as many new varieties (see Figure 5). In

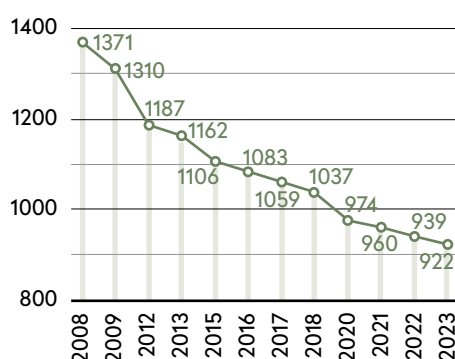


Figure 3: Number of members of the Japan Seed Trade Association

addition to the legislative changes (see above), there are two further main reasons for this decline. One is the elimination of subsidies for public seed services previously provided by the national government to the local governments. After adoption of the PVP Act in 1998, this was replaced with a lump-sum local subsidy. The second reason is that there has been a general decline in the agricultural sector caused by policies that supported trade liberalization and import tariff reductions (making imported food more competitive on the market). Apart from the rapid decline in the agricultural population and the shrinking seed market, the number of people with knowledge of plant breeding

is also fast decreasing. In light of all these, it has become difficult to maintain the ability to develop new varieties in Japan.

In 2001, 1,011 plant breeders' rights (PBR) titles were issued for new varieties in Japan (800 for residents, 211 for non-residents). At that time, only the European Union had more PBR titles issued. Since then, other countries have rapidly increased the number of PBR titles issued, while Japan has seen a decline, falling to around 500 in recent years. Today, China, the EU, the USA, Ukraine, the UK, the Russian Federation, the Republic of Korea, and the Netherlands issue more PBR titles per year than Japan. Even countries implementing non-UPOV PVP systems,

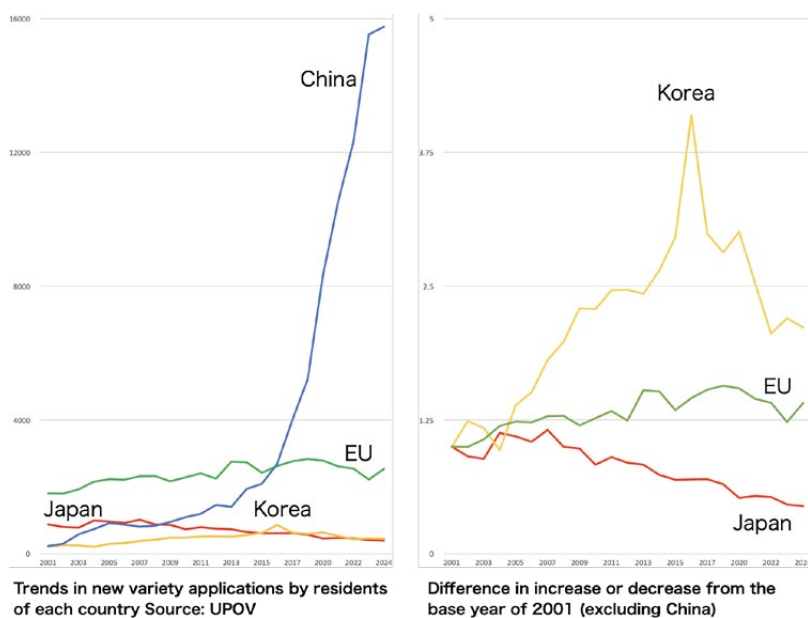


Figure 4: Number of applications for plant breeders' rights filed, 2001–2024

Source: UPOV

DEVELOPMENT OF NEW VARIETIES IN JAPAN IS STAGNATING

- The number of applications for **variety registrations** is decreasing.
- **Applications by prefectures** has **decreased by more than 50%** since fiscal 2007.
- The **stagnation in the development** of new varieties will hinder the **development of agriculture**.

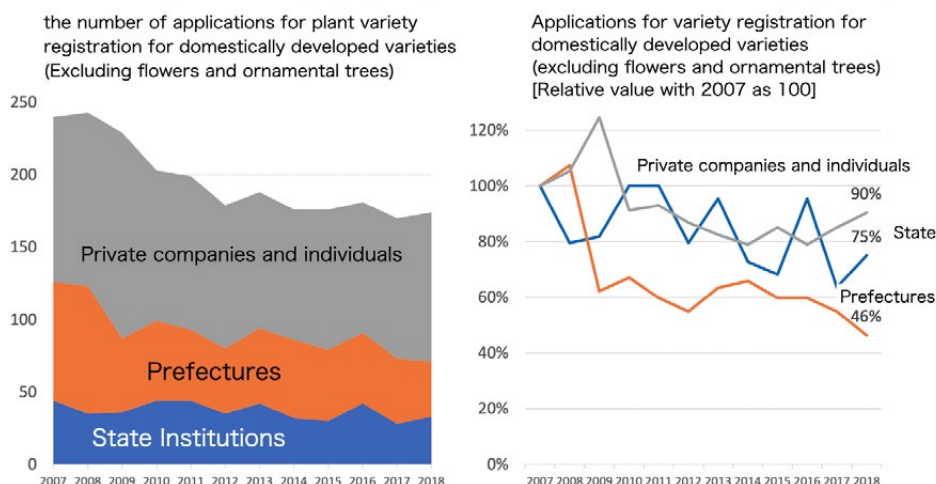


Figure 5

Source: "The Status Quo and the Issues Surrounding the Seed System: The Purpose and Background of the Amendment of the Plant Variety Protection and Seed Act". Ministry of Agriculture, Forestry and Fisheries. July 2020.

such as India, have granted more PBR titles. And this trend appears to be continuing. The latest figures show that the grant of plant variety rights reached a new low in 2023 with only 497 grants; the negative trend affects both foreign breeders (184 grants) and domestic breeders (313 grants). In 2024, the number of grants rose to 703 (451 for residents, 252 for non-residents). However, this is still well below the 2001 figure (1,011 grants), and the number of applications (599 in 2024) does not indicate a reversal of the negative trend.²⁹

Historically, it is the public seed sector which has been in charge of developing popular rice crop varieties in Japan. This sector experienced the largest decline in the number of new variety developments, although a decline was observed in all sectors (see Figures 4 and 5).

In contrast, the proportion of varieties developed by foreign entities (both legal entities and individuals) has been growing rapidly (see Figure 6). Article 4 of UPOV 1991 allows foreign entities to be granted the same treatment as domestic entities. Countries that ratified UPOV 1991 are not allowed to prevent any registration of plant varieties by foreign entities.

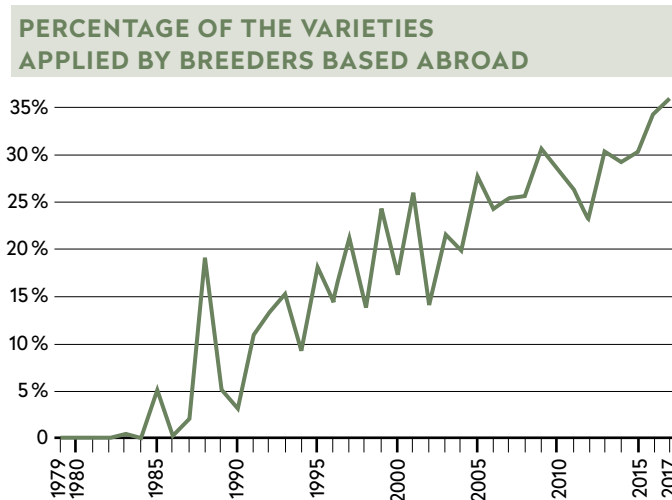


Figure 6: 36% of new applications in 2017 were by breeders based overseas (corporate and individual) (mainly flower varieties; cereals and vegetables less common).

Data from MAFF.

While more foreign companies have entered the Japanese seed market, the offshore activities of Japanese seed companies have also increased during this period. Several Japanese companies engaged in higher rates of overseas seed production to lower the cost of production. As a result, the number of seed production farms within Japan has declined. Table 3 shows the total area of seed production plots in Japan by crop (data is not available post-2007). Roughly 90% of vegetable seeds are produced overseas. This means that if seed importation is hindered in Japan, food production will be equally affected (for most crops except rice and potatoes). Japan's policies and dependency on seed imports have increased its food insecurity.

	1990	1998	2007
Japanese white radish	400	171	65
Onion (edible plant, <i>Allium cepa</i>)	132	104	102
Pea (<i>Pisum sativum</i>)	110	99	15
Green beans	76	86	25
Pickled vegetables	140	75	51
Cabbage	165	72	35
Chinese cabbage (<i>Brassica campestris</i> var. <i>amplexicaulis</i>)	86	56	20
Green onion	91	54	13
Turnip	41	42	25
Great burdock (<i>Arctium lappa</i>)	82	39	24
Lentil (<i>Lens culinaris</i> , <i>Lens esculenta</i>)	40	29	9
Cucumber	50	23	13
Spinach	31	23	2
Carrot (<i>Daucus carota</i>)	73	15	5

Table 3: Total area of vegetable seed and seedling production in Japan (in hectares)

Source: Centre for the Promotion of Advanced Technology Industries in Agriculture, Forestry and Fisheries.
Available at: www.jataff.or.jp/project/download/pdf/30-2010033010274710560.pdf

HIGH PROPORTION OF PROTECTED VARIETIES

When amending the PVP Act, MAFF justified it by saying that the amendment would only ban self-propagation (farm-saved seed) of the 10% of varieties which were protected and would not have a significant impact on farmers.³⁰ However, as Figure 7 demonstrates, 52% of varieties of rice are protected. Table 4 additionally shows a high percentage of protected rice varieties, especially in the Hokkaido and Aomori regions.³¹

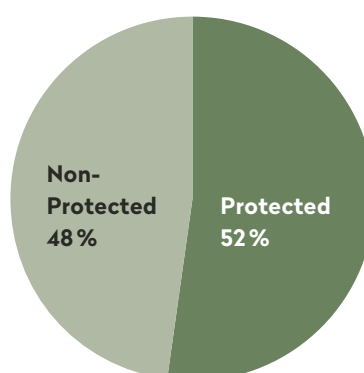


Figure 7: The proportion of protected varieties in Japan's total rice production

Rice Variety	Percentage by production volume	Percentage by number of varieties
Hokkaido	88%	73%
Aomori	99%	60%
Aichi	63%	55%
Nagano	6%	40%
Hiroshima	27%	50%
Okinawa	14%	66%

Table 4: The percentage of protected rice varieties by volume and number³²

Regional special crops also tend to have a high percentage of protected varieties. For instance, 90% of sugarcane varieties in Okinawa Prefecture are protected (see Table 5). Based on this data, it seems highly unlikely that the number of protected varieties could account for just 10% of the total number of seed varieties in use.

Hokkaido slime flakes	53%	Gifu chestnut (<i>Castanea crenata</i>)	50%
Aomori apple	29%	Shiga wheat	71%
Akita edamame (green soybeans)	71%	Wakayama plum tree (<i>Prunus salicina</i>)	39%
Yamagata cherries	44%	Fukushima peach	71%
Ibaraki asparagus	69%	Tottori soybean	83%
Tochigi strawberries	83%	Okayama pear	50%
Gunma Lettuce	50%	Hiroshima Other cankers	64%
Chiba peanut	50%	Kagawa kiwifruit	71%
Kanagawa tomato	57%	Kumamoto sweet potato	50%
Yamanashi grape	56%	Kagoshima Tea	44%
Nagano soba	43%	Okinawa sugarcane	90%

Table 5: Percentage of protected varieties in regional special crops³³

In fact, MAFF does not appear to have statistics that show the ratio of protected to non-protected varieties. After several deliberations in the House of Representatives Committee on Agriculture, Forestry and Fisheries, it began to appear as if the estimate of 10% was not based on evidence.³⁴

More than 70% of the rice produced in Akita Prefecture comes from protected varieties. The prefecture plans to replace all rice varieties with patented varieties by 2030. A guideline issued by MAFF in 2018 recommended that prefectures introduce patented rice varieties.³⁵ Saving seed from these varieties will also be prohibited.

POLICY SUPPORT FOR THE CHEMICAL/ BIOTECH SECTOR

In response to the decline in the number of trained plant breeders, the national government presented new measures to revitalize the Japanese agricultural sector. They aimed to strengthen the breeding system as part of the “Green Food System Strategy”. However, this strategy did not focus on developing human resources in the field of breeding. Instead, it presented a plan to create a public-private academic collaboration platform with a focus on the use of biotechnology.³⁶

This plan aimed to overcome the challenges facing Japan's plant breeding sector by forging cooperation between local government and national research institutes, including universities, and private companies—a plan similar to the Biotech Community Initiative by the Cabinet Office. Biotechnology was the basic approach within this strategy. However, biotechnology start-ups do not have facilities on farmland. Fortunately for the strategy, it appeared this issue could be solved by local governments, which do have such infrastructure. At first glance, this plan may have seemed promising, but it carried some major flaws.

There were at least two major issues: 1) the plan undermines conventional breeding practices, and encourages a reliance on biotechnology, and 2) the plan contributed to increased market monopolies and private sector profits. New variety development based on biotechnology (such as genetic modification or genome editing) has a very low success rate.³⁷ While this approach may benefit a small number of companies, the development outcomes are protected by intellectual property rights and are not available to anyone other than those companies. Therefore, it is unlikely that this policy approach to strengthening breeding will advance the public interest. Lastly, this policy plan favors the production of profitable varieties. Consequently, regionally adapted varieties or those with limited markets are less likely to be developed. Profitable varieties are prioritized over diverse local varieties.

NEW BREEDING PLATFORM

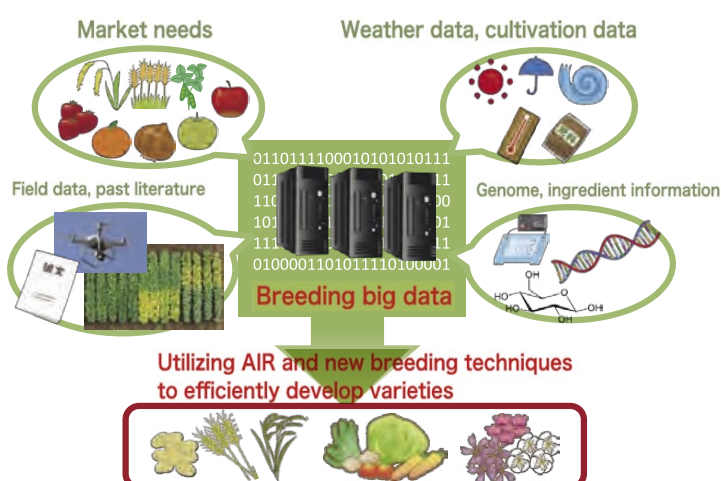


Figure 8: New breeding platform

Source: Ministry of Agriculture, Forestry and Fisheries

THE CASE OF THE SICILIAN ROUGE HIGH GABA TOMATO

As part of its policy focus on biotechnology, the government funded genome-editing research in universities, yet only a few varieties were developed. One example is the Sicilian Rouge High GABA tomato, for which a variety registration was filed in March 2022.

The tomato was developed at the University of Tsukuba. However, due to difficulties in obtaining a commercial license for patents held by Corteva (USA), Sanatech Life Sciences was established. Sanatech Seed Co. Ltd., which markets the tomato, was originally the Japanese branch of Pioneer (now Corteva).³⁸

It remains unclear how much public funding supported this development, although the benefits accrued mainly to private companies. Public skepticism toward genome-edited foods also made distribution challenging. In response, Sanatech distributed free seedlings to 4,000 home gardeners in 2021. Plans to expand distribution to care facilities and schools were later abandoned, likely due to nationwide opposition.

Initially grown mainly in Kumamoto Prefecture, cultivation has since spread. The tomatoes entered the market in September 2021, followed by online seedling sales in October 2021 and tomato puree sales in May 2022.

The product was sold at a relatively high price. Initially set at 7,506 yen for 3kg, the price later dropped to 5,238 yen but the tomato remained costlier than organic alternatives which were sold online. Around 2024, Sanatech Seed started to sell genome-edited tomatoes in supermarkets in small packages at a relatively lower price (650 yen for 300g). In 2026, the price dropped to 420 yen for 300g, but it was still more expensive than normal tomatoes. The seeds were also sold at premium prices.

Due to limited media coverage, some farmers may perceive these crops simply as high-end varieties without understanding their origin. In Japan, genome-edited crops are protected under both plant variety protection and patent law. Unlike plant variety protection, patent law does not include a breeder's exemption, restricting further breeding and potentially increasing market concentration.

The Agricultural Competitiveness Enhancement Support Act (2017) allows public institutions to transfer agricultural knowledge to private companies. This raises concerns that publicly developed varieties may come under private control. A proposed solution is to require local assembly approval before transferring breeders' rights. However, this may not be sufficient. If public institutions provide the infrastructure while private firms retain the rights, the public seed sector may still decline. In this case, the University of Tsukuba does not hold the breeders' rights and must pay patent fees to Corteva. Similar patterns are emerging in other projects.

Biotechnology is costly and does not always lead to successful products. In contrast, conventional breeding has proven effective. Increased funding for biotechnology may therefore disadvantage traditional breeding and reduce the development of locally adapted crop varieties.

EROSION OF GENETIC DIVERSITY

With the development of industrial agriculture, hybrid (or F₁) seed varieties came to dominate commercial vegetable production. These seeds were preferred for their ability to produce uniform characteristics and disease resistance, including predictable ripening times, which are advantageous for growers on the market.

However, there are some disadvantages to moving to F₁ seeds exclusively, especially when it comes to the preservation of genetic diversity. The companies which produce F₁ seed crops manage the parent crops of each genetic line. If one of these breeding companies folds due to bankruptcy or a merger, the parental lines may get lost. As maintaining genetic lines requires substantial effort, it is sometimes challenging for seed companies to take over the genetic lines that were previously managed by other companies. The government is making some contributions to the conservation of genetic resources by storing these seeds in the national gene banks, but this method of seed storage is far removed from the use of living seeds in farmers' fields. Valuable living genetic resources are being rapidly lost.

FAILURES IN THE PRIVATE SEED MARKET

One of the largest private companies to produce rice seeds in Japan is Sumitomo Chemical, which developed a rice variety called Tsukuba SD. In 2015, the company announced an ambitious plan to increase Tsukuba SD production by more than 50-fold within five years.³⁹ This plan drew attention because its time frame aligned with the abolition of the Main Crop Seeds Act.

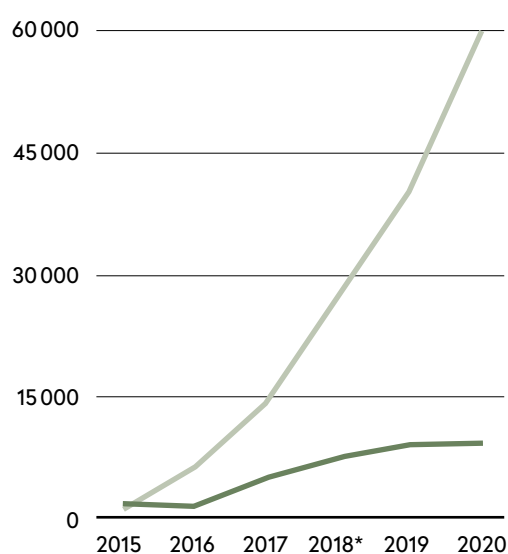
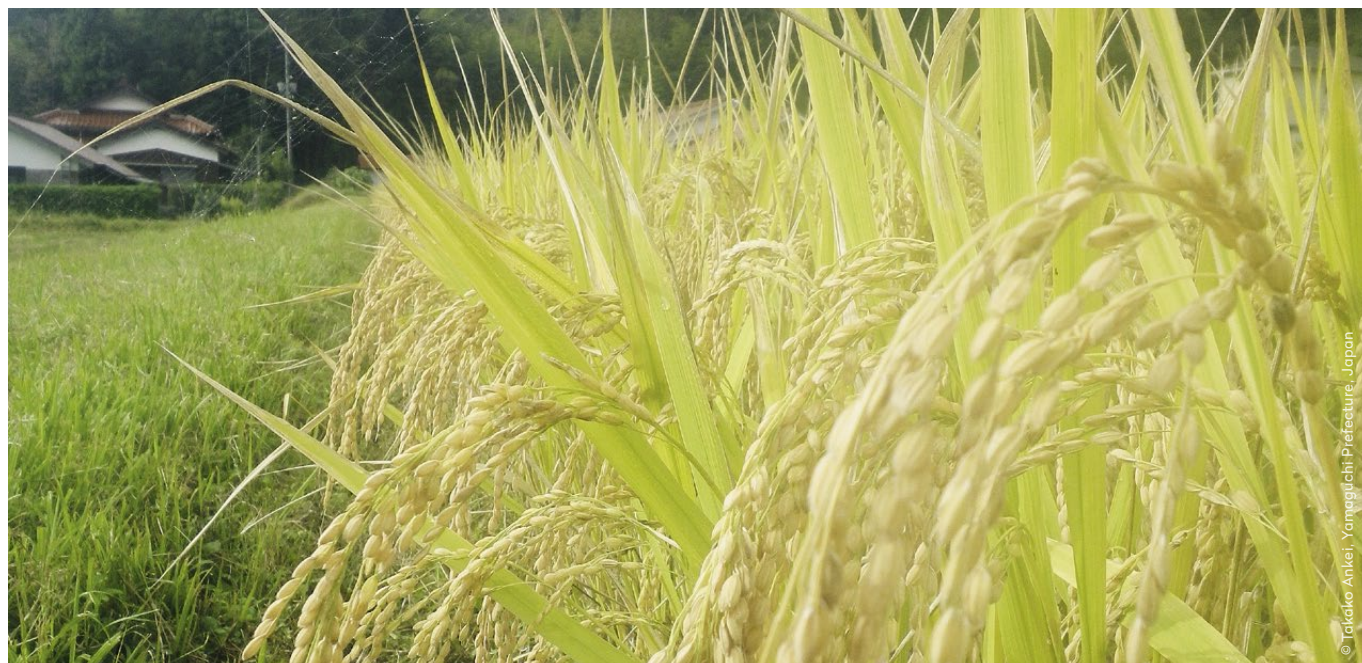


Figure 9: Planned vs actual production of Tsukuba SD by Sumitomo Chemical (vertical axis in tonnes). The green line shows planned production (source: Sumitomo Chemical Management Strategy Briefing, December 2, 2015). The blue line shows actual production.



However, the production of Tsukuba SD fell far short of the initial goal. Sumitomo Chemical's goal was to achieve a 0.83% share of the rice market in 2020. In reality, it is estimated to have reached less than 0.2%, which is a near-negligible presence in the market (see Figure 9).⁴⁰

Another company, Mitsui Chemicals, developed a variety called Mitsuhihari, which competed against Tsukuba SD as a leading private-sector-developed rice variety. However, Mitsui Chemicals announced that it would suspend the supply of Mitsuhihari seeds in 2023.⁴¹

Because Mitsuhihari is a hybrid variety, producing its seeds requires more time, labor, and careful control of pollination. As a result, the same area of land produces only about 60% as many seeds as compared with some non-hybrid varieties. This lower yield makes hybrid seeds more expensive to produce and therefore more costly to buy.

Hybrid varieties tend to be more vulnerable to environmental changes because their traits are homogenous. Extremely hot summers in recent years in Japan have resulted in poor seed production, making it impossible to supply quality seed rice in sufficient quantities.

Further issues have also plagued Mitsui Chemicals. The company was found guilty of committing fraud by selling different varieties of rice under the brand name Mitsuhihari since 2016.⁴² Mitsui Chemicals, which produces several strains of Mitsuhihari such as "Mitsuhihari 2003" and "Mitsuhihari 2005", was accused of mixing different varieties to cover the demand for "Mitsuhihari 2003", violating the PVP Act (inappropriate labeling).⁴³

In its Intellectual Property Strategy 2020, MAFF emphasizes the importance of private-led hybrid crop varieties, and the Mitsuhihari rice variety was supposed to be the role model of this strategy. However, Mitsui's fraud and violation of the PVP

Act were left unchecked for several years. The eventual revelation of the fraud, coupled with poor seed production due to the heat effects of climate change, culminated in the suspension of Mitsuhihari's seed supply in 2023.

This incident should cause one to question whether the private sector can be relied upon for the sustainable production of staple seed crops. Sumitomo Chemical and Mitsui Chemicals account for only less than 1% share of the current rice market in total. Ensuring an adequate production of rice is of paramount importance for Japanese society. The amount of rice needed is massive and its production requires significant infrastructure and maintenance. Whether any other private company could step up to ensure the sustainable supply of rice if two of Japan's largest seed companies (Sumitomo Chemical and Mitsui Chemicals) are not able to do so, is open to question.

In addition, it is accepted practice for private companies listed on the stock market to abandon their operations if the business ceases to be profitable. This logic, when applied to agricultural production, can be the cause of a food crisis. Therefore, there is a good argument to be made that the public seed sector must be involved in "main crop" seed production to ensure its continuance and sustainability. In general, many companies find that it is not profitable to produce a high diversity of seed varieties nor to offer them at low prices. The largest private producers of rice seeds, Sumitomo Chemical and Mitsui Chemicals, offer only a few strains of the same variety. For private companies, demonstrating profit is necessary for the continuation of any one variety. In contrast, the public seed sector was able to maintain varieties that were not necessarily profitable. It therefore seems impossible to guarantee the diversity of regional rice varieties if rice production is left solely to private companies. This also raises the question of whether the Main Crop Seeds Act should be reinstated.

SECTION 4

The Future of Seed Production in Japan

This section summarizes some potential trends that may impact the future of seed in Japan. Using the example of the Koshihikari Kan No. 1 rice variety, it underlines the need for seed sovereignty and argues that public consultation in the seed sector should be improved.

GENOME-EDITED CROPS

In October 2019, Japan started to allow the distribution of registered genome-edited organisms without screening or labeling. A few months earlier, in June 2019, the Trump administration in the US had published a guideline regarding the handling of genome-edited organisms and called for other countries to adopt similar policies. Immediately after this, Japan formed a study group comprising MAFF, the Ministry of the Environment, and the Ministry of Health, Labor and Welfare. They decided to introduce genome-edited organisms without any discussion in the Diet.

The first genome-edited food product in Japan was the Sicilian Rouge High GABA tomato mentioned previously. Sanatech Life Sciences Corporation⁴⁴ submitted the notification to the ministries in December 2020 according to the procedure for distribution of genome-edited foods defined by the Japanese government in 2019. Subsequently six varieties and eight strains of genome-edited organisms were registered in Japan, including a genome-edited fish developed by the Regional Fish Institute. In addition to Sicilian Rouge, Sanatech also developed a medium-sized gene-edited tomato variety called Espresso for salad use. It registered the variety in May 2023, yet it had still not been commercialized by January 2026. Corteva Agriscience Japan Corporation registered a gene-edited waxy corn variety in March 2023, but this too has not yet been cultivated or sold.

The government has decided to exclude genome-edited foods from the scope of its regulations governing genetically modified organisms (GMOs), claiming that they are not genetically modified. By July 2025, 161 genetically modified plant varieties had been approved for cultivation and commercialization,⁴⁵ but their cultivation is limited to flowers. Genetically modified food crops are not cultivated except for experimental purposes. However, there are strong demands from civil society for mandatory labeling for genome-edited plants similar to that for GMOs, on the grounds that genome-editing technology represents a new form of genetic engineering ("new GMOs").

The fact that genome-edited foods no longer require approval or labeling could have a major impact on Japan's seed industry. Genome-edited crops are protected by patents; breeders and farmers cannot freely use them for propagation or further breeding without a special license.⁴⁶ With Japan allowing distribution of genome-edited foods without labeling, genome-edited tomatoes are gradually making their way into local supermarkets, but they have met with limited demand because general public sentiment appears to be against genome-edited foods.⁴⁷ The situation may change with the introduction of a new breeding technology called heavy ion beam radiation breeding.

HEAVY ION BEAM RADIATION BREEDING

In 2012, NARO developed a new rice variety called Koshihikari Kan No. 1 using heavy ion beam radiation technology. This variety was developed as a countermeasure against cadmium contamination, as it absorbs very little cadmium. In the development process, one base of a gene (OsNramp5) with a cadmium absorption function was deleted using heavy ion beam radiation technology.

In 2018, MAFF published "Implementation Guidelines for Reducing Cadmium and Arsenic in Rice" which stated that any new rice varieties developed thereafter should possess the same low-absorption characteristics as Koshihikari Kan No. 1. In response to the guidelines, 10 prefectures including Miyagi, Akita, Hyogo, and Yamaguchi Prefectures started to introduce new varieties that were cross-bred with Koshihikari Kan No. 1.

Akita Prefecture has decided to completely embrace the new variety Akitakomachi R, developed by cross-breeding Koshihikari Kan No. 1 and Akitakomachi, from 2025 onwards. Akitakomachi is a variety that accounts for more than 70% of the rice produced in Akita Prefecture. In fact, the prefecture is planning to cross-breed not only Akitakomachi but also all other rice varieties offered with Koshihikari Kan No. 1 so that by 2030, all rice produced there (with the exception of a few hybrid varieties produced by private companies) will have been cross-bred with Koshihikari Kan No. 1.

Moreover, Akita Prefecture plans to sell Akitakomachi R under the label of Akitakomachi and has stated (alongside MAFF) that it can be certified as organic. If this occurs, consumers will not be able to distinguish products bred using heavy ion beam

radiation technology even if they choose products with organic labels. It may be a dangerous gamble to convert the entirety of rice production in Akita Prefecture to a variety bred with this technology. Yamaguchi Prefecture has been experimenting with the cultivation of Koshihikari Kan No. 1 since 2014. In 2022, for unknown reasons, its rice variety suddenly lost its characteristics as a low cadmium absorber and began to absorb cadmium just like the original variety.⁴⁸

ISSUES SURROUNDING KOSHIHIKARI KAN NO. 1

MAFF has stressed that there will be no safety issues with Koshihikari Kan No. 1 since radiation breeding is a proven technology with a long track record.⁴⁹ However, heavy ion beam radiation technology is relatively new compared with gamma radiation technology (which is an older, more proven method). According to the International Atomic Energy Agency, more than 3,000 registered varieties have been bred with gamma radiation while only 26 registered varieties have been bred with heavy ion beam radiation. Among those 26 varieties, six came from China, and the remaining 20 were produced in Japan. Currently, Japan is leading the way in heavy ion beam radiation breeding technology but there have been no scientific studies demonstrating the safety of this technology.

The OsNramp5 gene is known to have a function related to the crop's absorption of cadmium. This same gene is also related to the absorption of manganese. According to the National Institute of Agrobiological Sciences, damaging this gene reduces the crop's ability to absorb manganese by more than one order of magnitude in straw and by more than one-third in seeds, compared with its natural absorption rate. This may lead to leaf blight disease in paddy fields with a manganese deficiency.⁵⁰

Manganese plays a crucial role in the process of photosynthesis. If rice experiences high temperatures around the time of

ear emergence in a manganese-deficient paddy field, the harvest may drop by 20% to 30%.⁵¹ If Japan continues to have hotter summers due to climate change, this variety may not produce well in manganese-deficient areas. Therefore, the suitability of Koshihikari Kan No. 1 to provide food security for the long term is questionable. Its developer, NARO, has acknowledged this problem and subsequently published research showing that disrupting a different base in the OsNramp5 gene could improve manganese absorption.⁵²

Despite this, there has been no move to replace Koshihikari Kan No. 1 with an improved variety. One possible explanation is that any such variety with improved manganese absorption would need to be developed using genome-editing technology, which may cause a strong backlash from Japanese society, whereas radiation breeding technology appears to elicit less negative reaction because of its longer history in the breeding industry. There have also been several attempts by NARO, using genome-editing technology, to develop new rice varieties that absorb less arsenic. Therefore, it could have been a strategic move by NARO to introduce Koshihikari Kan No. 1 first, before using genome editing on this variety — heavy ion beam radiation technology may be seen as a bridge to further application of genome-editing technology in the future.

PATENTING OF KOSHIHIKARI KAN NO. 1 AND ITS WIDESPREAD USAGE

When NARO developed Koshihikari Kan No. 1, it obtained a patent for the OsNramp5-2 gene. This means that NARO holds the patent rights over Akitakomachi R and all the other varieties in Akita Prefecture that have been cross-bred with Koshihikari Kan No. 1. The patent right is applied to all stages of production including the stock seeds, the rice seed, and rice crops. Patent rights have an even broader scope than the breeders' rights provided by the PVP Act. Breeders' rights allow the free use of a variety for research purposes and further breeding. Patent rights prohibit such use as long as the patented trait or gene still expresses its function in the new variety and as long as the person does not hold a license issued by the patent holder. Rice farmers do not have to negotiate for a license, but they are not allowed to save seed and need to pay a royalty as part of the seed price if the rice is covered by the patent.

As previously stated, in Akita Prefecture, more than 70% of rice seeds will be patented from 2025 onwards, with a plan to reach nearly 100% by around 2030. However, there has been very little amount of cadmium-contaminated rice detected in the prefecture (less than 3% of total production).⁵³ Thus, the vast majority of rice produced in the prefecture already has sufficiently low cadmium levels. How is it then justifiable to force the cultivation of Akitakomachi R instead of the conventional Akitakomachi in areas with low cadmium contamination?

According to Akita Prefecture, "If Akitakomachi R is grown only in limited areas, people will consider those areas as cadmium-contaminated areas. This may lead to a bad reputation for Akitakomachi R." They continue, "On the other hand, regular Akitakomachi varieties may also be subject to the reputation

GENETIC MECHANISM OF KOSHIHIKARI KAN NO. 1

Koshihikari Kan No. 1 was produced using heavy ion beam radiation technology, a mutation-breeding technique in which accelerated ions induce targeted genetic changes in plant material. In this case, a base in the OsNramp5 gene was deleted. Because OsNramp5 regulates cadmium transport in rice plants, disruption of the gene reduces the plant's ability to absorb cadmium from contaminated soils.

The low-cadmium characteristic associated with the OsNramp5-2 mutation behaves as a recessive trait. For the phenotype to be expressed, both parent plants must carry the mutation. If cross-pollination occurs with conventional rice lacking the mutation, the next generation typically loses the low-cadmium trait. This inheritance pattern complicates seed production and maintenance of the characteristic.

that Akitakomachi has high cadmium content.”⁵⁴ If we accept this logic, it means that the whole country will have to produce Koshihikari Kan No. 1–based varieties, because not doing so may harm the reputation of rice produced in Akita Prefecture (if Akita was the only producer of Koshihikari Kan No. 1–based varieties).

Indeed, the Japanese government has been planning to introduce Koshihikari Kan No. 1–based varieties nationwide and MAFF allocated a budget in 2025 to introduce Koshihikari Kan No. 1 in half of the country's prefectures by 2030 as part of its countermeasures against cadmium contamination.⁵⁵ These steps arguably represent a coercive conversion of rice varieties across the country and appear to violate the basic principles of seed sovereignty as such policies force farmers to grow heavy ion beam radiated rice, regardless of their interest and the necessity of doing so.

SEED SOVEREIGNTY AND FARMERS' RIGHTS

Akita Prefecture has stated that farmers who do not wish to grow heavy ion beam radiated rice can buy seeds from other prefectures or save seeds on their own.⁵⁶ However, buying rice seed from other prefectures is a burden for farmers as it is more expensive to buy from outside the region and from areas with dissimilar climate conditions. Additionally, if the regional *nougyoukyoudoukumiai* collect and distribute only the Akitakomachi R variety, those farmers won't be able to sell other varieties (even the conventional Akitakomachi variety) unless they develop their own distribution system.

Until 2024, farmers were able to save seeds from most of the rice varieties grown in Akita Prefecture. In the past, local farmers also used to develop new varieties of rice. At times, such development was brought about by the accidental discovery by the farmers of mutant varieties. As stated in the ITPGRFA and UNDROP, farmers are crucial actors in the development of agriculture as they have developed various crops throughout history. The future of seeds was always in the hands of the farmers. However, in Akita Prefecture, this freedom appears to have been potentially taken away as farmers become little more than agricultural laborers who are practically forced to grow the varieties prescribed by the prefecture if they are to achieve an economically viable harvest year after year. If seeds, which used to be the common property of all farmers, are increasingly covered by ever-expanding intellectual property rights, the risk is that seed sovereignty will be lost entirely.

If the prefecture also uniformly labels Akitakomachi R as Akitakomachi, consumers' food sovereignty (i.e., the right to determine one's own food) will arguably be violated as well, as buyers will not be able to truly know whether what they are eating was bred using heavy ion beam technology. Additionally, Akitakomachi R will also be included in school meals. Currently, consumers' access to this kind of information is very limited.

Although NARO states that it is not planning to sell the food crop patents to private companies, it is by no means certain that it will not change its stance in the future. If most planted rice varieties in Japan become patented and if the patents fall into

the hands of private companies, Japan's staple food may end up being entirely controlled by these companies. This potential future scenario would effectively amount to a loss of food sovereignty across the country.

PUBLIC CONSULTATION AND DISCLOSURE IN THE SEED SECTOR

Why did such a huge project as heavy-ion-radiation-bred rice production proceed without much public awareness? At the Akita Prefectural Assembly in February 2023, the prefecture publicly shared its plan to convert its rice production to the Akitakomachi R variety.⁵⁷ However, it only mentioned that Akitakomachi R was a newly developed variety and did not provide any explanation on the heavy ion beam radiation technology.

There is no publicly available information which explains how and why Akita Prefecture adopted the Akitakomachi R variety. Local governments have control over whether or not to disclose such information, and who gets to participate in the decision-making process determining selection of regionally supported varieties. There are regions that disclose the minutes of meetings and regions that do not, regardless of the existence of local seed ordinances. The minutes of meetings in Akita Prefecture are not publicly available, and the prefectural councilors rejected a request to release this information. Therefore, there is currently no way to know what kind of discussions took place in Akita leading to these decisions.

Similarly, Hyogo Prefecture is currently planning to convert all of its Koshihikari rice cultivation to Koshihikari Kan No. 1. There has also been no public statement made by the prefecture yet in regard to this decision. By the time it makes its plan public, there may no longer be any room for making changes (which is what occurred in Akita Prefecture). This lack of public consultation and disclosure relates directly to the rights of farmers to decide what kind of crops they grow.

Incidentally, Hyogo was one of the first prefectures to enact a local seed ordinance (after the abolition of the Main Crop Seeds Act) so that it could protect and manage its existing local seed initiatives. However, the ordinance did not include any provision for information disclosure, nor any provision about the right of farmers to be involved in the decision-making processes. In fact, there is no provision in any local government's seed ordinances and seed guidelines for farmer consultation with regard to changing rice seed. Under the current ordinances, change is possible at the discretion of the head of the local government. Therefore, the present system allows local governments to make unilateral decisions over seeds without any regard for farmers' seed sovereignty. It may thus be essential to undertake revisions of the current seed ordinances in order to protect farmers' right to participate in making decisions regarding seeds.

SECTION 5

Main Challenges and Suggested Solutions

The purpose of this report has been to deepen understanding of Japan's seed policies and their implications for agriculture, farmers, and food security. Current policy directions emphasize industrial agricultural development and corporate seed markets, while comparatively less attention is given to domestic seed security, farmer needs, and the long-term sustainability of Japan's seed system.

Japan is also experiencing a rapid decline in the number of farmers and local seed companies. This trend weakens domestic seed production capacity and may increase the country's vulnerability to food supply disruptions. At the same time, Japan has promoted seed policy frameworks aligned with the UPOV regime in neighboring Asian countries, raising concerns among farmers and civil society groups across the region.

Although public debate on seed policy in Japan has historically been limited, awareness has increased following the repeal of the Main Crop Seeds Act in 2018 and the amendment of the PVP Act in 2020. These developments have prompted wider discussion about the future of seeds, agriculture, and food systems. The 2020 amendment to the PVP Act was not intended to promote the overseas sale of Japanese seeds; rather, it aimed to restrict the use of certain Japanese seed varieties abroad in order to protect Japan's agricultural exports. However, if the domestic market continues to shrink, the crisis facing the Japanese seed industry will only worsen. The Japanese government is planning to amend the PVP Act again in 2026 to allow the export of seeds.⁵⁸ The key goal is to allow seed exports under special licenses (called "strategic overseas licenses") that only permit foreign growers to sell their products outside of Japan's agricultural export season (so as not to interfere with Japan's agricultural exports). In other words, the Japanese government's seed globalization policy will be further entrenched by the revision of the PVP Act in 2026.

This concluding section proposes policy measures designed to rebuild a resilient and diverse seed sector. Recommendations are presented across five key areas: national seed policy, national bio-chemical seed sector, public seed program, farmer/peasant seed system, and local food policy councils.

NATIONAL SEED POLICY

Main Challenges

Since 1998, the national government has been advancing the privatization of the public seed program. This paradigm shift

was explicitly demonstrated with the repeal in 2018 of the Main Crop Seeds Act—which had historically mandated the government to ensure the stable supply of high-quality seeds—and the enactment of the Agricultural Competitiveness Enhancement Support Act.⁵⁹ The latter law fundamentally dictates the transfer of publicly accumulated technologies for breeding and multiplying superior varieties to private enterprises.

However, there is no guarantee that private companies can reliably secure the seed supply required to maintain Japan's food security. The concentration of breeding capabilities in the hands of a few private corporations raises significant concerns: it risks the loss of agricultural biodiversity, thereby diminishing resilience to severe environmental changes, and increasing vulnerability to natural disasters.

Furthermore, while the Japanese government formulated the ambitious Strategy for Sustainable Food Systems (MIDORI Strategy)⁶⁰ in 2021—aiming to expand organic farming 50-fold by 2050—there are currently no concrete plans established for the production of the organic seeds necessary to achieve this goal.

Given Japan's diverse climate, ranging from subtropical to subarctic, securing a diverse array of locally adapted seeds cannot be left solely to private companies whose primary objective is mass sales in broader markets. It is imperative to rebuild a robust breeding and seed production system centered on local prefectures. While the prefectures must lead this initiative, the national government retains a fundamental obligation to support them.

On the international front, the Japanese government has been pressuring other Asian countries to join the UPOV 1991 Convention and revise their plant variety protection laws in order to promote Japanese seed exports. However, these intellectual property rights regimes restrict farmers' rights to save, use, exchange, and develop seeds. At the same time, as the climate crisis intensifies, the genetic resources preserved by Asian farmers will become increasingly vital for adaptation and resilience. Rather than pushing for stronger intellectual property protections, the Japanese government should recognize and support the ongoing efforts of farmers who have long safeguarded and cultivated this invaluable diversity of seeds.

In developing new crop varieties capable of adapting to a rapidly changing environment, the importance of Asia's diverse biological genetic resources continues to grow. Japanese technological expertise and experiences also have a significant role to play in the legitimate utilization of these resources. There-

fore, rather than heavily focusing on the enforcement of breeders' rights, the Japanese government is called upon to cooperate with other nations to protect farmers' rights in Asia and facilitate the collaborative use of genetic resources.

Key Policy Recommendations

- **Recognize farmers'/peasants' rights:** Formally recognize farmers' and peasants' rights in accordance with United Nations declarations and relevant international treaties. This should include a review and reassessment of current policies based on the UPOV 1991 Convention, including Japan's support for the East Asia Plant Variety Protection Forum.
- **Support local seed systems:** Collaborate closely with local prefectures and municipalities to establish robust breeding and seed production systems, thereby protecting and effectively utilizing vital regional plant genetic resources.
- **Strengthen human resource development:** Promote education and training in conventional breeding techniques to ensure the long-term development of skilled breeders and the preservation of breeding knowledge.

CHEMICAL/BIOTECHNOLOGICAL SEED SECTOR

Main Challenges

Japan once possessed a rich diversity of agricultural genetic resources. However, agrobiodiversity is declining as the biotechnology-based seed sector expands.

Technologies such as genome editing, ion beam breeding, and Ribonucleic Acid (RNA)-based pesticides are expected to play an increasingly prominent role in agricultural development. While such technologies attract significant policy support in Japan, many countries continue to prioritize diverse breeding approaches, including organic and conventional methods.

Concerns have also been raised regarding transparency and safety assessment. Some genetically engineered crops may be introduced without clear labeling or comprehensive testing. In addition, large biotechnology firms could further consolidate market power through acquisitions of smaller seed companies. Furthermore, there are serious doubts as to whether these technologies will deliver long-term agricultural gains that justify the enormous financial investment required.⁶¹

Public-private-academic partnerships also require careful oversight to ensure that public funding serves broader societal interests rather than primarily benefiting private corporations.

There are concerns that the current Japanese government's single-minded focus on biotechnology will hinder the future progress of Japanese agriculture.

Key Policy Recommendations

- Require mandatory risk assessments before biotechnology-derived crops enter the market.
- Introduce transparent labeling for gene-edited or genetically engineered crops.
- Establish strict regulatory frameworks to monitor the environmental and socio-economic impacts of emerging agricultural biotechnologies.

- Strengthen the oversight of public-private-academic partnerships receiving public funding.
- Promote diversified breeding strategies, including conventional and organic breeding.
- Encourage citizen participation in monitoring and public debate regarding new technologies.

PUBLIC SEED PROGRAM

Main Challenges

Public seed services have long played a central role in Japan's seed system, particularly for staple crops such as rice, wheat, and soybeans. These programs have historically provided reliable and affordable seeds while collaborating with local agricultural cooperatives and distribution companies.

Under the now-repealed Main Crop Seeds Act, the development of varieties—particularly rice—tailored to local climates and food cultures was driven by regional prefectures. Seed production plans were formulated based on the needs of local municipalities and subsequently coordinated on a national level. This facilitated a bottom-up approach to seed production across the country.

While this bottom-up approach had limitations, as demonstrated in the case of Akitakomachi R, where local farmers' perspectives were not always incorporated, it is noteworthy that the nationwide seed production system was fundamentally established through initiatives originating at the local government level.

The repeal of the Main Crop Seeds Act weakened the financial and legal foundations of this system, which heavily relied on local allocation of tax grants. This disruption is expected to accelerate with the proposed Bill for the Promotion of Breeding Important Varieties and Producing their Propagating Material,⁶² which is scheduled for debate in the 2026 Diet session. This proposed legislation outlines a top-down approach wherein the central government designates "important varieties" and cooperates predominantly with private corporations to develop them.

Crucially, the 2026 bill contains provisions allowing private enterprises to draft and propose basic seed plans to local governments. This mechanism could permit private companies to utilize public prefectural infrastructure to multiply their proprietary varieties. The seeds envisioned by this bill are intended for wide-area commercial distribution, fundamentally shifting away from locally adapted seeds. Consequently, local governments risk being reduced to subcontractors for large-scale or multinational seed corporations. Deprived of the ability to leverage unique regional characteristics, local farmers will face direct competition across broader geographic areas, which threatens to depress agricultural prices and hinder regional economic revitalization.

Key Policy Recommendations

- **Establish participatory seed policy platforms:** Create platforms that allow local farmers and citizens to participate directly in seed policymaking, ensuring that seed production continues to align with regional needs.

- **Support farmers of local varieties and form collaborative councils:** Provide support for farmers cultivating local varieties to preserve seed diversity. Form councils involving relevant local sectors to promote both the production and practical utilization of these seeds.
- **Create integrated regional food system plans** that connect local seed production with community-based end uses, including school meal programs, hospitals, and hotels.
- **Build inter-prefectural cooperative mechanisms:** Establish frameworks for cooperation with other prefectures and national agencies to facilitate the development of new varieties, improve domestic self-sufficiency rates, and ensure resilience against seed shortages during natural disasters.

TRADITIONAL SEED AND LOCAL SEED COMPANY SECTOR

Main Challenges

Seeds are the culmination of generations of effort by farmers and form the absolute core of agricultural activity. While commercial seed systems have expanded in recent years, they are fundamentally built upon the foundation of existing farmers' seed systems. The commercial system is frequently referred to as the "formal sector", while the farmers' system is termed the "informal sector". However, given the historical context, the farmers' system is the true core system, and the "formal" sector should simply be recognized as the commercial sector.

In Japan, this farmers' seed system has cultivated the nation's agricultural biodiversity and shaped region-specific food cultures. It is irreplaceable by commercial alternatives and remains indispensable for the intrinsic development of agriculture. Today, however, this core system has been almost entirely excluded from government support and faces a critical threat of extinction. Preserving this system is vital not only for protecting traditional food cultures but also for maintaining the genetic diversity required to combat the intensifying impacts of climate change.

Key Policy Recommendations

- Provide direct support to farmers engaged in the production of vital regional and local seed varieties.
- Invest in the education and training of personnel involved in local native seed production and traditional breeding.
- Support the establishment and maintenance of regional seed banks, seed libraries, and community seed exchange networks.
- Decentralize and utilize national gene bank resources to actively revive and reintegrate genetic resources at the local level.
- Build collaborative platforms where farmers, researchers, consumers, and local seed companies can exchange knowledge and resources.

LOCAL FOOD POLICY COUNCILS

Main Challenges

The rapid advancement of globalized food systems has frequently resulted in the erosion of local food cultures, imposing significant negative impacts on regional economies. Addressing these complex, interconnected issues requires expertise that transcends traditional silos. Local Food Policy Councils can bridge these gaps by convening diverse stakeholders — including farmers, consumers, researchers, and policymakers — to facilitate decision-making based on comprehensive insights and to promote locally tailored, sustainable solutions.

Key Policy Recommendations

- Establish Local Food Policy Councils that actively unite local farmers, citizens, local businesses, researchers, and policymakers.
- Develop integrated local food policies that seamlessly connect seed production, sustainable agricultural systems, and local food markets.
- Support the specialized breeding and production of organic seeds to practically enable the expansion of organic farming.
- Strengthen inter-regional and international cooperation, anchored by local municipalities, to build nationwide networks aimed at improving the overall resilience of the food system.

Strengthening local seed systems in Japan could also contribute to broader international efforts to promote sustainable agriculture and food sovereignty. Given Japan's reliance on food imports, international cooperation will remain essential. However, long-term food security cannot be achieved through policies that undermine farmers' rights or weaken local food systems elsewhere.

Instead, supporting seed diversity, farmer participation, and regional food systems in Japan can contribute to more resilient and equitable food systems both domestically and globally.



APPENDIX

Acronyms and Abbreviations

AI	Artificial Intelligence
EAPVP	East Asia Plant Variety Protection (Forum)
F1	First-generation hybrid
F2	Second generation following an F1 hybrid
FAO	Food and Agriculture Organization of the United Nations
GABA	Gamma-Aminobutyric Acid
GMOS	Genetically Modified Organisms
ITPGRFA	International Treaty for Plant Genetic Resources for Food and Agriculture
JATAFF	Japan Association for Techno-innovation in Agriculture, Forestry and Fisheries
JICA	Japan International Cooperation Agency
MAFF	Ministry of Agriculture, Fisheries and Forests (Japan)
MIDORI STRATEGY	Strategy for Sustainable Food Systems

NARO	National Agriculture and Food Research Organization (Japan)
NCSS	National Center for Seeds and Seedlings
PBR	Plant breeders' rights
PVP	Plant variety protection
PVP ACT	Plant Variety Protection and Seed Act
RNA	Ribonucleic Acid
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
UNDROP	United Nations Declaration on the Rights of Peasants and other people working in rural areas
UPOV	International Union for the Protection of New Varieties of Plants
UPOV PRISMA	UPOV's online plant variety registration system
WTO	World Trade Organization

Endnotes

- 1 Japanese Seed Policy and UPOV, drive.google.com/file/d/1SPDXATc4L_kW05riE-i6NWHkCamx-0JQj/view?usp=sharing
- 2 Desmarais, A. A., Wittman, H., & Wiebe, N. (2011). Sovereignty now! *Alternatives Journal*, 37(2), p. 18.
- 3 See noguchiseed.com/hanbai
- 4 An F1 hybrid is the first-generation offspring of two different parent plants that have been selected for specific traits. The process of creating an F1 hybrid involves controlled cross-pollination, meaning breeders manually transfer pollen from one plant to another to ensure the desired traits are passed on. Seeds from an F1 hybrid produce plants that are not identical to the parent plants. When seeds from an F1 hybrid are sown, the next generation (F2) will have unpredictable characteristics.
- 5 Dutfield, Graham (2011). Food, Biological Diversity and Intellectual Property: The Role of the International Union for the Protection of New Varieties of Plants (UPOV). Quaker United Nations Office.
- 6 In this report, the term “protected” plant varieties is used for plant varieties that are protected by plant variety rights.
- 7 www.apbrebes.org/node/327
- 8 spcommreports.ohchr.org/TMResults-Base/DownloadFile?gld=38120
- 9 Golay, Christophe (2019). The Implementation of the UN Declaration on the Rights of Peasants and Other People Working in Rural Areas. Research Brief, Geneva Academy.
- 10 In responses in the Diet, the Minister of Agriculture, Forestry and Fisheries Saito Ken has repeatedly stated that the rights of small farmers have not been established. For example, in his response to Representative Kawadai Ryuhei of the Agriculture, Forestry and Fisheries Committee of the House of Councillors in the 195th Diet (December 5, 2017), he has also repeatedly mistakenly stated in negotiations with the MAFF that small farmers do not exist in Japan, mistaking them for tenant farmers.
- 11 See, for example: stopupov.org/#start; www.twn.my/title2/books/Potential_Impact_UPOV_Malaysia.htm; and www.apbrebes.org
- 12 Agricultural Seeds and Seedlings Act (1947–1998): www.shugiin.go.jp/internet/itdb_housei.nsf/html/houritsu/00119471002115.htm; PVP Act (1998–2020): ja.wiki.source.org/wiki/%E7%A8%AE%E8%8B%97%E6%B3%95
- 13 MAFF, Food Industry Affairs Bureau, Intellectual Property Division, www.maff.go.jp/j/kanbo/tizai/brand/ikuseisyaken.html
- 14 eapvp.org/files/report/docs/philippines/meeting_documents/EAPVPF_11_04_05.pdf
- 15 Quoted from: Shashikant, Sangeeta (2025). The East Asia Plant Variety Protection Forum and UPOV 1991: Implications for Seed Systems in Southeast Asia. TWN, www.twn.my/title2/books/EAPVP_Forum_and_UPOV_1991.htm
- 16 Strategic Overseas License, www.maff.go.jp/j/kanbo/tizai/brand/ikuseisyaken.html
- 17 According to EU Regulation 2100/94, small farmers are “farmers who do not grow plants on an area bigger than the area which would be needed to produce 92 tonnes of cereals”.
- 18 See: IP Australia. About Plant Breeder’s Rights. www.ipaustralia.gov.au/manage-my-ip/someone-is-using-my-ip/farm-saved-seed
- 19 See Figure 2 on page 12.
- 20 Promoted varieties are crop varieties promoted by local prefectures for production and distribution. These are usually rice, soybeans and wheat. However, some prefectures also include potatoes, sugarcane and other crops in this category. The local prefectures support the production of their seeds, and they provide certification upon distribution to promote their sale. Local varieties make up a broader category. The local governments may not support the production of their seeds but they may receive certification.
- 21 www.maff.go.jp/j/kanbo/nougyo_kyousou_ryoku/sienhou
- 22 See www.jpo.go.jp/resources/report/chiki-chusho/document/r6-chusho-shien-nourinsuisan/report.pdf and Ministry of Agriculture, Forestry and Fisheries Intellectual Property Strategy 2030, www.maff.go.jp/j/kanbo/tizai/brand/b_senryaku/attach/pdf/index-44.pdf
- 23 www.maff.go.jp/j/shokusan/hinshu/ikuseisyaken_hogo/attach/pdf/ikuseisyaken_hogo-26.pdf
- 24 www.maff.go.jp/j/kanbo/tizai/brand/b_senryaku/pdf/tizai_senryaku_2020.pdf
- 25 All figures based on UPOV’s PVP statistics: www.upov.int/en/plant-variety-protection/pvp-statistics
- 26 Quoted from MAFF: www.maff.go.jp/j/kanbo/tizai/brand/ikuseisyaken.html
- 27 Ayako Kawai, Understanding the diversity of seed saving practices in contemporary Japan, 2020 Statistics sourced from the website of the Japan Seed Trade Association, www.jasta.or.jp, including archived versions on the Wayback Machine, web.archive.org/
- 28 www.maff.go.jp/j/seisan/syoryu/kensa/kome
- 29 All figures based on UPOV’s PVP statistics: www.upov.int/en/plant-variety-protection/pvp-statistics
- 30 www.maff.go.jp/j/shokusan/syubyohou
- 31 Figure 7: Production volume is calculated based on the percentage of protected varieties and the data from agricultural product inspections in the same year. Table 4: Numbers are calculated based on the production volumes and varieties sourced from agricultural inspection data. Calculation based on data from MAFF (2018) on production area by variety, and data from the variety registration database on expiry dates. Database of protected varieties: www.hinshu2.maff.go.jp/vips/cmm/apCMM110.aspx?MOSS=1
- 32 Rice agricultural inspection results: www.maff.go.jp/j/seisan/syoryu/kensa/kome MAFF agricultural product inspection data, www.maff.go.jp/j/seisan/syoryu/kensa/kome
- 33 MAFF. Specific variety and producing region, www.maff.go.jp/j/seisan/syoryu/kensa/sentaku; and variety registration database, www.hinshu2.maff.go.jp/vips/cmm/apCMM110.aspx?MOSS=1
- 34 The 203rd Diet, House of Representatives, Committee on Agriculture, Forestry and Fisheries, kokkai.ndl.go.jp/#!/detailPD-F?minId=210305007X00320201112&page=21&spkNum=147¤t=2
- 35 Ministry of Agriculture, Forestry and Fisheries, Consumer Affairs and Safety Bureau, “Implementation Guidelines for Reducing Cadmium in Rice”, developed in 2011, revised 2018. www.maff.go.jp/j/syouan/nouan/kome/k_cd/2_taisaku/attach/pdf/01_tec-11.pdf
- 36 For information on breeding platforms, see www.maff.go.jp/j/council/attach/pdf/05-16.pdf. For the Green Food System Strategy reference document, see www.maff.go.jp/j/kanbo/kankyo/seisaku/midori/attach/pdf/team1-156.pdf

- 37 Sustainability and innovation in staple crop production in the US Midwest, www.tandfonline.com/doi/full/10.1080/14735903.2013.806408; Failure to Yield: Evaluating the Performance of Genetically Engineered Crops, www.ucs.org/sites/default/files/2019-10/failure-to-yield.pdf; Gene Editing: Myths and Reality, www.greens-efa.eu/files/assets/docs/geneediting-myths_report_a4_v4_web_reduced.pdf
- 38 sakura-sac.tokiwap.co.jp/wp-content/uploads/2022/12/sakura-sac-summary-2nd.pdf
- 39 Sumitomo Chemical Management Strategy briefing materials. 2015. www.sumitomo-chem.co.jp/ir/event/files/docs/20151202.pdf
- 40 Sumitomo Chemical doesn't disclose the amount of production. The actual production data for Figure 9 was sourced from MAFF statistics. www.maff.go.jp/j/seisan/syoryu/kensa/kome
- 41 Mitsui Chemicals Crop & Life Solutions, Inc., www.mc-croplifesolutions.com/assets/pdf/topics/%E5%A0%B1%E5%91%8A%E6%9B%B8%E5%BC%88%E6%A6%82%E8%A6%81%E5%BC%89.pdf
- 42 On August 18, 2023, MAFF requested Mitsui Chemicals to submit a report regarding the inappropriate display of information on the warranty for the sale of "Mitsuhikari 2003" since 2016. Mitsui Chemicals was summarily indicted by the Tokyo District Public Prosecutor's Office for fraud and fined by the Tokyo Summary Court in January 2025. www.mc-croplifesolutions.com/topics/yed84jqab
- 43 www.mc-croplifesolutions.com/top-ics/71wvmcmmt
- 44 Formerly Sanatech Seed Co. Ltd.
- 45 www.maff.go.jp/j/syouan/nouan/carta/torikumi/index.html
- 46 For patented crops, auto-propagation by farmers is not allowed.
- 47 Surveys on attitudes toward genome-edited foods in Japan have been conducted by the Consumer Affairs Agency and the Council for Biotechnology Information Japan. Consumer Affairs Agency survey: www.caa.go.jp/policies/policy/food_labeling/information/research/2023/assets/food_labeling_cms201_240813_01.pdf. Council for Biotechnology Information Japan survey: cbijapan.com/wp-content/uploads/2022/03/2021_CBIJ_Consumer_Survey_on_GM.pdf
- 48 Yamaguchi Prefectural Agriculture and Forestry Technology Centre Annual Report on Operations in FY2022, November 2023, www.pref.yamaguchi.lg.jp/uploaded/attachment/166499.pdf
- 49 Agriculture, Forestry and Fisheries Research Council of MAFF, www.affrc.maff.go.jp/docs/mutationbreed/mutation-breedqa.html
- 50 www.jstage.jst.go.jp/article/dojo/88/5/88_880520/_pdf
- 51 OsNramp5基因变异影响水稻重要农艺性状的研究进展, www.ricesci.cn/article/2022/1001-7216/1001-7216-36-6-562.shtml
- 52 Rice cadmium-manganese transporter protein: Identifying the amino acid site that regulates its function – National Agriculture and Food Research Organization, www.jacom.or.jp/saibai/news/2022/12/221206-63285.php; A weak allele of OsNRAMP5 confers moderate cadmium uptake while avoiding manganese deficiency in rice, academic.oup.com/jxb/article/73/18/6475/6631284
- 53 Around 0.4–2.6% in 2004–2009 (data from Akita Prefecture, June 2010). In highly contaminated areas, contamination of rice is kept to a minimum by avoiding cadmium absorption through waterlogging management and other measures.
- 54 See the Akita Prefectural Department of Agricultural Policy's response to the 2023 Akita Prefectural Assembly.
- 55 Budget request by the Ministry of Agriculture, Forestry and Fisheries, www.maff.go.jp/j/seisan/kankyo/hozen_type/attach/pdf/index-49.pdf
- 56 This has been repeatedly stated during negotiations between Akita Prefecture and citizens' groups, and a similar message is also conveyed in a report by the prefecture (www.pref.akita.lg.jp/uploads/public/archive_0000089609_00/%E4%BB%A4%E5%92%8C%E5%BC%96%E5%B9%B4%E5%BA%A6%E5%B9%B4%E6%AC%A1%E5%A0%B1%E5%91%8A/%E5%85%A8%E6%96%87.pdf).
- 57 See www.pref.akita.lg.jp/pages/archive/70452
- 58 www.shugiin.go.jp/internet/itdb_gian.nsf/html/gian/honbun/houan/g22109047.htm
- 59 www.maff.go.jp/j/kanbo/nougyo_kyou-sou_ryoku/sienhou/index.html
- 60 www.maff.go.jp/j/kanbo/kankyo/seisaku/midori
- 61 National Academy of Sciences (2016). Genetically Engineered Crops: Experiences and Prospects. www.nationalacademies.org/projects/DELS-BANR-13-06; Union of Concerned Scientists (2009). Failure to Yield: Evaluating the Performance of Genetically Engineered Crops. www.ucs.org/resources/failure-yield-evaluating-performance-genetically-engineered-crops
- 62 www.shugiin.go.jp/internet/itdb_gian.nsf/html/gian/honbun/houan/g22109046.htm





The Association for Plant Breeding for the Benefit of Society (APBREBES) is a network of civil society organizations from developing and industrialized countries. The purpose of APBREBES is to promote plant breeding for the benefit of society, fully implementing Farmers' Rights to plant genetic resources and promoting biodiversity.

Association for Plant Breeding for the Benefit of Society (APBREBES)

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OK SEED PROJECT

The OK Seed Project was launched by citizens in 2021 to enable consumers to choose foods free from genetic modification by affixing the "OK Seed" label to seeds and produce—including marine catches—that have not undergone genome editing or genetic engineering.

OK Seed Project

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