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Original article

LONG-TERM PLANS FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT IN JAPAN

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Abstract

The paper is focused on the agricultural problems in Japan, precisely on the issue of sustainable agriculture. The sector contributes less than 1% to Japan's GDP (27% comes from the industry and 73% from the service sector), which is a small share like in other developed countries, however the role of agriculture in Japan is very high in terms of the national security aspects. The analyzed data is collected from the Japanese databases and original documents produced by the Japanese government. The research comes to the conclusion that the ideas of sustainable agriculture had started to germinate in Japan earlier than the SDGs appeared. The goals targeted in the official documents are ambitious, but the achievements are not as good. The programs are mainly focused on food supply security aspects, but the environmental problems are left aside. Finally, pesticides and chemical fertilizers are still highly used in the country.

Keywords: Japan; agriculture; sustainable development; Ministry of Agriculture, Forestry and Fisheries; Sustainable Development Goals; SDGs

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Научная статья

ДОЛГОСРОЧНЫЕ ПЛАНЫ ПО УСТОЙЧИВОМУ РАЗВИТИЮ СЕЛЬСКОГО ХОЗЯЙСТВА В ЯПОНИИ

О.Н. Емельянова, Д.А. Щербаков

Аннотация

Статья посвящена проблемам сельского хозяйства в Японии, в частности, вопросу устойчивого развития. Доля этого сектора в ВВП Японии незначи-

тельна и составляет менее 1% (27% приходится на промышленность, 73% – на сферу услуг), что характерно и для других развитых странах. Однако с точки зрения национальной безопасности роль сельского хозяйства в Японии крайне высока. Информация, которая анализируется в статье, была собрана из японских статистических баз и исходных документов, подготовленных японским правительством. На основании исследования сделаны выводы о том, что идеи устойчивого сельского хозяйства начали зарождаться в Японии раньше, чем были сформированы ЦУР. В целом, цели, поставленные в официальных документах, амбициозны, но степень их реализации не соответствует ожиданиям. Программы в основном сосредоточены на продовольственной безопасности, но экологические проблемы остаются без должного внимания. Пестициды и химические удобрения продолжают по-прежнему широко применяться.

Ключевые слова: Япония; сельское хозяйство; устойчивое развитие; Министерство сельского хозяйства, лесных угодий и рыбного промысла Японии; цели устойчивого развития; ЦУР

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Introduction

Agriculture development in Japan is being under observation of analytics both from Japan and abroad as it is one of the most important issues of national security. Most of the research documents in Japan are produced by the government institutions, mainly by Ministry of Agriculture, Forestry and Fisheries (MAFF), and there are much less materials published by the domestic academic scientists. Among the leading researchers there are Nobuhiro Suzuki, Toshiko Takeya and Ryoichi Yamamoto. They are mainly taking the social format topics, and less cover the actual problems of Japanese national security in agriculture [33]. Similar questions are raised by Hiroda Oguchi. The researcher also represents the variety of new farmers and organic farming case in order "to narrow the physical and psychological gap between food and agriculture spheres". One more attractive topic discussed in the book covers "off-market distribution" opportunities [24].

But the most contemporary and detailed materials, which take into consideration fundamental questions, are presented in the Journal "Agricultural Development in Japan" prepared by the Japanese Agricultural Journalists Association. Some of the authors are Japanese officials, like Hiroyuki Suematsu, who was a Vice-Minister of Agriculture, Forestry and Fisheries, and Toru Nakaya, who

was a Chairman of Central Union of Agricultural cooperatives. This journal presents the most essential materials on the present Japanese agricultural sector development. The issue covered one of the most core problems – "The increasing food shortage in Japan" [39].

Among the Russian researchers the most prolific on the topic is S.B. Markar'yan. The scientist researched the central issue, which is the role of the government support in the development of agriculture, e.g. subsidies and import tariffs measures, and gave the historical overview of the agricultural development in Japan [1-3]. Since the neoliberal agenda has been introduced in Japan, the problem of regulation measures relief has been well analyzed [4]. The topic was also under the discussion of the scientists V.A. Popov, N.M. Bragina, S.B. Markar'yan during the Soviet period.

In the English language literature, the topic has been analyzed even deeper. There is a variety of papers starting from traditional rice and agricultural policies problems [11], ending up with the more fundamental works on food security [16, 17, 10]. There are also articles, which demonstrate the efforts of the Japanese government to provide Green Transformation. On the base of the targets fixed by the government the researchers come to the conclusion that "the insights gathered from Japan's experience… can provide valuable furnishing guidance for developing nations aspiring to establish their own sustainability programs and goals" [6]. But the conclusions have to be more accurate as the targeted goals are too far from being achieved within the fixed period, and the problem of highly used fertilizes still remains big.

Although there are many publications covering this topic, the facts are changing more rapidly than information flows across the border. It means that the most actual and up-to-date resources for analysis of the present food security policy are still the documents of the Japanese official institutions. That is why the bases for this research became the materials and documents of Japanese Ministries and Agencies.

Purpose. The goal of the research is to identify the prospects of development of agriculture in Japan from the point of view of sustainable development goals.

Methods and materials

The paper is based on academic literature, official policy documents and statistical data on Japanese agriculture available from open sources. Methods of statistical analysis were applied to these data.

Findings. The research demonstrates that the ideas of sustainable agriculture had started to germinate in Japan earlier than the SDGs were formulated. The goals of sustainable agriculture development in Japan targeted in the offi-

cial documents are ambitious, but the results are not as good. The government programs are mainly focused on food supply security aspect, which is an important issue for the Japanese social security, but the environmental problems are left aside. They are under discussion, but the implemented measures are not enough. Moreover, pesticides and chemical fertilizers are still remained highly in use in Japan, as the newly introduced productivity increased methods are not effective enough to allow local farmers to abandon their traditional methods of increasing the productivity of their farms.

The institutional foundation of sustainable agriculture in Japan

The transformation of socio-economic paradigm reflected in strategy "Society 5.0" is unable to avoid the agricultural sector. It is evident that the new standards should be implemented in all spheres in order to avoid structural imbalances and to achieve sustainable economic development of the country. The principles of circular economy (in jap. "Sound material-cycle society" term is used) are the integral part of the new approach in order to reduce the burden on the environment and to achieve sustainable agriculture.

Since the United Nations adopted "Sustainable Development Goals (SDGs)" at the Summit 2015, as a part of the 2030 Agenda for Sustainable Development, the domestic efforts for the SDGs in Japan have steadily expanded with a high level of government initiative.

In May 2016, the "SDGs Promotion Headquarters" was established, headed by Prime Minister and accompanied with the Chief Cabinet Secretary and Minister of Foreign Affairs as the deputies, and all other ministers as the members. The organization takes a leading role in implementing the SDGs in Japan. To guide Japan's efforts the Headquarters developed the "SDGs Implementation Guiding Principles", which were based on the decisions made at the "SDGs Promotion Roundtable Meeting" organized in December 2016, where a wide range of stakeholders (the government, NGO/NPOs, experts, private sector international organizations and etc.) participated [13].

The principles of circular agriculture and environment protection agriculture can be found in Japan even earlier. In the "Basic Concept of Sustainable Agriculture", published in April 1994 by the Department of Sustainable Agriculture Development of MAFF, environment-friendly agriculture is formulated as "sustainable agriculture that takes advantage of the material cycle function of agriculture, pays attention to harmony with productivity, and considers reducing the burden on the environmental due to the use of chemical fertilizers and pesticides through soil preparation" [26].

Today the department, which implements measures of sustainable agriculture is the Sustainable Agriculture Division of the Agricultural Production Bureau at the Ministry of Agriculture, Forestry and Fisheries [21]. The activities of the division can be divided into 4 main groups: (1) direct payments for environmentally friendly agriculture, (2) organic agriculture promotion (3) activities against Global Warming, (4) Promotion of "good agricultural practices" (GAP).

Challenges and sustainable agriculture measures promotion

One of the central documents which is targeted to regulate sustainable agriculture in Japan is "MIDORI Strategy for sustainable food systems" [40], sometimes it is also called "Measures for achievement of Decarbonization and Resilience with Innovation (MeaDRI), (in English language literature). It was developed by MAFF in 2021. The Japan Crop Protection Association (JCPA) views MeaDRI as an innovation-driven and mid- to long-term strategy.

If we put together the main targets set in the document, there is the following list:

- zero CO2 emissions from fossil fuel combustion in the agriculture, forestry and fisheries (by 2050)
- 50% reduction in risk-weighted use of chemical pesticides by dissemination of the Integrated Pest Management and newly developed alternatives (by 2050)
- 30% reduction in chemical fertilizer use (by 2050)
- increase in organic farming to 1Mha (equivalent to 25% of farmland) (by 2050)
- at least 30% enhancement in the productivity of the food manufacturers (by 2030)
- sustainable sourcing for import materials (by 2030)
- above 90% usage of superior variety of alternatives and F1 plus trees in forestry seedling (by 2050)
- 100% usage of artificial seedling rates in aquaculture of Japanese eel, Pacific bluefin tuna, and etc. (by 2050)

Direct payments for environment-friendly agriculture

In order to promote sustainable agriculture, the government started to create special budgets since 2011. In combination with efforts to reduce chemical fertilizers and synthetic pesticides by 50% or more these special budgets are highly effective in preventing global warming and preserving biodiversity [27]. Since 2015 the direct payments to the farmers started, based on the "Act on Multi-functional Promotion of Agriculture" (Act No. 78, 2014) [27]. There is also a tendency for the amount of the environment reserve agriculture budget to grow.

Table 1.

Environmental conservation-type agriculture direct payment subsidies in Japan

	Number of cases	Area (ha)	Subsidy amount (million yen)
2023	3 245	86 545	4 826
2022	3 163	82 803	4 605
2021	3 144	81 743	4 502
2019	3 479	79 839	4 543
2017	3 822	89 082	4 587
2015	4 081	74 180	4 213
2013	15 240	51 114	3 082
2012	12 985	41 439	2 996
2011	6 622	17 009	1 331

The area covered by the direct payment subsidy for environment friendly agriculture in 2023 provided by the MAFF was approximately 87,000 ha (Table 1 [28]). Starting from the initial 2011 year the territory has increased significantly. The amount of payment has also increased and achieved the amount almost up to 5000 million yen. Although the general structure of current subsidies is stabilized from around 2015 that was the year when the number of projects was extremely reduced.

The direct payments for farmers are classified by their effectiveness in two objectives: in “preventing global warming” (applying compost, planting cover crops, interplant living mulch) and “preserving biodiversity” (organic farming, biotope, which is providing habitats for aquatic organisms by filling some parts of the paddy field with water, filling a paddy field with water in winter, that secures a watering period of more than 2 months) (Table 2 [9]).

Table 2.

Granted amounts of payments for common national activities in Japan

Subject of activities		Granted amounts of payments
Organic farming	Farm products except coarse cereals (e.g., buckwheat) and forage crops	12,000 yen/10a
	When you do organic farming with effective soil carbon sequestration[1], 2,00 yen/10a is added.	
	Coarse cereals (e.g., buckwheat) and forage crops	3,000 yen/10a

[1] Organic farmers shall introduce one of the following options and conduct soil tests: 1) applying compost, 2) planting cover crops, 3) living mulch, 4) sod culture.

Applying compost	4,400 yen/10a
Planting cover crops	6,000 yen/10a
Living mulch (wheat, barley, and Italian ryegrass)	5,400 yen/10a (3200 yen/10a)
Sod culture	5,000 yen/10a
No-tillage farming[2]	3,000 yen/10a
Extending midseason drainage[3]	800 yen/10a
Autumn plowing[4]	800 yen/10a

According to the survey of effects on the prevention of global warming provided by the Ministry of Agriculture, Forestry and Fisheries (MAFF), published in 2023 [41], the result of the activities provided for the period 2020-2023 greenhouse gases emissions have been cut by 170,048 tons of CO2 equivalent per year. It is approximately 0,016% of the total emission in Japan in 2022 (1 085 000 kt) [22].

Survey of the results of the activities on the biodiversity preservation were also found effective. In case of the organic farming, winter flood control and Integrated Pest management (IPM) fields indicator organism score was found about 4.0. In case of conventional cultivation fields indicator organism score is lower, it is slightly higher than 2.5 [9].

Measures to prevent Global Warming

Concerning Greenhouse gas emission, Japan has quite a low level which has a tendency to decrease. It was about 1150 million tons of carbon dioxide equivalent (Mt CO_2 eq.) in 2020, that is 5.1% down compared to 2019 [15]. At the same time most of the emissions come from energy production, rather than agriculture. According to the information provided by Japan Center for Climate Change Actions, Japan produced only 3.2% of the world total in 2018 [34]. The share of agriculture and forestry industry was only 4% of the Japanese CO2 emissions while the world average number is 24% [29]. However, Japan is ranked fifth among the countries that emit the most CO_2 in the world, following China, the U.S., India and Russia [5].

[2] No-tillage farming refers to the activity in which the ridge lows of the previous crop are used and the seeds are sown by a non-tillage seeder that cultivates only the part of the ridge lows to sow.

[3] Extending midseason drainage is the activity to dry the surface of a paddy field by draining water for more than 14 days in the middle of growing rice.

[4] Autumn plowing is the activity of plowing a paddy field after harvest. Flooding the paddy field shall be done four months after plowing.

Table 3.

Emission of Greenhouse Gases (in million tons of CO_2 equivalent)

Greenhouse Gases	2010	2015	2018	2019	2020	2021
Total	1 303	1 321	1 247	1 212	1 147	1 170
Carbon dioxide	1 217	1 226	1 146	1 108	1 042	1 064
Methane	31.9	29.2	28.6	28.4	27.4	27.4
Nitrous oxide	22.2	20.7	20.1	19.8	19.7	10.5
Hydro fluorocarbons	12.3	39.3	47.0	49.7	52.2	53.6
Per fluorocarbons	4.3	3.3	3.5	3.4	3.5	3.2
Sulphur hexafluoride	2.4	2.1	2.1	2.0	2.0	2.0
Nitrogen trifluoride	1.5	0.6	0.3	0.3	0.3	0.4

In 2021 the Prime Minister Cabinet approved the Plan for Global Warming Countermeasures and introduced a new target of reducing the greenhouse gas emissions by 46% (compared to fiscal 2013) by fiscal 2030. However, it seems that efforts are insufficient to achieve the goal (Table 3 [7-8]). According to the Green Food System Strategy guidelines, developed by MAFF, carbon dioxide (CO_2) emissions in the agriculture and fisheries sectors should be reduced virtually to zero by 2050 [25], but this goal is not achievable either.

One more ambitious initiative is the development of renewable energy, which is being actively introduced in agricultural industry. The initiative solves a variety of challenges, it reduces the burden both on the farmers' electricity bills and on the environment, making the shift from traditional energy sources to "green" ones.

The initiative is provided on the base of the "Act on Promoting the Generation of Electricity from Renewable Energy Sources Harmonized with Sound Development of Agriculture, Forestry and Fisheries" (Act No. 81, 2015) [35], which was enacted by the Diet in December 2013. The trigger for the Law turned to be the Fukushima nuclear plant incident caused by the 2011 Great East Japan Earthquake. The energy crisis emphasized the importance of decentralized power generation, and renewable energy introduction seemed to be the way out. The document was last time revised in July 2019.

The Basic Energy Plan, renewed in October 2021, indicates a target of boosting renewable energy's share of total power generation to 22-24% by FY2030. The share in FY2019 rose by 1.2 percentage points from the previous year to the level of 18% [23]. The government also sets the target to double the economic scale of the districts that make efforts to develop local agriculture, forestry and fisheries by utilizing renewable energy from 2018 (30 billion yen) till 2023 (60 billion yen). The registered one-year growth was 7.5 billion yen, reaching 37 billion yen in 2019 [36].

The number of renewable energy power generation facilities in agricultural and rural development projects is also steadily growing (Figure 1 [32]). The increase happens both in farm-type solar power generation, in which a pillar is set up on the farmland and a solar power generation facility is installed in the upper space to generate power while continue farming (in 2019 increased to 560ha, by 147ha from the previous year), and in the number of agricultural land conversion for installing equipment (in FY2019 increased to 1,992 items, by 481 items from the previous year) [32].

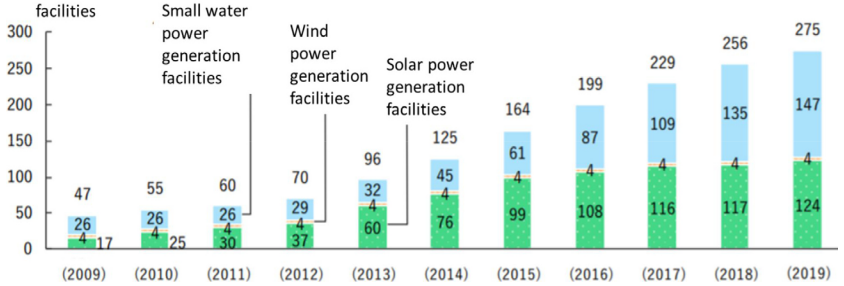

Fig. 1. The number of renewable energy power generation facilities in agricultural and rural development projects (2009-2019)

Organic agriculture promotion

Another important issue is chemical fertilizers, as Japan is heavily dependent on them. The amount used in Japan in 2008 was 259 kg/ha, which was higher than across most of the developed countries. The UK uses 20% less, Germany – 39% less, France – 47% less. Only South Korea consumes by 64% more chemical fertilizers per hectare than Japan [38]. Concerning the amount of chemical fertilizers used as a whole, Japan is ranked 5th worldwide (0.5%), following India (16.2%), Brazil (10.2%), the U.S. (9.9%) and Indonesia (3.3%) [37]. The amount of chemical fertilizers used in 2016 was 900,000 tons and it is expected to be reduced to 720,000 and 630,000 tons in 2030 and 2050 respectively [25].

Government realizes that heavy dependency on the chemical fertilizers prevents industry from long-term land productivity and potentially negatively affects both soil itself and nature in general through pollution of the nature. In order to reduce the burden on the environment, especially in terms of pesticides and chemical fertilizers usage, MAFF encourages farmers to follow the requirement for receiving subsidies from April 2024. From 2027 onwards, the government is considering expanding these efforts to all subsidies and checking

whether the information, filled in by the farmers, is corresponds to the actual state of things. The official government target is to reduce the use of pesticides by 50% and chemical fertilizers by 30% by 2050. In 2022, the program's funding grew to 2.9 billion yen (USD 25.4 million) [31].

Japanese Agricultural Standards (JAS) for organically grown plants and organic processed foods of plant origin were first established in 2000, along with the Codex Alimentarius Commission's adoption of the Guidelines for the Production, Processing, Labeling, and Marketing of Organically Produced Foods [14]. In the case of organic agriculture, they have a guideline called "Japanese Agricultural Standard for Organic Plants" [19].

Another initiative introduced by MAFF is the promotion of organic agriculture hubs by creating examples. One of them is the hub in Izumi City, Chiba Prefecture, where experienced organic farmers have been educating students and developing a supply chain for organic rice and vegetables for school lunches since 2018. Nevertheless the results are quite poor with the organic cultivation area increase of 0.1% of the total cultivated land during the period from 2018 to 2021 (from 24,000 ha to 26,600 ha out of 4.3 million hectares) [12].

Water conservation is another challenge for sustainable agriculture in Japan, connected with fertilizes problem. As most of the Japanese agricultural production consist of irrigated paddy fields, it is responsible for consuming approximately 65% of the country's water resources [12]. In the study released in 2000 agriculture was responsible for around 11–17% of pollution in four major lakes in Japan (Lake Biwa, Lake Kasumigaura, Lake Inbanuma, and Lake Suwa) [12]. The usage of slow-release fertilizers brought positive results in an approximately 19.6% decrease in the nitrogen load running off into water bodies, such as Lake Biwa.

Promotion of good agriculture practices

"GAP is a set of management activities of agricultural production process to ensure sustainability in agriculture by five components": food safety, environmental conservation, worker safety, protection of human rights, and farm management [20].

The specific approach of developing simple steps in order to provide institutional changes is reflected in the development of GAP. Dissemination of GAP is provided in two steps: "implementation" and "acquisition of certification". The first one is expected to contribute to better farm management. The second one means that the farmers are audited and proved with a certificate by third party institutions (namely certification bodies complying with the ISO/IEC 17065

standard). "Acquisition of GAP certification" is a step to expand sales channel by ensuring the credibility of the products through visualizing their farm practices.

The GAP certification in Japan has a growing trend. It increased from 4581 farmers in 2017 to 7979 farmers in 2022 [20]. Though the trend is a growing one, the result seems to be quite poor (0.6%), if we take into consideration the number of farmers (1,23 million farmers in 2022) [18].

One more challenge for the country is a reduction of food waste. The amount of food loss and waste generated by businesses and households has been reducing in Japan over the last decade, but the rates are quite low. The estimated amount of food waste generated in 2018 was approximately 25.31 million tons, of which 6 million tons were thrown away despite being edible (Table 4 [42]).

Table 4.

The estimated amount of Food Loss and Waste (million tons)

	FLW excluding inedible portion			FLW including inedible portion		
	Total	Business	Households	Total	Business	Households
2022	4,72	2,36	2,36	-	-	-
2021	5,23	2,79	2,44	-	-	-
2020	5,22	2,75	2,47	-	-	-
2019	5,70	3,09	2,61	-	-	-
2018	6,00	3,24	2,76	25,31	17,65	7,66
2017	6,12	3,28	2,84	25,50	17,67	7,83
2016	6,43	3,52	2,91	27,59	19,70	7,89
2015	6,46	3,57	2,89	28,42	20,10	8,32
2014	6,21	3,39	2,82	27,75	19,53	8,22
2015	6,32	3,30	3,02	27,97	19,27	8,70
2016	6,42	3,31	3,12	28,01	19,16	8,85

Waste reduction activities are regulated on the base of the "Act on Promotion of Food Loss and Waste Reduction", introduced in October 2018. It sets the goal to reduce food loss based on the SDGs by 2030 in two times compare to 2000. Some of the efforts of this initiative are prolongation of delivery deadline, expiration date extension, improvement of demand forecast accuracy.

But as we could see in the paper the results are not up to the plans.

Conclusion

The latest tendency of the policies provided by the Japanese government is targeted at the introduction of sustainable development principles, and agriculture is not an exception, as all the spheres of socio-economic system should be balanced to each other. But sustainable agriculture in Japan is not strictly based

on SDGs, developed by the United Nations in 2015. The ideas have a strong Japanese background, and some of the approaches have started to be adopted even earlier. The policy targeted at sustainable agriculture is mainly developed by MAFF and fixed in a range of documents, published by the Ministry.

The turning point in the sustainable agriculture strategy development happened in 2021, when "MIDORI Strategy for sustainable food systems" was published. The document puts together all the elements of the environment protection policy and sets the targets for 2030 and 2050 in all the fields of sustainable agriculture.

Though the government keeps an eye on the problems and there are evident positive shifts, the measures provided are not enough to achieve the goals within a targeted period. The main focus is made on social and food supply security aspects, but the environmental problems are left at the backyard. The most complicated issue is high-level reliance on pesticides and chemical fertilizers.

References

1. Markaryan, S. B. (2017). Import substitution in Japan's agricultural sector. *Japanese Studies*, *(1)*, 46–59. Retrieved from: https://www.japanjournal.ru/jour/article/view/151/145 (accessed: 26.05.2022)
2. Markaryan, S. B. (2009). The issue of food security in new economic conditions. In *World crisis and Japan* (I. P. Lebedev & S. B. Markaryan, Eds.). Moscow: AIRO XXI, 99–121
3. Markaryan, S. B. (2007). Agricultural cooperation in Japan: challenges and prospects. *Yearbook Japan*, *36*, 131–147. Retrieved from: https://www.yearbookjapan.ru/jour/article/view/84/85 (accessed: 25.03.2022)
4. Milovidov, V. D., & Asker Zade, N. V. (2020). Protectionism 2.0: the new reality of the globalization era. *World Economy and International Relations*, *64*(8), 37–45. https://doi.org/10.20542/0131-2227-2020-64-8-37-45
5. Blokhin, A. (2024). *The 5 countries that produce the most carbon dioxide (CO_2)*. Investopedia. Retrieved from: https://www.investopedia.com/articles/investing/092915/5-countries-produce-most-carbon-dioxide-co2.asp (accessed: 06.09.2024)
6. Bosquerolli, M. (2025). Evolution of sustainable development in Japan: from historical foundations to green transformation. *Asian Journal of Agricultural Extension, Economics & Sociology*, *43*(3), 54–65
7. Statistics Bureau of Japan. (2022). Chapter 17, Environment. In *Japan Statistical Yearbook 2022*. Retrieved from: https://www.stat.go.jp/english/data/nenkan/71nenkan/index.html (accessed: 02.09.2024)
8. Statistics Bureau of Japan. (2024). Chapter 17, Environment. In *Japan Statistical Yearbook 2024*. Retrieved from: https://www.stat.go.jp/english/data/nenkan/73nenkan/index.html (accessed: 02.09.2024)

9. MAFF. *Direct payments for environmentally friendly agriculture*. Retrieved from: https://www.maff.go.jp/e/policies/env/sustainagri/directpay.html (accessed: 02.09.2024)
10. Emelyanova, O. N. (2024). Japan's agricultural policy towards food security improvement: key strategies, initiatives and outcomes. *Vostok. Afro-Aziatskie obshchestva: istoriia i sovremennost [Oriens. African-Asian societies: history and modernity]*, *(1)*, 153–164. https://doi.org/10.31857/S086919080029514-2
11. Freiner, N. L. (2019). *Rice and agricultural policies in Japan: the loss of traditional lifestyle*. London: Palgrave Macmillan, 197 p. https://doi.org/10.1007/978-3-319-91430-5
12. Fuhrmann Aoyagi, M., Miura, K., & Watanabe, K. (2024). Sustainability in Japan's agriculture: an analysis of current approaches. *Sustainability*, *16*(2). https://doi.org/10.3390/su16020596
13. MOFA. *Government's efforts*. Retrieved from: https://www.mofa.go.jp/policy/oda/sdgs/effort/index.html (accessed: 25.03.2022)
14. FAO. (1999). *Guidelines for the production, processing, labelling and marketing of organically produced foods*. Retrieved from: https://www.fao.org/input/download/standards/360/cxg_032e.pdf (accessed: 28.08.2024)
15. Ministry of Environment. (2022). *Japan's national greenhouse gas emissions in fiscal year 2020 (final figures)*. Retrieved from: https://www.env.go.jp/en/headline/2599.html (accessed: 03.09.2024)
16. Lama, P. (2017). Japan's food security problem: increasing self-sufficiency in traditional food. *IndraStra Global*, *3*(7). Retrieved from: http://www.indrastra.com/2017/07/Japan-s-Food-Security-Problem-Increasing-Self-Sufficiency-in-Traditional-Food-003-07-2017-0029.html (accessed: 15.02.2022)
17. Niehaus, A., & Walravens, T. (2017). *Feeding Japan: the cultural and political issues of dependency and risk*. London: Palgrave Macmillan, 551 p. https://doi.org/10.1007/978-3-319-50553-4
18. Statista. (2024). *Number of core persons engaged in the farming industry in Japan from 2005 to 2023*. Retrieved from: https://www.statista.com/statistics/1289069/japan-number-person-engaged-farming/ (accessed: 09.09.2024)
19. MAFF. *Organic JAS*. Retrieved from: https://www.maff.go.jp/e/policies/standard/specific/organic_JAS.html (accessed: 28.08.2024)
20. MAFF. (2023). *Promotion of GAP in Japan*. Retrieved from: https://www.maff.go.jp/e/policies/env/sustainagri/attach/pdf/promogap-6.pdf (accessed: 09.09.2024)
21. MAFF. *Sustainable agriculture*. Retrieved from: https://www.maff.go.jp/e/policies/env/sustainagri/ (accessed: 09.09.2024)
22. Ministry of Environment. (2024). *2022*年度の我が国の温室効果ガス排出・吸収量について *[Publication of the Japan's greenhouse gas emissions and ab-*

sorption in FY2022]. Retrieved from: https://www.env.go.jp/press/press_03046.html (accessed: 02.09.2024). (In Japanese)
23. METI. (2021). エネルギー基本計画 *[The basic plan of energy development]*. Retrieved from: https://www.meti.go.jp/press/2021/10/20211022005/20211022005-1.pdf (accessed: 28.05.2022). (In Japanese)
24. Oguchi, H. (2021). 日本の食と農の未来 「持続可能な食卓」を考える *[Thinking about the future of Japanese food and agriculture: sustainable dining table]*. Kōbunsha, 248 p. (In Japanese)
25. Nikkei. (2022, June 21). 化学肥料*20%*削減、政府が*30*年目標　農業の脱炭素促す *[20 % reduction in chemical fertilizer: government targets 30-year agricultural decarbonization]*. Retrieved from: https://www.nikkei.com/article/DGXZQOUA20AV10Q2A620C2000000/ (accessed: 02.09.2024). (In Japanese)
26. MAFF. (2016). 環境保全型農業の推進について *[Promoting environmentally friendly agriculture]*. Retrieved from: https://www.maff.go.jp/j/seisan/kankyo/hozen_type/pdf/suisin_280401_part1.pdf (accessed: 24.05.2022). (In Japanese)
27. MAFF. 環境保全型農業直接支払交付金 *[Direct payment subsidy for environmental conservation agriculture]*. Retrieved from: https://www.maff.go.jp/j/seisan/kankyo/kakyou_chokubarai/mainp.html (accessed: 24.05.2022). (In Japanese)
28. MAFF. (2023). 環境保全型農業直接支払交付金について *[Direct payment subsidy for environmental conservation agriculture]*. Retrieved from: https://www.maff.go.jp/j/seisan/kankyo/kakyou_chokubarai/attach/pdf/mainp-166.pdf (accessed: 02.09.2024). (In Japanese)
29. MAFF. (2020). 気候変動に対する農林水産省の取組 *[Efforts by the MAFF to address climate change]*. Retrieved from: https://www.maff.go.jp/j/kanbo/kankyo/seisaku/GR/attach/pdf/s_win_abs-71.pdf (accessed: 30.03.2022). (In Japanese)
30. MAFF. 国内総生産に関する統計 *[GDP statistics]*. Retrieved from: https://www.maff.go.jp/j/tokei/sihyo/data/01.html (accessed: 02.09.2024). (In Japanese)
31. NHK. (2024, January 11). 持続可能な農業に向けて 環境負荷低減の取り組み促進へ 農水省 *[MAFF promoting efforts to reduce environmental impact for sustainable agriculture]*. Retrieved from: https://www3.nhk.or.jp/news/html/20240111/k10014316861000.html (accessed: 28.08.2024). (In Japanese)
32. MAFF. (2021). 食料・農業・農村の動向 *[Trends in food, agriculture and rural areas]*. Retrieved from: https://www.maff.go.jp/j/wpaper/w_maff/r2/pdf/zentaiban.pdf (accessed: 30.03.2022). (In Japanese)
33. Chikasada, M. (2011). 日本の食卓を守る食料安全保障政策*:* 食料自給と農業再生 *[Food security policy to protect Japan's dining table: food self-sufficiency and agricultural regeneration]*. Yūyama sha, 101 p. (In Japanese)

34. Japan Center for Climate Change Actions. (n.d.). データで見る温室効果ガス排出量 *[Greenhouse gas emissions in data]*. Retrieved from: https://www.jccca.org/global-warming/knowleadge04 (accessed: 30.03.2022). (In Japanese)
35. MAFF. (2021). 農山漁村再生可能エネルギー法 *[Agriculture, forestry and fisheries renewable energy act]*. Retrieved from: https://www.maff.go.jp/j/shokusan/renewable/energy/houritu.html (accessed: 24.03.2022). (In Japanese)
36. MAFF. (2018). 農山漁村再生可能エネルギー法の施行状況と検討の方向性について. 農林水産省 *[Status of the rural renewable energy law and its further review]*. Retrieved from: https://www.maff.go.jp/j/council/seisaku/syokusan/bukai_28/attach/pdf/index-9.pdf (accessed: 20.05.2022). (In Japanese)
37. MAFF. (2023). 肥料をめぐる情勢 *[The overview of fertilizers]*. Retrieved from: https://www.maff.go.jp/j/seisan/sien/sizai/s_hiryo/attach/pdf/HiryouMegujiR5-5b.pdf (accessed: 26.04.2023). (In Japanese)
38. MAFF. (2014). 平成*25*年度 食料・農業・農村白書 全文 *[White paper on food, agriculture and rural areas, FY2013]*. Retrieved from: https://warp.ndl.go.jp/info:ndljp/pid/12232574/www.maff.go.jp/j/wpaper/w_maff/h25/zenbun.html (accessed: 02.09.2024). (In Japanese)
39. 農政ジャーナリストの会 [Agricultural Journalists' Association]. (2022). 広がる「食の格差」とどう向き合うか 日本農業の動き *No. 213 [How do we deal with the increasing food gap? Japanese agricultural movement, No. 213]*. 123 p. (In Japanese)
40. MAFF. みどりの食料システム戦略トップページ *[MIDORI strategy for sustainable food systems]*. Retrieved from: https://www.maff.go.jp/j/kanbo/kankyo/seisaku/midori/ (accessed: 02.09.2024). (In Japanese)
41. MAFF. (2023). 令和４年 地球温暖化影響調査レポート *[Global warming impact survey report 2022]*. Retrieved from: https://www.maff.go.jp/j/seisan/kankyo/ondanka/attach/pdf/report-64.pdf (accessed: 02.09.2024). (In Japanese)
42. Ministry of Environment. (2024). 我が国の食品ロスの発生量の推計値（令和４年度）の公表について *[Publication of the estimated amount of food loss in Japan (FY2022)]*. Retrieved from: https://www.env.go.jp/press/press_03332.html (accessed: 02.09.2024). (In Japanese)

Список литературы

1. Маркарьян, С. Б. (2017). Импортозамещение в аграрном секторе Японии. *Японские исследования*, (1), 46–59. URL: https://www.japanjournal.ru/jour/article/view/151/145 *(дата обращения: 26.05.2022)*.
2. Маркарьян, С. Б. (2009). Проблема продовольственной безопасности в новых экономических условиях. В *Мировой кризис и Япония* (под ред. И. П. Лебедева, С. Б. Маркарьян). М.: АЙРО-XXI, 99–121.

3. Маркарьян, С. Б. (2007). Сельскохозяйственная кооперация Японии (проблемы и перспективы). *Ежегодник Япония*, *36*, 131–147. URL: https://www.yearbookjapan.ru/jour/article/view/84/85 *(дата обращения: 25.03.2022)*.
4. Миловидов, В. Д., & Аскер-Заде, Н. В. (2020). Протекционизм 2.0: новая реальность эпохи глобализации. *Мировая экономика и международные отношения*, *64*(8), 37–45. https://doi.org/10.20542/0131-2227-2020-64-8-37-45
5. Blokhin, A. (2024). The 5 countries that produce the most carbon dioxide (CO_2). *Investopedia*. URL: https://www.investopedia.com/articles/investing/092915/5-countries-produce-most-carbon-dioxide-co2.asp *(accessed: 06.09.2024)*.
6. Bosquerolli, M. (2025). Evolution of sustainable development in Japan: from historical foundations to green transformation. *Asian Journal of Agricultural Extension, Economics & Sociology*, *43*(3), 54–65.
7. Statistics Bureau of Japan. (2022). Chapter 17, Environment. In *Japan Statistical Yearbook 2022*. URL: https://www.stat.go.jp/english/data/nenkan/71nenkan/index.html *(accessed: 02.09.2024)*.
8. Statistics Bureau of Japan. (2024). Chapter 17, Environment. In *Japan Statistical Yearbook 2024*. URL: https://www.stat.go.jp/english/data/nenkan/73nenkan/index.html *(accessed: 02.09.2024)*.
9. MAFF. Direct payments for environmentally friendly agriculture. URL: https://www.maff.go.jp/e/policies/env/sustainagri/directpay.html *(accessed: 02.09.2024)*.
10. Emelyanova, O. N. (2024). Japan's agricultural policy towards food security improvement: key strategies, initiatives and outcomes. *Vostok. Afro-Aziatskie obshchestva: istoriia i sovremennost* [*Oriens. African-Asian societies: history and modernity*], (1), 153–164. https://doi.org/10.31857/S086919080029514-2
11. Freiner, N. L. (2019). *Rice and agricultural policies in Japan: the loss of traditional lifestyle*. London: Palgrave Macmillan, 197 p. https://doi.org/10.1007/978-3-319-91430-5
12. Fuhrmann-Aoyagi, M., Miura, K., & Watanabe, K. (2024). Sustainability in Japan's agriculture: an analysis of current approaches. *Sustainability*, *16*(2). https://doi.org/10.3390/su16020596
13. MOFA. Government's efforts. URL: https://www.mofa.go.jp/policy/oda/sdgs/effort/index.html *(accessed: 25.03.2022)*.
14. FAO. (1999). *Guidelines for the production, processing, labelling and marketing of organically produced foods*. URL: https://www.fao.org/input/download/standards/360/cxg_032e.pdf *(accessed: 28.08.2024)*.
15. Ministry of Environment. (2022). *Japan's national greenhouse gas emissions in fiscal year 2020 (final figures)*. URL: https://www.env.go.jp/en/headline/2599.html *(accessed: 03.09.2024)*.

16. Lama, P. (2017). Japan's food security problem: increasing self-sufficiency in traditional food. *IndraStra Global*, *3*(7). URL: http://www.indrastra.com/2017/07/Japan-s-Food-Security-Problem-Increasing-Self-Sufficiency-in-Traditional-Food-003-07-2017-0029.html *(accessed: 15.02.2022)*.
17. Niehaus, A., & Walravens, T. (2017). *Feeding Japan: the cultural and political issues of dependency and risk*. London: Palgrave Macmillan, 551 p. https://doi.org/10.1007/978-3-319-50553-4
18. Statista. (2024). *Number of core persons engaged in the farming industry in Japan from 2005 to 2023*. URL: https://www.statista.com/statistics/1289069/japan-number-person-engaged-farming/ *(accessed: 09.09.2024)*.
19. MAFF. *Organic JAS*. URL: https://www.maff.go.jp/e/policies/standard/specific/organic_JAS.html *(accessed: 28.08.2024)*.
20. MAFF. (2023). *Promotion of GAP in Japan*. URL: https://www.maff.go.jp/e/policies/env/sustainagri/attach/pdf/promogap-6.pdf *(accessed: 09.09.2024)*.
21. MAFF. *Sustainable agriculture*. URL: https://www.maff.go.jp/e/policies/env/sustainagri/ *(accessed: 09.09.2024)*.
22. Ministry of Environment. (2024). *2022*年度の我が国の温室効果ガス排出・吸収量について [Publication of the Japan's greenhouse gas emissions and absorption in FY2022]. URL: https://www.env.go.jp/press/press_03046.html *(accessed: 02.09.2024)*. (In Jap.)
23. METI. (2021). エネルギー基本計画 [The basic plan of energy development]. URL: https://www.meti.go.jp/press/2021/10/20211022005/20211022005-1.pdf *(accessed: 28.05.2022)*. (In Jap.)
24. Oguchi, H. (2021). 日本の食と農の未来 「持続可能な食卓」を考える [*Thinking about the future of Japanese food and agriculture: sustainable dining table*]. 光文社, 248 p. (In Jap.)
25. Nikkei. (2022, June 21). 化学肥料*20%*削減、政府が*30*年目標　農業の脱炭素促す [*20 % reduction in chemical fertilizer: government targets 30-year agricultural decarbonization*]. URL: https://www.nikkei.com/article/DGXZQOUA20AV10Q2A620C2000000/ *(accessed: 02.09.2024)*. (In Jap.)
26. MAFF. (2016). 環境保全型農業の推進について [*Promoting environmentally friendly agriculture*]. URL: https://www.maff.go.jp/j/seisan/kankyo/hozen_type/pdf/suisin_280401_part1.pdf *(accessed: 24.05.2022)*. (In Jap.)
27. MAFF. 環境保全型農業直接支払交付金 [*Direct payment subsidy for environmental conservation agriculture*]. URL: https://www.maff.go.jp/j/seisan/kankyo/kakyou_chokubarai/mainp.html *(accessed: 24.05.2022)*. (In Jap.)
28. MAFF. (2023). 環境保全型農業直接支払交付金について [*Direct payment subsidy for environmental conservation agriculture*]. URL: https://www.maff.

go.jp/j/seisan/kankyo/kakyou_chokubarai/attach/pdf/mainp-166.pdf *(accessed: 02.09.2024)*. (In Jap.)
29. MAFF. (2020). 気候変動に対する農林水産省の取組 [*Efforts by the MAFF to address climate change*]. URL: https://www.maff.go.jp/j/kanbo/kankyo/seisaku/GR/attach/pdf/s_win_abs-71.pdf *(accessed: 30.03.2022)*. (In Jap.)
30. MAFF. 国内総生産に関する統計 [*GDP statistics*]. URL: https://www.maff.go.jp/j/tokei/sihyo/data/01.html *(accessed: 02.09.2024)*. (In Jap.)
31. NHK. (2024, January 11). 持続可能な農業に向けて 環境負荷低減の取り組み促進へ 農水省 [*MAFF promoting efforts to reduce environmental impact for sustainable agriculture*]. URL: https://www3.nhk.or.jp/news/html/20240111/k10014316861000.html *(accessed: 28.08.2024)*. (In Jap.)
32. MAFF. (2021). 食料・農業・農村の動向 [*Trends in food, agriculture and rural areas*]. URL: https://www.maff.go.jp/j/wpaper/w_maff/r2/pdf/zentaiban.pdf *(accessed: 30.03.2022)*. (In Jap.)
33. Chikasada, M. (2011). 日本の食卓を守る食料安全保障政策*:* 食料自給と農業再生 [*Food security policy to protect Japan's dining table: food self-sufficiency and agricultural regeneration*]. 雄山社, 101 p. (In Jap.)
34. Japan Center for Climate Change Actions. (n.d.). データで見る温室効果ガス排出量 [*Greenhouse gas emissions in data*]. URL: https://www.jccca.org/global-warming/knowleadge04 *(accessed: 30.03.2022)*. (In Jap.)
35. MAFF. (2021). 農山漁村再生可能エネルギー法 [*Agriculture, forestry and fisheries renewable energy act*]. URL: https://www.maff.go.jp/j/shokusan/renewable/energy/houritu.html *(accessed: 24.03.2022)*. (In Jap.)
36. MAFF. (2018). 農山漁村再生可能エネルギー法の施行状況と検討の方向性について. 農林水産省[*Status of the rural renewable energy law and its further review*]. URL: https://www.maff.go.jp/j/council/seisaku/syokusan/bukai_28/attach/pdf/index-9.pdf *(accessed: 20.05.2022)*. (In Jap.)
37. MAFF. (2023). 肥料をめぐる情勢 [*The overview of fertilizers*]. URL: https://www.maff.go.jp/j/seisan/sien/sizai/s_hiryo/attach/pdf/HiryouMegujiR5-5b.pdf *(accessed: 26.04.2023)*. (In Jap.)
38. MAFF. (2014). 平成*25*年度 食料・農業・農村白書 全文 [*White paper on food, agriculture and rural areas, FY2013*]. URL: https://warp.ndl.go.jp/info:ndljp/pid/12232574/www.maff.go.jp/j/wpaper/w_maff/h25/zenbun.html *(accessed: 02.09.2024)*. (In Jap.)
39. 農政ジャーナリストの会 [Agricultural Journalists' Association]. (2022). 広がる「食の格差」とどう向き合うか 日本農業の動き *No. 213* [*How do we deal with the increasing food gap? Japanese agricultural movement, No. 213*]. 123 p. (In Jap.)

40. MAFF. みどりの食料システム戦略トップページ [*MIDORI strategy for sustainable food systems*]. URL: https://www.maff.go.jp/j/kanbo/kankyo/seisaku/midori/ *(accessed: 02.09.2024)*. (In Jap.)
41. MAFF. (2023). 令和４年 地球温暖化影響調査レポート [*Global warming impact survey report 2022*]. URL: https://www.maff.go.jp/j/seisan/kankyo/ondanka/attach/pdf/report-64.pdf *(accessed: 02.09.2024)*. (In Jap.)
42. Ministry of Environment. (2024). 我が国の食品ロスの発生量の推計値（令和４年度）の公表について [*Publication of the estimated amount of food loss in Japan (FY2022)*]. URL: https://www.env.go.jp/press/press_03332.html *(accessed: 02.09.2024)*. (In Jap.)

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