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*Review*

# State of the Art Review on Land-Use Policy: Changes in Forests, Agricultural Lands and Renewable Energy of Japan

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**Abstract:** Policies in Japan are shifting focus on sustainable land-use management-related policies through consensus building, given the complex options for the community and the landowners. For instance, conversion of agricultural lands to renewable energy sites, which is an example of "land-use conversion for a newly found objective", is rapidly progressing, and actions on "managing of croplands in a minimal (low labor demand) way" has been embodied in certain policies. Currently, there are political and scientific efforts to balance environmental conservation with production activities in agriculture and forestry sectors based on science and evidence. With policies catching up, it is possible to confirm what has been moved from the planning to the implementation stage of the proposed consensus-building system by summarizing and discussing the current progress of the project. More specifically, we highlighted the trends in reusing agricultural lands under the current national-level policies and management options for croplands, such as the "less maintenance way." We also discussed and presented the preliminary results, insights, and prospects from the ongoing project, which then led to the discussion of future considerations in sustainable land-use management in Japan.

**Keywords:** evidence-based policymaking; agricultural land; forests; consensus building; Japan



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## 1. Introduction

There is increased attention to evidence-based policy makings (EBPMs) in the field of agriculture and forestry, for instance, towards agricultural sustainability and food security [1] and sustainable management of forests [2]. Supporting decision-making with evidence-based policy analysis tends to do better in the long run [3] and provides confidence to policymakers in developing policies [4]. In Japan, government officials, academic researchers, and the general public recognize the necessity of EBPM, yet, the evaluation of the actual implementation of EBPM is not as frequent as initially expected [5]. Sugitani [6] noted that if EBPM relied on fewer experts in the formulation of policies, it would not produce a positive contribution; however, if EBPM adopted a participatory policy-creation process, it would provide solid evidence, because the responses of stakeholders can be compiled, reflected upon, and consequently, directions of policy-makings would be re-directed with accountability, which can be translated into practice and ordinary words [6].

With the decreasing population and labor forces in Japan, strategic decisions, for instance, on environmental conservation, animal damage, and disaster prevention are required, and downsizing the labor cost, demand, and management areas should be taken into consideration for EBPMs [7]. Shrinkage or strategic downsizing has been a buzzword for policy making and the sciences alike. For instance, there are ongoing discussions in the field of urban planning and biodiversity conservation [8–10], and increasingly so in the field of forests and agricultural lands [11–13]. In existing literatures, rural areas with unoccupied houses, abandoned farmlands, unmanaged forest lands, or unknown owners,

are increasingly becoming challenges in contemporary Japan [14]. The decreasing number of residents can have multiple negative effects such as: (i) there are fewer workers in the field, resulting in the deterioration of the productivity of agriculture and forests lands, (ii) damage from wild animals accompanied by land abandonment, (iii) dangers from unoccupied houses increases the risk of disasters and social safety, and (iv) increased difficulties to maintain the cost of infrastructures including water supply, bridges, roads, and general social services. There is an increased awareness that rural land areas require policies and scientific attention. It is forecasted that the declining and aging population in Japan is expected to accelerate, albeit with regional differences, which in turn, will result in a decrease in the usage of land areas (Figure 1). For instance, in mountainous agricultural areas, the population will be halved in the next 30 years, and the majority will be 65 years old or older (Figure 1) [15].

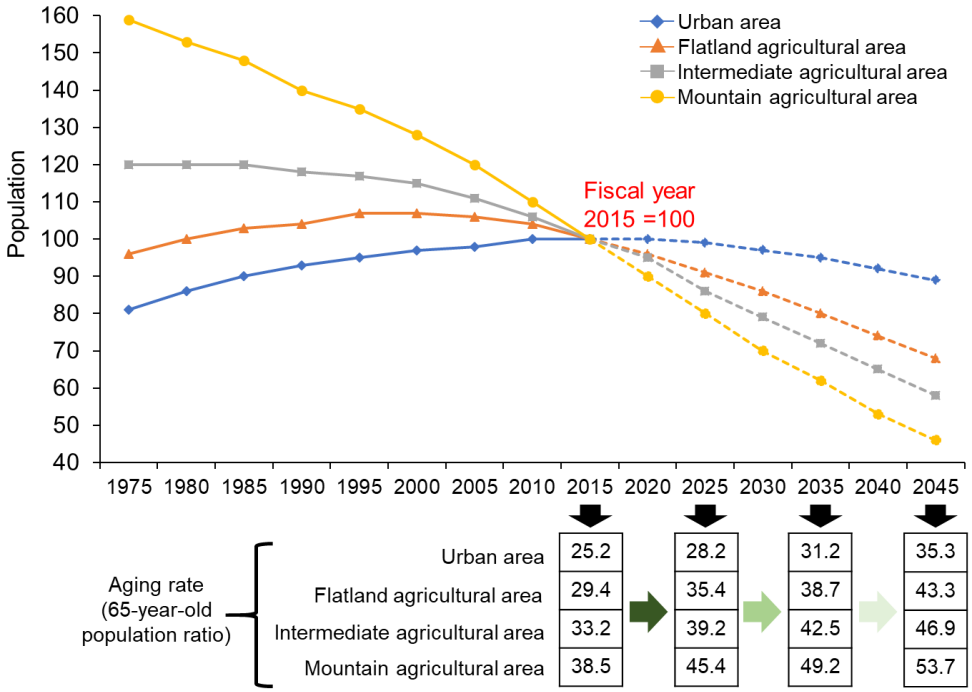


**Figure 1.** Population trends and future forecasts by agricultural area type (modified from [15], MAFF 2019, [Ministry of Agriculture, Forestry and Fisheries]).

Currently, there are political and scientific efforts in Japan to balance environmental conservation with production activities in the agriculture and forestry sectors by applying a evidence-based approach (referred here as EBPM), which encompasses social, economic, and environmental aspects (e.g., land-use, land abandonment, community group discussions and designs, wildlife management, landowner preferences, and trans-generational knowledge transmission) at the local and regional levels [7]. We conducted preliminary reviews of the newly evolving topic with a focus on academic literatures, relevant policy documents, newspaper articles, and other non-peer-reviewed documents. We reviewed different documents since the scope ranged from both practical and scientific areas, and peer-reviewed literatures were still limited, given that changes in the policies are fairly recent. Local contexts were highlighted because landowners have different perceptions on land-use characteristics, which can either be positive (environment, tourism, identity) or negative (damage by wildlife, deterioration of ecosystems, and landscapes) attributes, or both. In other words, it is increasingly recognized that "landowners have (public) responsibilities," in addition to rights, that have been conventionally recognized in legal terms.

In this work, we focused on the broader consensus building beyond individual landowners since we observed during the initial phase of the project that decisions at

local levels were frequently formed by a series of groups, instead of aggregations of individual landowners. First, we reviewed the rapidly changing state-of-the-art policy changes at the national level. Second, we provided project-level results to share the experiences and unique insights obtained from the implementation. The project-level insights were obtained from a project entitled "Development and Implementation of Consensus Building Method for Policies on Balanced Conservation, Agriculture and Forestry," which is based in the Iidaka area, Matsusaka City, Mie, Japan [7]. This 3.5-year project (October 2020 to March 2024) is supported by the Research Institute of Science and Technology for Society, Japan Science and Technology Agency (JST RISTEX) [7].

The review presented here is conducted in two layers (both national and local—project site level) since the changes at the national level can affect decisions at the local level (with possible feedback mechanisms). Moreover, increased policy attention is given to the consensus of the community at national levels, particularly for agricultural lands (i.e., the *Hito Nouchi* Plan or the Agricultural Land Management Plan), and the scientific communities are responding by designing science-based tools, attuned to local policy settings and processes, that support the decisions of the community.

Currently, policies at the national level are still progressing, with a gradual shift on sustainable land-use management-related policies through consensus building, given the complexity of communities and landowners. As shown in Figure 2, there are several options that can be considered by landowners in sustainably managing their lands. For example, "the conversion of agricultural and forest lands to renewable energy sites," is the usual way of repurposing abandoned lands [16]. Additionally, management activities requiring less maintenance and low labor costs are being embedded in policies, such as the "conversion of croplands to grasslands" [17].

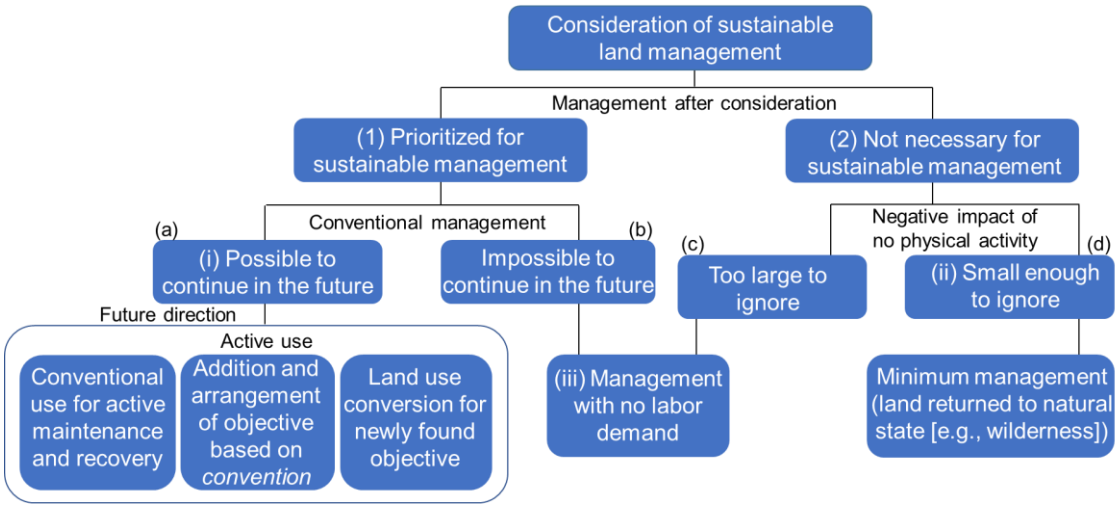


**Figure 2.** Development and planned implementation of the consensus-building mapping system to promote policies that balance agriculture and forestry production with environmental conservation. To achieve sustainable land management goals, croplands that are: (a) possible to manage in the future, (b) cannot be manage, (c) too large to ignore, and (d) small enough to ignore are identified (modified from [7]).

With policies still progressing, we aim to capture the trends, particularly in the planning and the implementation phase of the proposed consensus-building system. More specifically, we highlighted the trends in reusing agricultural lands under the current national-level policies (Section 2) and management options for croplands such as "low labor costs" (Section 3). In addition, we discussed and presented the preliminary results, insights, and prospects from the project site (Section 4). Finally, we elaborated and discussed the general trends observed and the future considerations that can be tackled as the project progresses (Section 5).

## 2. Diversifying Roles of Agricultural Lands under National-Level Policy Framework

### *2.1. Promotion of Active Utilization of Abandoned Agricultural and Degraded Cropland*

Article 2 (1) of the Cropland Act (Act No. 249 of 1952) defines "cropland (*Nochi*)" as "land used for cultivation" [18]. Based on this law, there are measures to manage abandoned croplands (Figure 3). In Article 32 (1), there are two types of "abandoned cropland (*Yukyu-Nochi*)" based on the progress of abandoning cultivation. First, Article 32 (1) (i) states that if the abandonment progresses further, the cropland will be described as "not used for cultivation and is not expected to be used in the future (*Ichigo-Yukyu-Nochi*)." Second, Article 32 (1) (ii) describes croplands as "croplands where agricultural use is found to be significantly inferior compared to other croplands in the surrounding areas (*Nigo-Yukyu-Nochi*)". The first type can also be described as a "degraded agricultural land (*Kohai-Nochi*)." As the abandonment of cultivation practices progresses and the degraded agricultural lands continue not to be used, they will be recognized as "difficult to recycle" by the Agricultural Commission (*Nogyo-Iinkai*) under the Cropland Act [18].

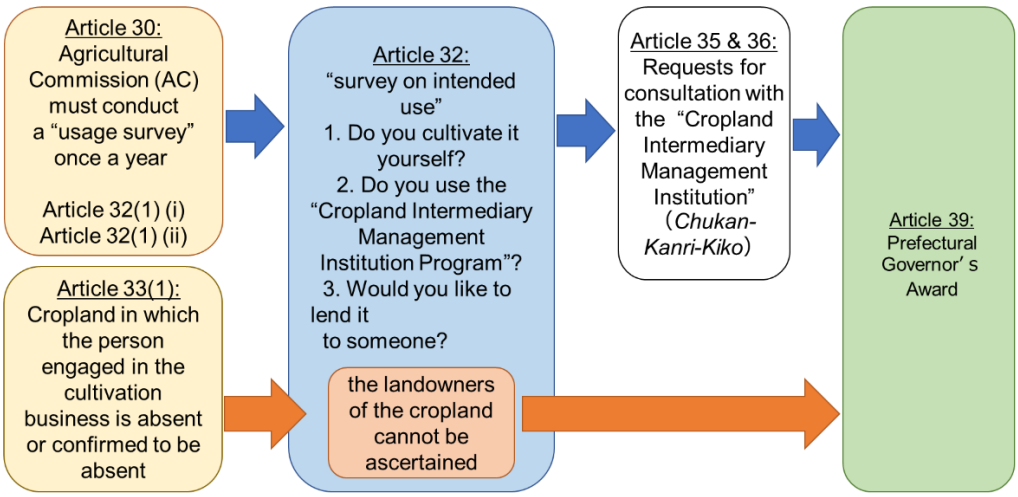


**Figure 3.** Measures in managing abandoned croplands [18].

The Ministry of Agriculture, Forestry and Fisheries (MAFF) categorizes agricultural lands that are not cultivated into four types: (1) abandoned cultivated land (*Kosa-ku-Hokichi*), (2) abandoned land (*Fu-Sakuzukechi*), (3) degraded agricultural lands (*Kohai-Nochi*) that can be reused, and (4) degraded agricultural lands that cannot be reused. In the first category, abandoned cultivated land is defined as "formerly cultivated land without production in the past one year and the owner does not intend to produce crops [in the next] few years" [19]. The first category is problematized in policy debates that aggregate areas that are equal to the size of Saitama or Shiga prefectures [20]. Although, it is noted that the definition of the first category is related to "subjective elements" of the intent of landowners, and not simply the "objective elements" of agricultural lands, which are defined in categories 3 and 4. The second category describes abandoned land as the "land that has not been planted in the past year but might be (re-)cultivated with the landowner's willingness [19]. Moreover, the third category is "cropland that is not actually used for cultivation and is not expected to be used in the future (Article 32 (1) (i) [18])" and the fourth category notes the cropland that is "currently not used for cultivation and cannot be cultivated again due to . . . abandonment and [is] objectively impossible to cultivate crops with [using] conventional measures" [21] (Table 1).

**Table 1.** Classification of degraded cropland (determined annually by field surveys of the MAFF [21]).

| Type of Degraded Cropland | Definition |
| --- | --- |
| Category 3—degraded cropland that can be reused (approximately 90,000 ha of farmland; 55,000 ha of this total is accounted for agricultural areas).<br><br>Category 4—degraded cropland that is difficult to reuse or cultivate again (approximately 192,000 ha of farmland; 81,000 ha of this total is accounted for agricultural areas). | This category of cropland is not actually used for cultivation and is not expected to be used for cultivation in the future (Article 32 (1) (i) of Cropland Act [18]).<br>This category can also refer to land that will not be continuously utilized even if it is restored as cropland due to surroundings or physical conditions, such as forested areas, where restoring or revitalizing the cropland is extremely difficult due to long abandonment. |

Currently, 6% of the total agricultural land area (4,654,000 ha) in Japan falls under categories 3 and 4, which were identified as "degraded agricultural lands" by the Agricultural Commission and staff of municipalities (Figure 4) [22]. According to the MAFF [22], a certain portion of these degraded croplands is expected to be converted to renewable energy lands; however, conversions of agricultural lands are challenging because of the presence of the Cropland Act, which protects and regulates the conversion of "cropland" into other land-use types [18]. Although, recent developments concerning conversion to other land-use types are gaining traction in Japan because of the increasing number of abandoned arable lands resulting from a declining labor force [23]. For example, certain portions of cropland were converted to an installation site of solar power generation facilities.

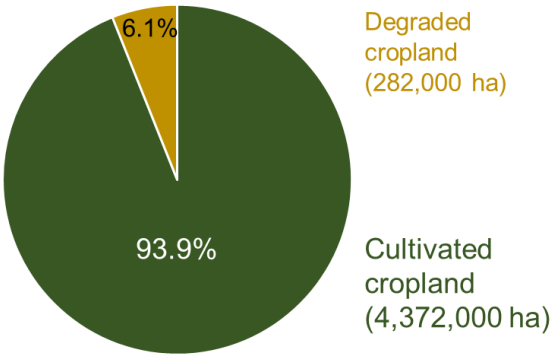


**Figure 4.** Percentage of cultivated and degraded croplands in Japan as of the end of 2020 [22].

### *2.2. Conversion of Agricultural Lands to Renewable Energy Sites*

There are two ways to introduce solar power generation facilities, either the whole croplands are converted, or shared-use systems are implemented, where land continues to be used for agriculture with additional renewable energy purposes. To date, the latter approach of "solar sharing" is adopted in the majority of croplands, in which farming activities are being continued while the agricultural power plant is generating electricity [23]. First, it is frequently not realistic to immediately convert the whole cropland to have another use. There are financial reasons related to tax; the fixed asset tax of the land will increase if the land is converted from cropland or farmland [23]. This shared land-use system (both farming and solar power) is allowed when a "permit to convert" is granted and built panels of the solar power are specified [23]. In this framework, solar power plants built on cropland were referred to as agricultural power (*Einogata-Hatsuden*) facilities or solar sharing.

There are complications when the installer of solar power generation facilities differs from those who practice farming on site. If the operator wishes to install superficies for underground or overhead structures (*Chijyo-ken*) including solar panels (as set forth in

Article 269-2 (1) of the Civil Code Act [24]), they are requested to obtain the permission set forth in Article 3 (1) of the Cropland Act [18].

The move to consider agricultural power generation (solar sharing) is promoted under the framework of the "Rural Renewable Energy Act (Act No. 81 of 2013)" or the "Act promoting the sound development of agriculture, forestry and fisheries and power generation of renewable energy" [25]. The law was enforced in 2014 to introduce renewable energy in rural areas and improve regional income through renewable energy regeneration [25]. The enforcement of the law encouraged municipalities in developing a system that establishes and approves a renewable facility generation plan without interfering with the flow of food production or national land preservation [26]. There is a strict monitoring of the solar sharing system in Japan, which mandates that the average production volume of the farm should not be decreased by more than 20% (at least maintaining 80% of the production level before the introduction of the solar system) to continue farming activities efficiently with solar panels, and to prevent utilizing the farmland solely as a power generation site [26].

### *2.3. Deregulation of Cropland Use*

On the ground, the monitoring and maintenance of the production level are not well maintained. The MAFF, for example, admitted in March 2022 that 80% of the cropland yield was not met due to interference of solar power plants in farming activities; 308 cases out of 2591 farming cases did not meet the requirement as of the end of 2019 [27]. Amongst the 308 cases, 247 have had inadequate cultivation management [27]. The MAFF documented that 60% of these cases had solar power generators installed by people who lack farming knowledge; thus, the cropland is geared towards electricity sales revenue rather than farm production yields [27]. If the required production yield is not met, the prefectural government or the AC will order farmers to improve their yields or convert cultivated crops. In cases of non-compliance, where farmers do not follow the rules, solar panels are de jure removed. Although, as of February 2021, there were no cases ordering the removal of solar panels [27].

Due to this accelerating trend, these regulations were deregulated recently in a drastic manner, and the mandate on maintaining a cropland yield of 80% has been retracted in Japan [28]. Instead of requiring landowners to produce a yield of 80% in the converted cropland, the MAFF decided to simplify the requirement by examining if the cropland along the solar power plant is utilized properly and efficiently [28]. Thus, when the permit to convert cropland to other land-uses expires (after 10 years), the operators of the solar power plants can renew their permits without considering agriculture production yields. In addition, with the renewal of permits becoming a less tedious process, financial support during cropland conversion is more attainable, and a management system through "project finance" schemes have begun to be sought after in Japan [29].

Recently, the MAFF submitted a draft amendment of the "Agriculture, Forestry and Fisheries Vitalization Act (Act No. 48 of 2007)" or the "Act on settlement for the revitalization of rural areas and promotion of inter-regional exchange" that will enable a collective transfer of cropland rights as a measure to counter degraded croplands [30]. When the AC determines that the cropland is categorized as degraded, and is difficult to reuse or cultivate again (Category 4 in Table 1), they will notify the owners, municipalities, and other relevant parties or organizations [28]. In return, the recipient of the notice is requested to send a notification, ex officio, to the Legal Affairs Bureau to change the land category, for example, as "non-cropland" or "degraded cropland" [28]. With regard to degraded cropland that is exempt from conversion under the Rural Renewable Energy Act [25], when production conditions continue to be unsuitable and non-cultivation for a considerable period has been observed, the law will be relaxed allowing conversion to other land-uses [28].

Another reason for the deregulation of cropland law is due to a general surge of demands to address climate change and increasing global warming countermeasures. There has been an increase in the number of municipalities and populations declaring that they will become carbon-neutral by 2050 or "zero-carbon cities by 2050" in Japan. As of

February 2022, there were a total of 598 municipalities, which is composed of 40 prefectures, 365 cities, 20 special wards, 144 towns, and 29 villages, that showed a strong commitment to counter global warming (Figure 5) [31]. In terms of population density, 115.2 million or 92.0% of the total population of Japan expressed a strong social demand and motivation for climate change countermeasures (Figure 5) [31].

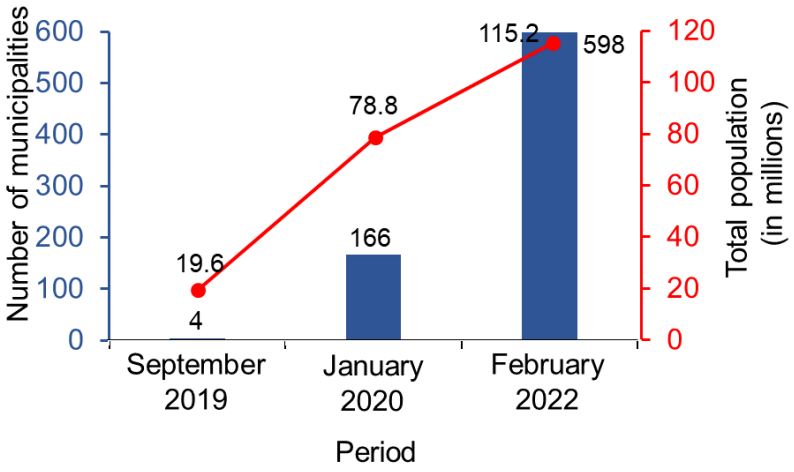


**Figure 5.** Number of municipalities and population (in millions) with a strong social demand and motivation to increase global warming countermeasures [31].

In addition, the revision of the "Act on Promotion of Global Warming Countermeasures (Act No. 117 of 1998)" [32] that will take effect on April 2022, stated that prefectural governments and government-designated cities are required to set and disclose targets for the introduction of renewable energy, and that the local government is required to designate areas ("promotion area" or *Sokushin-Kuiki*) to the promotion of renewable energy (Figure 6) [33]. These can become zones where solar or other renewable energy installations will be encouraged.

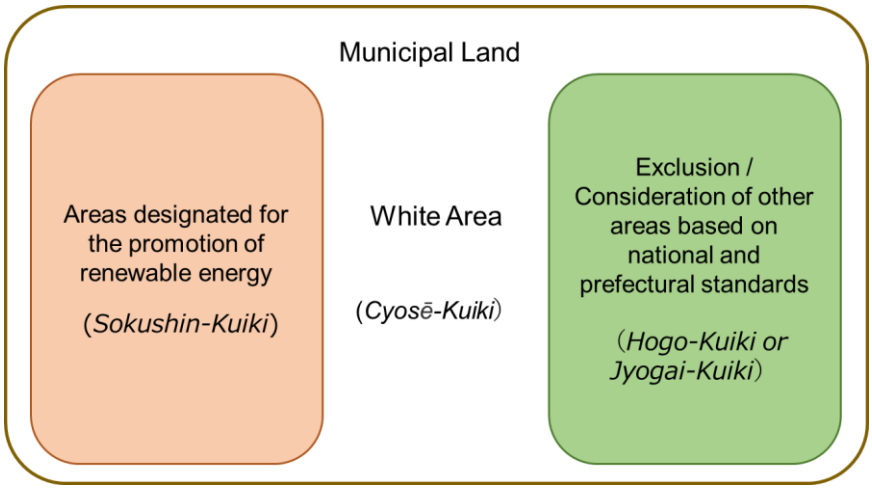


**Figure 6.** Local governments designate "promotion areas" or *Sokushin-Kuiki* for renewable energy sites [33].

## 3. Management Options for Croplands at National Level

The MAFF has provided support for businesses in districts that engage community members in the maintenance of croplands to prevent the increase of "degraded cropland", brought about by shortages within the labor force [34]. In relation to this support, "optimal land-use measures" (*Saiteki Tochi Riyo Taisaku*) is one of the policy measures that the MAFF

initiated in the fiscal year 2021, concerning the willingness to utilize croplands [35]. In the framework, areas with 10 ha of cropland are covered by the measure [35]. This initiative, which plans the use of croplands, is a collaborative work among different stakeholders including the Agricultural Commission, regional agricultural cooperatives (e.g., Japan Agricultural Cooperative), the Cropland Intermediate Management Organization (Cropland Bank), land improvement district offices, municipalities, farmers, and local residents. The MAFF aims to achieve the maintenance and strengthening of the communities through this project in 100 areas nationwide by the fiscal year 2026. The regional development division of the MAFF said that "If you are having trouble maintaining a village due to aging and lack of successors, I would like you to use this project to discuss sustainable land-use measures" [34].

During the planning process, agricultural districts can divide croplands into "croplands that can be cultivated and concentrated with farmers" and "degraded croplands that are difficult to manage or cultivate." In the latter land type, landowners can decide the management method to use, either (1) grazing, (2) cultivating labor-saving crops like honey-source plants, or (3) afforestation with wildlife buffer zone functions. In addition to these three management methods, financial support and infrastructure improvements such as the leveling of ground and the necessary installation of electric fences will be carried out [36]. In the first management method, the "recommendation of grazing on abandoned cultivated lands" published by the National Livestock Improvement Center was introduced on the website of the MAFF [37], and financial support was provided for conditioning the land for electrical pasture fences. For example, during the fiscal year 2021, there were five districts nationwide that applied low-cost land-use projects for grazing and planting of local crops such as those located in the Hokkaido and Oita prefectures [34,37].

In the second management method, which considers cultivating labor-saving crops, financial assistance was provided for the procurement of seeds and seedlings of honey-source crops and necessary equipment [34]. Moreover, in the third management method, financial support for afforestation methods included, for instance, subsidies for project meetings (up to 5000 Japanese yen per 0.1 ha) and hardcore projects such as land development (approximately 36,000 Japanese yen per 0.1 ha) [34].

The addition of the third management option (afforestation) is one of the unique features added to the project in the fiscal year 2022. This new addition seemed to show a certain gap between the agriculture and forestry sectors, and the decision to start "afforestation" in the agricultural sector raised concerns in terms of how far the sector will be involved in the disaster prevention (ecosystem-based disaster risk re-duction (Eco-DRR)) and habitat provision (wildlife buffer zone) services that come with the afforested area (green infrastructure [GI]). It is important that the agricultural sector clearly delineates these services, especially since they are investing in public subsidies to implement Eco-DRR/GI using planting trees methods.

As an example of how important it is to clearly set boundaries in policies, a similar afforestation method was adopted in the 1997 revision of the River Act (Act No. 167 of 1964) [38], where "forest belt zones" (*Jyurin-Tai*) were added to the "river management facility" (*Kasen-Kanri-Shisetsu*) in Article 3 (2) of the aforementioned law. In this law, the forest zone is controlled by the River Bureau of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), indicating that they shall become the defendant in cases where there is a defect in the control of the forest belt zone. This is regarded as a different scene from the vertically divided administration of Japan. This is because, in the case of river management, if there are any defects in the management of the afforestation area, and there are serious damages caused by the wildlife, the agricultural authority of the MAFF will be in charge to deal and implement preventive measures, instead of the forestry authority.

## 4. Insights and Prospects from Matsusaka City Project Site

To date, the project is conducting social experiments in Matsusaka City, Mie Prefecture, where agriculture and forestry are being practiced [7]. This site was selected because the area is active in both agriculture and forestry. There were two approaches involved in the investigation. First, the labor schedule was obtained by interviewing the actual workers. This was done to estimate the labor required in maintaining such land-use types (e.g., cropland). Based on the 2020 agriculture and forestry census in the Iida area (Miyamae, Kabata Mori, Haze districts), there were 96 and 50 management entities in agriculture and forestry, respectively. Amongst this group, we were able to conduct preliminary interviews with 18 workers from forestry, tea, rice, and other agricultural industries from July to October 2021. Then, the information gathered is used in comparing and simulating future scenarios with decreasing populations and possible changes to products. Second, we organized group discussions with the local communities about their present and future preferences for society from a general perspective. In that discussion, we also presented the changes to the legal system (as summarized in this paper), and shared that these changes do not force members of the community to do anything, but rather, they expand their options. As an example, subsidies will be provided to landowners who prefer a minimal management–demand system (e.g., grazing). There are also options to convert agricultural lands to renewable energy sites, which is expected to have an economic spillover effect of up to about 180 million yen per year for local residents and businesses [39]; however, this option is challenging because in order to create a ripple effect in the region, "an increase of 188 migrants for measures against vacant houses and 18,880 for tourism promotion is needed" [39].

The trade-offs between the presentation of future scenarios (selective only), and the advantages and disadvantages of each scenario were discussed as clearly as possible. At that time, we focused on (1) the grand model scaled for the entire region, (2) the decision-making of the Agricultural Commission, which is the representative organization of the farmers, and (3) the decision-making of the individual residents (Figure 7). We tried to give advice, where possible, on each of the steps (1–3 in Figure 7), and suggested specific models and trade-off factors for each.

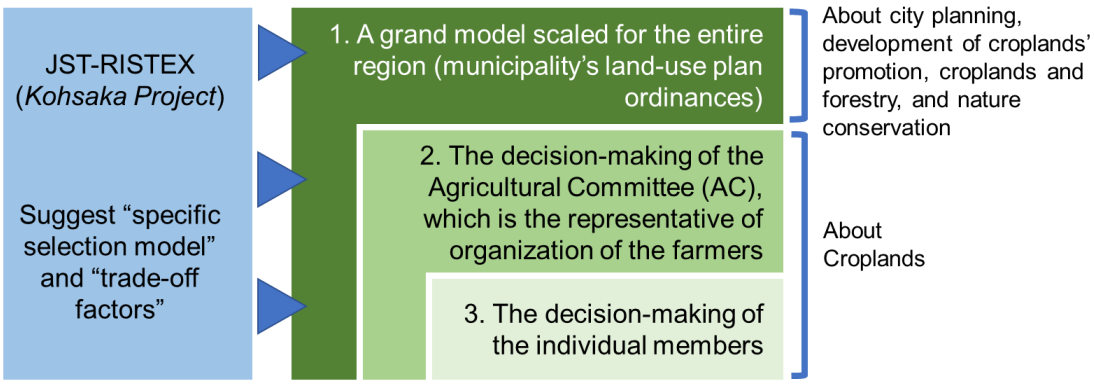


**Figure 7.** Multi-layered decision-making of community members about croplands.

We documented that the most important one is the "grand model" scale of the entire region. If there is a higher-level unified view, it will integrate normativity. Each piece of land belongs to an individual, but if it is used differently between neighboring lands, it will be inefficient, and the unity of the area will be lacking. Moreover, it does not quite establish regional brand products. After the controvertible problem arose, community members tended to think of the problem as their own, which made it difficult to develop a unified and objective view; therefore, we deduced that it is important to prescribe a unified image of the area when there are no specific problems. In other words, it is important to

establish a higher-level norm of the region and a unified image of the future that can play a normative role when deciding things.

The preliminary results of the project showed that broader topics allowed the community members to discuss and share their general perspectives on planning issues, including, for instance, transportation, education, and employment issues. We drew the possible implications for land-use in their areas from these general discussions. For instance, from interviews and discussions, we noted that there are land use-related implications such as the critical points in selecting potential sites for downsizing, which included (i) areas that can still be managed in the future, (ii) areas that are "returning to nature" with minimal management, and (iii) areas that can be managed with a minimal labor force (e.g., strategic zoning) (cf. Figure 2).

From the group discussions, we gained further insight into community members' perspectives. The discussions intentionally avoided focusing on land-use, and instead focused on broader topics, since the community members tended to avoid directly expressing their views on sensitive topics such as land use. Initiating discussions with less direct matters was one of the insights and lessons learned.

The project is still in progress. Based on our understanding thus far, the project aims to propose a consensus-building mapping system in the long-term, aiming to produce maps with fundamental information on agriculture, forestry, and environmental conservation to supporting local land-use policies and decision making. The planned mapping system intends to classify areas for management plans, in the case of forestry, the forests, and other areas, for the introduction of coniferous and broad-mixed forests. Furthermore, based on the stage of development of the project, the proposed system will consider specific businesses and management methods that can simultaneously improve productivity and environmental conservation in the areas.

## 5. Discussion and Future Considerations

The recent progress of the project (i) presents ongoing discussions on the active promotion of reusing degraded cropland and (ii) provides valuable insights to be considered moving forward. Here, we raised three major points for consideration that are paramount in supporting the central government (e.g., MAFF of Japan) in its strategic zoning of cropland, particularly those categorized as "degraded", to make a balanced system between agriculture, forestry sectors, and environmental conservation.

The first point is the addition of the new management method—"afforestation"—in the agricultural sector of the MAFF. This method is, of course, not new to the forestry sector, but for the agricultural sector, the new addition to the system would be the first policy change since the end of World War II. The MAFF of Japan covers three jurisdictions, including agriculture, forestry, and fisheries. In the current system ("agriculture > forestry > fisheries"), the use of a "forestry tool (afforestation)" and investment of the subsidies (e.g., public subsidies) that come with it from the agricultural sector, must make a major change to the ministry. The current system mainly refers to orders in budget allocation, staff sizes (14,199 for MAFF headquarter (mainly in agriculture), 4705 for the Forestry Agency, and 987 for Fishery Agency as of 2022), and hierarchical orders on human resources, which are critical for the consciousness of insider bureaucrats. The differences in roles are conventionally clear, and afforestation-related measures were under the control of the Agency of Forestry in the post-war period; thus, the newly introduced measures indicated that there is a shift in such authoritative boundaries (e.g., agricultural-related departments will handle afforestation measures). This point is very crucial moving forward, since the ministry is the primary actor in the "optimal land-use measures" (or *Saiteki-Tochi-Riyou* in Japanese) of the government; thus, the change in the policy should be further evaluated to ensure that there is no overlapping of projects with other sectors (e.g., forestry), and to implement it efficiently and effectively.

The second point we raised is the difficulty in balancing carbon reduction measures with cropland conservation. Though recent trends showed an improvement, as discussed

in Chapter 2, there are still many challenges in achieving a balanced system between conservation and economic goals. For instance, the MoE of Japan said that "the person who controls carbon reduction measures shall be adopted by the next generation"; however, Japan's agriculture is the "home industry" of the country, so, even if the next generation is governed by energy-related policies, food security will always be one of the foundations of national security.

The MoE has shown that the introduction of solar power generation (5000 kW or 1000 households at 5 kW per household) will benefit the local economies (e.g., migration and tourism), and will have an economic ripple effect of up to approximately JPY 180 million per year for local residents and enterprises. To create such an economic spillover effect in the region, there should be an increase of 188 migrants to occupy vacant houses, and 18,800 tourists for tourism promotion [39,40]; thus, effective promotion of migration and tourism is needed to entice people. Alternatively, it is also possible to evaluate the attitude of promoting the introduction of renewable energy that is cost-effective. For instance, the MoE suggested that "it is important to make renewable energy projects that benefit the region such as revitalizing regional economies and building disaster-resilient regions", since there is a problem with "regional consensus-building" [39].

It is necessary for the region to decide what is best for them in terms of revitalizing the regional economy. In the past, opportunities were limited in terms of utilizing degraded cropland based on the Cropland Act [18]; however, to date, there are now other possibilities such as conversion to renewable energy sites or coexistence with renewable energy facilities (e.g., solar sharing). With a series of cropland policies concerned with deregulation, and abandoned cropland marketed as "degraded cropland," the freedom to use alternative management has increased, and croplands have been flexibly converted and operated. This rapid increase has, in turn, raised a question from the local government and residents: "what kind of region should be created?" Thus, local actors play an important role in regional consensus building. We suggested to the local communities to think about ideal conditions in 30 years, which covered temporal and spatial scales. This was suggested because the owners frequently think about the past, particularly what their ancestors did or what the current difficulties are. Thus, the issues are locked down in individual ownership-related topics; however, thinking towards the long-term promotes communities to think holistically beyond land types and ownerships. In a similar vein, changing the viewpoints on different scales can promote discussions from different angles and perspectives.

Finally, regarding the third point, coordination among various plans such as landscape (target area), renewable energy (promotion area), and land-use (utilization area) plans is extremely critical. In areas where there is no interest in conserving cropland in the future, we documented that there were individuals with a "desire to install solar panels." The authenticity (earnest desire) of the landowner is an essential factor to be considered, but for the conversion and operation process, it is paramount to take a careful stance after examining the negative aspects through the lenses of various plans. Moreover, on a personal level, each individual has their own intentions and desires, and although they are the landowners, there is a risk that the landscape, ecosystem, and aspects of the "region" will be changed. Thus, "regional consensus or agreement" is necessary to achieve a comprehensive and systematic utilization plan.

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