# ID 1389 | STUDY ON THE CONDITIONS OF LAND USE CONVERSION FROM RESIDENTIAL LAND TO FARMING LAND

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**ABSTRACT:** The demand for residential land is declining and the number of vacant houses and lots is increasing in depopulated areas in rural areas, suburbs and old city centre in Japan for this a few decades. Recently, afforestation for urban forestry and urban agriculture is being promoted as a countermeasure to the increase in vacant houses and plots in depopulated areas of Detroit in the USA. On the other hand, these countermeasures are rarely found in depopulated areas in Japan because abandoned farmland and derelict forests are also increasing in depopulated areas in Japan due to growing aging population. The Ministry of Agriculture, Forestry and Fishery in Japan gives priority to the reuse of abandoned farmland and derelict forests because of already developed infrastructure, like irrigation systems, rather than focusing on the reuse of vacant residential land. Current scenario of Japan gives rise to a question i.e. “will vacant residential land continue not to be used in the future?” Examples of recycling residential land for farmland are very limited. At present, the only known case of land use conversion in Japan is in the city of Fukugawa where colonization residential lots have been converted to farmland. The aim of this study is to conducts a case study on Fukugawa Land Conversion and investigates the implications of the possibility of land use conversion from vacant residential lots to farmland and of smooth shrinkage of the city area. The colonized residential lots are scattered along the river Ishikari in Hokkaido. In this area, the original colonizers constructed their own accommodation in the centre of their farming land when they settled in the Meiji Period. As a result, the farming landscape became concave. When aged residents of the colonized residential land stopped farming and moved out, this irregular form of farmland prevented transfer of ownership to other farmers because of its low productivity. The main industry of the City of Fukagawa is farming, so the Fukagawa municipal agriculture committee decided to subsidize the demolition of vacant houses, redevelopment of farmland and costs of land use change up to 90%. As a result, some of the colonized residential lands have been transferred and are used as farmland now. At the same time, the lower productivity farmland is being abandoned and derelict farmland in mountainous areas is being left as it is. This case suggests that the economic rationality of improving farming productivity is needed in order to convert land use from residential land to farmland. In an era of population growth and economic growth, the actual demand for secondary and tertiary industries and residential land use increased and consumed farmland, but in a period of population decline, farmland has also shifted and moved from lower productivity areas to higher productivity areas and actual land demand for farming may not be increasing. In other words, the possibility of increased productivity in agriculture and forestry can create the possibility of land use change from residential land to farmland or forest land. This suggests the importance of productivity improvement of regional agriculture and forestry for discussing shrinking city areas.

## 1 INTRODUCTION

The concerns on the increase in vacant houses and lands are growing significantly in Japan facing due to the problem of population decline. The Ministry of Land, Infrastructure, Transport and Tourism (MLITT), in Japan has already introduced several policies favoring increase in the number of vacant houses. MLITT, for example, is encouraging both promotion of reusing second-hand houses by renovation and conversion from vacant houses to elder care facilities. These are typical examples of reducing the number of vacant houses despite their limited quantitative impact in the reduction of vacant houses. This is because number of total households in Japan will also decline after 2020 and even when the new house construction will become zero, the decline in the number of households leads to increase in the number of vacant houses. Consequently, sooner or later, the reduction of vacant houses and increase in the vacant lots are easily expected to become next social issues.

The vacant lots in the residential areas can be used as the seed lots for expansion of neighbor houses and open space for crowded residential areas. Otherwise, they can be used as green infrastructure to prevent inner-flooding and to conserve bio-diversity. In addition, as can be seen in Detroit in the state of Michigan

and Cleveland in the state of Ohio in the USA, those vacant lots can be used as the land for urban agriculture and urban forestry.

In Detroit, its population decline in the city area, in particular, middle class outmigration from the city areas resulted in food-desert in the city because chain stores like super market withdrew owing to the shrinking its market area. Urban agriculture is proposed as one of countermeasures for this difficult situation. On the other hand, Ministry of Agriculture, Forestry and Fishery (MAFF) in Japan are not positive to convert the vacant residential or commercial land to farming land and forestry land. The ministry considers that the vacant agricultural land (derelict agricultural land) with enough irrigation infrastructures should be revived for the new comer to agricultural sector prior to use those vacant residential land and commercial land needing newly development of irrigation infrastructure. This policy by the ministry has a certain rationality to save the additional investment for land improvement even though the land use conversion to urban agriculture and forestry are the is recent phenomena in the world.

The case introduced in this study is of a city losing its population. It is a rather rare case and completely opposite to the government policy which doesn't prioritize residential lands as the seeds land of farming. As of December, 2016, this case may be the only case of the land conversion from residential land to farming land in Japan. This study, therefore, aims to clarify the rationalities and conditions of land conversion from residential lands to farming land.

The structure of this paper is as follows;

Firstly, the residential land of the case study is very famous as colonized residences. The history and feature of as colonized residence are explained. Secondly, the case history and outline are explained. History of this case includes the background information and the background information becomes the basis of the discussion of the rationality and conditions of the land conversion in this case. Thirdly, the rationalities and conditions of this case are discussed. Fourthly, the implications for land conversion from residence to farming land in depopulated area are extracted from the case. Finally, the discussion is summarized and further research tasks are proposed.

## 2 METHODOLOGY

### 2.1 LOCATION OF THE CITY OF FUKAGAWA

The case study area of the city of Fukagawa is located in Hokkaido, Japan. The area is famous for agriculture. There are many rice pads in the city areas.


Figure 1 Location of the city of Fukagawa in Hokkaido, Japan

The city of Fukagawa has been losing its population continuously. Also farming population is also declining significantly in contrast to the stable number of households. The population dropped from 36,579 in January 1975 to 21,500 (estimated) in February 2017. The farming population also dropped from 3531 in February 2000 to 1611 in February 2015. This demographic change means that there are many retired farmers in the city due to ageing and outmigration of the younger generation of farmers' families.

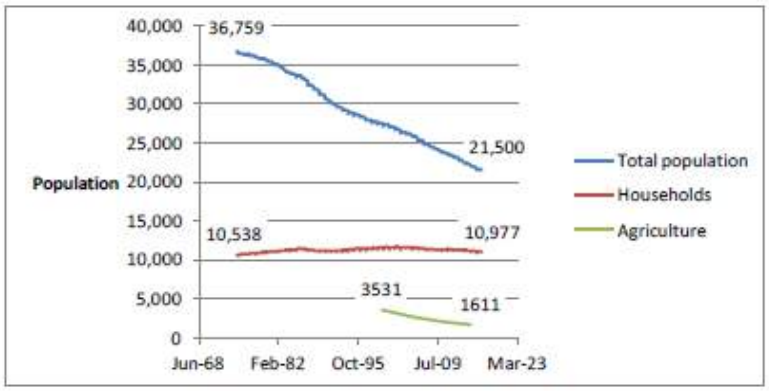


Figure 2 Demographics in the city of Fukagawa
Source: “total population” and “households” are from the statistics of the city of Fukagawa and “agriculture” is from “Agriculture and Forestry census of Japan” by the Ministry of Agriculture, Forestry and Fishery in Japan.

### 2.2 LITERATURE REVIEW

Only two articles, i.e. Muramoto (2010) and Yamamoto (2012), were published on this. The history and outline of this case were introduced by these articles.

### 2.3 FIELD INTERVIEW

Due to the lack of information on the case, the field interview was conducted on 7th October, 2016 in Osamunai office of the city of Fukagawa. Three officers of municipality agriculture committee, Mr. Yahitsu (Director), Mr. Miyatani (Deputy director) and Mr. Kubota (Agricultural land promotion chief), were corresponded. Outline of the case, background, response from the citizens, and possibility of application to other areas and prospects of this case were discussed in the interview.

## 3 RESULTS

### 3.1 CASE OF LAND CONVERSION FROM RESIDENCE TO AGRICULTURE IN THE CITY OF FUKAGAWA

The city of Fukagawa is located locates on the almost at the centre of Hokkaido in Japan. The city was colonized by many colonizers when Hokkaido was colonized in Meiji era. Colonizers constructed their accommodation in the center of pioneered farmland. This accommodation with unique location is called as colonizer’s residential lots (屯田宅地). These colonizer’s residential lots are typical landscape in the centre of Hokkaido.

Figure 3 Aerial photograph of colonizers’ residential lots in the city of Fukagawa Source: Yamamoto (2012)

Figure 4 Residential lots’ map in the city of Fukagawa Source: Yamamoto (2012)

The placement of colonizers' residential lots in their farmland was efficient when colonizers cultivated their farmlands on their own or by using cattle horses because of closer distance between their house and farmland. The irregularly shaped narrow farmland surrounding colonizer's residential lot has become inefficient for the cultivation by larger agricultural machines.

Once the trend of farmer's retirement and movement to other areas due to ageing in Fukagawa started like in other agricultural areas of Japan, these irregularly shaped narrow farmlands started facing the difficulty in transfer to the new successors, like neighborhood farmers because of its low efficiency. The case with a vacant house on the land, in particular, creates more difficult situation a vacant house is left even when the surrounded farmlands were transferred.

Fukagawa is famous for its rice production area. Improvement of in the agricultural production efficiency by existing farmers is one of the key issues for sustaining the rice production as major regional industry. The abandoned cultivation lands including colonizer's residential land near existing farmers, in particular, the good agricultural lands, are expected to be liquidized and be transferred to the successor smoothly resulting into the efficiency of farming activity. In addition, this farmland consolidation to existing farmers is also expected from another point of view to keep the area clean. As vacant houses and abandoned cultivation land sometimes causes a nuisance as the weeds on them becomes the sources of pests, deteriorates landscape. Invariably garbage, such as peeled-off tin roof etc. get thrown on the surrounding farmland. The liquidation of vacant houses and colonizer's residential lots was not promoted in spite of these problems like in other regions mainly because of the cost of demolition of vacant houses and land registration changes. Also, permanent vice-minister of MAFF issued the circular of "Shinki Kaiden no Yokusei ni tsuite (新規開田の抑制について) i.e. regulation of new rice /paddy field development" on 10th February, 1969. This regulation does not allow any farmers to increase the area of rice pad freely. This circular also becomes a strong barrier to promote the liquidation of abandoned cultivation land between retired farmers and successors.

In this situation, the central government in the second supplementary budget created a special temporary grant to revitalize the Regions and Life (地域活性化・生活対策臨時交付金). This grant was 100% subsidy to the local government which does not matter regardless of the type of employment. The Fukagawa agricultural committee, therefore, decided to use this grant to liquidize colonizer's residential lots to successors as good farmlands. The agricultural committee created the project of promotion of non-agricultural land reuse (非農用地利活用促進事業) and during 2008 and 2009, conducted survey of objective land and re-registration of land use, did soil works to develop agricultural land. This new countermeasure was developed to cope with the above mentioned circular by MAFF. The committee asks the successor to replace the area of rice pad within his/her ownership to satisfy with the circular request. Normally replaced rice pad is converted to the farmland for vegetables and other crops.

In 2009, the upper limit of subsidy set to 90% and 1.35 million JPY. After 2010, the city of Fukagawa developed the same policy and subsidized the cost of land conversion including soil works, survey and re-registration costs by 90% and 0.7 million JPY. As a result, more than 10 applications have been received every year and vacant houses have been demolished.

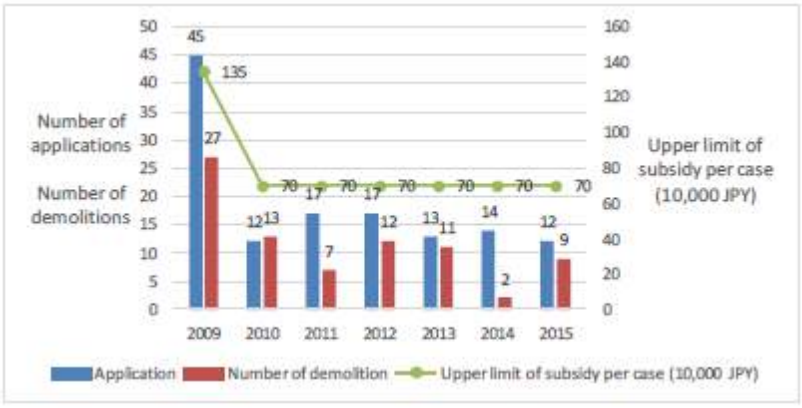


Figure 5 Results of non-agricultural land utilization promotion programme
Source: interview results to Fukagawa municipality agricultural committee

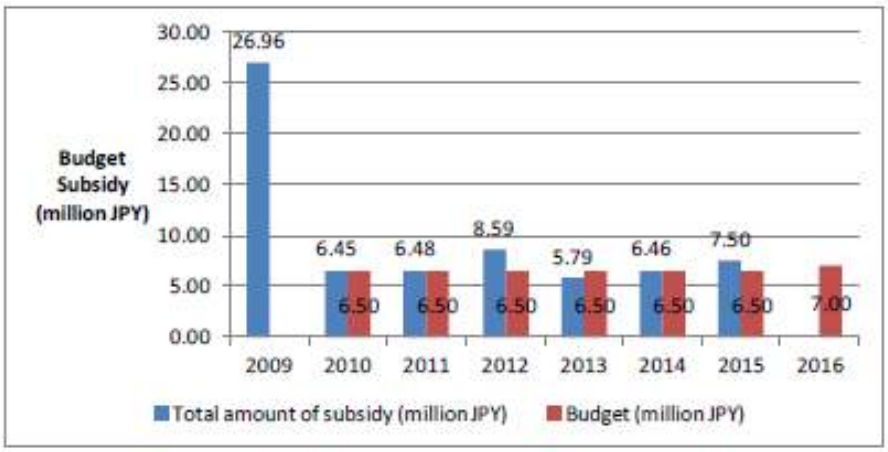


Figure 6 Budget and total subsidy of non-agricultural land utilization promotion programme
Source: interview results to Fukagawa municipality agricultural committee

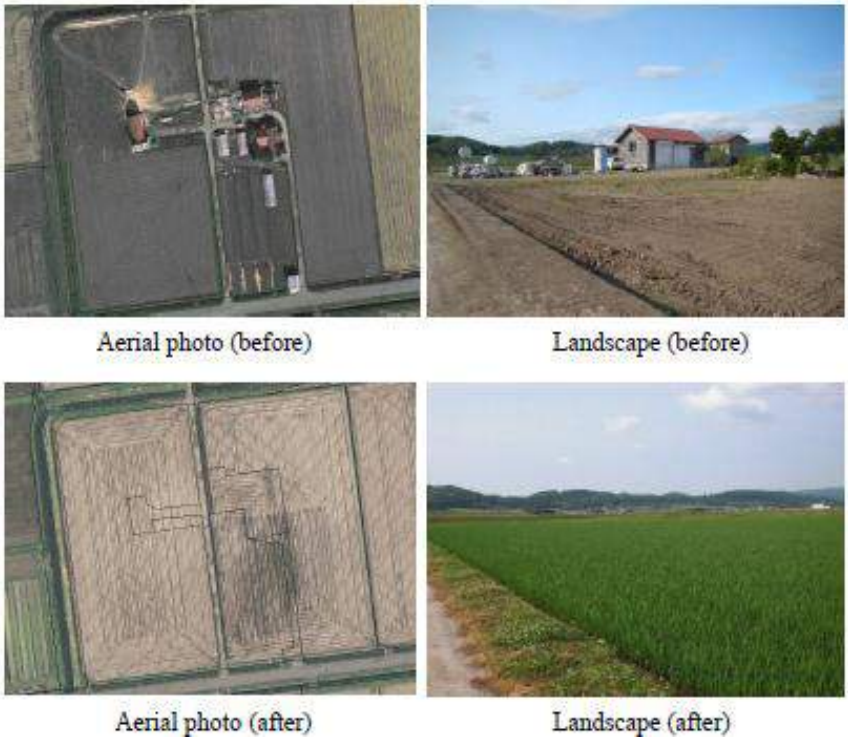


Figure 7 Before and After results of removal of vacant houses from farming lands
Source: Yamamoto (2012)

Annually 6.5 million JPY have been allocated in the budget under this policy. In 2012 and 2015, the actual execution amounts were over the original budget, and the supplementary funds were allocated to the deficit. This policy is being demanded by the locals; hence, the officers' in-charge in the committee recommended the policy to continue for the time being.

The results of this policy i.e. before and after are shown in the following pictures. It is obvious from the picture that that the formerly irregular land has been developed to rectangular rice pad.

## 3.2 EFFECTS AND ISSUES OF THE CASE OF COLONIZER'S RESIDENTIAL LAND CONVERSION

The committee reported the followings as the positive impact of this policy.

- The cases of abandoned farmland with colonizer's residential lots acquisition are increasing and this has resulted in the prevention of increase in the number of absentee land owners.
- Local contractors receive orders of soil works and demolitions. As a result, this policy contributes to local economy development

In addition, the committee also highlighted the following positive impacts in the interview conducted in October, 2016;

- Water distribution in the rice pad has become more efficient and this also makes it easier to demonstrate the performance of agricultural machinery. Accordingly, both the committee and farmers recognize the improvement in the efficiency of farming.
- The committee and farmers understand that the property value of farmland can be sustained by this policy because the farmland can be used as good farmland with rectangular shape.

The committee didn't evaluate the effect of this policy quantitatively, but the demand for this policy is still high and sufficient consensus of the merit of this policy has already been formed. Therefore, it is understood that this policy has sufficient cost-benefits ands needs to be continued.

On the other hand, several issues remain unanswered.

- In principal, a land owner of colonizer's residential lot and surrounding farmland has to apply for this policy. Consequently, this policy cannot solve the problem of existing abandoned lands owned by absentee landlord.
- The MASS circular is still effective and this policy cannot be used for the expansion of rice pad area for regional development.
- This policy cannot be applied to residential or commercial lots if they are not situated next to farmland. In the city of Fukagawa, the different policy has been developed for vacant residential or commercial properties.

The first two issues are not the matters of the city of Fukagawa. The countermeasures for this are expected to be developed by the central government.

## 4 IMPLICATIONS OF THE CASE

Implication in the implementation of the countermeasures to utilize vacant housing lots in the period of population decline is that the land conversion possibility depends on the needs of productivity improvement in adjacent farmlands.

The reason why farmland is eroded by land conversion to housing land during population growth and economic growth period is because of the high demand for housing lands. This land conversion resulted in the net decline in the area of farmland and net increase in the area of housing land.

Based on this research results, even in the period of population decline, as long as the MASS circular is effective, the vacant residential lots will not use for the land conversion seeds of farmland. There will be a decline in the residential lands, but the area of rice pad will not increase when the land conversion from housing land to farmland happens just for the sake of agricultural productivity improvement. This means that, in Japan, based on the current regulatory framework in agriculture, as the reason of land conversion from residential land, the land demand for the expansion of farmland, in particular, rice pad, is not strong enough.

It can be concluded that the land conversion demand for residential lands by agricultural productivity improvement occur in the following process in Figure 8.

Firstly, population decline leads to decline in the number of agricultural workers. This decline will demand for larger agricultural machines and higher performance in order to cultivate the same area of farmlands with fewer workers. Solutions under such circumstances, for improved agricultural productivity and better efficiency are: shaping irregular farmland and expansion of the farmland area. Converting the neighboring residential lands to farmland is the most logical step under those circumstances. This conversion leads to replace active rice pad. Better and closer rice pads are preferred and worse and farther farmlands are

abandoned. At a later date, even if we assume that the MASS circular is abolished, still, worse and farther farmlands, typically, in low uplands are abandoned in case that the work capacity of farmers is limited and low efficient farmland should become inferior. This farmland replacement process can also lead to the improvement of agricultural productivity.

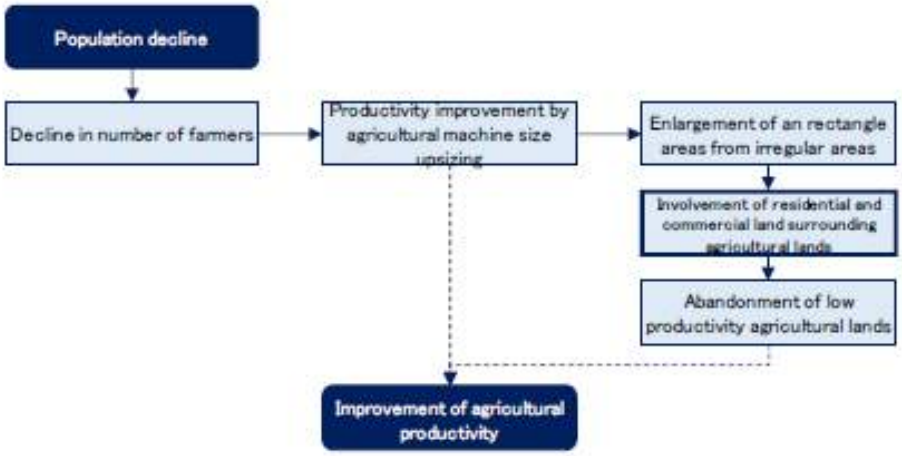


Figure 8 Residential land conversion process in the process of agricultural production productivity improvement caused by population decline

This process suggests that aggressive agricultural policy to improve Japanese agricultural productivity may lead to land conversion from residential land adjacent to farmland. On the other hand, how many areas are converted from residential land to farmland depends on the shape of farmland and how much agricultural productivity is improved there.

| Type | Adaptive tractor | Width of work (cm) | Performance (minutes/10a) |
|---|---|---|---|
| HC10 series | 11- 18 | 160-202 | 13-32 |
| HS20 series | 16- 33 | 183-244 | 11-28 |
| HR20 series | 20- 54 | 200-310 | 5-15 |
| HL20 series | 45-100 | 274-391 | 4-11 |

Table 1 Pudding performance by types of tractor
Source: Yammer (2016)

For example, in pudding case of rice pad, pudding performance varies depending on the type of tractor. The difference is about three times as shown in Table 1.

Output of tractors in Japan has become gradually higher, but only 14% of tractors of 50 ps output that can attach the high efficient padding equipments are being used. High performance tractor is of course costly, and cost-benefit should be considered carefully. But, from the view point of expansion of per capita cultivation area in the period of population decline, there is a big potential to introduce high performance tractors in Japan. This introduction may lead to shape and expand irregular rice pads and this shaping and expansion may lead to land conversion from vacant residential land.

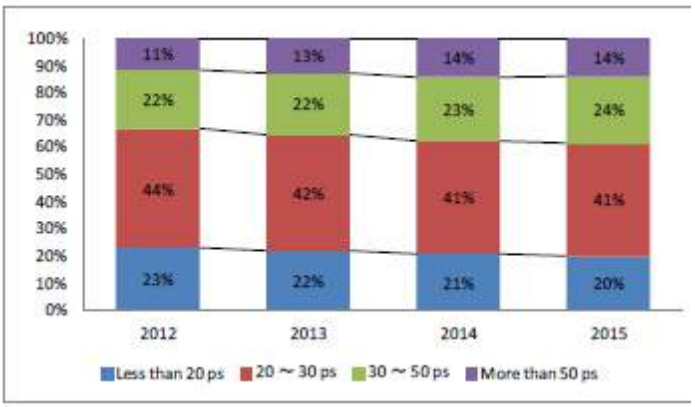


Figure 9 Composition ratio by based on tractor output
Source: Nichinoko Toukei (each year) by Japan Agricultural Machinery Manufacturers Association

Note: Estimates from shipping statistics on the conditions that durable year Life with the use of tractors is assumed as seven years.What you mean by durable? Is it life?

It is noted that the urban small residential lots adjacent to farmland sometimes has concrete boundary wall as compared to the colonizer's residential land. As can be seen in Figure 10, a colonizer's residential land is very low and there is very little height gap between residential area and farmland. This little gap can reduce the amount of soil movement and save the cost of land conversion. On the other hand, recently developed small residential lands converted from rice pads usually have concrete boundary wall. This means that the demolition works of these small concrete boundary walled residential areas are more costly than that of colonizer's residential area.

Figure 10 Colonizer's residential lands with a vacant house and surrounding farm land

Figure 11 Land conversion work from a colonizer's vacant house to farming land

Ground leveling work in the land conversion can be shown in Figure 11.

Firstly, the embankment for the house is removed. After that, the top soil of rice pad is scraped and collected to move to the area of previous residential area to cover the land there. Finally, the ground leveling work is conducted for smooth supply of water.

The above mentioned discussion is based on the current situation of preventing the new rice pad development and formation by consent of existing landlord on the colonizer's residential land. Once the MASS circular is abolished and much bigger agricultural production corporation is established for expanding its production size on the field, much bigger land conversion from residential land may be happened. Moreover, a new policy for absentee and unknown land owner to liquidate abandoned cultivation, residential and commercial land can be introduced for helping administrative intervention, existing derelict cultivation and more numbers of residential land can be used as active cultivation land.

There are cases of typical abandoned vacant residential lands that are not adjacent to farmland and of big residential complex on the slopes of the hills in the suburb of big cities in Japan that do not have any big farmland area near there. Such cases are difficult and different solutions have to be worked out for such cases.

## 5 CONCLUDING REMARKS

The countermeasures of vacant houses and vacant land are the usual discussion from supply-side, but Fukagawa case suggests the importance of discussion from demand-side as well. The case suggests that discussions should be held not only from quantitative aspect like demand of areas, but also from qualitative aspect like productivity.

Fukagawa case suggests that the vacant residential land adjacent to farmland may have a possibility to convert to farmland, but it also suggests that “how much of size” depends on “how much of productivity improvement”. It can be found that the expansion of field area, abolishment of the MASS circular on prohibition of new rice pad development and enhancement of agricultural machinery are some of key triggers for potential land conversion. In other words, aggressive agricultural policy reforms are expected to promote land conversion from residential land to farmland.

Fukagawa case can be applied to for only residential lots adjacent to farmland, but there are no good solutions found for the vacant residential lots in the city. We, therefore, have to still look for other solutions for major problems of vacant residential lands. The case study of Fukagawa case suggests that researchers should also take up the perspective of productivity of land use into their research and investigation works.

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