



## **Present State of Paddy Cultivation by the Direct Seeding Method**

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### **INTRODUCTION**

Japan's agricultural structure is changing from small farm sizes to relatively larger one. The 2015 World Census of Agriculture published in 2016 shows that the number of agriculture management entities<sup>1</sup> in Japan falls by 18% from 1.68 million in 2010 to 1.38 million in 2015. It also reveals that agricultural management entities above 10ha, which represent large farmers<sup>2</sup>, occupy 47.6% in Japan of all farmland areas, which increases from 41.7% in 2010.

In Japan, scale expansion does not lead to the improvement of the efficiency of paddy farms. Generally speaking, a farm which expands its farm scale (for example, cultivating areas, the number of rearing livestock and so on) can reduce the production cost per unit due to the scale economy. However, in Japan, the small and scattered farmland system and short periods for transplanting and harvesting prevent the efficient utilization of machines and labors. Together with the land improvement integrating and consolidating small and scattered farmlands, new innovative technologies are expected to be diffused in actual farming scenes. One of the most expected technologies is the direct seeding method which can omit the process of raising seed pots and transplanting.

In this article, I will summarize and translate a document of the Ministry of Agriculture, Forestry and Fisheries (MAFF) which was published in 2008 to explain the present state of paddy cultivation by the direct seeding method<sup>3</sup>. This translation is not the official publication of the MAFF.

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<sup>1</sup> According to the MAFF, "agriculture management entity" conducts management over a certain scale stipulated by the MAFF (for example, cultivating over 30 ares) or contracts farming works from other managements (<http://www.e-stat.go.jp/SG1/estat/PdfdlE.do?sinfid=000012781989>).

<sup>2</sup> Readers of this article might think that farmers who manage 10ha of farmlands are not so large. However, the average farm size of Japan in 2015 is just 2.5ha.

<sup>3</sup> If you wish to read by original language, refer to the MAFF's website ([http://www.maff.go.jp/j/seisan/ryutu/zikamaki/z\\_genzyo/pdf/all.pdf](http://www.maff.go.jp/j/seisan/ryutu/zikamaki/z_genzyo/pdf/all.pdf)) ([http://www.maff.go.jp/j/seisan/ryutu/zikamaki/z\\_genzyo/attach/pdf/index-3.pdf](http://www.maff.go.jp/j/seisan/ryutu/zikamaki/z_genzyo/attach/pdf/index-3.pdf)).

## TRANSLATION

### Present State of Paddy Cultivation by the Direct Seeding Method

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The Ministry of Agriculture, Forestry and Fisheries

- It is expected that the structural reform will accelerate due to the aging population engaging in agriculture. While large farmers will expand their farm size, farming works in spring, for example raising seedlings and transplanting, would prevent the improvement of their efficiency. Especially, it is also expected that the sense of burden on raising seedlings would intensify because this process could not benefit from the scale economy (Table 1).
- The direct seeding method has some merits. First, it reduces the burden of farming in spring, omitting the process of raising seedling and transplanting. Second, it introduces the different periods of growing paddy which moves the stage of harvesting in autumn. So direct seeding method could accelerate expanding farm size and reduce production cost. However, germination and the establishment of seedling tend to be unstable under the cool and humid weather condition. And, farmers are required to get high skilled abilities in order to achieve stable yields and quality compared to the original transplanting method, because some varieties, such as *Koshihikari*, tend to fall down during the harvesting season and causing the degradation of quality.
- Total area of land choosing the direct seeding method had increased to 55,000 hectares in 1974 mainly on drying paddy field, because agricultural workforces had outflowed to the urban labor market due to high economic growth of Japan's economy. After that, the area decreased to 7,000 hectares in 1993 because transplanting machines and facilities for raising seedling were prevailed. After high precision seeding machines and the way of drained-water were developed, the area has increased and reached to 17,000 hectares in 2007<sup>4</sup> (Fig. 1).
- The way of draining water from the paddy immediately after seeding contributed to the stable germination and establishment of seedlings. The National Agriculture and Food Research Organization (NARO), experiment stations of each prefecture and private manufactures developed high precision seeding machines which contribute to the above problems. Some herbicides for weeding the Japanese barnyard millet (*Hie*) have been developed. NARO and experiment stations have developed some varieties which suit to the direct seeding method, for example, *Fukuhibiki*, *Moeminori* (Tohoku region), *Dontokoi*, *Ajikodama*, *Itadaki* (Hokuriku region), *Fukuizumi* (Kyushu and Okinawa region) and *Mirenisiki* (NARO).
- Experimentations conducted by MAFF in 2001-03 revealed that the direct seeding method reduced 1) working hours per 10 ares by 20% while also reduced 2) yields by 10%. These results led to the reduction of the production cost by 10% (Table 2)<sup>5</sup>.
- We have, by and large, solved technical problems such as instabilities of germination and establishment of seedling through implementing practical experiments in various regions, cooperating with experimental stations and public extension organizations. We have to diffuse this technology, focusing on large farms and regions which intend to diversify their management and community farming to rationalize the distribution of workforces. We also

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<sup>4</sup> It reached 2.7 thousand hectares in 2014.

<sup>5</sup> Table 2 shows that the cost reduction per the production quantity unit (60kg) diminishes to just 3.5% due to low yields of the direct seeding method.

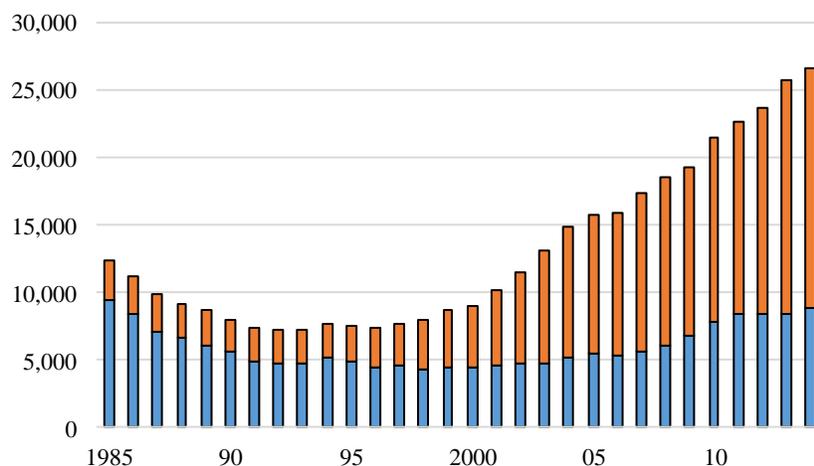
have not only to overcome technological problems but also to evaluate its effects on the whole system of regional farming, for example the position of the direct seeding method in the efficient utilization of farmer's mutually used machines and facilities such as grain elevators, and the crop rotation of grains.

Table 1. Working hours per 10 areas by scales in the case of the transplanting method (CY 2016)

	Average	0.5-1ha	1-2ha	2-3ha	3-5ha	5-10ha	10-15ha	10-15/average
All	28.0	34.6	30.1	24.7	20.6	18.1	16.2	57.9%
Preparing Seeds	0.4	0.4	0.4	0.3	0.3	0.2	0.2	57.1%
Raising Seedling	3.5	3.3	3.7	3.6	3.2	3.3	3.9	<b>111.2%</b>
Plowing	3.8	5.2	4.1	3.0	2.6	2.2	1.8	48.8%
Transplanting	3.9	4.8	4.4	3.2	3.1	2.7	2.6	66.0%
Harvesting	4.1	5.3	4.1	3.1	2.6	2.4	1.8	43.6%
Drying and Processing	1.4	1.2	1.7	1.5	1.1	1.2	1.2	88.9%
Raising Seedling + TransPlanting	7.4	8.1	8.1	6.8	6.2	6.0	6.4	87.3%
Percentage	26.3%	23.4%	26.9%	27.6%	30.3%	33.3%	39.7%	

Source: MAFF, *Production Cost of Rice and Wheat Varieties* .

Fig. 1. Trend in the area of choosing the direct seeding method



Source: MAFF.

Table 2. Comparison of working hours, yields and production cost between the direct seeding and transplanting

	Direct Seeding	Transplanting	Comparison
Working Hours	13.8h/10a	18.4h/10a	-25.0%
Yields	488kg/10a	526kg/10a	-7.2%
Production Cost	92,618JPY/10a	103,499JPY/10a	-10.5%
	11,387JPY/60kg	11,806JPY/60kg	-3.5%

Source: MAFF.

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