Challenges of organic rice farming in Jeonnam Province, Korea

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Key words: rice, organic, no-chemical, Korea

Abstract

The production practices, productivity and economic performance of organic and non-chemical rice farming were compared in Jeonnam Province, Korea. Korean organic rice farming showed a lack of use of resistant varieties and rotational cropping systems as well as less use of farm wastes and a high dependency upon external inputs. When compared with no-chemical rice production practices very little differences were found. However, organic rice farming showed 15% to 18% higher profits than no-chemical farming even though the productivity was arguably similar between the two farming types. This may encourage more farmers to convert to organic production rather than non-chemical farming as the farming practices are very similar, thereby resulting in increased supply of organic products and decreased prices for organic rice near future. There is a need to more greatly differentiate organic farming practices and products from those of no-chemical farming.

Introduction

Paddy field rice is the largest crop in Korea and Jeonnam province occupies the highest proportion (19.7% of production area, 18.4% of production)(MIFAFF 2009). The total acreage of Jeonnam Environmentally-Friendly Agriculture is 101,256ha but organic farming makes up only 20% of this land area (NAQS 2008). Organic rice farming in Jeonnam is facing some serious structural problems. For example, the official repeal of the 'low-chemical (use of chemicals by half of conventional)' agriculture certification system out of the Korean EFA (MIFAFF 2008) may bring significant challenges because a substantial transition of 'low-chemical' rice producers to 'no-chemical (no use of chemical biocides)' or 'organic' farming systems is expected to some extent, resulting in more production thereby lower prices for organic or more price competition against 'no-chemical' rice

Materials and methods

A total of 10 organic and no-chemical certified rice farmer organizations (e.g., cooperatives, farmer's unions or associations) were selected and 3 sample farms (organic or no-chemical farming) from each organization were investigated for the comparison of two systems. The organic farms investigated were at least 5 years past organic conversion. For economic performance, 33 questions were asked in the 2nd

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visit including selling price per kg, fertilizer cost, working hours. Rice production field observations were carried out to understand seasonal management practices on every farm visit.

Results and Discussion

A. Variety selection. 'Japonica' type rice varieties (including 'Dongjin#1', 'Nampyongbye', and Japanese variety, which are white and the dominant rice for Korean consumption, as well as 'Heukmichalbye', purple and stickier, were dominantly being cultivated in both organic and no-chemical farming, despite most 'Japonica' type rice varieties having no resistance to major rice pests and diseases (Lee 2007, Park 2007). **B. Introduction of crop rotation**. In Jeonnam province, young rice seedlings are transplanted in mid to late May and harvested in early to mid October (Oh *et al.* 2005). As a green manure milk vetch (*Astragalus sinicus*) is sown just after rice harvest, then cut and ploughed a few weeks before transplanting the following season. This cycle is repeated annually and there is no rotational cropping for fertility building and pest/disease control similar to that seen in many organic farms in Europe. **C. Soil fertility management**. Milk vetch green manure is widely used in both organic and no-chemical farming. However, the majority of organic and no-chemical farmers are still using excessive purchased organic fertilizers (factory produced, manure, ricebran or sesame oil cake) throughout the growing season. In terms of the recycling of farm by-products to contribute to soil fertility, rice straw is sometimes returned at harvest but farmers often remove straw for other uses such as livestock feed and bedding or for sale. **D. Pest and disease control**. Rice water weevil (*Lissorhptrus oryzophillus* Kuschel), grass leaf roller (*Cnaphalocrocis medinalis* Guenee) and brown plant hopper (*Nilaparvata lugens* Stal) were the major pests and rice blast (*Pyricularia oryzae* Cavara) was the most problematic disease in both organic and no-chemical farming in Jeonnam province. The major control measure for both pests and diseases is spraying 'environmentally-friendly (organic or no-chemical) certified farming materials (EFCFM)' usually one or two times but up to three or four times where pests and diseases occur frequently. The EFCFMs can be divided into two types according to the manufacturer; one is farmer prepared EFCFMs (which include plant extracts, fermented liquids, soya oil, vinegar) and the other is factory-produced EFCFMs which are purchased commercially. **E. Weed control**. Weed control begins with ploughing before transplanting of rice seedlings in both organic and no-chemical farming systems (two or three times swallow ploughing by tractor). In both organic and no-chemical farming systems, baby snails (*Pomacea canaliculata* Lamarck) (one week after transplanting) and ducklings are introduced as weed control agents until the rice grains emerge. The weeding effect of snails and ducks is considered excellent although there are some concerns over the possibility of snails overwintering and damaging young rice seedlings just after transplanting and the high cost of duck management (Oh *et al.* 2005). **F. Productivity and incomes**. In terms of the relative yield between organic and no-chemical rice farming, organic farming systems were similar to no-chemical (Tab. 1). Rice yield between organic and no-chemical farms was similar in 2005 and 2007 (Tab. 1) but the organic yields in this study were lower than previous survey data (4,340 to 4,580kg)(Park *et al.* 2001, Kim *et al.* 2006, Jung 2007). Rice productivity between the two types farming systems can therefore be considered similar though some variances are expected by season and farm.

Tab. 1. Productivity and economic performances of organic and non-chemical farming (Won per ha).

Financial performances	Organic (A)		No-chemical (B)		A/B (%)	
	2005	2007	2005	2007	2005	2007
Yield (kg/ha)	4,010	3,950	3,800	4,340	106.4	90.8
Price (per kg)	28,700	25,860	25,740	20,100	112.5	131.3
Rice income	11,519,740	10,197,260	9,703,610	8,694,840	119.7	119.4
Extra income*	644,990	2,467,70	444,990	466,770	131.3	100.0
Gross income	12,164,73,	10,444,030	10,148,600	9,161,610	120.3	118.9
Input cost†	4,118,810	5,201,850	3,530,390	4,689,900	114.3	116.7
FI**	8,045,920	5,242,180	6,618,210	4,098,330	122.9	121.1
Subsidy***	1,320,000	1,433,330	1,320,000	1,450,000	100.0	98.8
FI + subsidy	9,365,920	6,675,510	7,938,210	5,523,330	118.3	115.5

*Duck meat and rice straw sale, **FI; farm income, ***subsidy for farming material purchase. †Direct cost for rice production.

The Gross and net farm income of organic rice farming was 19-20% and 21-23% higher, respectively, than those of no-chemical rice farming (Tab. 1). G) Major external input costs. The external farming material costs of organic rice farming were on average 6 to 8% higher than no-chemical farming (Tab. 2). In organic rice farming, the purchase costs for soil management and weeding-related farming materials decreased by 5.2% and 42% but that of pest and disease control significantly increased by 51.7% (Tab. 2). This may indicate that technical improvements in soil fertility management and weeding practices are being achieved in organic rice farming but pests and diseases are increasing resulting from the lack of effective rotations and the consecutive use of only a few certain commercial varieties.

Tab. 2. Comparison of major input costs for soil management, pest and disease control and weed control between organic and no-chemical farming methods (Won per ha).

Input cost	Organic (A)		No-chemical (B)		A/B (%)	
	2005	2007	2005	2007	2005	2007
Soil managements*	766,710	727,450	834,210	608,030	92	120
Pest and disease control**	512,700	778,120	536,630	644,430	96	121
Weed control***	1,020,350	595,670	794,450	686,920	128	87
Average	2,299,760	2,101,230	2,165,300	1,939,380	106	108

*Mainly organic fertilizers and soil conditioners, **EFA alternative farming materials, ***including snail and duckling purchase and keeping facilities.

Conclusions

There is a potential risk that organic rice farming is recognized by consumers as the same as no-chemical farming because current organic and no-chemical rice production practices do not actually differ distinctively. Although organic rice farming is

more porfitable the long term sustainability of organic rice farming is questioned due to the higher production cost associated with external input dependency including increasing pests and disease control cost.

Acknowledgments

This article was based on the data of 2 projects (led by the late Mr. Seo Gui Soo) of Jeonnam Agricultural Research and Extension Services (JARES) and RDA in 2005 and 2007 and authors deeply appreciate British council for the study support of this.

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