

Current practices and economic performances of organic kiwifruit production in comparison with conventional one in Korea

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Abstract

Organic production practices varied among producers. Generally, organic producers were relying on imported input materials such as organic compost and liquid fertilizer even more than conventional producers. Very few organic farmers had composting facilities or sites for the own supply of compost in need. The productivity of organic kiwifruit orchard (92%) was not as low as that of conventional while the net income (243%) was more than double that of conventional. This was mainly attributed to high farm gate price of organic fruits, low paid labour use and electricity. As a consequence, organic kiwifruit production seems to become a feasible option in Korea. However, high dependence on imported farming material, fuel and labour for too frequent liquid fertilizer spray should be addressed to achieve long term sustainability of organic kiwifruit production.

Introduction

By now, kiwifruit is regarded as an easy crop for organic conversion in Korea due to less occurrence of pest and diseases and strong vigour (Koh *et al.* 2008). However, organic kiwifruit production is only 2.1% in Korea according to the survey of Fruit Research Institute of Jeonnam province (unpublished, 2010). Some reasons for this presumably prevail at every corner including the worries on low yield, difficulties in pest and disease control and soil nutrient management thereby low farm income (Leake 2000, Lee *et al.* 2005, Niemsdorff and Kristiansen 2006). Meanwhile, a long-term case study from New Zealand shows that there are even more nutrients input than removal in organic kiwifruit production system (Carey *et al.* 2009). Soil organic matter has increased in organic kiwifruit orchard soil and significant nutritional deficiencies were not found in organic kiwifruit leaves (Hasey *et al.* 1995). Recent statistics showing high demand on organic foods and governmental plan to raise organic industry are attracting more farmers into organic production. However, almost no organic kiwifruit information is available in Korean condition. So, this survey research was performed to know current production-level problems and economic

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achievement so as to set up better cultural practices and improve economic performances.

Materials and methods

5 pairs of commercial organic and conventional kiwifruit orchards were selected for comparison (3 in Jeonnam, 1 in Gyeongnam and 1 in Jeju province). Each orchards received 2 visits for observation and questions on farm and 1 phone interview to complete the questionnaire (90 items in total). Each pair had very similar cultural conditions such as orchard soil properties (sandy loam or loam), wind breaking net facilities (less 2mm²) and same variety (cultivar name, 'Hayward (*Actinidia deliciosa*)') at similar ages fully producing (24 to 32 year-old vines). All the general cultural practices were the same between organic and conventional such as pruning (winter and summer), shoots training on pergola system, artificial hand pollination, spring cooler irrigation during drought period only, harvest at over 7°Bx soluble solid content by hand refractometer, storage at 0 to 1°C and packaging by small scale weight grader and hands) between each pair of orchards. 5 organic orchards have been managed organically at least 5 years up to over 20 years. These orchards were also blocked and separated by wind breaking nets, wide trenches (1.5m wide and deep each) and agricultural road (3 to 4m wide) around orchards at least. Common practices were summarized by several categories (Tab. 1). For the comparison of production and economic performances, each of organic and conventional orchards' data was averaged. The individual orchard yield was achieved from recent 3 years' average (2008 to 2010).

Results and Discussion

A. Cultural practices. The major differences between organic and conventional kiwifruit cultivation are briefly summed in Tab. 1. **Soil surface management.** In organic system, growers used to introduce rye to improve physical underground soil condition by its root system and suppress weeds by its strong weed competitiveness. But they did not sow rye in recent years because physical soil condition was improved and weeds do not become problematic after introducing rye for several years. **Use of fertilizer and its source.** In winter, organic compost is applied as basic fertilizer before or after pruning but organic growers were largely purchasing most organic fertilizer from organic fertilizer companies not from own sources. In growing seasons, some organic growers started to spray liquid plant extracts or mineral mixture from early spring to just before harvest. The purposes of this spray are various, pest and disease control, supply of nutrients by folia spray, fruit firmness enhancement, for example. In some case, more than 18 times sprays were given throughout the year which required much labour and time, not to mention cost. **Fruit size enhancement.** Conventional growers have been using 'CPPU [*N*-(2-Chloro-4-pyridyl)-*N*-phenylurea]' or some unidentified materials for better fruit size about 2 weeks after pollination. However, some organic growers were using liquid form amino acid formula or plant and fruits extracts by own recipe on farm. The use of these unknown materials still needs further evaluation. **Pest and disease control.** Both organic and conventional system introduce light bulbs at night to trap insects and install simple bottles with attractants such as fermenting fruits and juice in it. To control scales (i.e., *Pseudaulacaspis pentagona*), black sheet bondages are used to wrap trunk around

and major branches as well where scales favour to lay eggs, then, bondages are removed and brush scales out on the trunk surface at certain time.

B. Comparative production cost. The expenses of production cost in organic system were lower than conventional (Tab. 2). Regardless of unpaid or paid labour cost, as seen in low paid labour of organic system (44.9%), organic growers are more dependent upon their own labour than conventional. One reason of this low paid labour cost was attributed to the more frequent exchange of labour with neighbours, which was not included as paid labour. Organic growers were actively sharing their labour with neighbours in turns. Organic system was also less dependent on fuel and electricity. However, organic kiwifruit growers seemed to heavily rely on external input materials compared to conventional growers. Most of inputs imported out of their farms were organic fertilizers, which were much more expensive than conventional compost.

C. Productivity and economic performances. Organic kiwifruit productivity was slightly lower than conventional (Tab. 3). However, the farm net income was almost 2.5 times the conventional. This was due to the double selling price of organic kiwifruit. Another reason for this could be different marketing route. Organic growers had direct selling marketing route in most cases by phone, internet and mail from dedicated customers.

Tab. 1: Major cultural practices investigated between organic and conventional kiwifruit production system

Practices	Organic	Conventional
Soil surface management	Native herbs, cut and mulch 3-4times	Rye (<i>Secale cereale</i>) introduced as cover crop, herbicide spray
Fertilization	Organic compost in winter, liquid extracts foliar spray from spring to autumn 10-18 times	conventional compost in winter, NPK or NK in spring to autumn 2-3 times
Compost source	Imported or rarely own sources	Imported
Fruit size enhancement	Natural plant extracts or amino acids 1-3 times or none	Synthetic growth promoter 2 times
Pests and disease control	Installment of insect traps, black sheet bondage, natural extracts from various herb sources under trellis	Insecticides or insect traps, fungicides 3-5 times

Tab. 2: Comparison of production cost between organic and conventional orchard system (Korea won/ha)

Farming system	Labour		Input materials	Fuel and electricity	Total cost (unpaid labor)
	Unpaid	Paid			
Org.	8,102,149	1,030,208	6,190,070	517,383	15,839,810
Con.	10,752,492	2,292,000	4,368,950	710,628	18,124,070
Org/Con	75.4	44.9	141.7	72.8	87.4

*Org; organic, Con; conventional, won; Korean currency. Unpaid labor means family labour.

Tab. 3: Productivity and economic performances between organic and conventional kiwifruit production system.

Production system	Yields (ton/ha)	Farm gate price (won/kg)	Gross income (won/ha)	Net income (won/ha)
Org.	17.2	5,500	94,600,000	78,760,190
Con.	18.7	2,700	50,490,000	32,365,930
Org/con (%)	92.0	203.7	187.4	243.3

*Org; organic, Con; conventional, won; Korean currency. Net income without unpaid labor cost.

Conclusions

Organic kiwifruit production system is not so different from conventional but rely on imported farming materials which need to be addressed. The productivity was slightly lower than conventional but it showed better profitability which resulted from higher selling price and direct sales. Consequently, organic kiwifruit system is considered a good option for kiwifruit growers in Korea.

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