Evaluation of Beneficial Function for Organic Paddy Farming in Korea

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Abstract

In order to evaluation of beneficial functions for organic farming, we have divided beneficial functions as 9 sub-functions such as flooding control, fostering water resources, purifying the air, mitigating summer climate, purifying water quality, decreasing soil erosion, accumulating soil carbon, conserving biodiversity, and preventing accidents from pesticides. And they were quantified by searching related repots and statistics, and surveying fields. Organic farming, especially organic paddy farming, showed that some functions like fostering water resources, accumulating soil carbon, conserving biodiversity, and preventing accidents from pesticides were higher than conventional paddy farming, while the others were almost similar. The fostering water resources function was evaluated as 4,297 ton ha^{-1} $year^{-1}$ to increase about 3.6% comparing with that of conventional farming. New function for accumulating soil carbon at organic paddy fields has been assessed by 4.67 ton ha^{-1} in terms of long periods over 10 years. Considering area of organic paddy farming in Korea and value of carbon price, it was evaluated monetary value as 22.4 to 84.1 billion won using replaced method. It could be also evaluated that flooding control, fostering water resources, purifying the air, mitigating summer climate, purifying water quality, decreasing soil erosion, and preventing accidents from pesticides were 2,980, 123.4, 482.6, 87.5, 0.9, 55.6, and 284.1 billion won, respectively. Conserving biodiversity function would be very big at organic farming though it couldn't be evaluated as monetary value.

Key words: Multifunctionality, Beneficial Function, Organic Paddy Farming

Introduction

Modern agriculture made it possible to grow more food per unit area by using of modified seeds and chemical input like pesticides and chemical fertilizers. Because agro-ecosystem has been threatened by over application of pesticides and fertilizers, the current challenges is to meet the food demands of a growing population by maintaining and enhancing the productivity of agricultural system without further damaging their beneficial functions, so called multifunctionality. Especially, organic paddy farming will be predicted to have higher values of beneficial function than conventional paddy farming. But most people don't know how much beneficial values has been embedded, even though they have recognized there are many beneficial side in paddy farming including organic farming. The role of environmental service at organic farming should be need to propagate to public citizen.

Objectives of this study were to assess the beneficial functions of organic paddy farming on the basis of research reports, national statistics, and fields' survey, and evaluated as monetary values.

Materials and Methods

Categories There would be many beneficial functions according to researchers or other peoples because of differences on standpoints. According to privious reports(Seo et. al.), it could be categorized 6 sub functions at conventional paddy farming such as flooding control, fostering water resources, purifying the air, mitigating summer climate, purifying water quality, decreasing soil erosion. In addition to these sub functions, it could be also esteblished sub functions at organic paddy farming such as accumulating soil carbon, conserving biodiversity, and preventing accidents from pesticides.

Assessment It was quantified the amount of each function against 9 categories. flooding control, fostering water resources, purifying the air, mitigating summer climate, purifying water quality, decreasing soil erosion were followed by previous research's method, which were established estimated models. Especially, the depth of water level at organic paddy fields was measured with near conventional paddy fields for estimating the function of fostering water resources. The function of accumulating soil carbon was analyzed by establishing model using data from long-term rice cultivating fields and analyzing soil carbon at organic paddy fields. The function of preventing accidents from pesticides havd used with stastical data about pesticides poisoning death.

rates were evaluated using the first-order kinetic models.

Economic value After assessment on beneficial functions about organic paddy farming, we made a attempt each function to monetary value by means of replacing method. The amount of carbon accumulated in soil at organic paddy fields should be replaced by the price in carbon exchange marckets which is related climate changes.

Results and Discussion

As results of surveying the level of flooded water at organic snail paddy fields with near conventional paddy fields, it was showed water level at organic snail practice filed were deeper as almost two times than near conventional practice. Comparing soil organic matter with organic and conventional paddy fields, its content at organic was also higher than conventional, recorded 30.1 and 23.5 g Kg^{-1}, respectively. On the basis of soil carbon in the view of long term practices, the function of accumulating soil carbon could be estimated by 4.69 ton ha-1 at organic paddy farming. Organic farming could prevent their sustainable practices from poisoning pesticides accidents. The amount of each sub function was estimated by unit area as shown as Table 1 except conserving biodiversity.

Table 1. The amount of beneficial function for organic paddy farming dividing as 8 categories

Sub functions	Amount of sub function	Monetary value (billion won)	Comparing with conventional farming
flooding control	2.94 ton ha^{-1} $year^{-1}$	2,980	Same
fostering water resources	4.3 ton ha^{-1} $year^{-1}$	123.4	Increase 3.6%
purifying the air	CO_2: 21.9 ton ha^{-1} $year^{-1}$	76.2	Same
	O_2: 15.9 ton ha^{-1} $year^{-1}$	406.4	Same
mitigating summer climate	3,049 ton ha^{-1} in summer	87.5	Same

purifying water quality	20.7 N kg	0.9	Same
decreasing soil erosion	110.8	55.6	Same
accumulating soil carbon	4.69 C	22.4-84.1	New
preventing accidents from pesticides	984 person	284.1	Average in 2003-2005

Table 1 is also showed their monetary values for sun functions on organic paddy farming while the function of preventing accidents from pesticides was about whole organic farming. But It was couldn't quantify about the function of conserving biodiversity even though there were many evidences related during the research times for example finding rare animals in organic paddy fields.

Conclusion

The beneficial function on organic paddy farming was investigated by analyzing reports, statistics and fields data. In the view of environmental conservation function, almost sub functions were very similar with conventional farming except fostering water resources, which is increased by 3.6%. But in the view of alleviating green house gases, new beneficial function was revealed to make a role of accumulating soil carbon in long term continual practices. Generally organic farming doesn't use dangerous chemicals. It means that organic farming has the function for preventing accidents from pesticides which bring about social problems.

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