

Comparison of paddy yield and soil qualitative characteristics among different farming systems in three regions of Mazandaran

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Extended Abstract

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Introduction

Organic cultivation of rice (*Oryza sativa* L.) has been carried out in some parts of the world. Despite a lot of research, policy and public attention, only a small portion of the total agricultural land is devoted to organic farming (Surekha *et al.*, 2013). Due to the adverse effect of conventional agriculture on environment through the excessive use of chemical inputs, the importance of considering to alternative agriculture is increasing day by day (De Ponti *et al.*, 2012). One of the pillars of sustainable agriculture is the use of organic fertilizers in agro-ecosystems with the aim of eliminating the use of chemical fertilizers. Due to the emerging trend for organic cultivation of rice in Mazandaran province and the existence of numerous potential for transition from conventional to organic agriculture, the present study was designed to evaluate the paddy yield and qualitative characteristics of paddy soil in three cropping systems of conventional, low-input and organic farming.

Materials and Methods

In order to study effect of different farming systems on paddy yield and qualitative characteristics of paddy soil, an experiment was conducted during 2015 and 2016 cropping seasons in three different regions of Mazandaran province including Amol, Babol and Fereydunkenar. For organic, low-input and conventional farming systems, three, four and six fields were selected in these regions, respectively. In

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each farming system and region, grain yield, biological yield and harvest index were determined in three replications. Also, in order to measure the quality of soil in each system, 10 separate samples were taken from soil depths of 0 to 30 cm. The amount of soil nitrogen was calculated by kjeldahl method, phosphorus by Olson-Summers method and potassium by ammonium replacement method. The data was processed by Excel software and after analysis of Bartlett test for uniformity of variances, the mixed analysis of variance was done using SAS statistical software ver. 9.1. Also, the mean comparison was performed by Duncan's test at 5% probability level.

Results and Discussion

The results showed that the highest paddy and biological yields were obtained in Fereydunkenar region under low-input farming system, which differed 4.73 and 2.80 percent and 29.9 and 29.12 percent as compared to the conventional and organic systems, respectively. The values for harvest index in organic, low-input and conventional systems were 37.48, 38.69 and 36.85 percent, respectively. However, there was no significant difference between organic and low-input systems. Also, the farming systems positively affected the soil quality characteristics (Zhu *et al.*, 2014). The maximum organic carbon content of 2.25 percent was related to organic system and the lowest amount (1.67 percent) was recorded under conventional farming system in the second year. The total nitrogen content in the conventional system decreased from 0.21 percent in the first year to 0.18 percent in the second year, which showed a decrease of 14.28 percent. Also, this rate was reduced by 5 percent in low-input system in the second-year and increased by 5 percent from 0.19 to 2.0 percent in organic system in the second year. The maximum available phosphorus of 14.98 mg/kg was obtained under organic farming system, which showed a significant difference with the low-input (8.34 percent) and conventional systems (13.75 percent). The amount of available soil potassium in organic system in the first year was lower than conventional and low-input systems by 17.67 and 56.68 percent and this difference was 21.25 and 4.6 percent in the second year, respectively.

Conclusion

The results of the present study in three regions showed that organic farming system produced less paddy yield than low-input and conventional systems. However, the highest paddy and biological yields were obtained in Fereydunkenar region under low-input farming system; on the other hand, there was no significant difference between conventional and low-input systems in the other two regions. Therefore, in terms of production quantity and less consumption of chemical inputs, low-input system can be recommended as a suitable system. Although, the quantitative

reduction of yield in organic farming is noticeable as compared to the low-input and conventional systems, soil quality characteristics such as pH, organic matter percent, total nitrogen, absorbable P and K significantly improved under organic farming system.

Keywords: Organic culture, pH, paddy yield, conventional

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