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# Improvement of soil fertility and rice productivity by using green manure crops in paddy fields

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**[Introduction]**

The purpose of this study is to understand whether paddy soil chemical properties and rice yield can be improved by the addition of the green manure, namely, Italian ryegrass (IRG) and rye.

**[Materials and Methods]**

This experiment was performed from February 2016 to November 2016 at paddy field in Gunwi, Gyeongbuk providence. In this experiment, rye, Italian ryegrass and rice were used. The race of the rye, Italian ryegrass and rice are Goguhomil, Kowinearly and Jopyeong. Planting rye and Italian ryegrass were conducted by broadcast seeding at 29$^{th}$ February. Whole fields were crosswise puddling on the heading date of rye or Italian ryegrass to use green manure for rice growing. And then rice named "Jopyeong" was sown at 29th April and was transplanted by the machine. Rice grew under non-fertilization during whole rearing period. Before the crosswise puddling, Italian ryegrass and rye were sampled to analyze the mineral components in green manures. Nitrogen are measured by Kjeldahl method. The mineral in green manures are analyzed according to AOAC method. Using ICP (Inductively Coupled Plasma, Iris Intrepid Thermo Elemental Co., UK), Ca, K and P in the final solution are analyzed. Approximate RF power was 1,150 W. And analysis pump rate was 100rpm. Nebulizer pressure and observation height were 20 psi and 15mm respectively. Riceter M (Kett, https://kett.com/) are used to measure the moisture content in rice. 1000-Grain weight are also gauge after harvesting. Measuring amylose and protein brown and white rice was done using NIRT Grain Tester AN_820.

**[Results and Discussions]**

Dry matter yields of the rye and Italian ryegrass were 2.21 and 1.81 t ha$^{-1}$, respectively. Fertilizer ingredient content (K-P-N) of IRG and rye was 21-7-40 kg ha$^{-1}$ and 25-7-47 kg ha$^{-1}$, respectively. The height of the Italian ryegrass-fertilized rice was the tallest of the fertilized variants. The soil chemical properties changed with the growing of rice. The Italian ryegrass-fertilized field was the most acidic among the three fields. Italian ryegrass and rye-fertilized fields had better chemical properties than the non-fertilized ones. The most important trait, the yield of the variant-fertilized rice, had a large difference. The yield of rice from the Italian ryegrass-fertilized field was much more than the yield of rice from the non-fertilized field.

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