

INFORMATION ON RESEARCH RESULTS

1. General information:

Project title: Environmental impact assessment of production of rice, fruit trees, and upland crops in the Mekong delta.

Code number: B2010 - 16 - 177

Project leader: Le Thanh Phong, PhD

Institution: Can Tho University

Duration: from 01/01/2010 to 31/12/2011

2. Objective(s):

Quantifying and assessing the environmental impact of the production of rice, watermelon, tomato, maize, Hoa Loc mango, and pummelo in the Mekong delta.

Propose measures appropriate farming techniques to improve the environmental impacts towards the environmentally-friendly.

3. Creativeness and innovativeness:

Quantifying the environmental impacts of global warming, acidification, and eutrophication in production of some important crops in the Mekong Delta.

4. Research results:

Research results showed the level of intensive farming of rice, vegetables and fruit trees was quite high. It was expressed mainly by higher doses of fertilizer use than recommendation. Amount of nitrogen fertilizer was supplied the most for Da Xanh pummelo (869.1 kg per ha) and Nam Roi pummelo (751.8 kg per ha) followed by Hoa Loc mango (411.5 kg per ha), watermelon (300.9 kg per ha), maize (265.8 kg per ha), tomatoes (248.3 kg per ha), and lowest amount for rice (107.1 kg per ha). Amount of phosphate fertilizer was supplied the most for Da Xanh pummelo (685.2 kg per ha) followed by watermelon (385.9 kg per ha), Nam Roi pummelo (356.5 kg per ha), Hoa Loc mango (208.9 kg per ha), tomatoes (175.8 kg per ha), maize (155.3 kg per ha), and lowest amount for rice (74.0 kg per ha). Amount of potassium fertilizer was provided the most for Nam Roi pummelo (350.8 kg per ha) and Da Xanh pummelo (278.7 kg per ha) followed by watermelon (171.5 kg per ha), Hoa Loc mango (164, 5 kg per ha), tomatoes (133.8 kg per ha), rice (81.5 kg per ha), and the lowest amount for maize (71.9 kg per ha).

Survey results also showed that tomato (31.30 tons per ha) and watermelon yield (29.67 tons per ha) were the highest yields followed by Nam Roi pummelo (21.8 tons per ha), Da Xanh pummelo (13.6 tons per ha), Hoa Loc mango (8.19 tons per ha), rice (6.947 tons per ha), and the lowest yield was maize (3.95 tons per ha).

The environmental impact assessment results per 1 kg product as follows:

(i) the highest global warming impact was on Da Xanh pummelo fruit (1009.44 g CO₂-equivalent) followed by maize fruit (970.75 g CO₂-equivalent), Hoa Loc mango fruit (an average of 739.35 g CO₂-equivalent), rice grain (609.55 g CO₂-equivalent),

Nam Roi pummelo fruit (535.51 g CO₂-equivalent), watermelon fruit (161.60 g CO₂-equivalent), and tomato fruit (128.78 g CO₂-equivalent).

(ii) the highest acidification impact was on Da Xanh pummelo fruit (13.23 g SO₂-equivalents) followed by maize fruit (12.75 g SO₂-equivalents), Hoa Loc mango fruit (an average of 9.47 g SO₂-equivalents), Nam Roi pummelo (6.93 g SO₂-equivalents), rice grain (4.70 g SO₂-equivalents), watermelon fruit (2.08 g SO₂-equivalents), and tomato fruit (1.66 g SO₂-equivalents).

(iii) the highest eutrophication impact was on maize fruit (48.92 g NO₃-equivalent) and rice grain (47.90 g NO₃-equivalent) followed by Da Xanh pummelo fruit (36.12 g NO₃-equivalent), Hoa Loc mango fruit (an average of 29.54 g NO₃-equivalent), Nam Roi pummelo fruit (20.02 g SO₂-equivalent), watermelon fruit (7.38 g NO₃-equivalent), and tomato fruit (7.27 g NO₃-equivalent).

Use of crop protection chemical products and fuel (petrol/electric) had contributed to the effects of global warming, acidification, and eutrophication, but this impact was quite low compared to fertilizer. The highest land use efficiency was on tomato (0.32 m² per kg fruit) followed by watermelon (0.34 m² per kg fruit), Nam Roi pummelo (0.46 m² per kg fruit), rice (0.48 m² per kg seed), Da Xanh pummelo (0.74 m² per kg fruit), Hoa Loc mango (1.22 m² per kg fruit), and the lowest land use efficiency was on maize (2.52 m² per kg fruit).

To reduce the environmental impact of global warming, acidification, and eutrophication of the crops in production, the improvement of nitrogen use efficiency (amount, kinds of nitrogen fertilizer, fertilizing time) can be an important measure to reduce the environmental impact. This can help to reduce N₂O emissions, leaching of NO₃⁻, NH₃ emissions, and help increase the yield of rice, vegetables and fruits through better nutrient absorption of crops, thereby reducing the impact of global warming, acidification, eutrophication per kg product produced, and also increase the efficiency of land use. In rice production, application of crop rotation can help to reduce CH₄ emissions from paddy soil. Application of techniques of crop mulching to vegetables, fruit trees can be suggested to reduce nutrient leaching and limit the impact of eutrophication.

5. Products: 01 Final Report, 01 article, and 04 BSc theses.

6. Effects, transfer alternatives of research results and applicability:

Research results can be used in teaching; reference for study of environmental impact of crop production; provide information for extension activities in advising farmers for improving the use of fertilizers.