RICE PRODUCTION WITH THE PRACTICE OF RICE STRAW INCORPORATION - SUPPORTED BY TRICHODERMA

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I. Objectives:

- Open field burning of rice straw is a major problem in the intensive rice cropping systems, and really popular in the Mekong Delta. It leads to environmental pollution, unsustainable cropping and increased greenhouse gas emissions. This practice also results in losses of nutrients, particularly nitroge, waste of organic matter.
- Spraying the fungus *Trichoderma* to decompose chopped rice straw for making organic fertilizer *in situ* is a possible way to maintain the soil fertility for a long term. However, the contribution scale of nutrients to the soil by decomposed rice straw and the methane and other green house gases released from rice field have not known.
- This experiment entitled: “Experiments and evaluation of rice straw incorporation supported *Trichoderma”* was conducted in two seasons of Summer-Autumn 2016 and Winter-Spring 2016-2017 ***to find out the effects of different treatments of straw management on growth and yield of rice, soil fertility, methane emission in the field under normal condition in the Mekong delta of Vietnam.***

II. Methodology of research

1. **Venue**: Dinh Thanh Agricultural Research Center (DTARC), belonging to Loc Troi Group.
2. **Crop season**: Autumn – Winter season of 2016
3. **Experimental design**:
   - 3 treatments
   - 5 replications
   - Completed randomized design (CRD)
   - Measured parameters
     - Rice plant growth
     - Yield components and yields
     - Green house gases

[T1] Incorporation of chopped straw with *Trichoderma*

[T2] Remove straw, incorporation of stubble without *Trichoderma*

[T3]: In-field burning straw (Control treatment)

III. Results:

3.1. Effects of the treatments on the growth of rice

There is no significant difference among treatments on rice plant heights measured at 20; 40; 60 days after sowing (DAS) and at harvest. The average data at those stages are 24.0; 49.9; 69.0 and 86.2 cm.

Table 1: Rice plant heights affected by treatments

No.	Treatment	Plant height (cm)			
		20 DAS	40 DAS	60 DAS	Harvesting
1	T1	23.6	48.3	68.7	86.0
2	T2	24.1	49.5	67.8	86.2
3	T3	24.3	51.7	70.5	86.4
Average		24.0	49.9	69.0	86.2
F		ns	ns	ns	ns
CV (%)		3.49	5.72	6.78	3.48

III. Results:

3.1. Effects of the treatments on the growth of rice

The number of tillers is not affected by treatments at 20; 40 and 60 DAS. The average data in those growth stages are : 305; 394 and 365 tillers / m^2 .

Table 2: Number of tillers affected by treatments

No.	Treatment	No. of tiller (tiller/m^2)		
		20 DAS	40 DAS	60 DAS
1	T1	295	399	365
2	T2	306	392	366
3	T3	313	391	365
Average		305	394	365
F		ns	ns	ns
CV (%)		7.56	7.38	4.92

III. Results:

3.2. Yield components and yields

There is no significant difference amongst treatments regarding yield components and yield.

Table 3: Yield components and yield affected by treatments

No.	Treatment	No. of panicles/m2 (panicle)	No. of filled grains/panicle (grains)	Filled grain percentage (%)	1.000 grain weight (g)	Yield (t/ha)
1	T1	255	72.8	82.9	25.6	4.36
2	T2	268	65.2	85.0	25.9	4.40
3	T3	271	76.0	84.9	25.5	4.25
Average		264	71.3	84.3	**25.6**	**4.34**
F		ns	ns	ns	ns	ns
CV (%)		5.40	19.4	3.95	1.15	4.54

III. Results:

3.3. Greenhouse gas emissions

3.3.1. CH_4

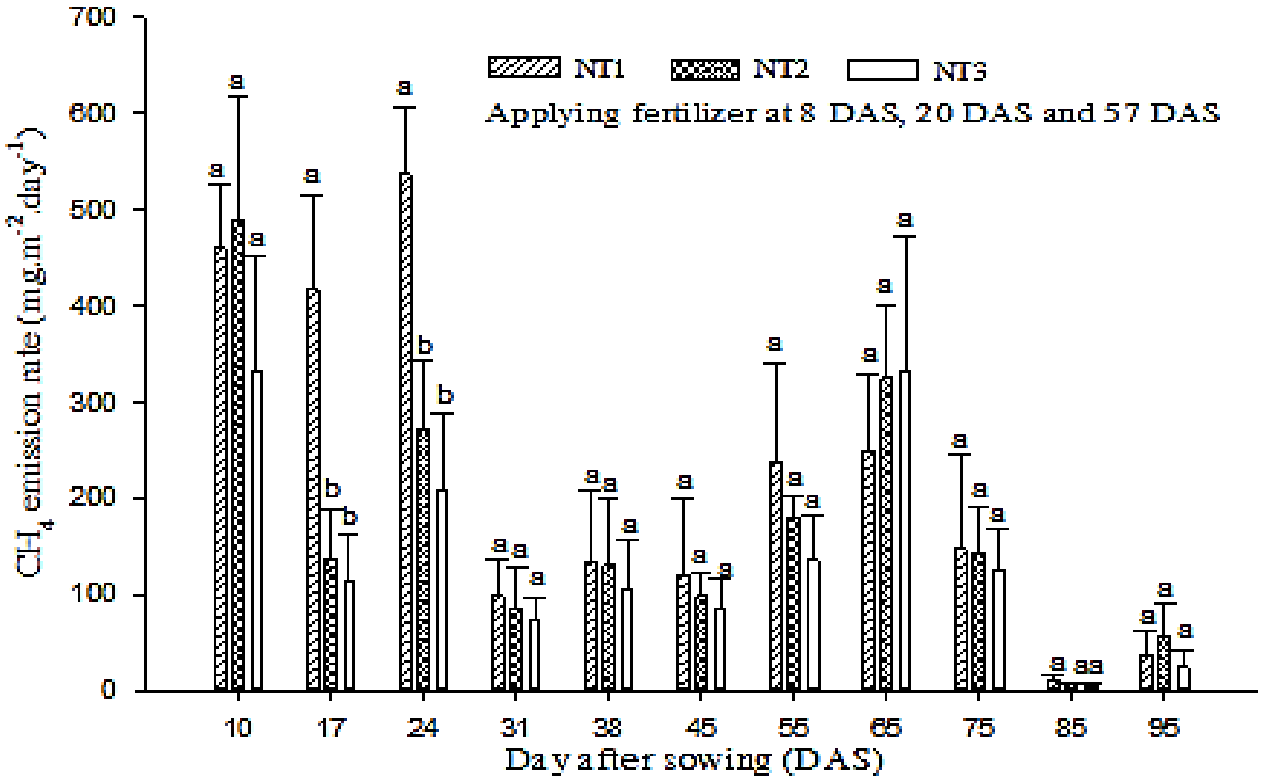

Figure 1. CH_4 emission rate

The emission rate of CH4 in treatment T1 is not significantly different to the other two treatments T2 and T3 in almost sampling date ($p>0.05$), except 17 and 24 DAS.

Besides, CH_4 emission rate in all three treatments in the first three weeks and 55 – 65 days after sowing higher than the other periods of the experiment.

III. Results:

3.3. Greenhouse gas emissions

3.3.2. N_2O

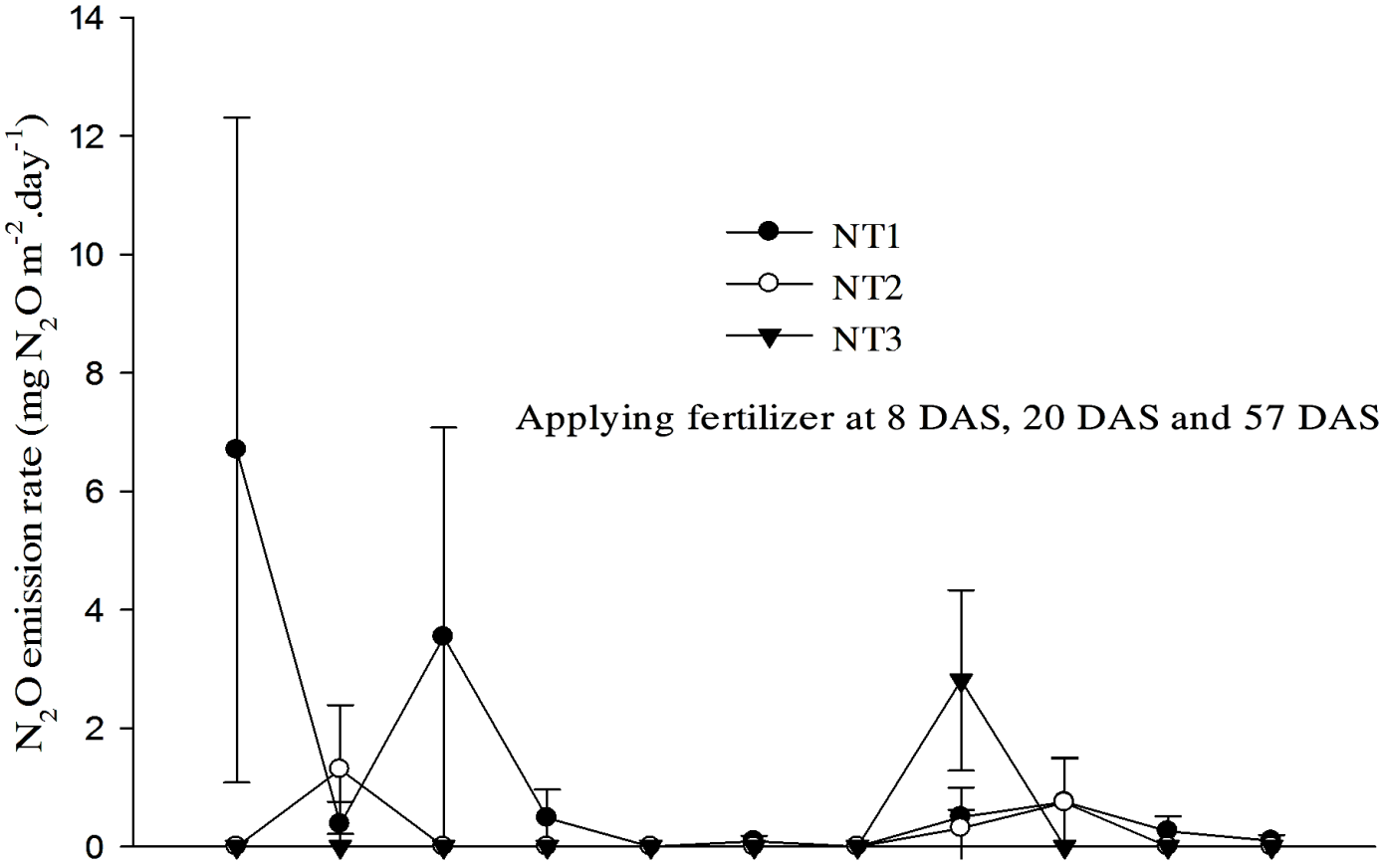

Figure 2. Rate of N_2O emission

The emission of N_2O in three treatments was 0 – 6.57 $mg.m^{-2}.day^{-1}$ and mostly there is no N_2O emission. The N_2O emission is higher during the period of adding fertilizers to the field than the other days and there is no significantly different among three treatments in N_2O emission ($p>0.05$).

III. Results:

3.3. Greenhouse gas emissions

3.3.3 Total emission of CH_4

The total emission of CH_4 in three treatments of T1, T2 and T3 are 139.7 – 222.6 $kg.ha^{-1}.season^{-1}$. CH_4 emission in T1 is quite fluctuated. However, there is not significantly different in CH_4 emission among three treatments ($p>0.05$).

3.3.4 Total emission of N_2O

Not much N_2O emitted and not significantly different among three treatments. However, the emissions of N_2O among three treatments are quite fluctuated. The emission of N_2O of the Autumn Winter Crop 2016 is 0.21 – 1.16 $kg.ha^{-1}.season^{-1}$ and is not significantly different among three treatments.

III. Results:

3.4. CO_2 equivalent emission

The emission of CO_2 equivalent (CO_{2eq}) is 3.6 – 5.9 ton $CO_{2eq}.ha^{-1}$ and is not significantly different.

However, the emission of CO_{2eq} per kg of rice straw incorporating to the rice field with *Trichderma* in T1 (2.18 ± 0.1 kg $CO_{2eq}.ha^{-1}.kg$ rice $straw^{-1}$) is significantly higher than its in the treatments T3 (in-field burning rice straw) (1.27 g CO ± 0.33 kg $CO_{2eq}.ha^{-1}.kg$ rice $straw^{-1}$).

IV. Lessons learned and suggestions

- It has been observed that after one season, there is no significant effects of different rice straw management techniques on the growth, yield of rice and gases emitted from rice field.
- The same experiment has been continued to conduct in the same field with the same layout to study the cumulative effects of treatments on the rice growth, yields and soil fertility in Winter-Spring season of 2016-2017.

THANK YOU