



2016

"Small and Medium-sized  
Enterprises Competitiveness"

ISBN 978-602-7577-70-1



# PROCEEDING

## INTERNATIONAL CONFERENCE

Agribusiness Development for Human Welfare



**UMY**

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Muhammadiyah  
Yogyakarta

Unggul  Islami

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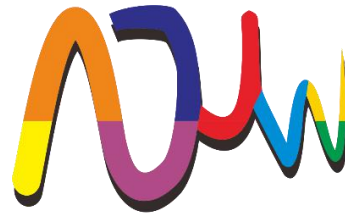
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# PROCEEDING INTERNATIONAL CONFERENCE

AGRIBUSINESS  
DEVELOPMENT FOR  
HUMAN WELFARE

*“Small and Medium-sized  
Enterprises Competitiveness”*



Agribusiness Development  
for Human Welfare

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## **EDITOR FOREWORD**

The economic integrations by ASEAN certainly have given a major influence on Small and Medium-sized Enterprises (SMEs). Beside economic integration in the form of free trade area (FTA) that has been going on since the early 2000s, economic integration in the form of ASEAN Economic Community (AEC) has been ongoing since the beginning of 2016. Through this integration, SMEs have opportunity to expand access to markets, technology, and capital. But at the same time SMEs are required to improve their competitiveness in order to survive in the market.

In order to explore ideas, concept, and innovations related to the competitiveness of SMEs, International Conference on Agribusiness Development for Human Welfare (ADHW 2016) was held in Yogyakarta on May 14, 2016. The conference organized by Department of Agribusiness Universitas Muhammadiyah Yogyakarta, in collaboration with Department of Agribusiness and Information System Universiti Putra Malaysia, Department of Agro-Industrial Technology Kasetsart University, Department of Agriculture Socio-Economics Universitas Gadjah Mada, Department of Agriculture Socio-Economics of Universitas Brawijaya, Indonesian Society of Agriculture Economics, Agribusiness Association of Indonesia. Hopefully proceedings of ADHW 2016 provide stimulus for increasing competitiveness of SMEs in ASEAN, especially in Indonesia.

Furthermore, we are grateful to Allah, the Sustainer of all word, who always makes it easy for our affairs. We would like to acknowledge with thanks to all the institution and individual who joined with resources and efforts in organizing the conference that resulted in the papers which are published in this proceeding. Special thanks to all authors and discussants who contributed with their intellectual capital and responded to our call papers. Thanks and acknowledgment are also due to all reviewers of the conference who helped in evaluating submitted papers; and to the members of the Organization Committee, who ensured smooth execution of the event.

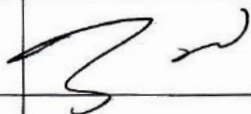
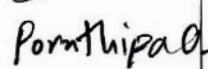

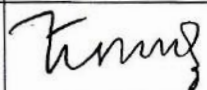
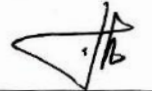
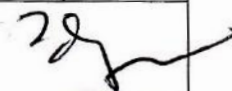
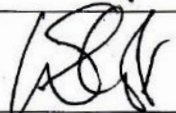
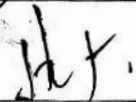
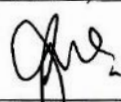

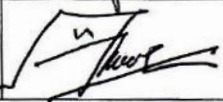
May 30, 2016

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## PREFACE

Assalaamualaikum, Warahmatullaahi., Wabarakaatuh.  
Dear Honorable Governor of Yogyakarta Special Province  
Dear respectable Prof. Dr. Zainal Abidin Mohamed  
Dear respectable Asist. Prof. Pornthipa Ongkunaruk  
Dear respectable Rector of UMY Prof. Dr. Bambang Cipto, MA.  
Dear all invited Guests, Speakers, and Participants of International seminar of ADHW 2016.

Alhamdulillah, all praise be to the Almighty God, so that we can be gathering here today at Muhammadiyah University of Yogyakarta in order to attend the Conference on Agribusiness Development for Human Welfare (ADHW) 2016.

Ladies and Gentlemen,

On behalf of the committee, I would like to say welcome to this International Conference on ADHW 2016 and thank you for attending our invitation.

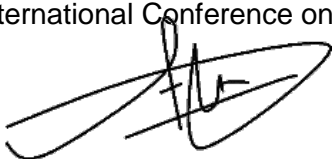
Especially, we are grateful to invited speakers, Prof. Zainal Abidin Mohamed and Asist. Prof. Pornthipa Ongkunaruk, for their willingness to share information and thoughts in this conference. As a bit report, that this conference has been attended by 85 speakers coming from five countries.

This conference entitled "Small and Medium-sized Enterprise Competitiveness". ASEAN Economic Community is the largest economic integration that is going to be implemented at the beginning of 2016 (December 31, 2015). Through this integration, SMEs will have opportunity to expand access to markets, technology, and capital. But at the same time SMEs are required to improve their competitiveness in order to survive in the market. We expect that this seminar is capable of producing thoughts building SMEs within ASEAN, especially Indonesia, to face the free trade.

This event can be done by support and efforts from all sides. Therefore, I would like to say thank you to all committee members having worked hard to conduct this event. We, as the organizer committee, do apologize when there is a shortage in conducting this event.

Wassalamualaikum, Warahmatullaahi., Wabarakaatuh.

Chairman  
International Conference on ADHW 2016



Dr. Aris Slamet Widodo, SP., MSc.



## **WORDS OF WELCOME**

Assalamu'alaikum warahmatullahi wabarakatuh

Alhamdulillah, all praise be to Allah SWT, who has given us His blessings so that this International Seminar of Agribusiness Development for Human Welfare (ADHW) 2016 entitled "Small and Medium-sized Enterprises Competitiveness" can be conducted. This International Conference is held in cooperation among Agribusiness Study Program of Muhammadiyah University of Yogyakarta with Putra University of Malaysia (UPM), Kasetsart University (KU), Association of Indonesian Agricultural Economy (PERHEPI), and Agribusiness Association of Indonesia (AAI), Universitas Gadjah Mada (UGM) and Universitas Brawijaya (UB).

Countries of ASEAN members like Indonesia, Malaysia, and Thailand have more than 90% Small and Medium-sized Enterprises (SMEs). In general, SMEs play important role in economic developments such as in terms of employment, added value, improve foreign exchange, and economic growth. For Indonesia, the role of SMEs is limited to employment and added value, while the foreign exchange from SMEs is still low. According to the General Director of SMEs of Industrial Ministry, in 2013 the total SMEs being able to pass through export market is just under 5 percent. For that required many breakthrough and innovation so that the role of SMEs becomes real economic development, especially in Indonesia, and generally in ASEAN countries.

On behalf of Agribusiness Department of Universitas Muhammadiyah Yogyakarta, we would like to express our gratitude Putra University of Malaysia (UPM), Kasetsart University (KU), Association of Indonesian Agricultural Economy (PERHEPI), Agribusiness Association of Indonesia (AAI), Universitas Gadjah Mada (UGM) and Universitas Brawijaya (UB) for all supports, sponsors, and all committee members having worked so hard that this International Conference can be conducted.

Hopefully, these synergies coming from various parties can provide contribution for developing SMEs in Indonesia and other ASEAN countries as well.

Wassalamu'alaikum warahmatullahi wabarakatuh

Head of Agribusiness Department  
Universitas Muhammadiyah Yogyakarta



Ir. Eni Istiyanti, MP.



**Gubernur**

**Daerah Istimewa Yogyakarta**

**Sambutan**

**KONFERENSI INTERNASIONAL**

**“AGRIBUSINESS DEVELOPMENT FOR HUMAN WELFARE”**

**Yogyakarta, 14 Mei 2016**

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Assalamu'alaikum Wr. Wb.

Salam sejahtera untuk kita semua.

Yang Saya hormati :

- Rektor Universitas Muhammadiyah Yogyakarta;
- Para Narasumber;
- Hadirin dan Para Peserta yang berbahagia,

Puji dan syukur marilah kita panjatkan kehadirat Allah SWT karena hanya atas limpahan rahmat serta karunia-Nya, kita dapat hadir pada kesempatan acara **Konferensi Internasional “Agribusiness Development For Human Welfare”** ini dalam keadaan sehat wal’afiat.

Pada kesempatan kali ini, secara ringkas Saya akan menyampaikan mengenai industri kecil menengah nasional yang menjadi tema pada pembukaan Seminar Internasional “Agribusiness Development For Human Welfare” ini.

**Hadirin dan Saudara-saudara sekalian yang Saya hormati,**

Berdasarkan data BPS, pertumbuhan industri pengolahan nonmigas pada tahun 2015 secara kumulatif sebesar 5,04%; lebih tinggi dari pertumbuhan ekonomi (PDB) pada periode yang sama sebesar 4,79%. Pada periode Januari-Desember 2015, nilai ekspor produk industri pengolahan nonmigas mencapai USD 106,63 Milyar, dan nilai impor mencapai USD 108,95 milyar, sehingga neraca perdagangan industri pengolahan nonmigas pada periode yang sama sebesar USD 2,32 milyar (neraca defisit).

Usaha pemerintah untuk memperkecil defisit di atas, salah satunya dengan cara memberdayakan Industri Kecil dan Menengah (IKM) yang merupakan bagian penting dalam perkembangan industri nasional. Sampai saat ini, Industri Kecil dan Menengah



telah berkontribusi sebesar 34,82% terhadap pertumbuhan industri pengolahan nonmigas secara keseluruhan.

Angka ini dapat tercapai karena dukungan lebih kurang 3,6 juta unit usaha, yang merupakan 90 persen dari total unit usaha insutri nasional. Jumlah unit usaha tersebut telah mampu menyerap tenaga kerja sebesar 8,7 juta orang, yang tentunya berdampak pada meningkatnya ekonomi nasional serta mengurangi kemiskinan.

Industri Kecil dan Menengah (IKM) memiliki peran yang strategis dalam perekonomian nasional. Hal ini sejalan dengan Visi Pemerintah dalam Rencana Pembangunan Nasional Jangka Menengah (RPJMN) 2015-2019 yaitu *“Terwujudnya Indonesia yang berdaulat, mandiri, dan berkepribadian berlandaskan gotong royong”*.

Untuk lebih meningkatkan peran tersebut, Penumbuhan dan Pengembangan Industri Kecil dan Menengah diarahkan untuk memiliki tujuan jangka menengah guna mewujudkan industri kecil dan industri menengah yang berdaya saing, berperan signifikan dalam penguatan struktur industri nasional, pengentasan kemiskinan dan perluasan kesempatan kerja, serta menghasilkan barang dan/atau jasa Industri untuk keperluan ekspor.

**Hadirin dan Saudara-saudara sekalian,**

Awal tahun ini, kita telah memasuki era Masyarakat Ekonomi ASEAN (MEA). Dengan demikian, perekonomian nasional akan langsung bersaing dengan para pelaku pasar di kawasan ASEAN. Produk dan jasa termasuk investasi negara-negara anggota telas bebas memasuki pasar di kawasan ASEAN.

Dalam rangka menghadapi hal tersebut, Pemerintah mengambil langkah-langkah strategis berupa peningkatan daya saing industri dan mendorong investasi di sektor industri; di mana peningkatan daya saing industri itu sendiri dilakukan melalui penguatan struktur industri dengan melengkapi struktur industri yang masih kosong serta menyiapkan strategi ofensif dan defensif dalam akses pasar.

Pemerintah telah melakukan Penguatan Sektor IKM dengan strategi ofensif dan defensifnya melalui beberapa program pelaksanaan, diantaranya antara lain: Penumbuhan Wirausaha Baru; Pengembangan IKM melalui Pengembangan Produk IKM serta Peningkatan Kemampuan Sentra dan UPT; Pemberian Bantuan Mesin dan Peralatan Produksi; Perluasan Akses Pasar melalui Promosi dan Pameran; Fasilitasi Pendaftaran Hak Kekayaan Intelektual; Fasilitasi Sertifikasi Mutu Produk dan Kemasan; serta Fasilitasi Pembiayaan melalui Skema Kredit Usaha Rakyat (KUR).

Saya berharap agar berbagai program-program pemerintah tersebut dapat didukung secara sinergis oleh seluruh komponen masyarakat. Untuk itu, Saya berpesan kepada Saudara-saudara sekalian agar semua program pemerintah dalam bidang

Industri, khususnya dalam program pemberdayaan Industri Kecil dan Menengah, didukung dengan sepenuh hati, agar dapat lebih bermanfaat bagi masyarakat dalam rangka pengembangan industri kecil menengah.

**Hadirin dan Saudara-saudara sekalian yang Saya hormati,**

Demikian beberapa hal yang dapat Saya sampaikan. Akhirnya dengan memohon ridho Allah Subhanahu Wata'ala, seraya mengucap "*Bismilahirrahmanirrahim*", **Konferensi Internasional "Agribusiness Development For Human Welfare"** dengan ini secara resmi Saya nyatakan dibuka. Semoga Allah SWT memberikan petunjuk, bimbingan, perlindungan dan kemudahan dalam setiap langkah dan upaya kita. Amien.

Sekian dan terima kasih.

Wassalamu'alaikum Wr. Wb.

Yogyakarta, 14 Mei 2016  
GUBERNUR  
DAERAH ISTIMEWA YOGYAKARTA



**HAMENGKU BUWONO X**

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## PLANTING DISTANCE AND DOSE OF ORGANIC MANURE ON THE SOIL CHEMICAL PROPERTIES AND YIELD OF LOWLAND RICE

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### ABSTRACT

The objectives of the study were to evaluate the effects of planting distance and dose of manure applications on soil chemical properties and yield of lowland rice. Experimental design was used a factorial randomized complete block design with three replications. The treatments consisted of plant spacing (30 x 15, 30 x 30 and 30 x 45 cm) and manure doses (0, 10 and 20 tons manure ha<sup>-1</sup>). The results showed that a mixture of manure and urea significantly affect the C-organic, N-total and P-available in the soil. The average of increasing C organic was classified as low categories, N-total was medium and P-available was low. There was significant interaction effect between plant spacing and mixture of dose manure and urea on the grain yield. Increasing the level of planting distance and dose organic manure will be stimulated on plant height and some yield components of rice crops and the optimized level for organic manure application was 20 tons.ha<sup>-1</sup> due to limited C-organic content in the rice field of Empetring village, Darul Kamal Aceh Besar Sub-district area. The average of grain yield was reached 6,26 tons ha<sup>-1</sup> which gained in doses of 10 tons ha<sup>-1</sup> manure and urea mixture.

**Keywords:** Planting distance, manure, chemical soil properties, rice yield

### INTRODUCTION

Rice crops in Indonesia are not just as a food commodity, but also as a strategic commodity which has a high sensitivity of political, economic and social vulnerability (Andoko, 2002). In term of supporting rice plants with high productivity, it is necessary to apply some right technology components in order to provide optimal results. One approach which is being studied in order to improve the productivity of rice fields is through the integrated crop management approach by using improved varieties, young seedlings and plant spacing (Balai Penelitian Padi, 2003).

Plant spacing is one of the factors which affects the crop yields. Basically, grain yields are determined by three main factors, namely soil, plants, and climate. The last factor is a kind of factor that cannot be changed by humans such as solar radiation, precipitation, air

temperature and relative humidity. Meanwhile the factors of soil and plants can be modified to suit the growth and the yield of crops.

Plant spacing highly depends upon the level of soil fertility and soil moisture conditions. In the dense spacing, there are more plant populations. But the competition of sunlight, water and nutrients cannot be avoided; consequently it would interfere with the plant growth and the yields (Sumarno, 1986).

According to Setyati (1984), the distant spacing will provide the opportunity for the growth of weeds, but it can avoid the competition of sunlight, water and nutrients. So that plants can grow and develop properly. Based on the research of Tamrin (2010), about plant spacing of 30 cm x 30 cm by ignoring manure distribution in paddy fields may result up to 8.01 tons ha<sup>-1</sup> of rice

production. In fact (Sarief, 1989) stated that manure is a highly significant by product, consisting of solid and liquid excrement of livestock mixed with food waste, which can increase the nutrients in the soil.

According to Khalid *et al.* (2008), which conducted research on Pidie Jaya, North Aceh and West Aceh by using 2.5 tons  $\text{ha}^{-1}$  of manure on Ciherang variety, can give effect to the increase of rice production up to 6.07 tons  $\text{ha}^{-1}$ .

The study in Aneuk Glee Aceh Besar Subdistrict with application of two tons of manure  $\text{ha}^{-1}$  on Ciherang varieties gave yields up to 6.5 tons  $\text{ha}^{-1}$  (Iskandar *et al.*, 2008). While Kariada and Aribawa (2005), have produced the highest rice production with organic fertilizer on a dose of 8.0 tons  $\text{ha}^{-1}$ , which is about 7.23 ton  $\text{ha}^{-1}$  Dried Yield Harvesting.

Some test results of Instalasi Penelitian dan Pengkajian Teknologi Pertanian (IPPTP) Mataram (2001) showed that the use of manure at the dose of 10-20 tons  $\text{ha}^{-1}$  which was done on the cultivation of rice paddy fields at various new locations, gave results varied from 4.28 to 5.83 tons  $\text{ha}^{-1}$ .

This study aims to determine the best plant spacing, the dose of mixed Urea and manure on the soil chemical properties, and the rice yield.

## METHODOLOGY

The research was conducted in Empetring village, Darul Kamal Aceh Besar Subdistrict, on December 2010 up to May 2011 during rainy season 2010/2011 in the irrigated rice fields. The Experimental design was used factorial randomized completed block design (FRCBD) and replicated on three times.

The research consisted of two factors, which were the plant spacing and doses of manure. As the first factor (plant spacing) were covered : a. 30 cm x 15 cm, b. 30 cm x 30 cm, c. 30 cm x 45 cm while the second factor (dose manure) were covered : a. without application manure and urea, b. application 10 ton manure + 100  $\text{kg} \cdot \text{ha}^{-1}$  Urea, c. application 20 ton manure + 100  $\text{kg} \cdot \text{ha}^{-1}$  Urea

All of the treatments were applied by 50  $\text{kg} \cdot \text{ha}^{-1}$  SP-36 fertilizer and 50  $\text{kg} \cdot \text{ha}^{-1}$  KCl, while rice variety that used was Ciherang as derived from Balai Besar Penelitian Padi (Balitpa) Sukamandi with seed class FS (Foundation Seed). The seed was planted on 16th days with 1 - 2 seeds per planting hole.

Some observations that was done during this research covered chemical soil properties (C-organic content, N total, P available and CEC soil), rice yield components (plant high, the amount of tiller, length of tiller, the amount of grain per tiller, the weight of 1000 grains) and the rice yield by weighting the dried rice grain harvest in accordance with the plant spacing conditions (2.25 m x 2.7 m, 2.7 m x 2.7 m, and 2.8 m x 2.7 m). The soil samples were taken on the top soil (0-20 cm) in every plot treatments, which was totalized as 27 plots then it was analyzed on soil laboratory.

The collected data were analysed descriptively for determining the level differences of the treatment combination and processed with SAS package (SAS Institute Inc., 1999) for analysis of variance (ANOVA) and mean comparison. The ANOVA was used to detect the differences of treatment effect; mean comparison using least significant different (LSD) test at significant level of 5 % was applied to determine the differences of mean values of the treatments.

## RESULT AND DISCUSSION

### ***The effect of Planting distance and dose of manure on chemical soil properties***

#### **a. C-organic and N-total content**

The average of C-organic content in the soil due to the treatment was presented on Table 1 as bellow.

Manure singly gave significant effect on C-organic content but there was no mutual interaction between dose of manure and planting distance. The manure treatment with dose of 20 tons  $\text{ha}^{-1}$  gave the highest value of C-organic in the soil namely 1.40%. The lowest value of C-organic was achieved on the

treatment without dose of manure namely 1.13% and it was significantly different with the doses of manure 20 tons ha<sup>-1</sup>.

However, it was not significantly different with the manure treatment with dose of 10 tons ha<sup>-1</sup>.

Table 1. The Average Value of C-Organic (%) and N Total Due to The Planting Distance and Dose Manure

Dose of Manure	Planting Distance			Average
	30x15cm	30x30cm	30x45cm	
----- C- organik (%) ----				
Without manure+ Urea	1,04	1,20	1,13	1,13a
Manure 10 ton + 100 kg Urea. ha <sup>-1</sup>	1,63	1,15	1,32	1,37ab
Manure 20 ton + 100 kg Urea. ha <sup>-1</sup>	1,36	1,41	1,43	1,40b
Average	1,34a	1,25a	1,30a	
----- N total (%) ----				
Without manure+ Urea	0,32	0,18	0,20	0,23a
Manure 10 ton+ 100 kg Urea. ha <sup>-1</sup>	0,18	0,19	0,21	0,19a
Manura 20 ton+ 100 kg Urea. ha <sup>-1</sup>	0,22	0,22	0,23	0,23a
Average	0,24a	0,20a	0,21a	

Description: The numbers with the same letter in the same column donot differ significantly (LSD 5% test).

The distribution of 20 tons ha<sup>-1</sup> of manure showed that were significant increases in C-organic compare without the dose of manure, but there were no significant difference with the treatment of 10 tons ha<sup>-1</sup>. The 20 tons ha<sup>-1</sup> of manure treatment indicates that there was an increase of C-organic in the soil up to 1.40 %, much higher than the dose without manure treatment or 10 tons ha<sup>-1</sup> of manure treatment. To maintain the content of soil organic matter in order not to get decrease, the minimum of 8-9 tons per ha of organic material is required annually (Suryani, 2007).

According to Harahap (2008), it is view from the biological properties of soil, then carbon is a source of food for soil microorganisms so that the presence of this element in the soil will encourage and increase the microorganism populations and activities. Therefore, the total of microbes in the soil will also get increase.

Manure application can provide a growing media for soil microbes, in which microorganisms will take up carbon so that it will gradually decrease the number of C-organic in the soil.

The decreasing in C-organic was assumed as the result of soil microorganisms activity which use carbon compounds for the formation of their body cells, and some carbons are released in

the form of CO<sub>2</sub> during decomposition process, therefore C-organic content is reduced (Jacob, 1992). This opinion goes with Hadisumitro's opinion (2002) which stated that the sufficient distribution of manure (organic fertilizer) can improve the physical and chemical properties of soil. Besides, it will also be able to increase the activity of mycorrhizal fungi so that more P elements can be released and become available to plants .

According to Sulaeman *et al.* (2005), 1-2 % of C-organic value is included as low criteria, so the values of C-organic at the beginning and the end of the study are including low as well. Soil with low content of C-organic can cause the increasing need of nitrogen fertilization because its efficiency is deteriorated due to the high level of leaching.

Manure singly gave significant effect on N-total but there was no interaction with each other. The average highest value of N-total was 0.23 which was found in the manure treatment with dose of 20 tons ha<sup>-1</sup> (Table 1).

However, the addition of manure doses could increase the value of N-total of soil. The N-total value of the soil prior to the study namely 0.21 got increase to 0.23 after the 20 tons ha<sup>-1</sup> of manure treatment was given. This result was better than

Khairunnisa study (2010) which showed that the treatment of 10 tons of biochar ha<sup>-1</sup> tended to decrease N-total soil compared with no biochar treatment.

This suggests that the given dose of manure into the soil can increase the levels of N-total. Hakim *et al.* (1986) stated that decomposition of organic materials will produce N-containing compound, such as ammonium, nitrite, nitrate and nitrogen gas. The similar results of studies were also presented by Hairunyah

(1991) and Raihan and Nurtirtayani (2001) who said that the content of N-total of soil was increased with manure application.

#### b. P-available in the Soil

The average content of P-available in the soil is presented in Table 2. Manure singly gave significant effect on P-available in the soil, but there was no interaction with each other.

Table 2. The Average Value of P-Available in The Soil (PPM) Due to The Planting Distance and The Manure Doses Treatment

Dose manure	Planting distance (cm x cm)			Average
	30x15	30x30	30x45	
----- P <sub>2</sub> O <sub>5</sub> available (ppm) -----				
Without manure+Urea Manura	3,57	3,96	3,09	3,54a
10 ton+00 kg Urea. ha <sup>-1</sup>	4,10	3,03	5,25	4,13ab
20 ton+100 kg Urea. ha <sup>-1</sup>	6,89	3,57	4,81	5,09b
Average	4,85a	3,52a	4,38a	

Description: The numbers with the same letter in the same column donot differ significantly (LSD 5% test).

On the table 2 shows that the values of P-available tended to increase with increasing doses of manure. The manure treatment with dose 20 tons ha<sup>-1</sup> has produced the highest value of P-available namely 5.09 ppm but it was not significantly different with manure treatment with dose 10 tons ha<sup>-1</sup> that produced P-available value 4.13 ppm. Yet, it was significantly different with the treatment without manure namely 3.54 ppm.

Manure treatment with the dose of 20 tons ha<sup>-1</sup> increases the retention and availability of soil nutrients, so the P-available in the soil will not be easily lost from the soil, although the availability of P in the soil was still significantly in low criteria.

Furthermore Evenson (1982) said that enhancement mechanism of various P-available from organic matters given into the soil will lead to mineralization process of P, so that the inorganic P in the

soil will be released. Moreover, the addition of organic matters into the soil will increase soil microbial activities. Palm, Myers and Nandwan (1997) suggested that the microbes will produce phosphatase enzyme as decomposer for decomposing P-organic compounds into P-inorganic. Beside decomposing P from the added organic matter, phosphate enzyme can also decompose P from soil organic matters. This leads to an increase in the number of microorganism populations, so it will help in binding the soil particles which are very helpful in improving soil fertility.

Organic fertilizers which are returned through manure can be used as a source of soil organic matter and a source of nutrients for plant growth (Ende and Taylor, 1969). Organic matter plays an important role in tropical soils, because almost all of the elements are contained in it (Agboola, 1974). High cation exchange capacity is associated with a high content

of organic matter. According to Agboola and Corey (1973), there is a relation between the P-available in the soil with the content of organic matter. A significant relation between soil organic matter and P-available can be found if the content of organic matter is more than 3 percent. Organic matter in the soil prevents the deposition of phosphorus by aluminum and iron.

Even though it contains a low nutrient, organic matter is important in: (1) providing macro and micro nutrients such as Zn , Cu , Mo , Co , Ca , Mg and Si, (2) increasing the cation exchange capacity (CEC) of the soil, and (3) being able to react with metal ions to form complex compounds, so that the metal ions which become toxics to plants or inhibit the provision of nutrients such as Al, Fe and Mn can be reduced (Setyorini, 2006).

### c. Cation Exchange Capacity (CEC)

The cation exchange capacity is the total amount of exchangeable cations (exchangeable cations) on the surface of colloidal with negative charge. The unit of CEC measurement result is milliequivalent cations in 100 grams of soil or me cation per 100 g of soil.

The average of CEC as the result of observation was presented in Table 3 as bellow. On table 3 shows that the average CEC soil due to the influence of interaction treatments ranged from 36, 48-42,48 me. 100 g<sup>-1</sup>.

Cation exchange capacity (CEC) is one of chemical soil properties which is closely related with the availability of nutrients for plants and an indicator of soil fertility. Plant spacing, doses of manure, and their interactions give a very significant effect on the value of CEC.

Table 3. The Average Values of CEC Due to The Treatment of Dose Manure and Planting Distance

Dose of manure+ Urea	Planting distance (cm x cm)		
	30 x 15	30 x 30	30 x 45
----- CEC (me/100 g soil )-----			
Without manure+Urea	36,48aA	38,80aB	41,24abC
Manure 10 ton+ 100 kg Urea. ha <sup>-1</sup>	36,96abA	39,15abB	40,33aC
Manure 20 ton+ 100 kg Urea. ha <sup>-1</sup>	40,44bA	40,96bA	42,48bB

Description: The numbers with the same letter in the same column donot differ significantly (LSD 5% test). Lowercase read in vertical line and uppercase read in horizontal line.

CEC values of the soil due to the plant spacing treatments were inconsistently increasing with the increasing doses of manure. The highest average CEC value of the soil was 42,48 me.100 g<sup>-1</sup>, was found in the condition of manure treatment with the dose of 20 tons ha<sup>-1</sup> and plant spacing of 30 cm x 45 cm, yet it was significantly different with the similar dose of manure with a spacing of 30 cm x 30 cm namely 40.96 me.100 g<sup>-1</sup> soil and with a spacing of 30 cm x 15 cm namely 40.44 me.100 g<sup>-1</sup> soil .

The increases in manure doses significantly increased soil organic matter content (Table 1) which would be as colloidal humus and clay colloids. In line

with the opinion of Brady (1990) in Candra (2003), the given cow manure into the soil will be decomposed and ended up as mineralization and the relative resistant humus will be formed. Humus, which is composed of cellulose, lignin and proteins, have C-organic content generally by 58 % so that the provision of cow manure will increase the amount of humus in the soil and CEC soil. According to Hanafi (2007), CEC of soil organic matter varies between 200-300 me/100 g of soil. While the clay CEC values only range from < 10 (clay oxides) to > 100 me/100 g soil (clay type 2:1). CEC value of colloidal humus (organic) can reach 2 – 20 times of the clay CEC (colloidal clay).

Despite they are small, organic matters have large effects on CEC soil, so that the higher organic matters are in the soil, the higher the CEC soil will be.

Sanchez (1992) stated that soil organic matters plays an important role in increasing the aggregate stability, water holding capacity, CEC, soil buffering capacity and lower the P absorption by soil. The higher the organic matters are in the soil, the higher its CEC will be, where this provision applies if the other factors are equal. Further, it is said that the amount of CEC soil is influenced by the nature and the characteristics of the soil including soil reaction or pH, in which the increasing of pH will increase the CEC of soil. (Hakim et al., 1986); (Duxbury, Smith and Doran., 1989).

### ***The effect of Planting distance and dose of manure on rice yield components and rice production***

#### **a. Performance of plant and yield components**

The performance of rice plant and average of yield components on Ciherang rice variety was presented on Table 4 as bellow. The variation in plant height due to nutrient sources was considered to be due to variation in the availability of major nutrients. This research was showed that more higher planting distance and doses of organic manure will be increased on the rice plant heigh (Table 4). Muhammad *et al.* (2008), observed on similar results with application of organic manure in rice

plant. The available nutrients might have helped in enhancing leaf area, which thereby resulted in higher photo-assimilates and more dry matter accumulation. These results are supported by the findings of Yadana *et al.* (2009).

Tillering is an important trait for grain production and is thereby an important aspect in rice yield. It is also reported by Mirza *et al.* (2010, which stated that increasing in number of tillers of rice plants due to influence of different organic fertilizer combinations. According to them more number of tillers per square meter might be due to the more availability of nitrogen, which plays a vital role in cell division. Organic sources offer more balanced nutrition to the plants, especially micro nutrients which positively affect number of tiller in plants.

The yield components of rice crop *viz.* length of panicle, the amount of grain per panicle and the weight of 1000 grains were showed increases due to more higher planting distance and doses of organic manure application and showed significant different. These were due to more completed nutrients available in the soil which applicated by organic manure as amount of 20 tons.ha<sup>-1</sup> compare to the below its organic fertilizer. On the same case Salem (2006), reported that application of organic compost along with nitrogen fertilizer significantly increased number of panicles per square meter, panicle length, panicle weight, number of filled grains/panicle, 1000-grain weight and grain yield in rice crop.



Table 4. The Average of Plant Height and Yield Components Due to The Doses of Manure Treatments and Planting Distance

Treatment	Plant height (cm)	The amount of rice tillers	Length of panicle (cm)	The amount of grain per panicle	Weight of 1000 grains
Planting distance (cmxcm)					
30x15	100,62a	21.93a	21,69a	215.68a	27,45a
30x30	100,91ab	27.67a	23,28b	227.12ab	27,07a
30x45	101,49b	39.73b	24,37c	234.55b	26,86a
Dose of manure (ton ha <sup>-1</sup> )					
0	98,89a	27.76a	22,32a	220.34a	26,67a
10	101,38ab	29.62a	23,26ab	222.93a	26,42a
20	102.76b	31.96b	23,76b	234.07b	27,27a
Average of LSD 5%	2.86	5.96	0.99	17.89	1.88

#### b. Dried Grain Yield (DGY)

Manure singly gave significant effect to the Dried Grain Yield results, but there was no interaction with each other. The average of DGY results due to the influence of manure is presented on Table 5.

Table 5 showed that the highest dose of DGY result can be found in the manure treatment with the dose of 20 tons

ha<sup>-1</sup>, namely 6.59 t ha<sup>-1</sup>, and it was significantly different with the dose without manure treatment and do not differ significantly with manure treatment with the dose of 10 tons ha<sup>-1</sup> (6, 26 t ha<sup>-1</sup>). The GKP lowest results can be seen in the manure treatment without dose namely 4.99 tons ha<sup>-1</sup>.

Table 5. The Average of Dry Grain Yields Due to Doses of Manure Treatments and Planting Distance

Dose of manure (ton.ha <sup>-1</sup> )	Rice Production DGY (ton.ha <sup>-1</sup> )
0	4.99 a
10	6.26 b
20	6.59 b

Description: The numbers with the same letter in the same column do not differ significantly (LSD 5% test).

#### CONCLUSION

The mixture of manure and urea give a significant effect on C-organic, N-total and P-available in the soil. The increases of C-organic in the soil were low, N-total was moderate, and P-available was low. A significant interaction occurred between planting distance and the mixture of manure and urea on the

Cation Exchange Capacity (CEC) of the soil.

Increasing the level of planting distance and dose organic manure will be stimulated on plant height and some yield components of rice crops and the optimized level for organic manure application was 20 tons.ha<sup>-1</sup> due to limited C-organic content in the rice field

of Empetring village, Darul Kamal Aceh Besar Subdistrict area.

The average of grain yields on Ciharang rice variety were 6.26 tons ha<sup>-1</sup> which occurred at the dose manure treatment of 10 tons ha<sup>-1</sup>.

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**DISCUSSION FROM PARALLEL SESSION**

<b>PAPER TITTLE</b>	Planting Distance and Dose of Organic Manure on The Soil Chemical Properties and Yield ff Lowland Rice
<b>AUTHOR</b>	Abdul Azis and Damasus Riyanto
<b>DISCUSSION</b>	
<b>QUESTION</b>	
<b>ANSWER</b>	
<b>SUGGESTION</b>	<ol style="list-style-type: none"><li>1. Have no references list.</li><li>2. Give the ratio if want to say low or high.</li></ol>



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