

GROWTH AND LEAVES DIGITAL IMAGE ANALYSIS OF RICE CULTIVATED IN VARIOUS LEVELS OF NITROGEN CONCENTRATION AND BROWN PLANTHOPPER INFESTATION

Partoyo¹, Mofit Eko Purwanto¹, Sari Virgawati¹, Frans Richard Kodong², Sri Sumarsih¹

¹Agrotechnology Department, Faculty of Agriculture

²Informatics Department, Faculty of Industrial Technology

UPN "Veteran" Yogyakarta

* Corresponding author: partoyo@upnyk.ac.id

ABSTRACT

The information of recommended fertilizer dosage and pest control that is location-specific is required by the farmer for the success of its agricultural cultivation. In this research, digital image analysis of the rice leaf sample was conducted to obtain a basis data for determining its nutrient sufficiency status and pest attack level. Hydroponic rice planting is performed in the green house with variations of nitrogen sufficiency and variations of brown planthopper population. Along the rice crop development, rice leaf photography is performed to capture the digital image of rice leaf from various treatments of nitrogen sufficiency variation, pest attack level variation, and plant period variation. The process of digital image processing is performed to obtain image parameter, which are Red (R), green (G), dan blue (B). The variation of nitrogen content from 10% - 150% of recommended dosage produces various rice leaf greenness, amount of tillers, amount of panicles, and plant biomass weight. The increase of nitrogen content from 10% - 150% causes color diversity from greenish yellow with the value of R: 86, G: 131, and B: 46, to dark green with the value of R: 119, G: 169, and B: 72. Rice crop that is attacked by brown planthopper changes from green with the value of R: 206, G: 193, and B: 159 into brownish yellow with the value of R: 196, G: 98, and B: 86 along with the increase of it population.

Keywords: rice crop, nitrogen, planthopper, digital image.

INTRODUCTION

In 2014, the government targets a surplus of hulled rice in the amount of 10 million tons (Tri, 2012). The production means whose role is very vital in supporting the national rice production improvement is fertilizer. The recommendation of N, P, and K fertilizing on the Rice of Location-Specific Rice Field is regulated with Minister of Agriculture Regulation No. 40/Permentan/OT.140/04/2007 (Deptan RI, 2007). However, this recommendation has a limitation such as this recommendation is assembled on district level. The actual fertilizer dosage also can be lower than recommended dosage if its soil fertility variability is high. The use of PUTS is limited to the availability of equipments in the field so that the farmer cannot use it when needed (Virgawati, 2010). The productivity levelling off and the increase of fertilizer

price is a stimulation to improve the efficiency of agro-business system especially the efficiency of fertilization on rice field which is the biggest fertilizer consumer. Therefore, the determination of precise fertilizer dosage becomes urgent for achieving an efficient fertilization.

In 2010, *Education for Sustainable Development* (ESD) UPN “Veteran” Yogyakarta research team conduct a research about the application of *Precision Agriculture* (PA) concept and technology in several district in Magelang Regency (Virgawati *et al.*, 2010). *Precision Agriculture* designs soil and crop management carefully according to diversity that is found in the land (Shibusawa, 2001). Plant and characteristic of soil in the land is not only varied on distance and depth, but also time. This diversity problem becomes the basic difference between *Precision Agriculture* dan *Conventional Agriculture* (Srinivasan, 2006).

Pest attack often becomes a problem in the rice productivity improvement effort. The main rice pest in Indonesia is green planthopper and brown planthopper. Green planthopper is a vector that spreads ‘tungro’ disease while brown planthopper spreads dwarf virus. This pest can form a huge population only in a short time and damage plants on every single growth phase. Planthopper attack can cause a loss whose amount is depended on the attack level, from low attack level until fail to pay back level (Anonim, 2010).

This research is designed to produce information especially recommended fertilizer dosage and pest control that is location-specific. For that reason, digital image analysis of the rice leaf sample was conducted to obtain a basis data for determining its nutrient sufficiency status and pest attack level. This research is aimed to assemble technology that combines *artificial neural network* (ANN) technique with digital image data communication technique to determine fertilizer need and pest control recommendation. This technology is designed so that the farmer can find out recommended fertilizer dosage and pest control recommendation needed for the agricultural land only by sending data in the form of rice leaf image through short messages (MMS) to the system.

MATERIALS AND METHODS

The details of each phase are as follow:

A. Hydroponic rice planting in green house with nitrogen nutrient sufficiency variation and pest attack level variation.

1. This phase begins with preparing plant media in the form of river sand. Before used, the sand is cleansed with tap water until the water is clear. The aim is to remove materials except sand that are possible to carry nutrition.
2. Planting is performed in 69 plastic pots, consists of 23 treatments with 3 repetitions. The variety chosen is Ciherang with consideration as the most popular variety that is planted in the research area and shows a clear visual indication of planthopper attack.
3. The liquid media of hydroponic is prepared with complete nutrient composition which is based on the need of rice crop according to IRRI (Yoshida *et al.*, 1976), except for the nitrogen content, variations of sufficiency percentage are made with the value of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%,

110%, 120%, 130%, 140%, 150%. Meanwhile, for the pest attack treatments, rice is planted with optimum hydroponic media composition (100%) and infested with brown planthopper with population 1, 2, and 3 pair of adult planthopper (age of 4 days) with male and female comparison of 1:1 to arouse pest attack level variations.

4. The plant is kept until harvest age.

B. Observation of plant growth and planthopper population

1. Growth of the rice plant was observed for plant height, wet and dry weight of plant biomass, amount of tiller, and amount of panicle per pot.
2. Population of planthopper was observed every week from week 1 until week 7 to monitor the population change.

C. Photography of hydroponic rice leaf in green house.

1. This photography is performed to record digital image of rice leaf from various treatments of nutrient sufficiency variation, pest attack level variation, and plant age variation. This photography is performed by using digital camera Canon EOS 500D.
2. This photography is performed on selected leaf sample that has been completely developed (*fully expanded leaf*), starting from plant age of three weeks after transplanting (WAT) in 10 days of interval. This photography is performed until it comes into bud.

D. Parameter analysis of the digital image of rice leaf.

The process of digital image processing is performed to obtain image parameters, which are: Red (R), Green (G), dan Blue (B).

RESULT AND ANALYSIS

The plant height is mostly ranged between 95 and 105 cm. There are two treatments that produce plant height below 90 cm, i.e. 30% and 130% N concentration. The four topmost plant heights are treatment of 70%, 80%, 90%, and 100% (Figure 1). This result indicates a better nitrogen sufficiency in those four levels of nitrogen concentration.

The average amount of tillers per hill shows the mode in between 80% and 110% N concentration (Figure 2). It might be said that optimum nitrogen content for tillering is around 80% to 110% of recommended concentration. Lower or higher N concentration is resulted in the lesser amount of tiller per hill.

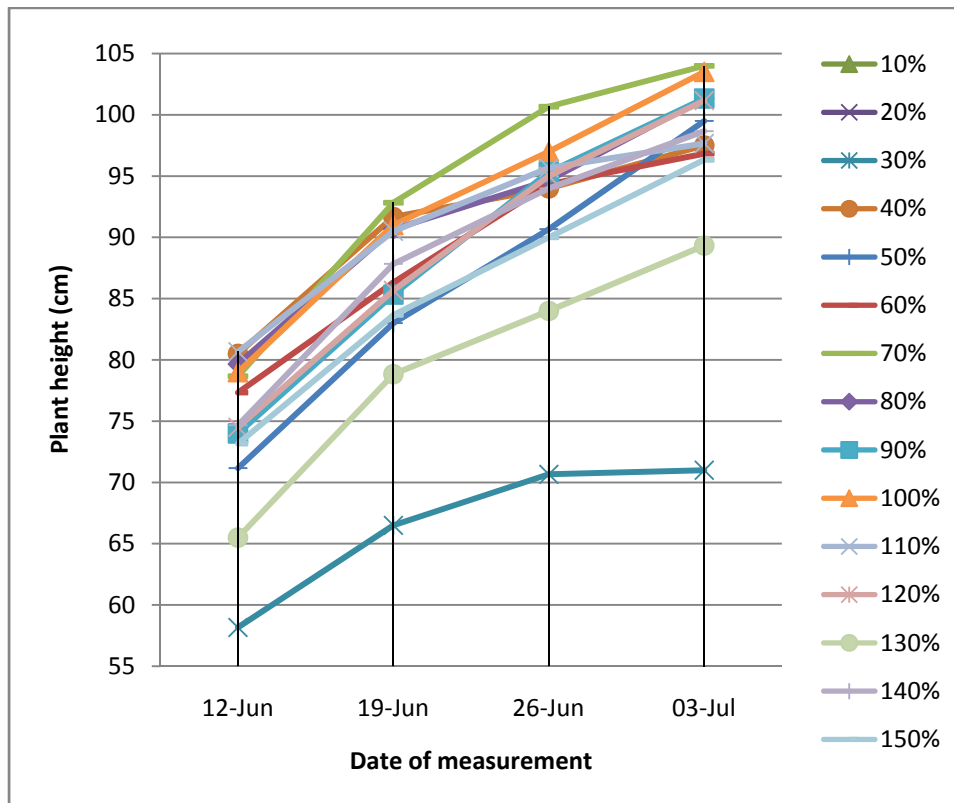


Figure 1. The average height of rice crop up to maximum vegetative

The pattern of amount of tiller per hill is similar to the average amount of panicles per hill (Figure 3). The weight of panicles per hill is connected with the amount of panicles per hill so that the weight diversity of panicles is similar with the amount of panicles per hill pattern (Figure 4). It can be seen that the most weight panicle was produced by 100% N concentration treatment.

The weight of plant tissue which includes straw and root shows that on treatment with nitrogen content higher than 100% until 150% produced plant tissue weight that is similar to treatment with nitrogen 100% (Figure 5). The rice straw on treatment with high nitrogen content (above 100% of dosage) still shows a high vegetative growth during panicles maturation. One of the indications is the leaf which tends to be constant in green although the panicles have turned into yellow until harvest age. Nevertheless, the produced tissue contained less dry weight as compared to 100% N concentration treatment (Figure 5).

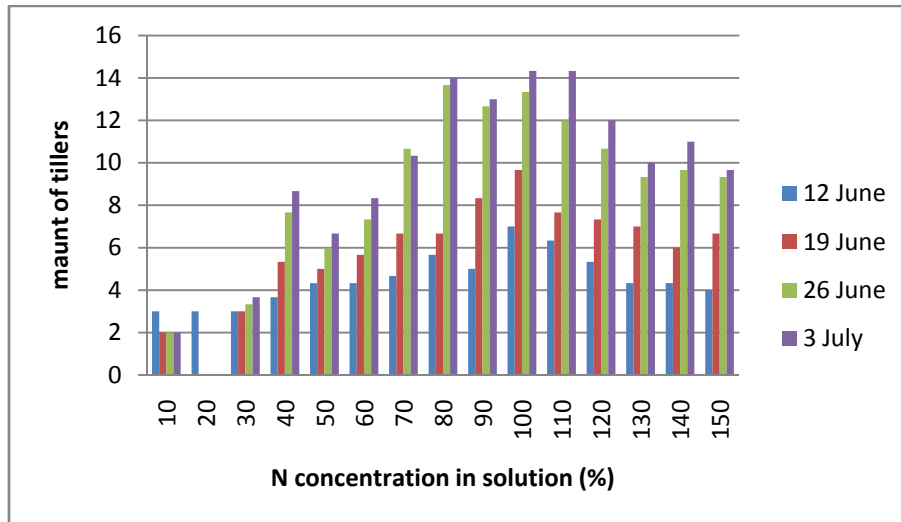


Figure 2. The average amount of tillers per hill at the harvest time

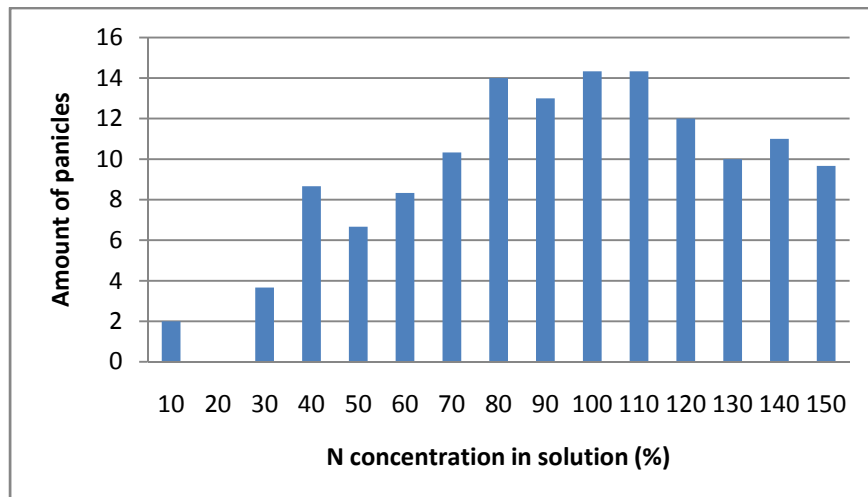


Figure 3. The average amount of panicles at the harvest time

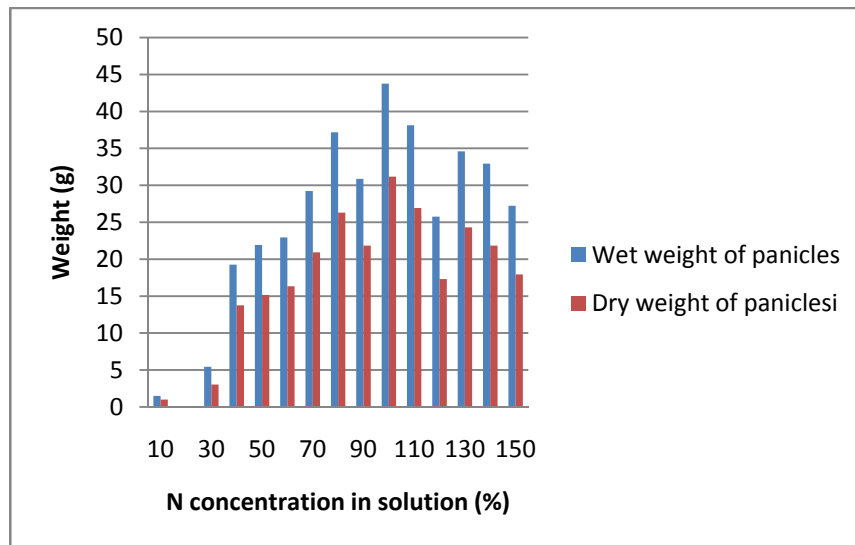


Figure 4. The average wet and dry weight of panicles

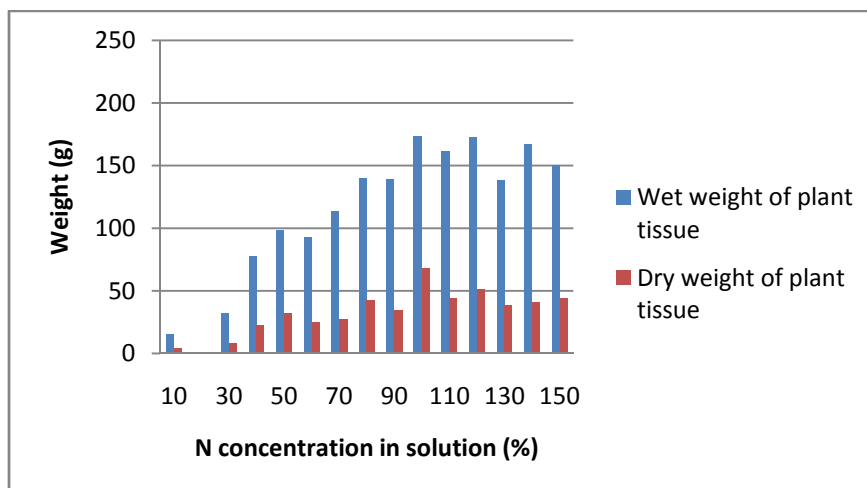


Figure 5. The average wet and dry weight of plant tissue

The experiment pot that is infested with brown planthopper is made into three limits of initial planthopper population with three repetitions and it uses hydroponic nutrition composition with 100% of nitrogen content. The experiment pot of brown planthopper attack is given a cover made from mica sheet. The infestation of brown planthopper is performed when the rice crop attains the age of 1 week. The population of brown planthopper is observed every 7 days so that the fluctuation of planthopper population can be obtained. The initial population of brown planthopper influences the population development. The rice crop that is infested with adult brown planthopper (imago at the age of 4 days) with higher initial population will develop its population faster. The population of brown planthopper with three pair initial population is developed faster than two pair and one pair initial population. This rapid population increase is followed by rapid decrease as well. Rice crop that is relatively young is more sensitive toward brown planthopper attack, so that the high population will rapidly decrease its ability to provide nutrition for the next offspring. The low initial population will increase

population slowly and the crop damage as well, so that the population of brown planthopper will decrease slowly as the plant is increasingly damaged (Figure 6).

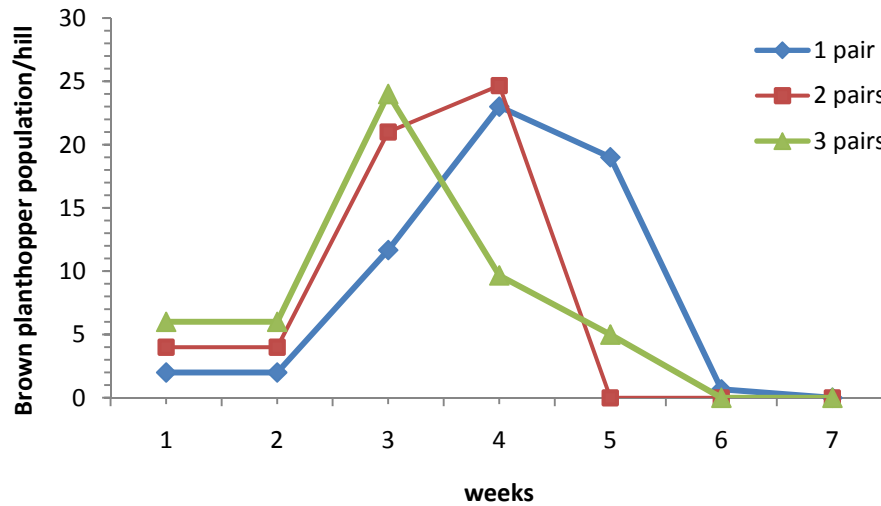


Figure 6. The population dynamic of brown planthopper on rice crop Cihorang variety, with initial population of 1, 2, and 3 pairs

The digital image parameter that has been successfully extracted from the data of leaf image for all treatments is Red, Green, dan Blue (RGB). The output of digital image processing is listed on Table 1.

Table 1. The parameter of digital image of rice leaf from a number of variations of nitrogen (N) sufficiency, pest attack, at the age of 1, 7, and 8 weeks

Treatment	No	Week 1			Week 7			Week 8		
		Red	Green	Blue	Red	Green	Blue	Red	Green	Blue
01-1-10 %	1	146	217	79	158	184	91	186	176	116
01-2-10%	2	121	199	87	102	165	34	125	136	111
01-3-10%	3	79	139	51	86	131	46	134	149	117
02-1-20%	4	129	185	88	129	139	111	130	142	88
02-2-20%	5	158	234	102	130	178	126	229	222	214
02-3-20%	6	80	134	38	189	196	156	165	175	129
03-1-30%	7	126	176	41	69	115	51	118	180	57
03-2-30%	8	151	219	80	106	165	57	154	194	119
03-3-30%	9	129	206	74	94	130	43	141	175	99
04-1-40%	10	149	214	70	71	132	52	112	152	86
04-2-40%	11	156	216	84	72	120	60	137	153	97
04-3-40%	12	113	181	68	90	131	63	134	149	95
05-1-50%	13	143	178	74	54	100	51	92	133	62
05-2-50%	14	138	185	81	99	171	107	92	134	58
05-3-50%	15	153	234	93	60	103	34	124	163	100
06-1-60%	16	86	132	33	62	120	59	108	145	74
06-2-60%	17	129	188	78	41	83	33	122	140	90
06-3-60%	18	134	222	60	135	185	116	124	150	90
07-1-70%	19	100	140	41	126	173	119	120	144	86
07-2-70%	20	154	196	84	137	178	120	148	153	105
07-3-70%	21	137	217	60	126	164	77	125	152	76
08-1-80%	22	153	244	104	71	131	61	176	187	116
08-2-80%	23	148	247	102	103	166	113	152	147	108
08-3-80%	24	150	242	104	81	124	53	120	141	98
09-1-90%	25	184	241	124	169	183	121	144	165	102
09-2-90%	26	154	240	120	86	152	90	122	140	94
09-3-90%	27	153	217	118	102	143	55	87	121	72
10-1-100%	28	141	223	95	114	176	79	101	118	48
10-2-100%	29	139	219	105	91	146	61	114	160	124
10-3-100%	30	153	223	95	76	127	52	131	185	110
11-1-110%	31	200	255	155	172	175	117	97	134	100
11-2-110%	32	160	225	97	159	176	110	103	154	111
11-3-110%	33	153	217	120	93	131	58	109	118	80
12-1-120%	34	157	217	97	140	148	83	80	127	62
12-2-120%	35	158	240	114	93	145	83	102	147	47
12-3-120%	36	153	237	97	102	143	75	122	162	101
13-1-130%	37	138	224	89	90	140	77	129	147	78
13-2-130%	38	124	176	68	177	181	112	129	147	78
13-3-130%	39	151	238	125	146	160	72	101	144	86
14-1-140%	40	68	115	35	106	125	52	127	175	76
14-2-140%	41	114	177	70	91	136	95	128	166	127
14-3-140%	42	100	166	56	121	167	105	124	153	78
15-1-150%	43	57	111	17	62	118	57	108	150	86
15-2-150%	44	95	167	57	73	124	67	83	125	58
15-3-150%	45	138	203	87	123	180	39	90	145	74
H1-1	61	81	121	33	133	117	104	152	127	97
H1-2	62	80	119	30	69	91	53	112	135	88
H1-3	63	75	110	75	152	123	105	206	193	159
H2-1	64	60	121	32	140	112	98	255	255	255
H2-2	65	79	121	30	165	129	105	236	218	204
H2-3	66	102	144	48	165	147	127	217	195	172
H3-1	67	94	140	32	126	109	93	210	191	148
H3-2	68	80	130	30	167	154	136	196	98	86
H3-3	69	94	118	32	161	145	130	232	218	183

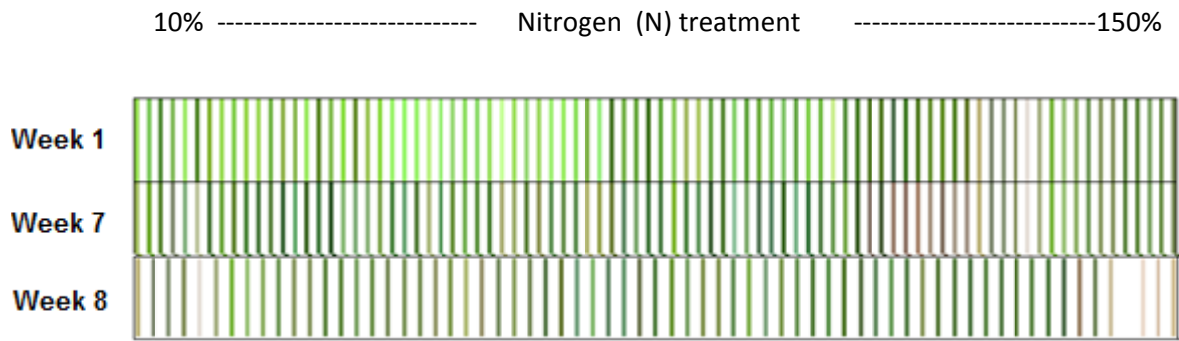


Figure 7. The color diversity of rice leaf on nitrogen (N) content treatments from 10% until 200%

CONCLUSION AND SUGGESTION

1. The variation of nitrogen content from 10% - 150% of recommended dosage produces various rice leaf color, amount of tiller, amount of panicles, and plant tissue weight.
2. The increase of nitrogen content from 10% - 200% causes color diversity from greenish yellow with the value of R: 86, G: 131, and B: 46, to dark green with the value of R: 119, G: 169, and B: 72.
3. The initial population of brown planthopper influences the population development. This rapid population increase is followed by rapid population decrease because of food source insufficiency from rice crop.
4. Rice leaf that is attacked by brown planthopper turns from green with the value of R: 206, G: 193, and B: 159 into brownish yellow with the value of R: 196, G: 98, and B: 86 along with the increase of brown planthopper population.

ACKNOWLEDGEMENT

The authors cordially thank to the Directorate of Research and Community Services (DITLITABMAS-DIKTI) for funding this research.

REFERENCES

- Ahmad, U. 2006. *Pengolahan citra digital dan pemrogramannya*. Graha Ilmu. Yogyakarta.
- Anonim, 2010. *Standar Operasional Prosedur (SOP) Pengendalian Wereng Coklat dan Virus Kerdil*. Informasi Ringkas Bank Pengetahuan Tanaman Pangan Indonesia. Balai Besar Penelitian Tanaman Padi.
- Blackmore, S. (1994). Precision Farming : an overview. *Agricultural Engineer* 49(3),86-88.

- Deptan RI, 2007. Peraturan Menteri Pertanian Nomor 40/Permentan/OT.140/04/2007 tentang Rekomendasi Pemupukan N, P, dan K Pada Padi Sawah Spesifik Lokasi. <http://www.litbang.deptan.go.id/regulasi/one/11/file/Revisi-Permentan-no-40.pdf>. diakses 2 Mei 2012.
- Dibike, Y.B., and D.P.Solomatine. 1999. River Flow Forecasting Using Artificial Neural Networks. <http://www.ihe.nl/hi/sol/papers/EGS99-annriverflow.pdf>
- Fu, L.M. 1994. Neural Network in Computer Intelligence. McGraw-Hill, Inc. New York. 459p
- Hermantoro, 2011. Prediksi Kadar Bahan Organik Tanah dengan Pengolahan Citra dan Jaringan Syaraf Tiruan Menggunakan Telepon Genggam. Prosiding Seminar Nasional Informatika Pertanian 2011 “Akselerasi Pengembangan Informatika Pertanian untuk Pemberdayaan dan Perlindungan Petani”.
- Munir & Rinaldi. 2004. Pengolahan Citra Digital. Informatika Bandung. Bandung.
- Paola, J. D. & Schowengerdt, R. A., 1995. A detailed comparison of neural network and maximum likelihood classifiers for urban land use classification, IEEE Trans. Geosci. Remote Sensing 33 (4), 981-996.
- Pham, D.T. 1994. Neural Network for Chemical Engineers. Elsevier Press. Amsterdam.
- Pujiharti, Y., J. Barus, dan B. Wijayanto. 2008. Teknologi Budidaya Padi. Seri buku inovasi: TP/01/2008. Balai Besar Pengkajian dan Pengembangan Teknologi Pertanian. Badan Penelitian dan Pengembangan Pertanian RI. 30hal.
- Srinivasan, A. (2006). Precision Agriculture: An Overview. In A. Srinivasan (Ed.), Handbook of Precision Agriculture: Principles and Applications (pp. 3-18). New York: The Haworth Press Inc.
- Suyamto, 2010. Strategi dan Implementasi Pemupukan Rasional Spesifik Lokasi. Pengembangan Inovasi Pertanian, 3(4), 306-318
- Toth, E., & Brath, H. 2002. Flood Forecasting Using Artificial Neural Networks in Black-Box and Conceptual Rainfall-Runoff Modelling. [Http://www.iemss.org/iemss2002/proceedings/pdf/-volume%20ue/370_toth.pdf](http://www.iemss.org/iemss2002/proceedings/pdf/-volume%20ue/370_toth.pdf)
- Tri, Y., 2012. Pemberdayaan Petani melalui Denfarm Padi. Sinar Tani Edisi 22-28 Februari, No. 3445, Tahun XLII.
- Virgawati, S., S. Sumarsih, F.R. Kodong, D. Nuryadin, E. Murdiyanto, H. Lukito, & W. Choiriyati, 2010. Pusat Kegiatan Belajar Masyarakat (PKBM) Sebagai Media Penerapan Teknologi Precision Farming dengan Decision Support System untuk Optimalisasi Pengelolaan Tanaman Pangan Ramah Lingkungan. Laporan Akhir Hibah Penelitian ESD DP2M Dikti.
- Yoshida S, Forno DA, Cock JH, Gomez KA, 1976. Laboratory Manual for Physiological Study of Rice. IRRI. Los Banos. The Phillipines. 83p.



**Green Agro - Industry
Investment For Our Future**
International Conference, Yogyakarta, Indonesia, November 12-14, 2013

Organized by:
**Faculty of Agriculture,
Universitas Pembangunan Nasional "Veteran" Yogyakarta**

and supported by:



2013 ICGAI Committee

Steering & Scientific committee

1. Prof. Sakae Shibusawa – Tokyo University of Agriculture and Technology, Japan
2. Prof. Dr. Nilda Burgos – University of Arkansas, USA
3. Prof. Dr. Lin Qing – Fujian Normal University, China
4. Prof. Paul Holford – University of Western Sydney, Australia
5. Prof. Sri Rahardjo – Universitas Gadjah Mada, Indonesia
6. Prof. Suharto – Universitas Pembangunan Nasional “Veteran” Yogyakarta, Indonesia
7. Prof. Jesusa D. Ortuoste – Sultan Kudarat State University, Philippines
8. Prof. Sulaiman Hanapi – Universitas Malaysia Sarawak, Malaysia
9. Prof. Endang Gumbira Sa'id – Bogor Agricultural University, Indonesia
10. Dr. Wimalaratana - University of Colombo, Sri Lanka
11. Dr. Coen van Ruiten – HAS den Bosch, Netherlands
12. Dr. Rosa S. Rolle – Agricultural and Food Engineering Technologies Service, FAO Agricultural Support Systems Division, Thailand)
13. Dr. Siti Syamsiar – Universitas Pembangunan Nasional “Veteran” Yogyakarta, Indonesia
14. Dr. Setyo Wardoyo – Universitas Pembangunan Nasional “Veteran” Yogyakarta, Indonesia
15. Ratna Roostika, PhD – Universitas Pembangunan Nasional “Veteran” Yogyakarta, Indonesia
16. Partoyo, PhD – Universitas Pembangunan Nasional “Veteran” Yogyakarta, Indonesia

Organizing Committee Members

Chair person	:	Assoc. Prof. Dr. Sri Wuryani
Vice chair person	:	Dr. Rr. Rukmowati Brotodjojo
Secretary	:	Dr. Mofit Eko Poerwanto, Sari Virgawati, Tuti Setyaningrum
Treasure	:	Dyah Arbiwati, Dwi Aulia Puspitaningrum
Proceeding and Paper	:	Dr. Oktavia Sarhesti Padmini, Dr. Yanisworo WR, Indah Widowati, R. Agus Widodo
Program Section	:	Ari Wijayani, Heni Handri Utami, Vini Arumsari, Dr. Budyastuti
Presentation	:	Ellen Rosyelina Sasmita, Dr. Budiarto, Didi Saidi
Food and Beverage	:	Wulandari D.E.R, Heti Herastuti,
Sponsorship	:	Dr. Mustajab Hery Kusnadi, Vandrias Dewantoro
Accommodation and Publication	:	Darban Haryanto, Lanjar Sudarto, Tutut Wirawati, Agus Santosa, Endah Budi Irawati, Endah Wahyurini,

Preface

Over the past decades, rapid growth of global economic has lifted millions of people out of poverty. In line with rising population, rapid urbanization, and industrialization, it has also led to increase consumption of resources and generate of waste almost beyond the limits of the ecological carrying capacity.

The coming decades will likely witness of the increasing pressures on industries to shift to more resource-efficient and low-carbon production processes as part of global efforts to sustain growth, conserve resources and slow down the pace of climate change. Countries and regions that successfully manage this transition will get a better position to exploit the opportunities created by the shift towards a low-carbon world economy. It is green industry's initiation, a pattern of industrial development that is sustainable in economic, environment and social.

Universitas Pembangunan Nasional "Veteran" Yogyakarta in conjunction with its global partners is proud to announce the International Conference on Green Agro-Industry, to be held on November 11-14, 2013, at Yogyakarta, Indonesia. The basic aim of the conference is to contribute to the development of highly productive methods and technologies for the various segments of the agro-industries. This conference is designed to provide a forum for the presentation, discussion and debate on state-of-the-art and emerging technologies in the field of agro based industry and any issues related to sustain the environment.

Finally, we would like to express our gratitude to the Rector UPN "Veteran", Yogyakarta for the financial support, the Dean of the Faculty of Agriculture for hosting, and the Scientific and Steering Committee. We wish to thank the keynote speaker Director of PT Astra Agro Lestari Tbk and Plenary Speakers: Prof. Sakae Shibusawa (Tokyo University of Agriculture and Technology, Japan), Prof. Raj. Khosla, Ph.D. (Colorado State University, USA), Prof. Dr. Nilda Burgos (University of Arkansas, USA) Ir. Toine Hattink (Director of Department of Horticulture, HAS den Bosch, Netherlands) Prof. Dr. Endang Gumbira Sa'id (Bogor Agricultural University, Indonesia) . Nur Iswanto, PhD. (IKAGI, International Society of Sugar Cane Technologists Councillor), Prof. Wijitapure Wimalaratana. (Department of Economics, University of Colombo), Prof. Hassan M. El Shaer (Desert Research Center, Cairo, Egypt), Dr. Mofit Eko Poerwanto (UPN "Veteran" Yogyakarta, Indonesia) as well as participants for their contribution in making the International Conference on Green Agro-Industry.

We wish to thank PT Astra Agro lestari as the major sponsor and all other sponsors for their contribution in making this Conference possible. As a Chairperson, I highly appreciate the great efforts of the members of the organizing committee whose hard work made this seminar a great success.

Yogyakarta, November 11 , 2013

Sri Wuryani

Chairperson, ICGAI 2013

Contents

Table of Contents

Committees
Preface

Keynote Speaker

Managing Green Agro-Industry: Economic, Environmental and Social Consideration. PT Astra Agro Lestari Tbk (**Joko Supriyono**) **K - 1**

Plenary Speakers:

- 1 Eco-friendly agrochemicals practices to support green agro-industry. **Nilda Burgos**. University of Arkansas, USA. **P-1**
- 2 Sustainable Horticulture Supply Chains. **Toine Hattink**. Director of Department of Horticulture, HAS den Bosch, Netherlands. **P-10**
- 3 Zero waste technology in green agro-industry: Special Case for Palm Oil Industrial Cluster. **Endang Gumbira Sa'id** (Bogor Agricultural University, Indonesia) **P-17**
- 4 Integrated Sugar Industry: Maximizing Energy Utilization of the Cane. **Nur Iswanto**. IKAGI, International Society of Sugar Cane Technologists Councillor. **P-30**
- 5 Economic Perspective Of Sustainable Agro Industry. **Wijitapure Wimalaratana**. Department of Economics, University of Colombo **P-39**
- 6 Implementation of precision farming in green agro-industry concept. **Sakae Shibusawa**. Department of Environmental and Agricultural Engineering, Tokyo University of Agriculture and Technology, Fuchu, Japan **P - 45**
- 7 New approaches in Management and Utilization of Agriculture Wastes in the WANA Region. (**Hassan M. El Shaer**) (Desert Research Center, Cairo, Egypt) **P-53**
- 8 Implementation of green agriculture technology for reducing CVPD. **Mofit Eko Poerwanto**. UPN "Veteran" Yogyakarta, Indonesia) **P-65**

Economic and Business

1	Micro, Small and Medium-Sized Enterprises of Banana's Variety Products to Support the Green Agro-Industry. (Heni Handri Utami, Siti Hamidah)	1
2	Impact of Plant Conservation on Additional Income Generation in Rural Gardens: A Case Study of Talawi Mudik Village of West Sumatera. (Sumilah, Nirmala F. Devy and Hayani)	8
3	The Role of Women in Developing Entrepreneur / Merchandise Case in Maju Makmur Small Group Activity (Sga) Kejajar District, Wonosobo Regency, Central of Java. (Teguh Kismantoroadji and Indah Widowati)	16
4	Analysis Effect Of Environmental Food Production Toward Consumer's Intermediate Behaviour Product Slice Noodle. (Novita Erma K.)	21

Agronomy

1	Application of Agricultural Waste to Reduce Inorganic Fertilizer and Improve Sugarcane Plant Resistance to Stem Borer Attack. (R.R. Rukmowati Brotodjojo, Oktavia S Padmini, Saefudin Saeroji)	31
2	Climatic Factor in Epidemic of Vascular Streak Dieback of Cocoa (Herry Wirianata, Suprih Wijayani, Elisabeth Nanik K)	40
3	The Effectiveness of Several Dosages of Sour-Sop (<i>Annona Muricata</i> L.) Leaves and Seeds Powder for Controlling <i>Callosobruchus Sp.</i> and Maintaining the Quality of Mungbean Stored Seeds. (Ami Suryawati , Chimayatus Solichah)	45
4	Filed application of Oberon [®] and Envidor [®] on <i>oligonychus sacchari</i> (prostigmata: tetranychidae) and its predator <i>stethorus punctillum</i> (Coleoptera: Coccinellidae). (Amin Nikpay, Masoud Arbabi, Peyman Sharafizadeh, Mahmood Poormahmood)	54
5	Implementation of Mineral Oil for Controlling Aphid and White Rust Disease of Chrysanthemum. (Mofit Eko Poerwanto & Ari Wijayani)	60
6	The Role of Weeds in the Spread of Vector of Peanut Stripe Virus (PSTV). (Mofit Eko Poerwanto, Siwi Hardiastuti EK)	66
7	In Vitro and <i>In Vivo</i> Digestibility Evaluation of <i>Bacillus</i> Phytases in Plant Ingredients and Diets by Tilapia, <i>Oreochromis Mossambicus</i> (Rande B. Dechavez , Augusto E. Serrano Jr.)	72

8	Isolation and Expression Analysis of Hydroxy Phenyl Pyruvate Reductase (HPPR) Derived from <i>Orthosiphon aristatus</i> (Hairul Azman Roslan, Zuliza Ahmad) ⁸⁷	89
9	Evaluation of the Effect of <i>Azospirillum</i> -like Bacteria on the Growth and Yield of Green Onion (<i>Allium cepa</i> L.). (Carlos E. Lacamento)	96
10	Characterization and Evaluation of Microflora Bacteria on Various Plantation Soils Against <i>Phytophthora Capsici</i> of Black Pepper (<i>Piper Nigrum</i> L.), (Awang Ahmad Sallehin Awang Husaini, Linda Nirwana Caroline, Samuel Lihan, Hairul Azman Roslan, Mohd Hasnain Md Hussain)	106
11	Heterologous Expression of Xylanase Gene from <i>Klebsiella Pneumoniae</i> in <i>E. Coli</i> B121 (De3) for Potential Use in Green Technology. (Suhaila Zainol, Nikson Fatt Ming Chong, Awang Ahmad Sallehin Awang Husaini)	113
12	Genetic Diversity of Fusarium Wilt Resistant Potato Planlet Produced by Gamma Ray Irradiation. (Rahayu Sulistianingsih, Rina Sri Lestari and Ari Wijayani)	118
13	Nutrient Analysis of Palm Empty Fruit Bunch, Palm Fruit Fibers and Sawdust as Media for White Oyster Mushroom Cultivation. (Sulistiyanto. Y , Balfast. Usup. A)	125
14	Growth and Yield of Sweet Potato Varieties Using Organic and Inorganic Fertilizers and Vermitea. (Ana Maria F. Maglalang , Tessie E Navarro)	135
15	Use of Poultry Manure as Carrier for Biofertilizers: Effects on Maize (<i>Zea Mays</i>) Growth. (Tunde Ezekiel Lawal, Olubukola Oluranti Babalola)	147
16	The Effect of Various Fertilizers on the Growth of Oil Palm Seedlings in The Main Nursery. (Pauliz Budi Hastuti , Ni Made Titiaryanti)	154
17	Gibberellic Acid Synthesis in the Developing Seeds of Cocoa (Yohana Theresia Maria Astuti, Kumala Dewi, Santosa, A. Adi Prawoto)	161
18	Alternative Propagation Technology for Rubber (<i>Hevea Brasiliensis</i>). (Onofre S. Corpuz)	169
19	Testing and Evaluation of Upland Rice Varieties in Sultan Kudarat Province (R. Ortuoste , J. Ortuoste)	182
20	Improvement of Wheat (<i>Triticum Aestivum</i> L.) Crop Tolerant in Lowland through Mutation Induction. (Budyastuti Pringgohandoko)	193
21	Utilization of Waste Palm Oil as a Source Soil Organic Matter for Support Green Agroindustry. (S. Setyo Wardoyo)	202

22	Improving Soil Productivity with Biochars (Arnoldus Klau Berek, Nguyen V. Hue)	209
23	Land Management Salak Pondoh (<i>Salacca Edulis Reinw</i>) Especially Based on Altitude at Turi Sleman. (Subroto Padmosudarso)	220
24	Development of Purwaceng (<i>Pimpinella pruatjan</i> Molkenb) to Support Herbs Industry and Soil Conservation in Dieng Plateau, Central Java. (Partoyo, Eko Amiadji Julianto, M. Husain Kasim, Teguh Kismantoroaji, and Indah Widowati)	226
25	Isolation and Characterization of Humic Acid of Various Waste Matterial on Saline Soil and Their Effects to Paddy. (Wanti Mindari, W. Guntoro, Zaenal Kusuma, Syekhfani)	234

Clean Technology

1	LCA Methods on The Treatment of Biomass Residues In a Palm-Oil System. (Edi Iswanto Wiloso, Reinout Heijungs)	243
2	Reducing Ammonia Gas Concentration from Composting of Leftover Food by Natural Zeolite from Japan (Ida Ayu Gede Bintang Madrini, Sakae Shibusawa, Yoichiro Kojima, Shun Hosaka)	254
3	A Study of Soil Adsorption Toward Chromium in Liquid Waste from Tanning Industry (Agung Sahida, Sari Virgawati, AZ. Purwono)	260

Agriculture Engineering

1	Growth and Leaves Digital Image Analysis of Rice Cultivated in Various Levels of Nitrogen Concentration and Brown Planthopper Infestation. (Partoyo, Mofit Eko Purwanto, Sari Virgawati, Frans Richard Kodong, Sri Sumarsih)	270
2	Productivity, Soil Fertility, and Economic Benefit in Changes from Conventional to Organic Rice Farming System at Sragen District. (Oktavia Sarhesti Padmini),	280
3	Utilization of visible-Near Infrared Real-Time Soil Sensor as a Practical Tool for Precision Carbon Farming Practice. (B. S. N. Aliah, S. Shibusawa, M. Kodaira)	288
4	Designing of Ergonomic Soybean Grinder to Increase Industry Productivity (Case Study on Home Industry of “Tempe” In Bantul, Yogyakarta). (Dyah Rachmawati Lucitasari and Deny)	297

- | | | |
|---|---|-----|
| 5 | Organic Farming Technology Using Guano Fertilizer and Mulch in Cultivating String Beans (<i>Phaseolus vulgaris</i> L.)
(Tutut Wirawati and Endah Budi Irawati) | 303 |
|---|---|-----|

Other Topic

- | | | |
|---|---|-----|
| 1 | Study of Growth Hormone Gene Variety Based on Bioinformatics.
(Mariana Rengkuan) | 308 |
| 2 | SWOT Analisis for Integrated Eco-Tourism Development in Strengthening National Resilience (Case Study in Gajah Wong River, Yogyakarta, Indonesia). (Istiana Rahatmawati) | 318 |
| 3 | People Empowerment throught Green Water Resources (Study in Gajah Wong River) (Purbudi Wahyuni) | 327 |

Poster

- | | | |
|----|--|-----|
| 1. | Prospect of Clove Leaf Based Essential Oil Industry in Indonesia: A Case Study of District Samigaluh Kulonprogo Regency (Juarini, Ni Made Suyastiri YP) | 335 |
| 2 | The Analysis of Technological Contribution and Competitiveness of Cokrotela Cake Company Yogyakarta to Support Green Agroindustry. (Sri Wuryani, Budiarto, Ani M. Nurhayati) | 344 |
| 3 | Effect of Varieties and Blanching for Making Cocoyam (<i>Xanthosoma</i> Sp) Flour and Food Product. (S.S. Antarlina , P.E.R. Prahardini, S.S. Antarlina , P.E.R. Prahardini) | 351 |
| 4 | Diversified Food Products of Pumpkin (<i>Cucurbita moschata</i>). (Aniswatul Khamidah , SS. Antarlina) | 359 |
| 5 | Fresh Calyses as Health Drink from Roselle Cultivation in Polybags Utilizing Open Spaces at Home. (Sugeng Priyanto and Wahyu Widodo) | 371 |
| 6 | Growth Performance and Potential Oil Content of Several Basil (<i>Ocimum Basilicum</i> Linn) Variety as Fruit Fly Controller (S. Yuniastuti, L Rosmahani, E Korlina, W. Handayati) | 375 |
| 7 | Survival of Sugarcane White Grub in Treated Soil by Entomopathogenic Fungi (Harjaka T, B.H. Sunarminto, E. Martono) | 381 |
| 8 | Application of Nano Particles in Pest Management Programs - A Review. (Masumeh Ziaee, Fatemeh Hamzavi) | 386 |

9	A Review of Plant Essential Oils as a Component of Integrated Pest Management in Stored Products Protection. (Masumeh Ziaee, Fatemeh Hamzavi)	394
10	Screening of Sweet Potato Genotypes for Water Stress Resistance. (Agnes C. Perey, Belinda A. Tad-awan)	403
11	Yield Potency of Sweet Potato Varieties under Drought Condition in Sandy Land. (Tutut Wirawati, Endah Budi Irawati, Ami Suryawati)	418
12	The Identification of Useful Vegetations on Different Ages of Oil Palm (<i>Elaeis quineensis</i> Jack). (Ety Rosa Setyawati)	424
13	Variation on Colchicine'S Concentrations and Germination Phases to Produce Polyploid Tomato Plant. (Rati Riyati, Nurngaini, Basuki)	433
14	Utilization of Critical Land for Tuber Crops Cultivation as Raw Materials of Agro-Industry (Bargumono, Tuti Setyaningrum)	440
15	Potential of Thermotolerance Isolates Bacteria from the Land that Affected by Merapi Eruption as a Plant Growth Promoting Rhizobacteria (PGPR). (Yanisworo W Ratih, Lelanti P Wiratri)	443
16	The Application of PGPR (<i>Plant Growth Promoting rhizobacteria</i>) on Chili Plant as an Interposed Plant between Salak Plant in Sub-District Srumbung (Ellen R. Sasmita, Sri Sumarsih, Oktavia S. Padmini and Endah B. Irawati)	451
17	A Study of Impact of Brick Industries on Soil Fertility in Potorono Banguntapan Bantul Yogyakarta (R. Agus Widodo, Susila Herlambang)	462
18.	The Potential of Groundwater on Unconfined Aquifer in Jogonalan Area Klaten Central Java. (Lanjar Sudarto)	469
19.	Determination of Depth Groundwater Levels Based on Geophysical with Geoelectric Method Around the Prambanan Temple Region Yogyakarta Province. (Agus Santoso, Sismanto, Ari Setiawan, Subagyo)	475