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Biodiversity of Arthropod in Cropping of Local Upland Rice Planted in Lowland with Organic Agriculture System and the Effect on Rice Plant Growth

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Abstract: ***The purpose of this research study arthropod biodiversity on local upland rice crop comes from the mountains of Meratus organically grown in the lowlands and the effect on rice plant growth. Research using survey methods with 5 (five) treatments and 4 (four) replications. The treatments were a) organic fertilizer with a dose of 2 tons per acre, b) organic fertilizer at a dose of 4 tons per hectare. c) organic fertilizer dose of 6 tonnes per hectare d) organic fertilizer at a dose of 8 tons per hectare; e) inorganic fertilization is done with a total dose of 300 kg NPK (Ponska) plus 100 kg urea/hectare. To determine the level of stability of agro-ecosystems in rice crops with organic farming systems analysis Dominance Index (C), biodiversity index (H'), level of similarity (E), and Richness index (R). From the results of research and discussion, it can be concluded that 1) organic fertilizer at a dose of 8 tonnes per hectare can be increased by the highest number of arthropods than inorganic fertilizer plots given; 2) organic fertilizer at a dose of 8 tons per hectare to improve the diversity index, the index species richness, the degree of similarity, as well as decrease the dominance index; 3) Biodiversity of arthropods are at moderate, both in plots treated with organic fertilizer and inorganic fertilizer with a range of values of diversity index 2> H '<3, 4) organic fertilizer is no different than the effect of inorganic fertilizer application on rice plant height at 40 days after planting observations, 54 days after planting, 61 days after planting and 68 days after planting; 5) organic fertilizer is also no different influence on the number of seedlings compared with the number of seedlings in experimental plots inorganic fertilizers on observations of 40 days after planting , 47 days after planting, 61 days after planting and 68 days after planting, but different influence on rice tillers at observations of 54 days after planting.***

Keywords: Biodiversity, Arthropod, Organic Agriculture, Local Upland Rice, Lowland

1. Introduction

Food is the most basic human needs of people, so the availability of food for the people must always be guaranteed. Rice is a staple food for most Indonesian people prosecuted available in sufficient quantity, quality, and affordable. National rice requirement increase each year in line with increases in population. National rice requirement in 2007 reached 30.91 million tons, assuming consumption per capita average of 139 kg per year. Indonesia with an average population growth of 1.7 percent per year and the harvest area of 11.8 million hectares faced with the threat of food insecurity in 2030.

Food security is a major government program to meet the food needs of the entire population regarding availability and affordability of food in sufficient quantity and quality. The program includes aspects of supply includes the production and distribution aspects of purchasing power, and affordability of every resident to food . Target of the food security program is to increase national rice production so that all the rice requirements can be met from within the country.

Efforts to increase rice production, improving rice productivity in areas not yet optimal. Obstacles encountered in efforts to increase rice productivity is limited new technological breakthroughs, especially varieties as well as the conversion of arable land for industrial, residential and other non-agricultural land use.

Increased agricultural land area during the period 1980 to 1989 by 1.78 percent per year, during the period 2000 to 2005 continued to decline to 0.17 percent per year. The balance paddy field in the period 1981 to 1989 was positive 1.6 million hectares , but in the period 1999 to 2002 the negative balance of 400 thousand hectares of rice fields. Land use resulted in a decrease in harvest area by 0.9 per cent in Indonesia. In connection with that in 2007 the government opened a new rice cultivation area of 20 thousand hectares and the planned 50 thousand hectares in 2008.

The use of abandoned land area of 9.7 hectares as paddy fields is not easy to do because of the cost required large . The state's ability making new paddy field has not been able to keep pace over the land so that national production has continued to decline .The decrease national rice The use of abandoned land area of 9.7 hectares as paddy fields is not easy to do because of the cost required large. The state's ability to make new paddy field has not been able to keep pace over the land so that national production has continued to decline. The decrease national rice production is also caused by damage to the irrigation network. Damage to irrigation of an area of one million hectares of seven million hectares of irrigation network in Indonesia. Damage to irrigation networks resulted in low efficiency and effectiveness of irrigation.

Indonesia has a fairly extensive dry land and not utilized optimally. The dry land in question is land that has no irrigation channels. Contained water only from rain water which is retained by soil particles. Therefore dry land are generally affected by drought in the dry season. The nature or character of the dry land to the limited cultivation of crops that can be developed.

One of the food commodities which can production in dry land is upland rice . The development of upland rice on dry land that has not been utilized to the optimum can be one solution in facing problems of food security. The decline in rice acreage due to land use changes and turned into a residential area and an industrial factory, the high cost of opening new rice fields, as well as the allotment of irrigation water is increasingly limited paddy fields causing upland rice becomes important to develop.

One of upland rice varieties are widely planted in dry land Meratus mountains of South Kalimantan is the kind of upland rice locally by local people called the mountain rice. Among the mountain rice grown in the Meratus mountains are varieties of dugong, gadagai and carnik.

The opening of agricultural land in mountainous areas will tend to destroy the forest ecosystem in the mountains of Meratus, namely the opening of the forest land which should serve as catchment. As a result of forest clearing for agriculture by shifting agriculture, it will damage the existing forest ecosystems in the mountains Meratus. To increase rice production in South Kalimantan, we intend to develop a local Gogo rice (Rice Mountain) in regions which are not mountains like Banjarbaru, such as by seeing the growth and development of arthropods on upland rice cultivation in dry land area is not mountainous.

The purpose of this research is to study the biodiversity of arthropods on local planting upland rice originating from the mountains of Meratus organically grown on the plains as well as to determine the effect of organic fertilizer on plant growth of upland rice.

2. Methodology

The experiment was conducted on dry land, Banjarbaru city, South Kalimantan, for about 2.5 months, from September to November 2013, while the upland rice varieties used comes from the mountains of South Kalimantan Meratus ie varieties of duyung. Materials used consist of upland rice seed varieties of duyung, Phonska, urea fertilize, organic fertilizer, gauze, paper labels, and ethanol. The tools used consisted of a dissecting microscope, light microscopes, cameras, knives, scales, tillage equipment, petri dish, erlenmeyer, plastic bag, Fitfall trap, insect nets, yellow traps and length measuring tools. Research used survey method with 5 (five) treatments and 4 (four) replicates . The treatments are:

a. Organic fertilizer with a dose of 2 tons per hectare,
b . Organic fertilizer with a dose of 4 tons per hectare,
c . Organic fertilizer with a dose of 6 tons per hectare,
d . Organic fertilizer with a dose of 8 tons per hectare,
e . Inorganic fertilizer is done with a total dose of 300 kg NPK (Ponska) plus 100 kg Urea/ha.

Timing of fertilizer is done as follows : a) First fertilization at 10 days after planting with a dose of 100 kg NPK/ha ; b) Second fertilization at 20 days after planting with a dose of 100 kg NPK/ha; c) Third fertilization at 35 days after planting with a dose of 100 kg NPK / ha, d) Fourt fertilization at 50 days after planting with a dose of 100 kg urea/ha. Timing of fertilizer can also be adjusted to soil moisture conditions (when the fertilized soil is moist). Fertilization performed drill, namely by making a hole in between plants and fertilizers, after the pit covered with soil.

Experimental unit is in the form of terraced rice plants with a size of 3 x 3 m^2. Land preparation is done by cutting the grass (weeds) by using hoe and grass cutting equipment. Then land cultivated with tractors until crumbly. Upland rice planting technique is to drill, namely by making a hole with a certain distance to drill to a depth of 3-5 cm . Aromatic upland rice plant spacing is 25 x 25 cm. Each planting hole is filled 4 grains per hole and covered with soil.

Observation of the arthropod community since old plants 10 days after planting, with the interval of observation time of 7 days. Sampling used the absolute method and relative method. Observations were also conducted on the number of tillers of rice plants every 7 days, starting at 40 days after planting, as many as five (5) times.

In a plot set 5 units sampled systematically with diagonal system. The sample unit used is a unit of area planted (1 m x 1 m). Data were collected for all individuals fauna (natural enemies, pests, and other fauna) in the sample unit. Identification of parasitoids and predators, as well as insect pests based on identification keys made Boucek (1988), Goulet and Huber (1993), Barrion and Litsinger (1990), Barrion and Litsinger (1995), and is supported by the description of natural enemies by Yasumatsu *et al*., (1982), Ballitan Banjarbaru (1986), and the description of the family of insects by Borror and White (1970). Observations were made also by the relative method that is by using a trap. Traps are used in each field consists of pitfall trap as many as 100 pieces of each plot 5 pieces, and yellow traps as many as 20 pieces, each plot was one yellow trap.

To determine the level of stability in the rice agro-ecosystem with organic farming systems are used:

1. Dominance Index (C)

$C = \Sigma\ (ni/N)^2$

ni: total number of individuals of a species
N: total number of individuals of all species

2. The diversity index (H ') by Shannon - Weaver (Southwood, 1978; Ludwig and Reynolds, 1988)

$H' = - \Sigma$ pi ln pi

pi: proportion of the i-th species of the total sample

3. The level of similarity (E) according to Pilou (Ludwig and Reynolds, 1988)

$E = H'/\ln S$

H ': diversity index

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S : kind entirely

4. Richness Index (R) according to Margalef (Ludwig and Reynolds, 1988).

$$R = \frac{S-1}{\ln N}$$

S: kind entirely
N: total number

3. Results and Discussion

3.1 Arthropod identification

The research found that species of arthropods found in experimental plots treated with organic fertilizers 8 tons per hectare and 4 tons per hectare has a number of arthropods are more than those treated inorganic fertilizer with the details as follows: Number of arthropods on grids trial treated organic fertilizers 8 tons per hectare is 48 species, and 49 species for the treatment of 4 tons of fertilizer per hectare while the treated inorganic fertilizer that is 45 species.

This shows that organic fertilizer can increase the number of arthropod species on upland rice crops organically. Organic materials can improve soil insects such as Collembola, digger, cicada (stage nymphs), termites, various burrowing bees and wasps, beetles, flies and some aphids that fall prey to predators. According to Borror, Johnson, and Tripelhorn (1996), insects in the soil varies in eating habits, many insects that feed on flowers of soil or decaying plants, some eating of plants that are growing and there are eating decaying organic material. There are dining on the ground and use the land only as a nesting site, some of these insects, such as wasps and bees bring a digger into the ground. The types of wasps, flies and ants are found in experimental plots treated with organic fertilizers.

According to Sutanto (1999), organic agriculture contains many elements of macro and micro nutrients required for plant growth. It can be associated with an increased insect population, because of increasing the fertility of crops, the insect population will also increase both insect pests, predators and parasitoids, as well as insect decomposers.

Table 1: Type of arthropods found in treated plots 2 tons of organic fertilizer per hectare

Order	Family	Species
Coleoptera	Chrysomelidae	*Pagria sp.*
Hymenoptera	Dolichoderidae	*Dolichoderes sp.*
Hemiptera	Pentatomidae	*Gonophora xanthomela*
Coleoptera	Curculionidae	*Araneus*
Hymenoptera	Formicidae	*Anoplolepsis longipes*
Hymenoptera	Aphididae	*Aphis sp.*
Hymenoptera	Brachymeridae	*Brachymeria*
Coleoptera	Chrysomeridae	*Pagria sp.*
Diptera	Agromyzidae	*Agromyza sp.*
Hymenoptera	Formicidae	*Pheidologeton spp.*
Odonata	Coenagrionidae	*Ischnura senegalensis*
Coleoptera	Coccinellidae	*Coccinella transversalis*
Hymenoptera	Formicidae	*Anoplolepsis longipennis*
Orthoptera	Acrididae	*Tagasta marginella*
Orthoptera	Blattidae	*Pycnocellus sp.*
Coleoptera	Coccinellidae	*Epilachna sp.*
Arachnida	Araneae	*Oedothorax gibbosus*
Lepidoptera	Pieridae	*Appias libythea*
Lepidoptera	Pieridae	*Eurema blanda*
Lepidoptera	Hesperiidae	*Pelopidas mathias*
Coleoptera	Coccinellidae	*Coelophora inaequalis*
Orthoptera	Acrididae	*Oxya spp.*
Coleoptera	Coccinellidae	*Coccinella septempunctata*
Hymenoptera	Braconidae	*Orientopius punctatus*
Orthoptera	Acrididae	*Valanga nigricornis*
Lepidoptera	Lycaenidae	*Hidari irava*
Orthoptera	Acrididae	*Oedipoda germanica*
Homoptera	Delphacidae	*Nilaparvata* sp.
Coleoptera	Curculionidae	*Sitophilus* sp.
Hemiptera	Scutelleridae	*sp1*
Hymenoptera	Ichneumonidae	*Nitelia* sp
Diptera	Tabanidae	*Tabanus* sp.
Hymenoptera	Siricidae	*Sirex noctilio*
Coleoptera	Coccinellidae	*Micraspis discolor*
Orthoptera	Gryllidae	*Anaxipha longipennis*
Diptera	Cecidomyiidae	
Lepidoptera	Nymphalidae	*Acraea violae*
Orthoptera	Gryllidae	*Metioche vittaticolis*
Orthoptera	Curculionidae	*Cylas formicarius*
Hemiptera	Coreidae	*Leptocorixa acuta*
Diptera	Muscidae	*Musa* sp.

Table 2: Type of arthropods found in treated plots 4 tons of organic fertilizer per hectare

Order	Family	Species
Coleoptera	Acrididae	*Gonophora xanthomela*
Orthoptera	Tettigonidae	*Cnocephalus* sp.
Hymenoptera	Formicidae	*Anoplolepsis longipes*
Hymenoptera	Aphididae	*Aphis* sp.
Hymenoptera	Brachymeridae	*Brachymeria*
Coleoptera	Chrysomeridae	*Pagria* sp.
Orthoptera	Acrididae	*Tagasta marginella*
Coleoptera	Coccinellidae	*Coccinella* sp.
Orthoptera	Acrididae	*Coryphistes ruricola*
Coleoptera	Chrysomelidae	*Dicladispa armigera*
Lepidoptera	Nymphalidae	*Acraea violae*
Lepidoptera	Hespiridae	*Pelopidas mathias*
Orthoptera	Tettigonidae	*Atractomorpha* sp.
Lepidoptera	Noctuidae	*Chilo suppresalis*
Araneae	Thomicidae	*Thomisius* sp.
Orthoptera	Acrididae	*Locusta* sp.
Diptera	Muscidae	*Musa* sp.
Lepidoptera	Lycaenidae	*Lampides boeticus*
Coleoptera	Coccinellidae	*Monochilus sexmaculatus*
Orthoptera	Acrididae	*Melanoplus* sp.
Ixodida	Ixodidae	*Rhipicephalus sanguineus*
Hemiptera	Pentatomidae	*Pycanum* sp.
Lepidoptera	Lycaenidae	*Chilades pamdava*
Orthoptera	Acrididae	*Oedipoda germanica*
Araneae	Lycosidae	
Hemiptera	Miridae	*Helopeltis* sp.
Coleoptera	Chrysomelidae	*Nisoptera* sp.
Homoptera	Ciccadelidae	*Idioscopus* sp.
Coleoptera	Chrysomelidae	*Erystus andamanensis*
Orthopetera	Gryllidae	*Anaxipa longipennis*
Coleoptera	Chrysomelidae	*Aulacophora indica*
Hemiptera	Lygaedae	*Eremocoris podagricus*

Order	Family	Species
Coleoptera	Erotylidae	
Hemiptera	Aleydidae	*Leptocorixa acuta*
Coleoptera	Curculionidae	*Sitophilus* sp.
Lepidoptera	Hespiridae	*Atalopedes* sp.
Coleoptera	Coccinellidae	*Micraspis discolor*
Coleoptera	Staphylinidae	*Paederus fuscipes*
Homoptera	Delphacidae	*Nilaparvata* sp.
Hymenoptera	Siricidae	*Sirex noctilio*
Diptera	Tabanidae	*Chrysops* sp.
Coleoptera	Melyridae	
Hemiptera	Lygaeidae	*Spin leaf bug*
Diptera	Simuliidae	
Coleoptera	Coccinellidae	*Harmonia octomaculata*
Orthoptera	Blattidae	*Blattaria* sp.
Orthoptera	Gryllidae	*Metioche vittacolis*
Diptera	Drosophilidae	*Drosophila melanogaster*
Diptera	Therevidae	*Ozodiceromya argentata*

Table 3: Type of arthropods found in treated plots 6 tons of organic fertilizer per hectare

Order	Family	Species
Hymenoptera	Dolichoderidae	*Dolichoderes* sp.
Coleoptera	Chrysomelidae	*Gonophora xanthomela*
Coleoptera	Chrysomelidae	*Pagria* sp.
Hymenoptera	Formicidae	*Anoplolepsis longipes*
Hymenoptera	Aphididae	*Aphis* sp.
Hymenoptera	Brachymeridae	*Brachymeria*
Hemiptera	Alydidae	*Leptocorisa acuta*
Hemiptera	Coreidae	*Riptortus linearis*
Coleoptera	Chrysomelidae	*Aphthonomorpha Collaris*
Hymenoptera	Formicidae	*Oecophyla sparagdina*
Orthoptera	Acrididae	*Tagasta marginella*
Glomerida	Spirobolidae	*Narceus* sp.
Hymenoptera	Bethylidae	*Gonizus* sp.
Diptera	Muscidae	*Atherigona oryzae*
Coleoptera	Buprostidae	
Orhtoptera	Acrididae	*Melanoplus* sp.
Hemiptera	Gerridae	*Lymnogonus*
Lepidoptera	Papilonidae	*Delias*
Coleoptera	Dermestidae	*Trogoderma granarium*
Hemiptera	Miridae	*Lygus* sp
Diptera	Tachinidae	*Compsilura concinata*
Odonata	Libellulidae	*Neurothemis*
Coleoptera	Carabidae	*Selena* sp
Homoptera	Cicadellidae	*Amblycellus* sp.
Diptera	Muscidae	*Musa* sp.
Lepidoptera	Crambidae	*Cnaphalocrosis medinalis*
Hymenoptera	Braconidae	*Stenobracon* sp.
Orthoptera	Tettigonidae	*Conocephalus longipennis*
Hymenoptera	Vespidae	*Vespula* sp.
Homoptera	Cicadellidae	*Idioscopus*
Hymenoptera	Jassidae	*Athymus argentarius*
Homoptera	Delphacidae	*Nilaparvata* sp.
Orthoptera	Gryllidae	*Metioche vittalis*
Araneae	Theraphosidae	*Lyrognathus*
Odonata	Libellulidae	*Ortherum* sp.
Coleoptera	Coccinellidae	*Coleomegilla* sp.
Hemiptera	Lyaedae	*Oncopeltus fasciatus*
Orhtoptera	Acrididae	*Oedipoda germanica*
Hymenoptera	Apidae	*Aphis melliperae*
Hemiptera	Pentatomidae	
Lepidoptera	Nymphalidae	*Acraea violae*
Coleoptera	Coccinellidae	*Micraspis discolor*
Diptera	Tabanidae	
Hymenoptera	Ichneumonidae	
Coleoptera	Coccinellidae	*Harmonia octomaculata*

Order	Family	Species
Diptera	Therevidae	*Ozodiceromya argentata*

Table 4: Type of arthropods found in treated plots 8 tons of organic fertilizer per hectare

Order	Family	Species
Hymenoptera	Dolichoderidae	*Dolichoderes* sp.
Coleoptera	Chrysomelidae	*Gonophora xanthomela*
Coleoptera	Curculionidae	
Hymenoptera	Formicidae	*Anoplolepsis longipes*
Hymenoptera	Aphididae	*Aphis* sp.
Hymenoptera	Brachymeridae	*Brachymeria*
Coleoptera	Chrysomeridae	*Pagria* sp.
Diptera	Muscidae	*Musa* sp.
Orthoptera	Acrididae	*Valanga* sp.
Hymenoptera	Formicidae	*Cramatogaster difformis*
Lepidoptera	Nymphalidae	*Acraea violae*
Coleoptera	Carabidae	*Ophionea* sp.
Homoptera	Delphacidae	*Togosodes orizicolus*
Coleoptera	Carabidae	*Paederus fuscipes*
Orthoptera	Blattidae	*Neostylopygia rhombifolia*
Coleoptera	Coccinellidae	*Coccinella transversalis*
Orthoptera	Blattidae	*Pycnocelus* sp.
Homoptera	Delphacidae	*Laodelphax* sp
Orthoptera	Acrididae	*Tagasta marginella*
Coleoptera	Chrysomelidae	*Dicladispa armegera*
Coleoptera	Coccinellidae	*Monochilus sexmaculatus*
Orthoptera	Tettigonidae	
Hemiptera	Miridae	*Lygus* sp.
Lepidoptera	Crambidae	*Cnaphalocrosis medinalis*
Homostera	Delphacidae	*Sogatodes oryzycola*
Hemiptera	Lygaedae	*Eremocoris podagricus* F
Coleoptera	Chrysomelidae	*Agelastica alni*
Lepidoptera	Lycaenidae	*Chilades pamdava*
Coleoptera	Chrysomelidae	*Erystus andamanensis*
Hemiptera	Lygaedae	*Pachybrachius fracticollis*
Coleoptera	Coccinellidae	*Micraspis discolor*
Hemiptera	Pentatomidae	*Megymenum gracilicorne*
Diptera	Tephridae	*bactrocera* sp
Lepidoptera	Hesperidae	*Atalopedes campestris*
Lepidoptera	Pieridae	*Eurema lisa*
Hymenoptera	Tiphiidae	*Agriomyia* sp.
Diptera	Sarcophagidae	*Sarcophaga* sp.
Coleoptera	Coccinellidae	*Harmonia octomaculata*
Coleoptera	Buprestidae	*Chrysochroa*
Lepidoptera	Lycaenidae	*Hemiargus ceranus*
Hymenoptera	Formicidae	*Pheidologeton* sp
Hymenoptera	Ichneumonidae	
Coleoptera	Curculionidae	*Cylas formacarius*
Hemiptera	Coreidae	*Leptocorixa acuta*
Hymenoptera	Diapriidae	*Formosus phyllantus*
Orthoptera	Gryllidae	*Metioche vittacolis*
Hemiptera	Miridae	*Plesiodema pinetella*
Diptera	Syrphidae	*Syrphus ripesii*

Table 5: Type of arthropods found in plot treated inorganic fertilizer

Order	Family	Species
Coleoptera	Chrysomelidae	*Pagria* sp.
Araneae	Lycosidae	
Hymenoptera	Aphididae	*Aphis* sp.
Hymenoptera	Formicidae	*Anoplolesis longipennis*
Coleoptera	Coccinellidae	*Coccinella* sp.
Coleoptera	Curculionidae	*Cosmopolites sordidus*
Hemiptera	Nepidae	
Coleoptera	Coccinellidae	*Coccinella transversalis*

Order	Family	Species
Lepidoptera	Nymphalidae	*Acraea violae*
Lepidoptera	Noctuidae	*Agrotis interjection*
Coleoptera	Coccinellidae	*Monochilus sexmaculatus*
Orthoptera	Acrididae	*Tagasta marginella*
Hemiptera	Pentatomidae	*Pycanum alternatum*
Hymenoptera	Dolichoderidae	*Dolichoderes bituberculatus*
Diptera	Tachinidae	*Compsilura concinnata*
Orthoptera	Acrididae	*Oedipoda germanica*
Odonata	Libellulidae	*Orthetrum sabina*
Coleoptera	Carabidae	*Selena* sp,
Homoptera	Ciccadelidae	*Idiospus* sp.
Coleoptera	Chrysomelidae	*Nisoptera* sp.
Coleoptera	Chrysomelidae	*Erystus andamensis*
Hemiptera	Lygaedae	*Pachybrachius fracticolis*
Hymenoptera	Sphecidae	
Coleoptera	Melyridae	
Coleoptera	Bruchidae	*Bruchus* sp.
Lepidoptera	Crambidae	*Cnaphalocrosis medinalis*
Hymenoptera	Braconidae	*Bracon* sp.
Araneae	Lycosidae	
Lepidoptera	Lycaenidae	*Hemiargus ceraunus*
Orthoptera	Acrididae	*Melanoplus devastor*
Coleoptera	Coccinellidae	*Micraspis discolor*
Coleoptera	Curculionidae	*Cylas formicarius*
Orthoptera	Acrididae	*Oxya* sp
Hemiptera	Lygaedae	*Dryophilocoris* sp.
Diptera	Tabanidae	
Orthoptera	Tettigonidae	*Conocephalus longpennis*
Hemiptera	Lygaedae	
Hemiptera	Pentatomidae	*Podisus maculiventris*
Diptera	Muscidae	*Musa* sp.
Coleoptera	Coccinellidae	*Harmonia octomaculata*
Araneae	Thomicidae	*Thomisius* sp
Hemiptera	Alydidae	*Leptocorisa acuta*
Araneae	Oxyopidae	*Oxyopes salticus*
Orthoptera	Blattidae	*Blattaria* sp.
Hemiptera	Miridae	*Lopidia* sp.

3.2 Stability of Agroecosystem

Based analysis we found that the highest diversity index obtained at the experimental plot of upland rice crops treated with 8 tons of organic fertilizer per hectare (2.53) with species richness index of 7.90, 0.153 dominance index, and the index of similarity of 0.655. Lowest biodiversity index found in experimental plots treated inorganic fertilizer (2.35) with species richness index of 7.37, 0.184 dominance index, and the index of similarity of 0.616. The high diversity index is due to the high species richness index, which means treatment of 8 tons / ha of fertilizer causes high arthropod species richness in the plot, was also caused rendak dominance index and high index of similarity type. According to Odum (1993), diversity is formed by two components, namely the richness and the index of similarity. Diversity will be high when the high species richness index and high similarity index.

According to Himawan (2000) organic matter including compost will give effect to the devolution of biodiversity that will bring agriculture to the natural balance of ecosystems which will indirectly be able to control the pest organism naturally. According Suyoto (2002), the provision of green manure and litter can increase the diversity of arthropods in cropping of cotton, while according to Odum (1971) a high diversity will lead to increasingly long chains of food and more symbiosis (mutualism, parasitism, comensalism, and predatism) , thereby increasing the diversity of the fauna in the crop, as a result of ecosystems in these places tend to be more stable.

According Soegianto (1994), a community is said to have a high diversity when comunity were compiled by many species with an abundance of the same or nearly the same, and vice versa community is said to have diversity of species is low if the community is composed by very few species and few species dominate. High species diversity indicates that a community has a high complexity, because it happened in the community of species interactions that high anyway.

So every high diversity index is always accompanied by high indices of species richness, the low index of dominance, and the high similarity index. According Suana and Harjanto (2007) diversity index H '<1 is called diversity is very low, 1 <H' <2 low, 2 <H '<3 moderate, 3 <H' <4 High, and H> 4 is very high. So it can be concluded that the diversity index of upland rice crop is planted either organic or inorganic in this study was moderate.

Table 6: The index value of diversity, richness, dominance index and index of similarity of rice cultivation of organic and inorganic

Treatment	*The diversity index (H)*	*Richness Index (R)*	*dominance index (C)*	*index of similarity (E)*
2 tons of organic fertilizer/ ha	2,39	7,35	0,156	0,642
4 tons of organic fertilizer/ ha	2,37	7,76	0,208	0,610
6 tons of organic fertilizer/ ha	2,51	7,45	0,167	0,655
8 tons of organic fertilizer/ ha	2,53	7,90	0,153	0,655
Inorganic fertilizer	2,35	7,37	0,184	0,616

3.3 Growth of Rice

Based on the results of analysis of variance showed that organic fertilizer application is no different than the effect of inorganic fertilizer application on plant height of rice on observations of 40 days after planting, 54 days after planting, 61 days after planting and 68 days after planting. Provision of different organic fertilizer influence than inorganic fertilizer application on plant height at 47 days after planting observations. Likewise, the provision of organic fertilizers are no different influence on the number of seedlings of plants as compared to the number of tillers at the experimental plot by inorganic fertilizer on observations of 40 days after planting, 47 days after planting, 61 days after planting and 68 days after planting plant, but different effect on seedling rice on observations of 54 days after planting (Table 7). It is due to fertilizing with organic fertilizers can improve the physical, chemical, and biological soil but in terms of the willingness of inorganic fertilizer nutrients faster than inorganic fertilizers.

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According to Hanafiah (2004) physically organic matter plays a role in (1) stimulates granulation, (2) Lowering flastisitas and cohesion, (3) improving soil structure, (4) improve the durability of the soil in retaining water so that the drainage is not excessive, humidity and temperature land to be stable, but it can increase the number and activity of soil microorganisms. The physical properties of the soil can be improved because of humus as a result revamp organic materials may be colloidal, so by adding organic matter or organic fertilizers means it will increase the amount of soil colloids. It is important to coarse textured soils that have little soil colloids, so that the organic fertilizer, the water holding capacity and cation exchange capacity to be good (Muhadi, 1979), revamping soil organic material as will as a buffer and nutrient source (Stevenson, 1983), increase the ability of soil to hold water through aggregate stability, triggering the activity of microorganisms involved in the reform process (Muhadi, 1979).

From the test results mean value tiller number on the experimental plot by organic fertilizer more than the number of seedlings on plots experimental plot by inorganic fertilizer on observations of 54 days after planting, as well as plant height by organic fertilizers 8 tonnes per hectare higher than that given inorganic fertilizer at 47 days after planting observations (Table 7 and Table 8).

Table 7: Average of number of tillers on experimental plots treated with organic fertilizer on the observation date 54 days after planting

Treatment	*Average of number of tillers (tiller)*
Inorganic fertilizer	6.00 a
Organic fertilizer with a dose of 4 tons per hectare	11.35 b
Organic fertilizer with a dose of 2 tons per hectare	11.65 b
Organic fertilizer with a dose of 6 tons per hectare	12.75 b
Organic fertilizer with a dose of 8 tons per hectare	13.15 b

Description: The average of number of tillers followed by the same letters are not significantly different by Duncan's multiple range test with a confidence level of 95%.

Table 8: Average of plant height at experimental plots treated with organic fertilizers on the observation date 47 days after planting

Treatment	*Average of plant height (cm)*
Inorganic fertilizer	39.93 a
Organic fertilizer with a dose of 2 tons per hectare	44.40 a
Organic fertilizer with a dose of 6 tons per hectare	44.76 a
Organic fertilizer with a dose of 4 tons per hectare	48.48 ab
Organic fertilizer with a dose of 8 tons per hectare	56.80 bc

Description: The average height of plants followed by the same letters are not significantly different by Duncan's multiple range test with a confidence level of 95%.

4. Conclusions

From the results of research and discussion can be concluded that:

1) Provision of organic fertilizer with a dose of 8 tons per hectare to increase the number of arthropods highest compared to plots given inorganic fertilizers.
2) Organic fertilizer with a dose of 8 tons per hectare may improve diversity index, index of species richness, similarity index, as well as lower the index of dominance.
3) Diversity of arthropods is ranked moderate, both in plots treated with organic fertilizers and inorganic fertilizers with a range of values of diversity index 2> H '<3.
4) Organic fertilizer is no different than the effect of inorganic fertilizer application on plant height of rice on observations of 40 days after planting, 54 days after planting, 61 days after planting and 68 days after planting.
5) Organic fertilizer is no different influence on the number of seedlings of plants as compared to the number of tillers at the experimental plot by inorganic fertilizers on observations of 40 days after planting, 47 days after planting, 61 days after planting and 68 days after planting plant, but different effect on paddy saplings on observations of 54 days after planting.

5. Future Scope

The results of this study are very helpful to improve the products of rice plants. however, further research is needed to the production of rice plants.

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