The Growth Production Paddy and *Tilapia sp* with Legowo Row Planting System Support of Security Food and Maritime in Indonesia

Ameilia Zuliyanti Siregar
Department Agrotechnology, Faculty of Agriculture, Universitas Sumatera Utara, Jl. DR.A.Sofyan No 3 Kampus USU Medan 20155, Sumatera Utara, Indonesia.

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Abstract: Indonesia, agricultural productivity is declining predictably due to shrinkage of agricultural land to non-farms such as plantation, industry and fishery sectors. The purpose of this research is to analyze how big the effect of the use of Legowo row planting system to growth and production of rice plants, to analyze the amount of fish population density and interaction of fish farming with Legowo row planting system optimal to the production and population density of Tilapia sp fish. This research was conducted in Manik Rambung Subdistrict, Simalungun Regency, North of Sumatera Province during April-July 2017. Based on research carried out which obtained 10 kinds of pests of various and less species, namely: *Nezara viridula, Leptocorica acuta, Sogatella coarctata, Scircophaga incertulas, Naraenae, Cardiochiles philippinensis, Scliphron* sp, *Aphis* sp, and *Chilochorus sp*. The method used in this research is purposive random sampling which is arranged in randomized block design (RBD) factorial pattern with 2 factors, namely: first factor of planting system of Legowo row system consists of 4 levels, namely: (tandur row), (Legowo row 2:1) , (Legowo row 3:1), (Legowo row 4:1). And the second factor of density of Tilapia sp fishes used consisted of 4 levels: (without fish), (1 fish/m²), (2 fish/m²), and (3 fish/m²). The result of the research showed that the planting system of Legowo row row 2: 1 yielded the best result on the 60 DAP of plant height, the panicle length, the weight of the cultivar, the weight of the grain of rice, the production of rice ton ha^{-1}. While the Legowo row 4:1 row system gives the highest yield on the parameters of the number of productive tillers, and the weight of 1000 grains of grain. And the population density of *Tilapia* sp (24 fish/plot) gives the best fish weight, while the density of fish population of 12 tails gives the best result on the parameter of fish survival rate and fish weight per fish. Based on the value of R / C and B / C ratio, the fish farming system profitable and feasible to be developed in support of food security and maritime in Simalungun, North of Sumatera, Indonesia.

1 INTRODUCTION

The decline of Manik Rambung Sub-district rice production is due to seasonal conditions that are less supportive for rice farming. the prolonged rainy season makes rice growth less than optimal. Additionally, continuous rainfall has resulted in the explosion of pest populations, as most rice pests tend to thrive in humid places. The eradication of rice pests in Manik Rambung Sub-district is difficult to do with maximum, because most farmers do not understand the types of pests that attack their rice crops. All types of pests in paddy fields are considered the same so that farmers only use one type of pesticide for various types of pests. If spraying is done once perceived as unsuccessful the farmers do the spraying a second time, so do so of course with a higher dose. Farmers in Percut, Manik Rambung and Dairi districts do not understand if spraying pesticides repeatedly with higher doses does not make pests die but instead make resistance to pests, so the existence of pests more difficult to eradicate. Pests that attack rice plants there are various kinds of animal phyla, and some are not yet known to the taxonomy. According to the expert findings most of the pests that attack rice plants can be described as follows. Based on the part of rice plants attacked, rice pests are divided into: 1. Destroyer pests nursery: rats, caterpillars, flies, seeds. 2. Root pest: nematodes, soil dogs, uret (Coleoptera larvae), root lice. 3. Stem destructive pests: mice, stem borer, and pest. 4. Leaf-eating pests: leafminer, beetle, grasshopper, caterpillar, and caterpillar. 5. Leaf-sucking pests: thrips, ladybirds, peppermint, brown planthopper and green leafhoppers. 6. Destructive pest: *Nilaparvata lugens*, ladybugs, caterpillars, rats, and birds Nur Tjahjadi, 2007: 64).

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In addition to the physical condition of rice fields are separated, soil conditions, water availability, and height of different places make different types of pests in each region also varied rice fields. But the farmers do not understand it. In addition, the rapid increase of the population can lead to further narrowing of land area that can be used for various fields of agriculture and fishery. Due to the increasingly limited production area, there is a need to find alternative methods of processing to increase rice and fish production as staple food. Indonesia has pioneered efforts to increase rice production since Pelita I to date. The results are quite encouraging with the achievement of rice self-sufficiency in 1984 (Suryadiputra et.al., 2005), one of the optimization of potential irrigated rice fields and increasing farmers' income is to engineer the land using appropriate technology. The way that can be done is to change the monoculture system to agricultural diversification system, through fish farming cultivation.

With the maintenance of fish in the rice fields, in addition to improving soil fertility and water, can also reduce pests of disease in rice plants Various obstacles encountered in creating and maintaining national food security is the decline in growth rate and productivity, diversion of agricultural land to non- , and the utilization of land that has not been optimal. One way that can be done is with Integrated Fish Farming System is a combination of agriculture and fisheries, such as fifth farming business system which is a change of agricultural system monoculture towards agricultural diversification. The fish farming model is quite efficient and effective to be applied to irrigated rice fields with water availability during rice and fish growth. Even the development model of PTT both SRI (System of Rice Intensification) and organic farming directed is very possible to be recommended to the farmers community (Hardaningsih & Kastono 2008 Darini., 2011).

In fish farming system, in addition to the regular planting system, Legowo row. The existence of fish in the fish farming system allegedly affected the growth and production of rice (Kurniasih et al., 2003). The results of field tests show that farmers 'profits increase by incorporating fish into the production system, by knowing optimum fish populations per area of land is expected growth and rice production is not disturbed and farmers' income will be improved both from rice and fish.

According to Syamsuddin (2014), in the aquaculture activities, efforts to optimize the sustainable use of land productivity are pursued through means of land management and the application of good cultivation technology, known as the way of good fish cultivation (WGFC). While the management of the external environment includes the arrangement of the external environment related to irrigation improvement, as well as optimization of aquaculture and fishing technology. The average fish yield on fish farming at the farm level is still low, ie around 50 kg/ha. This is caused by the inappropriate selection of fish species and the high price of fish seeds (Sasa & Syahroni, 2006). The farmers do not have guidance on adaptive fish species for fish farming. In response, in an effort to increase the value of wetland and increase production of farmers, then one alternative that can be done is to implement fish farming, namely the maintenance of fish in the field along with rice planting.

The aim of this study to analyze how much influence the use of various systems planting row Legowo row growth and production of rice plants, to analyze the amount of fish population density in an optimal Legowo row planting system on the production of *Tilapia sp* sp, to analyze the interaction between the use of various Legowo row planting systems and the amount of fish population density on rice production and production of *Tilapia sp* sp.

2 MATERIAL AND METHODS

2.1 Materials and Research Tools

The materials used in this research are: rice seeds of Ciherang varieties, organic fertilizer cow shed, Tilapia sp seeds, lemongrass, tobacco, detergent, papaya leaf, soursop leaf, brown sugar, garlic, and water as material for the manufacture organic pesticides. The tool used in this research are: Hand Tractor, hoe, bucket, scales, ruler, sickle, rapiah rope, plywood, hoses, tarpaulins, plastic folders, labels, gauges, bamboo sticks, safety net, paper, camera and stationery write. Type of Research This research uses experimental method conducted in the field which is arranged in the form of experiment using randomized block design (RBD) factorial pattern with 2 factors, namely: The first factor of treatment system of Legowo row system consists of 4 levels, namely: L0 (Tandur row), L1 = (Legowo row 2:1), L2 = (Legowo row 3:1), L3 = (Legowo row 4:1). And the second factor is the population density of the Tilapia sp that is used consist of 4 levels ie: i0 = (without fish) i1 = (1 fish/m^2), i2 = (2fish/m^2), and i3 = (3 seeds fish/m^2). It is based on solid stocking of fish according to Nugraha (2009). Namely: 2-3 cm size as much as 2-3 tail / m^2 and size 3-5 cm as much as 1-2 tail / m^2. The combination of treatments were: L0i0, L1i0, L2i0, L3i0, L0i1, L1i1, L2i1, L3i1, L0i2, L1i2, L2i2, L3i2, L0i3, L1i3, L2i3, L3i3 and repeated 3 times.

2.2 Research Sites

This research was conducted in Mnaik Rambung Subdistrict, Simalungun Regency, Sumatera Utara Province on irrigated wetland. The study was conducted from April 2017 to July 2017. Data Analysis The collected data were analyzed using rantau analysis, with the following mathematical equations: $Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \kappa_k + \varepsilon_{ijk}$ Where: Y_{ijk} = Result of observation for factor A to level i, factor B jth stage in group k μ = common middle value α_i = influence of factor A at the i-th stage β_j = influence of factor B on the j-th stage $(\alpha\beta)_{ij}$ = the interaction effect of AB on the level i (of factor A), and the level of Gen (from factor B). k k = the influence of the k ijk group = random effect (experimental error) at the i-th stage (factor A), the jth stage (factor B), the interaction of the i to the j and the j The observed data is tabulated, then analyzed the scales. If the analysis of variance there is a significant effect on significant at level 5% among the tested treatment, then tested continued by using the smallest real difference test (BNT). The real level used is ά = 0.05. Research Variables and Data Collection The parameters observed in this study include: Plant height (cm), measured at plant age 20, 40, and 60 Day After Plantation (DAP), Number of productive tillers (stem), Length of panicle (cm), g), Weight 1000 grains (g), Weight of paddy grain (kg), Rice production (ton ha ha), Graduation rate of live Tilapia sp (%), Fish weight / tail (g), fish weight / plot taken at fish harvested in paddy field with Wt - Wo indicator, water quality analysis, (dissolved oxygen), and protein analysis (%). Data collection was obtained from observation and measurement directly in the field by measuring all research variables, the result of data from measurement in tabulation then analyzed its diversity.

3 RESULTS AND DISCUSSIONS

3.1 Composition of Insects in Fish Farming Sites

From the research in the fish farming has been done obtained the highest number of individuals insects caught used yellow trap are 1011 individuals, followed by sweep net (700 individuals) and the lower used the core sampler (117 individuals). These results can be seen in Table 1.

Table1. Biodiversity insects used three traps in fish farming sites

Fish-Farming Sites	**Traps**			**Total**
Ordo/famili/genus(spesies)	**SN**	**YT**	**CS**	
Orthoptera/Tettigoniidae/*Antracomorphacrenulata*	2	0	0	2
Orthoptera/Acrididae/*Valanga nigricornis*	5	2	0	7
Araniae/Tetragnatidae/*Tetragnatha* sp	4	2	0	6
Araniae/Tomisidae/*Thomisius* sp	14	0	0	14
Araniae/Lycosidae/*Lycosa* sp	16	1	0	17
Lepidoptera/Pyralidae/*Cnaphaclosis medinalis*	69	65	0	134
Lepidoptera/Hesperiidae/*Hesperia* sp	10	140	0	150
Lepidoptera/Crambidae/*Scircophaga incertulas*	1	1	0	2
Lepidoptera/Pyralidae/*Scircophaga* sp	3	0	0	3
Lepidoptera/Noctuidae/*Naraenae*	1	1	0	2
Lepidoptera/Pyralidae/*Nympula defuncalis*	0	7	0	7
Odonata/Coenegrionidae/*A.femina*	79	0	15	94
Odonata/Coenegrionidae/*A.pygmae*	48	0	0	48
Odonata/Coenegrionidae/*Pseudagrion*	31	0	14	45
Odonata/Coenegrionidae/*A.rubescens*	12	0	0	12
Odonata/Libelluidae/*Orthetrum sabina*	0	0	10	10
Odonata/Coenegrionidae/*Ceriagrion*	8	0	4	12
Diptera/Muscidae/*Atherigona oryzae*	14	21	0	35
Orthoptera/Acrididae/*Melanoplus sanguinipes*	14	126	38	178
Diptera/ Sciaridae	62	66	12	140
Diptera/ Chironomidae	8	5	14	27
Diptera/ Cecidomyiidae	4	27	0	31
Diptera/ Tachinidae	5	3	0	8
Diptera/Tipulidae	2	14	0	16
Diptera/Ephryidae	1	5	0	6
Diptera/Sarcophagidae/*Sarcophaga* sp	0	4	0	4
Diptera/Pipunculidae/*Tomosvaryella subvirescens*	0	20	0	20
Hyemenoptera/Ichneumonidae/*Temelucha* sp	9	7	0	16
Hyemenoptera/Ichneumonidae/*Amauromorpha accepta*	0	74	0	74
Hyemenoptera/Ichneumonidae/*Xanthopimpla* sp	2	0	0	2
Hymenoptera/Braconidae/*Cardiochiles philippinensis*	0	1	0	1
Hymenoptera/Formicidae/*Camponotus consobrinus*	0	2	0	2
Hymenoptera/Spechidae/*Scliphron* sp	0	1	0	1
Hymenoptera/Elasmidae/*Elasmus* sp	0	28	0	28
Hymenoptera/Pteromalidae/*Panstenon* sp	0	7	0	7
Hymenoptera/Pteromalidae/*Telenemus* sp	0	9	0	9
Hymenoptera/Apididae/*Aphis* sp	0	2	0	2
Coleoptera/Coccinilidae/*Verania lineata*	23	11	0	34
Coleoptera/Coccinilidae/*Chilocorus* sp	1	0	0	1
Coleoptera/Carabidae/*Ophioneani nigrofasciata*	9	2	0	11
Coleoptera/Staphylinidae/*Paedorus fuscipes*	6	2	0	8
Coleoptera/Tenebrionidae/*Tenebrio* sp	3	5	0	8

Coleoptera/Salpingidae/*Lissodema* sp	0	2	0	2
Hemiptera/Miridae/*Cyrthorinus* sp	27	17	0	44
Hemiptera/Alydidae/*Leptocorisa acuta*	124	86	0	210
Hemiptera/Pentatomidae/*S.coarctata*	0	1	0	1
Hemiptera/Gerridae/*Limnogonus fossarum*	0	2	10	12
Homoptera/Pentatomidae/*Nezara viridula*	201	48	0	249
Homoptera/Cicadellidae/*Nephotettix* spp	19	9	0	28
Homoptera/Delphacidae/*Nilaparvata* sp	12	14	0	26
Homoptera/Delphacidae/*Sogatella* sp	10	12	0	22
T Total	**1011**	**700**	**117**	**1828**

Note: SN = Sweep Net; YT = Yellow Trap; CS = Core Sampler

These results show a combination of the number of constituent species on fish farming with the diversity of rice has not shown any uneven distribution of insect populations. So is the sites did not control all kinds of insects can be found distribution on the same sites. So the level of evenness in the insect population will affect the diversity of insects in the rice field. According to Kreb (1978) and Siregar (2014, 2015) reinforces the claimed that species diversity index depends on the species richness and evenness.

In the fish farming sites dominated by *Nezara viridula,* and *Leptocorica acuta*. This is supported (Siregar, 2015) which states that the value of the largest equity index is 1 (maximum evenness index). It is claimed that the desert habitat types/bush no insect species dominate (Susnihati, et al., 2005). *Sogatella coarctata, Scircophaga incertulas, Naraenae, Cardiochiles philippinensis, Scliphron sp, Aphis* sp, and *Chilochorus* sp are less individuals recorded.

From table 1 recorded that many insects caught with Sweep Net (SN), namely the Order of Hemiptera, Family Alydidae, Genus *Leptocorisa acuta* sp by 124 individuals. This insect is a type of typically found during the flowering stage of the rice crop, which coincides with rainfall and high humidity at the beginning of the wet season. These insects were caught in a trap net sweep for spiders used to make nests in leaves of rice plants, so that when sampling is very easy to get these insects (Roja, 2009).

From the Yellow Trap (YT), which caught many insect of the Order Hemiptera, Family Pentatomidae, *Nezara viridula* (201 individuals). This is due to insect larvae will grow into imago spread to the land and at the moment of capture insects, the life cycle of the imago phase that many caught. In addition, insects are more attracted to yellow light waves reflected from the trap so that the insects approaching the traps yellow yolk that has been unsealed. This is supported by research Fournately (2006), Siregar (2015) which states the type of trap yellow (yellow traps) favoured by many imago insects, especially insects of the order Hemiptera types of the coffee plant in lowland and upland rice field of North of Sumatra.

At the Core Sampler (CS), an insect that most captured from the Order Orthoptera, Family Acrididae, *Melanoplus sanguinipes* (38 individuals) are diverse than other insects in Manik Rambung.

3.2 Plant Height, Number of Productive Tillers and Cultivated Weights

The analysis results showed that the treatment system of Legowo row planting and population density of *Tilapia sp* sp did not give effect to plant height at age 20, and 40 DAP. However, the plant height is 60 DAP, the number of productive tillers and the weight of the panicle stock give a real effect to the system of planting Legowo row. Test BNT test Show that the average height of 60 DAP age of the highest yields found in treatment L1 (Legowo row 2:1) of (94.36) and significantly different from the treatment of L0, and L3. However, it was not significantly different from L2 treatment (Legowo row 3:1). The average number of best productive tillers was found in the L3 treatment of Legowo row 4:1 (16.82) and the lowest yield on the L0 tandur row alignment treatment (14.47). The result of BNT test showed that the treatment of L3 (Legowo row 4:1) was significantly different from the treatment of L0, (tandur row) L2, (Legowo row 3: 1) and did not differ significantly on L1 treatment (Legowo row 2:1). The average weight of the pyterhole (g) of the highest yield was in treatment (L1) Legowo row 2:1 and the lowest yield was in treatment (L2) Legowo row 3:1 and the BNT test showed that the 2:1 Legowo row planting system gave the best result (1.89), and differed significantly from the tandur jajar (1.47) treatment, Legowo row 3:1 (1.40) and Legowo row 4:1 (1.23). Further test results of BNT can be seen in table 2.

Table 2. Mean plant height 60 HST (cm), number of productive tiller (panicle) and weight of panicle (Kg) at end of study

Legowo row (L)	Plant Height (60 DAP)	Number of productive tillers	Heavy panicle grown
L0	85.20c	14.47b	1.47a
L1	94.36a	16.42a	1.89a
L2	84.29a	15.34b	1.40b
L3	89.11b	16.82a	1.23b

Description: The numbers followed by the letters that are not the same meaning are significantly different at the 5% real level based on the BNT test

Table 1 described the results of this study indicate that the average growth and production of rice crops in various systems of planting Legowo row and population density of Tilapia sp in general can be described that the results of analysis of variance in this study showed that Legowo row planting system gives a real effect on growth parameters (high plant age of 60 DAP, Number of productive tillers, weight of poultry stock, weight of grain of breeding (kg) and rice production of ton/ha $^{-1}$, whereas in the parameters of plant height age 20, 40 DAP, panicle length, and weight of 1000 grain did not show real effect of Legowo row cropping system and population density of Tilapia sp The plant height of 60 DAP in this study showed that the ^{2}nd Legowo row system is the best when compared with other treatment because it has a wide range of Legowo row 2:1 and more plant populations so that the nutrients contained in the soil can be absorbed by plants evenly.

3.3 Average Weight Analysis of the Weight of the Pepper (g), and the Production of Rice (Ton ha^{-1})

The result of the average weight analysis of the weight of the pepper (g), and the production of rice (ton ha^{-1}) shows that the Legowo row planting system and the density of the fish population have a significant effect on the weight of the per plot and the number of fish populations gives a significant effect on the weight of the per plot and the population of fish, but does not provide interaction between Legowo row planting system and fish population density. The average BNT test result of the weight of the printed grain (kg) showed that the L1 treatment of Legowo row 2:1 (3.85 kg) was significantly different from the treatment of L0 (Tandur row) and L2 (Legowo row 3:1), but not significantly different from the L3 Legowo row 4:1 for (3.63 kg). While the treatment of fish population of 36 head/plot (3.70) was significantly different from treatment (without fish), (12 heads/plot), but not different with the treatment of fish population of 24 head/plot (3.67).

The average yield of rice (ton ha^{-1}) based on the BNT test showed that treatment (L1) Legowo row 2:1 gave the highest yield compared to other treatments with average rice production (3.24 ton/ha), and not significantly different from the treatment (L3) Legowo 4:1 (2.84 tons/ha) but significantly different from the treatment (L0) Tandur row (2.49 tons/ha) and (L2) Legowo row 3:1 (2.68 tons ha^{-1}). While the highest fish population treatment was found in treatment (i3) density of 30000 fish/ha^{-1} of (2.87 tons ha^{-1}) significantly different from treatment (i0) without fish and (i1) fish density of 10000 head/ha^{-1}. But not significantly different with treatment (i2) fish density of 20000 ha^{-1} of (2.92 tons/ ha^{-1}). BNT advanced test results can be seen in table 3.

Table 3. Average weight of grain of breeding (kg), and Production of rice (ton ha^{-1}) in the Legowo cropping system and population density of Tilapia sp at the end of the study

Legowo row (L)	the weight of the plot (kg)	Rice production (ton ha^{-1})	Fish Population (I)	Weight of grain /plot (Kg)	Rice production (ton ha^{-1})
L0	2.96b	2.49 b	i 0	2.90 b	2.42 b
L1	3.85a	3.24 a	i1	3.30 b	2.75 b
L2	3.14b	2.68 b	i2	3.67 a	2.92 a
L3	3.63a	2.84 a	i3	3.70 a	2.87 a

The results of previous research were proposed by Yosida, 1981 in Aribawa (2012), which gained higher plant height produced in more plant populations in one stretch. High plant growth has not yet ensured high crop productivity. Well grown plants can absorb nutrients in quantities, the availability of nutrients in the soil affect the activity of plants including photosynthesis activities, so that the crop can increase growth and production. Treatment of Legowo row planting system gives a real effect on rice production /plot. This can be seen from each treatment showing the real difference. Applications of various Legowo row cropping systems affect production directly. This process can occur because there are many other environmental factors that influence the growth and development of plants such as rainfall, pests that attack, dead or not productive puppies.

Yuhelmi (2002), the most important factor affecting the production yield is the tillers and the number of panicles that are formed. The results of Nadira et al (2012) showed that the increasing number of unhulled grains and the decrease of the number of unhulled grains influenced the increase of harvest index value. This is thought to be due to the addition of organic matter to certain doses causing the creation of an ideal growing environment for the development of rice plants so that physiological processes can take place. The availability of nutrients in rooting media which are then transported into the body of the plant will still ensure the on going process of photosynthesis to form assimilates which will eventually be translocate to the grain part, the more assimilates transferred to the seed will further increase the yield of dried grain.

3.4 Level of Survival Fish, Fish Weight Fish and Fish Weight Fishing

Results of analysis of variance of fish survival rate (%), fish/tail (g) weight and fish/plot weight (g). The result of BNT test showed that fish population of 12 head/ plot (i1) gave the highest yield (68.47%) and was significantly different with the fish population/fish weight. treatment i3 fish population 36 head/plot (49.11%) treatment i2 fish population 24 head/plot of (57.82%).The average weight of *Tilapia* sp fish shows that 12 fish/ compared with other treatments (18.99 g) and significantly different from the treatment of fish population of 36 heads/plots (i3) of 15.48g. However, it was not significantly different with the fish population treatment of 24 head/plots (18.57 g). The weight of fish/plot (g) shows that the treatment of fish population of 24 animals/plot gave the highest yield (252.75 g) and was significantly different from the 12 fish/pet fish population (145.23 g), but not significantly different to the treatment of fish population of 36 head/plot (241.37 g). Further test results of BNT can be seen in table 4.

Table 4. Average survival rate of fish (%), fish / tail (g) weight and fish weight / plot (g) legowo cropping system and end-fish population density.

Mean of fish (i)	Fish Survival Rate (%)	Fish Weight Per Tail (g)	Fish Weight Per Parcel (g)
i0	0.00	0.00	0.00
i1	68.47a	18.99a	145.23b
i2	57.82b	18.57a	252.75a
i3	49.11b	15.48b	241.37a

Yudafris et al (1994) in Dewani et al (2014), stated that too close spacing will inhibit plant growth, but if it is too tenuous it will also reduce the number of crops per unit area so that production is lower and besides that the chances for weed growth are greater. Where the planting system of Legowo row 2:1 makes almost all the rows of plants are edge beds or get side effects, plants that get side effects (border effect), the production is higher than those who do not get side effects. The mean of fish survival based on the result of the analysis of variance gave a significant effect on fish survival (%), and fish weight/ tail from BNT test showed that the treatment (i1) of fish density of 12 heads/plot yielded higher percentage of fish (68.47%) when compared with treatment (i0, and i3). But not significantly different with treatment (i2) density of fish 24 tail / plot of (57.82%). This is caused by the higher fish density the greater the fish population on maintenance media, the greater the competition of oxygen and food among individual fish, so the higher the mortality rate of the fish. This is supported by a lower concentration of dissolved oxygen at high density, the oxygen required in the fish breathing process for fish metabolism requires approximately oxygen concentration (2-4 mg/L). At a high density level of 36 heads/plot the concentration of dissolved oxygen is lower than the requirement if only (1.17 mg/L), whereas in the low dispersion concentration the dissolved oxygen concentration satisfies that requirement (2.43 mg/L).

This is supported by the opinion of Mintarjo (1984) referred to by Hasanudin (2001). That states that the amount of oxygen content that needs to be considered to ensure a good fish life is not less than 3 ppm. While the results of research Karlyssa et al (2013), showed that the content of dissolved oxygen on the media maintenance of nipkins agile fish during maintenance is still relatively low for optimal growth of fish. The range of oxygen dissolved during maintenance in this study ranged from 3.2 to 4.9 mg/L was produced by a density of 2 and 4 heads/L. In the density of 6 Ls/L there was a decrease of oxygen content reaching 2.8 mg/L Increased density of fish stocking along with increased oxygen consumption causes decrease in oxygen solubility in maintenance media. Low levels of dissolved oxygen during maintenance lead to fish stress and slow growth of fish.

However, the stress experienced by fish during the maintenance period does not lead to decreased fish appetite. The average weight of fish make in the plot in this study can be described that the density of fish populations have a real effect on the weight of fish in the plot. The result of research showed that the treatment of population density of fish (plot) of the highest yield of 24 fish/plot (252.75 g) was not significantly different with the treatment of 36 heads/plots (241.37 g). But it was significantly different with the 12 tail/plot treatments (145.37 g).

This is due to the dense distribution of fish directly related to the competition of feed produced from rice crops so that with the density of fish stocking more fish growth decreases, compared with the lower density of the spread. For the maintenance period of the fish at the site of the study occurred in fish deaths that reduced the number of fish stocked, this is caused by predators of predators such as cranes, lizards, and mammals that enter into the location of the experiment.

3.5 Analysis of R/C and B/C Ratio

Analysis of farming system fish farming system for farmers needs to be done to find out how much added value that can be obtained from the business, the economic analysis as part to know whether the system is feasible or not developed and to know fish farming systems provide benefits or not. So below is described in a simple analysis of farming system fish farming system applied with a single attempt in one growing season.

The analysis of fish farming system shows that the total cost incurred in one planting season is Rp.8.725.000 and the total revenue obtained is Rp.17.425.500, so that the profit from fish farming system is Rp.8.700.500. Thus the fish farming system is worth developing because the value of R/C ratio 2.06 which means farming has been efficient because the R/C ratio is more than one, so the value of B/C ratio is more than one that is 1.08. The net profit earned after deducting the total cost is Rp.8.700.500

The opinion of Syamsuddin (2014), that the cultivation environment becomes the trigger factor of the coming (entry) of predators in and around the cultivation environment that will prey on fish in the public waters. Predators can be predatory fish, birds, reptile animals such as monitor lizards, and mammals that enter the cultivation environment. The attack of birds, reptiles, and mammals can consume fish in large quantities. The results showed that between Legowo row cultivation system and fish population density based on analysis of variance did not give real interaction to plant height variable 20,40 and 60 DAP, number of productive tiller, panicle length, cubic weights, weight of 1000 grain, , fish survival rate, fish weight per tail, and fish weight of fish. This occurs where during the fish maintenance period at the experimental site there is death on the fish, thus breaking the phase produced from the fish as nutrient elements for rice plants, so the absorption process nutrients by rice plants do not run optimally.

According to Soepardi (1985) in Supriyanto et al (2008), states that increased nutrient uptake by plants causes the metabolism process to run smoothly, increasing the production of carbohydrates and starches transculted throughout the plant for growth and the rest accumulated on the plant tissue. Therefore, more and more carbohydrates and starches are accumulated in plant tissues will affect the growth and production of plants. The growth of fish on tile planting system 25 x 25 cm with dense clumps make the movement of fish is not free, lighting and oxygen concentration into the water becomes less because the growth of fish is influenced by internal and external factors. Internal factors are: body weight, sex, age, fertility, health, movement, acclimation, biomass activity, and oxygen consumption. While external factors consist of abiotic and biotic factors. Abiotic factors consist of pressure, temperature, salinity, water oxygen concentration, discharge of metabolite, ph, light of season. Nutritional factors include biotic factors including feed availability, feed intake, feed digestibility, and feeding competition.

4 CONCLUSIONS AND SUGGESTIONS

Based on the result and discussion from this research, it can be concluded that Legowo row 2:1 planting system gives a real effect to the growth parameters of plant height 60 DAP (94.36 cm) weight of panicle density (1.89 grams), the weight of the grain (3.85 kg), the production rice (ton ha ha) (3.24 ton ha ha). While the system of planting row Legowo row 4:1 gives a real effect on the number of productive tillers (16.82 panicles). While the density of fish population of 24 tilapia/plot gives a real effect on the weight of fish/plot of (242.25 g). And the survival rate of fish, and the weight of fish/tail is produced by solid stocking of 12 tail/plot (65.27%), fish weight/tail (18.79 g). Legowo row planting system and population density of tilapia do not give real interaction to Legowo row planting system and population density of indigo fish. Fish farming system is one of alternative of farming development in paddy field, so it is suggested to farmers, especially farmers with narrow land, minapadi system supported by the use of organic fertilizer as recommended. Further research is needed on Legowo row planting system at different planting distance with fish population density of fish farming system, on growth and production of rice and fish.

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