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"Development and improvement of sustainable agricultural practices toward environmental and global well-beings"

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"Development and improvement of sustainable agricultural practices toward environmental and global well-beings"

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WELCOME MESSAGE

FROM CHAIRMAN OF ORGANIZING COMMITTEE

On behalf of the Organizing Committee of the 3rd International Conference on Food and Agriculture 2020 (ICoFA 2020), I would like to express our greatest gratitude to all distinguished speakers and participants for joining the conference. I wish to thank all advisory board members and organizing committee members for their effort in preparing this conference. They have prepared this event eagerly to assure all activities during conference would proceed smoothly.

In this year, during the pandemic Covid-19, this conference was held virtually as a measure for the spread of the corona virus and participants have been registered and papers will be presented orally. I do hope that all participants can share their experiences and discuss recent issues in food and agriculture as well as extend their network. In turn, this conference will be fruitful to all participants.

Finally, I would like to thank Ministry of Education and Culture the Republic of Indonesia, Kyushu Institute of Technology, Japan, Wageningen University and Research, Netherland, and Animal Nutrition Rajamangala University of Technology Thanyaburi, Thailand for supporting this conference. Hopefully, we can continue our collaboration in developing science and technology on Food and Agriculture in upcoming activities.

Thank you,

Dr. Ir. Nanang Dwi Wahyono, MM

WELCOME MESSAGE
FROM DIRECTOR OF POLITEKNIK NEGERI JEMBER

Dear all of the scientists and participants,

First and foremost, it is my great pleasure to welcome all of our distinguished forum speakers, presenters and participants to the 3rd International Conference on Food and Agriculture (ICoFA) 2020. It is an effort of continuously contribution of Politeknik Negeri Jember (State Polytechnic of Jember) in applied sciences as well as in relation with its 32 nd annual anniversary celebration.

This year, the 3rd ICoFA is very special since it is conducted in the covid-19 Pandemic. Hence, unlike previous years, ICoFA 2020 is conducted in the form of virtual conference. The ICoFA remains become one of scientific icon of State Polytechnic of Jember and as usual, the event is intended to provide technical forum and research discussion on food, agriculture, and how technology is effectively employed for sustainable development of food and agriculture.

The conference covers a series of presentations and discussions in plenary, concurrent and poster sessions. It is aimed to bring researchers, academicians, scientists, students, and practitioners together to participate and present the latest research findings, developments, and applications related to various aspects comprising agriculture engineering and biotechnology, organic agriculture, agroindustry and agribusiness, animal nutrition, animal production, and veterinary science, food science and technology, food safety, food security and sovereignty, IT for agriculture, renewable and novel energy sources and other topics related to food and agriculture.

I believe that several parties involved to make this event succeed. To that end, I want to thank Wikan Sakarinto, S.T, M.T, Ph.D. Director-General of Vocational School, Ministry of Education and Culture, Indonesia for the valuable support. Also, I would like to deliver my acknowledgment and appreciation to the international speaker; Associate Professor Toshinari Maeda from Division of Environmental Engineering, Department of Biological Functions and Engineering, Kyushu Institute of Technology, Japan, LH (Leon) de Jonge, Ph.D from Wageningen University and Research, Netherland, Animal Nutrition, and Dr. Lalita Siriwattananon. Dean Faculty of Agricultural Technology, Rajamangala University of Technology Thanyaburi, Thailand.

Last but not least, I hope that ICoFA will increase research collaborations between institutions involved and look forward for the 4th ICoFA 2021.

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Characterization of Several Rice (*Oryza sativa* L.) Varieties as Germplasm

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Abstract. Characterization of Rice plant (*Oryza sativa* L.) is required to obtain its potential or to eliminate unwanted characters for variety improvement. This research was conducted from September 2018 to April 2019. Non-factorial randomized block design (RBD) was used, with five varieties, namely 'Landak' (V1), 'Inpari 24' (V2), 'Sintanur' (V3), 'Sidenuk' (V4) and 'Ciherang' (V5). The characters observed were plant height, number of productive tillers, panicle length, flag leaf length, flowering age, harvesting age, number of grain, number of pithy grains, and yield potential. The data were analyzed using ANOVA and Tukey's HSD test at 5%. The result showed that Ciherang belonged to the first group (≤ 20 tillers). Sidenuk, Sintanur, Inpari 24 belonged to the second group (21-30 tillers), and 'Landak' fell under the third group (> 36 tillers). For harvesting age, 'Ciherang' and 'Sintanur' were in the first group (≤120 days), 'Sidenuk' and 'Inpari 24' were in the second group (121-140 days), and 'Landak' come under the third group (> 140 days). For 1000 grain weight, three varieties resulted lower than their plant description: 'Landak' (20.26 g), 'Ciherang' (25.30 g), and 'Sintanur' (26.48 g), while 'Inpari 24' and 'Sidenuk' exceeded their plant description with 26.89 g and 26.06 g, respectively.

1. Introduction

Indonesia is one of the countries that is wealthy in large diversity of germplasm, but this potential has not been developed optimally. The development of the potential for germplasm is needed to create development in various industrial fields, especially agriculture. The development of germplasm for the benefit of farmers continues. One of the realistic efforts that can be done is by reducing input costs, for example, by producing superior local rice seeds at relatively cheap cost, so that the benefits obtained by farmers are greater. The development of germplasm also aims to conserve local rice varieties as gene banks for plant breeding purposes [1].

Rice is a very important staple requirement for the society. Rice contains sufficient nutrients which is also known as an energy food which is very important for human body as the main sustenance [2]. However, many people currently prefer food that is not only compact with energy, but also have health and medicinal benefits, such as black rice.

Black rice is one type of rice in the world, apart from white rice, brown rice and red rice. Currently, black rice is starting to be in great demand and consumed by the public as a functional food because it contains one or more compounds that have physiological functions for health. Black rice is one of the rice that has a high anti-oxidant content compared to white rice because it has a dark purple pericarp layer [3]. Anticancer content can be used as a health functional food ingredient because it functions as an anticancer, antioxidant, hypoglycemia and provides anti-inflammatory effects. Anthocyanin pigments are also effective which can reduce cholesterol levels. Hence, black rice has a good health

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value for functional food. However, it has a slightly unlikable taste compared to white rice. Further variety improvement for black rice is a prospective option, in order to preserve its health benefit, but improve other qualities.

Thus, black rice as one of the germplasm that needs to be preserved, which can also be used as a genetic source in plant breeding, needs to be characterized to determine its genetic potential. With the identification of the agronomic and morphologic characters of local superior variety of black rice, it is hoped that information obtained can later be used in development programs of local potentials.

2. Materials and Methods

The research was conducted from September 2018 to April 2019 at the Jember State Polytechnic screen house, Jember Regency, East Java. This study used a non-factorial randomized block design with 1 factor Variety (V), namely:

V1 = Black ('Landak')
V2 = 'Inpari 24'
V3 = 'Sintanur'
V4 = 'Sidenuk'
V5 = 'Ciherang'

Each treatment was repeated 5 times, in which 25 experimental units were obtained. The results of the observations were analyzed using ANOVA and further tested using Least Significant Difference (LSD) at 5% error level.

Observation parameters include qualitative and quantitative parameters. Qualitative parameters include plant shape, stem color, leaf surface, leg color, leaf tongue color, leaf ear color, leaf color, grain color, grain shape. Quantitative observations include vegetative plant height (cm), number of tillers, flowering age (days after planting), harvest age (days after planting), generative plant height (cm), panicle length (cm), flag leaf length, number of productive tillers, number of grains per panicle, number of pithy grains per panicle, Production per hectare, potential yield.

3. Results and discussion

3.1. Qualitative Parameters

Qualitative observations are descriptive observations using analyzes that are differentiated by class or type, both visually and using scores. The results of qualitative observations of five local superior rice cultivars are presented in Table 1.

Table 1. Summary Of Qualitative Observation Data

Characters	Varieties				
	V_1	V_2	V_3	V_4	V_5
Plant Form	Upright	Upright	Upright	Upright	Upright
Stem Color	Drak Green	Green	Green	Green	Green
Leaf Surface	Very Rough	Rough	Rather Rough	Rough	Rough
Foot Color	Dark Green	Green	Green	Green	Green
Color Of Leaf Togue	Colorless and hairy	Colorless	Colorless	Colorless	Colorless
Leaf color	Green	Green	Green	Green	Green
Grain color	Straw yellow	Straw yellow	Net yellow	Straw yellow	Straw yellow
Grain form	Medium	Gent	Gent	Gent	Gent

Note: Landak (V_1), Inpari 24 (V_2), Sintanur (V_3), Sidenuk (V_4), Ciherang (V_5)

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Based on the data in Table 1, it can be seen that the shape of 'Landak' (V1), 'Inpari 24' (V2), 'Sintanur' (V3), 'Sidenuk' (V4) and 'Ciherang' (V5) is upright which is depicted from the angle of the stems formed less than 30°. Plant shape is the appearance of a clump of plants based on the angle formed between the tiller stems and the imaginary line in the middle of the clump and perpendicular to the ground surface area. An upright plant shape can trigger the growth of many and productive tillers so that it can increase production yield.

The color of the stems, the surface of the leaves, the color of the legs, the color of the tongue of the leaves and the color of the leaves show different observations for each rice plant variety as shown in Table 1. Differences in the color of the legs, tongue color, stem color and leaf surface are caused by genetic factors brought by their parents. The appearance of a plant is determined by genetic, environmental and interactions between the two. The qualitative characters that emerge are influenced by many genetic factors that are carried or passed down from the parents [4]. Green leaves provide a better opportunity for photosynthesis and the leaf epidermis, including stomata, is an anatomical feature that can be used to distinguish rice cultivars [5]. The appearance of the epidermis, which consists of long cells and short cells, as well as the stomata type are characteristics that can be used to distinguish each type of plant from the Gramineae tribe. The chances of photosynthesis are better in green rice plants, this is the leaf that has a lot of chlorophyll so that it can produce assimilates which will later be stored in the form of rice [6].

Grain color and grain shape in each variety also have different characteristics. These differences are due to different rice varieties. This is influenced by genetic factors that can produce different shapes and colors of grain. Genetic factors can be in the form of parental traits or genes carried by parents that are passed on through the parent so that the form of grain can be produced according to the description of the rice variety. Grain is actually not a seed but a rice fruit covered in lemma and palea. This fruit occurs after the completion of pollination and fertilization. Lemma and palea are what form the husk or grain skin [7]. The shape of the grain in each rice plant variety shows that 'Landak' (V1) is round and small in shape and the color of the grain is straw yellow so it has less weight than the four varieties, while 'Inpari 24' (V2), 'Sintanur' (V3) 'Sidenuk' (V4) and 'Ciherang' (V5) showed slender grain shape and are straw yellow and clean yellow.

The shape of grain can affect the production of grain produced in each rice variety. The larger the grain size, the higher the weight of 1000 grains in which will affect rice production in each variety. The form of grain which is slender and has a yellow-straw color of grain is favored by farmers because of its shape and will affect the weight of 1000 seeds. The new type of rice (PTB) IRRI apart from low yields, long life, still has a round grain shape and medium lime grains so it is not liked by farmers [6].

3.2. Quantitative Parameters

Quantitative characters which are important characters such as production, protein content and yield quality are controlled by many genes, each of which has a small effect on these characters [4]. The summary of data from quantitative observations on several rice varieties can be seen in Table 2 below:

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Table 2. Summary Of Results Test F (Anova) Quantitatitve Observation

No.	*Observation Parameters*	*Notation*
		Factor V (Varieties)
A.	*Vegetative phase*	
1.	*Plant height at 21st DAP*	NS
2.	*Number Of Tillers at 70st DAP*	**
B.	*Generative phase*	
3.	*Plant height*	**
4.	*Panicle length*	**
5.	*Flag leaf length*	**
6.	*Number of productive tillers*	**
7.	*Flowering age*	**
8.	*Harvest age*	**
9.	*Number of grains per panicle*	**
10.	*Number of pithy grains per panicle*	**
11.	*Yield (production per hectares)*	**
12.	*Yield potential*	**

Note :
NS = non significant
* = significant at 5% of error level*
** = significant at 1% of error level*

The qualitative parameters of each variety showed different results, this was influenced by genetic factors that were passed on by the parents. Quantitative parameters indicate the number of tillers that appear due to the spacing used during cultivation. The rice varieties used in this study had a higher number of tillers compared to the number of tillers in the variety description. This is because the method of planting is on a bucket and each bucket consists of one plant, while planting on land can produce smaller number of tillers. The small number of tillers was caused by the competition for nutrients that were given so that the absorption of nutrients was not optimal. Nutrient provision, spacing, and temperature can affect plant height [8]. Dense planting, high nitrogen application, and high temperature can affect the length of the stem internodes, besides the genetic characteristics carried can affect the plant height of each rice plant variety.

Table 3 Quantitative character of each variety tested on several agronomic parameters

Variety	Observation parameters					
	Generative Plant Height (cm)	Number of Productive Tillers	Panicle Length (cm)	Flag Leaf Length (cm)	Flowering Age (DAP)	Harvest age (DAP)
Sidenuk (V4)	99,60 ab	20,73 a	22,19 b	22,12 b	85,13 a	122,67 cd
Ciherang (V5)	96,80 a	19,40 a	22,32 b	21,86 a	84,07 a	122,53 c
Sintanur (V3)	100,60 b	22,27 a	22,04 b	22,93 b	85,13 a	118,47 b
Inpari 24 (V2)	110,53 c	23,33 a	21,79 b	21,99 b	86,60 ab	114,47 a
Landak (V1)	152,33 d	35,73 b	19,62 a	32,91 b	112,00 b	221,47 d

Note: Numbers followed by the same letter in the same column show insignificant differences according to the LSD test at 5% error level

From table 3, it appears that 'Landak' (V1) has the highest generative plant height and the number of productive tillers compared to other varieties, with 152.33 cm of plant height and 35.73 productive

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tillers. The number of productive tillers determines the level of reproductive ability of a variety. The classification of the number of tillers was classified as very high (> 25 tillers/plant), high (20 - 25 tillers/plant), moderate (10 - 19 tillers/plant), low (5 - 9 tillers/plant), and very low (<5 tillers/plants) [9].

'Landak' has the shortest panicle, which is 19.62 cm, but has the longest flag leaf which is 32.91 cm. The length of the panicles can trigger a lot of grain growth, so that rice production can increase with the presence of grains that appear in each rice plant panicle. The ability to produce rice panicle types and the productivity level of each panicle will determine the total productivity of the plant [10].

'Ciherang' (V5) had the fastest flowering age at 84.07 days after planting (DAP), while the longest flowering age was 'Landak' (V1) with 112 DAP. The fastest harvesting age was 'Inpari 24' (V2) with 114.47 DAP, while the longest harvesting age was 'Landak' (V1) with 221.47 DAP. The flowering age of rice plants affects the harvest age of each rice plant variety. The faster the rice plants flower, the faster the harvest age of each rice plant variety will be.

Flowering age is influenced by the generative characteristics of these rice varieties. In addition to generative characteristics, factors that can affect the flowering age of rice plants are temperature, solar radiation, humidity and season when the plants enter the generative phase.

Table 4. Quantitative character of each variety tested on several production parameters

Variety	Observation parameters				
	Number of Grain Per Panicle	Number of Pithy Grain Per Panicle	Production Per Hectare (ton/ha)	Potential Yield (ton/ha)	Weights of 1000 grains
Sidenuk (V4)	177,73 b	177,73 c	13,01 ab	15,43 ab	26,06 bc
Ciherang (V5)	157,44 ab	140,27 b	11,01 a	12,34 a	25,30 b
Sintanur (V3)	143,64 a	127,04 ab	11,99 a	13,54 a	26,48 c
Inpari 24 (V2)	136,78 a	120,27 ab	11,98 a	13,64 a	26,89 cd
Landak (V1)	148,16 a	106,53 a	14,93 b	17,14 b	20,26 a

Note: Numbers followed by the same letter in the same column show insignificant differences according to the LSD test at 5% of error level

Table 4 shows that 'Sidenuk' (V4) produced more grain per panicle and more pithy grain per panicle than other varieties, with 177.73 grains per panicle and 177.73 pithy grains per panicle. The varieties that had the most production per hectare and yield potential were 'Landak' (V1) 14.93 ton/ha and 17.14 ton/ha, respectively.

The number of grains per panicle consists of empty and pithy unhulled rice, this is influenced by genetic and phenotypic factors. One factor that is influenced by genetic factors is the number of tillers that appear in rice plants, while the phenotypic factors are influenced by sunlight, temperature, climate and proper maintenance.

Meanwhile, the variety that had the highest weight of 1000 seeds was the 'Inpari 24' (V2) with 26.89 gram, while the variety with the lowest 1000 grain weight was the 'Landak' (V1) 20.26 gram. 'Landak' has a low seed weight of 1000 seeds because the size of 'Landak' seed is small compared to the size of the seeds of other varieties. The 1000 grain weight is one of the methods used to test the quality of a seed. The shape and size of the seeds are determined by genetic factors that can affect the weight of 1000 seeds of a seed. The length and weight of seeds depends on the amount or not of dry matter contained in the seeds [7]. The dry matter in the seeds is obtained from photosynthesis which can then be used for seed filling.

3. Conclusions

In conclusion, the agronomical and morphological characters of 'Landak' as a local black rice has been obtained, in both vegetative characters and production characters, with of all the tested white rice variety above being in accordance with the variety description.

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The Success Rate of Red Onion (*Allium ascalonicum* L.) Crosses in the Lowlands Area of Jember

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Abstract. Shallots (Allium *ascalonicum* L.) are vegetable plants that use as spices and cannot be subtituted. The existing shallot varieties are generally not yet able to adapt to climate change or the altitude of the planted area and are still susceptible to important diseases. Therefore it is necessary to make efforts to obtain superior red onions that are adaptive to climate change and tolerant of important diseases. Red onion crossing is one way to expand genetic diversity, and combine the desired characters so that new populations are obtained as selection material in the assembly program for new superior varieties of shallots. Crosses in this study use local varieties of East Java. Bauji variety is one of the local shallot varieties in East Java which is adaptive in lowland areas, can be planted in the rainy season, and tolerant of diseases. Tajuk variety is also a local East Java variety with the advantage of being able to adapt to the dry season and to withstand the rainy season. The aim of this study was to determine the success rate of crossing two shallot varieties in order to produce an adaptive lowland variety of shallot and tolerant of important shallot diseases. The research was conducted in the Antirogo experimental garden at an altitude of 89 asl from August to November 2020. The study used a non-factorial randomized block design with three replications.

1. Introduction

Shallot is quite important vegetable and much needed in Indonesia. This fact causing the demand for shallots be higher from year to year [3]. [2] reports that shallot production has been under control for the last five years, however, farmers still use tubers as planting material. Even though there is an alternative planting material in the form of true shallot seed (TSS) which has more advantages. [4] reports that availability of shallot bulb as seeds could not provides farmer needs every year. In 2009, total of requirement is 120. 020 tons of shallot tubers for seeds and only 19,770 tons were available, consisting of 13,400 tons of domestic production and 6.370 tons of imports. Rates availability of new shallot seed tubers reaches 15 - 16% of the annual requirement. Therefore continuity is needed in the provides of shallot seeds. This is the most important factor in maintaining shallot production for sustainable development of shallot cultivation in Indonesia.

The use of seed tubers as planting material still has many weaknesses, such as seeds risk in carry tuber (seed)-borne diseases which can lead to decreased productivity [12]. Large volume of seed tubers do not last long enough to be stored for a long time, requiring a place for storage and special transportation [5]. The need for seed tubers can reach 1-1.2 tones / ha-1 [6] so that it requires a fairly high cost for the provision of tubers, reaching 40% of production costs [9]. The use of TSS can maintain

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and increase the production of shallot seeds. As reported by [7], the source of shallot seeds using TSS is very prospective to increase the production and quality of shallot bulbs.

Crosses are an attempt to improve plant genetic diversity. Hybridization manipulation attempts with a combination of two or more plant traits to produce new individuals [10]. In order to obtain superior traits, one of the ways that can be done is by improving new traits or varieties such as combining the good qualities of several superior local shallot varieties through crossing, so that new superior and high productivity clones or new varieties can be obtained even better than his parents. In doing crosses, there are several factors that can affect the success of crossing. One of the factors that influence success is the selection of elders. According to [11] success in breeding is determined by the selection of elders to be crossed. In the selection of parents it is very important and it is hoped that the parents who will be crossed are suitable or compatible so that high crosses can be produced [10]. Meanwhile information about Information about pollen and ovule fertility in shallots is still mixed. [14] stated that the fertility of diploid onion pollen reaches 81-95% while the ovule fertility is lower, which is around 42-46%. This is the basic information on the existence of a maternal effect on shallot flowers so that a reciprocal crossing method is needed.

Tajuk and Bauji are shallots varieties from East Java that have been released by the Ministry of Agriculture and widely used in East Java also adaptive in the lowlands [1]. The superiority of the Tajuk variety is its ability to adapt well to the dry season and withstand the rainy season. It has a very sharp aroma which is suitable for fried onions as well as high production. Bauji variety can produce up to 18 tons / ha but is less resistant to important diseases. The cross between the two is expected to be able to produce new high yielding varieties, tolerant of important diseases and adaptive in all seasons.

2. Methods

This research was conducted in Antirogo Village, Jember Regency, at an altitude of 89 m above sea level from August to November 2020. This research was conducted using a non-factorial randomized block design that are crossing factor. These crossing containing as selfing and reciprocal. Each treatment variable had 3 replications, each replication had 30 populations, a total population of 540 populations. The samples of reciprocal crosses were 124 plants, for selfing were 124 plants. The parameters observed included number of umbels per plant, number of flowers per umbel, percentages of crossing test, number of capsules per umbel, number of seeds per umbel, weight of TSS per umbel, the weight of seeds per 100 TSS. The data obtained were analyzed using DMRT test analysis at the 5% significance level.

3. Results and Discussion

The research is currently on going and the plant was in its flowering phase. Crossing activities test have not occurred because the flowers that appear not yet entered the anthesis period, either as male flowers or female flowers. The following is temporary data from experiments that have been carried out (Tabel 1).

Table 1. Number of Flower Stalk of Bauji and Tajuk Varieties in the Lowland area of Jember

Treatments	Number of Flower Stalk of Shallot
Bauji Variety	0.75 a
Tajuk Variety	0.25 b
Mean	0.5
Coef of Varian	33%

The numbers followed by the same letters within the same column were not significantly using DMRT at a 0.05. Ns= not significantly

The result showed that Bauji Variety have more flower stalk than Tajuk Variety. This condition showed that Bauji have chance being female parental and Tajuk as male parental. But, these two variety could be reciprocal treatment depend on its number of flower. [13] said that reciprocal cross is a kind of crossing strategy, using female and male parents to make crosses between a pair of parents. Usually a cross is expressed in the way that the first parent is female and the second parent is male. Number of

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flower however can influenced by temperature, altitude and its variety. How ever, there is still low information about fertility of pollen and ovule of shallot, [14] said that ovule fertility lowest than pollen fertility, so it could caused maternal effect. So, reciprocal crossing method is needed in this case.

4. Conclusion

Both varieties had the opportunity to become male as well as female elders, but the Bauji variety had a greater chance of becoming female parents because of the higher number of flowers.

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Optimization of Sterilization Techniques and Effects of Coconut Water for the Induction of Shoots of Stevia (*Stevia rebaudiana* Bertoni)

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Abstract. The advantage of stevia is that it doesn't bring teeth, has a low-calorie content and is suitable for diabetics, and is safe to use. In this study, the explants used were derived from the stem segment of the stevia plant. The results showed that shoots had a contamination percentage of 30-40% and the treatment experienced 10% browning in the T1M1, T2M3 and T3M1 treatments. and the percentage of shoot growth produced was the same from all treatments, namely 60%. While the fastest shoot emergence time at 8 days after planting (HST) was found in the sterilization technique treatment using 70% alcohol for 1 minute and the use of 0 ml / L coconut water (T1M1). The treatment that had the highest number of shoots was the sterilization technique using 70% alcohol for 1 minute and using coconut water 0 ml / L coconut water (T1M1) as many as 2.9 shoots.

1. Introduction

Plant is a source of natural sweetener which has a sweetness level of 200-300 times sweeter than cane sugar. Stevia can provide a solution for consumers who cannot or should not consume sugar / cane sugar, for example diabetics, because of course stevia sugar is safer than synthetic or artificial sweeteners. The advantages of stevia are that it does not cause pockets on teeth, has low calorie content and is suitable for diabetics, and is safe for use. Stevia plants can be propagated sexually and vegetatively, but the most proven one is vegetative propagation. Generative propagation by seed is difficult because of its very low germination capacity. Vegetative propagation of stevia plants can be done using tillers, stem cuttings, and tissue culture. This study aims to determine the use of sterilization techniques and proper coconut air concentration in the stevia induction process.

2. Methods

ResearchThe research was carried out at the Jember State Polytechnic Tissue Culture Laboratory in January 2020 - March 2020. This study used a completely randomized design (CRD) consisting of 2 factors, namely differences in sterilization techniques, namely: T1 = 70% alcohol for 1 minute, T2 = NaOCl 5% + 2 drops of tween 20 for 1 minute, T3 = NaOCl 5% + 2 drops of tween 20 for 1 minute +

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$HgCl_2$ 0.01% + 2 drops of tween 20 for 30 seconds and using the concentration of coconut air, namely: M1 = 0 ml / L, M2 = 50ml / L, M3 = 100 ml / L, M4 = 150 ml / L.

3. Research and Materials

Toolstools used are erlenmeyer, dissecting set, measuring cup, pH-meter, pipette, autoclave, laminar water flow, petri dishes, culture bottles, culture racks, bunsen, plastic pipettes, analytical scales, stoves, pans, magnetic stirrers, stirrers, beakers, hot plates, rulers, cameras, stationery.

The materials used are stevia plant seeds, sterile distilled water, 70% alcohol, tween 20, 5% NaOCl, $HgCl_2$ 0.01%, bactericides and fungicides, agar - agar, sugar, aluminum foil, stock solution AH, NaOH, HCl, water. coconut.

3.1. Research Design

study used a completely randomized design (CRD) which consisted of two factors. The first factor is the difference in sterilization techniques with 3 types of techniques, namely:

T1 = 70% alcohol for 1 minute
T2 = 5% NaOCl + 2 drops of tween 20 for 1 minute
T3 = 5% NaOCl + 2 drops of tween 20 for 1 minute + $HgCl_2$ 0.01% + 2 drops of Tween 20 for 30 seconds

while the second factor is the use of coconut water with 4 kinds of treatments, namely:

M1 = MS +2 ppm BAP + 0 ml / L coconut water
M2 = MS +2 ppm BAP + 50 ml / L coconut water
M3 = MS +2 ppm BAP + 100 ml / L coconut water
M4 = MS +2 ppm BAP + 150 ml / L coconut water The

data obtained were analyzed using analysis of variance (ANOVA), there was a significant difference between the DMRT further test (Duncan's Multiple Distance Test) with a level of 5%.

4. Results and Discussion

4.1. Contamination

In in vitro culture, the initiation phase is the first phase which aims to obtain explants that are free of microorganisms and produce the initiation of new growth. Initiation is the stage of taking explants from the parent plant which will be propagated by tissue culture. It is at the initiation stage that the contamination problem is the main limiting factor that is often encountered. Things that must be considered in the sterilization process include the type of sterilization material, the concentration of the sterilization material, and the time of immersion (Kumar, 2001).

The following is a graph of the proportion of stevia explant contamination produced in each treatment.

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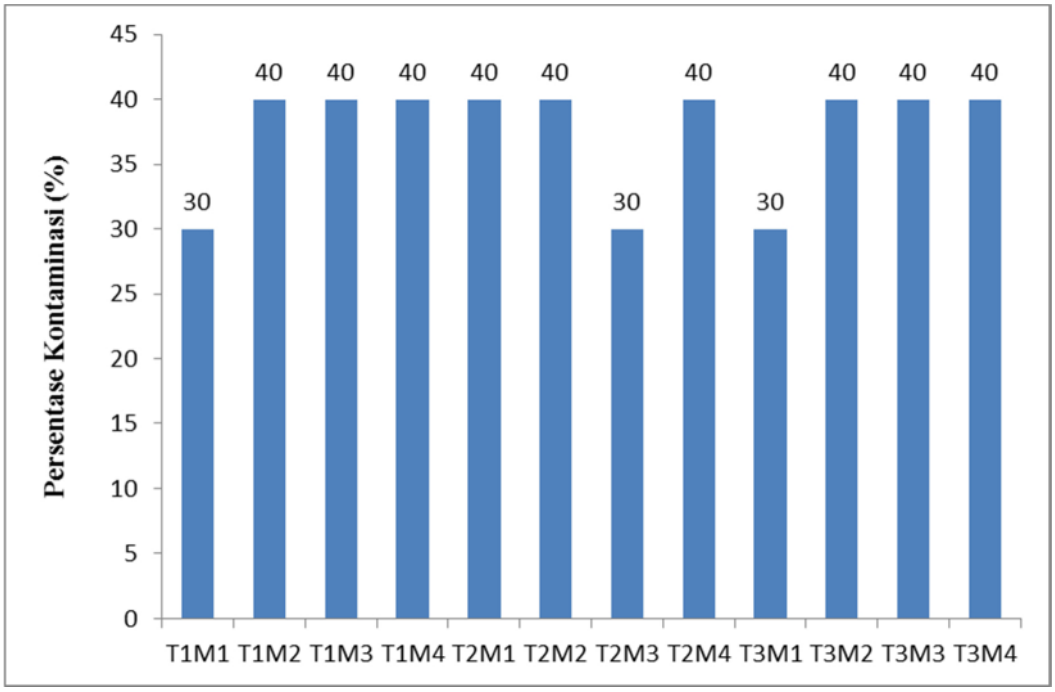

Figure 1 Contamination Percentage

Graph Graph 4.1 shows that the proportion of contamination on stevia explants ranges from 30-40%. Contamination in this stevia explant is a fairly large contamination because the percentage figure is almost half of the 100% figure. The following explants are contaminated.

Figure 2. Bacterial contamination, around the explants and the media there is mucus

Figure 3. Fungal contamination, around the explants and the media there is a white hyphae.

The observation in the image above is one of the explants that has been contaminated by fungi and bacteria. In bacterial contamination, symptoms such as around explants and the media contain mucus, while in fungal contamination the symptoms are such as white hyphae. This statement is supported by Shonhaji (2014), namely the contamination that often occurs in plant tissue cultures containing two types of contamination by bacteria and contamination by fungi. To distinguish the type of fungal or bacterial contamination, it can be seen from the physical characteristics that appear on explants and culture media. When exposed to bacterial contamination, mucus appears, this is because the bacteria directly attack the tissues of the plant body itself. Meanwhile, if contaminated by fungi or fungi, a fungal hyphae will appear on the affected plants and can usually be characterized by the presence of white to gray lines (like threads).

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The contamination of the stevia explants was suspected due to sterile conditions at the time of planting. This is also supported by Kristina, DKK (2017) stated that the tissue culture process requires sterile conditions. If the conditions are contaminated, the culture will die or be damaged. The components most susceptible to contamination by microorganisms are growing media and explants.

Contamination is also caused during planting, exploration is not paying attention to the acceptability of both hands, the stage tools at the time of sterilization which cause contamination to spread quickly and rapidly in breeding and contaminated explants will not grow properly and will experience explant death because the nutrients and substrate in the media have been used. taken for breeding. This is supported by the statements of Doods and Roberts (1983) and Gunawan (1988) that growth media and explants can be contaminated by microorganisms because both can function as good subsrates for the growth of microorganisms including bacteria and fungi.

4.2. Browning

The occurrence of browning is a physiological setback of an explant which is often found in in vitro culture which ultimately inhibits the development of an explant.

In this study, the treatment that experienced browning occurred in only 3 treatments, namely the T1M1, T2M3 and T3M1 treatments by 10%. While the other treatments did not experience browning.

Browning on the explants is thought to be caused because the explants were injured during planting so that the explants turned brown. This is supported by the statement of Sri Hutami (2008), namely the explant tissue culture that turns brown (browning) or black (blackening) at any time after isolation which in turn can inhibit growth and eventually cause tissue death.

Browning stevia explants showed brown explants and did not grow. This is supported by Mariska's (2003) statement that browning is a character that can inhibit the growth and development of explants that change the color of the explants to black / brown. This occurs because of changes caused by physical or biochemical effects (injury or disease).

4.3. Percentage of shoot growth. Shoot

formation in in vitro culture is often a parameter in a culture. In this study, all explants could respond to each treatment.

The following is a graph of the proportions of the stevia explant plants produced in each treatment.

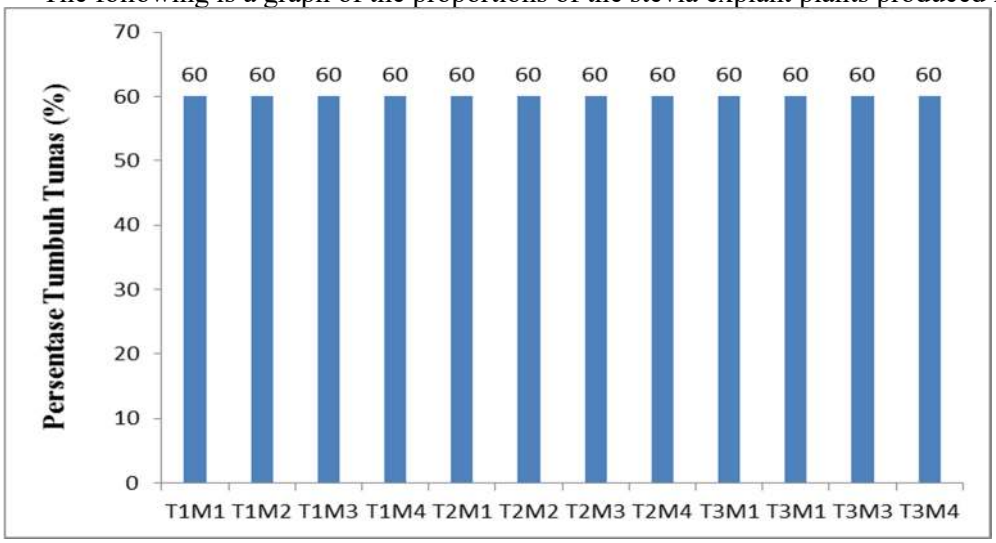

Figure 4. Shoot Growth Percentage Graph The

Graph shows that, the proportion of shoot growth on stevia explants is the same, namely 60%. The growth of this stevia shoot has a proportion that reaches 100%. This is thought to be using sterilization techniques and growth regulators to provide an optimal growth response so that the proportion of shoot

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growth is uniform. Growth regulators given through stevia explants, namely cytokinins in the form of coconut water. According to Pisesha (2008), the statement that the cytokinins contained in coconut water from small missiles can support plant growth.

4.4. The emergence of shoots The
formation of shoots on the explants is an initial phase of growth of the explants. Shoots are part of a newly grown plant (Raharja and Wiryantha, 2003).

The results of variance for parameters when searching for shoots on stevia explants can be seen in table 4.1 below.

Table 1. Sidik Analysis of Optimization Variety of Sterilization Techniques and Effects of Coconut Water for the Induction of Stevia Shoots on the emergence of shoots

Source of diversity	Db	JK	KT	Fhit	Notation	F Table	
						5%	1%
Deuteronomy	4	192.85	48.21	0.48	ns	2.58	3.78
Treatment	11	1683.41	153.04	1.52	ns	2.01	2.68
T	2	915.60	457.80	4.56	*	3.21	5.12
M	3	272.55	90.85	0.90	ns	2, 82	4, 26
T x M	6	495.27	82.54	0.82	ns	2.31	3.24
Gallat	44	4422.15	100.50				
Total	59	98.41Significantly					

Note: (*)different, (**) Different very real, (ns) Different not

Above table 1, it can be denied that the treatment of sterilization technique (T) has an effect on when it materializes, the interaction between the sterilization technique (T) and coconut water (real M) does not have a significant effect on when the shoot is manifested, and the treatment coconut water (M) has no significant effect on the alarm time.

Following are the results of the 5% DMRT test for the sterilization technique (T) treatment is presented in table 2 below.

Table 2. Results of the Advanced Test of the Effect of the T Factor on the Appearance of the Stevia Explant Shoots Using the DMRT 5% Advanced Test

Treatment	Average(HST)
T1	14.4 b
T2	22.2 a
T3	23.1 a

Description: The numbers followed by the same letter indicate not significantly different in the DMRT level of 5%.

The results of the 5% DMRT further test on the sterilization technique (T) treatment showed the fastest shoot emergence speed on the stevia explants with the sterilization technique (T1) treatment with a mean of 14.4 days after planting (HST). While the slowest shoot emergence rate was found in treatment (T3) with a mean of 23.1 days after planting (DAT). In the sterilization technique (T2) and (T3), the sterilization technique used was 5% NaOCl + 2 drops of Tween 20 for 1 minute and 5% NaOCl + 2 drops of Tween 20 for 1 minute +$HgCl_2$ 0.01%+ 2 drops tween 20 for 30 seconds. Whereas in the sterilization technique (T1), the sterilization technique used was only 70% alcohol for 1 minute. The difference in the speed of shoot formation in the stevia explants at the induction of each treatment was probably due to the different sterilization techniques used. The following is a graph of the mean when determining shoots for each treatment.

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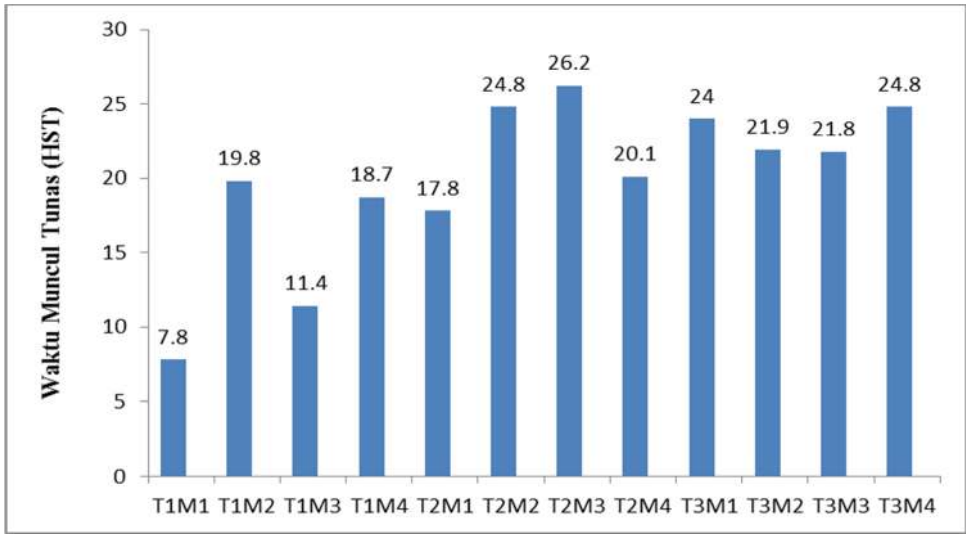

Figure 5. Graph of MeanAppearance Time in DAS

Sprout Data on the graph, show that the actual stevia explants were first counted on the 8th day after planting and explants appeared shoots ranged from 8 to 26 days after planting (DAT).

The combination of sterilization technique using 70% alcohol for 1 minute with a coconut air concentration of 0 ml / L (T1M1) has the lowest mean, this shows that in this treatment explants appear shoots faster than the others, which is about 8 days after planting (DAS), while other treatments were around 11-26 days after planting (DAT). This means that the longer the explants grow, the current level of the shoots is slow, conversely, the faster the explants grow, the better the current rate of sprouting. So that the explants that have an average day to grow shoots smaller (earlier) have a fast response in absorbing the nutrients provided in the medium.

In tissue culture, coconut water contains cytokinin ZPT. Cytokinins themselves are ZPT which are important in regulating cell division and morphogenesis. Some kinds of cytokinins are natural cytokinins (for example kinetin and zeatin) some are synthetic cytokinins. Natural cytokinins are produced in actively growing tissues, especially in roots, embryos and fruits. The cytokinins produced in the roots are then transported by xylem to target cells in the stem (Gunawan, 2008). Coconut water is an organic compound that is often used in tissue culture engineering applications. This is because coconut water is natural water that contains high levels of K and Cl. In addition, coconut water contains sucrose, fructose and glucose (Netty, 2002).

4.5. Number

Number of explant shoots, the number of shoots counted when explant shoots are 1-1.5 cm in size. The number of shoots was counted from the shoots that emerged from the axillary buds or side shoots on each explant. Shoot growth on each explant is varied. The difference in shoot growth may be due to nutrient uptake for different explants for regeneration such as shoot growth and development. Another possibility is the adaptation of explant growth and development in a small environment such as a culture bottle.

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The results of variance for the number of shoots parameters can be seen in table 4.3 below.

Table 3. Variety Fingerprint Analysis and Optimization Techniques Sterilization Effect of Coconut Water For Plants Induction of Stevia to Total Tunas

source of diversity	Db	JK	KT	Fhit	Notation	Ftabel	
						5%	1%
Deuteronomy	4	96 407	24 102	86 192	**	2,584	3,778
Treatment	11	10 805	0.982	3,513	**	2.014	2.680
T	2	4790	2395	8565	**	3209	5123
M	3	0061	0020	0072	ns	2816	4261
T x M	6	5955	0992	3549	**	2313	3243
Gallat	44	12.304	0.280				
Total	59	119,516					

Description: (*) DIFFERENT Real, (**) DIFFERENT Very Real, (ns) Not significantly different

Based on table 3 it can be ignored that the treatment of the sterilization technique (T) has a very significant effect on the number of shoots and the treatment interaction between the sterilization technique (T) and coconut water (M) has a very significant effect on the number of shoots. Meanwhile, coconut water treatment (M) had no significant effect on the number of shoots.

The following are the results of the 5% DMRT test for the combination of sterilization technique (T) treatments presented in table 4.4 below.

Table 4. Results of the Advanced Test of the Effect of the T Factor on the Number of Shoots Using the DMRT Advanced Test 5%

Treatment	Average Number of Shoots
T1	2,6 a
T2	2,3 b
T3	1,9 b

Description: The numbers followed by the same letter show no significant difference in DMRT test at 5% level.

Table 4 shows the results of the 5% DMRT further test the effect of the T factor on the number of shoots formed in each treatment. The highest average was found in T1 treatment which reached 2.6 tuna. While the lowest average was found in the T3 treatment which reached 1.9 shoots. The T1 treatment is the treatment of sterilization techniques using 70% alcohol for 1 minute, the T2 treatment is the treatment of sterilization techniques using 5% NaOCl + 2 drops of tween 20 for 1 minute, while the T3 treatment is a sterilization technique using 5% NaOCl + 2 drops Tween 20 for 1 minute +$HgCl_2$ + 2 drops of Tween 20 for 30 seconds. Following are the results of the 5% DMRT test for the combination of sterilization technique (T) and coconut water (M) treatment are presented in table 4.5 below.

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Table 5. Result of Further Test the Effect of Factor T and M on the Number of Shoots Using the DMRT Advanced Test 5%

Treatment	Average Number of Shoots
T1M1	2.9 a
T2M4	2.7 ab
T1M3	2.7 ab
T3M2	2.6 abc
T1M4	2.5 abcd
T1M2	2.4 abcde
T2M1	2,3 abcdef
T2M3	2,1 bcdef
T2M2	1,9 cdef
T3M3	1,8 def
T3M1	1,7 ef
T3M4	1,6 f

Description: The numbers followed by the same letter show no significant difference in the level of DMRT test 5%.

Table 5 shows that the results of the 5% DMRT follow-up test had the effect of the T with M factor on the number of shoots formed in each treatment. The mean number of shoots in the sterilization technique using 70% alcohol for 1 minute and 0 ml / L coconut water (T1M1) was 2.9 tuna. While the lowest average number of shoots was found in the sterilization technique treatment using 5% NaOCl + 2 drops of tween 20 for 1 minute + $HgCl_2$ + 2 drops of tween 20 for 30 seconds and 150 ml / L coconut water (T3M4), namely 1.6 shoots.

The data in table 4.5 shows that the average number of shoots that appears is 2-3 shoots. Stevia explants can have a few or many shoots because the explants can absorb nutrients from coconut water. Cytokinins found in coconut water can help increase the number of tuna (Mandang, 1993). According to Pisesha (2008), the statement that the cytokinins contained in coconut water from small missiles can support plant growth. According to Kristina and Siti (2012), coconut water is a source of natural growth regulators, including the cytokinin group. Coconut water can spur the growth of tuna.

5. Conclusion

Based on the results of observations and discussions that have been obtained, it can be concluded as follows:

- The treatment of sterilization techniques provides a proportion of contamination to the induction of stevia plants ranging from 30-40% and the treatment that undergoes browning is only 3 treatments, namely T1M1, T2M3 and T3M1 of 10%. The proportion of plant growth produced by stevia plant induction was the same in the treatment of 60%. The treatment of the sterilization technique had a significant effect on the corrected parameters and the treatment of the sterilization technique had a very significant effect on the parameter of the number of shoots. The treatment of T1 sterilization technique gave the fastest shoot emergence rate, namely 14.4 days after planting (DAT). While the number of shoots produced by the effect of the T1 sterilization technique, the highest number of shoots was 2.9 tuna.
- The treatment of offering coconut water at the induction of stevia plants had no significant effect on the alarm parameters and the number of shoots.

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Concentration of Soaking Coconut Water and the Use of Kinds of Clon Entres toward the Growth of Bud Shoots of Cocoa (*Theobroma cacao* L)

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Abstract.The purpose of this research is to find out the influence of concentration of soaking coconut water and the use of kinds of clon entres toward the growth of bud shoots cocoa. This research was conducted on October 2019 until January 2020 at Lapang (Saung) Laboratory, Polytechnic of Jember. This research used Complete Random Design Factorial. Concentration of soaking coconut water was determined as first factor with 4 levels: 0% ; 25% ; 50% ; and 75%. While the use of kinds of clon entres was determined as second factor with 3 levels: Sulawesi Clon 1; Sulawesi Clon 2; and MCC Clon 2. There were 12 treatments combination and 3 repetitions. Further, the researcher conducted a 5% of DMRT (Duncan Multiple Range Test) follow-up test. The result shows that concentration of soaking coconut water did not give significantly different treatment on all parameters. The use of MCC Clon Entres 2 gave significantly different result toward leaf area and shoot length parameters.

1. Introduction

Cocoa (Theobroma cacao L.) is a plantation crop that has an important role for the national economy, especially as a source of income and foreign exchange. An increase in cocoa production every year in Jember Regency, East Java, needs to be balanced with more, fast and quality seeds. Grafting the shoots is one way of vegetative propagation of cocoa seedlings. The choice of the use of scion or scion must use superior clones of cocoa. One of the growth regulators (ZPT) that can help the growth of cocoa so that the proportion of growth is higher and the transfer of ready-to-plant seedlings is faster is the natural growth regulating agent (ZPT) of coconut water. This study aims to see the effect of its effect on the air concentration of coconut and the use of clone types of scion on the grafting of cocoa shoots..

2. Research Method

This research was conducted from October 2019 to January 2020 at the Field Laboratory (Saung), Jember State Polytechnic. This study used a Factorial Completely Randomized Design (CRD) with the first factor being Coconut Water Immersion Concentration and the second factor was the use of various types of Entres clones, there were 12 treatment combinations and 3 replications. The concentration factor

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of Coconut Water Immersion consists of 4 levels, namely 0%, 25%, 50% and 75%. The use of factors for different types of entry clones consists of 3 levels, namely Sulawesi 1, Sulawesi 2 and MCC 2.

2.1. Tools and Materials

The tools needed in this research are meter, gembor, measuring cup / liter, razor / cutter, knife, container, scissors, stationery.

The materials needed in this study were 5 months old ICCRI 06H rootstock cocoa seedlings in polybags, Sulawesi clone 1 top stem entres, Sulawesi clone 2 and MCC 02 clone 5 months old with 2 segments, water, 3 month old young coconut water (coconut inside), plastic straps, plastic covers, observation books.

2.2. Research methods

This study was compiled using a completely randomized design (CRD) factorial with 12 treatments, including:

- The concentration of coconut water immersion consists of 4 levels, namely:
  A1: 0%, A2: 25%, A3: 50%, A4: 75%
- The use of various Entres Clones consists of 3 levels, namely:
  K1: Sulawesi 1, K2: Sulawesi 2, K3: MCC 02

There were 12 treatment combinations with each treatment consisting of 3 replications in order to obtain 36 experimental units. Each unit consists of 5 polybags so that a total of 180 polybags

Combination treatment of Coconut Water Immersion Concentration and Use of Types of Entres Clones is presented in table 3.1 as follows:

Concentration of Coconut Water	**Klon Entres**		
	K1	K2	K3
A1	A1K1	A1K2	A1K3
A2	A2K1	A2K2	A2K3
A3	A3K1	A3K2	A3K3
A4	A4K1	AK2	A4K3

1. A1K1 = 0% Coconut water + Sulawesi 1
2. A1K2 = 0% Coconut water + Sulawesi 2
3. A1K3 = 0% Coconut water + MCC 2
4. A2K1 = 25% Coconut water + Sulawesi 1
5. A2K2 = 25% Coconut water + Sulawesi 2
6. A2K3 = 25% Coconut water + MCC 2
7. A3K1 = 50% Coconut water + Sulawesi 1
8. A3K2 = 50% Coconut water + Sulawesi 2
9. A3K3 = 50% Coconut water + MCC 2
10. A4K1 = 75% Coconut water + Sulawesi 1
11. A4K2 = 75% Coconut water + Sulawesi 2
12. A4K3 = 75% Coconut water + MCC 2

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The statistical model RAL (Completely Randomized Design) factorial
used ie :

$$Yijk = \mu + \alpha i + \beta j + (\alpha\beta)ij + \varepsilon ijk$$

Information :

Yijk: the value of the k-observation that obtained the combination of the treatment of the jth immersion concentration of coconut water and the treatment of the use of the i-th entres clone

μ: common mean

αi: the effect of the treatment of the i th immersion concentration of coconut water

βj: the effect of using the j-th type of entres clone

(αβ) ij: the effect of the combination of i-th and j-treatments

εijk: experimental error of the i-th and j-th treatments in the k-th experimental unit

The data obtained were analyzed using analysis of variance (ANOVA). If there is a significant difference, continue with the DMRT (Duncan Multipe Range Test) further test with a level of 5%.

3. Results and Discussion

Table 4.1 Recapitulation of Various Concentrations of Coconut Water Immersion and Use of Types of Entres Clones on the Growth of Cocoa Shoots (Theobroma cacao L.)

Observation Parameters	Factor A	Factor K	Factor A*K	KK (%)
Shoot diameter 13 MSS (cm)	NS	NS	NS	21
Number of Leaves 13 MSS (helai)	NS	NS	NS	25
Leaf area 13 MSS (cm^2)	NS	**	NS	26
Number of shoots13 MSS	NS	NS	NS	21
Shoot length 13 MSS (cm)	NS	**	NS	22

Description: MSS: Week After Connecting; (A): Coconut Water Concentration; (K): Entres clone; (*): Real Different; (**): Very Real Different; (NS): Not Real Different

3.1. Live Percentage

Observation of the percentage of live shoot grafting of cocoa seedlings was carried out when the seedlings were 2 MSS (Week After Connection) by counting the number of live shoot grafting seeds. The grafting seedlings of cocoa are said to be successful if the scion or scion is still green and does not rot. The results of the observation of the percentage of live grafting of cocoa seedlings at the age of 2 MSS can be seen in table 4.2, there is 1 dead grafting seedling, namely A4K1 seedlings in replication 1.

Table 4.2 Percentage of Life Gathering Cocoa Shoots 2 MSS

No.	Treatment	∑ Connect Pucuk	∑ Connect the Top of Life	∑ Connect the Dead Top	Percentage
1.	A1K1	15	14	1	93,33%
2.	A1K2	15	15	0	100%
3.	A1K3	15	15	0	100%
4.	A2K1	15	15	0	100%
5.	A2K2	15	15	0	100%
6.	A2K3	15	15	0	100%
7.	A3K1	15	15	0	100%
8.	A3K2	15	15	0	100%
9.	A3K3	15	15	0	100%
10.	A4K1	15	15	0	100%
11.	A4K2	15	15	0	100%
12.	A4K3	15	15	0	100%

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Percentage of survival is one indicator of the success of shoot grafting propagation of cocoa seedlings. From table 4.2, it can be seen that the results of the live grafting percentage of cocoa shoots aged 2 MSS showed that the percentage of live shoot grafting had a high success rate, namely 93.33% - 100%.

Treatment of coconut water immersion resulted in a survival rate of more than 90% of cacao shoot grafting. This is thought to be due to the content of the hormones auxin, cytokinins and gibberellins found in coconut water which can help the growth and grafting of cocoa shoots, resulting in a high percentage of life.

The use of clones of scion also gave a high percentage of live grafting of cocoa shoots, which was more than 90%. This is thought to be due to genetic factors in the cocoa clones that provide minerals and the performance of the cells in the plant for connection growth.

3.2. Shoot Diameter

Observation data on shoot diameter at 13 MSS are presented in appendix 3. The next data was analyzed for ANOVA variance which is shown in table 4.3.

Table 4.3 Scanning Analysis of Variety of Shoots Diameter 13 MSS (cm)

SK	db	JK	KT	F Hit	Notasi	F 0.05	F 0.01
treatmentn	11	0,050	0,005	1,062	NS	2,216	3,094
Factor A	3	0,008	0,003	0,601	NS	3,009	4,718
Factor K	2	0,027	0,014	3,184	NS	3,403	5,614
A x K	6	0,015	0,003	0,586	NS	2,508	3,667
Gallat	24	0,103	0,004				
Total	35	0,154					

Observation of shoot diameter of cacao shoot graft (Theobroma cacao L) was carried out at 5 MSS (Week After Connection), 7 MSS, 9 MSS, 11 MSS and 13 MSS. Based on the analysis of variance in Table 4.3, the treatment of coconut water immersion concentration (A), the treatment of using types of scion clones (K), and the interaction between the concentration of immersion in coconut water and the use of various types of clones of scion (A * K) showed no significant differences in shoot diameter at cacao shoot grafting seedlings (NS). The results of the observation of the concentration of coconut water immersion on the diameter of the shoot graft of cocoa can be seen in Figure 4.1

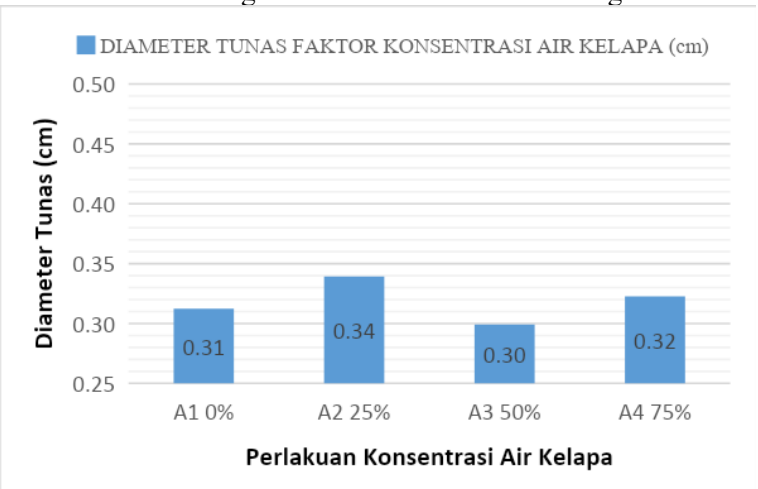

Figure 4.1 Graph of Average Effect of Coconut Water Immersion Concentration on Shoot Diameter (cm)

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Based on Figure 4.1 above, the control treatment (A1) produces an average shoot diameter of 0.31 cm, while for the treatment of 25% coconut water immersion concentration (A2) results in a shoot diameter of 0.34 cm, 0.30 cm for the concentration of 50 immersion in coconut water. % (A3), and 0.32 cm for the concentration of coconut water immersion 75% (A4). Putri et al (2016) stated that coconut water contains growth regulators such as phytohormones auxin and gibberellin, auxin hormones combined with the hormone gibberellin can help trigger the growth of vessel tissue and cell division in the vessel cambium so as to support stem diameter growth. In this study, the results of immersion in coconut water showed no significant difference (NS) to all concentrations used in the shoot diameter parameter. This is presumably because the concentration of coconut water immersion used has not been able to help the growth of shoot diameter grafting cocoa shoots. The use of immersion concentration in coconut water is closely related to the absorption of phytohormones contained in coconut water for the growth of shoot diameter of cacao shoots. This is supported by the statement of Nurman et al (2017) that giving coconut water to plants in the right concentration can increase the endogenous content of plants which can help accelerate the growth and development of plant organs.

The results of observations on the use of clones of scent clones on shoot diameter of cacao shoots can be seen in Figure 4.2

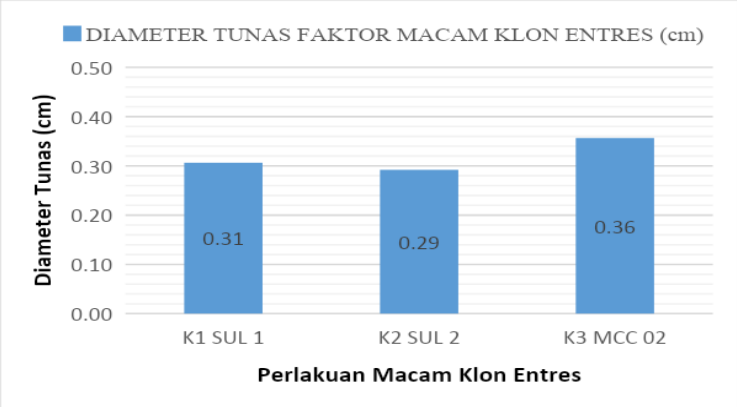

Figure 4.2 Graph of Average Effect of Use of Different Types of Entres Clones on Shoot Diameter (cm)

Seen from Figure 4.2 above shows that the treatment using the type of scent clone Sulawesi 1 (K1) had a shoot diameter of 0.31 cm, Sulawesi scion 2 (K2) clone produced shoot diameter of 0.29 cm and 0.36 cm for shoot diameter of MCC 02 clones. (K3). In general, the results of all treatments using these types of entrees clones were not significantly different (NS). This condition is presumably because the growth in shoot diameter is influenced by genetic factors of the clones used. Genetic factors for cocoa clones, which are annual crops, cause growth in shoot diameter that takes a long time. This is supported by Irvandi et al (2017) who state that annual crops such as cacao plants take a long time to grow horizontally, so increasing the diameter of the shoots in cocoa plants requires a long time to grow.

3.3. Number of Leaves

Observation data on the number of leaves aged 13 MSS are presented in appendix 3. The next data was analyzed for ANOVA variance which is shown in table 4.4.

Table 4.4 Analysis of the Variety of Parameters Number of leaves 13 MSS (strands)

SK	db	JK	KT	F Hit	Notasi	F 0.05	F 0.01
treatmentn	11	33,21	3,02	1,69	NS	2,22	3,09
Factor A	3	13,93	4,64	2,59	NS	3,01	4,72
Factor K	2	3,93	1,97	1,10	NS	3,40	5,61

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A x K	6	15,35	2,56	1,43	NS	2,51	3,67
Gallat	24	42,96	1,79				
Total	35	76,17					

Observation of the number of leaves of cacao shoot grafting (Theobroma cacao L) was carried out at 5 MSS (Week After Connection), 7 MSS, 9 MSS, 11 MSS and 13 MSS. Based on the analysis of variance in Table 4.4, the treatment of coconut water immersion concentration (A), the treatment of using types of scion clones (K), and the interaction between the concentration of immersion in coconut water and the use of various types of clones of scion (A * K) showed no significant differences in the number of leaves. on cacao shoot grafting seedlings (NS). The results of the observation of the concentration of coconut water immersion on the number of leaf grafting cacao shoots can be seen in Figure 4.3

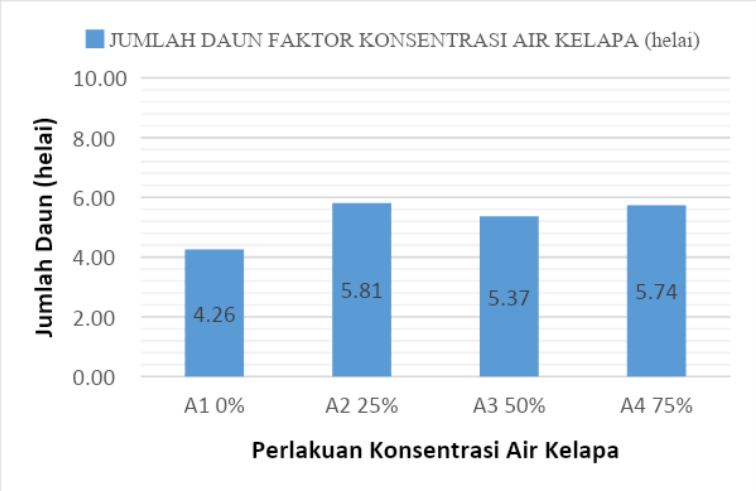

Figure 4.3 Graph of Average Effect of Coconut Water Immersion Concentration on Number of Leaves (strands)

Judging from Figure 4.3 above, the treatment of 0% coconut water immersion concentration (A1) produces an average number of leaves 4.26 leaves, while for the treatment of coconut water immersion concentration of 25% (A2) results in the number of leaves 5.81, 5.37 leaves for coconut water immersion concentration of 50% (A3), and 5.74 leaves for coconut water immersion concentration of 75% (A4). The results of immersion in coconut water showed no significant difference in the parameters of the number of leaves grafting cocoa shoots (NS). This is presumably because the use of coconut water has not helped to increase the number of leaves on the shoot graft of cocoa but can help as an inhibitor in leaf shedding, so that coconut water functions to maintain the number of leaves that grow on the shoot grafts of cocoa. In accordance with the statement of Putri et al (2016) which states that coconut water contains the auxin hormone which functions as an inhibitor of leaf decay or shedding. Auxins can react in plants to produce inhibitors that function as inhibitors of the formation of ethylene, which causes loss of various plant organs.

The results of the observations on the use of scion clones on the number of leaf grafts of cocoa shoots can be seen in Figure 4.4

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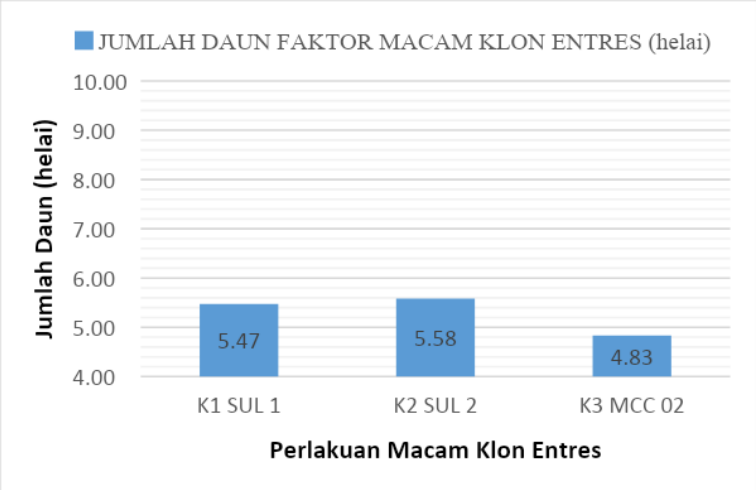

Figure 4.4 Graph of Average Effect of the Use of Types of Entres Clones on the Number of Leaves (strands)

Based on Figure 4.4, it can be seen that the treatment of using the type of scent clone Sulawesi 1 (K1) resulted in an average number of leaves of 5.47 leaves, Sulawesi 2 (K2) scion clone resulted in an average number of leaves of 5.58 and MCC 02 (K3) clones resulted in the average number of leaves was 4.83 leaves. The treatment of using different types of clones of entres was not significantly different for all types of clones of entres used in the number of leaves (NS) parameter. This condition is thought to be because the growth in the number of leaves can be influenced by the combination factor between scion and rootstock clones, resulting in a metabolic process. Excessive metabolic processes in new plants can be the cause of the low number of leaves growing because the seedlings are still in a state of adjustment after being wounded for shoot grafting. This is in accordance with the statement of Anita Sari et al (2012), namely the low number of leaves formed is caused by the metabolic process in the seeds that occurs continuously as long as the seeds cannot produce their own food reserves.

3.4. Shoot Length

Observation data on the length of shoots at 13 MSS are presented in appendix 3. The next data was analyzed for ANOVA variance which are listed in table 4.8.

Table 4.8 Analysis of the Variety of Parameters for Shoots Length 13 MSS (cm)

SK	db	JK	KT	F Hit	Notasi	F 0.05	F 0.01
treatment	11	119,86	10,90	3,20	**	2,22	3,09
Factor A	3	23,87	7,96	2,34	NS	3,01	4,72
Factor K	2	56,52	28,26	8,31	**	3,40	5,61
A x K	6	39,47	6,58	1,93	NS	2,51	3,67
Gallat	24	81,60	3,40				
Total	35	201,46					

Observation of shoot length of cacao shoot graft (Theobroma cacao L) was carried out at 5 MSS (Week After Connecting), 7 MSS, 9 MSS, 11 MSS and 13 MSS. Based on the analysis of variance in Table 4.8, the treatment of coconut water immersion concentration (A), as well as the interaction between the immersion concentration of coconut water and the use of various types of clones of entres (A * K) showed insignificant differences in leaf length in cacao shoot grafting seeds (NS). However, in the treatment the use of different types of clone entres (K) showed a very significant difference. The

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results of the observation of the concentration of coconut water immersion on the length of the grafting shoots of cocoa can be seen in Figure 4.8

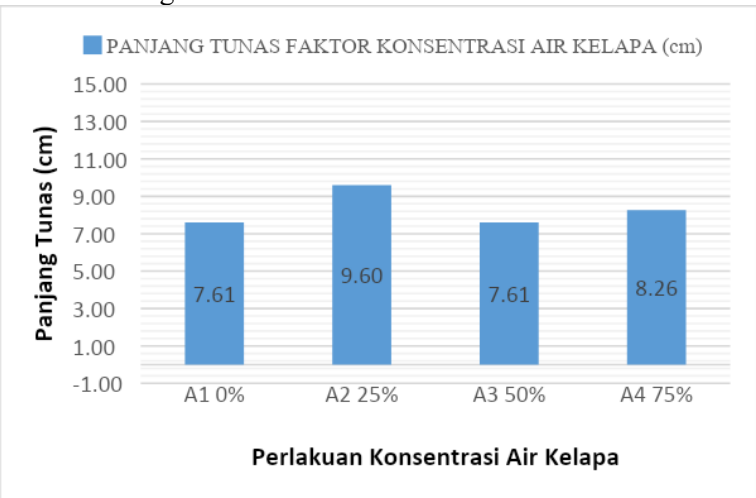

Figure 4.8 Graph of Average Effect of Coconut Water Immersion Concentrations on Shoot Length (cm)

Judging from Figure 4.8 above, the treatment of 0% coconut water immersion concentration (A1) resulted in an average shoot length of 7.61 cm, while for treatment of 25% coconut water immersion concentration (A2) resulted in shoot lengths of 9.60 cm, 7.61 cm for coconut water immersion concentration of 50% (A3), and 8.26 cm for coconut water immersion concentration of 75% (A4). The results of all treatment concentrations of immersion in coconut water showed no significant difference (NS) in shoot length parameters. It is suspected that the immersion concentration of coconut water is still low so that it has not been able to stimulate the growth of scion in the long parameter of grafting cocoa shoots. Coconut water immersion treatment will have an effect if you use the right concentration. Thamrin et al (2019) state that giving ZPT at excessive concentrations will disrupt cell functions in plants and inhibit growth, on the other hand, giving ZPT at too low concentrations causes ZPT administration to not appear in plant growth.

The results of the 5% DMRT test for the treatment of the use of the scent clone on the variable length of cacao shoot grafts are presented in Table 4.9 below.

Table 4.9 DMRT Advanced Test 5% Use of Different Types of Entres (K) Clones to the Average Length of Shoots of 13 MSS (cm)

Kind of Clone Entres	Average Shoot Length (cm)
K1	6,82 a
K2	7,84 a
K3	9,88 b

Note: the numbers followed by letters that are not the same are significantly different in the DMRT follow-up test 5%

Based on Table 4.9 above, it shows that the treatment of using the type of scion clone (K) gave very significantly different results on the length of the shoot graft of the cacao shoots. This condition is thought to be due to the genetic influence of using cocoa clone. The choice of using scent clones is also influenced by the nutritional and hormonal content of the scent. This is supported by the statement of Anita Sari et al. (2012) that shoot growth in plants is influenced by the ability of plant cells to carry out

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elongation or extension. Shoot elongation in plants is caused by the performance of the auxin hormone which functions in stem growth and is assisted by cytokinin hormones. The collaboration between the low auxin hormone content and the high cytokinin hormone will be very appropriate for shoot growth in buds. In this study, the use of MCC 02 (K3) scion clones gave the longest average shoot length of 9.88 cm and was very significantly different from the use of the scent clone in Sulawesi 1 (K1) and Sulawesi 2 (K2).

4. Conclution

Based on the results of research on the concentration of coconut water immersion and the use of various types of entres clones on the growth of cacao shoots (Theobroma cacao L), it can be concluded as follows:

- The immersion concentration of coconut water was not significantly different on the grafting growth of cocoa (Theobroma cacao L)
- The use of MCC 02 scion clones was very significantly different in the growth of leaf area and shoot length of cacao shoots (Theobroma cacao L).
- The combination of immersion concentration in coconut water and the use of different types of clones of scent was not significantly different on the grafting growth of cocoa (Theobroma cacao L)

Suggestion

From the results of these studies, it is necessary to carry out further research by reducing the interval of coconut water concentration used to determine the proper immersion concentration of coconut water for the growth of shoot grafts.

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Effect of Ethylene Curing on the Physical Properties and Nutritional Contents of Thai's Banana (Kluai Namwa)

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Abstract. Banana is one of energy source fruit which growth all over Thailand. As a shortage shelf life, most of bananas are cut while it still green in order to maintain its physical quality and also the damage while transporting. Practically after cutting banana, there are two different ways of ripeness; naturally ripe and gas curing. Both ways may affect to the quality of banana differently. So, this research interest has paid attention to compare the change of physical properties, potassium and magnesium contents in bananas from different ripeness methods. Three maturation phases of banana were applied as an unripe, naturally ripe and curing. Thai Banana of Kluai Namwa (Musa ABB cv. Kluai "Namwa") was used in this study. Kluai Namwa was cultivated after 15 weeks (when it still green), and then divided into two groups. The first one was kept it naturally at the room temperature until it ripe, the second one was cured using ethylene gas for 24 hours in order to make it ripe. The results showed that there were a significant different ($p \leq 0.05$) in color and hardness of bananas, as well as the potassium and magnesium contents of bananas from two different ripeness ways. The potassium content in cured Kluai Namwa showed higher than that in unripe and naturally ripe Kluai Namwa of 383.02, 373.20 and 324.50 (mg/100g), respectively. In addition, the unripe Kluai Namwa showed the highest magnesium content compared to cured Kluai Namwa and naturally ripe Kluai Namwa of 37.12, 35.41 and 27.08 (mg/100g), respectively. According to the results, it was recommended that curing method may help to increase the potassium and magnesium contents in ripe banana.

Keywords :Banana, Curing, Potassium, Magnesium

1. Introduction

Banana (Kluai Namwa) (*Musaceae* spp.) is a biennial plant, tall trees above the ground with a round shape, with a leaf cover overlaid with large green leaves. The nature of the banana flowers flowering at the end of a bouquet of hanging head 1-2 long elbows, which is called a pillow or a neck. When mixed, it will result in the appearance of the fruit will be attached to a panel called combs stacked several combs called the bunch when it is soft, the shape is quite square, the result is long, thick and green. Banana (Kluai Namwa) consists of Potassium and Magnesium [2] which a mineral that is essential to the body. It plays an important role in helping the normal functioning of the body, such as the nervous system and muscles. Potassium helps regulate electrolyte balance and acid-base balance in the body. Prevent acid

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over (hyperacidity) and also help control high blood pressure and reduce the risk of cardiovascular disease [1] [8].

Normally, people consume bananas when it turned yellow (ripe) but it has a shortage shelf life after that. Most of bananas are cut while it still greens in order to maintain its physical quality and also the damage while transporting. Practically after cutting banana, there are two different ways of ripeness; naturally ripe and gas curing. Both ways may affect to the quality of banana differently. In Thailand, there is a higher demand in banana consumption as well as production. When the production over consumption demand, a lot of bananas remain as a waste which affected an environmental problem. It is important to increase the value-added of banana as well as to decrease the banana waste. So, this research interest has paid attention to compare the change of physical properties, potassium and magnesium contents in bananas from different ripeness methods.

2. Materials and Methods

2.1. Banana material

Banana (Kluai Namwa) used in this study was collected from banana plantation field in Pathum Thani province, Thailand. Banana was harvested while it green (15 weeks after stabbing banana blossom) as show in Figure 1. After harvested, banana was transported (under room temperature condition) to the laboratory and used for the study immediately. Banana then divided into two groups and put into a paper box. Then the first one was kept it naturally at the room temperature, and the second one was cured using ethylene gas for 24 hours in order to help it turned yellow faster. After 24 hours curing, ethylene was taking out and two groups of bananas were continue kept it at the room temperature for 4 more days. Then, banana samples were taking for physical and chemical analysis.

Figure 1. Green banana used in the study

2.2. Physical analysis

Analytical method for color

Colorimetric measurements spectrophotometer; Model 3500d CIE L* a* b* system was used to measure the color of banana samples [3].

Analytical method for Firmness

To measure the firmness. Fruit pressure tester (Penetrometer Effegi) with 0.95 cm diameter probe and pressed on 0.5 cm deep banana meat converted the labor force from kilogram to newton (1) [5].

$$\text{Firmness (kg)} \times 9.807 \qquad (1)$$

2.3. Chemical analysis

Analytical method for potassium and magnesium

Banana samples were cut and used for the Flame Atomic Absorption Spectrometer (FAAS) analysis. Sample was mixed with 10 ml HNO_3 and heat up at 31°C for 10 minutes. Then adjust volume to 100 ml in volumetric flask with deionized (DI) water to measure potassium and magnesium by FAAS technique [6] [10].

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Statistical analysis

The data obtained from the study were analyzed variance by using a software Complete Randomized Design (CRD). In addition, mean was analyzed by applying Duncan's New Multiple Range Test (DMRT) with level of significance at P≤0.05.

3. Results and Discussion

The results of physical properties as well as the potassium and magnesium contents of banana (Kluai Namwa) from difference experimental treatments (control, natural ripe, and ethylene curing) are as follow.

Color

According to the experimental results, color of bananas shows in Figure 2. The brightness (L*), the redness (a*), and the yellowness (b*) of bananas by the colorimetric measurement spectrophotometer show in Table 1.

Figure 2. Banana (Kluai Namwa) from difference experimental treatments

Table 1. The color of banana (Kluai Namwa) from difference experimental treatments

Treatment	Color		
	L*^{ns}	a*^{ns}	b*^{ns}
Control	**76.16±3.09**	**3.41±0.18**	**20.18±0.45**
Natural ripe	**65.83±0.83**	**4.27±0.29**	**28.32±1.67**
Ethylene curing	**74.29±2.84**	**2.66±0.09**	**19.53±0.19**

Remark: ^{ns} **means within the same row with vertical are no-significantly different (p>0.05)**

Firmness

Table 2 shows the firmness of banana (Kluai Namwa) from difference experimental treatments of control, natural ripe, and ethylene curing were 6.96 N, 2.94 N and 4.22 N, respectively. The result showed that curing using ethylene gas has effect to accelerate the ripening of banana (Kluai Namwa), which was consistent to similar research results [4] [9] [11].

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Table 2. The firmness of Banana (Kluai Namwa) from difference experimental treatments

Treatment	Firmness (N)
Control	**6.96±6.48[a]**
Natural ripe	**2.94±1.96[c]**
Ethylene curing	**4.22±3.15[b]**

Remark: [a-c] mean within the same row with vertical are significantly different (p≤0.05)

Potassium and Magnesium

Table 3 shows the potassium and magnesium contents of banana (Kluai Namwa) from difference experimental treatments by Flame Atomic Absorption Spectrometer (FAAS) technique. The potassium content of banana (Kluai Namwa) from difference experimental treatments (control, natural ripe, and ethylene curing) was 373.20 mg/100 g, 324.50 mg/100 g and 383.02 mg/100 g, respectively. The magnesium content of banana (Kluai Namwa) from difference experimental treatments (control, natural ripe, and ethylene curing) was 37.12 mg/100 g, 27.08 mg/100 g and 35.41 mg/100 g, respectively. The experimental results show the same tendency to various researches [1] [8] that banana has higher potassium content. Additionally, applying curing technique using ethylene gas resulted in increasing the amount of potassium and magnesium in banana significantly (p≤0.05). The fruit is associated with ethylene which unsaturated hydrocarbon molecule is C_2H_4, with a double bond. Ethylene is a gas produced by the metabolism of plant especially in the near-ripening stage, this gas is highly dispersed, which is responsible for stimulating the respiration process and making the resulting fruit near maturation faster. Therefore, bananas that are cured with ethylene gas will help maintain the properties and quantity of minerals than normal cooked [7]. Liu *et al*., reported that ethylene production began to increase at 10 days after harvest with a sharp peak at 14 days, and then decreased rapidly. In bananas, ethylene is the dominant trigger for postharvest ripening [12]. In addition to Yong *et al*., reported that increased tolerance of banana fruit pre-treated with propylene to low temperature-induced chilling was related to higher post-storage ethylene production rates [13].

Table 3 Potassium and magnesium contents of Banana (Kluai Namwa) from difference experimental treatments

Treatment	Potassium (mg/100g)	Magnesium (mg/100g)
Control	**373.20±[a]**	**37.12±[a]**
Natural ripe	**324.50±[b]**	**27.08±[b]**
Ethylene curing	**383.02±[a]**	**35.41±[a]**

Remark: [a-b] mean within the same row with vertical are significantly different (p≤0.05)

4. Conclusion

The experimental results showed that there were a significant different (p≤0.05) in color and firmness of banana, as well as the potassium and magnesium contents of banana from two different ripeness ways. The potassium content in cured banana (Kluai Namwa) using ethylene gas showed higher than that in control (unripe) and naturally ripe. According to the results, it was recommended that curing method using ethylene gas may help to increase the potassium and magnesium contents in ripe banana. So, what

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find out from this research might further develop to increase value-added and alternative healthy products from banana.

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Structural model of main problems to developing agribusiness tobacco-based non-smoking diversified products in jember

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Abstract. Agribusiness tobacco has significance in the National economy. One of the tobacco-producing areas is Jember district, East Java. Tobacco agribusiness has driven the economy due in no small amount of labour absorption and the impact on other business sectors. Tobacco farming has cultured and heritage. But there is the fact that the main product of cigarette tobacco has become controversial. The controversy arose as a result of the negative impact of cigarettes on health. Efforts to diversify non-smoking tobacco products are urgent and essential. Diversification efforts will facilitate the sustainability of tobacco agribusiness while creating added value for tobacco farmers. This research aims to structurally analyze and model the main problems in the development of tobacco agribusiness based on non-smoking diversified products. Research methods use library studies and expert judgment to identify the constraints of agribusiness development, as well as use Interpretive Structural Modelling (ISM) analysis to create structural models. The results showed from 10 conditions, the factor of farmers' ability to diversify tobacco products and the high reliance of farmers on tobacco export companies are the main problems. They are critical factors for which must be overcome to develop agribusiness based on non-smoking diversified products.

1. Introduction

Tobacco agribusiness in Jember district has contributed a source of income for most farmers and other businesses. These conditions provide multiply economic effect contributing to the pulse of the welfare of jember people. Tobacco agribusiness shows an essential position for The Jember And encourages to continue to make sustainability efforts in the agribusiness. The sustainability of the business or farming is related to the large number of workers involved in tobacco farming [1].

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In addition to these problems, tobacco agribusiness is still faced with the fact that cigarette consumption hurts health. The United Nations and followed by Indonesia stated that cigarettes are the cause of human health problems, so efforts are needed to reduce their production. Jember Regency also made similar efforts through efforts to restrict tobacco land area and tighten supervision of cigarette consumption by the younger generation, and supervision operations on illegal cigarette production. Health issues are raised and become a problem in tobacco farming [2].

For tobacco farmers, especially farmers, restrictions on cigarette production will positively affect tobacco demand and affect the income and welfare of tobacco farmers. The condition of the problem faced by farmers and tobacco farmers needs to be researched to obtain solutions in the form of productive tobacco businesses that can reduce the pressure even replacing farmers' dependence on cigarette factories and the orientation of tobacco leaves for cigarette production. Tobacco agribusiness requires alternative efforts in the form of non-smoking tobacco derivative products so that the sustainability of tobacco agribusiness can continue to be carried out without acute reliance on cigarette manufacturers to produce cigarettes. Thus, efforts are needed to make alternative efforts to deversification of tobacco products. The business is expected to provide added value to farmers [3].

Based on this consideration, this research aims to analyze sub-elements or factors on the main constraints that influence in driving the development of agrotourism based on tobacco agribusiness, formulate structural models based on the main conditions of tobacco agrotourism development, and set critical factors on the main obstacles to dissipated other constraints. Determination of key factors and structural models of the main barriers can be used as a strategy for the development of tobacco agrotourism as an alternative business of non-cigarret tobacco derivative products.

2. Method

This research uses a quantitative and qualitative approach. Quantitative methods for mapping and identifying elements, and sub-elements with geometry mean calculations—qualitative methods of using ISM, determining sub-sub-elements in the development of tobacco agrotourism businesses. The design of agrotourism as an effort to develop PDTNR's business is carried out through mapping the needs, and the structure of the elements that become development. The appropriate method for carrying out such activities is the Interpretative Structural Modelling (ISM) method. The research steps are detailed consist of (i) library studies, and field observes determines elements and sub-elements of agrotourism development, (ii) interviews determine selected elements and sub-elements, (iii) ranking based on geomean (iv) modelling of elements and sub-elements using ISM.

Data on the determination of elements and sub-sub elements of tobacco agrotourism development is obtained from library studies, field observations and in-depth, in-depth interviews with tobacco agribusiness experts, local governments and agrotourism experts. Talks have been conducted with Tobacco researchers, Agricultural Counselors, Agricultural Mantri, Lecturers, and tourism researchers. Geomean measurement and ISM analysis will use intelligence judgment from six experts. The implementation of the research is a tobacco centre covering the sub-districts of Ajung, Balung, Sumbersari, and Ambulu jember districts.

3. Result and Discussion

3.1. Tobacco Business as a Tourist Attraction

Tobacco farming has distinct characteristics with morphological characteristics of its leaves that are wide green. Its growth period of approximately six months will give rise to and provide a green expanse along the area of the tobacco planting land. The distinctive green colour of this farm becomes an attraction of its own considering the green spectrum of flat plants and can be seen along as far as the eye also provides happiness for those who see it. Shades of green like tapestries will give potential appeal to community groups who have never known tobacco plantations. Such dynamic farming conditions in tobacco businesses can have appeal that can be offered [4].

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Agricultural activities carried out in the form of maintenance of tobacco crops will also provide a typical rural attraction. Crowds in the morning with the large workforce of both men and women who carry out work activities also give a distinct rustic feel. It is this typical rural landscape that is an attraction for people who have never seen the expanse of tobacco plantations.

Tobacco planning activities are carried out by the public in the form of public plantations and carried out by private companies as well as government-owned companies. The difference in the implementation of the cultivation business has different characteristics. This difference in organizing patterns also makes the attraction to the expanse, area, and culture techniques. The differences in patterns include the absence of tobacco that is attempted in the form of tobacco under the auspices or abbreviated as TBN. TBN is tobacco cultivation that utilizes waring or net cover to cover tobacco cultivation areas. TBN is one of the attractions and gives a great sense of curiosity to people who have or not known about tobacco cultivation.

Fermentation or drying activities in warehouses, both public warehouses and building owned by private companies and the government are attractions that can be shown to the public. In the drying process, there are different techniques and drying patterns, and this gives an interest that is not yet known by the public. Also, some activities for drying can also provide its appeal because the drying pattern carried out by the community and private companies as well as the plantations of state-owned companies has some differences.

3.2. Influential Elements and Sub Elements in Tobacco Agrotourism Development

To develop an alternative business of a-oogst tobacco farmers into a diversified product other than cigarette products, then the groups that will be affected in this activity and the obstacles faced the need to be considered. Based on literature studies and discussions with limited experts and researchers can be outlined several elements and sub-elements that affect the development of tobacco agrotourism. Elements of constraints in developing tobacco should be a priority to identify.

The obstacles in agrotourism development are the difficulties that may be faced in agrotourism development. In this context, the main constraints of agrotourism development include limitations on the human resources capacity of the perpetrator, the utilization of technology, the role of government or policymakers, and the condition of tobacco agrotourism facilities or infrastructure.

Library search results and expert assessments using geomean-based categorization show that the main constraints in agrotourism development are shown in table 1.

Table 1. Key constraints on agrotourism development

No	Variable	Geomean
1	Farmers' ability to diversify tobacco products remains low.	3.147345
2	Demand for non-smoking tobacco derivative products supporting agrotourism has not been large	3.301927
3	Technology for the conversion of non-smoking tobacco products has not evolved	3.086164
4	Farmer's ability to manage tourism based on farming is still low	3.086164
5	Not least the commitment of the Government and related institutions in facilitating tobacco agribusiness, especially to farmers	2.941683
6	Tourism-based tourism access facilities and infrastructure are inadequate	3.147345
7	Trust between farmers and tobacco entrepreneurs remains low	3.301927
8	Unclear support for agrotourism regulations and policies	3.086164
9	Tourism promotion is not maximal	2.803966
10	High reliance on tobacco companies	3.086164

Based on the expert assessment, that sub-element Demand for non-smoking tobacco derivative products support agrotourism has not been great, and Mutual Trust (Trust) between farmers and tobacco entrepreneurs is still low are obstacles that have an extensive association in the constraints of the development of tobacco agrotourism. Internally the role between actors still needs to be maximized in cooperation; on the other hand, it is necessary efforts to facilitate that non-smoking tobacco derivative

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products can be produced. At the same time, people need to educate that tobacco products are not just cigarettes but other ingredients that are beneficial to the needs of daily life.

3.3. Main Obstacles faced in Tobacco Agrotourism Development

Based on the results of the analysis using Reachability Matrix (RM), it can be known that the ability of farmers in the business of diversifying tobacco products is still low (E1) and the high reliance of farmers on tobacco companies (E10) has the highest value of power drivers which is 8. The high value of driver power indicates that farmers' ability to diversify tobacco products is still low and that the increased reliance of farmers on tobacco companies is the most vital driving factor in the development efforts of agrotourism in Jember Regency. The ability of farmers to try to show the power of farmers in managing their business to be productive. A productive company will provide top products that can be delivered or marketed to consumers. In the context of farmers' knowledge of diversification of non-smoking tobacco products will give essential value as a starting point in developing agrotourism that does not rest solely on the activities of the cigarette production process.

The high reliance of farmers on tobacco companies also has a high value of power drivers. This leads to the fact that a large number of farmers in other stakeholders will lead to a less healthy trading situation. Where farmers do not have relative bargaining power with the company, this condition certainly complicates efforts to complete the opportunities to increase agriculture in agrotourism. The dependency will decrease self-reliance, and this condition will make it challenging to develop new businesses because it is difficult to see new opportunities.

The variable ability of farmers in managing tourism based on agriculture is still low (E4) and Facilities and infrastructure tourism access based on farming is inadequate (E6) has the lowest value of power drivers which is 1. Both variables indicate that the ability of farmers in managing tourism based on agriculture is still soft and the facilities and infrastructure of tourism access based on agriculture is not adequate is the weakest driving factor in tobacco agrotourism development efforts in Jember Regency. Both variables relatively do not have a considerable impact on the development of tobacco agrotourism business in Jember Regency.

Also, when viewed from the level of dependency (dependence) it can be known that the ability of farmers in managing tourism based on agriculture is still low (E4), The facilities and infrastructure of tourism access based on agriculture are inadequate (E6). The promotion of tourism is not yet maximal (E9) has the highest value of dependence which is 6; this indicates that the third sub-element is a factor that has a high level of dependency. The ability of farmers in managing tourism based on agriculture is still low, the facilities and infrastructure of tourism access based on farming is not adequate, and tourism promotion is not maximal is the three essential elements in tourism development activities., The existence of these three sub-elements depends a lot on other sub-elements in the development. So it is known that these three elements are highly dependent and easily influenced by other elements.

Sub elements demand non-smoking tobacco derivative products support agrotourism has not been large /many (E2) has the lowest value of dependence which is 1, this indicates that both sub-elements are factors that have low dependence rates. Sub element Demand for non-smoking tobacco derivative products support agrotourism has not been massive in the efforts of tobacco agrotourism development in Jember Regency, this element is not dependent on other elements and is not easily influenced by other factors.

3.4. Matrix of Impact Cross Multiplication Applied to Classification (MICMAC) Quadrant Analysis

Matrix of Impact Cross Multiplication Applied to Classification (MICMAC) analysis, which is an analysis used to analyze the drive power and dependency power of a variable. MICMAC analysis can be seen in figure 1.

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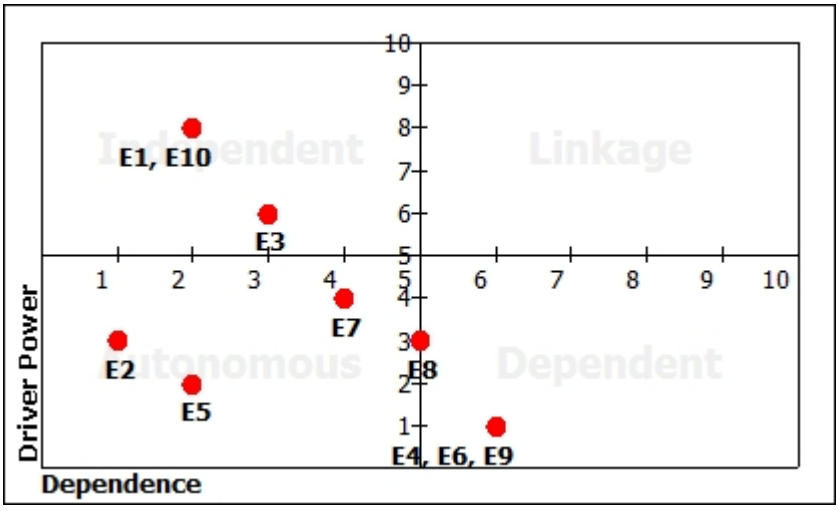

Figure 1. SubElement Sector Graph (MICMAC Analysis)

Based on the power and dependence power drivers, the sub-elements in the study can be classified into four groups, as explained below:

- Autonomous quadrants, sub-sub-elements located in these quadrants do not have high influence power and do not have a high dependency. In the autonomous quadrant of the existing sub-elements is the demand for non-smoking tobacco derivative products supporting agrotourism has not been large/many (E2), Not yet the full commitment of the Government and related institutions in facilitating tobacco agribusiness, especially in farmers (E5), and Mutual Trust (Trust) between farmers and tobacco entrepreneurs is still low (E7).
- Dependent quadrant, quadrant II is variable dependent which has low affect strength and high dependency. In the second quadrant, sub-element of farmer's ability to manage tourism based on agriculture is still low (E4), Facilities and infrastructure of tourism access based on agriculture are inadequate (E6), and tourism promotion is not maximal (E9). In his research, it is included in the category dependent. There is one element that is between quadrant I, which is an autonomous factor and quadrant II which is a dependent factor, that element Sub element Not clear support of regulation and agrotourism policy (E8). This indicates that the Unsanyrity of regulatory approval and agrotourism policy is an element that has low driving power and weak and robust dependence at the same time.
- Linkage quadrants, these sub-elements have both high influence power and increased dependency. The characteristics of the factors in this quadrant are that each action of this sub-sub-element will affect other factors that are above their level as well as the feedback effect on the aspect itself in that quadrant. Quadrant III is a quadrant for variable linkage. The results of this study show that there are no sub-elements categorized in quadrant factor III.
- Independent quadrant, i.e. factor in this quadrant has high influence power and low dependence. This factor represents quadrant IV, the results of the study found there are three sub-elements categorized on independent factors namely: Technology for the conversion of unconscionable non-smoking tobacco products (E3), The Ability of farmers in the business of diversifying tobacco products is still low (E1), The high reliance of farmers on tobacco companies (E10).

Based on the results of Micmac analysis can be known that In the quadrant autonomous sub-elements are demand for non-smoking tobacco derivative products supporting agrotourism has not been large/many (E2), Not least the commitment of the Government and related institutions in facilitating tobacco agribusiness, especially in farmers (E5), and Mutual Trust (Trust) between farmers and tobacco entrepreneurs is still low (E7).this indicates that the three sub-elements have weak driving power and weak dependence. So it can be ascertained that the three sub-elements do not have a direct association

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with agrotourism development systems and do not yet have some strong relationships when developed today.

There are three elements that are in quadrant II, namely the dependent factor, namely Sub-elements. The ability of farmers to manage farm-based tourism is still low (E4), the facilities and infrastructure for access to agriculture-based tourism are inadequate (E6), and the promotion of tourism is not optimal (E9). This indicates that these elements are elements that have a weak driving force and strong dependence. The elements in this sector are dependent elements. On the dependent factor, the dynamics and development will be heavily influenced by the sub-elements that become independent sub-elements.

There is one element that is between quadrant I, namely the autonomous factor and quadrant II, namely the dependent aspect, this element is the sub-element. There is no explicit support for regulations and policies on agro-tourism (E8). This indicates that the unclear regulatory and policy support for agro-tourism is an element that has low driving power and dependence on being healthy and weak at the same time. This element needs to be studied carefully because the relationship between elements can be unstable, or it can also be a factor that needs to be considered in the development of a tobacco agro-tourism business in Jember Regency.

The results of this study indicate that there are no sub-elements that are categorized as factor quadrant III. Quadrant III is a linkage factor. Thus there are no sub-elements that cause the potential for an unstable relationship between sub-elements. The characteristics of this factor are the potential to have an impact on other sub-elements, and the feedback on the effect can potentially increase the effect of the development of the tobacco agro-tourism development program.

There are three sub-elements that are categorized on independent factors, namely: The technology for the conversion of non-smoking tobacco products is not yet developed (E3), the ability of farmers to diversify tobacco products is still low (E1), the high dependence of farmers on tobacco companies (E10). This indicates that these elements are elements that have strong driving forces and weak dependence so that these elements are key factors in the development of tobacco agro-tourism in Jember Regency as an effort to diversify non-smoking tobacco products. The involvement of sub-elements in the independent sector will encourage involvement Another sub-element in the tobacco agro-tourism development system. This sub-element is a constraint factor that has a significant influence on other factors. This means that the implementation of the tobacco agro-tourism development system in Jember Regency is essential for the existence of this sub-element, as well as encouraging all obstacles that have the potential to hinder the development of agro-tourism.

3.5. Structural Model of Agrotourism Development Program

Based on the results of the analysis, it can be seen that there are five levels in the Interpretative Structural Modeling (ISM) digraph, as shown in Figure 2. Each of these levels offers a layer of structure which is a hierarchy of relationships that need to be considered in the development of agro-tourism. Through this structural layer, it can be seen what elements need to be considered first in order to be able to influence other aspects.

At level 5, there are two elements that are interconnected, namely:

- The ability of farmers to diversify tobacco products is still low. This is related to the power of farmers to use raw materials for tobacco leaves the need for non-smoking tobacco products. The majority of 90% of the interviewed farmers did not understand whether tobacco could be used as a raw material other than cigarette raw materials.
- The high dependence of farmers on tobacco companies. The dependence of farmers in tobacco agribusiness, especially on companies, makes the value chain in agribusiness still need to be empowered. The dependence of farmers on companies causes farmers to lower their bargaining power. This condition causes the trade and pricing of tobacco from farmers to be generally still low, and it is considered that it is not yet sufficient to provide a fair price.

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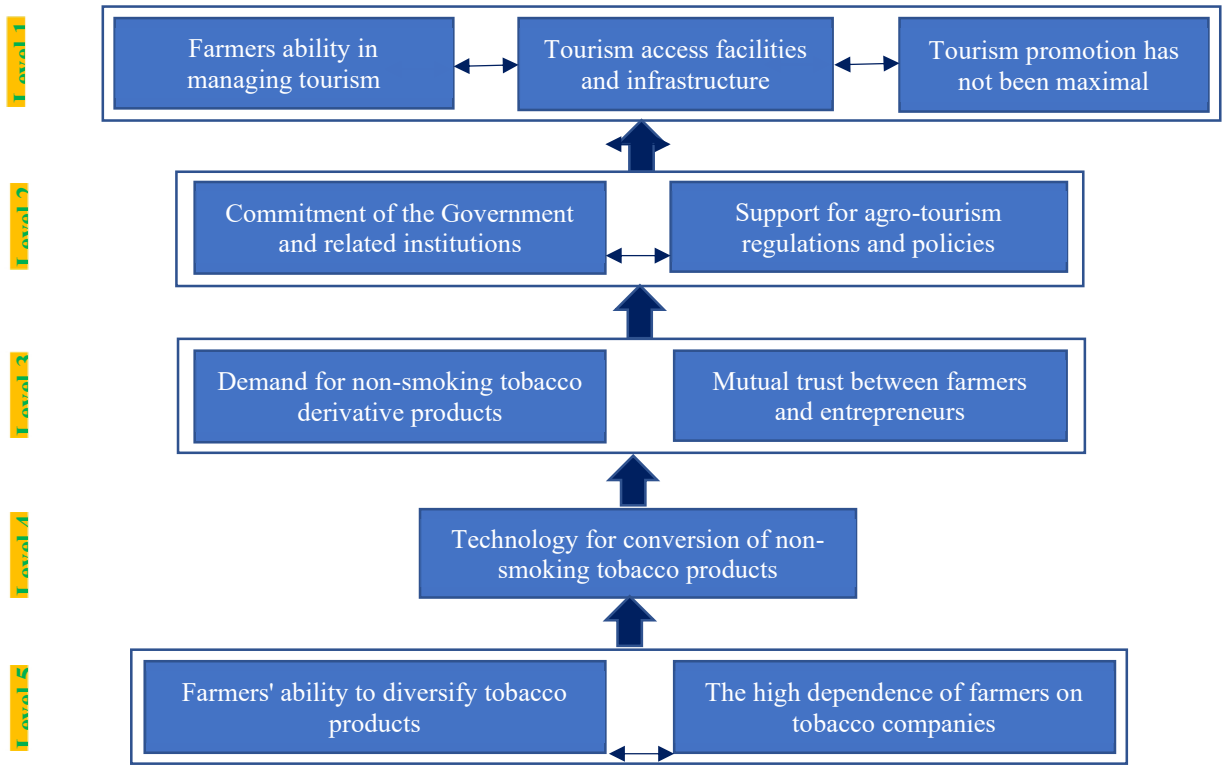

Figure 2. The structural model of agro-tourism-based development diversification of non-smoking tobacco products

Elements at level 5 are key factors in the development of na-oogst tobacco agro-tourism in Jember Regency. These elements are interconnected and affect the elements at the level above, namely the elements at level 4. This means that if the elements at level 5 are considered and optimized first, this will certainly have an effect on the elements above it. So the elements at level 5 are priority elements for improvement in the development of tobacco agro-tourism in Jember Regency.

At level 4, there is one element that can be influenced by the ability of farmers to diversify tobacco products is still low, and the high dependence of farmers on tobacco companies, namely technology for the conversion of non-smoking tobacco products has not yet developed. This means that the problem with the existence of technology for the conversion of non-smoking tobacco products is not yet developed. The dynamics are influenced by the low ability of farmers to diversify tobacco products and the high dependence of farmers on tobacco companies. Technology will be utilized in line with the need for efforts to process and produce tobacco derivative products and the existence of good cooperation between tobacco agribusiness actors.

At level 3, there are two elements that can be influenced by elements of technology for the conversion of non-smoking tobacco products that have not yet developed, namely the demand for non-smoking tobacco derivative products that support agro-tourism is not large/much, and mutual trust between farmers and tobacco entrepreneurs is still low. This means that the barriers associated with the demand for non-smoking tobacco derivative products that support agro-tourism are not large/many and mutual trust between tobacco farmers and entrepreneurs is still low. Most of it is influenced by the existence of technology for the conversion of non-smoking tobacco products has not yet developed. Technology for the conversion of non-smoking tobacco products is not yet developed, which will cause problems of low demand for non-smoking tobacco derivative products, and there is still potential for mutual distrust between farmers and entrepreneurs.

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At level 2, there are two elements that can be influenced by elements at level 1, namely the lack of commitment from the Government and related institutions in facilitating tobacco agribusiness, especially for farmers and unclear support for agro-tourism regulations and policies. Government commitment and regulatory clarity mean two main things, namely the government's siding with smallholders in carrying out farming, including facilitating communication policies between farmers and entrepreneurs. Apart from that, another important effort is clear support for efforts to facilitate clear tobacco areas into tourist areas. The demand for non-smoking tobacco derivative products that support agro-tourism is not large/much, and the mutual trust (trust) between tobacco farmers and entrepreneurs is still low, so it will affect how the implementation of the commitment to partiality to the community and regulations to facilitate agro-tourism development can be carried out.

At level 1, there are three elements that are interconnected and able to be influenced by price stability and the previous elements, namely the ability of farmers to manage farm-based tourism is still low, the facilities and infrastructure for access to farm-based tourism are inadequate, and tourism promotion is not optimal. This means that these elements are highly dependent elements and are easily influenced by the elements at the previous level. The elements at this level are the last elements to be improved because there are other elements that have the ability to dynamize other elements.

4. Conclusion

The development of tobacco agro-tourism in the short term needs to consider efforts to overcome the low ability of farmers to diversify tobacco products and the high dependence of farmers on tobacco companies. The second obstacle is related to strengthening the capacity of farmers' human resources as well as the competence and understanding of farmers in doing alternative businesses besides tobacco as raw material for a cigar or cigar cigarettes. The main determinants of key sub-elements in driving the development of agro-tourism based on tobacco agribusiness as a non-smoking tobacco derivative product are (i) the ability of farmers to diversify tobacco products, and (ii) the high dependence of farmers on tobacco companies. The two elements provide information that a maximum effort is needed to understand tobacco which can be used as a raw material other than cigarette raw materials. Furthermore, minimizing the dependence of farmers in tobacco agribusiness, especially on companies to make the value chain in agribusiness, still needs to be empowered.

There are two important aspects in developing strategies and scenarios for policy selection based on the design of a structural model for agro-tourism development for the implementation of a business development strategy for non-smoking tobacco derivative products, namely the dimension of developing strategies for each layer of structure or factor and the dimension of development based on time-based on the consideration of human resource capabilities, management. , the design and resources owned by the local government in developing the tobacco agro-tourism system so as to facilitate the sustainability of agribusiness and the welfare of tobacco farmers.

Acknowledgements

Thank you for completing this research, which is a part of a multi-year study. Our thanks especially to the Ministry of Technology Research and Higher Education, which has facilitated funding for activities. Our gratitude also goes to the Director of Politeknik Negeri Jember, the Jember District Agricultural Office, the Tobacco Entrepreneurs Association, the Tobacco Farmers Association and all parties who have helped the smooth running of the research activities. Hopefully, this research will contribute to the development of Jember tobacco agribusiness.

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Sensitivity factor and sustainability status social dimension in the development of na-oogst tobacco farm business in jember

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Abstract. Na-oogst Tobacco Jember is one of the types of tobacco raw materials of cigar making that has been known to the world. Cigar products are products that continue to increase stable demand in the world market. Steady demand has encouraged farmers to work on na-oogst tobacco cultivation. Tobacco farming has many factors that are categorized as social dimensions that play a role and influence on the sustainability and development of Na-oogst tobacco farming. This research aims to assess the status of sustainability and the most sensitive factors in the social dimension of the development of tobacco farming. The research method uses expert assessment to identify and assess ten attributes or factors, and the next is analyzed using Multi-Dimensional Scaling (MDS) to analyze the sustainability status of social dimensions in the development of Na-oogst tobacco farming. Analysis of the social dimension shows that Na-oogst tobacco farming is categorized as less sustainable. Factors or attributes that can be driven by the sustainability of the social dimension in the development of successive Na-oogst tobacco farms are the roles of private institutions, the part of labour absorption, and efforts to resolve conflicts in society.

1. Introduction

The agricultural sector is a sector that contributes to the development and dynamics of the economy. The agricultural sector makes a significant contribution to growth. The gift of the farming sector is still substantial. National GDP. Growth and contribution to GDP are essential for people's welfare.

The tobacco plant is a commodity that makes an essential contribution to the economy of Jember. Jember Regency is one of the most significant tobacco-producing areas in East Java, which has an area of nearly 14,000 tobacco, half of which is Na-oogst tobacco. The number of regions is indicated by the large number of people involved and the influence on other sectors and businesses. A large number of tobacco farming activities indicates its large influence on other sectors [1].

Although the number of the plant is quite large, the tobacco plant production process does not always experience an increasing trend. In the last two years, there has been a decline in production. The decline in tobacco production is closely related to several components of the conditions that cause it. These conditions include extreme weather, adequate needs for irrigation water, and the lack of infrastructure

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owned by farmers. Besides that, the ability of farmers to cultivate good agricultural practice is still not optimal. As an institution, there is low bargaining power among tobacco farmers when dealing with tobacco entrepreneurs.

The production of tobacco as a raw material for cigarettes has faced challenges from a public health perspective. Legally, the Indonesian government, through the Minister of Health, announces a Health Warning and Health Information on Cigarette Products, which states about the dangers of smoking and is detrimental to health. The potential for horizontal conflicts regarding the need for tobacco cultivation is becoming increasingly apparent. Society is differentiated on the pros and cons of producing tobacco as a raw material for cigarettes. The social conditions of the community become a different pressure for the agribusiness community, especially tobacco farmers, in producing tobacco. Health conditions and issues are a challenge for tobacco farming Health conditions and issues are a challenge for tobacco farming [2].

Based on this trade-off, this study aims to analyze the status of business continuity and Na-oogst tobacco farming on the social dimension and determine the sensitive factors that can be driven to encourage the sustainability of Naoogst tobacco farming.

2. Method

This research uses primary and secondary data types. Primary data were obtained from interviews with experts, the head of Farmers Group (Poktan), the leader of Farmers Group Association (Gapoktan), the management of Poktan and Gapoktan, members of Poktan and Gapoktan, as well as other parties related to the research.

Secondary data is data obtained from related agencies to complete primary data. Secondary information is used as supporting data in the analysis of the sustainability of the *na-oogst* tobacco business in Jember.

The sampling technique in this study is to use a purposive sampling method, which is the determination of the sample based on several considerations or specific criteria set in accordance with the objectives of the study. The selection used in this study was five expert respondents who could conduct an assessment of the sustainability of tobacco commodities.

Respondents in this study were the Head of the Tobacco Plantation Plant Division of Jember Horticultural Food And Plantation Office, Chairperson of the Indonesia Tobacco Farmers Association (APTI) of Jember, Chair of Jember Association of Farmers Group (Gapoktan), Extension and Farmers.

3. Result and Discussion

The sustainability of na-oost tobacco business in Jember Regency from the social dimension can be seen in Figure 1.

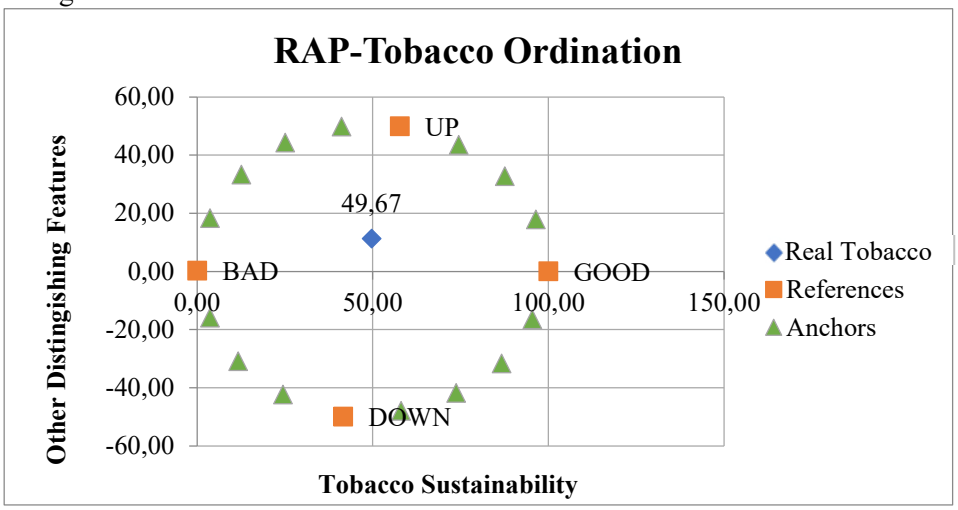

Figure 1. Status of Sustainability Viewed from the Social Dimension

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Based on Figure 1, that the social dimension of na-oogst tobacco business in Jember Regency has a sustainability value of 49.67. This value indicates that the sustainability status of the na-oogst tobacco business is on an ordination scale of 25.00 - 50.00, so it is categorized as Less Sustainable. The effect of each attribute on the social dimension on the sustainability of na-oogst tobacco business in Jember Regency can be seen in Figure 2. Many countries pay attention to the sustainability conditions of farming. Sustainability indicates efforts to align the performance of farms, environmental conciliations, and supply chain organizations [3].

Based on Figure 2, it can be seen that the lever factor that affects the social dimension and needs to be considered is the role of private institutions with an attribute effect value of 8.71. Meanwhile, the less influential factor in the sustainability of na-oogst tobacco business is family participation in agricultural activities with a value of 0.33.

In the na-oogst tobacco business, the role of private institutions is a leveraging attribute with an effective value of 8.71. This is because 80% of the tobacco farmers in Antirogo village have partnerships with private tobacco companies such as PT. Mayangsari, PT. MDR, and other companies. Farmers get benefits from these companies, such as guidance in cultivation, seed assistance, and certainty of harvesting tobacco products. This causes farmers to have an interest in continuing to cultivate tobacco because there are still many private companies engaged in processing na-oogst tobacco plantations in Jember Regency.

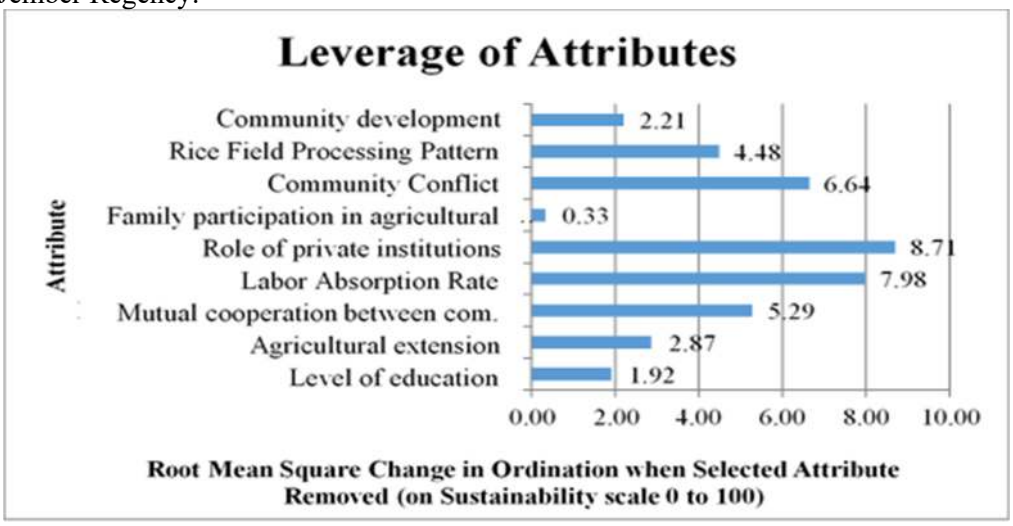

Figure 2. The Effect of Attributes on the Social Dimension

Family participation in agricultural activities is a less critical attribute because farmers perceive that in na-oogst tobacco business, farmers involve more people, especially as workers during the cultivation process to harvest, rather than family. Families in na-oogst tobacco businesses more often participate in management decisions such as the distribution of labour wages, labour making, and other management decisions that can be made by the farmers themselves.

The Social Dimension has two priority attributes that need attention, namely the role of private institutions and the rate of employment.

The first attribute or factor, namely the role of private institutions, has the largest scale of sustainability, namely 8.71, which means that this attribute is an attribute that is very important in the social dimension. Farmers have an interest in planting na-oogst tobacco in Jember Regency because private parties such as tobacco companies are willing to help farmers in cultivating na-oogst tobacco plants. Also, the company is also active in providing counselling so that farmers are able to produce quality products as desired by the company. The company also offers a partnership program that is quite profitable for farmers, in which the tobacco products of partner farmers are definitely purchased by the

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company. This is what then makes farmers interested in cultivating tobacco plants so that the role of private institutions and the relationship between farmers, private institutions and government needs to be maintained so that these roles are not lost and cause farmers to stop doing na-oogst tobacco cultivation. The purchasing power of private institutions, becomes one of the big roles and influences farmers in developing and motivating businesses. Other roles will be moved when private institutions provide roles that the public seems to know.

The second attribute or factor is the labour absorption rate which has the second-highest sustainability scale, namely 7.98 which means that in addition to the role of private institutions, the quality of employment has an essential role in supporting the sustainability of na-oogst tobacco businesses in Jember Regency. It is well known that tobacco absorbs a large amount of labour, especially during the tobacco harvest season. The high level of labour absorption has caused the community to continue to support the sustainability of the na-oogst tobacco business so that this condition has a large enough social impact on the community, especially the surrounding community and tobacco farmers. The movement of labor involved in tobacco farming will be the driver of the sustainability of tobacco farming. The existence of labour in seasonal farming is very important in economic activities [4].

4. Conclusion

The na-oogst tobacco business in Jember Regency has a sustainability status with the criteria of being unsustainable in terms of social dimensions. The unsustainable status indicates the current social environment that does not contribute to Na-oogst tobacco farming. If it continues, the social conditions will become a barrier to the development of Na-OOgst tobacco farming. This unfavourable condition can be approached by management with efforts to overcome leveraging factors, namely the role of private institutions, mechanisms and employment, as well as handling of conflicts between Na-oogst tobacco farmers.

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Designing Coffee Powder Products Through the Application of Quality Function Deployment Methods (Case Study at Small and Medium Enterprises Gusto Coffee)

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Abstract. Coffee is one of the world commodities that very famous because has a distinctive aroma and taste. One of the coffee processing industries is UKM Gusto Coffee which produces Robusta and Arabica powder coffee. As an SME business (UKM), Gusto Coffee must be able to know what attribute criteria are needed and desired by consumers for powder coffee products. One method that has proven to be effective and successful in fulfilling the needs and desires of consumers is using the Quality Function Deployment (QFD) method which begins with creating a product planning matrix (House of Quality), followed by creating a Product Planning matrix, Part Deployment, process planning and Production Planning. The purpose of this study was to identify the quality characteristics and level of preference of the Gusto Coffee UKM Powder coffee being tested, to analyze the development and improvement efforts of the Gusto Coffee UKM's powder coffee products using the Quality Function Deployment method. Important things for consumers that need to be considered in choosing powder coffee products include: (a) flavor, (b) aroma, (c) body. The order of priority for the technical response of powder coffee products from the highest includes: roasting, raw material selection (coffee beans), and grinding.

1. Introduction

Coffee is a drink that is very popular and favored by people around the world because of its taste. 70% of the taste quality of coffee is determined by the harvest and roasting process, while 30% of the quality of the coffee plant [1].

Roasting is the key to the roasted coffee production process because the character of the coffee flavor is only formed after the coffee beans are roasted. Roasting is an important step in developing the taste and aroma of the coffee beans. Different roast levels will result in different coffee flavors. During roasting, coffee beans undergo physical and chemical changes such as moisture content, color, volume, hardness, and volatile compounds. [2] A roasting problem that is often faced by coffee producers (UKM) is the difficulty in determining the right roasting time according to the desired roast level (degree). Therefore, the coffee roasting process must be controlled in such a way so that the taste of the coffee produced is in accordance with consumer desires. One of them is to use a drum-type roaster (electric) equipped with air flow (air control), cooling fan and temperature graphic display like that of CV. Gusto

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Coffee. CV Gusto Coffee has been established since 2016 and is engaged in the production of roasted coffee, powder coffee and ready-to-consume coffee. CV Gusto Coffee as a coffee producer is faced with competition from other coffee producers so that innovation is needed, especially in powder coffee products so that they have a taste that suits the tastes and desires of consumers.

One method that has proven to be effective and successful in meeting the needs and desires of consumers is Quality Function Deployment (QFD). QFD is a systematic approach to meet customer requirements and is appropriately linked to engineering design, production planning and production processes [3]. Through the collection of consumer voices combined with the 4-phase QFD method (Product Planning, Part Deployment, Process Planning and Production Planning), it is hoped that the right method can be developed so that powder coffee can be created with a taste that matches the consumer's wants and needs.

The purpose of this study was to identify the quality characteristics and level of preference of the Gusto Coffee UKM Powder coffee being tested, to analyze the development and improvement efforts of the Gusto Coffee UKM's powder coffee products using the Quality Function Deployment method.

2. Method

This study involved two components of respondents, namely business owners and consumers. The selected consumer respondents are end customers. These final consumer respondents were selected in order to assess consumer perceptions and expectations of the attributes of ready-to-consume coffee products (roast results). Information about consumer expectations of roasted coffee product attributes was obtained from interviews and distributing pre-questionnaires and questionnaires.

2.1. Data Analysis Technique

1) Make a diagram to classify customer issues based on voice of customer (WHATs). In this phase, customer needs (WHATs) are the main input in HOQ (House of Quality) which shows a priority list of basic customer requests (requirements and needs) which are usually stated in vague and imprecise terms. Analyze competitors' products to find out their advantages and disadvantages. The scale used is the same as the customer need scale, namely 1-5. Where scale 5 is the highest achievement of competitors.
2) Calculating the improvement factor and overall weighting. Improvement factor can be calculated by subtracting the performance value of the company's existing products from the planned performance score, namely the number of points of improvement. This difference is multiplied by the increase in the improvement (eg 0.2) and this is added to 1 to give an increase factor. The overall weighting can be calculated by multiplying the weight of the level of importance by the ratio of improvements and points of sale.
3) Creating Technical Requirements (HOWs), namely design characteristics that serve to meet customer needs (WHATs). Technical requirements (HOWs) are design characteristics that serve to fulfill WHATs.
4) Assess the relationship between technical requirements and customer needs in each aspect. Relationships consist of weak, medium, and high. The three relationships have their respective symbols. This phase can be called the Relationship Matrix, where the relationship matrix is a product characteristic or decision affecting the satisfaction of each customer need. It consists of the relationship that exists between each WHATs and each HOWs.
5) Taking into account the factors that affect customer need, technical requirements, competitors and the correlation of these three factors. Absolute Weight and Ranking of HOWs contains the priority results of product characteristics to meet customer needs. This is the impact of each HOWs attribute in WHATs and is the final step before ranking the weights for decision making.

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3. Result and Discussion

3.1. Whats Matrix

Coffee is a type of refreshing drink whose value is not only determined by its physical appearance, but also by its taste. The distinctive taste of coffee coupled with the physiological effects of caffeine in coffee which creates a fresh taste for those who consume it, causes coffee to be in great demand by Indonesians. Important things for consumers that need to be considered in choosing powder coffee products include: (1) aroma of brewed coffee, (2) flavor of brewing coffee, and (3) body of brewing coffee.

Aroma is something that is related to the impression a person feels when smelling the volatile components that are released from steeping coffee by using the sense of smell. Taste / Flavor is something that is related to the impression a person feels when tasting coffee with the help of their sense of taste. Thickness (body) is a physical characteristic of steeping coffee that creates a full impression during and after consuming coffee [4].

3.2. Technical Response Matrix (Hows)

The technical response matrix (hows) contains several attributes of technical characteristics (technical requirements) that need to be carried out by Small and Medium Enterprises. The technical response matrix is obtained by translating customer expectations or desires (whats) into the form of product development characteristics that the company needs to do so that it can meet consumer expectations and desires. The results of interviews and observations carried out obtained three technical response attributes, namely: Selection of coffee bean varieties (Robusta and Arabica), roasting, and grinding.

The improvement of the quality of the Gusto Coffee UKM's powder coffee products was realized by the company by making improvements to the powder coffee processing process which includes the process of selecting coffee bean varieties, roasting, and grinding. This is supported by the opinion [5] that the taste of coffee brewing is influenced by several factors such as: coffee beans, roasting, and grinding.

Following is an explanation of some of the technical response attributes (hows) which include:

3.2.1. Selection of Raw Materials (Coffee Beans)

Selection of coffee beans is the first technical matter that needs to be prioritized by Small and Medium Enterprises processing powder coffee, because coffee beans are the main basic material for making powder coffee. In this coffee bean selection, type or variety; quality level (quality); the origin of the coffee growing area; and the processing method of the coffee fruit into coffee beans greatly affects the taste of coffee drinks [5].

3.2.2. Roasting

Roasting is the most critical stage of the powder coffee processing process because it greatly affects the color, aroma, taste, acidity, and viscosity of powder coffee products. Roasting is the most critical stage in the processing of powder coffee. Coffee roasting really requires expertise, even though it is equipped with sophisticated technology. The right roasting process will be able to produce the flavor and color of the coffee powder according to consumer desires [2]. Arabica coffee has a strong aroma and light body so it requires a light roasting process, that is, with a lower temperature and medium maturity level [5]. On the other hand, Robusta coffee, which has an ordinary flavor and a strong body, requires a higher roasting temperature and a darker roasting rate. Lower roasting temperature is suitable for maintaining the acidity of Arabica coffee, but it cannot strengthen body robusta.

The measure of the ripeness of roasted coffee is the color of the beans, which ranges from dark brown to blackish brown, depending on consumer tastes. However, to maximize flavor, roasting should be stopped just before the coffee oil flows over the surface of the beans. The flavor formation of coffee takes place during roasting. Variables in roasting, such as the type and physico-organoleptic properties of coffee beans, the ratio between temperature and roasting time, roasting degree or style, the roasting

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method greatly determines the character of the coffee flavor to be produced [5]. During roasting, carbohydrates are decomposed into organic acids and CO2, followed by the breakdown and evaporation (volatilization) of these organic acids as compounds that form coffee aroma.

3.2.3. Grinding

Grinding aims to reduce the size of coffee particles. While the main objective is grinding / crushing. Grinding is to increase the specific extraction surface or increase the contact area between water and solids to facilitate the transfer of solutes and emulsions into hot water [6]. Grinding is the process of reducing the size of roasted coffee beans to make it easier to consume [7].

The results of grinding coffee beans are divided into three groups, namely: coarse (coarse powder), medium (medium powder), fine (fine powder), very fine (very fine powder). The choice of coarse and fine powder coffee is related to the way the coffee is brewed favored by the community. The grinding process releases CO2 gas from the coffee. Most of the CO2 gas is released during the process and after grinding. However, some CO2 gas may still be retained, especially in powder coffee.

The particle size of powder coffee affects the extraction process in brewing coffee [6]. The smaller particle size allows better contact of the coffee and water particles. However, a coffee particle size that is too fine (<0.5 mm) can give coffee a more bitter taste.

The house quality image of the powder coffee product is shown in Figure 3.1. Based on Figure 3.1 on the correlation between the Hows and Whats matrices, it can be seen that coffee aroma is strongly influenced by the roasting process. Product flavor is strongly influenced by the choice of coffee beans and roasting, while the body product is strongly influenced by the selection of raw materials and grinding.

Relationship between Whats vs Hows

●	:	Strong (9)
o	:	Medium (3)
△	:	Weak (1)

Interrelationship between Hows vs. Hows

++	: strong positive
+	: medium positive
-	: medium negative
--	: strong negative

Columns	1	2	3							
Direction of Improvement	↑	↑	↑							
Hows / *Whats*	Selection of Raw Material (Coffee Beans)	Roasting	Grinding	*Importance to customer*	*Customer satisfaction*	*Goal* (Sasaran)	*Sales point* (titik penjualan)	*Improvement ratio*	*Raw weight (bobot)*	*Normalized raw weight*
Aroma	o	●		4,37	4,40	5,00	1,50	1,14	7,45	0,33
Flavor	●	●	o	4,63	4,10	5,00	1,50	1,22	8,47	0,38
Body	●	o	●	4,27	3,90	4,00	1,50	1,03	6,57	0,29
Technical Response Weight	7,01	7,25	3,76							
Priority	**2**	**1**	**3**							

Figure 3.1. House of Quality of Powder Coffee Products

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3.3. Importance to Customer Sub Matrix (Consumer Interest Level)

Importance to customer sub-matrix contains consumer assessment of each product quality attribute. The highest order of importance to customer attributes includes: flavor, aroma, and body.

The flavor of brewed coffee is an organoleptic element of coffee which is the first priority for consumers. Coffee with a delicious taste and in accordance with consumer tastes will provide satisfaction for consumers and then consumers will return to buy the same product. The taste of coffee that is preferred by consumers is that which has a strong coffee flavor.

The aroma of brewed coffee is a second priority for consumers after the taste of brewed coffee. The aroma of brewed coffee that is generally preferred by consumers is with a fruity aroma, floral aroma and chocolate aroma. The organoleptic elements of coffee taste and aroma are interrelated, coffee with a delicious aroma and taste will be able to provide satisfaction to consumers so that in the end consumers will want to go back to consuming the same product.

The third priority level of importance is the body of brewing coffee, which is an organoleptic element that is preferred by consumers. Coffee products that have a fairly high body are very popular with consumers and this is also related to the taste aspect. Coffee that has a low viscosity level generally has a bland taste because the coffee particles that make up the taste of coffee are only slightly dissolved in the brewed water.

3.4. Sub Matrix Customer Satisfaction Performance (Level of Customer Satisfaction)

Determination of the level of satisfaction is determined from the results of the consumer evaluation questionnaire. Customer satisfaction performance is the consumer's perception of the quality of powder coffee products obtained from the product hedonic test (30 panelists). The order of customer satisfaction performance attributes from the highest includes: aroma, flavor, and body.

3.5. Priority Sub Matrix

The priority sub-matrix is obtained by sorting the technical response weight values from the highest to the lowest value. Technical responses that have a weight above the average should be prioritized because they have a major contribution to product quality. The technical response weight value is obtained by multiplying the normalized raw weight with the numeric relationship matrix. The order of priority for the technical response of powder coffee products from the highest includes: roasting, raw material selection (coffee beans), and grinding.

The technical response attribute that has the largest contribution is roasting so it gets the first priority. The roasting process is a very important process in determining the final quality of powder coffee products. The roasting method/method must be determined precisely (temperature variations and roasting time) in order to produce roasted coffee color and taste (aroma and taste) according to consumer desires.

The second priority is the selection of raw materials (coffee beans). Coffee beans are the main raw material for making powder coffee. Types or varieties; quality level; the area where coffee is grown has a significant effect on the flavor of coffee drinks. High quality coffee beans, if processed into powder coffee, will be able to produce a product with high taste.

Grinding is the third priority. Coffee grinding can affect the flavor, body and aroma of coffee. Grinding powder coffee into particles with a very small size (<0.5 mm) will increase the bitterness and increase the consistency of the coffee brew. The color of the coffee brew will also get darker with the smaller the coffee particle size.

4. Conclusion

- Important things for consumers that need to be considered in choosing powder coffee products include: (a) flavor, (b) aroma, (c) body.
- The order of priority for the technical response of powder coffee products from the highest includes: roasting, selecting raw materials (coffee beans), and grinding.

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Jalak Suren (*Sturnus Contra*) Bird Breeding Using Colony System Innovation and Special Incubator

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Abstract. The aim of this activity is: (a) implementing every stage of business management and marketing, breeding techniques for Jalak Suren, and other things that support success; (b) provide good and quality Jalak Suren; (c) create and implement captive breeding for starlings of suren colony system in accordance with their character in nature; and (d) making and implementing a incubator capable of incubating Jalak Suren eggs. The output targeted in this activity (a) implementing every stage in developing business management and breeding techniques for Jalak Suren; (b) constructing and implementing a colony system of Jalak Suren; (c) making and implementing a special incubator capable of incubating Jalak Suren eggs; (d) Giving managerial competence in business management and marketing. The results that have been achieved in this PKM activity include providing guidance by means of tutorials and intensive discussions about the production of captive breeding, such as the introduction of Jalak Suren, matchmaking techniques, the amount and variety of natural and artificial feed given, timing of feeding, and other treatments required for the broodstock to produce; (b) provide counseling and intensive training on how to make and implement the colony system Jalak Suren.

Keywords: Jalak Suren, Captive Breeding, Colony System, Special Incubator

1. Introduction

Jalak Suren (*Sturnus contra*) is a species of jalak found in several regions of Indonesia, most of found on the island of Java, one of which is TNMB Jember-Banyuwangi, Sumatra, and Bali. in its development, the current Jalak Suren population has decreased by 85%. The main cause is the result of human hunting (bird charmers) that is getting out of control, especially when the bird's mating season arrives. As a result, the regeneration process of this unique and intelligent bird is disturbed in nature. In its development, the existence of Suren Starlings is favored by bird hobbyists who breed by breeding starlings, breeders and conservationists of Suren Starlings in Jember Regency who are considered economically productive (micro enterprises) are Mr. Chandra, (Chandra Bird Farm; CBF) and Mr. Sholehan (Sholehan Bird Farm; SBF).

The CBF is one of the Jalak Suren breeding business in Jember. The input and output process is handled by a simple technique. From a marketing perspective, the piyik of Jalak Suren that produced by

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CBF is still limited for local market or regional market. The process of developing of the CBF breeding business is not completely successful, mainly from the production of Jalak Suren eggs and the resulting egg-breaking piyik. The production of Jalak Suren eggs and the resulting egg cracked piyik is still not fully stable in terms of quantity and quality in terms of quality. The factor that became the cause was not all of the Suren Starling sires that were categorized as good and quality broodstock. Apart from the broodstock factor, the partner's breeding cages are not yet fully ideal for mating and producing Suren Starling eggs.

Referring to the analysis of the partner's current situation, the problems faced by CBF as partners in PKM activities is 1) egg production and starling Suren (piyik) produced by partners are not yet fully stable in terms of quantity and quality in terms of quality, 2) the breeding cages that are owned are not yet fully ideal for mating places and producing Suren Starling eggs - there is no known innovation in the breeding cage of Suren Starling Colony SYSTEM which has natural carrying capacity and micro-habitat according to its character in nature, 3) the incubator used to hatch Suren Starling eggs is still not suitable - there is no known innovation of SPECIAL incubators that can hatch Suren Starling eggs at zero day eggs (the eggs come out of the parent and then put in the incubator).

The aim of this activity is: (a) implementing every stage of business management and marketing, breeding techniques for Jalak Suren, and other things that support success; (b) provide good and quality Jalak Suren; (c) create and implement captive breeding for starlings of suren colony system in accordance with their character in nature; and (d) making and implementing a incubator capable of incubating Jalak Suren eggs. The output targeted in this activity (a) implementing every stage in developing business management and breeding techniques for Jalak Suren; (b) constructing and implementing a colony system of Jalak Suren; (c) making and implementing a special incubator capable of incubating Jalak Suren eggs; (d) Giving managerial competence in business management and marketing.

2. Implementation Method

The implementation method to solve the problems are conducting intensive counseling and training wtih : Lectures, using tools in the form of written material and / or projected images to attract attention and clarify the material to be delivered; discussion, the target audience has a wider opportunity to convey information; demonstration with an effort to show the target audience about the quality of eggs and Jalak Suren (piyik) hatched captive eggs using the colony system captivity and a special incubator that has been made.

3. Results and Outputs Achieved

The results achieved of the Community Partnership Program (PKM) for Jalak Suren (*Sturnus Contra*) Bird Breeder with Colony System Innovation and Special Incubator were carried out through several stages of activities as follows:

- Preliminary Survey
- *Providing Guidance To Partners Through Intensive Tutorials And Discussions*
- Sharing of facilities and infrastructure to support community service activities

3.1. Preliminary Survey

The preliminary survey by conducting observations before the implementation of PKM activities by conducting coordination activities and discussions with partners is carried out by digging up information on the service partners of the extent of breeding of Suren Starlings. So far, in breeding Suren starlings using hanging cages for the breeding process. In addition, during the breeding of the Suren Starling there were several obstacles, related to selecting the parent, the process of matchmaking and feeding in captivity. Based on the results of the discussion of captivity that was carried out at the end, it was still constrained because of the Covid 19 pandemic outbreak, so that the activities were very significantly constrained.

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Figur 1. Preliminary Survey

Figur 2. Follow-up Survey

3.2. Providing Guidance To Partners Through Intensive Tutorials And Discussions

This activity is carried out by providing guidance to community service partners by means of tutorials and intensive discussions. This activity aims to provide guidance on business management and breeding techniques for Suren Starlings and provide insight into the character recognition of starlings, matchmaking techniques, types of feed and timing of feeding performed as well as other treatments required so that the broodstock can produce. This is done because community service partners in terms of running starlings still use self-taught methods by relying on the experience they have.

Furthermore, in this PKM program, business management guidance is carried out through activities providing understanding which includes the breeding techniques of the Suren Starling fowl in the colony system and how to make and implement a SPECIAL incubator that can hatch Suren Starling eggs at zero day eggs, in this case discussion is carried out. directly involved in communicating with PKM partners and also invited several people who were interested and had done captivity in order to gain knowledge about bird breeding with the colony system.

3.2.1. • Introduction to Starling Characters

Suren starlings begin to mature at the age of 8-10 months. The physical characteristics and behavior of male and female birds can be distinguished. To distinguish them, must be done with careful observation. Male suren starlings have a straight body with a relatively larger size than the female. The body is oval and long, the head is bigger and rounder, the beak is relatively long and sturdy. The hair on the head, back and chest is jet black and shiny. The red color of the skin above the eyes is brighter and clearer. The part that has white fur, on the lower body, looks cleaner. Its tail is slightly longer and fused. The toes were longer and firmer. Its crest elongated and extends when expanding. The female has a round and short body shape. The black and white color is a bit gloomy. It's beak, toes, and it's tail is shorter and softer. The head is a little slender. The red color on the face is paler than the male bird

3.2.2. • Matching Technique, Type of Feed

Captive breeding (matchmaking) is an important solution in keeping the jalak suren population from becoming extinct. In breeding jalak suren, the following things need to be considered. The cage should have an elevated shape. Inside the cage is provided with tall, branched and dense leafy plants, such as yellow, klampis, cherry, or other plants that are similar to these plants. The cage floor also needs to be

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planted with shrubs or shrubs and grasses. Strived for perches that are large or wide to facilitate marriage. The place for feeding must be adequate and clean is maintained. Places for drinking and bathing also need to be provided. Sunlight must be able to enter the cage adequately. The amount of sunlight that enters greatly determines the productivity of mating and eggs. In addition, of course, you also need a place to take shelter when it rains. According to experience, suren starlings that are placed in cages measuring 100x 175 x 200 cm or larger (3 x 3 x 4 m) can actually breed well. The equipment in the cage is arranged so that it resembles natural conditions. The feed given is in the form of papaya, banana, and insects (for example, kroto, bamboo caterpillars, Hong Kong caterpillars, or crickets), also given a good quality voor. With this kind of feed, a pair of jalak suren that are already matched will breed well. The Jalak Suren are ready to breed at the age of 10-12 months. One year for females and 1.5 until 2 years for males is the ideal age for matchmaking. Usually females mature sex faster than males. Matchmaking techniques can be done in several ways. First, if there are many, matchmaking can be done freely. This means that each bird is free to choose its partner. If there is a pair of birds close to each other, chirping and making out, it is a sign of a mate. Matched birds must be moved in separate cages. Usually, birds that are already matched will dominate among others and attack each other or are otherwise disturbed by others who are both matchmaking or fighting over a mate. This will interfere with the subsequent mating and breeding process.

If there are only two tails, a male and a female, matchmaking can be done by bringing the female closer to the male. To do this, female birds are put in a small cage or hanging cage. Male birds are left in captivity. Furthermore, a small cage containing female birds is put into a captive cage. Due to their high heat and breeding season throughout the year, these two birds will soon mate. Matched birds will mate 2-4 weeks after the matchmaking. Furthermore, the birds will make nests to lay eggs on plants with lots of branches.

In the breeding cage suren starlings can be stimulated to make nests. This is done in several places that are suitable for nesting, for example in plants that have many strong, protected, and safe branches, given the basic nest structure. In the designated places, nesting material such as straw, long vine roots, twigs, or leaves are placed.

This nest material is arranged in a circle or in a regular pile. This method can stimulate and help suren starlings to nest. The Jalak Suren will choose their own suitable nesting sites. Nesting is done for 5-10 days, depending on the aggressiveness of the bird. Including large nest size. The length of the nest stack is 35-45 cm, 20-30 cm wide, and about 20 cm high. The hole where the birds enter and exit is on the top surface of the nest, slightly tilted with a degree of tilt between 40-45 °. Suren starling eggs are blue, measuring 19.8 x 27.7 mm, and amounting to 3-4 eggs. The male and female birds incubate the eggs alternately. The eggs will hatch after 14 days of incubation. Apart from being a substitute during incubation of eggs, the male also acts as a safety outside the nest. Suren starlings will be cared for by their parents until they are 1.5 months old.

Jalak Suren can breed throughout the year. Breeding peak occurs in the middle of the year, which is between January-June. July-December is a period of decline in marriage. Child care The suren starling parent will feed its newly hatched children from eggs with feed in the form of insects, for example kroto, grasshoppers, butterflies, crickets, Hong Kong caterpillars, bamboo caterpillars, or other types of insects found. Suren starlings are rarely fed fruit. Likewise with children who have left the nest, the feed given is in the form of insects, until the chicks are 1-1.5 months old. After that suren starlings start eating fruits.

Feeding is done 1-2 hours every day. Approximately 1.5 months of age Suren starlings have been weaned by their mothers. Furthermore, suren starlings can be separated from their mothers and treated like adult starlings. This young bird can then be trained to voice or be bred like broodstock.

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Figur 3. Suren starlings are ready to be mated

Figur 4. Showing jalak suren ready to be mated

3.3. Sharing of facilities and infrastructure to support community service activities

The technical provisioning activity designs and manufactures cages for breeding jalak suren with colony systems that have natural carrying capacity and micro-habitats in accordance with their characteristics in nature. Guidance and mentoring as well as debriefing are carried out for partners and some people who also do breeding Jalak Suren. This activity is carried out by the implementing team by paying attention to also providing provision regarding the management of the suren starlings, so that the activities carried out obtain maximum results and are able to provide economic welfare for the suren starlings.

Figur 5 Activity Sharing and discusion

Figur 6 Cages For Breeding Suren Starlings

4. Conclusion

The implementation of this program can have a direct impact on partners. PKM partner involvement with the executive team is a synergy that can provide mutual benefits. Economically, partners benefit from being able to develop a larger Jalak Suren breeding business with a large quantity and quality. Socially, partners are a reference for bird enthusiasts, especially suren starlings in the Jember Regency area. Some of the benefits that can have an impact in this activity are as follows:

The PKM activity partner is a pilot business carried out by his parents, but because his parents have died then he continues this suren starling breeder activity. The contribution provided by the partners is a business facility in the form of breeding activities for suren starlings. Mr. Andi as a partner in the implementation of this activity plays an active role with several people to make efforts to develop the breeding of suren starlings with a special colony and incubator system, so that economically these business actors are able to grow. sharing experiences and mutual communication will add insight and mutual benefits.

Acknowledgments

I would like to say thank you especially to the research team which has assisted during the research. In organizing this research, many people have provided motivation, suggestion, and support for the team. Thank you very much for the Director of Politeknik Negeri Jember (Polije) for the motivation. This program will never be conducted without their assistance, support, and patience. Another special gratitude is given to Ristekdikti which conducted this PKM through the DRPM fund in 2020

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Strategic Plan Development For Palm Sugar Agroindustry Using Interpretative Structural Modeling (ISM) and MICMAC Methodology: Case Study in Jember

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Abstract. This study develops a generic conceptual framework for strategic planning development from the coconut sugar agro-industry context in Jember Regency. The concepts and frameworks developed can be a useful resource for regional leaders, especially the Jember Regional Government to accelerate its strategic planning journey, which is essential to be competitive and successful in this developing era. From the exploratory nature of research, the interaction with experts and the findings from ISM and MICMAC hints at the need to evolve and implement strategies for a rapid increase in the overall competitiveness of the palm sugar business through Strategic Planning in creating overall activity programs. The main finding is that the matrix reflects the driving force of factors such as “Formulation of local regulations to support coconut agro-industry development” and “Outlining general zoning plans” (which depend on the leadership of the Local Government Top Management), are at a high level. MICMAC analysis thus proves and strengthens the popular belief that Top Management, in this case, the Regional Government of Jember Regency, plays an important role in initiating any initiatives / determining the future of the coconut sugar agro-industry through the development of sound and appropriate strategic planning. From the strategic aspect needed in the framework of developing strategic planning for coconut sugar agro-industry in Jember Regency, another strategy is "Integration between industrial sectors". The next priority strategy is "Identification of types of agro-industries that are feasible to develop", "development of incentive systems such as taxation and investment credit" and "development of information systems". Last but not least is “improving industrial licensing procedures” and “preparing land use management”.

Keyword: ISM. MICMAC, Palm Sugar, Strategic plan, priority

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1. Introduction

Coconut (*Cocos Nucifera l.*) Is a plantation crop from the Palmae family, where almost all of its parts can be utilized. The coconut tree is called the tree of life because every part of it has economic value. Efforts to diversify coconut crops are growing. One of the products is coconut sugar made from coconut juice. However, only a small portion of Indonesian coconuts are used as coconut sugar. The export value continues to increase [1].

Jember Regency is one of the big coconut producing districts in East Java, with a total production in 2018 of 14,124 quintals with average productivity of 1.50 quintals per hectare [2]. With a large amount of coconut production, the industrial sector must enter into coconut processing to increase added value and to empower the palm sugar farmers in coconut sugar centers.

The potential for this extraordinary raw material must be utilized optimally to increase the competitiveness of the area which will have a direct impact on Jember Regency, especially on PDRB. However, unfortunately, there are several indicators that the development of the agricultural sector has not been able to contribute to the development of the Jember Regency area, such as the growth rate of GRDP in the agricultural sector, which has decreased from 2.5% in 2017 to -0.04% in 2018 [2], and The agricultural sector has not yet developed towards the industrialization of agricultural or agro-industrial product processing which is a more advanced stage of agricultural sector development, this can be seen from the distribution of PDRB in the manufacturing sector in Jember Regency which contributed 21.34%, relatively smaller than the sector. agriculture, namely 26.89% in 2018 [2].

According to [3] that the reason for the development of the processing industry, especially agro-industry, is because the agricultural sector needs an extractive industry capable of processing all agricultural products and the industrial sector requires raw materials in the processing process. This was added by [4] that agro-industry is the main driving force for the development of the agricultural sector, especially in the future the position of agriculture is a mainstay sector in national development so that the role of agro-industry will be even greater.

It is common everywhere that the agricultural sector in Indonesia is mostly built by farmers with relatively small scale businesses. The situation that is not favorable for the agricultural business actors is increasing every year with a low level of welfare. Likewise for coconut sugar smallholders in Jember Regency, based on preliminary observations in the field, the results show that palm sugar farmers and coconut sugar entrepreneurs have complex problems including limited infrastructure; low productivity; low accessibility to capital, information technology and market information; and low capacity of farmers.

Given that the current sustainable agricultural development cannot be separated from the agribusiness system, the role of agricultural institutions plays an important role in the success of agricultural development, especially from the institutional system of farmers in villages. According to [5] farmer institutions in rural areas contribute to the acceleration of farmers' socio-economic development; accessibility to agricultural information; accessibility to capital, infrastructure and markets; and adoption of agricultural innovations. Also, the existence of a farmer institution will make it easier for the government and other stakeholders to facilitate and provide strengthening to farmers.

The institutional model for agro-industrial development is based on the agribusiness system approach and four institutional dimensions [6] which includes several subsystems, namely: 1) upstream subsystem, 2) farming subsystem, 3) downstream subsystem, 4) agro-industry subsystem, and 5) supporting facilities subsystem.

One of the big problems in the palm sugar agro-industry is the absence of clear and profitable policies for palm sugar farmers and palm sugar entrepreneurs. What is happening is that the palm sugar industry is running alone without any strategic programs from the Jember regional government, Most of them have little help from the government and many of the palm sugar craftsmen are developing very slowly in terms of their technological capabilities and business management. Based on the background and problem formulation above, the objectives of this study specifically to review the situation with the palm sugar agro-industry and develop a macro-level conceptual framework for the appropriate planning strategy for activities. To this end, we undertake extensive work and use methodologies such as

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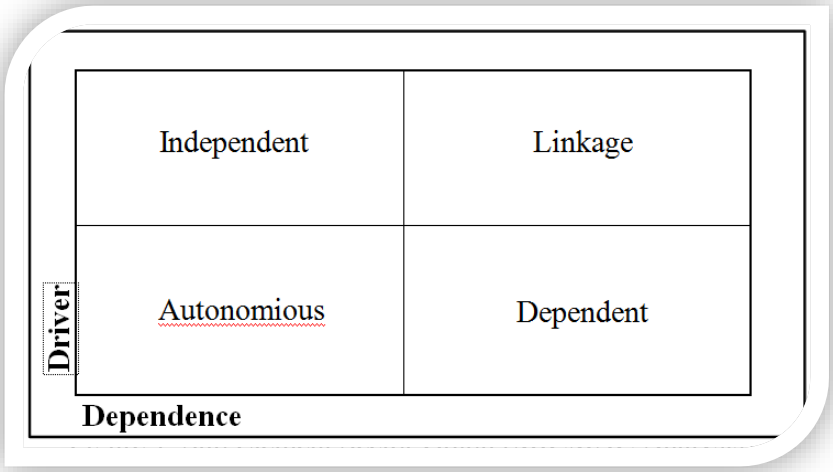
Interpretive Structural Modeling (ISM) and MICMAC, as they help identify the linkages, hierarchies, and levels of various palm sugar agro-industry programs and thus provide insight into complex issues.

2. Method

This research will be conducted in Jember Regency, East Java Province. Precisely in the Districts which are centers of coconut fruit production, such as the Districts of Wuluhan and Puger. Data collection was carried out in July-September 2020. Data collection methods were carried out in several ways, namely: (1) literature study, (2) field observations, namely seeing directly the coconut sugar agro-industry, and (3) in-depth interviews with experts conducted to obtain more comprehensive information about the coconut sugar agro-industry with a questionnaire guide. There are 5 experts involved in research on the development of the coconut sugar agro-industry with the consideration of existence, affordability, reputation, and experience in their fields. Interpretive Structural Modeling (ISM) is an analysis tool and decision support tool that facilitates a thorough understanding of complex situations by linking and organizing ideas on a visual map. The ISM process develops subject matter through discussion and analysis. Basic knowledge combined with a structured understanding of a problem is essential in making strong decisions. This knowledge is also needed when communicating a decision to others, including the rationale for the decision making [23]

MICMAC (*Matrix of Impact Cross Multiplication Applied to Classification*) analysis. Some of the sub-elements in an element are described in the driver power-dependency matrix [24]. To classify the driver sub-elements the power-dependence matrix is divided into the following four sectors.



Based on the driving powerand dependence, factors are classified into four clusters, as explained below. This classification helps inbetter understanding and clarifies the broader issues:

- Sector I: autonomous. Weak drivers and weak dependent variables (point near the origin); a group called autonomous variables. This variable is a factor that is relatively disconnected from the system. This variable has only a few links, although these links can be very strong.
- Sector II: dependent. The driver variable is weak and very dependent. This variable is the main dependent variable.
- Sector III: linkage. Driver variables are strong and highly dependent. These variables should be studied more carefully. This linkage variable is unstable. Any action on these variables will have an impact on the other variables and have a feedback effect on the variable itself to amplify or support the initial pulse.
- Sector IV: independent. The driver variable is strong and the dependent is weak. These variables are leftovers of the system and are called independent variables.

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3. Result and Discussion

Modeling Approach Used in this Research

The modeling approach in this research using ISM and MICMAC methodologies consists of nine steps as described in the Table 1.

Table 1. Modelling Approach

Steps	Description
Step 1	Identification of factors relevant for palm sugar, with help from literature and expert opinion
Step 2	Establishment a contextual relationships among the elements by which it is possible to establish their pair-wise comparison
Step 3	Developing a structural self interaction metrics (SSIM) of elements using pair-wise relationship
Step 4	Developing a reachability metrics from SSIM and by incorporating transitivity of elements
Step 5	Transitivity is established by the assumption that if element A is related to B and B is related to C, then A is related to C
Step 6	Partitioning reachability metrics into different levels
Step 7	Draw a digraph based on relationships as defined in Step 2
Step 8	Convert the resultant digraph to final digraph by removing indirect links
Step 9	MICMAC analysis to categorize the factors into various clusters based on their Driving Power and Dependence

Source: Developed by authors.

An extensive study of literature was carried out and expert opinion was taken to identify the various factors for developing the conceptual framework. The expert's view (a senior lecturer, a government employees and the head of village) was assimilated for this purpose. The various factors identified through literature review and expert opinion are listed and elaborated below:

- Elaborating (General Regional Planning) into detailed plans and regional development programs,
- Identifying types of agro-industries that are often developed in coconut-producing areas,
- Coordination between industrial sectors and other sectors as an effort to ensure the integration of the raw material supply system, production implementation, and marketing systems,
- Formulation of regional regulations to support the development of coconut agro-industries in coconut-producing areas,
- Development of incentive systems such as taxation and investment credit,
- Improvement of industrial licensing procedures in the regions accompanied by the development of a more transparent information system,
- Developing an information system covering information technology, industrial business, marketing of industrial products, business and investment opportunities as well as other important industry information,
- Preparing land use for growing coconut-producing areas.

These factors are thought to have a very vital role in the development of strategic planning for the coconut sugar agro-industry in Jember Regency. For clarity, the factors are described as in-depth as below:

3.1. Describe the general zoning plan (A1)

Efforts to balance the use of natural resources and the environment are through spatial planning based on achieving the sustainability of environmental functions. According to [25] The carrying capacity of the environment is the most important consideration in spatial planning, both in the preparation of the Regional Spatial Plan (RTRW) and in the evaluation of spatial use. The Regional Spatial Plan prioritizes commodity potentials in the study area. This plan implements an integration of several aspects, including

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natural resources owned, technology to be used, readiness of human resources, economy, socio-culture, and institutions, which are a very priority synergy relationship.

3.2. Identification of the types of agro-industries that are feasible to develop (A2)

This stage is very important because it will record the types of coconut processing in various regions, mapping is also useful in strategic planning. A statement from [26] that several types of coconut products that cannot be replaced by oil palm include coconut milk, sugar, fresh coconut water, sticks, coconut leaves, and coconut meat. Also, there are other products produced from coconut plants such as activated charcoal, coir, and the handicraft industry.

3.3. Integration between industrial sectors (A3)

Coordination between industrial sectors and other sectors as an effort to ensure the integrity of the raw material supply system, production implementation and marketing system, the existing coordination, especially in the case of information exchange, must run well and be carried out continuously, complete information availability, raw material supply, implementation production, and marketing systems will have a significant impact on industry performance [27]

3.4. Formulation of regional regulations to support the development of the coconut agro-industry (A4)

The formulation of regional regulations to support the development of coconut agro-industries in coconut-producing areas is useful in curbing and providing certain legal certainty for coconut processing business owners. So that entrepreneurs feel safe and comfortable in investing and building their industry, according to [28] in good agro-industrial planning, local government support is also needed which regulates clear laws and regulations for small industries.

3.5. Development of an incentive system such as taxation and credit for investment (A5)

One way for the government is the existence of a tax incentive policy that is expected to attract investment interest, [29] underlined that before investing, investors usually evaluate in two stages. The first stage is to select an area based on the size of the market, access to raw materials, availability of labor, and so on. If the first stage meets all the criteria, the second stage is to evaluate the tax rates, guarantees, and various incentives that will be obtained.

3.6. Refinement of industrial licensing procedures (A6)

The improvement of industrial licensing procedures in the regions accompanied by the development of a more transparent information system will greatly stimulate the rise of the palm sugar agro-industry. The Jember Regency Government is currently trying to foster an investment climate by providing ease of doing business. One of the strategies undertaken by the government is to facilitate bureaucracy and digitization of licensing services to start a business. [30] added that facilitate bureaucracy and digitization encourage the emergence of new businesses and create a better business climate.

3.7. information system development (A7)

The development of information systems that includes information technology, industrial products, marketing of industrial products, business and investment opportunities as well as other important information is a form of industrial revolution 4.0, which is currently unavoidable from human life. According to [31] there are many problems in business that can be resolved with an information system, the benefits of internal information and consumer behavior can be seen and recorded so that business actors can continue to develop service systems that are closer to the needs and desires of consumers.

3.8. Prepare land stewardship (A8)

Preparing land use for coconut-producing areas that have high fertility feasibility, this is very necessary to limit land that is getting narrower by the presence of office buildings and housing, so that

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the conversion of coconut land does not occur massively and causes loss of coconut center areas in Jember Regency.

Conceptual Framework Developed Using ISM

Using the Interpretative structural modeling methodology, a conceptual framework has been developed for the strategic planning development of the coconut sugar agro-industry (Figure 5). The framework developed provides the linkages, hierarchy, and level of factors identified for the coconut sugar agro-industry. This macro-level framework, although deceptively simple, provides invaluable insights into the context of the strategic planning of the coconut sugar agro-industry in Kabupaten Jember.

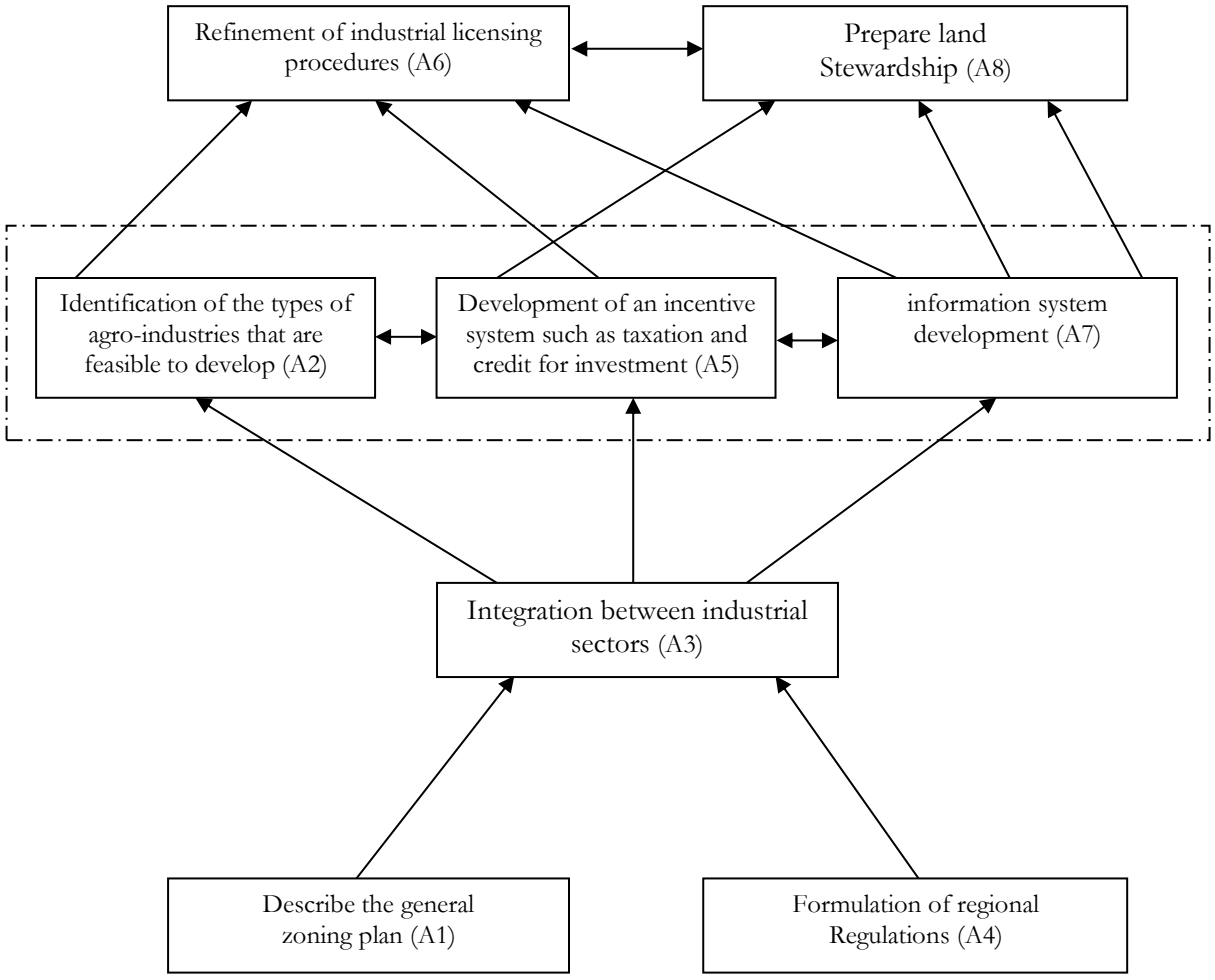

Figure 2. Conceptual Framework for Strategic Planning Development

The conceptual framework identifies “Outlining general zoning plans” and “Formulating regional regulations to support the development of the coconut agro-industry” as the main drivers of “Integration between industrial sectors”. It also identifies “types of agro-industries that are feasible to develop” as a way to develop a good coconut sugar agro-industry planning, in addition to “development of incentive systems such as taxation and credit for investment” and “development of information systems”. Another important point to note is that the “improving industrial licensing procedures” program is at the same level as “preparing land-use stewardship”. This can be explained by the fact that in the context of the coconut sugar agro-industry, there is a long process period for translating good planning. Based on the

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developed framework, it is suggested that the development of strategic planning for the coconut sugar agro-industry can be carried out as follows: Local governments need to develop integration between industrial sectors based on general regional planning and formulation of regional regulations.

Group sub elements with MICMAC

In this study, a MICMAC analysis was carried out and it was observed that the ratings of locomotion and dependence of factors for strategic planning development for the coconut sugar agro-industry were analyzed. The main results of the MICMAC study are shown in Figure 3.

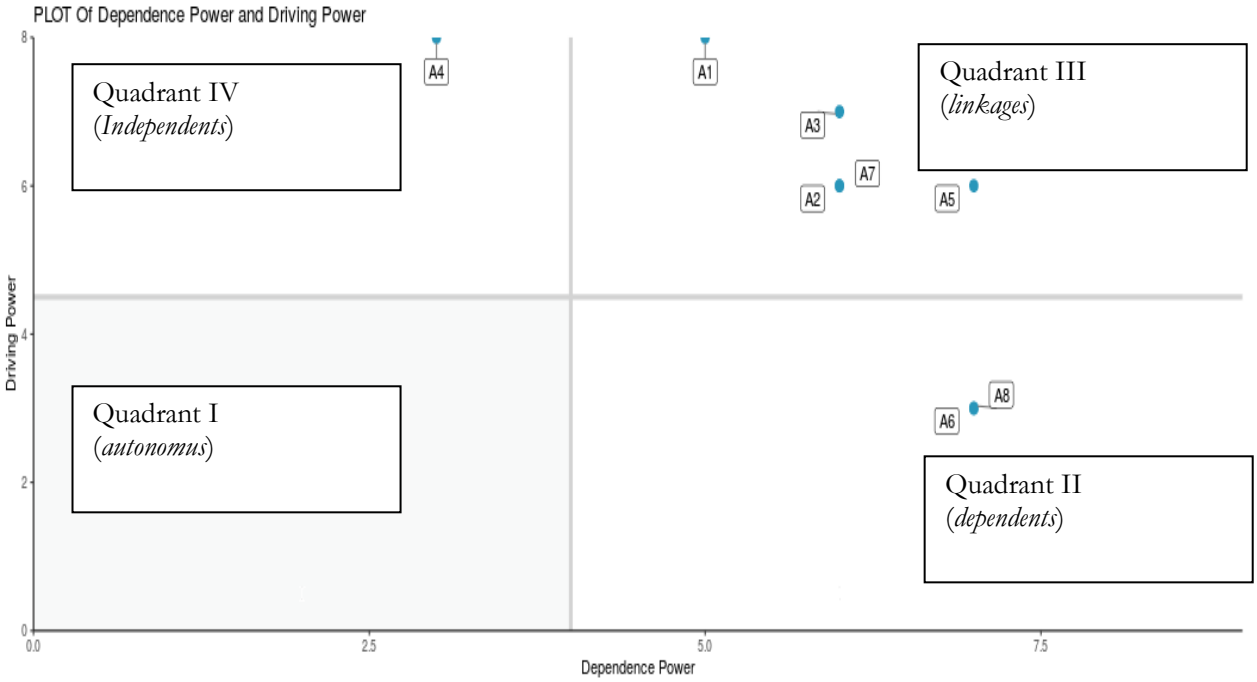

Figure 3. Driving Power and Dependence of Factors

The main finding is that the matrix reflects the driving force of factors such as “Formulation of local regulations to support coconut agro-industry development” and “Outlining general zoning plans” (which depend on the leadership of the Local Government Top Management), are at a high level. MICMAC analysis thus proves and strengthens the popular belief that Top Management, in this case, the Regional Government of Jember Regency, plays an important role in initiating any initiatives / determining the future of the coconut sugar agro-industry through the development of sound and appropriate strategic planning.

From the strategic aspect needed in the framework of developing strategic planning for coconut sugar agro-industry in Jember Regency, another strategy is "Integration between industrial sectors". The next priority strategy is "Identification of types of agro-industries that are feasible to develop", "development of incentive systems such as taxation and investment credit" and "development of information systems". Last but not least is “improving industrial licensing procedures” and “preparing land use management”.

Using the ISM methodology, a conceptual framework has been developed for palm sugar development. The framework developed provides the linkages, hierarchies and levels of the identified factors for palm sugar. This macro level framework, though appear simplistic innature, provide very valuable insights in the context of palm sugar in Indonesia.

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The complete results of the driving force - dependency matrix for the required activity elements are presented in Table 2.

Table 2. The driving force-dependency benchmark-program success matrix

No	Sector	Variables
1	Autonomous (I)	-
2	Dependent (II)	(A6) improvement of industrial licensing procedures in regions accompanied by development of a more transparent information system. And (A8) prepare land stewardship for coconut producing areas that have fast growth
3	Linkage (III)	(1) Describe RUTW (General Regional Planning) into detailed plans and regional development programs, (2) Identification of the types of agro-industry that are feasible to develop in coconut-producing areas, (3) Coordination between industrial sectors and other sectors as an effort to ensure the integrity of the raw material supply system. implementation of production and marketing systems, (5) development of an incentive system such as taxation and credit for investment, (7) development of information systems covering industrial business technology information. marketing of industrial results for business and investment opportunities as well as other important industry information.
4	Independent (IV)	(A4) Decision of regional regulations to support the development of coconut agro-industry in coconut producing areas.

4. Conclusion

This study develops a generic conceptual framework for strategic planning development from the coconut sugar agro-industry context in Jember Regency. The concepts and frameworks developed can be a useful resource for regional leaders, especially the Jember Regional Government to accelerate its strategic planning journey, which is essential to be competitive and successful in this developing era. From the exploratory nature of research, the interaction with experts and the findings from ISM and MICMAC hints at the need to evolve and implement strategies for a rapid increase in the overall competitiveness of the palm sugar business through Strategic Planning in creating overall activity programs.

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A Review of Morphometric Measurements Techniques on Animals Using Digital Image Processing

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Abstract. The existence of livestock, especially beef cattle in Indonesia, has enormous potential. In 2018, the population of beef cattle in Indonesia reached 16,432,945 heads. This population continues to increase in 2019 to 17,118,650 individuals. The increase in livestock productivity can be assessed from the dimensions of the body of the livestock by measuring directly using measuring instruments. This technique is called morphometrics. Morphometrics is a quantitative analysis technique (body dimensions) that includes shape and size. Morphometric data is an important parameter used to study livestock anatomy, productivity, growth rate, and performance quality of livestock. Manual measurements can provide several obstacles, including causing livestock to be stressed more easily, measurements become less accurate because cattle move too much and can even pose a risk of livestock aggressiveness that causes people to be injured by livestock attacks. This review article aims to summarize the literature related to morphometric techniques in animals in terms of the measurement approach used and the objects measured. Writing review articles are done by summarizing and analyze the morphometric measurement process approach technique. The articles studied were obtained by searching in international and national journals at Springer, ScienceDirect, IEEE, etc. The search was carried out with the keywords "Morphometrics", "Morphometrics", "Zoometric", and "Digital Image Analysis". The conclusion drawn from the review is that there are still many things that can be developed in this morphometric measurement technique. The key to the success of developing this morphometric technique method is that the more effective and efficient the measurement technique is, the better the results will be obtained. The final result expected in the future is to be able to create a morphometric approach technique that can be used in all fields and animals. Able to produce accurate and efficient morphometric measurements.

Keywords: *Animals*, *Morphometrics, Zoometric, Digital Image Analysis*

1. Introduction

The existence of livestock, especially beef cattle in Indonesia, has enormous potential. In 2018, the population of beef cattle in Indonesia reached 16,432,945 heads. This population continues to increase in 2019 to 17,118,650 individuals [1]. The Ministry of Agriculture through the Directorate General of

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Animal Husbandry and Animal Health noted that the national cattle population continues to increase. It was recorded that the birth of cows during 2019 reached 1,907,455 heads or exceeded the target of 1,680,000 heads, meaning that the number of cattle population increased by 113.54% [2]. This is in line with the vision of the Minister of Agriculture for Indonesia to become a world food barn by 2045 [3]. The role of livestock, especially beef cattle, is very important to note. Beef cattle are used as a provider of meat to meet food needs. One of the efforts to increase the productivity of beef cattle is by collecting quantitative data (body dimensions) of the cattle. Quantitative data are needed to identify and predict opportunities for increasing livestock productivity.

The increase in livestock productivity can be assessed from the dimensions of the body of the livestock by measuring directly using measuring instruments. This technique is called morphometrics. Morphometrics is a quantitative analysis technique (body dimensions) that includes shape and size. Morphometric data is an important parameter used to study livestock anatomy, productivity, growth rate, and performance quality of livestock. Conventional morphometric measurements are carried out by directly measuring livestock body parameters using a ruler, measuring stick, measuring tape regarding the bony prominence (tuberosity or processus) starting from height, body length, chest circumference, hip height, and so on [4]. The bone protrusion reference can also be used to determine the condition value of the livestock [5].

Manual measurements can provide several obstacles, including causing livestock to be stressed more easily, measurements become less accurate because cattle move too much and can even pose a risk of livestock aggressiveness that causes people to be injured by livestock attacks. [6]. Based on these constraints, many researchers have developed an easier method of measuring livestock morphometrics to reduce the risk of livestock stress during measurement and minimize the risk of livestock attack on the person measuring. This method is expected to be applied for safer morphometric measurements, produce more accurate data, and livestock that can be measured at the same time and can provide more data that cannot be taken in direct measurements [7].

2. Methodology

This review article aims to summarize the literature related to morphometric techniques in animals in terms of the measurement approach used and the objects measured. Writing review articles are done by summarizing and analyze the morphometric measurement process approach technique. The articles studied were obtained by searching in international and national journals at Springer, ScienceDirect, IEEE, etc. The search was carried out with the keywords "Morphometrics", "Morphometrics", "Zoometric", and "Digital Image Analysis". Most of the articles obtained are the results of research on the implementation of measurement techniques in animals using the morphometric approach. Articles that match the theme of the review are then reviewed by paraphrasing the core and common thread of the research. The following describes the details of the articles that have been reviewed and paraphrased.

Table 1. Details of the search method results for articles with specific keywords.

No.	Keywords	Total	Reference
1.	Morphometrics	8	[4] [8] [9] [10] [11] [12] [13] [14]
2.	Morfometrik	2	[6] [15]
3.	Zoometric	1	[16]
4.	Digital Image Analysis	12	[5] [7] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26]

3. Results and Discussion

Over the past two decades, the use of image analysis techniques as an alternative to measurements collected in direct contact with animals has increased. This technique allows more accurate measurements in shorter turnaround times and allows the storage of photo data to allow for subsequent

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consultation and verification, ultimately increasing the reliability of zoometrics. This measurement technique has the great advantage not only of an operational and an economic point of view but also of minimizing the stress on the animal when handled and measured. [17] [18] [7] [6] [15] [19] [8] [9]. Various image analysis methodologies for measuring morphometrics / zoometrics can be classified into two-dimensional (2D) and three-dimensional (3D) techniques. With 2D technique, an image is used to measure distances and angles after the appropriate scale factors are applied [6] [15] [18] [20]. With the 3D photogrammetric technique, several images are used simultaneously to recreate 3D information from the image. With this spatial information, beyond basic angular or distance measurements, photogrammetry allows a detailed study of the surfaces and shapes of various animal parts [21] [9] [8].

3.1. Two-dimensional (2D) measurement technique

In 2D image analysis, the accuracy and accuracy of the measurements depend on the image resolution, the accuracy of the distance measurement from the camera to the animal, and the orientation of the animal to the camera. A number of zoometric studies have been successfully carried out with 2-D image analysis of domestic animals, including pigs [22], rabbits [20], chickens [23] [24], cattle [6] [15] [5] [25], horses [9] [10] and buffalo [15] [19] [26]. One of the requirements of this 2D technology is that the morphometric/zoometric variables to be measured must remain perpendicular to the optical axis. In practice, this requirement limits the performance of many measurements in non-domestic animals. An example of a two-dimensional measurement technique in Ongole and Bali cattle. The parameters observed were macro parameters, namely in the chest, height, and body length. Measurement analysis is performed using the Image J application program by opening the digital image file to be measured. The next step is to determine the scale calibration by drawing a line on the measuring stick. Measurements can be made after calibration. Data analysis was performed using student's test hypothesis testing. The test results show that the body morphometric measurements between the manual method and digital image analysis do not show a significant difference, so it can be concluded that the digital image method on body measurements can be done and has the same value as manual measurement. [6].

3.2. Three-dimensional (3D) measurement technique

In 3D image analysis techniques, the use of a camera does not need to be oriented perfectly perpendicular to the morphometric/zoometric variables. So that it is possible to have more freedom in taking pictures of animal objects. However, the animal must remain in the same position while all pictures are taken from different viewpoints, and a minimum of two pictures using 2 cameras is required. With 3D image analysis, several zoometrics have been performed, including measurements of domestic and wild animals. As in the baleen rack 3D measurement model of the whale [11] obtained without incapacitating the animal. However, this measurement has the drawback of limited accuracy due to the inevitable movement of animals [12]. So that if you want good accuracy, the animal must not move or use more than 2 synchronized cameras. In several studies, animal immobilization has been performed under anesthesia on seals [13] and sea lions [14] to be able to estimate animal body weight. However, the use of anesthesia does not appear to be a suitable solution because of the costs and limitations of taking certain measurements on lying animals. Therefore a measurement technique was developed using several cameras to measure livestock using a 2D-image approach taken portally with a synchronized camera without anesthesia treatment on livestock [16].

3.3. Challenges in Developing Real-time Morphometric Measurement Techniques

More than 25 years of research has been developed on the technique of measuring livestock and wild animals using the morphometric approach. Many of these approaches have been developed starting from manual techniques with the risk of increasing the stress level of the animal causing the measuring party to become injured. Then an anesthesia technique was carried out to overcome this problem until the development of a two-dimensional (2D) measurement technique by capturing an image of the animal object using a digital camera with the measurement process done with digital computing [6]. However,

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this 2D technique has a drawback, namely the limited morphometric measurement process because the camera cannot reach the desired point in the morphometric process and it seems that it takes a long time to process the morphometric measurement results.

Based on these shortcomings, a three-dimensional (3D) measurement technique was developed. the measurement process is carried out using more than 2 cameras that are connected to each other with the placement of predetermined angles. This technical approach can overcome the shortcomings of the two-dimensional (2D) measurement approach. However, there are deficiencies in this 3D technique approach, namely that livestock objects are required to be in a fixed position to measure the desired point in the morphometric technique and need a special place to carry out the measurement process. This is because the 3D engineering approach requires measurable settings so that the animal measurement process cannot be carried out in the wild or non-portable situations. Therefore, the researchers formulated a new approach/technique to be able to overcome this problem, namely by developing a real-time morphometric measurement approach using a machine learning approach. It is hoped that this approach can solve the problems faced by previous researchers and be able to provide effective and efficient results.

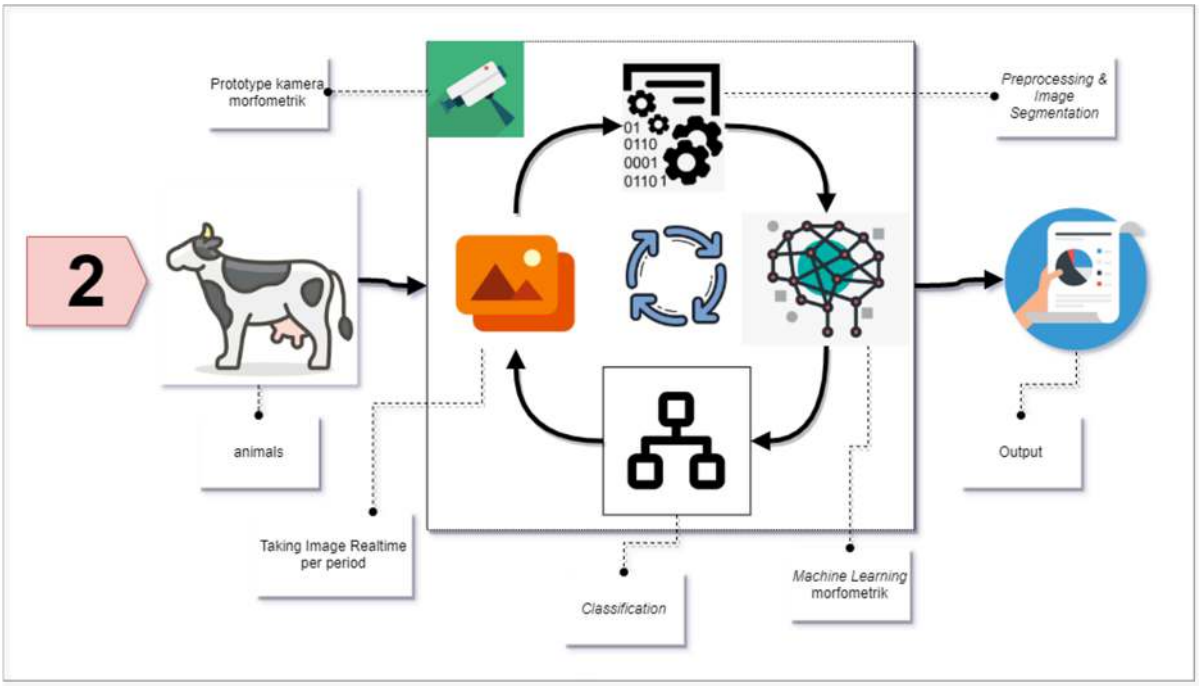

Figure 1. The Propose principles of development of real-time morphometric measurement techniques.

4. Conclusions

The approach to morphometric measurement techniques developed by many researchers with a large number of animal objects carried out to obtain information about animals, both livestock and wild animals, has resulted in significant progress. However, based on the literature review that researchers have done, there are still many things that can be developed in this morphometric measurement technique. The key to the success of developing this morphometric technique method is that the more effective and efficient the measurement technique is, the better the results will be obtained. The final result expected in the future is to be able to create a morphometric approach technique that can be used in all fields and animals. Able to produce accurate and efficient morphometric measurements.

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Development of Duck Farming in Gumuk Mas District, Jember Regency

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Abstract. The objective of this activity is to apply automatic system duck egg hatching machine technology to increase production capacity, reduce the mortality rate of day old duck (DOD), improve the quality of day old duck, be more efficient because the process of controlling temperature, humidity, reversal is done automatically, and is more energy efficient thus reducing production costs. . The development of a duck business has bright prospects in Indonesia, because duck eggs and duck meat are side dishes of staple foods that are popular with the public. This activity is carried out in small industry partners of UD Jawa Meri which is located in Menampu Village, Sub-district. Gumuk Mas, Regency Jember, which is engaged in the business of producing duck eggs and raising duck eggs. This industry has problems that are almost the same as other small duck industries, which are frequent and currently experiencing problems in duck egg incubators. The method of implementation in this activity uses the community empowerment method so that it can be accepted and beneficial to both user partners. The overall impact of this activity is the realization of community independence, namely people who are able to solve their own problems. The result of this activity was to develop and implement an automatic system duck egg incubator technology, providing training on the operation of an automatic system duck egg incubator. The application of one duck egg incubator has increased the production capacity of duck eggs from 15,000 seeds per month to 20,000 seeds per month. Hatchability of duck eggs increased from 65% to 85%. Production costs decreased from Rp. 2,900 per egg becomes Rp 2,500 per egg. The quality of the duck seeds produced is better. The results of this activity will be published through making videos of the results of the activities uploaded on YouTube, the Jember Pos print media, and participating in the ICoFA international seminar. An additional output is the creation of ISBN textbooks.

1. Introductions

Small industry of UD. Jawa Meri is located in Krajan RT 001. RW. 006. Menampu Village, Gumuk Mas Subdistrict, Jember Regency is engaged in the business of producing duck and duck breeding. Selection of small industry UD. Jawa Meri as a partner in this community service proposal, because this

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small industry has been in the duck farming business for more than five years and duck and duck breeding production have been marketed around Jember, Bondowoso, Banyuwangi, and Surabaya. UD. Jawa Meri started pioneering duck farming business since 2014. So far, UD. Jawa Meri has used simple egg hatching technology. Duck farming is a superior product in Menampu Village, Gumuk Mas District, Jember Regency, in this area a duck farming community has been formed and this community functions as a medium of communication and cooperation in overcoming existing problems both in production and marketing activities.

The Jember State Polytechnic has developed a better and more efficient automatic and automatic egg incubator. This machine is made with a larger capacity, better quality, higher success rate, easier to manufacture and maintenance because it uses components that are on the market and easy to obtain, the design is simpler, but its capabilities exceed those on the market. The proposed dedication will diffuse this technology into the small duck farming industry in Jember, especially the small industry of UD Jawa Meri.

UD. Jawa Mery has almost the same problems as other small duck industries, namely currently experiencing problems in duck egg incubators. Machines purchased from manufacturers in the market are expensive, have limited capacity, maintenance is more difficult and complicated. The use of labor in this job is less efficient because it requires continuous observation and treatment, the more difficult it is to find workers, and the production capacity is difficult to increase.

The general purpose of the activities of applying technology to UD small industries. Jawa Meri is to increase the production capacity of duck seedlings and duck slaughter production, while the specific objectives are application of the duck egg incubator developed by the Jember State Polytechnic, and Operation and maintenance training for the tools to be applied

2. Literatur

Rido S[9] explained that based on the results of the tests that have been done, it can be seen that the hardware has been successfully made using the ATMega 328 microcontroller system. In temperature sensor testing, there is an average error in the temperature sensor reading of 37 ^{0} C and humidity of 73%. The stepper motor for sliding the egg rack has worked in HIGH and LOW conditions. Overall it has worked well and according to the function that has been determined, namely taking temperature and humidity readings, adjusting the timing of the lights and shifting the egg rack. Performance test The tool has successfully hatched eggs on time (for 22 days) with a success rate of 90%. Anthony J, *at all*.[2]. The development of hot spring heat source incubator for duck eggs was deemed necessary to design the utilization of hot spring as heat source for incubating duck eggs, to reduce the use of electricity.

Supriyadi D, *at all*.[10] The system is designed to use an incandescent lamp and humidifier as an actuator and the sensors used are temperature and humidity sensors. In testing, this system can work well, it can be shown that the system can maintain the temperature and humidity of the incubator space in the temperature range of 36°C - 38°C and humidity of 60% - 70%. In addition, the conveyor can work automatically at 07:00, 10:00, 13:00, 16:00, 19:00, 21:00. The hatch success rate in the first test was 91.6%, while the hatch success rate in the second test was 41.6%. Karsid *at all*.[6]. The results obtained that, after the test, the performance of the egg hatch machine with PWM control is better than using the on-off control. Transition response using PWM control is faster, that is 120 seconds, while the on-off control is 240 seconds.

Dewanti R, *at all*.[4]. the treatment did not affect fertility and hatchability, but influenced hatching weight. The highest of hatching weight eggs was in the large weight (B3: 46.44 g). There was no interaction between eggs weight and turning frequency on fertility, hatchability and hatching weight of DOD. In conclusion, the eggs weight and turning frequency had no effect on fertility and hatchability, but egg weight influenced hatching weight.

Pratama RA, *at all*.[8]. hatch period at humidity 70% is 655,8 hours, humidity 75% is 647,2 hours and humidity 80% is 672 hours. And weight at hatch at humidity 70% is 66,13%, humidity 75% is 66,17% and humidity 80% is 67,45%. Darmawati1 D, *at all*.[3]. The process of hatching the egg ducks held for 28 days. The percentage fertility and hatchability results duck eggs *alabio* higher than *cihateup* duck

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eggs. Death embryonic the biggest occurred on the day to 26-28 days. Greater egg weights produce larger DOD.

Fuazen, *at all*.[5]. Machine dimension incubate capacity 100 with longing machine incubate are 600 mm, with Broad 450 mm, and Tall 450 mm and can keep temperature 38 o C until 41 o C so gets to be utilized on duck egg brood. kalor's charges on spatial incubator machine is as big as 47,48 kcal / h and energy that is given on incubator machine as big as 72,6 Watts. So gotten by happening calor efficiency on incubator machine room of charges compare count calor that needful incubator machine with calor's charges that is given on incubator machine is as big as 76%.

Kurniawan, *at all*.[7]. The results of weight loss and air sac change showed a significant difference (P<0,05) between H and UH eggs on 7 to 25 DOI, while the temperature of egg shell was only different on 25 DOI. The average characteristic of H group (temperature of egg shell, weight loss, and air sac alteration) on 25 DOI was recorded 38,46ºC, 11,84%, and 51,03%, respectively. It can be concluded that 3 characteristics of eggs influence hatchability of local duck. Weight loss and air sac alteration parameters can be applyed to estimate the hatched eggs between 7 and 25 DOI, but the temperature of eggshell can be administrated after 25 DOI

Abd El-Hack EM, *at all*.[1] Peking eggs have greater hatchability than Muscovy eggs. The eggs of Muscovy have presented values lower than 22.7% of hatchability. The hatchability of Peking duck eggs was 78.0% in the spring, while in summer it was around 46.5%. The best hatchability is observed during the winter (57.68%), as in the summer it decreases to 54.14%. The reproductive characteristics of flocks, age, external and internal quality of the egg, sexual ratio male female relation, and presence of lethal genes are factors that directly involve breeders. Larger sexual ratios between males and females of 1:4 to 1: 10 cause reduced egg fertility from 75.9% down to 49.6%.

3. Methodology

In order for this activity to be accepted and beneficial to user partners, the approach and steps to be applied is the community empowerment approach. The overall impact of this activity is the realization of community independence, namely people who are able to solve their own problems.

Community empowerment is a process in which people - especially those who lack access to development resources - are encouraged to increase their independence in developing their lives. In principle, communities assess their main development challenges and propose activities designed to address these problems. Community empowerment is a continuous cyclical process, a participatory process in which community members work together in formal and informal groups to share knowledge and experiences and strive to achieve common goals. So Community Empowerment is more of a process than a blueprint approach.

Based on the concept of community empowerment, the stages of implementing these community service activities are as follows:

- Coordination and preparation of activities by activity executors
- Socialization of activities to the duck farming small industry
- Preparation of a work plan between the executor and UD. Jawa Meri
- Making duck egg incubator unit
- Diffused machine tool training
- Monitoring and evaluation of activities
- Preparation of reports, scientific publications and mass media

4. Prototype

The prototype of duck egg incubator with the automatic system has the following specifications:

- Size (LXWXH): (240 x 240 x 260)cm
- Sensors: temperature and humidity
- Egg capacity: 5040 eggs
- Exhaust fan : 125 watt

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- Actuator : 60 watt
- Heat source: LPG stove
- Water pump: 125 watt
- Material: galvalum
- Actual weight: 280 kg

The component parts of the incubator are shown in figure 1.

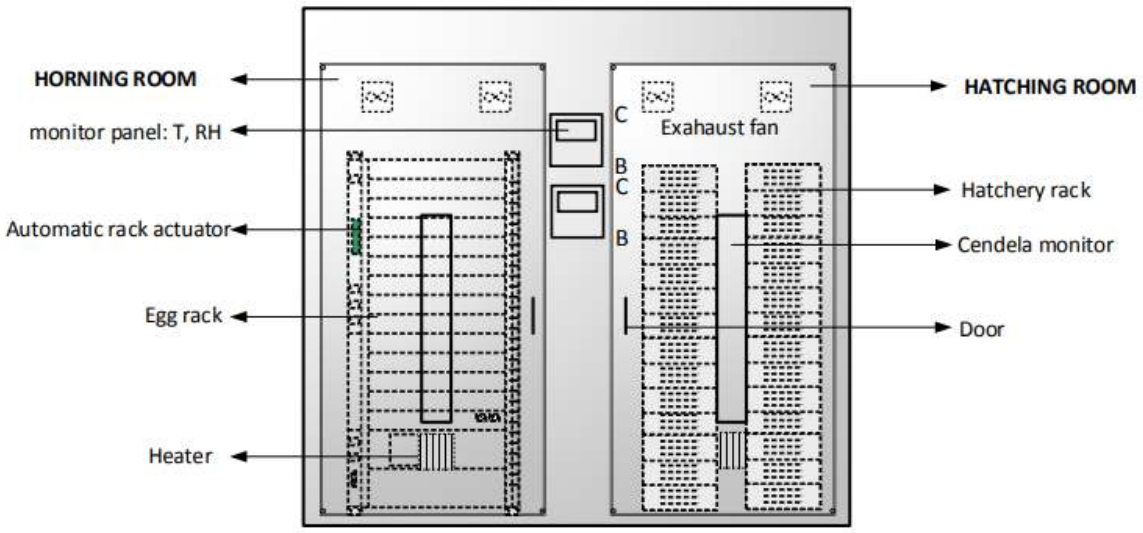

Figure 1. Duck egg hatcher with automatic system

5. Result and discussion

The application of one duck egg incubator has increased the production capacity of duck eggs from 15,000 seeds per month to 20,000 seeds per month. Hatchability of duck eggs increased from 65% to 85%. Production costs decreased from Rp. 2,900 per egg becomes Rp 2,500 per egg. The quality of the duck seeds produced is better.

This incubator works automatically to control temperature and humidity because it is equipped with temperature and humidity sensors. If the temperature is too low with the setting it will turn on the gas stove heating source, conversely if the temperature is too high it will turn off the gas stove and turn on the exhaust fan. Meanwhile, to adjust the humidity, if the humidity is too low from the setting, it will turn on the water pump to spray water in the hatchery chamber, otherwise if the humidity is too high it will turn on the exhaust fan and gas stove. This incubator has a precision level of about 95%, this has met the requirements for the performance of an incubator.

6. Conclusion

The prototype of duck egg incubator with the automatic system has the following specifications: Egg capacity: 5040 eggs, Size L 240 cm, W 240 cm, H 260 cm, Electricity 250 Watt, Material Galvalum, Actual Weight 280 kg. The application of one duck egg incubator has increased the production capacity of duck eggs from 15,000 seeds per month to 20,000 seeds per month. Hatchability of duck eggs increased from 65% to 85%. Production costs decreased from Rp. 2,900 per egg becomes Rp 2,500 per egg. The quality of the duck seeds produced is better.

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The position of cattle production in agricultural systems: A balance between food security and emission

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Abstract. The growth of the global population leads to an increase in demand for human edible food and cattle production plays an important role to realize this aim. Cattle or ruminants are capable to transfer fibre rich materials into human-edible products, such as meat and milk. This capability allows the exploitation of grassland, which is 50% of the land available for livestock, and the reuse of a large scale of by-products for the production of food. The use of non-human edible materials may make ruminants net producers of human-edible proteins. The disadvantages of this capability are the emission of methane, contribution to global warming, and the low milk N efficiency, leading to N emission to the environment contributing to water eutrophication, soil acidification, and global warming. Research work showed that the possibilities to reduce both types of emissions are relatively limited. The inclusion of more high-quality protein and starch into the diet reduces these emissions but this change also has a negative effect on the balance between the input of non-human edible material and the output of human-edible products. Balancing between both aspects is done by focusing on the ratio of emission units per animal product. This ratio should be minimized which can also be achieved by improvement of digestion of typical feed ingredients for ruminants, such as forage and fibre-rich by-products, leading to high animal production. Research work should focus on further improvement of the digestion of forages by technological, chemical, and biological treatments. The implementation of these improvements in practice, however, is a great challenge because it affects local agricultural systems and may lead to an increase in the price of animal products.

1. Introduction

Food production for the global population, or food security, is currently a major problem. The FAO estimated that in 2015 approximately 800 million people were undernourished which means insufficient access to macronutrients, i.e. proteins, fats, and carbohydrates, and micronutrients like vitamins [1]. Food from animal origin forms a significant part of the total food supply and globally contributes to 18% of the calorie and 25% of the protein consumption [2]. The contribution of products of animal origin to human food consumption is a subject of strongly emotional debates that affects the position of livestock production within agricultural systems. Gerber et al. [3] evaluated the role of livestock production on food security by focusing on additional positive effects such as the direct supply of macro- and micronutrients, the contribution of production animals to the agricultural system by production of manure, and the generation of income for people. This publication mentioned as negative effects on food security: animal feed that contains human-edible ingredients, agricultural land that is used for feed instead of food production, and the low efficiency of animals to convert feed into human-edible products. This low efficiency is a very important topic within the food security and focuses often on the production of cattle. The production of 1 kg beef is often criticized for its high consumption of grain [4] which has a very negative effect on food security. This negative effect will increase in the future because

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of the predicted global growth in demand for cattle products such as meat and milk with 57% and 48% respectively in the period 2005 to 2050 [5].

Animal production from cattle is not only criticized because of its negative impact on food security but also because of its negative impact on the environment. Global warming is regarded as a fundamental problem for the future of our planet and there is much pressure from society on politics to take measures to reduce the emission of Greenhouse gasses (GHG), such as methane, that are responsible for the increase in temperature. Livestock production contributes 13% to the total GHG emission which is for the main part related to cattle production (Gerber, 2013). The second emission is the N-outflow in the form of leaching of NO_3 and the volatilization of NH_3 and NO_2 into the environment (Dijkstra et al., 2013). These emissions have an impact on the direct environment and can affect the landscape and the water and air quality with a negative effect on human health especially in areas with a high population density like the Netherlands.

These emission problems had led to a political debate surrounding the reduction of dairy production by decreasing the number of cattle in the future in the Netherlands. The export of agricultural products, such as dairy products, is an important part of the national income of the Netherlands. Ruminants also play an important role within a sustainable agricultural system because of their capacity to transfer nonhuman-edible ingredients, such as forages and fibre-rich by-products, into food which has a positive effect on food security. This advantage makes this debate more complex and an increasing number of scientists are involved to find solutions regarding cattle production. This paper describes the contribution of scientists, especially in the field of animal nutrition, to face these challenges and solve the problems and challenges regarding cattle production.

1.1. Dairy production and digestion physiology

The Netherlands is one of the global leading countries regarding the production of dairy products and it has a very long tradition in the use and breeding of especially Holstein-Frisian cows with high productivity. The number of cattle in the Netherlands was around 3,720,000 in 2019, from which 1,590,000 can be regarded as dairy cattle. The total volume of milk produced was 13,787,769,000 kg with an average fat and protein content of 4.41% and 3.58% respectively. The average milk yield per dairy cow was 8,617 kg/year.

The digestion process of dairy cattle is much more complex because of the presence of an additional reticulorumen before the stomach and intestine compared to other production animals, such as pigs and poultry. The reticulorumen facilitates a pre-digestion of the diet before entering into the abomasum by two processes: rumination and fermentation. Rumination is a mechanical movement of the ingested diet between the mouth and rumen to reduce the feed particle size which is facilitated by saliva enzymes. Microorganisms in the rumen, such as bacteria and protozoa, are responsible for the anaerobic fermentation of the different dietary nutrients and this degradation contributes to the growth of bacteria. The advantages of this fermentation process are that ruminants can digest fibre and produce bacterial protein. In this fermentation process, short-chain fatty acids, i.e. acetate, propionate, and butyrate, are produced and absorbed in the bloodstream and use as an energy source by the cow. The microorganisms use the released energy and the available nitrogen, which can be in the form of ammonia, urea, amino acids, and small peptides, to synthesis the own proteins and the outflow of this microbial protein is the most important supplier for the absorption of amino acids in the small intestine. A part of the ingested feed, however, will not be fermented and these nutrients in this bypass fraction and a part of these may be (after hydrolysis) directly absorbed in the small intestine. The flow of protein into the gastrointestinal tract contains microbial protein and non-fermented bypass feed protein.

Numerous studies have been conducted to investigate this complex system of digestion and the utilization of nutrients during the last half of the previous century. This research work has resulted in the development of different feed evaluation systems [8-11]. The availability of these evaluation systems allowed farmers to achieve a more efficient utilization of diets leading to a more profitable production of milk.

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1.2. Cattle production in relation to food security and sustainability

The position of cattle production in relation to food security requires more information about feed use and feed use efficiency compared to the general statement, such as the use of grains for meat production [12]. This information should focus on the use of human-edible ingredients in the diet and the use of arable land to produce animal feed instead of producing food directly. The global livestock sector used 6.0 billion tonnes of feed (based on the dry matter) in 2010 [2]. The three major feed materials were grass and leaves (42%), crops residues such as straw (19%), and grains (13%). The contribution of human-edible feed materials was limited to 14% of the global livestock ration. The distribution of these materials in the ration strongly depended on the type of production animal. The diet of ruminants under grazing conditions was mainly roughage (approximately 90%) whereas the diet of industrial layers and pigs contains mainly grains (more than 50%) [2]. The largest fraction, i.e. grass and leaves, were exclusively used for ruminants that also produced most of the protein of animal origin (45%). These feed materials were divided into three groups by using the criteria human-edible and competes with food-crops for land [2]. The first group contained nonhuman-edible materials such as grass, fodder, silages, and several by-products from food production, such as rapeseed meal and corn gluten feed. The second group and the third group contained human-edible materials including soybean cakes. The feed conversion rate (FCR) for ruminants, expressed as kg protein feed/kg protein product, was 20 when all feed protein consumed is taken into account. This figure appears to be unfavourable, but these feed materials for ruminants contain mainly nonhuman-edible proteins. The FCR decreases to a favourable 0.6 if only human-edible proteins are taken into account, which means that the production of 1 kg protein product required 0.6 kg of human-edible proteins. The FCR based on human-edible protein can even be further decreased because ruminants do not need human-edible proteins in their diets [7]. Ruminants can, therefore, be regarded as net human-edible protein producers instead of consumers in contrast to other production animals such as pigs and poultry in most systems globally.

The second important issue is the use of arable land to produce animal feed instead of producing food directly. The total global area used to produce forage and feed is approximately 2500 million ha [2]. Grasslands make up 77% (i.e. 1700 million ha) of this total area and are used mainly for cattle production. Based on environmental conditions, such as soil, weather, and infrastructure, only around 33% of these grasslands are suitable for crop production, which leaves an area of 1260 million ha only suitable for cattle production. The exclusive use of 50% of the available area also emphasized the position of ruminants to fully exploit the agricultural resources to ensure food security in the future.

Cattle also play an important role in the valorisation of by-products and therefore contributes to realizing a sustainable agriculture system. By-products are mainly the remains of the food processing industry and they contribute to nearly 30% of global livestock feed intake [7]. The growing demand for food will likely increase the volume of these by-products. Production of sugar from sugar beets is a good example to illustrate the magnitude of the volume of by-products (beet pulp), which is for this process 84% of the original product. In 2018, a volume of 5.6 million tonnes of by-products was used for livestock in the Netherlands for which nearly 50% within cattle diets. The most important sources of these by-products were the grain processing industry (brewers grains and corn gluten feed), the potato processing industry (potato pulp and potato cuttings), the sugar processing industry (sugar beet pulp and chicory pulp), and the fermentation and yeast industry (wheat yeast concentrates). Some major characteristics of these by-products are their usually high fibre content and the low digestibility of the starch which makes them very suitable to use in cattle diets.

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1.3. Cattle production in relation to emission

The greatest challenge of cattle production is its emission of methane and nitrogen that both have a negative ecological effect on the environment. The emission of methane, which is an important greenhouse gas, is strongly connected with global warming or climate change which is one of the most urgent environmental topics in the future. The contribution of livestock production to the emission of GHG was 14.5% in 2013 which was mainly caused by ruminants [6]. The methane emission was estimated as 60 to 160 kg/yr for cattle but this value was strongly related to the feed intake and this value usually varies between 16 and 26 g/kg of dietary DMI (dry matter intake) [13]. An important approach to reduce methane emission was focusing on diet composition and management and the addition of additives to the feed. A lot of research capacity was spent on investigation of the relation of feed and methane emission and testing of strategies to reduce emission. A broad range of additives was tested and experiments showed that the addition of nitrate [14] ionophores [15], and tannins [16] had a positive effect on reducing methane emission. Additives, however, could also reduce the digestion of diets as was demonstrated for tannins [17]. A general problem with additives is the adaptation of microbes to these chemical compositions leading to a diminished effect after a certain time. The stoichiometry of ruminal fermentation predicts that more methane is produced with the fermentation of fibre compared to starch [18]. A higher inclusion of concentrates, such as grains, also reduced the methane emission but also increased the production leading which improved the ratio of both values [19]. Research work focusing on the diet composition that the emission of methane was positively correlated to the Gross Energy and fibre (i.e. NDF) intake and negatively correlated to the fat intake [20]. Improvement of nutritional quality and digestibility of forage also reduced methane emission [21] The positive effect of starch on reducing methane emission was also demonstrated by replacing grass silage by maize silage in the diet [22].

The second challenge for cattle production is the reduction of N-outflow into the environment. This N-outflow contains different forms such as leaching of NO_3, volatilization of NH_3, and the emission of N_2O. N_2O is a greenhouse gas and therefore contributes to the global warming problem that is associated with cattle production. Volatilization of NH_3 and leaching of NO_3 affects the local ecosystem and this emission has a negative effect on the air and water quality and landscape characteristics. The impact of these effects is especially large in the areas with a high population density such as the Netherlands. In this country, there is pressure from society to decrease cattle production and therefore to reduce its negative effect on the ecosystem and quality of life. The outflow of N is caused by the inefficient use of N by cattle, and to improve the utilization of N is regarded as an important challenge for dairy nutritionists in the Netherlands. The complexity of the digestive system of ruminants that enables the digestion of fibre and synthesis of microbial protein is the main reason for this low efficiency. The estimated theoretical maximum value for milk N efficiency of dairy cattle based on a standard diet and milk yield is 43% but in practice, this value varies from 20 to 25% [7]. This deviation from the theoretical maximum shows some room for improvement of the milk N efficiency. This may be obtained by balancing the supply of energy and protein to the microorganisms in the rumen, and by balancing the availability post-absorptively of energy-containing nutrients and amino acids.

Ammonia is the most important source of N for microbial protein synthesis and a concentration between 6 to 18 mM in the rumen is required to maximize microbial protein synthesis [23]. These concentrations will automatically lead to a net unavoidable loss of at least 30 g/d [7]. In vitro studies showed that supplementation of amino acids and peptides instead of only ammonia could improve this microbial efficiency to a certain point [24]. The diffusion of free ammonia through the rumen wall leads to an increase of urea in the blood that can be recycled to the rumen or be lost by the urine. Recycling of this urea followed by incorporation in microbial protein is important to increase the N efficiency which offers the opportunity to decrease the N content in diets [25]. Optimal microbial protein synthesis depends on a balance between available N and energy for the production and growth of microbes. The Dutch feed evaluation system (DVE/OEB 2007) expressed this balance as OEB value (rumen degradable protein balance) that can be estimated for the ingested diet based on table values [8]. The system recommends small positive values for OEB to be sure of the optimal utilization of N in the

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rumen to reduce its emission. Under optimal conditions the apparent efficiency of the use of dietary N to microbial N is 0.90, however, 20-25% of the microbial N is nucleic acid N that will be mainly lost in the urine [7]. The transformation of the absorbed amino acids to milk protein production is another important factor that affects milk N efficiency. Two efficiency factors were identified: the efficiency for an 'ideal' amino acid mixture and the efficiency for the difference between the absorbed amino acid mixture and the ideal one [26]. The total efficiency factor is set to 0.68 but based on animal trials this value seems to overestimate the efficiency of this process in practice leading to a much lower total efficiency, i.e. 0.38 [7].

A strategy to improve N milk efficiency is to only supply intestine digestible protein to avoid rumen fermentation, which leads to an increase in milk N efficiency from 0.43 to 0.65. This approach, however, has a very strong impact on the ratio between the output of human-edible protein in animal products and the input of human-edible in the feed. In practice, this value varied between 1.4 to infinite for dairy cattle and between 0.33 to infinite for beef cattle [7]. The inclusion of a great amount of high-quality protein would have a negative effect on this ratio.

2. Discussion

Ruminants play an important role within food security because of their capacity to convert fibre-rich material, such as forage and by-products, into human-edible products such as milk and meat. More than half of the global area used for livestock can only be used as grassland and the presence of ruminants enables society to use this area for the production of human-edible products. Ruminants are also important in the valorisation of fibre-rich by-products from food processing and therefore play a vital role in circular and sustainable agricultural systems. Their capacity to synthesis protein from non-protein N sources and nonhuman-edible proteins makes ruminant net human-edible protein producers. The price of these benefits is the impact of the production on the environment by the emission of greenhouse gasses, especially methane, and the outflow of nitrogen. Research work showed that the exchange of fibre by starch and the inclusion of more high-quality protein reduced these emissions but made the diet more comparable to that of a monogastric animal. These diets will contain more human-edible feed ingredients and have therefore a negative effect on the feed food discussion. To balance both aspects, research is starting to express the amount of emission related to the corresponding amount of animal products such as methane/kg milk. The next step could be to relate emission to net human-edible protein production. The challenge for nutritionists is to minimize this ratio for typical ruminant materials such as forages and fibre-rich by-products. The improvement can be realized by technological, chemical, or biological treatment of forages that focus on the degradation of cell wall components. The presence of lignin-cellulose complexes forms a rigid barrier that prevents the degradation of cell wall components [27]. Incubation of forages with white-rot fungi is an effective method to break down the lignin-cellulose complex in such a way that cell wall carbohydrates become available for ruminal microbes [28]. A recent in vitro study confirmed this positive effect of this treatment also for wheat straw which is an important by-product [29]. This research work shows that there are still scientific opportunities to further improve digestibility and therefore the balance between production and emission.

The greatest challenge, however, is to implement these kinds of improvements in practice [29]. This implementation has some serious consequences for the type of livestock system by changing from free grazing in pasture to more housing in a barn that offers the opportunity of pre-treatment of materials and precision feeding to achieve a better ratio between production and emission. This transition, however, needs the commitment of society before it can be successfully implemented. Society should be willing to pay the costs for this transition which will lead to an increase in the price for animal products.

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Fulfilment of Quality and Safety Standard for Dairy Products of Kaligondo Village at Banyuwangi District to Improve Market Competitiveness

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Abstract: This community service activity is in the form of training on how to produce Good Manufacturing Practice (GMP) which aims to increase knowledge and understanding of small industry entrepreneurs about production processes that meet standards production in order to improve product quality and competitiveness. Approach method to resolve the existing problem, is to carry out the Technology Transfer Method to assess the implementation of Good Manufacturing Practice (GMP) at CV Indo Dairy Fresh. Process of GMP assessment is filling out the questions that contain about aspects of processing room, pest, equipment, supply water, and personal hygiene. The training results show that knowledge and understanding of participants increases, participants are able to identify and assess independently of the GMP aspects according to production standards and capable participants apply the GMP aspects. The application of the GMP rules shows an increase from 63,8 before implementation, to 85,6 after GMP implementation.

Keywords: Good manufacturing practice (GMP), small industry, Quality and safety standard, milk dairy product

1. Introduction

Kaligondo Village is one of center for healthy fresh milk whit concept of refining the production of ready-to-drink fresh milk that already exists in the village. Healthy fresh milk is designed to provide a product with a touch of quality and food safety standards, including the application of GMP and nutritional value for pasteurized healthy fresh milk. In CV Indo Dairy Milk purpose, a ready-to-drink fresh milk sales business which does not provide income significant because there are many similar businesses that sales in area Genteng District, they only processing milk in a simple way. And also, the lack of human resources in processing technology according to quality and food safety standards it causes a decrease quality of the milk and product cannot enter the bigger market because of low quality and food safety quality, low product shelf life.

One of the efforts to encourage and develop small-scale processing industries so that they can have good quality, safe for consumption, available on an ongoing basis, and economically competitive is by controlling the production process through management system based on the concept of an integrated

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quality management program based on Good Manufacturing Practice (GMP). In food processing, an effective quality management system can guarantee product quality and safety [1].

Based on the situation analysis, to solving a problem CV Milk Dairy Fresh in Kaligondo village to create products that are safe for consumption and have long-term goals to become superior products of Banyuwangi district that capable to compete in the global market, it is necessary to carry out training and application of management systems quality in the form of application of Good Manufacturing Practice (GMP).

2. Research Method

This activity was implemented in CV Milk Dairy Fresh, Kaligondo Village, Banyuwangi District. The implementation of the activity was divided into tree stage, there are preparation, implementation process of training and application GMP, and monitoring stage.

2.1. Preparation (Survey/data Collection)

This survey activity aims to determine the condition or location partner and the objects especially regarding product quality control and the application of GMP, Interview with business owners and employees who involved in the production process to find out the how far they understanding of products, processes and quality control in production, and direct observation in the production area by observing each production activity.

2.2. Implementation Process of training and application GMP

This activity is to provide an understanding of the importance or benefits of implementing a good food production method, then teach and assist them (owner and employees) directly in the assessment of GMP aspects using a processing facility inspection form issued by BPOM.

2.3. Monitoring and evaluation Stage

The Monitoring stage are carried out to determine the benefits of GMP training on improving the production system and process at CV Indo Dairy Fresh after being given training.

3. Result and Discussions

3.1. Preparation (Survey/data Collection)

Target from Data collection activity are to know members of CV Indo Dairy Milk in GMP processing products and apply it to respective processing units based on check list of ratings aspects of GMP through direct observation before and after GMP application. This survey data / data collection (preparation) was held on February 2020.

Figure 1. Collecting Data in CV Indo Dairy Milk Kaligondo Village

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3.1.1. Assessment of GMP aspects

Assessment of the GMP Aspects is carried out using the scoring method. The processing this assessment are requiring GMP aspect and documentation to determine the condition of the processing room, the state of the production site, production equipment, water supply, personal hygiene and so on. The requirements for an assessment of GMP aspects are seen in Table 1.

Table 1. Assessment of GMP aspects

SKOR	DESCRIPTION
81.00 - 100	Good (B)
51,00 – 80,00	Enough (C)
< 50	Less (K)

3.1.2. Evaluation GMP aspect in CV Indo Dairy Milk before implementation

Assessing the GMP aspects by providing an assessment of the GMP aspects at CV Indo Dairy Milk, Kaligondo Village processing unit. The assessment was carried out using a processing facility inspection. Based on observation in CV Indo Dairy Milk, there are still many aspects that do not meet product management standards. Personal hygiene for employees is a basic requirement that can create a good condition for the product, this aspect is one of the important aspects in implementing GMP. Before this community service activity (GMP training) in CV Indo Dairy Milk, employee health has not become a major concern yet. For the results of observations before the application of GMP, the value of the GMP aspect was only around 46.0 or categorized as “less”. In pest control system, for an assessment of this aspect based on scoring method trainer gave a score of 60.0 or were categorized as “Enough”. Similar with two aspect before, that processing unit and equipment are also not standards even though the availability of equipment is still categorized as sufficient, but it is necessary to pay attention to the cleanliness. The results of the GMP aspects before implementation of GMP can be seen in Table 2.

Table 2. Results of the assessment before the implementation of GMP (February 2020)

Element	Sub Element	Average	Final Criteria
	(amount)	Final Score	(B / C / K)
PROCESSING ROOM	14	60,0	C
PEST CONTROL	3	60,0	C
EQUIPMENT	4	78,0	C
SUPPLY WATER	7	75,0	C
PERSONAL HYGIENE	5	46,0	K

3.2. Implementation Process of training and application GMP

Based on the results of assessment product unit in CV Indo Dairy Milk, Kaligondo Village, indicate that there are need improvement to implement of GMP aspect. This also shows that the understanding and knowledge of the training participants are able to assess and apply processing standards based on GMP aspects.

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Figure 2. Delivering Process material Aspect of GMP Standard

This training activity was attended by 30 participants include owner and employees and was held on February 2020 after preparation activity. During training activities of standard GMP Processing units, participants was verry enthusiastic in following and listening the explanations. Delivering material of GMP standart can be seen on figure 2.

After delivering and explaining material, all participants implement the GMP aspect in their processing process step by step. After 8 months (from February – September 2020) implement aspect of GMP in Processing unit, result of GMP assessment are increase this can be show in table 3.

Table 3. Results of the assessment after implementation of GMP (September 2020)

Element	Sub Element	Average	Final Criteria
	(amount)	Final Score	(B / C / K)
PROCESSING ROOM	14	90,0	B
PEST CONTROL	3	85,0	B
EQUIPMENT	4	82,0	B
SUPPLY WATER	7	90,0	B
PERSONAL HYGIENE	5	81,0	B

Based on the result of assessment implementation aspect GMP Processing unit in VC Indo Dairy Milk, Kaligondo Village, indicate that are any improvement. That means, this training activity are running effectively. It also shows that the understanding and knowledge of the training participants in assess and apply processing standards based on GMP aspects are increase.

Substantial changes occur in the hygiene aspects of individuals prior to the application of its value increased to 46.0 after the application of 81.0 or categorized “enough”. This value indicated that the participants awareness had begun to increase after being given an understanding of the importance of personal hygiene in the processing process. After GMP Training employees in CV Indo Dary Milk wear work clothes, headgear, masks, gloves and work shoes during the processing milk. Increasing personal hygiene in CV Indo Dairy Milk can be shown on Figure 3. This is very important to ensure the safety of the products produced, in addition to preventing the spread of disease through food [2].

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Figur 3. Personal Hygine Aspect of GMP on Processing Unit

From the aspect of the pest control system, it also shows an increase, where before the application the value is 60.0 after implementation becomes 85.0. Pest control system aspects are also a concern for improvement because frequent contamination caused by pests that enter the production room. It is necessary to take the minimum possible steps that already exist in the requirements of the pest control system to prevent this by providing given the seal of PVC plastic curtain between space production (Shows in Figure 4) and providing a cover on each of the existing air net vents.

Figure 4. Seal of PVC plastic curtain between space production

In equipment aspect, it also shows an increase where before implementation the value was 78,0 and after implementation GMP aspect processing units increased to 82,0. According to [3], an industry that related in processing must have processing equipment in accordance with the requirements, not easy to rust, easy to clean and complete with instructions.

From Supply water and processing room shows in figure 5. increasing result after training and implementation GMP aspect. In supply water aspect there is only minor repairs such as improvements in water holding containers. But in Processing room aspects, several improvements were made there are: The building is not adjacent to the dairy cow barn, the floor is ceramic which is not slippery when exposed to water, the door from the outside to the room is made of wood, good condition but easily weathered for a long time and is not waterproof, and soon.

3.3. Monitoring and Evaluation

Result of GMP assessment after implementation is increase 85,6 from 63,8 can be seen in table 4 and chart in figure 6. Figure 6 shows, this chart show the comparison between before and after implementing

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GMP Aspects in production process unit. It indicates that CV Indo Dairy Milk, Kaligondo Village has started to implement GMP principle in their processing unit product to increasing quality of their products.

Figure 5. processing room shows

Table 4. Evaluation of Implementation of GMP in CV Indo Dairy Milk, Kaligondo Village

Element	Sub Element	Before implement GMP (Average)	After implement GMP (Average)
	(amount)	Final Score	Final Score
PROCESSING ROOM	14	60	90
PEST CONTROL	3	60	85
EQUIPMENT	4	78	82
SUPPLY WATER	7	75	90
PERSONAL HYGIENE	5	46	81
LEVEL OF GMP IMPLEMENTATION		63,8	85,6

There are still many aspects of GMP that have not been done, it is associated with a substantial investment and a fairly long time to implement them. However, the commitment of the owner of CV Indo Dairy Milk is very great to continuing gradually improve on production unit so that it is in accordance with the correct GMP principles.

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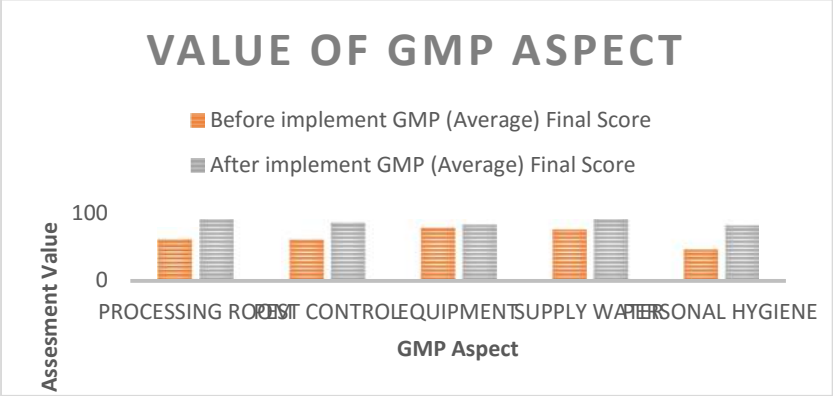

Figure 6. Chart Value Aspect GMP assessment

4. Conclusions

Based on research targets, the results can be obtained from these activities are:

- The GMP training activities were carried out well and the participants attended the training with great enthusiasm.
- Participants are able to independently assess the application of GMP aspects.
- The implementation of GMP aspects has been applied to the work partner processing unit with a value of 85,6 or categorized “enough”.

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Physical, chemical and organoleptic quality of sweet potato leaves (*Ipomoea batatas* L.) ice cream

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Abstract. During the Covid19 pandemic, many people are looking for healthy foods to boost their immune systems. The immune system can be boosted by consuming foods that contain vitamins, phenols, flavonoids and antioxidants, and one of these foods is sweet potato leaves. Sweet potato leaves have not been utilised optimally. So, to increase its utilisation, sweet potato leaves can be processed into a popular product, one of which is ice cream. The purpose of this study was to make healthy ice cream with the addition of sweet potato leaves extract. This study used a Completely Randomised Design (CRD) 2 factors. The first factor was the concentration of skim milk (10%, 13%, 16%). Meanwhile, the second factor was the sweet potato leaves extract 5%, 10%, 15%. Each treatment was repeated three times. The test parameters used in this study were physical analysis, namely overrun; chemical analysis, namely antioxidants (IC50), fat content, protein content, carbohydrate content, and crude fibre content; and organoleptic tests, including taste, colour, aroma, and softness. The results proved that S3D1 treatment with a concentration of 16% skim milk and 5% sweet potato leaves extract was the best treatment. This treatment obtained the highest Result Value (RV), which is 0.78. The other parameter results obtained were the taste test 6.44 (like); overrun 65%; softness 5.96 (like); IC50 value 112.30 ppm; protein content of 5.63%; fat content 0.76%; carbohydrate content 10.02%; crude fibre content 5.27%; vitamin C content16.79 mg; aroma 5,52 (like); and colour 5.59 (like).

Keywords: sweet potato leaves; ice cream; healthy; antioxidants; pandemic

1. Introduction

Sweet potato is one of the most popular tubers for Indonesian consumers. Consequently, more sweet potato leaves are produced [1]. Unfortunately, until now, the use of sweet potato leaves has only been limited to animal feed and vegetables, which are less favourable than mustard leaves or spinach. In actual fact, according to [2], sweet potato leaves contain beneficial nutrients, such as vitamin B, vitamin C, beta-carotene, iron, calcium, protein and zinc; as well as bioactive components that can function as antioxidants, namely flavonoids and phenolic compounds [3]. Phenolic compounds and flavonoids can function as antioxidants and are often used as antidiabetic, anti-cholesterol, anti-inflammatory and anti-tumour properties [4], [5]. Moreover, during the current Covid-19 pandemic, ingredients that contain vitamins, phenolic compounds, flavonoids, and antioxidants are highly demanded by the public .

One way to increase the consumption level of sweet potato leaves is to process it into a popular, trendy, and healthy product, ice cream [6]. The uniqueness of sweet potato leaves ice cream is that though it is sweet, this product is low in calories and fat, and enriched with ingredients rich in vitamins

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and bioactive compounds. Based on this phenomenon, the researchers considered that it was necessary to conduct a study to obtain a formula for healthy sweet potato leaves ice cream with specific treatments, namely different concentrations of skim milk and sweet potato leaves extract to obtain the best chemical, physical and organoleptic qualities.

2. Methods

The research was designed using factorial randomised block design (RBD). Factor 1 is the concentration of skim milk (S) which consists of 3 levels (S1=10%, S2=13% and S3=16%) and factor 2 is the concentration of sweet potato leaves extract (D) which consists of 3 levels (D1=5%, D2=10% and D3=15%). Each treatment combination was repeated three times [7]. The process of making orange sweet potato leaves extract was based on to [8], while the making of ice cream on [9], which was modified by replacing full cream milk with skim milk and granulated sugar with stevia sugar. The parameters observed including physical parameters, namely overrun [10]; chemical parameters, namely contents of protein, fat, carbohydrates, crude fibre [11], vitamin C [12]; antioxidant activity / IC50 using the DPPH method [13]; and organoleptic parameters namely taste, aroma, colour and softness [14]. The resulting parametric data were analysed using SPSS 20. On the other hand, non-parametric data were analysed using the Kruskal Wallis test [15]. To determine the best treatment of all studies, researchers conducted an Effectiveness Test [16].

3. Results and Discussions

3.1. Observation of physical parameters (overrun) and chemical parameters in the concentration treatment of skim milk and sweet potato leaves extract on ice cream is presented in Table 1.

Table 1. Average results of physical and chemical parameters

Treatment Code	*Overrun (%)*	IC_{50} (ppm)	Fat content (%)	Protein Content (%)	Carbohydrate Content (%)	Crude Fibre Content (%)	Vitamin C Content (mg)
S1D1	$59,64^{f}$	$114,30^{h}$	$0,88^{a}$	$4,16^{a}$	$10,29^{a}$	$5,23^{a}$	$16,82^{a}$
S1D2	$53,97^{c}$	$109,53^{e}$	$0,90^{b}$	$8,75^{c}$	$11,31^{b}$	$6,81^{b}$	$18,31^{b}$
S1D3	$47,06^{a}$	$104,94^{c}$	$0,80^{b}$	$11,29^{f}$	$12,35^{c}$	$7,03^{c}$	$19,17^{c}$
S2D1	$62,27^{h}$	$113,11^{g}$	$0,09^{c}$	$4,21^{a}$	$10,57^{a}$	$5,42^{a}$	$16,93^{a}$
S2D2	$57,38^{e}$	$109,32^{e}$	$0,65^{d}$	$9,53^{d}$	$11,63^{b}$	$6,87^{b}$	$18,27^{b}$
S2D3	$52,31^{b}$	$104,54^{b}$	$0,09^{e}$	$11,32^{f}$	$12,69^{c}$	$7,11^{c}$	$19,21^{c}$
S3D1	$65,00^{i}$	$112,30^{f}$	$0,76^{f}$	$5,63^{b}$	$10,02^{a}$	$5,27^{a}$	$16,79^{a}$
S3D2	$60,00^{g}$	$108,75^{d}$	$0,77^{f}$	$10,02^{e}$	$11,11^{b}$	$6,79^{b}$	$18,35^{b}$
S3D3	$54,54^{d}$	$104,21^{a}$	$0,60^{g}$	$11,41^{f}$	$12,18^{c}$	$7,08^{c}$	$19,23^{c}$

Note: different notations indicate a difference in the LSD test with $\alpha = 5\%$.

Based on the overrun value obtained, the ice cream belongs to the small or medium industrial ice cream category because the value ranged from 50-70% [17]. The higher the concentration of skim milk and sweet potato leaves extract in ice cream, the lower the overrun value. This finding was consistent with the results of the research by [18], where the more grass jelly extract was added. The overrun value decreases because the more grass jelly extract was added, the thinner the dough was [19]. This situation causes the trapping of air to occur very quickly, which leads to the lower stability of the captured air bubbles. As a result, the overrun dropped further. The Indonesian National Standard on the quality requirements for ice cream [20] requires that the fat content in ice cream is at a minimum of 5%, sugar at a minimum of 8% saccharose, and protein at a minimum of 2.7%. Based on these standards, our sweet potato leaves ice cream can be considered healthier because it has low-fat content, higher protein

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content, contains crude fibre, vitamin C, and antioxidants. The average IC50 value of our sweet potato ice cream ranges from 100-150 ppm, which, according to [21] is classified as a product that has moderate antioxidant activity.

3.2. Organoleptic parameters

The organoleptic test aims to determine the panellists' preference for each treatment. In the organoleptic test, the panellists were asked to give personal responses about their subjective preferences. This hedonic scale analysis data was transformed into a numerical scale according to the panellist's preference level. The scale used was 1 = very dislike, 2 = dislike, 3 = somewhat disliked, 4 = neutral, 5 = rather like, 6 = like, 7 = very like it [22]. The organoleptic test means are presented in Table 2.

Table 2. Mean Results of Sweet Potato Leaves Ice Cream Taste Test

Treatment Code	Taste Average	Colour Average	Aroma Average	Softness Average
S1D1	6,08	5,71	5,37	5,53
S1D2	4,56	4,55	4,16	4,17
S1D3	1,67	4,04	3,27	3,67
S2D1	6,2	5,61	5,44	5,71
S2D2	5,24	4,76	4,19	4,56
S2D3	2,21	4,12	3,4	4,25
S3D1	6,44	5,59	5,52	5,96
S3D2	5,91	4,88	4,37	4,85
S3D3	2,4	4,23	3,61	4,47

Based on the results of the Kruskal Wallis test on the taste, colour, aroma and softness of sweet potato leaves ice cream, it was found that p = .0.001 <0.05. This means that the different concentrations of skim milk and sweet potato leaves extract had a very significant effect on the level of panellist acceptance of the colour, aroma, and softness of sweet potato leaves ice cream. This result is in accordance with the opinion of [22]–[24] that the ingredients of the ice cream strongly influence the taste of ice cream. According to [25], colour indicates the way of mixing or processing. The green colour of the ice cream came from the chlorophyll extracted from the sweet potato leaves. In the food industry, aroma testing is considered vital because it can quickly provide an assessment of consumer interest in their production [26]. In this study, sweet potato leaves were treated with blanching in order to reduce the unpleasant aroma of sweet potato leaves extract. [27], [28] stated that blanching treatment could activate enzymes that can affect the stability of foodstuffs, thereby increasing its organoleptic value. The degree of softness is greatly affected by overrun value. The higher the overrun value, the softer the texture of the ice cream is [18], [29]. Meanwhile, according to [19], [30], the more free water content, the bigger the ice crystals will be. The bigger the ice crystals formed, the harder the texture of the ice cream will be.

Table 3. Results Value (NH) of the effectiveness test of sweet potato leaves ice cream

Test Parameter	Result Value (RV) Treatment								
	S1D1	S1D2	S1D3	S2D1	S2D2	S2D3	S3D1	S3D2	S3D3
Flavor	0,12	0,08	0	0,12	0,10	0,01	0,13	0,12	0,02
Overrun	0,09	0,05	0	0,11	0,08	0,04	0,13	0,09	0,05
Softness	0,11	0,03	0	0,12	0,05	0,03	0,13	0,07	0,05
Antioxidant	0	0,06	0,12	0,02	0,06	0,13	0,03	0,07	0,13
Protein	0	0,08	0,13	0,001	0,10	0,13	0,03	0,11	0,13
Fat	0	0,009	0,009	0,07	0,07	0,08	0,12	0,12	0,13
Aroma	0,10	0,04	0	0,11	0,05	0,01	0,11	0,05	0,02

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Color	0,11	0,03	0	0,10	0,05	0,006	0,10	0,06	0,01
Total	0,53	0,38	0,26	0,65	0,56	0,44	0,78*	0,69	0,54

Note: * Best treatment

3.3. Effectiveness test

Based on the results of the effectiveness test on all test parameters including physical tests, chemical tests and organoleptic tests, it was found that S3D1 treatment with a concentration of 16% skim milk and 5% sweet potato leaves extract was the best treatment with the highest Result Value (RV) (see Table 3).

Table 3 shows that S3D1 treatment with a concentration of 16% skim milk and 5% sweet potato leaves extract was the best treatment with the highest result value (RV), namely 0.78. The criteria for the taste test parameters were 6.44 (like), overrun 65%, softness 5.96 (like), antioxidants (IC50 value) 112.30 ppm, protein 5.63%, fat 0.76 %, carbohydrates 10.02%, crude fiber 5.27%, vitamin C 16.79 mg, aroma 5.52 (like), and color 5.59 (like).

4. Conclusion

Making ice cream using stevia sugar, skim milk, and adding sweet potato leaves extract could provide an alternative to new products. Ice cream, which is synonymous with sweetness became a healthy product that is low in fat contains vitamins and antioxidants, and was in accordance with the needs of the community during the Covid-19 pandemic.

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Chemical and Sensory Characteristics of Dried Noodles with Addition of Telang Flower Extract (Clitoria ternatea L)

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Abstract: Indonesian people are very fond of noodles because they are cheap and practical. One way to improve the quality of the noodles is by adding several active ingredients. Judging from the phytochemical review, telang flowers have several active ingredients that have pharmacological potential. This study aimed to test the chemical characteristics and preference level of the panelists from dried noodles of the telang flower. This study used a randomized design with the treatment given in this study as additional telang flower extracts comprising 4 levels,: 0%, 25%, 50%, 60%, and 75%. The limits analyzed were the panelist acceptance rate, protein content, total phenol, and water content. From the research results on testing the protein content got an average value of 14%, the total phenol got an average value of 0.55mgGAE / g, and the water content got an average value of 13.96%. because in the organoleptic test, the average panelist gave a value from neutral to very fond of dry noodles with telang flower extract.

1. Introduction

The increase in the population of Indonesia that occurs from year to year encourages the Government to advance food self-sufficiency. This is very necessary to meet people's food needs sustainably with excellent quality, enough quantity, and variety, safe for consumption, and affordable anytime and anywhere. Noodles are a food product that is consumed by Indonesians. They record the consumption of noodles in Indonesia as the second largest in the world after the People's Republic of China (PRC) [4]. Noodles have become popular among the public because of their low price and simple processing and presentation. One way to improve the quality of the noodles is by adding several active ingredients that have pharmacological potential.

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Judging from the phytochemical review, telang flowers have several active ingredients that have pharmacological potential. The blue color found in telang flowers indicates anthocyanin content in it. Anthocyanin is a secondary metabolite and is a flavonoid. Anthocyanins themselves are chemical components that have antioxidant action that can act as antioxidants in the body [3]. Telang flower (*Clitoria ternatea*), often called butterfly pea, is a distinctive flower with a single BLUE petal [9]. Judging from the phytochemical review, telang flowers have several active ingredients that have pharmacological potential. The pharmacological potential of the telang flower, among others, is as an antioxidant, antibacterial, anti-inflammatory and analgesic, antiparasitic and anticidal, antidiabetic, anti-cancer, antihistamine, immunomodulator, and a potential role in the central nervous system, the Central Nervous System (CNS) [12].

Dry noodles are dry food products made from wheat flour with or without other food ingredients and permitted food additives and are in the form of noodles. Dry noodles are noodles that have been dried until the moisture content reaches 8 - 10%, are resistant to being stored for a long time, have a shelf life of ± 3 months, this is because of their low water content making it difficult to grow mold and mold [4]. Making noodles with telang flower extract is one of the diversification of food as local food, fortified with natural ingredients that have health functions because of the antioxidant content in them. The purpose of this study was to decide the protein content test and the organoleptic properties of dried telang flower noodles.

2. Materials And Methods

The method used in this study was a randomized design (CRD) with 3 replications. The treatment given in this study was telang flower extracts comprising 4 levels,: 0%, 25%, 50%, 60%, and 75%. The data got from the research results then carried out the analysis process using the variance fingerprint method. If there is a significant characteristic in treatment, they carry further analysis using Duncan's multiple range test (DMRT).

2.1. Time and Place

We conducted this research at the Food Analysis Laboratory and Food Processing Laboratory, Department of Agricultural Technology, Jember State Polytechnic from May to July 2020.

2.2. Materials and Tools

The raw materials used in this research are wheat flour, telang flower extract, eggs, salt, water. The tools used: trays, electric ovens, analytical scales, plastic containers, stoves, pans, sieves, knives, mills, and noodle molds.

2.3. Dried Noodle Processing

The procedure for making noodles is modified [8], 100 gr of wheat flour, then 2 eggs, 1 g of salt are added, and the addition of telang flower extract according to the treatment. Mix all the dough until homogeneous. The dough is divided into several parts and is made into a sheet using a rolling pin (dough thinner) with a thickness of ± 1.5 mm, then the noodles are ground using a noodle mill. Then the noodles are steamed for 1 minute. Picked up and dried at 60^0C for ± 8 hours.

2.4. Observation Variable

2.4.1. Water content

We weighed the sample as much as 2 grams in a known weight plate, then dried in an oven at 105 ^{0}C for 3 hours. We cool it in a desiccator until it reaches room temperature, then weighed. Then reheated in the oven for 30 minutes, cool in a desiccator, and weight. I repeat this treatment several times until it reaches a constant weight.

The formula calculates the water content:

Water content (%) = $= \frac{B-C}{B-A}$

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Note: A: The weight of the empty cup is expressed in grams
B: first plate + sample weight expressed in grams
C: we express the weight of the plate + dry sample in grams.

2.4.2. Protein Content

Weighed almost 1 gram of the sample and put it in the Kjeldahl flask. Added 15 ml of concentrated H_2SO_4 and 2 grams of selenium, then digested for 3 to 5 hours. Once complete, the solution becomes clear and cools. We diluted the results of the destruction with 100 ml distilled water and then calmly added with 50 ml of 30% NaOH. Then distillation was carried out. We collect distillation into a 250 ml Erlenmeyer flask containing 50 ml of 0.1 N KCl solution. The distillation handling is complete if the distillate collected is generally 75 ml. The remaining 0.1 N HCl solution which did not react with distillate was added 2 drops of Methil orange and then titrated with 0.1 N NaOH standard solution. I marked the endpoint of the titration by the presence of the first pink color and remained for 30 seconds. We performed a blank titration with the same treatment without using a sample.

2.4.3. Determination of Total Phenol Content using the Folin–Ciocalteu Method [13]

Weighed 100 mg of the extract and then dissolved up to 10 ml with distilled water to get a concentration of 10 mg/ml From, a concentration of 10 mg/ml pipette 1 ml and diluted with distilled water to 10 ml and got an extract concentration of 1 mg/ml. Pipette 0.2 ml of extract, add 15.8 ml of distilled water and 1 ml of Reagan Folin-Ciocalteu, then shake. Let stand for 8 minutes, then add 3 ml of 10% Na2CO3 to the mixture. Let the solution sit for 2 hours at room temperature. We measured the absorption using a UV-Vis spectrophotometer at the largest absorption wavelength of 765 nm. Performed 3 (three) repetitions so that the phenol levels got were obtained as mg of gallic acid equivalent / g of the fresh sample.

2.4.4. Organoleptic Test

Organoleptic test using the hedonic method or level of preference. We carried organoleptic test out to decide the level of preference for the panelists to the dried noodle product of Telang flower extract. Where this organoleptic test uses a panelist comprising 25 people by asking to offer a personal assessment of the sample presented. The limits analyzed are taste, color, aroma, and texture, by providing an assessment with the following scale

1. Very disliked
2. Dislike
3. Neutral
4. Like
5. Like

3. Results and Discussion

3.1. Water Content

The average water content of dry noodles with the addition of telang flower extract ranged from 12.7% to 15.8%. Water content is a quality need for dry noodles listed in SNI for dry noodles 01-2774-1992 that dry noodles must have the largest water content of 10%. Thus, the dry noodles with the addition of telang flower extract produced still do not meet the SNI requirements.

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Table 1. The average water content of dry noodles with the addition of telang flower extract

The Addition of Telang Flower Extract (%)	Average the Water Content (%)
0	12,76[d]
50	13,33[c]
60	14,26[b]
75	15,8[a]

The results of the analysis of variance showed that there was a very significant effect between the addition of telang flower extract (BNT 5%) on the water content of the dried noodles. We show the average water content in various treatment combinations in Table 1. The lowest water content value of dry noodles was treatment with the addition of 0% telang extract (control) and the highest was the addition of 75% telang flower extract.3The water content in dry noodles increased with the increasing concentration of the added extract of the telang flower. This is because the more water used in the manufacture of dried noodles in the telang flower extract is added, the first water content is in the noodles, thus affecting the water content of the final product. According to [15] the more raw materials added will affect the water content of the product. Also, suspected that the water content of dry noodles is getting higher because the drying treat is based on the occurrence of water evaporation (water suction by air) because of differences in the water content between air and dried products [11].

3.2. Protein Content

The average protein content of dried noodle extract of telang flower in various treatment combinations produced ranged from 13.641 to 15.018%. We can see the average protein content of dry noodle products in Table 2. The results of the analysis of variance showed that the variation in the level of addition of telang flower extract had a significant effect on the protein content of dry noodles.

Table 2 shows that the higher the rate of addition of telang flower extract, the protein content of dry noodles increases. This is because the protein content of dry noodles is influenced by the protein content of the telang flower extract, which is high, around 19% [3]. The protein content of dry noodles according to SNI 01-2774-1992 is at least 11% for quality I calculated based on the dry weight of the ingredients. The addition of telang flower extract to the noodle mixture aims to give innovation in noodle making not only to support food diversification but also to increase the protein content of the noodles.

Table 2. The average protein content of dry noodles with the addition of telang flower extract

The Addition of Telang Flower Extract (%)	Average the Protein Content (%)
0	13,64[d]
50	13,68[c]
60	14,01[b]
75	15,01[a]

3.3. Total Phenol

The total value of phenol in the dried noodles of telang flower extract increased with the addition of the extract given. We can see the mean total phenol value in Table 1. The results of the analysis of variance showed that the variation in the rate of addition of telang flower extract not had a significantly different effect on the total phenol of dry noodles, where the higher the rate of adding telang flower extract, the total phenol content of dry noodles tended to increase. According to [2], the total phenolic content in the telang flower extract was 19.43 ± 1.621 GEA (mg / g sample). According to other sources, the total content of phenolic compounds in telang flowers ranges from 53 to 460 mg of gallic acid equivalent per gram of dry extract (1; 5; 14]. The phenolic compounds comprise flavonoids, phenolic, acids, and tannins. The non-phenol bioactive components that have been identified in telang flowers are a group of phytosterol compounds, terpenes, sugar alcohols, alkyl aldehydes and peptides [10].

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Table 3. The average the total phenolic content of dry noodles with the addition of telang flower extract

The Addition of Telang Flower Extract (%)	Average the total phenolic content
0	0,282[b]
50	0,681[a]
60	0,6970[a]
75	0,6977[a]

3.4. Organoleptic Test

Organoleptic test results, conducted by 25 untrained panelists, show the results of the organoleptic test which aims to determine the level of preference for dried noodles from telang flower extract with the addition of 50% formulation of telang flower extract. The parameters tested were aroma, taste, texture and color.

3.4.1. Aroma

The smell of food is one way to determine the consumer's sense of smell for a food ingredient. We can see the results of aroma analysis in Figure 1.

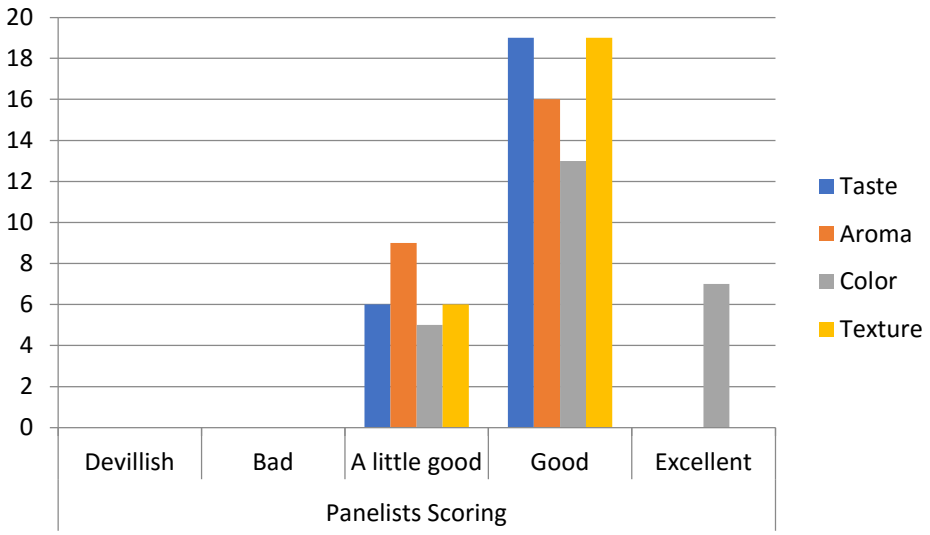

Figure 1. Panelists scoring in each of evaluated organoleptic characteristics

According to the organoleptic test results, the average preference level of 3,64 (A little good). The addition of telang flower extract in the manufacture of dry noodles gives off the aroma of the telang flower. According to [15], the smell of food determines the delicacy of the food and the taste of the food itself. Although food has a high nutritional value, when it smells bad, the level of preference for food can decrease. The presence of an unpleasant aroma will cause a dislike for food, even though it has not been consumed

3.4.2. Color

Color is very important in food and beverage products, to give color to food and drinks can impress consumers. The natural dye used in the manufacture of these dry noodles is from the telang flower extract because the blue color in the flower provides a special attraction for noodle lovers. We can see the results of the color analysis in Figure 1.

Based on the results of the organoleptic test on the color of dry noodles, it shows the level of preference with an average value range of 4.08 (Good). It means from the treatment given to dry noodles that have been tested, the panelists think they like this because of the color of the telang flower that

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shows up on the dry noodles. According to [15], apart from being an aspect that determines quality, it can also an indicator of freshness or maturity. The uniform and even color can show the mixing method or processing method. A food ingredient that has nutritional value tastes good and has a very good texture is less desirable if it has an unsightly color.

3.4.3. Taste

Taste as one of the primary factors in determining whether or not a product is acceptable among consumers, this is important because the ingredients used are the major requirements in producing the desired taste. Based on the results of tests that have been carried out on the taste of dried noodles in the telang flower extract, the average is 4,08 (good). We can interpret it that the level of preference of the panelists is like to well like. Taste is a very important parameter in determining the level of consumer acceptance of a food product. Good taste can support the product so that consumers accept it [7].

3.4.4. Texture

The texture is one of the most important factors in every food processed served, food has its texture, for example, hardness, stickiness, crunchiness, elastilation, chewiness, softness, and so on. Mixing good ingredients will still get excellent results to produce the desired product, for a reason consumers can accept a product that can be consumed or not. We can see the results of texture analysis in Figure 1.

Based on the tests that have been carried out on the texture of the dried noodles of the telang flower extract, the average results is 3,76 (A little good) so most of the panelists like it. Each food has its own textural properties. Physical, size, and shape. The texture is the biggest determinant of taste quality [6]. The resulting texture from mixing the telang flower extract with the gelatinization can present good texture.

4. Conclusion

Anthocyanins produced from telang flowers (*Clitoria ternatea L.*) can color dry noodles and the resulting color looks blue and does not fade after being processed and ready for consumption. The added telang flower extract affects protein content, moisture content, and total phenol content, color preferences, aroma, taste, texture.

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Exogenous enzyme increased feed intake but not growth and feed efficiency of sheep fed edamame wastes

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Abstract. Feed management strategies, for example using cheap agricultural by product to reduce feed cost, are commonly used in improvement of livestock farming. This research aimed to access efficacy of commercial exogenous enzyme (consisting of mixture *lignolytic* and *cellulolytic*) formulated with edamame waste on feed intake, growth, and feed efficiency of sheep. Nine local sheep were assigned using completely randomized design, treated with 3 levels of exogenous enzyme i.e. 0, 1.4, and 2.8 g/kg of total mixed ration formulated using edamame waste. The sheep were reared in individual cage and given treatment in 3 replications. Feeding and drinking were ad libitum and after two weeks feed intake (FI), average daily gain (ADG) and feed conversion ratio (FCR) were calculated. FI was significantly affected by the treatment and FI significantly increased in line with the treatment levels. However exogenous enzyme did not affect ADG and FCR

1. Introduction

National demands of meat have increased in line with population growth and its consumption level. Unfortunately, domestic meat supply does not meet the market requirement, leading to boost livestock production. Sheep is a livestock commodity that has been promoted to fulfill meat demand in Indonesia and there are several programs from the government that are provided for farmer, i.e. extension in farm management, and nowadays its farming system is conducted towards intensification.

Since feed cost has been the main component that contribute to the production cost, feed management strategies are commonly used to improve livestock farming, for example using cheap agricultural by product to reduce feed cost. To that end, edamame soybean wastes can be used as an alternative feed. Edamame soybean, also known as vegetable soybean, production in Jember account for 10,000 - 15,000 tons a day, exported in the form of fresh frozen and whole seeds. The process of edamame resulted wastes in the form of soybean pod.

Edamame is categorized as soybean varieties, harvested at premature state, in which its pod contains 11.3% crude protein, crude fiber and 32.5%[1] equivalent to elephant grass (9.7% protein; 36.1% fiber;). Soybean pod also contain ADF 36.8% and NDF 52.9% [1] and lignin at 9.88%[2], which became constraints for ruminants to digest[3]. From the aspect of nutritional physiology, the ability of small ruminants (like sheep) to utilize nutrients in ration is lower than that of large ruminants. Research showed that the ability of cattle and sheep to digest good, medium and low-quality forages. Based on digestibility data and volatile fatty acids, it was revealed that the digestive system of small ruminants was inadequate and had a lower ability compared to cows to digest low-quality forages[4].

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The application of exogenous enzymes i.e. enzymes treatment through the ration to improve digestibility, feed nutrition and livestock performance have been shown a positive result. Several studies have shown that exogenous enzymes (fibroltytic, cellulolytic or its combination) were successfully applied to improve the nutritional value of several feedstuffs (such as straw, alfalfa, and Bermuda grass), non-activating anti-nutrients that lead to improved performance and carcass of ruminants[5–9]. Application of exogenous enzyme in edamame is not well explored. Thus, this research aimed at access efficacy of commercial exogenous enzyme (consist of mixture fibrolytic and cellulolytic) formulated with edamame waste on feed intake, growth, and feed efficiency of sheep.

2. Methodology

2.1. Design of experiment

This experiment was conducted at Department of Animal Sciences, Politeknik Negeri Jember. Nine local sheep (*domba ekor tipis*), having average body weight 17.24 kg, were assigned using Completely Randomized Design, reared in individual housing of 1.2 m x 1 m of dimension. The sheep have been keeping for two months but the data published here for two weeks only due to the experiment is ongoing. Feeding and drinking were ad libitum.

We used fresh edamame that contained approximately 90% pod and 10% seed. The waste the dried up to 12% moisture and then ground using 5 cm grinding screen. Feed was formulated as Total Mixed Ration (TMR), in which edamame was the main constituent (Table 1). There were 3 treatments (P0, P1, and P2) i.e. the level of commercial exogenous enzyme (Bioproton, PTY LTD, Australia) were 0; 1,4; and 2.8 g/kg of TMR respectively.

Table 1. Feed Formulation of TMR used in this experiment

No	Ingredients	%
1	Edamame waste	35
2	Maize bran	25
3	Rice bran	8
4	Palm kernel meal	15
5	Copra meal	12
6	Molasses	2
7	$CaCO_3$	2
8	Premix	1
Total		100
Calculated nutrient content		
	Total digestible nutrient	71,39
	Crude protein	12,61
	Crude fiber	19,14

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2.2. Parameters of experiment

We used three parameters, namely feed intake (FI), average daily gain (ADG), and feed conversion ratio (FCR) using the following equations;

FI=Feed given-Feed refusal (1)

$$ADG = \frac{\text{Final body weight - Initial body weight}}{\text{Duration of rearing}} \quad (2)$$

$$FCR = \frac{FI}{\text{Final body weight - Initial body weight}} \quad (3)$$

2.3. Statistical analysis

Data analysis were conducted using SPSS 23. FI and FCR were normalized using 1/x transformation To meet the assumption of normality and homogeneity in Anova. Afterward, data were analyzed using analysis of variance (Anova) and then Duncan post hoc for data with significant result.

3. Results and discussion

FI of sheep fed TMR is in the range of 492.32 until 613.25. FI is statistically affected by the experimental treatment ($p<0.05$; Table 2). It is also found that FI linearly increased along with increasing the level of exogenous enzyme. Sheep fed P3 showed the highest FI and being increased about 24% compared with other treatments. ADG is ranging from 231.25 up to 462.50, and FCR in the range of 1.61 until 2.17. Even though both ADG and FCR were not affected by level of exogenous enzyme ($p>0.05$), there is a trend of increasing of ADG of sheep and improvement of feed efficiently.

Table 2. Performance of sheep fed TMR formulated with various exogenous enzyme levels

Parameter	Treatment			Anova	Contrast	
	P1	*P2*	*P3*		*Linier*	*Quadratic*
Feed Intake (g/d)	492.32[a]	494.25[a]	613.25[b]	p<0.05	p<0.05	p>0.05
ADG (g/d)	231.25	387.50	462.50	p>0.05	p>0.05	p>0.05
FCR	2.17	1.28	1.61	p>0.05	p>0.05	p>0.05

All values are Mean of respective treatment (N=3)
a,b,c Means in the same row with different letters differ significantly ($P < 0.05$).

The results of FI in this experiment is consistent with previous publication[10], in which growing lambs aged 5 months and 14.6 average of body weight, fed olive cake meal treated with fibrolytic exogenous enzyme showed improvement of performance. ADG and FCR of sheep in this experiment also in line with[10].

This research did not any data that support the explanation of FI elevation. Other parameters such as ruminal volatile fatty acid digestibility are needed. According to published research[10], it was speculated that FI increased due to the hydrolysis of polysaccharides resulting sugars which may improve feed palatability. Furthermore, the fibrolytic enzymes can elevate the level of fiber degradation by the ruminal microorganisms and this will reduce content of rumen and hence increase FI.

Contrary to the others publications[10,11], in the present experiment growth and feed efficiency in sheep did not affected by treatment. However, the data showed that the use of exogenous enzyme

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improved both parameters. According to published paper[11] improvement in the average live weight gain might be address to the high activity of ruminal fermentation and digestion of nutrient of the diet, which is attributable to improved feed efficiency increased availability of nutrients to the animals. Several factors affecting the difference in experimental results include the age of animals, the quality of diet, as well as activity and delivery of exogenous enzyme. This experiment used young local lambs that might have different capacity to digest diets.

As a conclusion, FI of sheep was significantly affected by exogenous enzyme treatment and it was also found that FI increased in line with the treatment levels. However, ADG and FCR were not statistically affected by exogenous enzyme. Further investigations that elaborate ruminal parameters need to be conducted.

4. Acknowledgement

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Determination of the Shortest Path in Web-Based Food Distribution

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Abstract: Food insecurity can be seen in terms of production, consumption, and distribution. The aspect of food insecurity is the ability to produce unbalanced with the fulfillment of needs. Production capability is not seen from the availability side, because availability can be met from the inter-regional supply. The consumption aspect is the inability to buy food because there is no purchasing power or the poor. The availability of food that does not meet the needs of the community resulting in food insecurity. Then the way to handle food insecurity in the region of Bondowoso is by distributing food that requires the shortest path to overcome the many areas that must be assisted given. Determination of the shortest path is a problem to find a path between two nodes with a minimum number of weights. The shortest path can be applied in the form of web-based application programs.

Keyword : Food insecurity, *Web-based food distribution,* Dijkstra

1. Introduction

1.1. Background

Food problems are a major problem for citizens of countries around the world, including Indonesia. In 1984 Indonesia had experienced a glorious period in the field of food, namely achieving self-sufficiency in food (rice). This food insecurity can occur due to sudden and unexpected shocks such as droughts and explosive pests, which severely limit household ownership of food, especially those in rural areas. Food insecurity can be seen in terms of production, consumption, and distribution. The aspect of food insecurity is the ability to produce unbalanced with the fulfillment of needs. Production capability is not seen from the availability side, because availability can be met from the inter-regional supply. The consumption aspect is the inability to buy food because there is no purchasing power or the poor. The aspect of distribution is the imbalance of supply to meet demand so that food scarcity occurs at a certain place, time, quantity, and price. (Mapping of Food-Prone Areas in Bondowoso Regency in collaboration with the State Polytechnic of Jember with the Bondowoso Regency Food Security Office, 2013).

The availability of food does not meet the needs of the community resulting in food insecurity. Then the way to handle food insecurity in the Bondowoso area is by distributing food that requires the shortest path to overcome the many areas that must be assisted. Determination of the shortest path is a problem to find a path between two nodes with a minimum number of weights. The shortest path can be applied in the form of web-based application programs.

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2. References

2.1. Determination of the Shortest Path

Determination of the shortest path is done to find a path and facilitate access to the distribution of goods between two nodes with a minimum amount of weight. In the case of determining the shortest path between two different locations on a map, the node will represent the location on the map and the weight represents the time needed to travel between the two locations. Determination of the shortest path can only be used on the main road or arterial road so that public transportation can cross the shortest path.

The user enters the origin and destination data on the system and then searches for the shortest path starts from filling the point (node) with the lowest weight, so the output is information on the name of the shortest sub-district along with the total distance traveled.

2.2. Definition of Distribution

Distribution is a marketing activity that seeks to facilitate the delivery of goods and services from producers to consumers so that their use is following what is needed (type, quantity, price, place, and when needed). [1]

2.3. Definition of food

This food is a basic need for humans, its role which is very influential in daily life is progressing rapidly because of the increasing population density from year to year. The food needed is rice, tubers, fruits, eggs, meat, beans, etc. Food that is a basic need must fulfill 4 (four) healthy 5 (five) perfect. 4 (four) healthy foods 5 (five) are perfect foods that contain carbohydrates, protein, vitamins that must be considered every day such as rice, vegetables, meat or fish, fruits, and can be added to milk. Try to process vegetables not too long how to cook it so that the vitamin levels are not lost. [2]

2.4. Bondowoso

Bondowoso is the only district in the horseshoe area that does not have a coastline. Bondowoso Regency is one of the districts in the province of East Java. Bondowoso Regency has an area of 1,560.10 km² which is geographically located at coordinates between 113 ° 48′10 ″ - 113 ° 48′26 ″ East and 7 ° 50′10 ″ - 7 ° 56′41 ″ LS. Bondowoso Regency has a fairly cool temperature range of 15.40 ^{0}C - 25.10 ^{0}C because it is located in the mountains. Bondowoso Regency is not crossed by a state road that connects between provinces and Bondowoso also does not have seas, which makes Bondowoso difficult to develop compared to other districts in East Java. The majority of the inhabitants who inhabit the area of Bondowoso Regency are from Javanese and Madurese tribes with a livelihood as farmers. The natural condition of Bondowoso also provides great potential as a contributor to the visit in East Java tourism, because here there are several attractions worth visiting such as Ijen Crater, Jampit Plantation, Polo Agung Waterfall, and others. [3]

3. Results and Discussion

3.1. Requirement analysis dan definition

At this stage, the user tells the needs of the program to be made. This application requires complete and appropriate information that is the name of the district, the shortest path and the total distance traveled. To build this application requires real data that is matched with the information needs in the following.

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Table 1. Data Kecamatan

No	Kecamatan
1	Bondowoso
2	Tegalampel
3	Tenggarang
4	Taman Krocok
5	Wonosari
6	Tapen
7	Klabang
8	Botolinggo
9	Prajekan
10	Cermee
11	Sukosari
12	Sumber wringin
13	Sempol
14	Tlogosari
15	Pujer
16	Jambesari Darus Sholah
17	Tamanan
18	Maesan
19	Grujugan
20	Curahdami
21	Binakal
22	Pakem
23	Wringin

Data from these sub-districts is used as a table to help determine the shortest path, while graphical visualization media in the form of graphs requires village data consisting of village code or Kode, sub-district name or Kecamatan, village name or Desa, and postal code or Kode Pos. Can be seen as follows.

Kode	Kecamatan	Desa	Kode pos
0101	Binakal	Baratan	68251
0102	Binakal	Bendelan	68251
0103	Binakal	Binakal	68251
0104	Binakal	Gadingsari	68251
0105	Binakal	Jeruk Soksok	68251
0106	Binakal	Kembangan	68251
0107	Binakal	Sumbertengah	68251
0108	Binakal	Sumberwaru	68251
0201	Bondowoso	Dabasah	68211
0202	Bondowoso	Blindungan	68212

Figure 1 Data of Villages

In determining the shortest path, a distance table is also needed to see the weight value, which is the number of distances, and the sub-district table is used to determine the potential of food in the area by looking at the amount of yield.

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Kode	Kec. asal	Kec. tujuan	Jarak	Nama Jalan
1	bondowoso	tenggarang	2870	Jl. PB. Sudirman
2	bondowoso	tegalampel	1680	Jl. RA. Kartini
3	bondowoso	wringin	12110	Jl. Diponegoro, Jl. Raya Wringin,
4	bondowoso	binakal	5740	N/A
5	bondowoso	curahdami	3430	Jl. Letnan Rantam
6	bondowoso	grujugan	7840	Jl. Ahmad Yani, Jl. Bondowoso-Jember, Jl. Mastrip
7	bondowoso	tamanan	11970	N/A
8	tegalampel	bondowoso	1680	Jl. RA. Kartini
9	tegalampel	wringin	11480	N/A
10	tegalampel	tenggarang	2800	N/A
11	tegalampel	taman krocok	6720	Jl. KH. Ali

Figure 2 Distance data between origin and destination

Kode	Kecamatan	Alamat	Padi	Jagung	Ubi Kayu
1	Binakal	Jl. Binakal	4.022	2.926	0
2	Bondowoso	Jl. Letjen Haryono MT. No 32	8.596	1.147	0
3	Botolinggo	N/A	4.969	8.670	0
4	Cerme	Jl. Raya Cerme	9.443	17.122	0
5	Curahdami	Jl. Poncogati Curahdami	6.994	6.404	0
6	Grujugan	Jl. Jember Grujugan	7.927	4.438	0

Figure 3 Data on the potential for food crops in each district

This application was created based on user needs regarding the information on the potential of foodstuffs in each region in Bondowoso. Information on food potential will be used as graphical visualization media in the form of graphics so that the public and the Office of Food Security can easily predict areas that are experiencing food insecurity. After knowing the area is experiencing food insecurity, the user wants an application that can be used to handle the process of distributing food so that it is faster and more efficient because of the large number of areas that must be provided with assistance. This application provides a solution in the form of determining the shortest path to get to the place that was first given assistance by seeing the path closest to its headquarters.

3.2. Implementation and unit testing

This stage is the core stage of all analyzes that have been carried out at an early stage. This stage is the stage of making the program. Database design and design is done using the PHP programming language with Dreamweaver CS5 tools, after which a trial program is run when filling, updating, and deleting data in tables (forms). The following are the stages of system implementation:

3.2.1. Creating Database

The database functions to accommodate the tables that have been created in the class diagram design. Making a table includes the process of naming fields and selecting detailed data types and determining the index (primary key) to create relations between tables. Can be seen in the following image.

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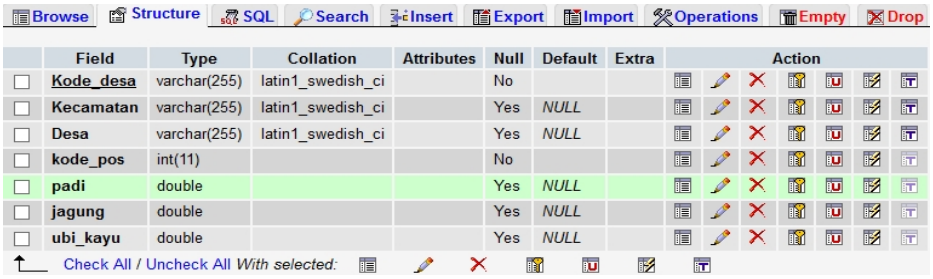


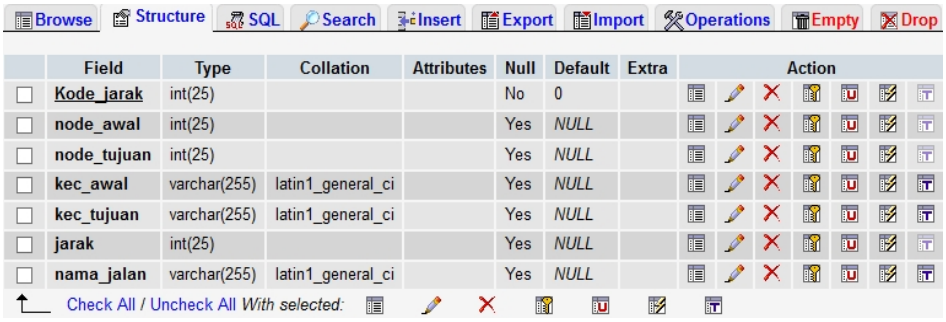
Browse | Structure | SQL | Search | Insert | Export | Import | Operations | Empty | Drop

	Field	Type	Collation	Attributes	Null	Default	Extra	Action
☐	Kode_desa	varchar(255)	latin1_swedish_ci		No			
☐	Kecamatan	varchar(255)	latin1_swedish_ci		Yes	NULL		
☐	Desa	varchar(255)	latin1_swedish_ci		Yes	NULL		
☐	kode_pos	int(11)			No			
☐	padi	double			Yes	NULL		
☐	jagung	double			Yes	NULL		
☐	ubi_kayu	double			Yes	NULL		

Check All / Uncheck All With selected:

Figure 4 The data structure in the Village Table uses a MySQL database

In the village data database, there are 7 (seven) fields, namely kode_desa that is also selected as primary key kecamatan, desa, kode_pos, padi, jagung, dan ubi_kayu.



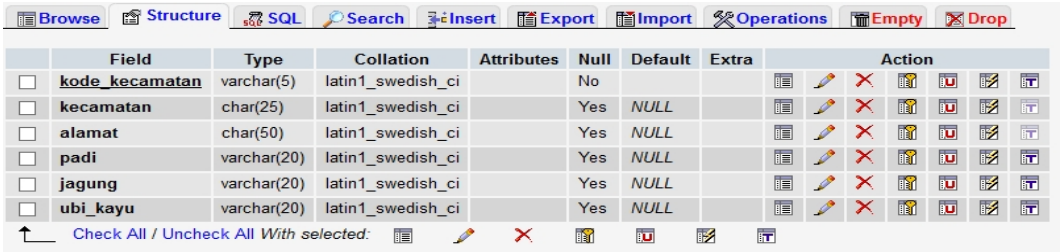
Browse | Structure | SQL | Search | Insert | Export | Import | Operations | Empty | Drop

	Field	Type	Collation	Attributes	Null	Default	Extra	Action
☐	Kode_jarak	int(25)			No	0		
☐	node_awal	int(25)			Yes	NULL		
☐	node_tujuan	int(25)			Yes	NULL		
☐	kec_awal	varchar(255)	latin1_general_ci		Yes	NULL		
☐	kec_tujuan	varchar(255)	latin1_general_ci		Yes	NULL		
☐	jarak	int(25)			Yes	NULL		
☐	nama_jalan	varchar(255)	latin1_general_ci		Yes	NULL		

Check All / Uncheck All With selected:

Figure 5 The data structure in the Distance Table uses a MySQL database

In the distance data database there are 7 (seven) fields, namely the kode_jarak which is also selected as the primary key, node_awal, node_tujuan, kecamatan_awal, kecamatan_tujuan, jarak, and nama_jalan.



Browse | Structure | SQL | Search | Insert | Export | Import | Operations | Empty | Drop

	Field	Type	Collation	Attributes	Null	Default	Extra	Action
☐	kode_kecamatan	varchar(5)	latin1_swedish_ci		No			
☐	kecamatan	char(25)	latin1_swedish_ci		Yes	NULL		
☐	alamat	char(50)	latin1_swedish_ci		Yes	NULL		
☐	padi	varchar(20)	latin1_swedish_ci		Yes	NULL		
☐	jagung	varchar(20)	latin1_swedish_ci		Yes	NULL		
☐	ubi_kayu	varchar(20)	latin1_swedish_ci		Yes	NULL		

Check All / Uncheck All With selected:

Figure 6 The data structure in the District Table uses a MySQL database

In the kecamatan data database there are 6 (six) fields, namely the kode_kecamatan which is also selected as the primary key, kecamatan, alamat, padi, jagung, ubi_kayu.

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Browse | Structure | SQL | Search | Insert | Export | Import | Operations | Empty | Drop

	Field	Type	Collation	Attributes	Null	Default	Extra	Action
☐	username	varchar(50)	latin1_general_ci		No			
☐	password	varchar(50)	latin1_general_ci		No			
☐	jabatan	varchar(50)	latin1_general_ci		No			
☐	kode_user	int(11)			No		auto_increment	

Check All / Uncheck All With selected:

Figure 7 The data structure in the User Table uses a MySQL database

In the user data database there are 4 (four) fields, i.e. Kode_user which is also selected as the primary key, username, password, and jabatan.

Browse | Structure | SQL | Search | Insert | Export | Import | Operations | Empty | Drop

	Field	Type	Collation	Attributes	Null	Default	Extra	Action
☐	id_kecamatan	varchar(5)	latin1_general_ci		No			
☐	nama_kecamatan	char(255)	latin1_general_ci		Yes	*NULL*		

Check All / Uncheck All With selected:

Figure 8 The data structure in the District Master Table uses a MySQL database

In the sub-district data database, there are 2 (two) fields, namely nama_kecamatan and id_kecamatan which are also selected as the primary key.

3.2.2. Making the Main Menu Display

- Main Menu *User*

Figure 9 User Main Menu / Login Form

This picture explains the main view for the user. There are 4 (four) menus, namely main content, graphics, shortest path, and calendar. The main content menu is the home and search menus. The home menu functions to return to the initial display. The search menu has a combo box that can search by sub-district name and yield, while the graph menu only has a menu of food potential, which can only display graphs. The shortest path menu has a path result menu which only fills in the combo box with various

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sub-district name options after that press the search button, and information about the shortest path will appear.

- Admin Main Menu

Figure 10 Admin Main Menu

This picture explains the main view for admins in determining the shortest path. There are 5 menus namely main content, graphics, shortest path, user management, and calendar. The main content menu is the home and search menus. The home menu functions to return to the initial display. In the search menu, there is a combo box that can search by sub-district name and yield, while the graph menu only has a menu of food potential, which can only display graphs. The shortest path menu has a path result menu which only fills in the combo box with various sub-district name options after that press the search button and then information about the shortest path will appear. In the admin, menu display there is an additional menu because the admin has the duty to add and determine the user's position. This user management menu has 3 submenus, i.e. user list, added users and user updates.

- Main Menu Head of Department of Food Security

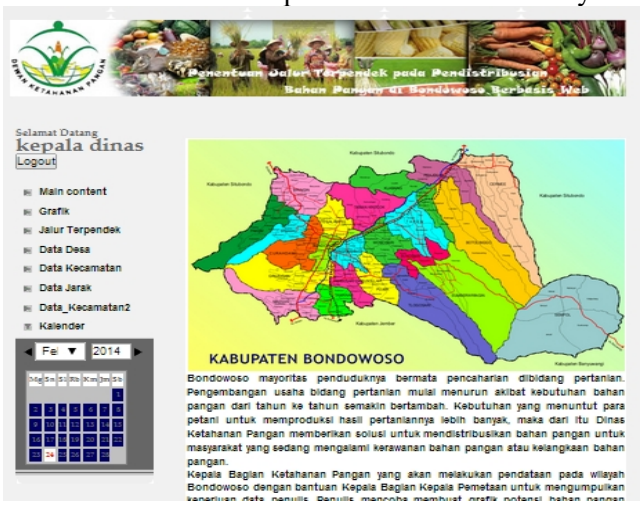

Figure 11 Main Menu Head of Department of Food Security

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This picture explains the main display for the Head of the Department of Food Security. There are 7 menus, namely main content, graphics, shortest path, village data, sub-district data, distance data, and calendar. The main content menu is the home and search menus. The home menu functions to return to the initial display. The search menu has a combo box that can search by sub-district name and yield, while the graph menu only has a menu of food potential, which can only display graphs. The shortest path menu has a path result menu that only fills in the combo box with various sub-district name options after that press the search button, and finally, information about the shortest path will appear. The menu display of a Head of the Department of Food Security has an additional menu because it has an important role which is to complete the database. The village data menu, sub-district data, distance data, user data have 3 submenus, namely adding data, updating data and listing data.

Data completeness is only carried out by a Head of the Department of Food Security, including village forms, sub-district forms, distance forms, and user forms. The following image can be seen below:

Figure 12 Village Form

In this village form image there are columns that must be filled in as data completeness. There are 7 fields including them kode_desa, kecamatan, desa, kode_pos, padi, jagung, dan ubi_kayu.

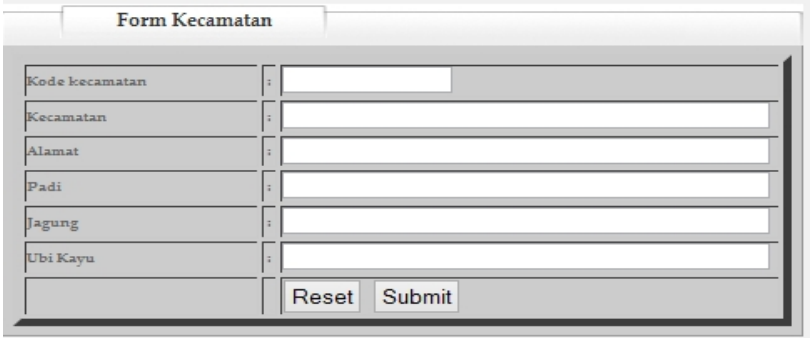

Figure 13 District Form

In this figure, there are columns which must be filled in as data completeness. There are 6 fields including them kode_kecamatan, kecamatan, alamat, padi, jagung, and ubi_kayu.

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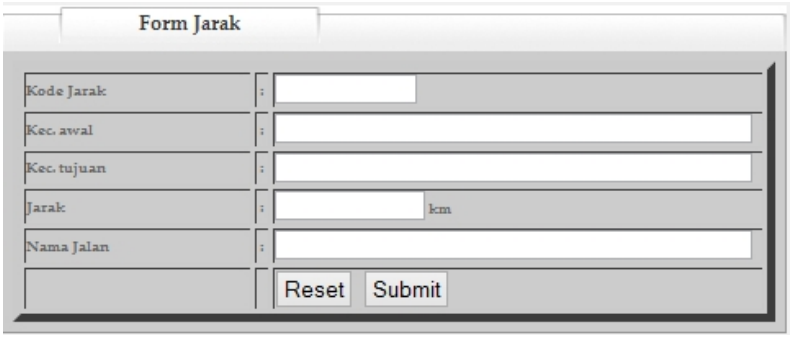

Figure 14 Distance Form

In this figure, there are columns that must be filled in as data completeness. There are 5 fields including them kode_jarak, kecamatan awal, kecamatan tujuan, jarak, nama_jalan and ubi_kayu.

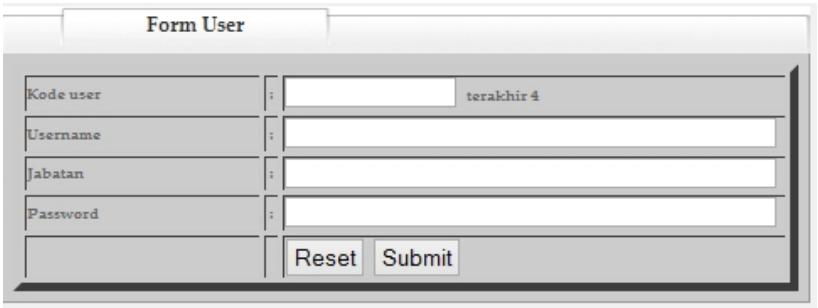

Figure 15 User Registration Form

In this user form figure there are columns that must be filled in as data completeness. There are 4 fields including them kode_*user*, *username*, jabatan, dan *password*.

3.3. Integration and system testing

This stage is the testing phase of an application in the shortest path determination application. Application testing is said to be successful if the web display has been linked according to page one with another page and can appear alternately according to the selected choice. Web appearance goes according to the expectations of the author. Form (table) added data also functions to store data entered into detailed data. Following is an example of testing an application on the main menu display of an Admin and its access rights.

An Admin runs an application to determine the shortest path, first, the Admin does the login and then displays the main menu in accordance with the permissions that are adding a new user and can determine the user's position. More can be seen in the following picture:

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Figure 17 Admin Main Menu

We choose the main content menu, in which there are 2 (two) submenu choices, namely the home menu and search. In the search menu, we can search for data by sub-district name and also food potential based on yield.

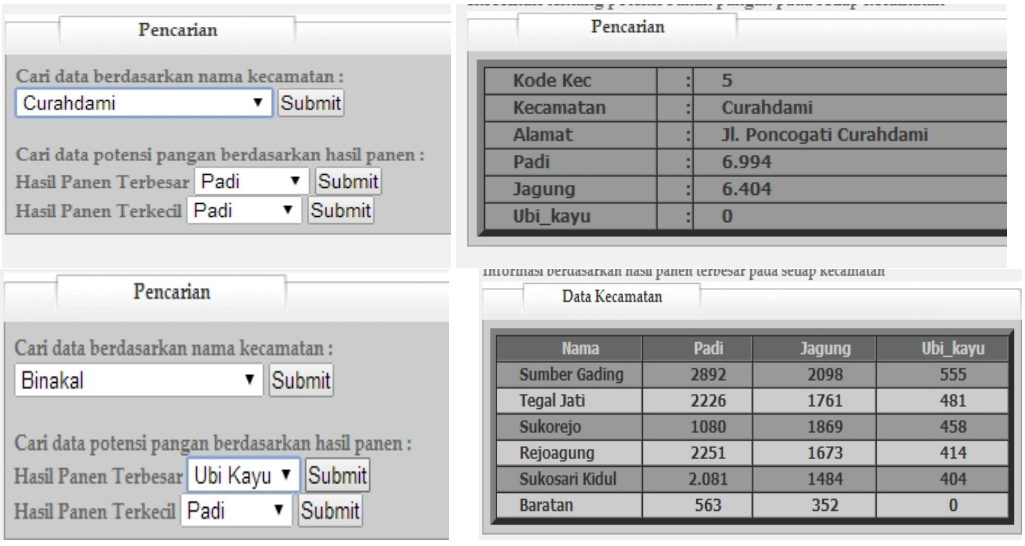

Figure 18 Search results based on district names and yields

The following figure 4.18 shows graphical visualization media in the form of graphs to find out the amount of potential foodstuff in the Bondowoso area.

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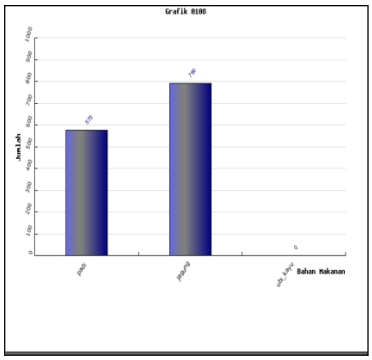


Daftar Desa

1 2 3 4 ... 11 Next >>

Kode_desa	Kecamatan	Desa	Action
0101	Binakal	Baratan	Grafik
0102	Binakal	Bendelan	Grafik
0103	Binakal	Binakal	Grafik
0104	Binakal	Gadingsari	Grafik
0105	Binakal	Jeruk Soksok	Grafik
0106	Binakal	Kembangan	Grafik
0107	Binakal	Sumbertengah	Grafik
0108	Binakal	Sumberwaru	Grafik

Figure 19 Graphic Visualization media

After the user sees the graphical visualization media in the form of graphics. Users can see the shortest path determination application by filling in the combo box so the search button can function to find the shortest path.

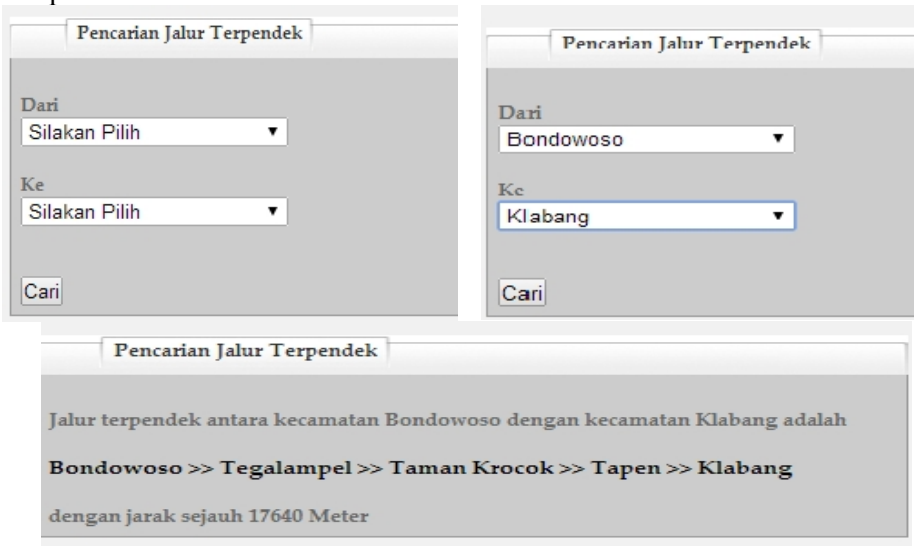
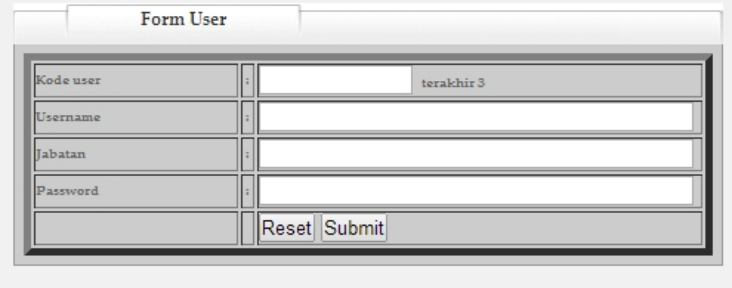


Figure 20 Shortest Path Application

Users can also add new users, so users registered in the user list table can log in according to their access rights. Next to appear the form added a new user, after filling in the form the data will automatically be saved in the list menu. Admin can change the position from an admin to a head of a service in the update menu by selecting edit in the action column.



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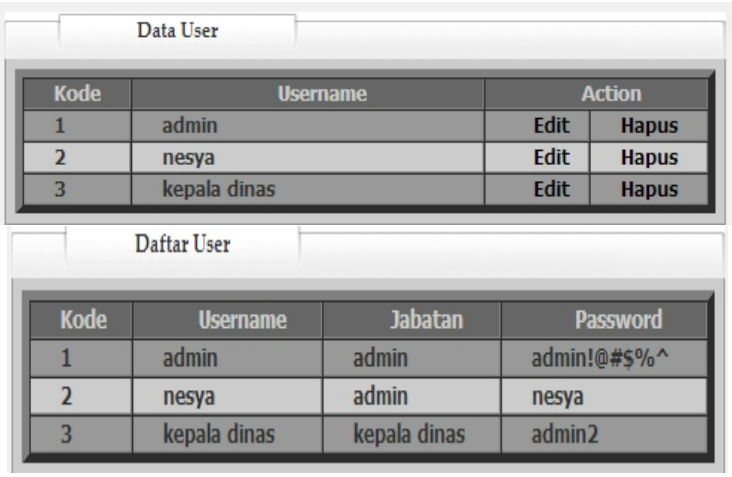

Figure 21 Management Users Menu

3.4. Operation and maintenance

This stage is to operate the application environment and carry out maintenance. Maintenance here is to make adjustments in each change because the application must adapt to the actual situation, where the data - the needs of this application can still be updated or added.

4. Conclusions and Recommendations

4.1. Conclusions

The conclusions that can be drawn from making the Shortest Path Determination Application are:

- Determination of the shortest path can be applied to web pages.
- This application will help the community in finding the shortest path so that they can work together with the Head of the Department of Food Security to assist the distribution of food at several points or places that have been determined so that access to the distribution of goods or activities to supply food to the community is also quickly handled and not reached delayed until protracted.
- Graphical visualization media as additional information about the potential of foodstuffs contained in the Bondowoso area through graphical visualization in the form of graphics, the public can find out food items that are increasing and areas that are experiencing food insecurity so that assistance will soon come to the area.

4.2. Recommendations

Suggestions that can be put forward to help the perfection of the Shortest Path Determination Application: For further research applications need to be made that can perfect the shortest path determination application. This application program does not use any method in determining the shortest path, therefore it is recommended to use a method including the Dijkstra algorithm. [4]

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Portable Device for Monitoring System in Network Culture Laboratory based on IoT

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Abstract. Tissue culture is one of the technological developments in the field of agricultural production. This technique is one way of vegetative nurseries to produce ready-to-plant seedlings. The benefits of plant propagation by tissue culture include reproducing pantogen-free plants in large numbers and in a relatively short time. However, in plant propagation by tissue culture it is necessary to pay attention to the factors that affect its success, for example environmental conditions. Environmental condition factors consist of irradiation intensity, temperature and humidity. The intensity of lighting affects the photomophogenesis process of the explants, while the temperature affects the formation of plant organs and the unstable humidity can make the explants and plantlets grow abnormally. In the Tissue Culture which is carried out at the Laboratory of the Department of Agricultural Production, the State Polytechnic of Jember, also often finds culture failure or it is called kontam (mushroom culture / rotten culture / dead culture) due to the influence of an uncontrolled environment. Manual monitoring activities require more effort and time, and the results obtained are not entirely effective. Based on these problems, this study designed a web system that can monitor temperature, humidity, and light intensity as well as remote control of tissue culture rack lighting based on Microcontrollers and Computer Networks. This system utilizes trending technology, namely the Internet of Things (IoT) and cloud computing. The internet of things allows the results of sensor readings to the temperature, humidity and light intensity levels of the tissue culture room to be accessed by the website. In addition, it also allows the website to adjust the brightness of the lighting according to the needs of the plants. In internet of things communication in this study, the compilers used the MQTT (Message Queuing Telemetry Transport) protocol which has the advantage of being able to run on small bandwidthIntroduction.

1. Introduction

Tissue culture is one of the technological developments in the field of agricultural and food production. This technique is one of the vegetative nurseries in producing ready-to-plant seedlings because each plant cell has the ability to divide or multiply to form new individuals (tettipotency) [1]. Plant propagation with tissue culture is useful for reproducing pantogen-free plants in large numbers and in a relatively short time, in contrast to conventional plant propagation which is considered slow [2]. [3] stated that the advantages of plant propagation through tissue culture are:

- Does not require a large space because it is done on a culture bottle.
- Free of disease, pests, and viruses because it is carried out in aseptic conditions.

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- The time for propagation is fast and unlimited.
- It doesn't depend on the season or climate.
- The mother plant can be stored in vitro so it does not require maintenance in the field.
- Save time, effort and cost.
- The resulting seedlings have roots (plantlets), so they can quickly grow in the field.

However, plant propagation by tissue culture needs to pay attention to the factors that influence the success of the nursery, one of which is environmental conditions. Environmental condition factors consist of irradiation intensity, temperature and humidity. Light intensity affects the photomophogenesis process of explants, while temperature affects the formation of plant organs and unstable humidity can make explants and plantlets grow abnormally [4].

In the Tissue Culture Laboratory of the Department of Agricultural Production, Jember State Polytechnic also often finds culture failure or it is called contamination (mushroom culture / rotten culture / dead culture). Even in every block of tissue culture shelves there are cultures that die and don't grow. Based on the results of interviews with the head of the laboratory, contaminants can occur due to fungi and the unstable lighting of the tissue culture room. Moreover, the need for irradiating each type of plant in the tissue culture block is different. These different needs also make laboratory staff have to frequently visit the culture room to monitor the temperature, humidity, and irradiation intensity of each culture block. Manual monitoring activities require more effort and time, and the results are not fully effective.

Based on these problems, this study designed a web system that can monitor temperature, humidity, and light intensity as well as remotely control tissue culture rack lighting based on Microcontrollers and Wireless Sensor Networks[4][5]. This system utilizes trending technologies, namely the Internet of Things (IoT) and cloud computing [6]. Internet of things allows the results of sensor readings to the level of temperature, humidity and light intensity of tissue culture space can be accessed by the website [7]. In addition, it also allows the website to adjust the brightness of the lighting according to the needs of the plants. In internet of things communication in this study, the compilers used the MQTT (Message Queuing Telemetry Transport) protocol [8] which has the advantage of being able to run on a small bandwidth. The use of cloud computing services on systems designed by compilers is an attempt to allow access to resources and applications from anywhere via the internet network. All data is processed and stored in the cloud, which can also be accessed easily by users. In this case, the tissue culture laboratory conditions can be monitored and controlled[9] from anywhere without having to come to the location, so as to save time and effort in the process of tissue culture nurseries.

Internet of Things (IoT) is a concept of expanding the benefits of internet connectivity that is connected continuously to meet human needs. Apart from sharing data, IoT allows data transfer over the internet without human-to-human interaction, which aims for machine-to-machine connectivity[10]. The internet of things has fundamental characteristics, namely:

- Interconnectivity: The interconnectedness of the global information and communication infrastructure.
- Things-related service: IoT is able to provide services related to matters within these limitations, such as privacy protection and simantic consistency between physical objects and related virtual things. The goal is to provide services related to matters within its boundaries, both technology in the physical world and in the information world to change.
- Heterogeneity: IoT devices are heterogeneous or different based on different hardware platforms and networks. They can interact with other devices or service platforms over different networks.
- Dynamic changes: The state of the device dynamically changing, connected and/or disconnected as well as the context of the device including location and speed. In addition, the number of devices can also change dynamically.

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- Enormous scale: The number of devices that are required to be managed and that communicate with each other is at least greater than the number of devices connected to the internet. What is more important is the management of the data generated and their interpretation for application purposes.

1.1. Hardware Design

The prototype case is made using 3D printer technology. The prototype is designed with a size of 4x4x20cm. The device consists of a sensor and controller box frame at the top, and a battery box at the bottom. The battery part is designed to be detached when recharging. The box design is designed using CAD which is then converted to * stl format. Figure 1 is the chassis design used for the monitoring device. The electronic circuit consists of a power circuit, a microcontroller shield, and a series of sensors. The stage of making electronic circuits begins with designing the PCB layout according to the system block diagram that has been made. Figure 2 is a system block diagram of the device created.

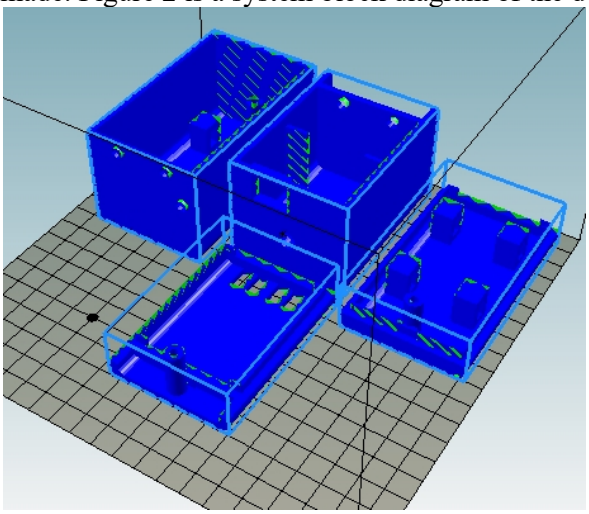

Figure 1. Chassis design used for the monitoring device

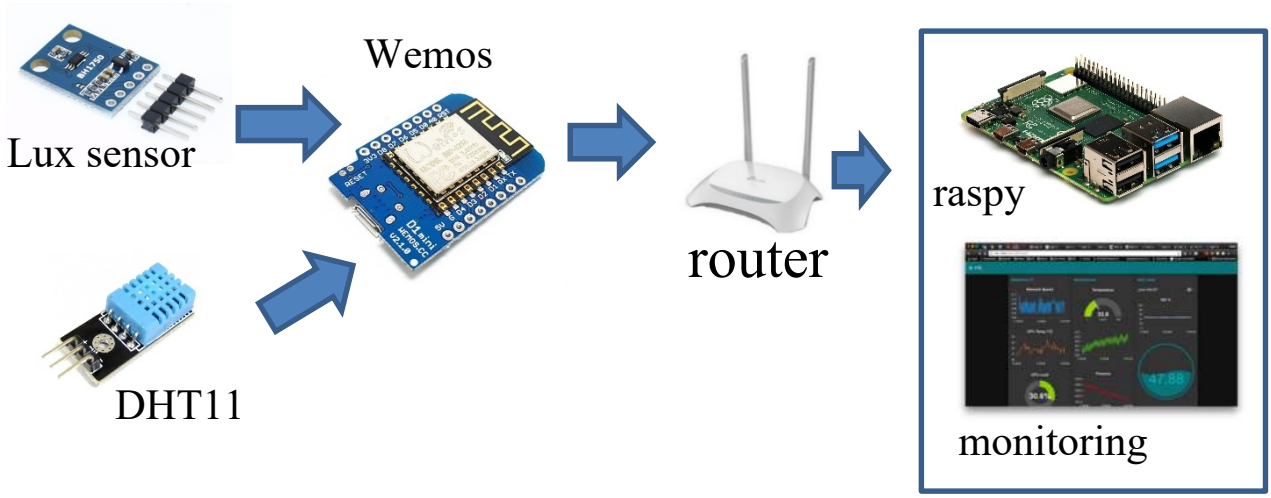

Figure 2. System block diagram of the device created

1.2. Software Design

The website is built using node-red software that has been installed on the cloud so that when building the website the computer / laptop used must be connected to the internet and access the IP cloud. The

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way to access nodered is to use an IP address with port 1880. Nodered is installed on the cloud server so that the access method uses the IP address of the server, namely 45.32.124.242. Development of a nodered website begins with structured connection of nodes. Nodered website developers must manage each node used. The nodes are configured with settings and some scripts in them. The script for this nodered uses the javascript programming language. At the planning stage, the website is designed with four website pages so that there are 4 (four) flows in the nodered website development. Figure 3 is a programming flowchart on the rasberry pi server using node-red.

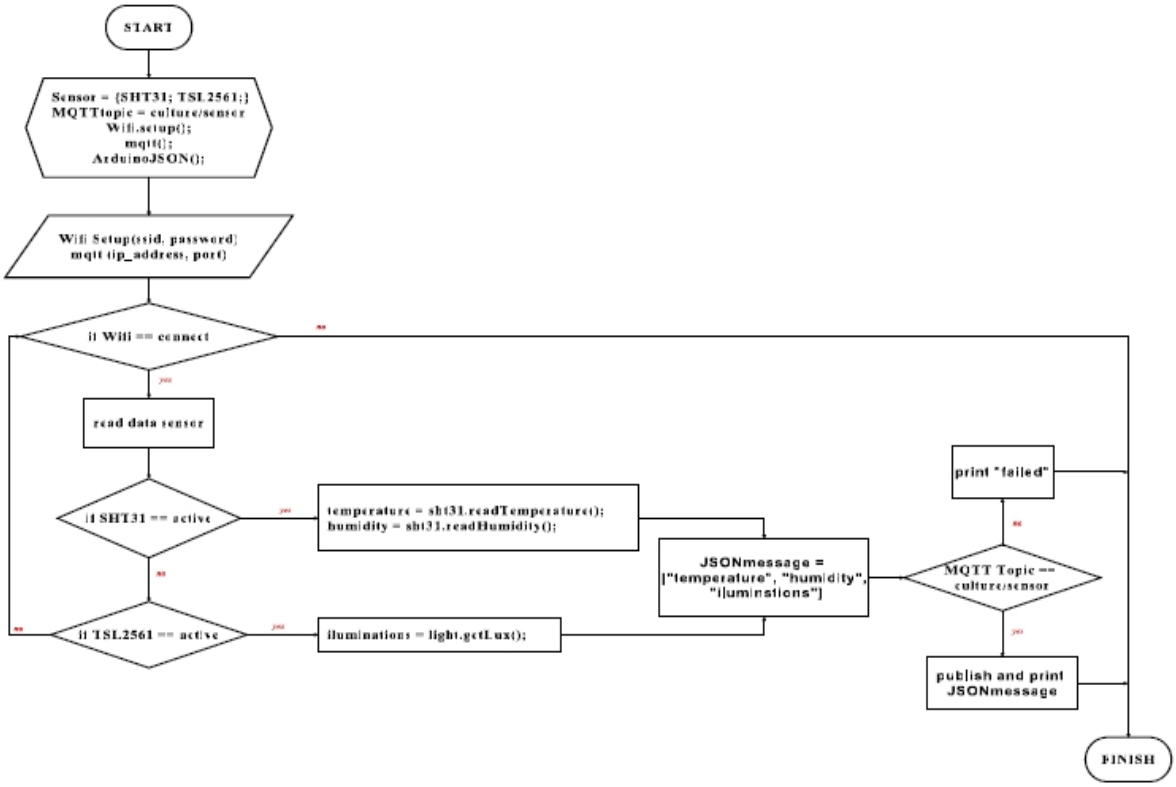

Figure 3. The programming flowchart on the rasberry pi server using node-red

The second is programming the Arduino IDE for microcontrollers. Wemos D1 Mini is used to access temperature, humidity and light intensity sensor data and then send it to the raspberry via a wifi network. Data transmission is carried out per 10 minutes. The programming flowchart for the microcontroller is shown in Figure 4.

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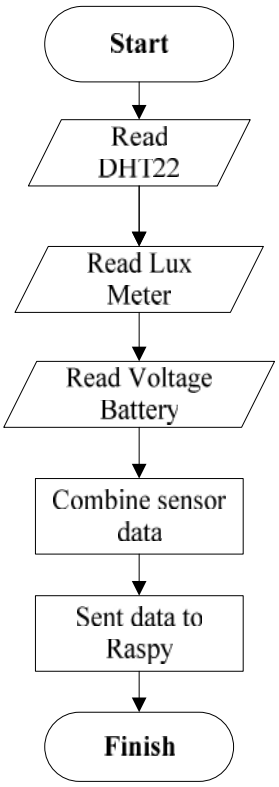

Figure 4. The programming flowchart for the microcontroller

2. Result and Discussion

2.1. System Realization

Power for the system using 2 batteries 85760 arranged in parallel. By using the balancer module, the battery can be recharged using a 5v usb charger. In addition to the electronic box which consists of several circuits, there are other parts that are related to and are still part of the electronic circuit, namely the sensor circuit. A sensor circuit like this consists of two slots as a place to place the sensor. This sensor circuit is connected directly with a cable to the i2c pin (SDA / SCL) of the microcontroller. The PCB design used in the device is shown in Figure 5. The battery box and electronic circuit are designed separately to make recharging the device easier. The sensor box is equipped with an indicator LED as a sign that the sensor is working or dead. Figure 6 is the result of the form of the device used for the monitoring system.

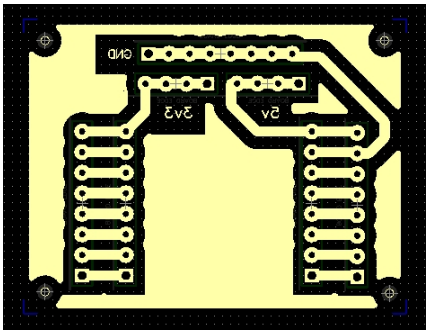

Figure 5. Design of Wemos D1 Mini PCB Shield

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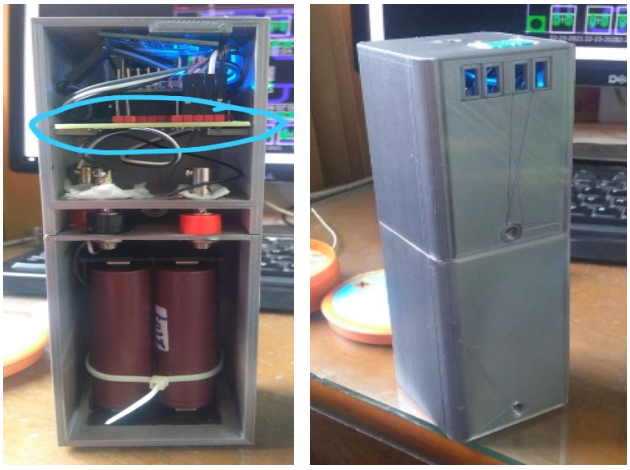

Figure 6. The form of the device used for the monitoring system**.**

In accordance with the planning stage for software, the website is designed with four website pages so that there are 4 (four) flows in the nodered website development. A series of nodered nodes that are made to design a website is described in Figure 7. The home menu flow contains the subscribe mqtt node which functions as a receiver for sensor data published by the microcontroller. This node is configured with the appropriate topic name in the Arduino program embedded in the microcontroller. In addition, there are output nodes that are used to display the data received and processed so that it becomes information that is easily understood by users. Output nodes can be gauge widget, chart, text, and template widget node for creating table views. The node configuration on the home menu is the main configuration for getting data to be stored in the database with the help of the database node so that the stored data can be used in data processing in other menus.

A series of nodes configured in such a way as to produce a website design that can be accessed by typing "IP_Address: port / ui" (45.32.124.242:1880/ui) in the browser url tab. This illumination standard is displayed with the aim of making it easier for users to compare the current level of illumination with the appropriate or different standards so that they can quickly perform treatment. At the bottom of the home menu there is a monitoring and controlling history table which can always be updated to find out details of changes in environmental conditions and control activities that have recently occurred.

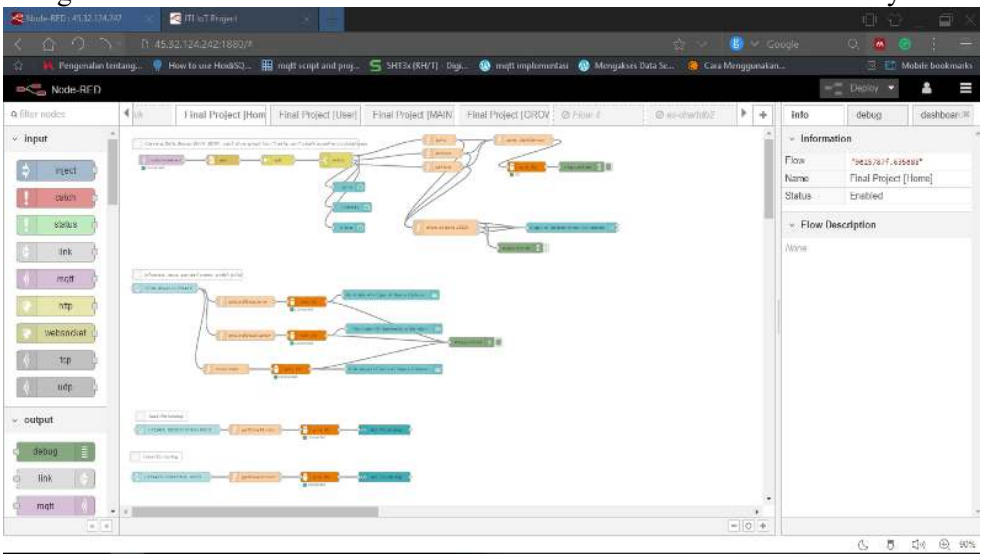

Figure 7. A series of nodered nodes that are created to design a website

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2.2. Testing result

Testing the accuracy of sensor readings is done by comparing the sensor reading value with the value shown by the measuring instrument. The measuring instrument used is the environment meter. Based on the test table 1 and 2 shows that the sensor readings of the three parameters, namely temperature, humidity, and illumination are quite accurate with a reading value that is not much different from the reading by the measuring instrument. The percentage error of the average temperature reading is 0.03%, the average humidity reading is 0.02%, and the average illumination reading is 0.07%.

Table 1. The sensor readings of the three parameters, namely temperature, humidity, and illumination

No	Temperatur (°C)			Humidity (%RH)			Iluminasi (Lux)		
	Sensor	Alat ukur	%error	Sensor	Alat ukur	%error	Sensor	Alat ukur	%error
1	30,48	31,3	0,03	77,10	76,2	0,01	201,89	165	0,18
2	30,48	31,3	0,03	77,29	75,2	0,03	308,28	265	0,14
3	30,47	31,5	0,03	76,79	76,6	0,00	388,86	403	0,04
4	30,51	31,7	0,04	77,33	75,5	0,02	503,22	442	0,12
5	30,52	31,9	0,04	77,09	74,3	0,04	608,14	608	0,00
6	30,54	31,7	0,04	77,08	74,1	0,04	703,14	683	0,03
7	30,57	31,5	0,03	77,14	75	0,03	797,6	806	0,01
8	30,55	31,4	0,03	76,28	74,8	0,02	900,04	885	0,02
9	30,55	31,4	0,03	76,14	74,4	0,02	1000,48	929	0,07
10	30,52	31,3	0,02	76,11	74,5	0,02	1099,84	1034	0,06
	Rata-rata error		0,03	Rata-rata error		0,02	Rata-rata error		0,07

Furthermore, realtime testing of sensor readings is carried out. This test aims to determine the length of time required to transmit data from the sensor to the website using the MQTT communication protocol. Figure 8 is a display when the monitoring application is run.

Table 2. Sensor data transmission time

Data ke-	Waktu Transmisi Data Sensor		
	Transmisi Time	Receive Time	Range Time
1	00:44:56.547	00:44:55.397	00:00:01:150
2	00:44:58.556	00:44:57.407	00:00:01:149
3	00:45:00.562	00:44:59.392	00:00:01:170
4	00:45:02.590	00:45:01.427	00:00:01:163
5	00:45:04.581	00:45:03.427	00:00:01:154
6	00:45:06.603	00:45:05.427	00:00:01:176
7	00:45:08.622	00:45:07.447	00:00:01:175
8	00:45:10.625	00:45:09.447	00:00:01:178
9	00:45:12.656	00:45:11.467	00:00:01.189
10	00:45:14.635	00:45:13.487	00:00:01.148

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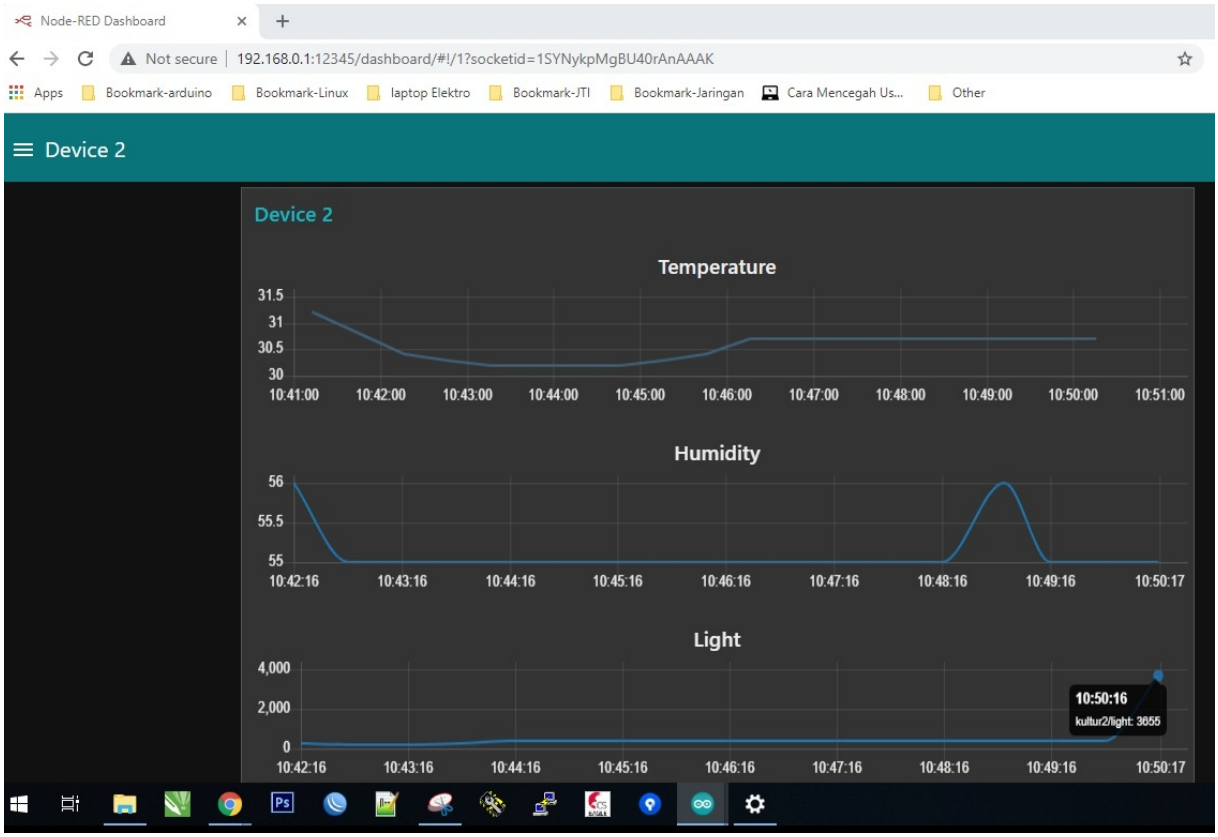

Figure 8. Display when the monitoring application is run

Based on the test, the percentage of monitoring system error is very minimal at 0.009%. For the precision of illumination, there is a TSL2561 sensor calibration process to adjust the brightness level of a given lamp with the current lighting conditions to match the standards inputted by the user. The fastest calibration time is +14 seconds and the slowest is +54 seconds. Based on the test, the lighting level other than the control lights in the room does not really matter.

3. Conclusion

The web-based monitoring and control tool has been successfully designed in prototype form. Device testing has been carried out with the end result that all website features are successfully running according to design. Sensor readings can be said to be accurate with a very small percentage error value, namely 0.03% for the temperature reading, 0.02% for the humidity reading, and 0.07% for the illumination reading. The data transmission speed between the software and hardware is quite fast, which is +1 second for sending sensor data to the website and + 1-2 seconds for the standard control action of the website's illumination against the lighting.

Acknowledgment

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Teleoperation System for v-Based Sterilization Robot

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Abstract. In December 2019, an outbreak of pneumonia of an unknown etiology emerged in Wuhan, China. A new coronavirus was identified as the cause, which has named 2019-nCoV by the World Health Organization (WHO). January 25, 2020, a total of 1975 cases have been confirmed nationwide with another 2684 cases suspected of being caused by 2019-nCoV / Covid-19. The case in Indonesia was first discovered on March 1, 2020. Based on a study on emerging cases, WHO equated prevention/crisis in the number of sufferers with Middle-East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). WHO confirms that human-to-human virus transmission can occur through droplets, contact, and fomites (the source of infection from inanimate objects). Fomites can be various objects that are touched in daily activities, such as door handles, train handles, chairs, tables, etc. So this research aims to present a solution by using robots for sterilization based on ultraviolet lamps. The robot is designed with a differential drive system and is connected to a computer via a telemetry device. An FPV camera is mounted on the front of the robot to aid operator vision for remote control. The output shows that the room sterilization process can be done remotely without the need for physical contact.

1. Introduction

December 2019 saw an outbreak of pneumonia of a previously unknown etiology in Wuhan, China. A new coronavirus was identified as the virus that causes it, which was later named 2019 by the World Health Organization (WHO). January 25, 2020, a total of 1975 cases have been confirmed nationwide with another 2684 cases suspected to be caused by 2019-nCov / Covid-19 [9]. On January 31, the first 2 cases of a novel coronavirus in Britain, [10] the first 2 cases in Russia, [11], and the first cases in Sweden and Spain were reported. Canada reports the 4th case. The case in Indonesia itself was first discovered on March 1, 2020, while currently, the cases found in Indonesia have reached 893 [12]. Looking at the emerging cases, WHO equates prevention/crisis in the number of sufferers with Middle-East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), human-to-human transmission occurs through droplets, contact, and fomites (sources of infection from inanimate objects) [1].

Fomites or sources of inanimate objects transmission are one of the 2019-nCoV transmission media, so this research aims to present a solution in the form of using robots for sterilization. The hope of this research can ensure that it does not fall into the Fomites category. Research on the use of robots for

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hazardous environments was carried out, among others, by [2] [3] [4] [5] [6]. Meanwhile, the type of robot used in this research is a type of robot with a differentiated drive as research conducted by [x] [8]. It's just that the front of the robot uses Omni wheels so that maneuvers can be done more flexibly.

The developed robot can be operated manually using a joystick. The robot is connected to a PC (Ground Station) operator using a 900MHz telemetry module. The robot is also equipped with an FPV Camera so that room images can also be accessed on the PC screen at the Ground Station. Based on the odometry system with a rotary encoder sensor mounted on the bottom of the robot, the robot can also be operated semi-automatically to perform sterilization evenly and sequentially in the room. So that the sterilization process is expected to be even and comprehensive, in the end, the spread through the 2019-nCoV fomites can be brought together.

2. Related Work

Mobile Robot is a type of robot with a wheel drive system that can be controlled manually or automatically[14], either wired or wirelessly [2]. Research conducted [2] [4] developed a teleoperation robot that is used for an unsafe environment (hazard), then a similar study was also conducted by [3] [6] [13]. The novelty of this research is a three-wheeled robot like the research conducted by [15] [8], the selection of this type aims to produce a more dynamic movement. However, with a special function to sterilize the room using UV at a low price with the title "Design of UV-Light-Based Room Sterilization Robot for Combating the Covid-19 Virus Outbreak"

AGV is a mobile robot that can move automatically[16] without using an operator. In its movement, AGV uses a depth camera as a sensor to read movement and direct it according to the user's wishes. The movement of the AGV is determined from the combination of sensor readings and a software program that will be implemented on an AGV drive which is usually a wheel or leg. In the manufacturing sector, AGV has been widely used in the distribution process. AGV has a function similar to lift-trucks, which is to deliver goods from a location to a specific location. The AGV used in this final project consists of 3 wheels, 2 front wheels act as driving wheels, and 1 rear wheel as turning wheels.

3. System Design

3.1. Hardware Design

The robot is designed with a differential drive system. The rear drive uses 2 PG36 motors. The front wheels of the robot use omni wheels to make it easier to maneuver the robot on uneven floors. The top of the robot is installed with a 38 Watt UV C lamp. This lamp uses a power supply from the battery which is then converted to AC voltage using an inverter. An FPV camera is installed on the front of the robot. This is to assist the operator in controlling the robot remotely. The design of the UV sterilizer robot that is made is shown in Figure 1.

To be able to control the actuator, an ATMega328 microcontroller is connected to the laptop. ATMega328 is an 8 bit microcontroller with a maximum clock of 16MHz. The microcontroller is responsible for translating the instruction data from the laptop to PWM pulses for 2 PG36 motors. BTS 7960 module is used as a PG36 motor driver. The sensor power supply and the driving motor use a 3S lipo battery respectively. For the microcontroller power supply using a 5v voltage derived from the 2S lipo battery. The microcontroller is connected to the PC using 433 MHz wireless telemetry. The schematic of the circuit used in the AGV is shown in Figure 2.

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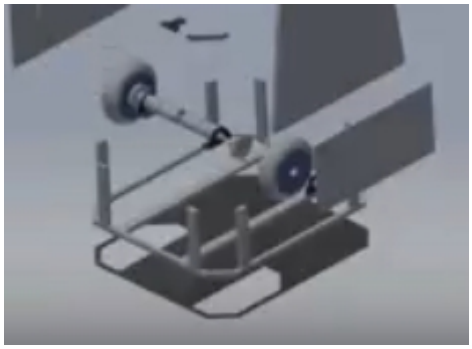

Figure 1. Robot design

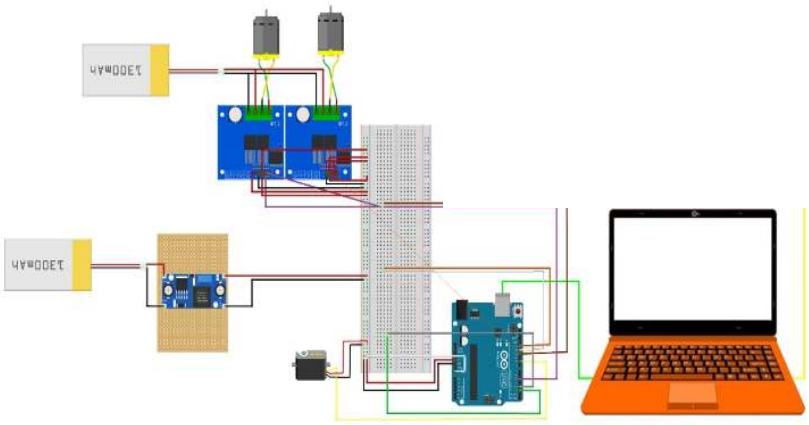

Figure 2. Diagram Block system

3.2. Software Design

There are 2 programming languages used in software design. The first is the use of Visual Basic for the GUI at the ground station. This GUI is used to control the robot wirelessly. Control is done by using the keyboard on the PC Ground Station. The design for the application is shown in Figure 3.

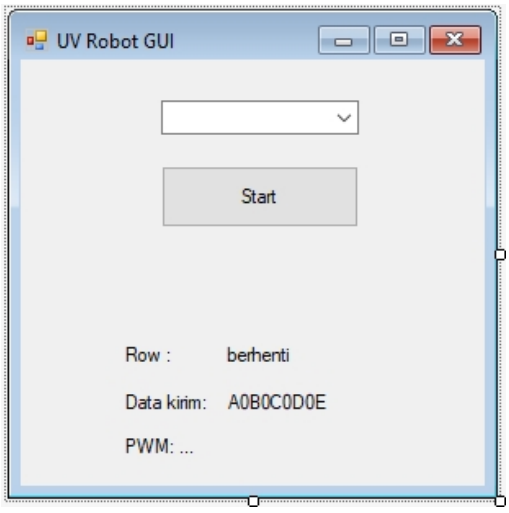

Figure 3 GUI for UV Robot

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The second is programming the Arduino IDE for microcontrollers. The microcontroller converts the data sent by the PC into PWM data for the servo and motor drivers. The data protocol sent by the PC is shown in Figure 4. The data is a combination of data on the direction of rotation and speed of the PG36 motor, as well as the condition of the UV lamp. If the value of the UV Relay status is 1, the UV lamp will turn on, and vice versa. Furthermore, the data is broken down into 5 variable values by the microcontroller. The programming flowchart for the microcontroller and PC is shown in Figure 5.

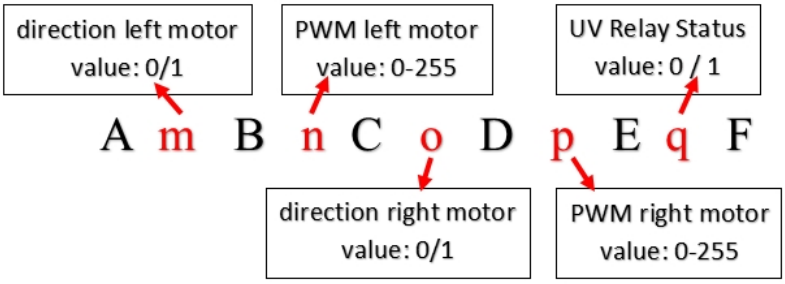

Figure 4. Data serial protocol

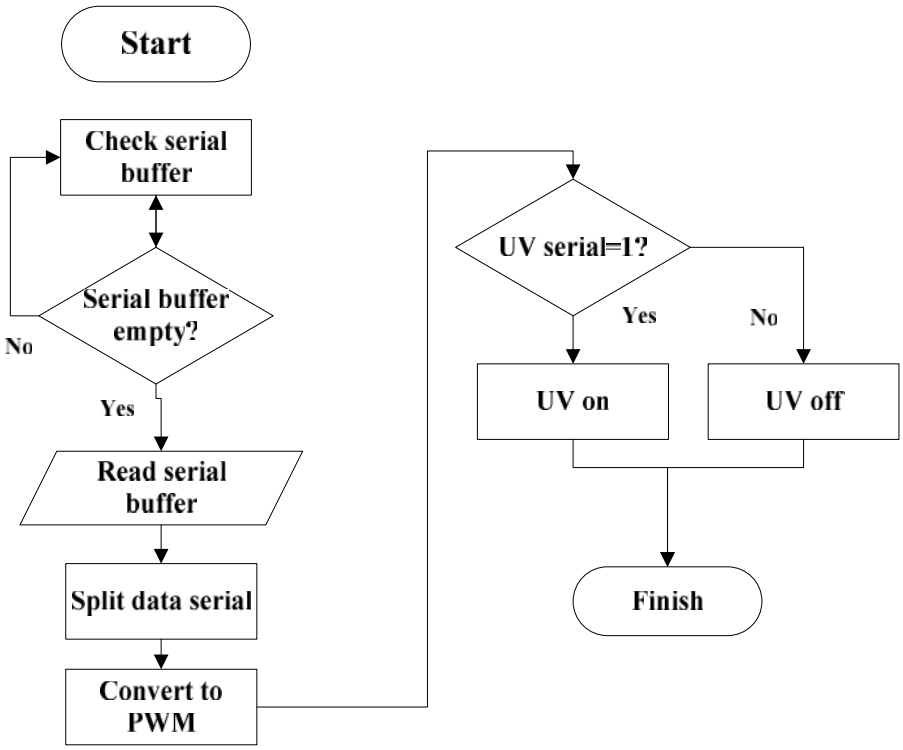

Figure 5 Flowchart System

4. Result and Discussion

4.1. System Realization

The front wheel of the robot uses omni wheels with a diameter of 15cm. While the rear uses 15cm diameter rubber wheels. The rear wheel is coupled to the motor directly using an 8 inch hub. This is so that the robot can maneuver on uneven floor areas. Figure 6 is a display of the realization of the robot body. The robot is designed to be able to carry an additional load of 15 kg. Robot material uses ACP so it is strong and light.

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The UV lamp is installed on the robot body which is made from ACP. The difference in speed of the left motor and the right motor will result in different robot maneuvering directions. FPV cameras can be accessed using the built-in Windows camera application facilities. The operator only needs to see the condition of the image displayed on the screen to control the robot. The button mapping for the control system is shown in table 1.

Figure 6. UV robot

Table 1. Keyboard mapping

Key	Function
Arrow Up	Move Forward
Arrow Down	Move Backward
Arrow Left	Turn Left
Arrow Right	Turn Right
Arrow Up+Left	Spin Left
Arrow Up+Right	Spin Right

4.2. Testing result

Testing is done by tracking objects in the laboratory. The track used for testing is shown in Figure 7. The test results show that the system can maneuver according to the trajectory passed. The normal walking speed of the robot is about 2 m / s. The longest distance between the operator and the robot during the test is 30 meters. The operator controls the robot from the room to avoid UV radiation which is harmful to the skin. Figure 8 is a display of the application when it is run. The power supply of the UV lamp in the form of a battery with a capacity of 7.2Ah can be used to operate for 15 minutes. Figure 9 is a collection of photos when the robot is tested.

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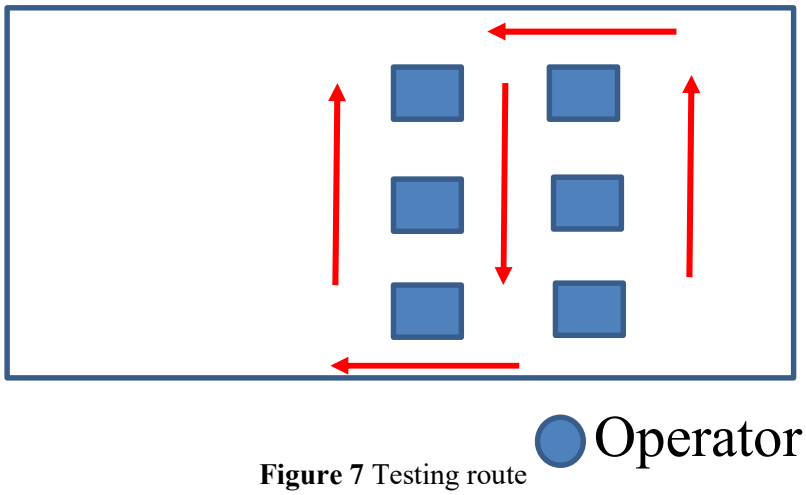

Figure 7 Testing route

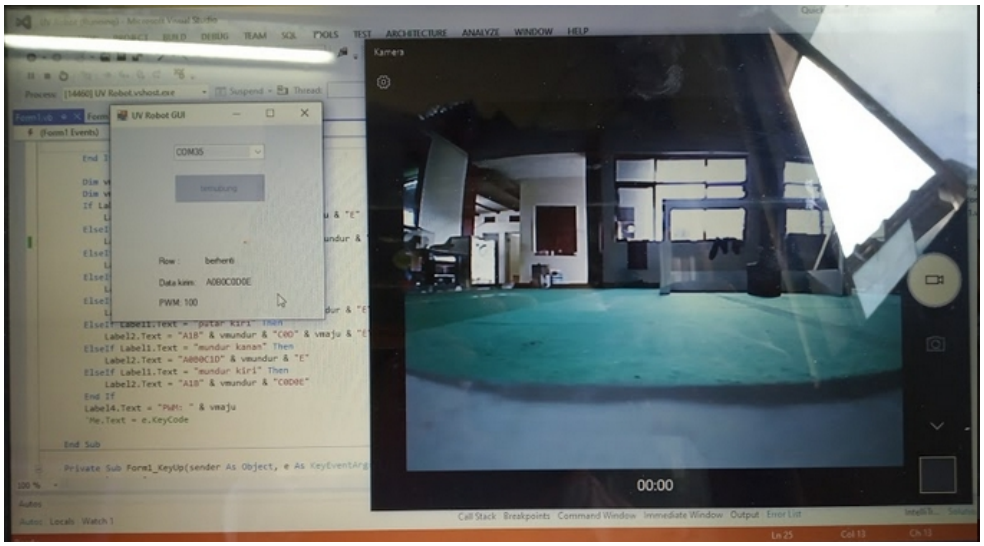

Figure 8 GUI view

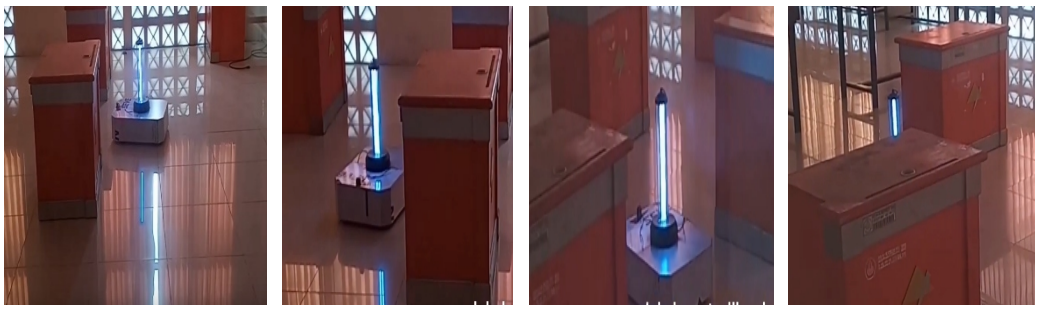

Figure 9 Testing condition

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5. Conclusion

The development of the Covid-19 pandemic has slowed things down. The imposition of social restrictions makes some activities impossible to do offline. In this research, a robot equipped with a UV lamp was successfully created. The robot can be operated wirelessly from a distance. The resulting system response shows the robot's performance can work well. In this case, the research output can be used to carry out UV lamp-based sterilization effectively.

Acknowledgment

The authors would like to acknowledge the financial support of this work by grants from PNBP, State Polytechnic of Jember. The author also thanked the P3M and Information Technology Department, State Polytechnic of Jember, which has provided support and assistance in completing this research.

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Contactless control system design for automatic guide vehicle (agv) based on depth camera

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Abstract. In early 2020, Chinese authorities announced news of an outbreak of a disease affecting the respiratory function. The outbreak came to the attention of the world community after in January 2020, health authorities in Wuhan City, Hubei Province, China, said there were patients who died after suffering from pneumonia caused by the virus. The new type of coronavirus that is attacking the world community today, in medical terms is called the 2019 Novel Coronavirus (2019-nCoV). In August 2020, Indonesia became the country with the highest death rate in Asia. However, to maintain economic stability, the government launched the New Normal activity. All activities can be carried out by implementing health protocols, including maintaining distance, washing hands and wearing masks. In the New Normal phase, several technologies are needed to prevent the spread of the virus. One of them is a contactless control technology. In this paper, a contactless control system for an Automatic Guide Vehicle (AGV) is developed. AGV is designed using a tricycle drive system and can be used to carry goods. Using a depth camera, the AGV is programmed to be able to follow human movements without marking or direct contact. The development of the system can be implemented in a broader field, such as supermarkets, airports, government offices, etc.

1. Introduction

In early 2020, Chinese authorities announced that there was an outbreak of a disease that attacks respiratory function. The outbreak came to the attention of the world community after in January 2020, health authorities in Wuhan City, Hubei Province, China, said there were patients who died after suffering pneumonia caused by the virus [1]. The new type of coronavirus currently attacking the world community is known in medical terms as the 2019 Novel Coronavirus (2019-nCoV) [2] [3]. The coronavirus is a type of virus that has been identified as the cause of respiratory disease, which was first detected in Wuhan City, China. The 2019-nCoV virus is known to have first appeared in an animal and seafood market, Wuhan City. It is reported that many patients suffering from respiratory problems are closely related to the animal and seafood market in Wuhan City. The first patient to fall ill with the 2019-nCoV virus was also known to be a trader in the market.

The disease outbreak caused by the 2019-nCoV virus is growing so rapidly that the WHO has categorized this outbreak as a pandemic [4]. In Indonesia, as of 24 March 2020, there were 686 patients who tested positive for the 2019-nCoV virus with 55 cases dying [5]. This made the government extend the disaster period of the Coronavirus outbreak until the end of May 2020 [6]. Various efforts have been made by the Indonesian government, such as: opening emergency hospitals, implementing social

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distancing, and preventing viruses by spraying massive disinfectants. Disinfectant spraying is carried out using the aid of a fire engine or using a spray device [7]. Spraying of disinfectant is carried out on public roads and public spaces.

With the rapid spread of the 2019-nCoV virus through droplets or direct contact, this study developed a contactless control system for wheeled robots. The robot is designed with a 3 wheel drive system[8]. Depth image sensors (depth sensors) are used to detect human positions. With the system created, the robot can be controlled to follow human movements[9]. The top of the robot can be used to carry goods thereby minimizing human contact with objects. The output of this research is expected to contribute to the handling of disease outbreaks caused by the 2019-nCoV virus.

2. Related Work

Research in the field of human-robot interaction includes research on humanlike motion robots [10]. Research in this area discusses how to control a manipulator robot so that it can move to mimic human movements. In 2010, Panagiotis K. and Kostas J.K. control the movement of the robotic arm using EMG signal processing attached to the human arm. In 2011, they perfected the research by using the regime-switching method so that control could be done in real-time. In addition to using EMG, controlling robot arm motion based on human movement can also be done using the stereo-vision method [11]. 2 cameras installed at a certain distance to produce 3-dimensional data from human hands. This data is then processed to move a robotic arm with 6 degrees of freedom. Further developments, after Microsoft released the Kinect RGB-D camera sensor in 2010, several researchers used it for gesture sensing systems [12][13][14]

Based on the use of sensors, motion-sensing systems are divided into 5 types: sensing using electric, optical, acoustic, magnetic, and mechanical sensors. Based on the types of objects that are recognized, motion-sensing systems are divided into 4 types: based on sensor location, illumination, objects and humans, and special needs. The results of the design of the motion itself consist of: dynamic/static motion, heterogeneous/homogeneous, 2D / 3D. With the development of the RGB-D camera sensor, motion sensing with output data in 3D can be done using only 1 sensor. Previously, motion detection based on image data had to use more than 1 camera.

AGV is a mobile robot that can move automatically without using an operator. In its movement, AGV uses a depth camera as a sensor to read movements and direct it according to the user's wishes. The movement of the AGV is determined from the combination of sensor readings and a software program that will be implemented on an AGV drive which is usually a wheel or leg. In the manufacturing sector, AGV has been widely used in the distribution process. AGV has a function similar to lift-trucks, which functions to deliver goods from a location to a specific location. The AGV used in this final project consists of 3 wheels, 2 front wheels act as driving wheels, and 1 rear wheel as turning wheels.

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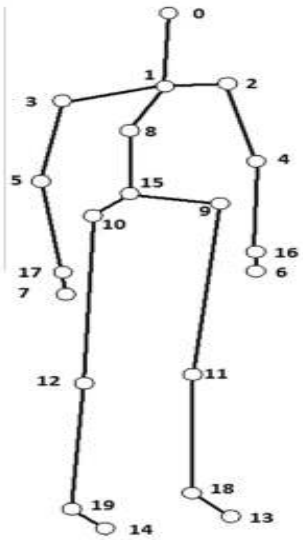

Figure 1 Skeleton data

3. System Design

3.1. Hardware Design

The robot is designed with a tricycle drive system. The front-drive uses 2 PG36 motors. For directional control, a standard servo with a torque of 25 kg is used. The Kinect sensor is installed on the robot's body in a position about 1m above the floor. This position is adjusted to the average human height (about 170cm). A laptop is installed at the bottom of the robot as the main controller. The AGV robot design is shown in Figure 2.

To be able to control the actuator, an ATMega328 microcontroller is connected to the laptop. ATMega328 is an 8-bit microcontroller with a maximum clock of 16MHz. The microcontroller is responsible for translating the instruction data from the laptop to PWM pulses for the PG36 servo and motor. BTS 7960 module is used as a PG36 motor driver. The sensor power supply and the driving motor use a 3S lipo battery respectively. For the microcontroller power supply using a 5v voltage derived from the 2S lipo battery. The microcontroller is connected to the PC using serial communication. The schematic of the circuit used in the AGV is shown in Figure 3.

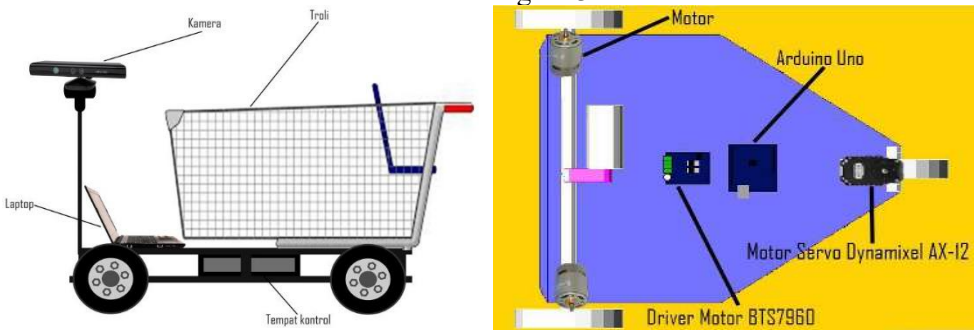

Figure 2. Robot design

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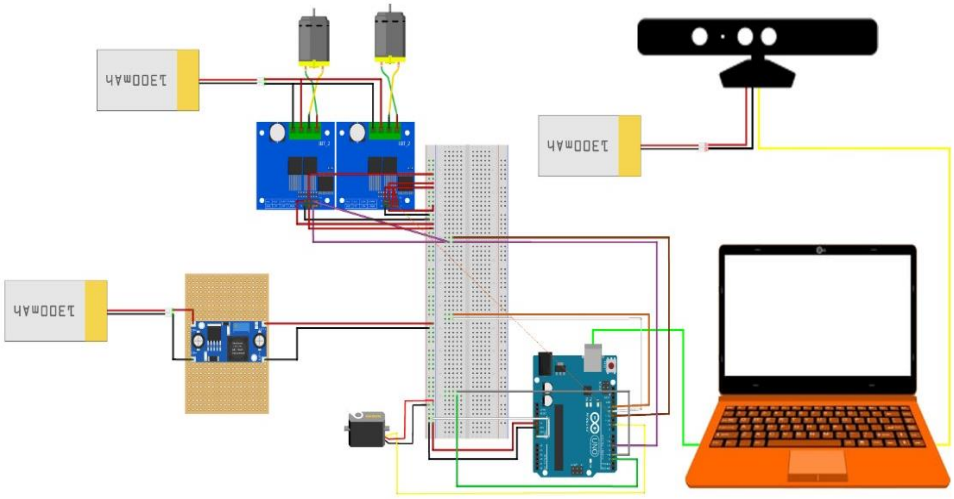

Figure 3. Diagram Block System

3.2. Software Design

There are 2 programming languages used in software design. The first is the use of Visual Basic for Kinect data processing. The Kinect sensor provides 3-dimensional coordinate data on each joint of the body. The coordinate data is in pixels (x, y) and centimeters (Z). In this study, the shoulder center joint point was used as the setpoint value. The data is then processed into the servo working angle and motor speed. The mockup design for the application is shown in Figure 3.

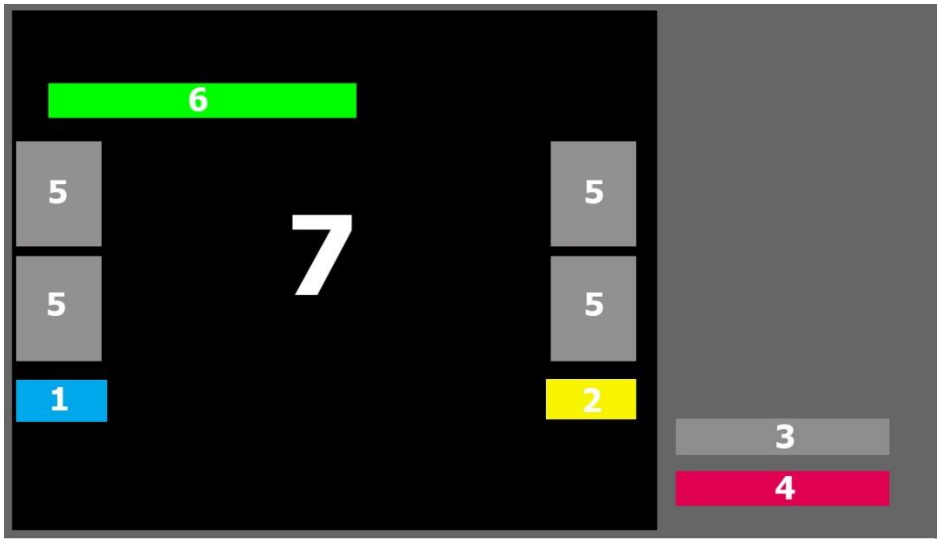

Figure 4 Mock-up GUI

The second is programming the Arduino IDE for microcontrollers. The microcontroller converts the data sent by the PC into PWM data for the servo and motor drivers. The data protocol sent by the PC is shown in Figure 5. The data is a combination of data on the direction of rotation and speed of the PG36 motor and the working angle of the servo. Furthermore, the data is broken down into 5 variable values by the microcontroller. The programming flowchart for the microcontroller and PC is shown in Figure 6.

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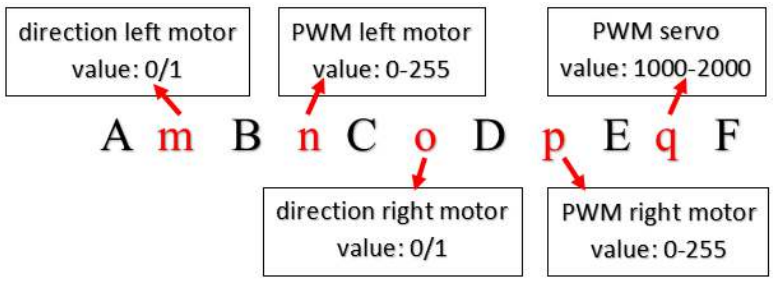

Figure 5. Serial data protocol

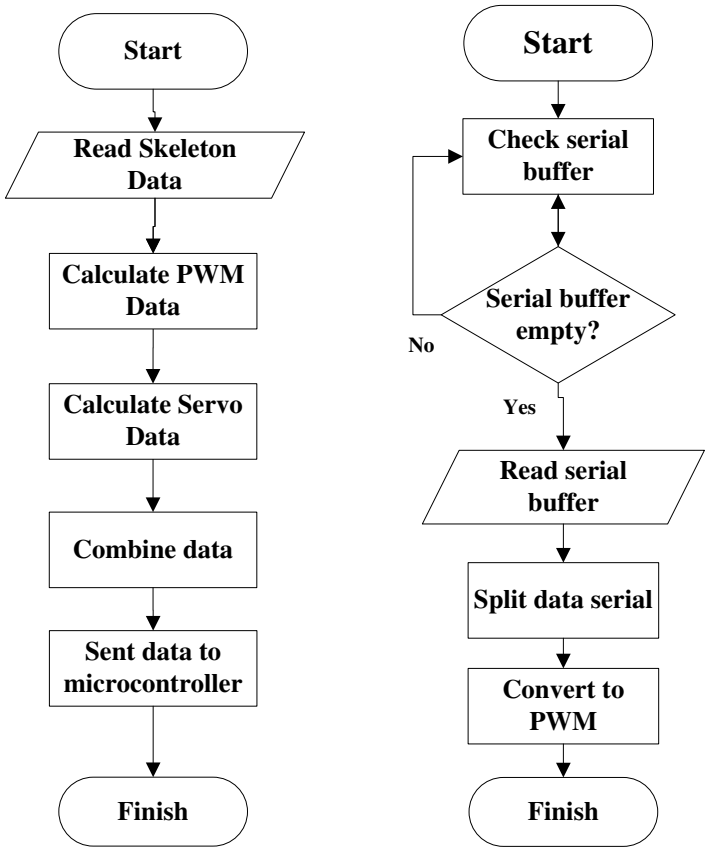

Figure 6 Flowchart system

4. Result and Discussion

4.1. System Realization

The front wheels of the robot use rubber wheels with a diameter of 15cm. While the rear uses 11cm diameter rubber wheels. The front wheels are coupled to the motor directly using an 8-inch hub. This is so that the robot can maneuver on uneven floor areas. Figure 7 is a display of the realization of the robot body.

The rear wheel is connected to the servo steering via a circular slider. The difference in the servo working angle will affect the direction of the motion of the robot. The servo working angle is influenced by the X coordinate value at the shoulder center. Convert the X coordinate value to the PWM servo value using equation 1. According to Figure 8, if the object's position is in area A, the servo will move

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clockwise. This will make the robot turn to the left proportional to the value of X. Conversely, if the object's position is in area B, the servo will move counterclockwise so that the robot turns right.

Meanwhile, the motor rotational speed is influenced by the Z coordinate value of the shoulder center. The Z coordinate represents the distance between the human object and the robot. The greater the Z value, the higher the motor rotational speed is proportional. This is so that the robot response can adjust according to the distance of the object being followed. Convert the Z value into the motor PWM value using equation 2.

$$\text{pwmServo} = \begin{cases} \frac{500}{320} * x + 1000, & x < 300; x > 340 \\ 1500, & 300 \leq x \leq 340 \end{cases} \quad \text{..... 1)}$$

$$\text{pwmMotor} = \begin{cases} \frac{255}{150} * (z - 100), & 100 \leq z \leq 250 \\ 0, & z \leq 100 \end{cases} \quad \text{.....2)}$$

Figure 7. Robot Hardware

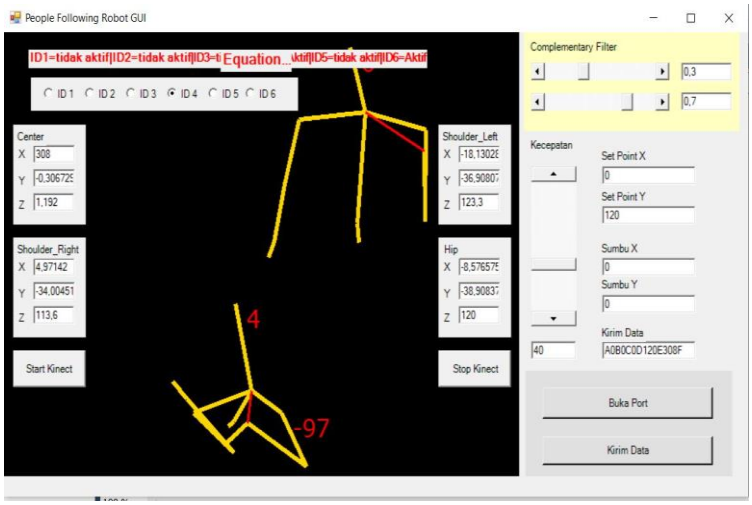

Figure 8. Depth Image Processing

4.2. Testing result

Testing is done by tracking objects on a certain path. The path used for testing is shown in Figure 9. The test results show that the system can follow the movement of human objects according to the trajectory passed. According to the sensor capability, the robot can track objects with a maximum distance of 3 meters. Table 1 and Table 2 are the results of robot testing according to the test path. Sensor recognition response speed based on the distance of the robot to the object. The shorter the distance of the robot to the object, the faster the initial recognition time. The tracking system can keep up with the speed of movement of human objects under normal running conditions. Normal walking speed is about 1.6 m/s.

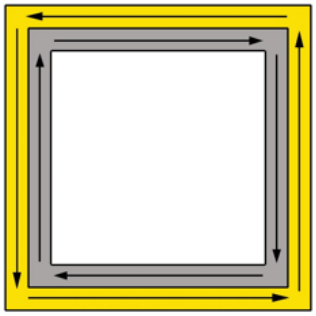

Figure 9. Testing Route

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Table 1. Tracking Test

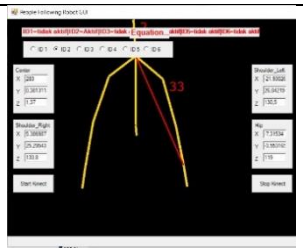
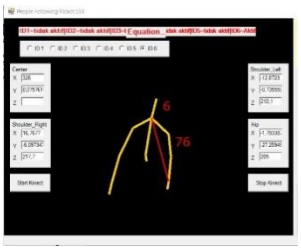
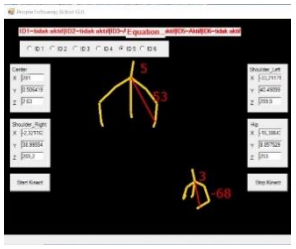
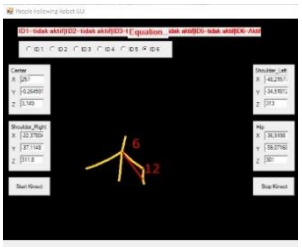
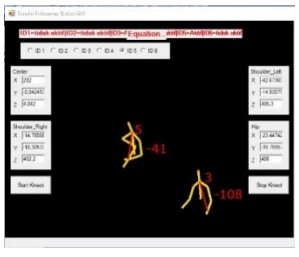
Testing number	Position Object	Image Procession Result	Delay Response	Information
1			6,27 second	Success
2			3,42 second	Success
3			5,44 second	Success
4			2,11 second	Success
5			5,23 second	Success

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Table 2. Response test

Testing Number	Distance for moving objects	Object Following Accuracy	Time moving	Information
1	10 Meter	Move accurately	15 second	Success
2	11 meter	Move accurately	17 second	Success
3	12 meter	Move accurately	20 second	Success
4	13 meter	Move accurately	21 second	Success
5	14 meter	Move accurately	23 second	Success

5. Conclusion

Contactless control system design for automatic guide vehicle (agv) based on depth camera are already presented on this paper. Based on testing, the system can work properly for tracking human objects. It's just that the performance response needs to be improved. In addition, the Kinect sensor has a low level of recognition when working outdoors with direct sun exposure. Therefore, this system is suitable for use in rooms with adequate lighting systems. Subsequent research is focused on adding robotic features to recognize obstacles in the environment while tracking.

Acknowledgment

The authors would like to acknowledge the financial support of this work by grants from PNBP, State Polytechnic of Jember. The author also thanked the P3M and Information Technology Department, State Polytechnic of Jember, which has provided support and assistance in completing this research.

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Implementation of the Web Scraping as Extract-Transform-Load (ETL) Module in the Data Warehouse Simulator

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Abstract. Data and information are the main assets in an organization. Especially when the data is very fast, it causes the demand for information to also increase. This phenomenon must be anticipated by the organization, because by paying attention to proper data growth it can increase the organization's profits. However, it takes a different architecture from conventional databases to store this kind of data. This storage architecture is called the Data Warehouse. One of the important Data Warehouse components is the Extract Transform Load (ETL) section. The purpose of ETL is to collect, filter, process and combine relevant data from various sources for storage into a data warehouse. In this paper, we propose a simple ETL model that uses web scraping technique for data retrieval. Web scraping are techniques that have been used to collect data from web sites. Its reliability in data collection, as well as its accuracy in sorting data makes it the right model for the ETL process. However, there are still some adjustments that must be made so that the desired data can be obtained. Among other things, the accuracy in sorting HTML elements and knowledge of finding the exact location of the desired data.

1. Introduction

Data and information are the main assets in an organization [1]. Especially when the data is very fast, it causes the demand for information to also increase. Information that used to be conveyed once a day through newspapers became obsolete when online news portals emerged, where new information could appear in minutes or even seconds. This phenomenon must be anticipated by the organization, because by paying attention to proper data growth it can increase the organization's profits. Data that has a rapid growth rate, with various data type and a large size is called Big Data [2].

Based on this definition, big data is not only data with a very large size but also has characteristics such as very diverse data types and very high growth rates and frequency of changes. In terms of variety of data, big data does not only consist of structured data such as numeric data and rows of letters originating from database systems in general such as financial database systems but also consists of multimedia data such as text data, voice data, and video which is known as unstructured data. That's why it takes a different architecture from conventional databases to store it. This storage architecture is called the Data Warehouse.

Data Warehouse (DW) is a data storage system used for reporting and data analysis. DW is considered to be a core component of business intelligence [3]. DW is an integrated data centre repository that has one or more different sources. Today, the internet is the most affordable source of data for an organization. One of the important DW components is the Extract Transform Load (ETL) section.

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Extract Transform Load (ETL) is a set of processes that must be followed in the formation of a data warehouse. Extract is the process of selecting and retrieving data from one or more sources and reading / accessing the selected data [4]. Transform is cleaning and transforming data from the original form into a form that suits the needs of the data warehouse, and Load is the process of entering data into the final target, namely into the data warehouse. The purpose of ETL is to collect, filter, process and combine relevant data from various sources for storage into a data warehouse [5]. However, how to describe the ETL process in a Data Warehouse simulator. How can a complex process be presented with a simple and understandable concept?

In this paper, we propose a simple ETL model that uses web scraping for data retrieval. Web scraping is the process of extracting data from a website. Web scraping is done using web scrapers, bots, web spiders, or web crawlers. A web scraper itself is a program that enters a website page, downloads its content, extracts data from the content, and saves data into a single file or database. Thus, it is hoped that the application of this web scraping method can describe the ETL process before the data is stored on DW.

2. Related Works

The attention of researchers to the ETL phase in the Data Warehouse process is very high. This is evidenced by several studies that specifically discuss this process. Some of them are research on resource optimization in the ETL process [6]. As is well known, the ETL (Extract-Transform-Load) process is responsible for integrating data into a place called a data warehouse. However, ETL is also a long and costly step in the use of IT and human resources. This research proposes an approach to facilitate ETL implementation, namely by using a cloud computing infrastructure with "unlimited" computing and storage resources. The result is the use of parallelization techniques such as MapReduce and relies on the classic ETL approach. However, with the solutions already offered, data integration problems in the big data environment still arise. Apart from that, the ETL module also has to deal with heterogeneity of data formats and structures.

Next there is also research on methods for modelling and organizing the ETL [7]. At the start of the DW project, one of the most important tasks was building the conceptual design of the ETL process. Several solutions have been proposed to support ETL designers in the process. One of them is a method for modelling and managing ETL processes based on real-world experiences. The proposed approach requires four inputs and generates a conceptual model of the ETL process using a graphical notation framework called KANTARA. However, there is still not a complete explanation regarding the use of the framework.

From these studies, it can be concluded that ETL process modelling is very important. This is due not only to the many methods that can be used in the modelling, so we must know how to choose the best method. But also, because the modelling process is important to determine the amount of resources and costs that will be used in the ETL process.

3. Methodology

Broadly speaking, the ETL process begins with extracting data from the data source, followed by changing the data that has been obtained and then uploading it to the storage media. To describe these three processes, the web scraping method will also be divided into three parts. The first part is represented by a spider bot that takes data from several online buying and selling sites. The second part is represented by a program module that is tasked with cleaning up data that has been obtained from online buying and selling sites as well as separating the data needed from those that are not. The third part is a module in charge of entering data into the database, as illustrated in Figure 1.

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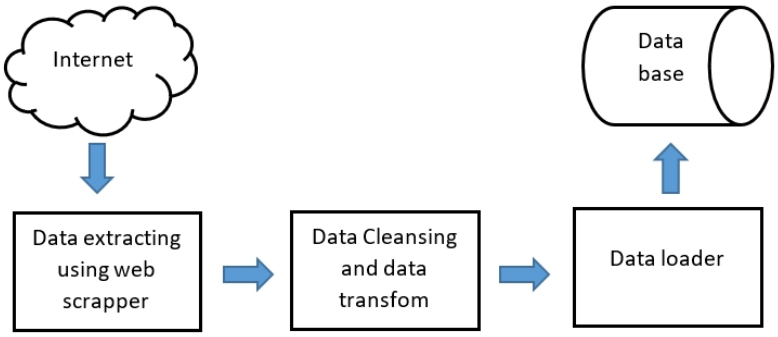

Figure 1. System Block Diagram

The web scraper used in this module is scrapy. Scrapy is a framework used for crawling and extracting structured data. Scrapy is used in data mining, information processing and history archiving. Scrapy is built using python which is twisted supported.

The data obtained through the scraping process will enter the cleansing and transformation stages. In the cleansing stage, the data is cleaned from the html code which is taken during the scraping process. Then the clean data are grouped by title, old price, new price, discount, cashback, url and product image. After that, the clean and grouped data are stored in a database that has been provided.

The data used in this paper is information on electronic products from online buying and selling sites https://kliknklik.com and https://eraspace.com/erafone. The data taken from the two sites is in the form of item name, initial price, price after getting a discount, cashback, discount, url and image url. The initial price is used here as a reference for the original price so that buyers know the price before getting a discount. Item url will be used as a direct link if the user wants to see details or is interested in the item. Image url is used as display picture for user.

The method used in web scraping is the Xpath selector [8]. The use of the Xpath selector here is recommended because it has better accuracy in the data scraping process. In addition, the Xpath selector is easier to use, that is, it is enough to specify the location of items with unique attributes. This is very useful for online buying and selling sites that have different layouts for item arrangement.

4. Results and Discussion

The building of a crawler bot starts from finding the Xpath location of the items needed at each of the online stores that have been mentioned. To determine of Xpath location, we use syntax and unique attributes which found in the online store web page source. As shown in Figure 2, in order to retrieve the desired item, details of the location of the item stored must be obtained. This is done by inspecting the desired item's html element. After the location of the desired item has been obtained, it can be converted into its Xpath form.

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Figure 2. Inspect element on source page

The item name of the item in Erafone is in the syntax image with the unique attribute class = "photo image" so that writing the Xpath can be written as follows. Figure 3 shows the syntax that functions as a product image extractor. The syntax tells the spider bot the location of the product image, so that it can go to that location and copy the product image.

```
'.//img[@class="photo image"]/@alt'
```

Figure 3. Xpath of the image element on Erafone page

Meanwhile, the item name item in Kliknklik is located in the syntax a with the unique attribute class = "product-name" so that the writing of Xpath is almost similar to Erafone, only with different unique attributes. Figure 4 shows the syntax that functions as a product name taker. Just like before, the syntax tells the spider bot the location of the product image, so that it can go to that location and retrieve the product name. however, because the element that holds the image and product name is different, an html "a" tag must be added. when viewed from the source tag, this also indicates that the product name taken is actually a hyperlink.

```
'.//a[@class="product-name"]/@title'
```

Figure 4. Xpath element of the product link

The use of "point" at the beginning of Xpath is to retrieve all similar items on one online shop page. Followed by a double slash to ignore all syntax before Erafone's img syntax and before a on click. @alt and @title are intended for extracting contents from the @title and alt attributes. After the Xpath location of the desired item is known, and has been embedded in the spider bot for each online buying and selling site, the web scraping process can be run via the command prompt in python.

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Figure 5. Scraping process

The process of scraping data from an online store that has been running is shown in Figure 5. In the scraping process, some data is taken, namely the name of the item, the initial price, the price after getting a discount, cashback, discount, url and image url. Every time scraping data, the author uses a different bot, this is because the Xpath location is different in each store. So, every bot that has been created has a special role for scraping data from only one online store.

The result of the scraping process is a list of item names, initial prices, prices after getting a discount, cashback, discount, url and image url. The list is then stored in a MySQL data base. From the data that has been obtained, most of the targeted items can be retrieved from the source website. however, some records were incomplete. This is caused by several things. first, not all items have content. for example, not all items displayed on the web site have a discount, so for some discount item records have no data. second, not all data have the same format, some have one image for one product, but some have 3 images for one product. This causes the data collected is not uniform in terms of the amount of data. Third, there are several products that have different data types, such as video for example. however, only some of them have the video, so this also causes the missing item to be captured.

By obtaining data from two online buying and selling web sites, web scraping techniques are proven to be used as a model for the ETL process in the data warehouse. Despite the incomplete data collected, web scraping is able to show three main processes in ETL. For the Extraction process, web scraping is proven to be able to retrieve data from a web site, even though the web site does not have the means for data access. In the transformation process, data mixed with html tags can be cleaned so that they match the format required by the database. And for the Load process, the data obtained from web scraping can be proven to be stored in the MySQL database that was previously created.

5. Conclusions

ETL is a process that must be carried out in every data warehouse system. ETL is in charge of preparing data in such a way that it is suitable for storage in a data warehouse. So, ETL modelling is very important to do in order to get a better understanding of the process.

Web scraping techniques are techniques that have been used to collect data from web sites. Its reliability in data collection, as well as its accuracy in sorting data makes it the right model for the ETL process. However, there are still some adjustments that must be made so that the desired data can be obtained. Among other things, the accuracy in sorting HTML elements and knowledge of finding the exact location of the desired data.

The basic problems that need to be resolved are the handling of empty data and problems in the storage area. Where there are some data that do not match the fields that have been prepared. For this problem, a NoSQL database that is capable of storing unstructured data is proposed.

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Differential-Drive Wheeled Robot Controller using Pulse-Width modulation in disinfectant sprayer robot

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Abstract. This paper describes dc motor control in disinfectant spraying robots using Pulse Width Modulation (PWM) applied to Koesnadi hospital in Bondowoso, East Java as a tool to help sterilize hospital building hallways during the COVID-19 pandemic. Differential drive wheel with caster wheel combination. The robot has a size of *L x W x H: 40 cm x 40 cm x 120 cm* moves at a set speed to get even spraying results, but that speed becomes unstable due to the linearly changing load of the disinfectant tube. Using PWM is expected to produce different robot speeds according to the load conditions carried by the robot. The Arduino Nano microcontroller as the main controller is used to manage pwm signal cycles as a reference for robot speed when performing disinfectant spraying tasks. The application of PWM to the disinfectant atomizer robot is explained by calculating the estimated time and speed with the observation of the reduction of load conditions on the robot.

1. Introduction

On December 31, 2019, the WHO China Country Office reported a case of pneumonia the etiology is unknown in Wuhan City, Hubei Province, China. On January 7, 2020, China, which identified pneumonia of unknown etiology as a new type coronavirus (novel coronavirus, 2019-nCoV). Additional cases for the number of 2019-nCoV / COVID-19 took place quite quickly and there has been a spread outside the Wuhan area and other countries [1]. On April 19, 2020, WHO reported that the number of cases globally was 2,241,778 people confirmed as COVID-19 [3]. With reports of confirmed cases of COVID-19 in Indonesia on that date, it was 6,248 with a death toll of 535, even though it was reported that on March 24, 2020 there were 579 patients who tested positive for COVID-19 with 49 cases died [3] [2]. With an increase in the number of confirmed cases, this shows the spread of this virus is very fast in several ways, one of which is the spread of this virus by touching the surface of objects that have been contaminated by this virus. This virus can survive on the surface of the object for up to 72 hours [4]. In the study of persistence of the COVID-19 virus on different surfaces show that the COVID-19 virus remained viable up to 1 day on cloth and wood, up to 2 days on glass, 4 days on stainless steel and plastic, and up to 7 days on the outer layerof a medical mask. Another study found that the COVID-19 virus survived 4 hours on copper, 24 hours on cardboard and up to 72 hours on plastic and stainless steel [8]. In addition, virus carriers that produce droplets through coughing, sneezing and talking can transmit

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directly or fall on the surface of objects which are then touched by other people [4]. One of the recommendations of the Centers for Disease Control and Prevention (CDC) is to clean and disinfect the surface of objects once a day, assuming that one person will eat with the outside world in various ways, one of which is the person who leaves and returns with bring goods in [4]. In this study, a wheeled robot was developed for disinfecting which was assigned to dr. Koesnadi Hospital in Bondowoso, East Java. The robot is designed with a 2 wheel drive system. Pulse Width Modulation (PWM) is used to help regulate the movement of the robot against the loads carried by the robot. With the system created, the robot can be controlled to adjust the movement speed of the robot to the heavy load conditions in the form of disinfectant liquid which is in line with the spraying carried out by the robot. Sprayer parts are made on both sides of the robot with 3 spray points each which aim to collect evenly to the object. In addition, the robot is also installed with an ultrasonic sensor to prevent the robot from crashing when. The output of this research is expected to contribute to the spread of disease outbreaks caused by the 2019-nCoV.

2. Related Work

Research in the robots for disinfectant spraying has been carried out, one of which is study conducted for disinfectant for livestock breeding (Feng, 2019; Wang, 2019). Study in this area discusses automatic robots consisting of a vehicle unit, a disinfectant spraying unit, a monitoring unit, and a controller unit, and supported automatic and remote operation. In this study a crawler robot was adopted as the carrier for the robot, and it could move along the line marked with the magnet and RFID label on the ground. A sprayer with gas-liquid extraneous mixture structure was developed to meet the need for the high-flow and long-range spray. the research show in the constant air speed, the droplet diameter was mainly determined by the liquid flux, and less affected by the spray distance. With the in-crease of liquid flux, the droplet diameter would get bigger. In year 2018, Priyanka K. and Mariyammal A. study on DC motor rotation control using Pulse Width Modulation (PWM) to demonstrate precise and accurate control of small DC motors. One of the results of this study is the speed will be in constant at different loads. In year 2016, Chery Mint and Nu Nu Win conduct to research mobile robot motion task is point to point motion task in an obstacle free indoor environment. The aim of this research is to reduce position error of two wheeled differential robot when the robot moves from one point to other point. This study mainly focused on the navigation system of two wheeled differential robot. The result of two wheeled differential robot navigation system can be used for mining application by moving from point to other point in desired distance and direction in order to find the dangerous mine if the robot control system is very robust. And then these mobile robot can be also candidates for farming applications, as well as for transportation in nuclear plants and factories [7].

3. System Design

3.1. Hardware Design

Robot is designed with dimensions of length = 40 cm, width = 40 cm and height = 120 cm using a two wheeled differential drive system. The rear drive uses 2 PG36 motors and is combined with caster wheels for the front wheels. The ultrasonic sensor is installed on the front of the robot with the height adjusted to the maximum average height of the human touch surface (about 120 cm). Disinfectant liquid tube is installed at the base of the robot with 6 liters disinfectant capacity. Robot design shown in figure1. For controlling the robot use a microcontroller based on ATMega328 that connected to all input and output devices on the robot. ATMega328 is an 8 bit microcontroller with a maximum clock of 16MHz. Microcontroller will translate the instruction data from the computer to the PG36 motor in a (pulse width modulation) PWM pulse value, while the BTS 7960 Module is a PG36 motor driver module that converts pwm into motor rotation. For microcontroller power supply using a 12 Volt Li-Po battery. The schematic of the circuit used in this robot shown in Figure 2.

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Figure 1. Robot Design

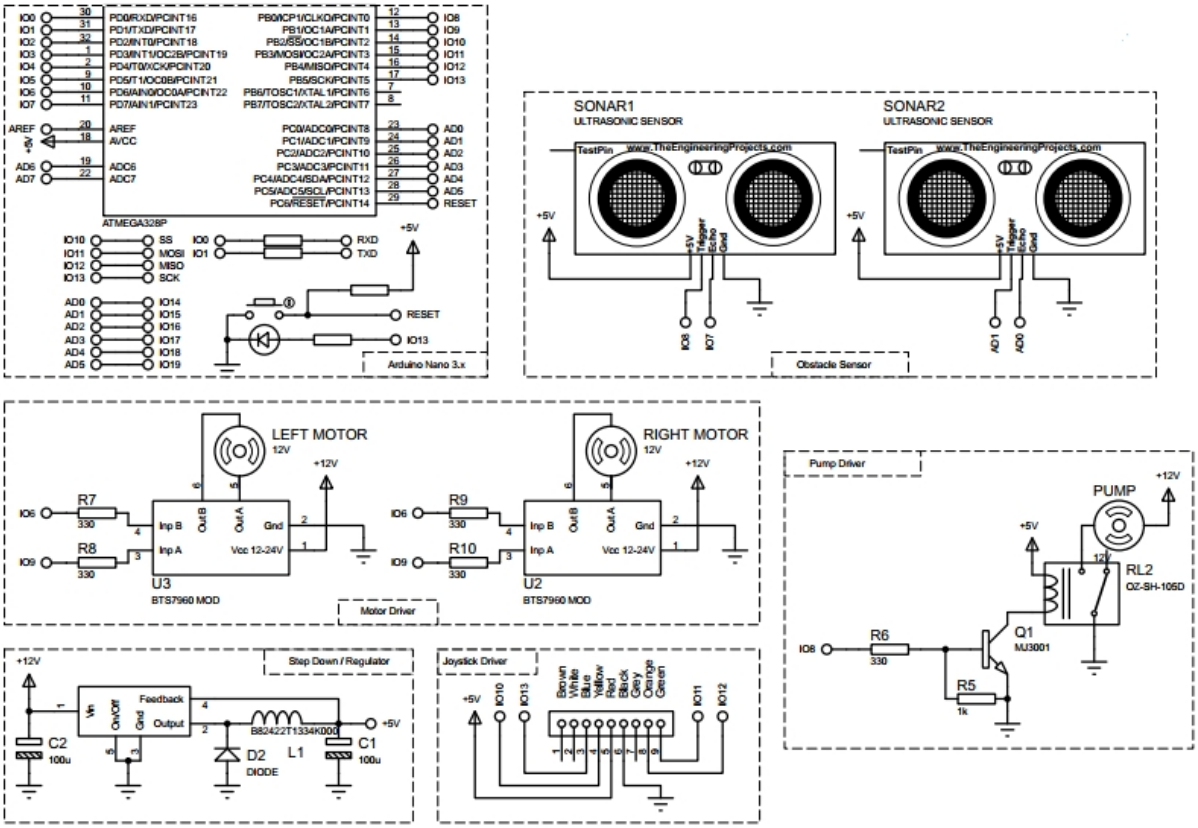

Figure 2. Robot scheme disinfectant sprayer

3.2. Software Design

Programming language in this research used arduino for robot control. The microcontroller receives data from the transmitter by Bluetooth communication, the received pulses are managed to control the DC 12V water pump and the PG-36 DC motor. The ultrasonic sensor sends a signal to the Arduino Nano to notify you if there are objects in front of the robot that can block movement. The system block is shown in Figure 3

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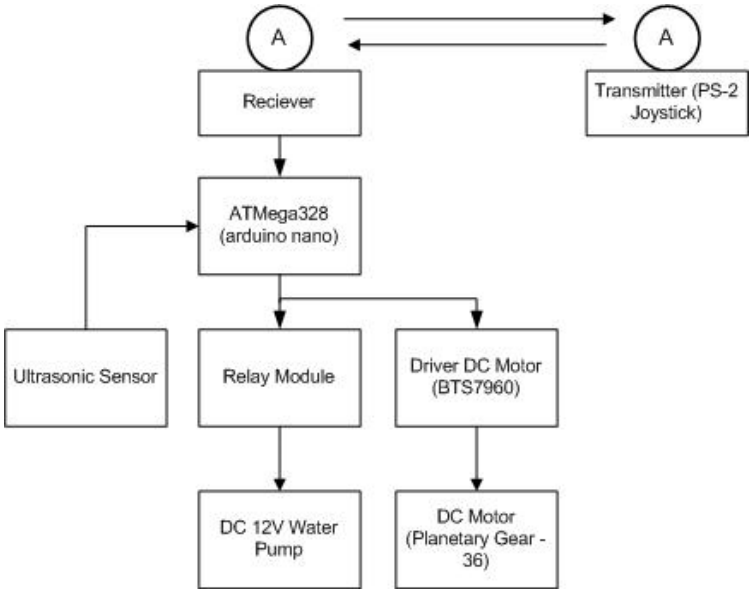

Figure 3. Block Diagram

One of the microcontrollers function is converting the data into PWM data for DC motor driver as the main driver and managing the PWM signal work cycle. Data protocol sent by the joystick controller is shown in Figure 4. The data is a combination of data from the direction of rotation and speed of the PG36 motor. Furthermore, the data is broken down into 4 variable values by the microcontroller.

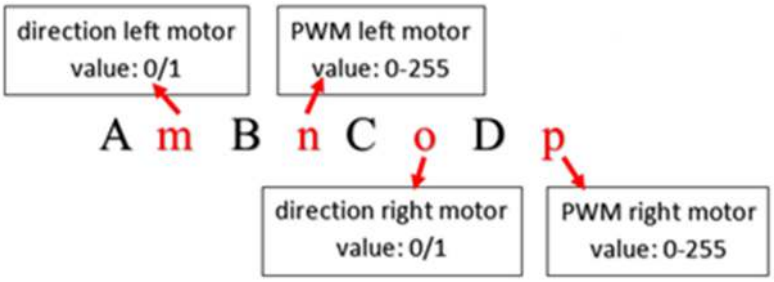

Figure 4. DC motor speed and direction data

PWM is a modulation technique used to encode a message into a pulsing signal by changing the duty cycle with fixed amplitude and frequency values. A pulse cycle is a high condition then it is in the transition zone to a low condition. PWM disinfectant sprayer in this robot using ON dan OFF technique with frequency of 1 KHz with equations:

$$T = \frac{1}{f}$$

$$duty\ cycle = \frac{t}{T} x\ 100\%$$

Where:
T = Signal period
f = Frequency
t = Pulse time

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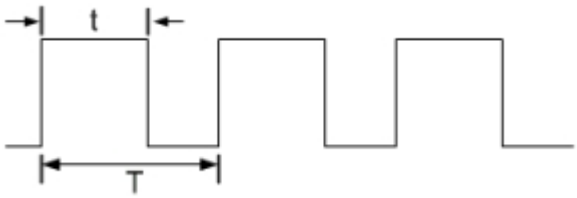

Figure 6. PWM signal

4. Result and Discussion

4.1. System Realization

Robot driving wheels use rubber wheels with diameter of 12 cm and the front uses canister wheels with a diameter of 8 cm. On figure 7 is a display of the results of the realization of the robot body when testing. The rear wheel is the driving wheel connected to the PG36 DC motor rotating based on the PWM value generated from the potentiometer rotation. The potentiometer produces analog data to be sent via Bluetooth communication and used as a parameter to regulate the duty cycle. More bigger potentiometer value produced, the faster the DC motor rotation. In the conversion in the duty cycle, if more bigger duty cycle or the so-called "high" state in one duty cycle period, then the motor rotation will be faster and applies to the reverse for the "low" state.

Figure 7. Robot when testing

4.2. Testing result

Testing activity in this research is carried out by running the robot running straight with a different weight of disinfectant fluid load. The track used for testing is walking straight at a distance of 30 meters. Test results show that the PWM system which is controlled from the potentiometer can be adjusted to the movement of the robot on the test track. In accordance with the capacity of the disinfectant tube, which is a maximum of 6 liters, in this test carried out by adjusting the movement speed of the robot based on the potentiometer rotation without spraying, then reducing the contents of the disinfectant tube continuously until 1 liter. Time reference for travel time is time period when robot move with a load of 6 liters disinfectant. Table 1 shows the results of the experiments carried out based on the load against the time achieved by setting the potentiometer rotation.

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Tabel 1. the results of the experiments

Testing Number	Distance (Meter)	Load (Liter)	Time (Second)	Description
1	30 Meter	6	15,2	Successful
2	30 Meter	5	14,3	Successful
3	30 Meter	4	14,5	Successful
4	30 Meter	3	14,2	Successful
5	30 Meter	2	13,8	Successful
6	30 Meter	1	14,1	Successful

5. Conclusion

Based on the test results, the use of potentiometers for PWM settings can be relied on to control robots with different load weights. From the experiment with a straight path as far as 30 meters with a reference time of 15.2 seconds, with different loads, the average travel time for the results of the experiment is 14.35 seconds. Thus, it is expected that when disinfectant spraying takes place by adjusting the rotation of the potentiometer for the speed of the robot, the results of spraying the disinfectant can be evenly distributed on surfaces that have contact with humans. With the results of evenly spraying disinfectants, it is hoped that it can reduce life cycle that sticks to the surface of objects

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Development of Goods Carrier Robots and Interaction of COVID-19 Patients with Medical Personnel at Politeknik Negeri Jember

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Abstract. Covid-19 virus is the first type of deadly virus found in wuhan city, China. Based on worldometer data that entered until August 25, 2020, in Indonesia, 157,859 people were positively infected with the Covid-19 virus. The increasing number of infected patients is at high risk to nurses and doctors because one of the causes of the infection is by direct contact with patients who are declared positive there is a corona virus. CNN Indonesia on August 25, 2020 recorded as many as 90 medical personnel killed from exposure to the Covid-19 virus. To reduce the risk of coronavirus spreading in nurses or doctors when carrying out the task of treating patients in hospitals or health facilities, Politeknik Negeri Jember designed the manufacture of robots that can bring medical needs or needs of patients to the treatment room. this aims to reduce direct contact between patients and medical personnel. Remote control based on keyboard with radio telemetry is expected to prevent physical contact between medical personnel and patients. So the chances of exposure to the Covid-19 virus are less. The use of an interface in the form of streaming video calls, allows patients to communicate directly with a nurse or doctor (telehealth).

1. Introduction

The covid-19 case stems from a WHO China Country Office report on December 31, 2019 reporting cases of pneumonia in Wuhan City, Hubei Province, China. Then on January 7, 2020, China identified the unknown pneumonia as a new type of coronavirus (novel coronavirus, 2019-nCoV). The increase in the number of cases in 2019-nCoV / COVID-19 took place fairly quickly and there has been a spread outside wuhan region and other countries [1]. CNN Indonesia news on August 25, 2020, in Indonesia there have been 157,859 cases declared positive COVID-19, with 90 cases of COVID-19 being health officials. Doctors and nurses are at high risk of contagion because they come into direct contact with COVID-19 patients. The virus is mainly spread between people during close contact, often via small droplets produced during coughing, sneezing, or talking [2]. In addition carriers of viruses that produce droplets through coughing, sneezing and speech can transmit directly or fall attached to the surface of objects that are then touched by others [2]. In this research developed a wheeled robot to assist doctors or nurses in carrying out their duties in the form of social distancing. The task that can be assisted by robots is to bring the needs of patients and the connection between the doctor and the patient. The robot is designed with a 2-wheel drive system and a combination with a caster wheel, with a robot rack consisting of 4 layers. The ZOOM application is used for patient communication with doctors in

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conducting consultations. The study is expected to contribute to the suppression of the spread of the 2019-nCoV virus-induced disease outbreak in health officials..

2. Related Work

Research in the field of human-robot interaction has done a lot of research on robot waiters. In Singapore, due to its demographic nature and the need to moderate reliance on foreign workers and to increase national productivity, robots in the service sector are being seriously considered. Robots developed using centralized computing handles such as sensors, cameras, speakers, charging battery systems. The design concept is based on the need to minimize human labor but not to replace it. Humans are still needed for personal relationship purpose, to engage the customers and to make their dining a pleasure [4]. In 2015, M Asif, M Sabeel, Mujeeb-ur-Rahman and Z H Khan designed and developed a butler robot that was considered a possible solution for restaurant automation. Robots can be divided into two main types. The first one deals with the teleoperated robots while the second one is autonomous robots [5]. In 2017, Md Kamruzzaman and Md Tareq designed and implanted prototype robot waiters to be able to accept orders through the android app, then collect food and drink from kitchen boy. Then travel to the order destination in order of order. Most of the waiter robots had been designed by using linefollowing technique. But in this design, wheel step counting has been used in the programming of Arduino. To serve tea/coffee according to the user‟s order through wireless communication, an automated system is designed by using a ready-made microcontroller kit "Arduino mega" [3]. Pandemics pose unique challenges to health care delivery. Although telehealth will not solve them all, it's well suited for scenarios in which infrastructure remains intact and clinicians are available to see patients [7].

3. System Design

3.1 Hardware Design

The robot is designed with dimensions length = 50 cm, width = 40 cm and height =120 cm using a differential two wheeled drive system. The rear drive uses 2 PG36 motors and is combined with a caster wheel for the front wheel. Ultrasonic sensors are mounted on the front of the robot to avoid collisions. To be able to control the robot, an ATMega328-based microcontroller module connects with a telemetry to be able to connect to the computer as a central control. ATMega328 is a microcontroller with a maximal clock of 16MHz. This 8-bit microcontroller is tasked with translating instruction data that has been sent from computer to DC motor PG36 to be translated into PWM pulse. DC bts 7960 motor driver is used as PG36 motor driver. The source of the waiter's robot voltage uses a 12 Volt Li-Po batteray. Schematics for sensors, DC motors, regulators and telemetry can be seen in figure 1. For telehealth use android tablets mounted on robots that also serve as eyes on the robot for the directions.

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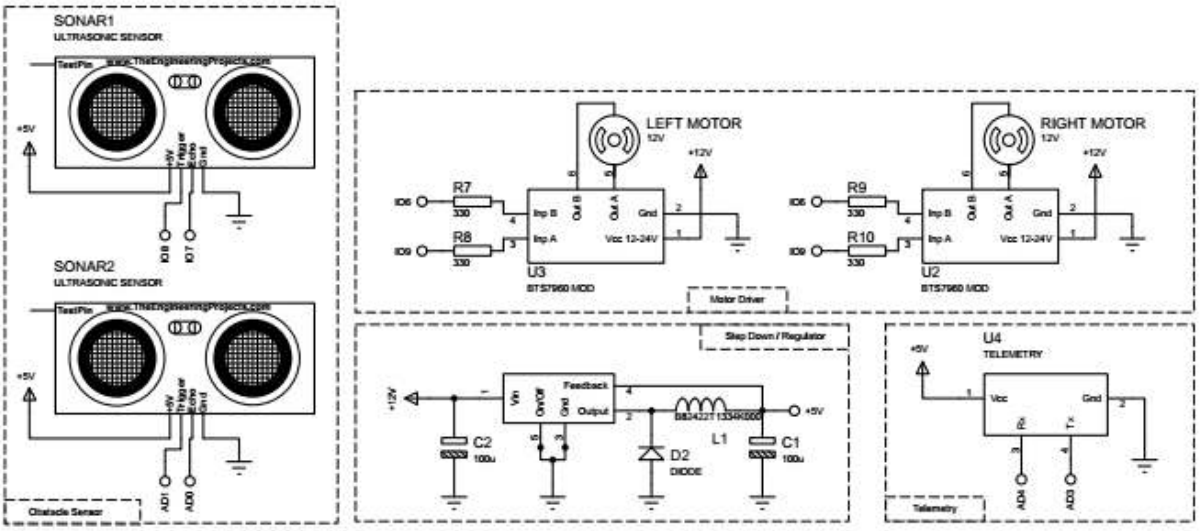

Figure 1. Schematics for sensors

3.2 Software Design

Use of 2 programming languages used in software design. The first is the use of Visual Basic for movement commands. The second is the Arduino IDE programming for microcontrollers. The microcontroller receives commands from the computer and converts the data sent by the computer into PWM data for wheel turning speed. The microcontroller also sends sensor reading data to the computer. For telehealth use zoom application by installing android device on robot that serves as robot path guide and as communication device between health workers and COVID-19 patients. The robot's movement command uses a button on the computer keyboard that can be seen in figure 3.

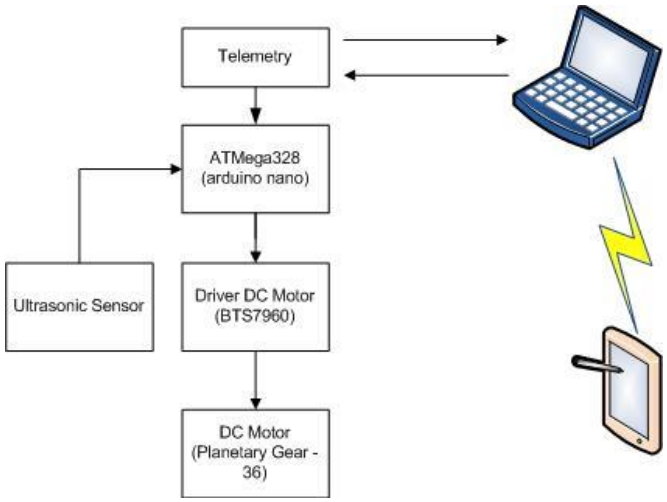

Figure 2. Block Diagram Robot Waiter

No	Button	Movement
1.	W	Straight Forward
2.	A	Turn Left
3.	S	Straight Backward
4.	D	Turn Right
5.	O	Andorid Tablet Tilt (Camera)

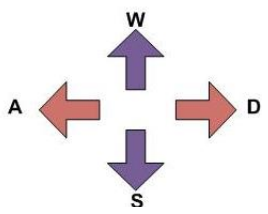

Figure 3. Movement Table

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4. Result and Discussion

The robot's drive wheel uses a 12cm diameter rubber wheel that is copping directly with the DC motor PG36. With a two wheel drive system combined with caster wheels to facilitate the movement of the robot for maneuverability. A robot with a height of 120 cm with maximum height is where to put android tablets for telehealth and road directions. Under the android tablet is a 3 layer rack to carry the needs of patients with the ability to carry a load of 10 kg.

Figure 4. Waiter Robot developed by Politeknik Negeri Jember

Testing is carried out by traveling in the Computer Systems and Control Laboratory with zoom application guide as a road guide by bringing the patient's needs (tissue paper, drinking water and hand sanitizer). The computer as a central control uses the Intel NUC core i7 with the ZOOM application as the host. Under normal walking conditions, android tablets tilt downwards as a road point, when telehealth between health workers and patients, the android tablet looks up by pressing the "O" button on the keyboard. Testing of the robot can be seen in figure 5.

a b

Figure 5. (a) Robot on the move, (b) Robot on telehealth

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5. Conclusion

Test results showed the robot's performance was helpful in reducing healthcare workers' direct contact with patients. From testing the moving robot for 10 minutes, the battery condition showed a decrease in voltage of not much. That is from 12.8 Volts to 11, 9 Volts. In addition, telehealth testing is also recommended to be applied to hospitals that are referrals for covid-19 patient isolation. The downside of the robot is the difficulty in controlling the movement of the robot guided by the results of the zoom app streaming video. This can be improved by multiplying the accustomed to operating the robot waiter so that there is no error seeing and describing the video of the robot's directions.

Acknowledgment

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Monitoring Information System of Progress Reporting Research and Community Dedication (P3M) at P3M Units of Jember State Polytechnic (POLIJE)

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Abstract. The Research and Community Service Unit (P3M) is one of the units in the Jember State Polytechnic (POLIJE) as the manager of research and community service activities. One of the problems in the P3M unit is the process of collecting research and service report documents which are still carried out conventionally with manual habbit, so that the can't monitor the progress of lecturers' reports with frequent delays in submitting reports. As a solution, it is necessary to implementating from SIMILITABMAS document reference to make a system that is adapted as internally in unit to the Monitoring Information System for Research Progress and Community Service Reports built on an online website as a tracer in real time in report collection activities with the aim. Increase in lecturer productivity to be more disciplined and to create integration, transparency and supervision between lecturers and officers of the P3M unit.

Keywords : P3M, Information System, Monitoring, Researches, Services Community

1. Introduction

The Research and Community Dedication Unit (P3M) is one of the units at the Jember State Polytechnic (POLIJE) as the manager of research and community dedication activities. P3M has a vision to become an Institute for Research and Community Dedication with international quality standards in supporting the vision of the leading Jember State Polytechnic in Asia in 2025.

P3M has a very important role in the tri dharma of higher education, namely the implementation of research and community dedication for educators and education circles. Every research and dedication carried out by educators and education personnel must always be reported and received approval from the P3M unit, either independently financed or financed by the government through the Jember State Polytechnic (Polije) and Dirjen DIKTI [1].

Researchers and servants who want to be funded by the government are obliged to submit a proposal according to the funding scheme. Of all proposals submitted, several reviewers will select their administration and their novelty, so that later proposals will pass and do not pass.

Applicants who pass will receive funding through the P3M unit for research and dedication, and are obliged to be accountable for the correct use of these funds. The P3M unit will provide the funds in

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stages according to the percentage of the progress and final results of research and dedication, namely the first stage is 70% and the second stage is 30%. 70% disbursement of funds is based on 70% of progress activities and 30% is disbursement in accordance with the final results of research and community dedication.

In order to have an orderly administration in disbursing research and dedication funds, it is necessary to monitor the reporting of the progress of the research and dedication results, both the results of research and dedication as well as the reporting of the use of funds. So far, P3M still uses a manual model in receiving progress reports on the results of research and community dedication. This has caused many problems, including the place where the archives are full, the need to destroy old archives, the search for old archives is difficult, there is no recapitulation of obedient and disobedient researchers or servants, and review of progress reports must be carried out at the P3M unit. Progress reports have urgency in the research and dedication process, especially for proposals that are approved using grant funding from institutions so that activities and budgets must be transparent so that they are easily monitored by P3M unit staffs

2. Methodology

The research concept is applied of the waterfall model which are software development method with systematic and sequential as shown in Figure 1.

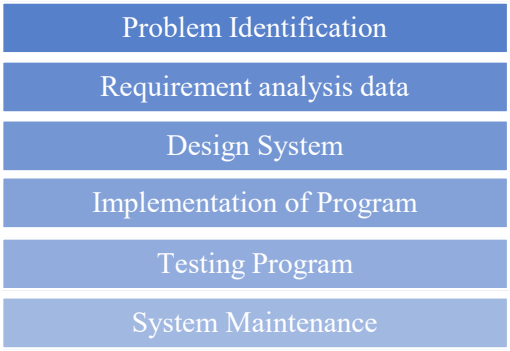

Figure 1. Methodology.

2.1. Problem Identification

The first stage is to identify the problem is not monitored the progress reports of research and dedication by P3M unit staff where there are often delays in collecting progress reports by the lecturers.

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2.2. Requirement analysis data

Analysis of data requirements is done by looking for literature to be used as input and output in the system by analyzing the input variables listed on the progress report menu on SIMLITABMAS by Kemenristekdikti. This Progress Report Monitoring Information System is used to assist monitoring activities on progress reporting and the final report on the results of research and community dedication in order to improve the performance of the P3M Unit. In this system all progress reporting activities of research and dedication activities will be managed digitally, so that all documents can be accessed anytime and anywhere by all stakeholders.

2.3. Design System

The design of the progress report monitoring information system design uses UML (Unified Modeling Language) diagrams using use case diagrams and activity diagrams. According to [2], before starting the development phase, first the system modeling is carried out using the Unified Modeling Language (UML). The description of the two diagrams as follows

2.3.1. Use Case Diagram

Use case diagrams are made to find out how system after the computerized process [3]. The use case description can be seen in the following figure, where this use case diagram shows a functional description of the system, what actors can do to the system as shown in Figure 2.

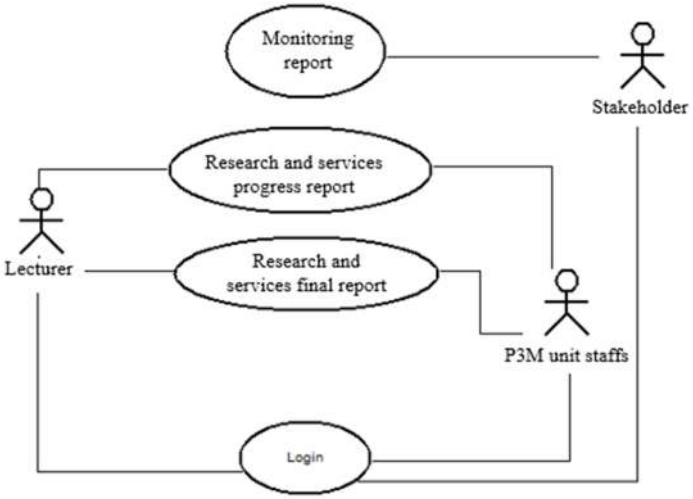

Figure 2. Use Case Diagram.

2.3.2. Acitivy Diagram

Activity Diagram in this study describes the activities of the process that has been designed in the previous use case.

- Login Acvitity Diagram
  In the Login Activity diagram starting from the user opening the website url, the login form page will appear. Then the user enters the username and password, in this case the username will be set as the NIP number as shown in Figure 3.

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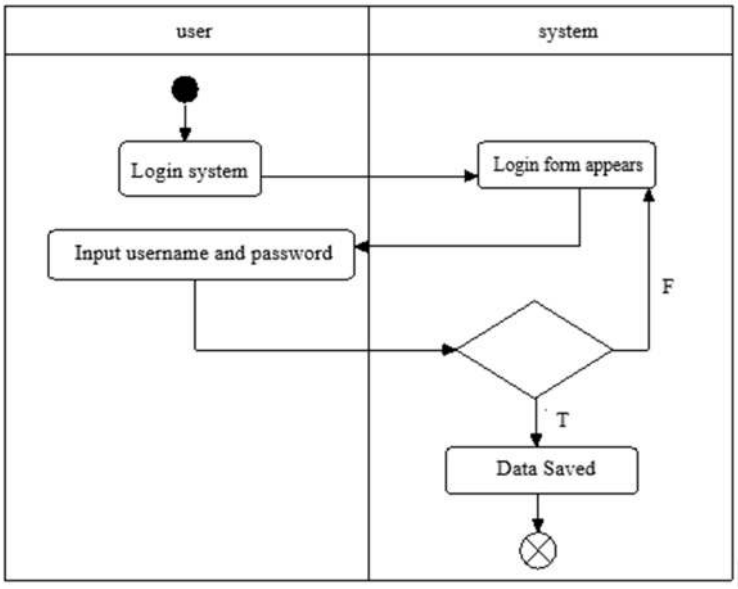

Figure 3. Login Activity Diagram

- Reports Progress activity diagram
  In the Activity diagram of the research and dedication progress report starting from the lecturer selecting the progress report menu then selecting the type of report whether research or community dedication then the system will display the data input form page for the progress report. Next, the lecturer uploads the progress report file and then saves the data. If a mandatory output is required, the system will display a mandatory output input form to be filled in. Then the officer will get realtime notifications for each progress report that has been entered for verification as shown in Figure 4.

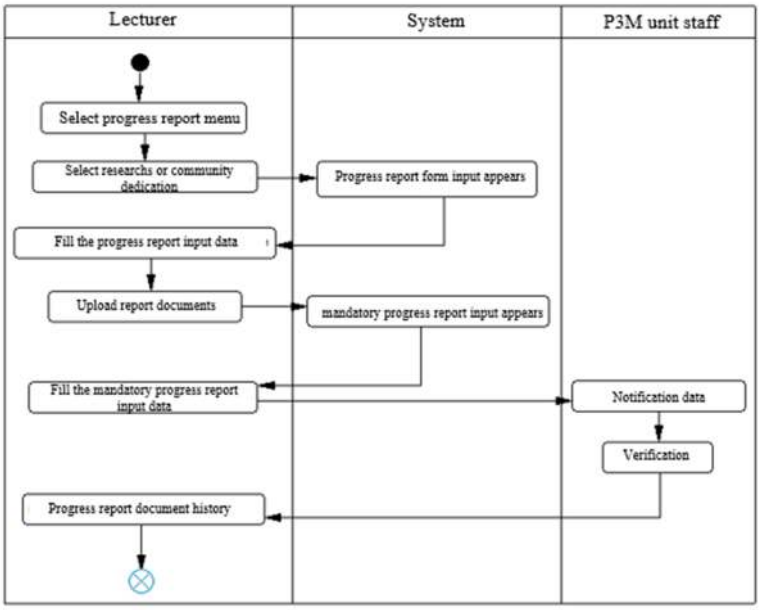

Figure 4. Report Progress Activity Diagram.

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- Monitoring reports activity diagram
  In the Activity diagram, the report starts from the leader choosing the report menu then selecting the type of report, year, the leader can see the details of each report by selecting one of the titles as shown in Figure 5.

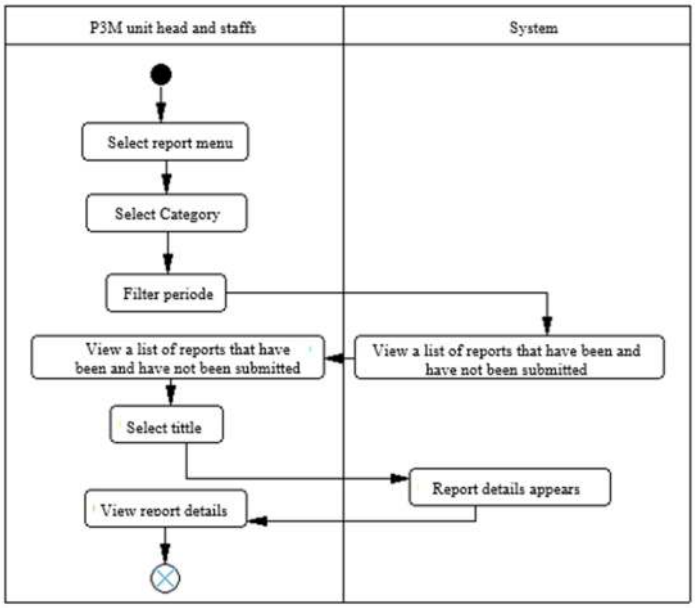

Figure 5. Monitoring Report Activity Diagram.

2.4. Implementation programs

Monitoring information system for progress reports and final reports of research and community dedication activities that have been designed, then the next stage is the implementation of the system by carrying out the program writing process.

2.5. Testing Program

System testing is a critical element of software quality assurance and represents a key study of specification, design and coding. The system testing model is by doing black-box testing of all functions in the application. Black-box testing is an application or software test that focuses on the functional requirements of the software. Besides that, there are also documentation activities of the product and the most important thing is the activity to release a product [4]. The importance of software testing that is able to be carried out with few resources but is able to produce good quality software [5]. Whether the program runs or not is also assessed by means of testing, so that the application runs smoothly as desired [6].

2.6. Maintenance System

Maintenance is the final stage, where the system can already be operated by the P3M unit and can be maintained until the system development in the next period

3. Result and Discussion

The flow of the hierarchical process of uploading progress reports and final reports according to the results of extracting needs with the P3M unit is that lecturers can input progress report documents and final reports on the P3M unit where the documents are stored digitally on a cloud server database whose data is processed so that it provides output in the form of reports that can be used as a consideration for decisions regarding the results of moniotoring by the P3M unit leaders shown in the following figure as shown in Figure 6:

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Figure 6. Flow Documents Process.

Based on the user's point of view, the following results of the real system display and are explained in each of them as follows:

- Login Page
  Login is the initial display when the information system is opened where user access is divided into two categories, is P3M unit staff as an administrators and lecturers. The username and password that users will use are default and customized through the system as shown in Figure 7.

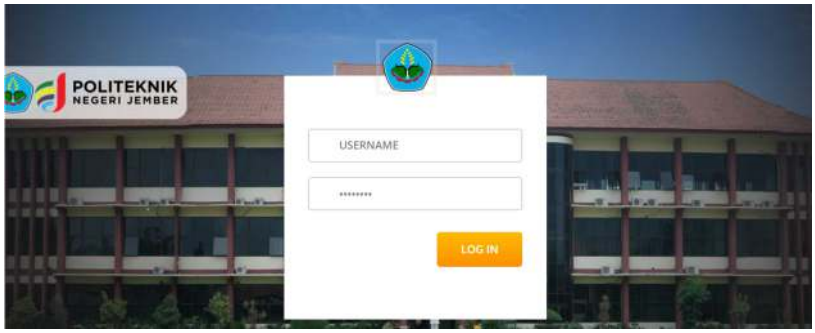

Figure 7. Login Page.

- Dashboard
  The dashboard page is the initial display after the user logs into the system, where the dashboard displays information about the schedule for uploading progress reports and final reports as shown in Figure 8.

Figure 8. Dashboard.

- Report schedule upload setting
  The schedule setting menu is a feature for administrators to provide vulnerable periods to the schedule for uploading progress reports and final reports made by lecturers. This periodization feature is intended to easily classify lecturers' report upload delays as shown in Figure 9.

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Figure 9. Schedule Setting.

- Monitoring submitted report
  One of the important features of the information system is the output in the form of a report where the contents of the resulting report are the classification of the delay in collecting the progress report uploads and the final report from a predetermined period as shown in Figure 10.

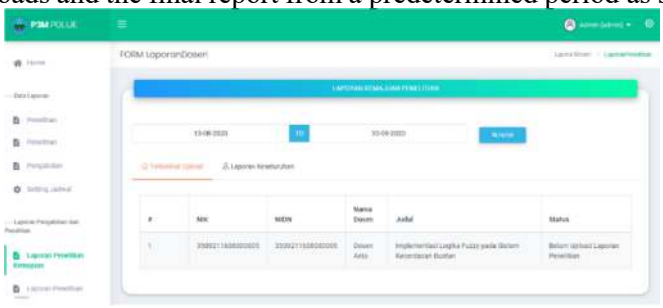

Figure 10. Monitoring submitted report.

- Upload the research progress report or final report document
  The upload feature of progress reports and final reports on research and community dedication is carried out using login access rights as a lecturer with a specified username and password. The procedure for uploading reporting documents is carried out by the lecturer based on the year of the research or community dedication is being carried out. On the research progress report list page, a selection of the implementation year will appear then add new data to start data filling and the document upload process and fill in mandatory outputs if available as shown in Figure 11 and 12.

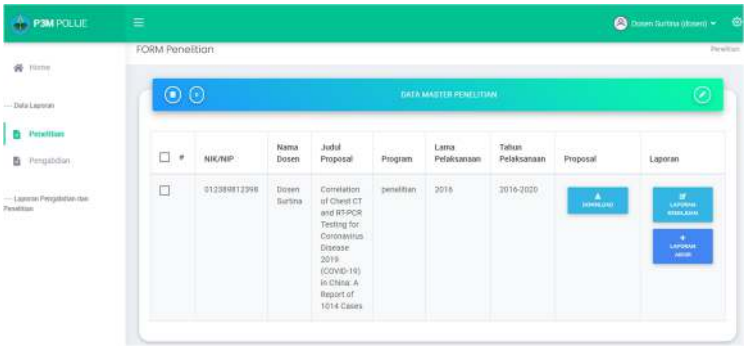

Figure 11. List data report.

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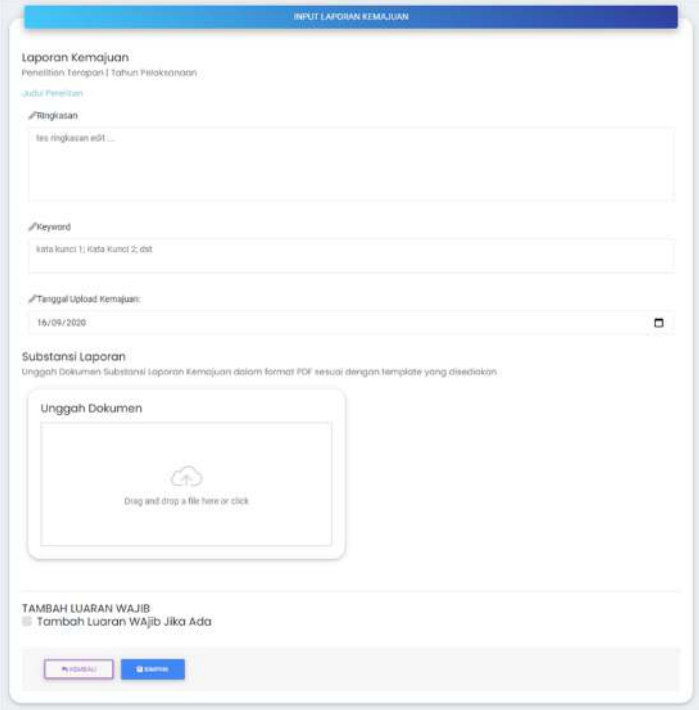

Figure 12. Form input data report.

4. Conclusion

This research is the application of the Monitoring Information System for the Progress Report and the Final Report on Research and Community Dedication Activities (P3M) at the Jember State Polytechnic is based on the website. The development of a progress report monitoring information system can be used as a media tracer for the progress reporting activities of researchers and dedication dedication to create transparency and facilitate monitoring by officers and leaders of the P3M unit..

Acknowledgment

This paper entitled “Monitoring Information System of Progress Reporting Research and Community Dedication (P3M) at P3M Units of Jember State Polytechnic (POLIJE)” is submitted to fulfill one of the requirements in accomplishing ICOFA. We sincerely thank to the Ministry of Research, Technology, Higher Education for the funding support (funds supported by PNBP 2020) and Politeknik Negeri Jember that this script can be carried out well. This script would hopefully give a positive contribution to the educational development or those who are willing to conduct further research.

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Application of Digital Image Processing to Predict the Diameter of Chrysanthemum Flowers Ready to Harvest

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Abstract: Since 1940, chrysanthemum was developed commercially. Potentially, the cut chrysanthemum commodity still has problems in its development. Chrysanthemum flower production scheduling is needed to increase the quantity, quality and continuity of chrysanthemum production according to market demand. This happens because usually managers or entrepreneurs only harvest flowers en masse without seeing some flowers that should not be suitable for harvesting are also cut off. Therefore, it is detrimental to the manager itself and reduces the quality of the chrysanthemum flower products that are sold. The solution to the existing problem is that there is a need to observe flowers by applying precise agricultural technology according to the times to ensure the bloom time. By knowing this phase, the flower harvest period can be predicted correctly so that the fulfillment of market demand can be met appropriately. Observations in this study use digital image processing with the threshold method, which is then used as a basis for predicting the diameter of chrysanthemum flowers ready for harvest, hopefully this will help farmers or chrysanthemum managers to optimize their harvest. The results showed that the data image observation as a whole experienced the percentage of missing data or errors with possible causal factors due to the density of storage traffic, the effect of lighting, humidity and air temperature. In addition, the use of "image processing" to find the diameter of chrysanthemum flowers ready for harvest has succeeded in approaching the actual condition, although it has not been tested in other varieties.

1. Introduction

Ornamental plants are the leading horticultural commodities that are most in demand by the public because of their beauty and benefits [1] [2]. The benefits of ornamental plants in general can be used as aesthetic sources, hygienic plants as a source of C02, climatological plants, protective plants, hydrological plants, orological plants, edaphic plants, ecological plants, educational plants, poeksosbud and pharmacological. Therefore, at present, ornamental plants have become a trend or lifestyle in society. Chrysanthemum (Chrysanthenum) is an ornamental plant that is very popular in Indonesia today [3] [4]. The advantages of the chrysanthemum plant include having various types of flowers with various shapes, and long-lasting bloom time accompanied by a lot of essential ingredients that can be used as medicinal agents [5] [6], [7], [8]. The intensity of flower color on chrysanthemum is due to the accumulation and combination of pigments [9]. The pigments in the various colored petals are classified into carotenoids and flavonoids [10]. In addition, the flowering of chrysanthemum can also be adjusted

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with the addition of light treatment so that harvest time can be carried out throughout the year [11]. Until now, the demand for chrysanthemum is in the top rank compared to other types of cut flowers. The total amount of cut chrysanthemum production in 2018 reached 488.18 million stalks, followed by roses with 202.06 million stalks production, and tuberose with 116.91 million stalks production [12]. Therefore, this plant has enormous potential to be developed. This potential will be optimized if the cultivation process including the management [13] of planting media, planting techniques [14], fertilization, light intensity, air temperature, and so on can be done optimally as well. Chrysanthemum plants that grow well will be able to be harvested when the planting age has entered 90 days.

Besides having the potential, the commodity of cut chrysanthemum still has problems and obstacles in its development. Chrysanthemum flower production scheduling is needed in order to increase the quantity, quality and continuity of chrysanthemum production in accordance with market demand because in fact there are still often chrysanthemum managers or entrepreneurs who cannot say how much and when the chrysanthemum flowers will be ready to be harvested. This happens because managers or entrepreneurs only harvest flowers en masse without seeing some flowers that should not be suitable for harvesting are also cut off. This is clearly detrimental to the manager itself and reduces the quality of the chrysanthemum flower products that are sold. In previous studies, prediction of chrysanthemum harvest at age and introduction of traditional morphology such as flower diameter and flower color.

One solution to the existing problem is the need to observe the flowers by applying precise agricultural technology according to the times to ensure the bloom time. By knowing this phase, the flower harvest period can be predicted correctly so that the fulfillment of market demand can be met appropriately. The harvest staging is when the flowers are half-bloomed or 3-4 days before full bloom or during the 6-10 day coloring phase before full bloom. Spray type 75-80% of the whole plant. The plant is ready to harvest after 3-4 months after planting [15]. Description of several varieties of cut flower chrysanthemums [16] including Reagent, Salmon Impala, Puma, Yellow Puma, and Peach Fiji.

Precision agricultural technology that can be applied such as digital image processing technology [17] to predict the diameter of ready-to-harvest chrysanthemums. This method is also widely used for plant identification [18, 19]. With the use of this method, plant morphological information becomes two-dimensional image information so that it can substantially simplify the process of collecting plant phenotypic data [20]. This technology has been applied to the [21] research for the rapid introduction of various types of chrysanthemum cultivars. In this study the researchers were able to quickly obtain the top 5 cultivar information to predict the cultivar name with the appropriate cultivar image from the system. In addition, recently uploaded images can be reused as input samples for subsequent literacy, which continues to improve the generalizability performance of the model.

The stages in applying this technology include:

1.1. Image

Importing images is the first step in data requirements. The data obtained from photos are in the form of images, taken using a camera that is placed on a krissan flower with a distance of approximately 1 meter. The chrysanthemum flower image is then read and processed by the system then converting it into a 3-dimensional matrix in RGB color space. The image used is in the Jpg format, which has a pixel of at least 550 times 550. A higher pixel density allows for a more perfect level of accuracy in the next process. Using the imread function converts it to a matrix which is 550x550x3 (Rows x Columns x RGB). The final dimension (RGB) corresponds to the intensity level of red, green and blue [22]. Then use the imshow function to preview the resulting image.

1.2. Thresholding

It is an image segmentation method that is used to separate objects from the background in an image based on differences in brightness or darkness. The area around the image that tends to be dark will be made darker so that it has a more perfect intensity value (0) or perfect black, while the area around the image that tends to be bright in intensity will be enhanced by being made lighter so that it becomes

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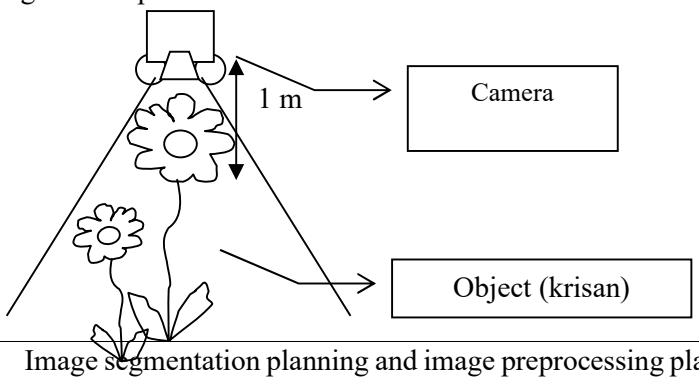
perfect white (1) [22]. This process divides the image into binary images to differentiate the background from the desired object.

1.3. Continuous Segmentation (removes noise)

The resulting initial segmentation will have less noise and we will need to clean up the image significantly to improve the accuracy of our diameter measurement. The procedure is taken to clean the image and provide a more uniform blob for analysis. The blobs in this image are collections of white pixels that touch to create a cohesive and distinct object

2. Methods

Tabel 1. Methods

The flow diagram	Description
Literature review	Looking for information about chrysanthemum plants, either through books or the internet.
Identification	a. Making a shooting tool at a chrysanthemum green house b. Collecting image data as a database of flowers through shooting c. Identification of the age of the chrysanthemum flower from the image data captured 
System Design	a. Image segmentation planning and image preprocessing planning b. Segmentation planning 2 c. Diameter calculation planning
Scripting	Implementing through programming language preparation, partial system
No Testing, ? Yes	Program trials, and program revisions
Analysis	Analysis of the final results of the program to the initial data of flower images
Report	Make a report

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3. Result and Discussion

This research uses MATLAB software to assist in the processing of imported images as a starting point for obtaining the initial object of the chrysanthemum flower to be processed. Use the imread command to read an image and convert it into a 3-dimensional matrix in RGB color space. The image used is a chrysanthemum taken at the location (Figure 1), which is an image measuring 456 x 342 pixels. The imread function converts it to a matrix which is 456 x 342 x 3 (Rows x Columns x RGB). The final dimension (RGB) corresponds to the intensity level of red, green and blue. Use imshow to view the resulting image in a new window.

Figure 1. Chrysanthemums are ready for harvest

Segment images into binary images to differentiate the background from the desired object. The first step is to divide the image into three images based on the intensity of each red, green and blue component in the image. It is a color based image segmentation. You can see from Figure 2 that the red plane is the best choice to use for Image Thresholding because it provides the greatest contrast between files.

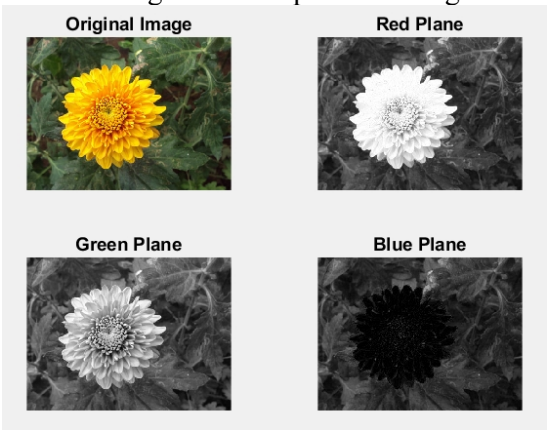

Figure 2. Image Thresholding

The desired object (foreground) and background. Image Thresholding takes the intensity image and converts it into a binary image based on the desired level. A value between 0 and 1 determines which pixel (based on the value) will be set to 1 (white) or 0 (black). Set the increment value to 0.01 and choose the best value for the threshold. Threshold at 0.37. You can see that image 3 has been segmented between the object we want to measure and the background. Advanced segmentation (Remove noise) as can be seen from the top left image in Figure 2, there is a little "noise" and we need to do it. Significantly cleans the image for improved diameter measurement accuracy. Figures 2 and 3 show the procedures performed to clean the image and provide a more uniform appearance for analysis. The blobs in this document are collections of white pixels that are touched to create a cohesive and distinct object file.

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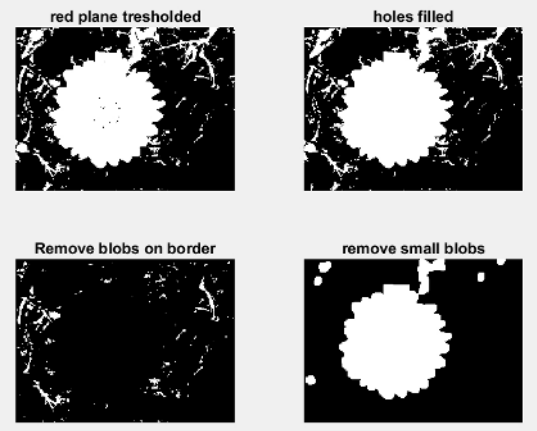

Figure 3. Advanced segmentation

Advanced Segmentation (Remove noise) As you can see from the top left image in Figure 2, there is less "noise" and it is necessary to do significant image cleaning to improve the accuracy of the diameter measurement. Refer to Figures 2 and 3 for the procedure performed to clean the image and give it a more uniform appearance for analysis. The blobs in this document are collections of white pixels to create a cohesive and distinct object file.

The regionprops function will provide the MajorAxisLength of the blobs in the image. As can be seen, the diameter is 228 pixels, or 6.0325 cm (Figure 4). Ready-to-harvest chrysanthemums have a diameter of around 6 cm, so the segmentation and threshold systems can be used to help measure the diameter of chrysanthemums.

Figure 4. The measurement results of the chrysanthemum diameter

The equipment needed to get the chrysanthemum flowers flower object image can be seen in the table below:

Tabel 2. Wiring on microcontrollers and raspberry devices

Controller	PIN	Device
ATMega328	A4, A5 (I2C)	Lux Sensor
	2	DHT22
	A1 (analog In)	Soil Moisture
	A4, A5 (I2C	OLed LCD
Raspberry Pi	2,3	Led Status
	Aux pin	Pi Camera

4. Conclusion

Observation of the data image as a whole experiences a percentage of data that is missed or error with possible factors due to storage traffic density, lighting effects, humidity and air temperature. The use of

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"image processing" to find the diameter of chrysanthemum flowers ready for harvest has succeeded in approaching the actual condition, although it has not been tested in other varieties.

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Network infrastructure development for strengthening of branding and digital marketing at KPJT Manut based on Mikrotik Routerboard RB951Ui

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Abstract: In line with the spirit of implementing research and government priority programs to build and strengthen rural communities, various efforts are being made. Klakah District continues to grow and shows its potential to become a center of Oyster Mushroom and Their Processed Products. Klakah village has a height of 193 m asphalt with annual rainfall of 1,480 mm and the number of rainy days as much as 123 days / year. Climatic conditions have an average temperature between 25-30ºC, RH humidity between 60-80%. This condition is in accordance with the conditions for growing oyster mushrooms so that the production of oyster mushrooms is very potential to be developed. KPJT Manut is a community group in the cultivation of oyster mushrooms and their processed products in Klakah District. During 3 years of developing the business, currently there are 28 members spread across 6 villages. Some carry out functions as mushroom producers, as well as dozens of others as processed producers. Opportunities to expand marketing access by utilizing digital marketing technology and branding of oyster mushroom-based culinary villages are constrained by internet network infrastructure. Through this activity an internet network service was developed for KPJT Manut members using a local area network by applying a star topology. Developed based on the Mikrotik Routerboard RB951Ui technology, 8 members in the oyster mushroom culinary village area have been connected with the center at KPJT Manut Inspiration House. The average user gets throughput up to 5 MBPS. With the application of this technology, it is hoped that the Klakah branding as the center for oyster mushrooms and the digital marketing of KPJT Manut will be wider and stronger.

Keywords: Branding, Digital Marketing, KPJT Manut, Mikrotik, Internet Network.

1. Introduction

The progress of partner village community service activities that have been achieved in the last two years has succeeded in solving several partner problems [1] [2]. Efforts to encourage business diversification and various processed products made from oyster mushrooms have been implemented successfully. Entering the third year of implementation of community service and assistance activities for KPJT Manut partners, new problems were found and pre-existing problems, including the condition of the kumbung which was too humid causing oyster mushrooms to absorb excess water; the results of

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the fungus are not resistant to storage and easily rot. Meanwhile, the problem at the oyster mushroom processed producer level is that the variety of processed products is felt to be continuously increased to absorb mushroom production from group member farmers who are not absorbed in the market, the method / method of processing mushrooms for other high-value products such as mushroom broth, mushroom crackers and mushroom ice cream, and do not have any special outlets or facilities to market the products they produce. Improvement on the management side is needed to strengthen the economic empowerment of partners [3]. The problems from the management side include the not yet massive branding that Klakah is a center for oyster mushrooms and its various processed products and the need for improvement in the management system in the form of production records, and strengthening the means to support the online marketing of various products produced [4].

For improvement on the management side, in the third year, the focus is on the Klakah branding as a center for oyster mushrooms and their preparations, as well as the pilot education of oyster mushrooms in Klakah. Efforts are made to the following organizational management, including: the formation and arrangement of the Mushroom Oyster Culinary Village around the KPJT Manut inspirational house, filing documents, business licensing, information technology-based production and sales records, promotional media and website-based KPJT profiles, training updates digital marketing content and various other supporting activities to strengthen the Klakah branding as a center for oyster mushrooms and its preparations.

The problems on the management side that are strived to be resolved include efforts to encourage the realization of the oyster mushroom culinary village as one of the tourist destinations in Klakah, marketing strategies by utilizing information technology supported by adequate internet connection infrastructure for all KPJT Manut members, especially those located around Kampung Oyster Mushroom culinary and home inspiration. In an effort to support the resolution of the problem from the management side, the provision of internet network infrastructure [5] for partners and members is crucial. Through this research, the development and implementation of the concept of internet network infrastructure based on conditions in the partner environment was carried out to support the strengthening of KPJT Manut branding and digital marketing [6] for various products produced by all KPJT Manut members.

2. Research Methods

Local Area Network (LAN) provides many advantages to users, including sharing information and resources. Local Area Network (LAN) is also a high-speed computer network with a fairly small area coverage. In a computer network there are many benefits that can be obtained, computers that are in a network can exchange information / data with other computers in the network. Users of a computer can access data on other computers in the network when file sharing is done. A computer network is a system consisting of computers and other network devices that work together to achieve goals. Two types of networks are peer to peer and client server networks. Peer to peer network every computer connected to the network can act either as a workstation or server. A client-server network is only one computer that serves as a server and other computers act as workstations.

Some network product service providers refer to the need for web-shaped information within an organization. The advantages that refer to information needs in building a computer network system include being able to share the use of existing equipment, such as hard drives, printers, modems, and others without moving the equipment to those in need, thus saving time and costs of purchasing hardware. In addition to other benefits, namely being able to share the use of files and data, multiuser applications, controlling users centrally and a backup system that is relatively easy because of centralized management.

This research method consists of several stages, such as literature review, data collection and problem identification, analysis and topology modeling, and implementation.

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2.1. Literature Review

Literature review is carried out to collect information from several references related to the issues to be discussed. Theories related to research problems are used as a basis for data processing. At this stage, identification and problems formulation will be conducted which will be the objectives of the research. Problem formulation to be examined based on the background of the problem.

2.2. Data Collection and Problem Identification

At this stage, data collection and identification of problems that become constraints are carried out in the provision of internet network infrastructure at partner locations. The designated locations are KPJT Manut members who are strategically expected to contribute to strengthening the KPJT Manut branding and digital marketing for the various products it produces.

2.3. Analysis and Topology Modeling

After data collection and problem identification are carried out, an analysis of the existing situation is carried out as a reference in determining the most suitable network topology model to be applied.

2.4. Implementation

Based on the results of the determined topology analysis and modeling, then the implementation of the network infrastructure installation at the KPJT Manut service partner location and evaluation of the bandwidth that can be accessed by each point in the house of each KPJT Manut member who is given access.

3. Result and Discussion

3.1. Literature Review

Literature review is carried out to collect information from several references related to the issues to be discussed. Theories related to research problems are used as a basis for computer network and internet connectivity. After a literature review is carried out, the next goal that must be determined is to determine the topology, technology and equipment and material requirements to achieve the targeted results.

3.2. Data Collection and Problem Identification

Based on the results of data collection carried out on partners, it is recommended to install or expand the internet access network for KPJT Manut members which is strategically expected to contribute to strengthening the KPJT Manut branding and digital marketing for the various products produced. These members are located around the house of inspiration as the coordination center for KPJT Manut, namely the mushroom bread production house, the screen printing and printing business unit, the mushroom ice cream production house, the corn rice production house, the mushroom cracker production house, the crispy mushroom production house, the house of the community leader, and KPJT Manut's house of inspiration. Thus, the total number reaches 8 location points to be connected.

3.3. Analysis and Topology Modelling

Based on data collection needs and situation analysis in the partner environment, it was decided that the most suitable topology is a star topology [7] with the house of inspiration as the center of the network to be implemented. The structure of the topology is implemented as shown in Figure 1.

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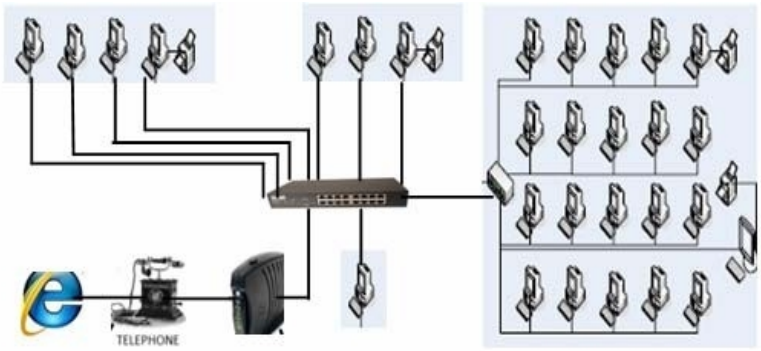

Figure 1. Star Topology implemented

3.4. Implementation

Based on the results of the determined topological analysis and modeling, the implementation of the installation of network infrastructure at the KPJT Manut service partner location and evaluation of the bandwidth that can be accessed by each point in the house of each KPJT Manut member is given access. The amount of bandwidth that can be distributed to eight location points is up to 20 Mbps.

With the 20Mbps bandwidth that KPJT Manut has, it must be able to be utilized and shared properly. Therefore, the use of Mikrotik [8] to distribute bandwidth is the PCQ method. PCQ is a bandwidth management mechanism that is quite easy because PCQ works using an algorithm that will divide bandwidth evenly among a number of active clients, in this case are 8 members of KPJT Manut. The ideal PCQ is applied when in bandwidth management we have difficulty in determining the bandwidth per client.

Here's an overview of how PCQ works;

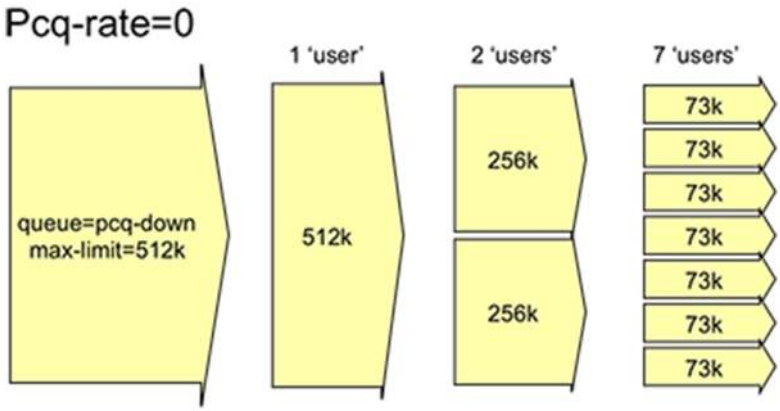

Figure 2. Overview of dynamic user management bandwidth

PCQ rate is the basic calculation of a router. How big is the rate-limit that will be given to active users. How to setup PCQ only needs to add Queue Type PCQ, then determine the classifier value and rate value. For download traffic management, select the dst.address classifier option. And for upload traffic management, select the src.address option.

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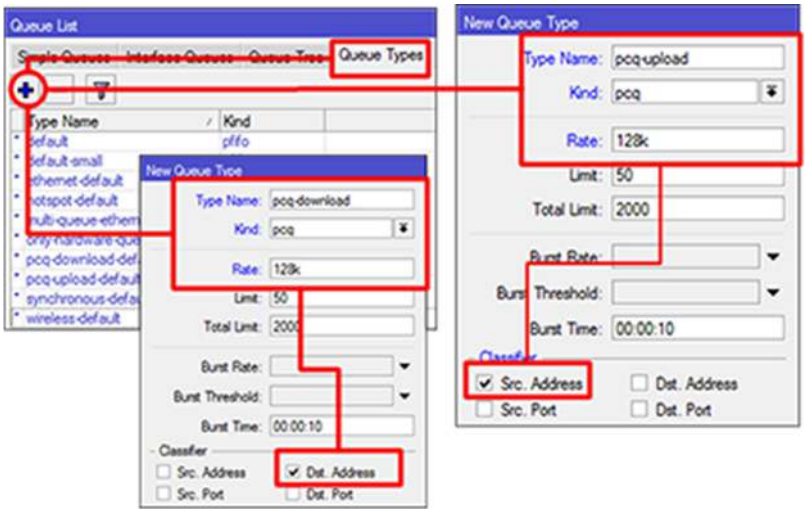

Figure 3. PCQ management traffic

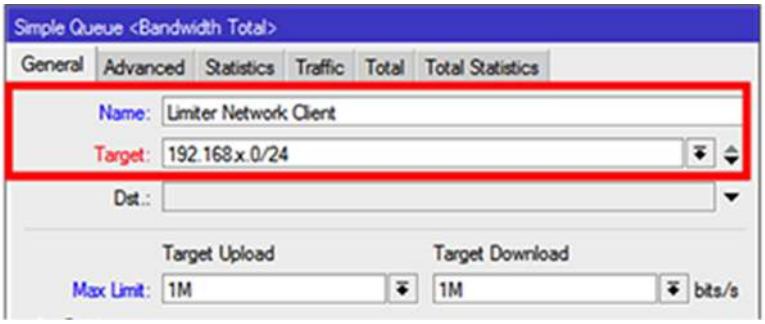

Figure 4. PCQ Queue

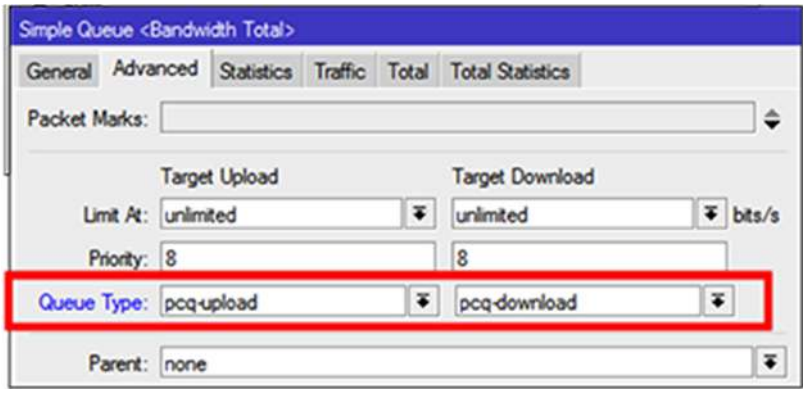

Figure 5. PCQ upload and download

With the use of PCQ, the problems that KPJT Manut has, which only has a bandwidth of 20 Mbps can be solved. So that the 8 KPJT Manut users can enjoy the internet network according to their needs, without sacrificing the internet network of other members who are connected in one network. The average user gets throughput up to 5 Mbps.

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4. Conclusion

Based on the research that has been conducted, it can be concluded several things. The implementation of star topology has been implemented in KPJT Manut partners and its 8 strategic units can share the use of the internet network to strengthen the branding of KPJT Manut and Klakah as production centers for oyster mushrooms and their processed products. Apart from this, the existing internet network infrastructure can also be used by visitors to the culinary village and oyster mushroom education tours, as well as to strengthen access to online marketing of KPJT Manut products. Developed based on the Mikrotik Routerboard RB951Ui technology, 8 members in the oyster mushroom culinary village area have been connected with the center at KPJT Manut Inspiration House. The average user gets throughput up to 5 Mbps. With the application of this technology, it is hoped that the Klakah branding as the center for oyster mushrooms and the digital marketing of KPJT Manut will be wider and stronger.

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Performance of OpenVSwitch Bridge Network in Virtual Cloud Environment

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Abstract. Cloud computing is the topic of the fastest growing area in the world of information and communication technology today. In order to provide cost-effective infrastructure services that include compute and storage services by cloud service providers, it is important to provide efficient compute, storage, and network virtualization so that these resources can be maximally shared across a large number of tenants in a massive multi-tenant cloud environment. Virtualization technology acts as the backbone of Cloud Computing for virtualization of compute, storage, and network resources that are delivered as services over the network. OpenVSwitch is a multi-tier standard software defined networking (SDN) switch based on the Apache 2.0 open source license. OpenVSwitch works at layer 3 of the OSI protocol in contrast to linux bridge which works at layer 2 of the OSI protocol. This study measures the performance of the OpenVSwitch SDN Switch in a virtual cloud environment. The performance meters measured include TCP upstream, TCP downstream, UDP upstream and UDP downstream. The performance measurement results are compared with the linux bridge performance on the same parameters. The performance measurement results show that there is a slight difference in the performance of OpenVSwitch and Linux Bridge.

1. Intoduction

Cloud computing is the topic of the fastest growing area in the world of information and communication technology today. In order to provide cost-effective infrastructure services that include compute and storage services by cloud service providers, it is important to provide efficient computing, storage, and network virtualization so that these resources can be maximally shared across a large number of tenants in a massive multi-tenant cloud environment [1].

Virtualization technology acts as the backbone of Cloud Computing for virtualization of computing, storage, and network resources that are delivered as services over the network [2]. Virtual network management is a basic component provided by cloud computing systems. In a cloud environment, the fact that VMs on the same subnet are located on different hosts, VM traffic attached to different users must be isolated, VMs will be migrated to other hosts makes network management different from those on the physical network. Technologies such as overlays and Software Defined Networking (SDN) are usually introduced to build reliable and efficient virtual network management schemes. However, there are many disadvantages such as flexibility and cost of hardware in most of the schemes introducing the technology mentioned above[3].

Virtualization allow multiple operating systems to run within virtual machine running on sam hardware. Virtual machine manager (VMM) allocates resources from hardware for virtual machines. The oter name for VMM is hypervisors and main task of hypervisor is to allocate resources from

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hardware to run several virtual machines simultaneously. Each virtual machine represents physical device. Multiple virtual machines can run on same hardware while each VM can run spesific operating system. performance of virtual machine dependeable on factor like CPU, memory, hard disk etc[4].

Computer networks are becoming increasingly complex and require high investment in line with the development of cloud computing infrastructure. In addition, the management of network devices in a large network scale is quite difficult and becomes complicated in heterogeneous network environments where network devices are adopted from different manufacturers. Software Defined Networking (SDN) is a new technology that defines traditional computer network architectures. As the name suggests, in SDN the network is defined, managed and controlled via a programmable interface such as computer software; thus, it allows the network to dynamically change its topology, characteristics and increase or decrease it as needed.

Software switch has emerged as a critical component in software defined networking and network virtualization areas[5]. Open vSwitch (OvS) is a widely used software switch which uses tuple space search algorithm for packet classification, and an exact match cache (EMC) for caching most frequently used flow. In this research hypervisor proxmox is used to create virtual environment. Linux Bridge (LB) and OpenVSwitch are virtual switches used in proxmox hypervisor. The aim of this study is to measure LB and OVS performance in virtual environment.

2. Method

The test was carried out on the Proxmox hypervisor, which was installed on a computer with an Intel Core i7 processor, 8GB RAM and 140GB SSD. The Linux bridge and the OVS bridge are used interchangeably. In the Proxmox hypervisor, a container-based guest operating system is created using Linux Container (LXC). Linux-based containers were chosen because they use less resources than virtual machines. The guest operating system used is Linux Ubuntu 16.04. The system test topology is shown in Fig 1. IP address distribution is shown in Table 1.

Testing is done by sending TCP and UDP packet from the client to the server. Package delivery is done using the iperf software. VM1 and VM2 are connected using a Linux Bridge network, while VM3 and VM4 are connected using an OVS Bridge network.

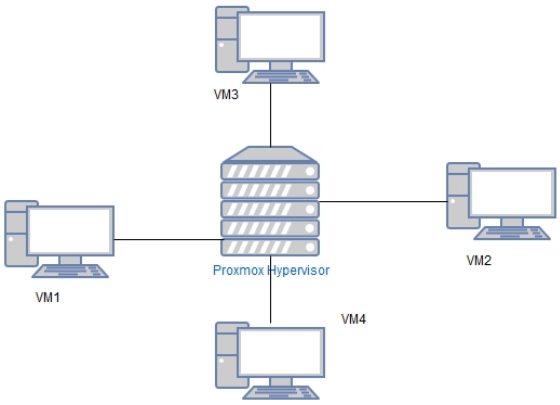

Figure 1. System under test

Table 1. Given IP Address

No	Machine Name	IP Address
1	Proxmox Hypervisor	10.10.1.98
2	Virtual Machine 1	10.10.1.99
3	Virtual Machine 2	10.10.1.101
4	Virtual Machine 3	10.10.1.40
5	Virtual Machine 4	10.10.1.70

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3. Result and Discussion

The test results of linux bridge using the TCP protocol are shown in Figure 2. The highest performance is achieved when the server uses 2 CPU cores and 1024 MB RAM. While the lowest results are achieved when the server uses 2 cpu cores and 512 MB RAM.

Figure 2. Performance of Linux Bridge measured using TCP protocol

The test results of OVS bridge using the TCP protocol are shown in Figure 3. The highest performance is achieved when the server uses 1 CPU cores and 512 MB RAM. While the lowest results are achieved when the server uses 2 cpu cores and 1024 MB RAM. According to [6], assigning more cores to the vSwitch results in better performance in case the number of cores required by the whole chain (VMs + vSwitch) does not exceed the number of cores of the server. When this happens, performance degrades until becoming unsustainable with 8 chained VMs. In fact, at this point some cores are shared among many polling threads and, for instance, it may happen that the operating system assigns the CPU to a VNF with no traffic to be processed, penalizing others that would actually have work to do.

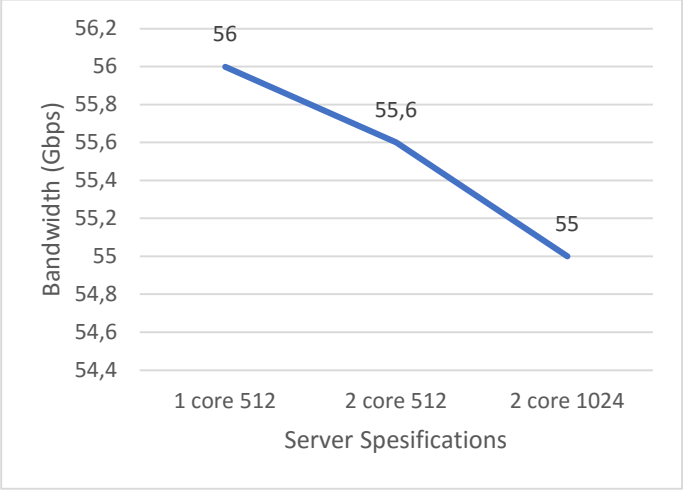

Figure 3. Performance of OVS Bridge measured using TCP Protocol

The highest throughput value for linux bridge is 55.1 Gbps while for OVS the highest throughput value is 56Gbps. It can be said that OVS has better performance than the Linux bridge on the TCP protocol.

In measuring network performance using the UDP protocol, both linux bridge and OVS bridge get the same results, namely 101 Gbps as shown in Figure 4 and Figure 5. According to [7], OVS-DPDK in container et the better performance compare with OVS-DPDK in host.

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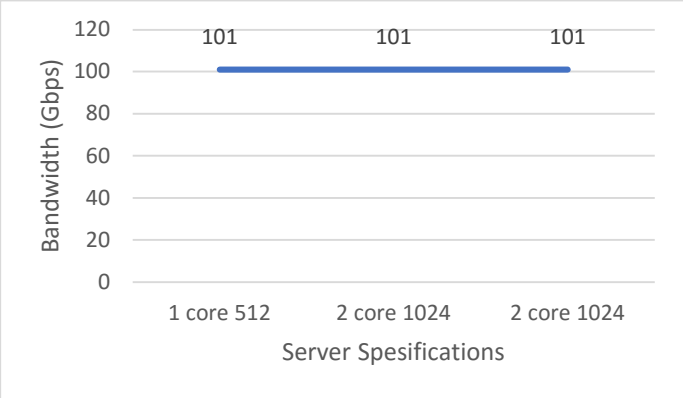

Figure 4. Performance of Linux Bridge measured using UDP Protocol

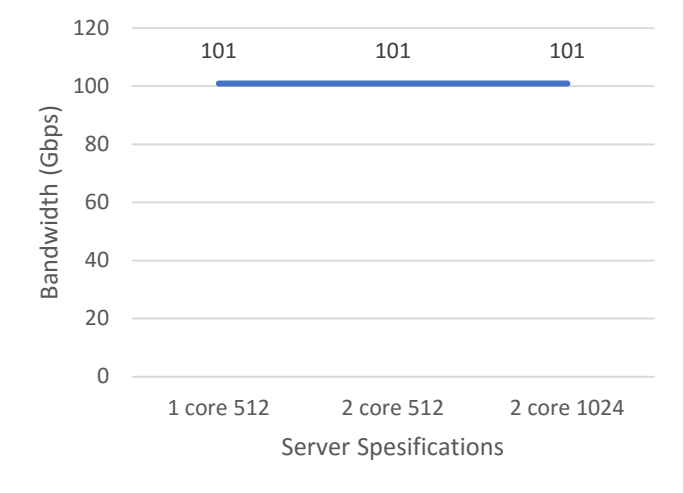

Figure 5. Performance of OVS Bridge measured by UDP protocol

According to [8] increasing the RAM size did not have a significant effect on the delay a packet experiences inside the OVS in the experiments we ran. This is the same as the experimental results that the addition of RAM does not automatically increase the throughput as shown in Figure 3. When the RAM increases to 1024 MB, the throughput value actually decreases compared to when the RAM is 512 MB. Compare with hardware-based switch, software-based switch still has less performance[9]. Overall ovs bridge has better performance than linux bridge. This is in accordance with the results of the research [10] which states that OVS showed good performance when compared to other Linux kernel for- warding techniques.

3. Conclusion

Hypervisors need the ability to bridge traffic between VMs and with the outside world. On Linux-based hypervisors, this used to mean using the built-in L2 switch (the Linux bridge), which is fast and reliable. So, it is reasonable to ask why Open vSwitch is used. The answer is that Open vSwitch is targeted at multi-server virtualization deployments, a landscape for which the previous stack is not well suited. These environments are often characterized by highly dynamic end-points, the maintenance of logical abstractions, and (sometimes) integration with or offloading to special purpose switching hardware.

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Water level control system in rice fields with the SRI (System Rice Intenfification) model based on IoT (Internet of Things)

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Abstract. The SRI (System Rice Intensification) model of rice cultivation has been able to produce higher productivity than conventional system. With the SRI model, land productivity can reach 21 tonnes per ha, 4 times the national productivity of 5.3 tonnes per ha. The water controller is one of the requirements in this model, and this one is become a major obstacle to be applied in the field at the farmer level. The water controller that is able to provide the highest land productivity is in the initial phase. in this phase the water level is 0-2 cm above the soil surface, in the vegetative and generative phases 3 cm below the soil surface, during the grain filling phase 7 cm below the soil surface, and it is dried. (irrigation is stopped) during the ripening phase or 10 days before harvest. In this research we develops a water control system using Internet of things technology so that all water level data can be recorded precisely and the process of adding water to the SRI rice field model can be done through an automation mechanism which controls the recorded process of control as well. The results of this study indicate the level of precision of the measuring tool works well and the automation system works as desired. The recorded measurement data can also be part of the analysis for the growth of the rice plant

1. Introduction

SRI is a rice cultivation technique that is able to increase rice productivity by 50%, even in some places it reaches more than 100%. According to 1] , water management mapping with SRI in West Java is at the age of vegetative rice, water is given capacity field except when weeding is done inundation (2 - 3) cm. When the age is more than 45 days, the land should be dried for 10 days to inhibit the growth of tillers, then water is given in random order again until the time of panicle growing, filling the grains of rice until well, then at the age of the plant more than 100 days the fields are dried until harvest.

The most optimum water supply is in the mild treatment regime wet with the average yield of experimental pots was 194.7 g / hill and water productivity 3.16 kg / m3 2]. In the slightly wet treatment regime, the water level in the initial phase was left randomly 0 cm to the soil surface. In the vegetative and generative phases, the water level is lowered at level -3 cm from ground level. next, in the grain filling phase the water level is high maintained at a level of -7 cm from the ground level. Then in the grain ripening phase until harvest.

From the story above it can be conclude that controlling the water level in the SRI model of the rice field irrigation system is very necessary and by using IoT technology, data recording is important to monitor plant growth.

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2. Design overview SRI model of rice field irrigation prototype

In this research, SRI model of rice field irrigation prototype create in demonstration plot with size 244 x 122 cm in which there is a given paddy soil and a place for rice to be planted. There are 2 pipes planted in the demonstration plot where 2 pipes are attached, each measuring the water level with 1 pipe filled with manual measuring instruments and the other pipe filled with measuring instruments designed using a JSNSR04 water level sensor which is connected to a microcontroller in charge of retrieving data and send to a database located on the cloud server. The overview of the tools shown in Figure 1

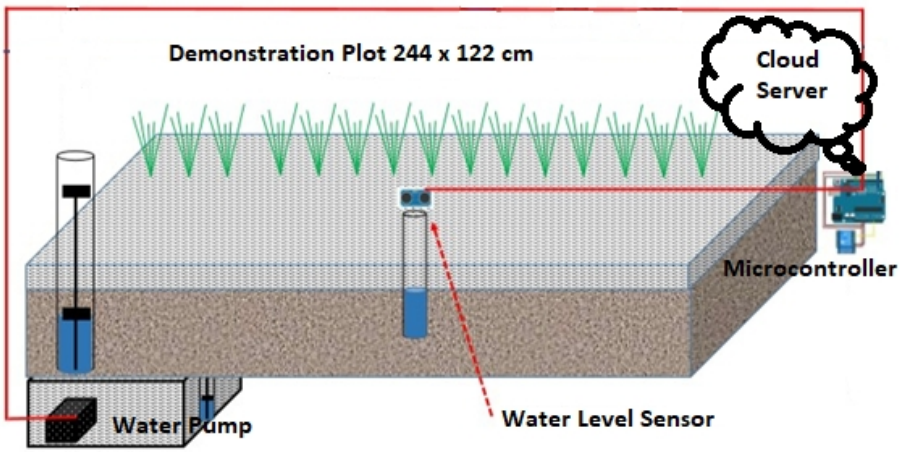

Figure 1. Demonstration Plot SRI Model of rice irrigation system.

3. Water level system kontrol based on IoT (Internet of Things)

3.1. Water level sensor otomation

The water level sensor in this research using ultrasonic sensor that is able to measure the distance between the sensor and the water surface in the pipe. The length of the pipe is the basis for calculating the water level where the length of the pipe minus the distance between the sensor and the water level will be the water level value in the irrigation demonstration plot. Part of the development of this equipment is sending water level data with IoT platform so that the data height value processed as an automation system to turn on and turn off the water pump to fill the field irrigation demonstration plot accordingly specified value.

The general model of automation in water level control systems is carried out by adjusting the set point value that water needed based on the water fulfillment pattern according to plant maintenance procedures. The overview of the system shown in Figure 2

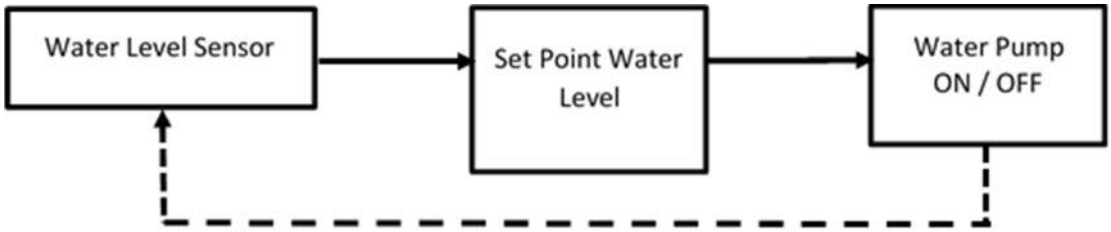

Figure 2. Basic system water level otomation.

3.2. IoT Platform to drive water level control system

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There are three layers developed in this research. The lowest layer is the layer of devices that are outside the cloud. in this layer sensors and actuators are developed as devices that will supply data or receive data. The sensor is assembled together with a WiFi module and a microcontroller which contains a program to translate the sensor into data that can be sent via the WiFi module. In this SRI irrigation system demonstration plot, the sensor made is the water level and the actuator to turn on or turn off the pump. programs embedded in this device layer use the Arduino language. the hardware package in the wifi module and micro system has been bundled in the wemos d1 mini.

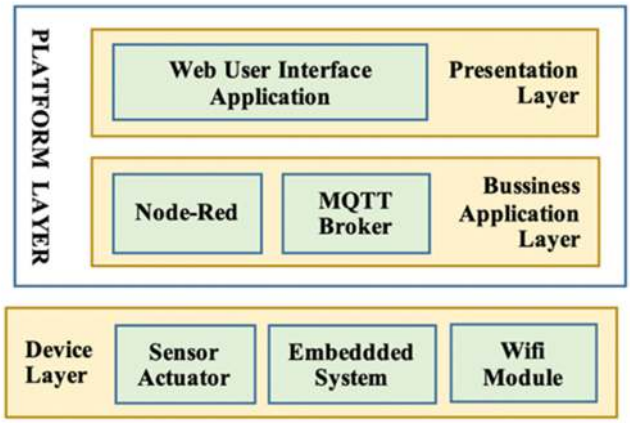

Figure 3. Iot Architecture development for water level otomation system

The platform layer consists of two parts which are developed separately, namely the business application layer and the presentation layer. The business layer application layer has functions to process data such as business process automation systems that have been designed. The presentation layer is the application development interface for the user. Technically, the business layer is developed through the Node-Red application to create a business application system and for MQTT brokers, the open source application Mosquitto is used. Illustration of the logic design of the water level automation system in the SRI model and web based interface in presentation layer can view in figure 4

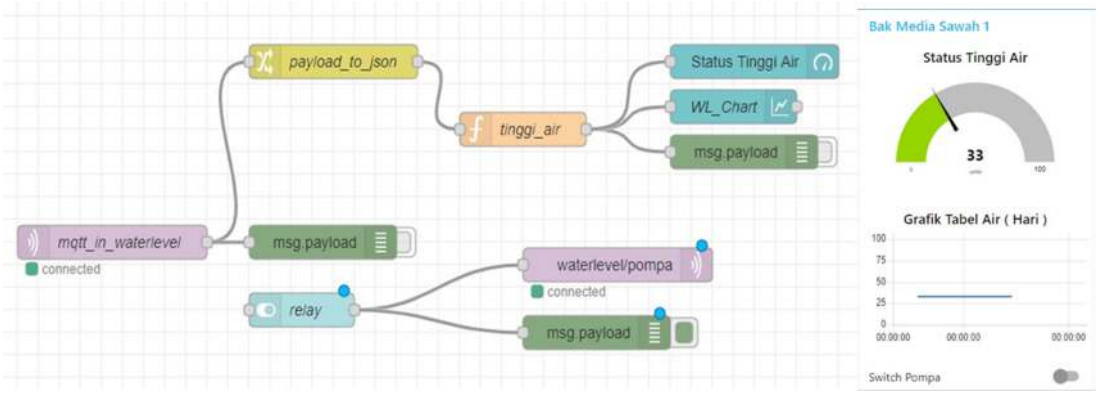

Figure 4. Logic system and presentation layer water level control system

4. Result and Conclusion

In the vegetative phase, day 1 to day 50, the water level measurements in the demonstration plot average is 4 cm and 3 cm per day. and the difference in measurement between the sensor and the manual indicates

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that the sensor is more unstable with a record shift of not more than 1 cm. in the generative phase when the water is drained the measurement on the sensor shows a value of 1 cm and in the manual measuring instrument it has a value of 0. This is a weakness of the error value of the sensor device. The process of filling the water in the demonstration plot is done by turning on the pump, and to increase the water level in the demonstration plot for 1 cm it takes 10 seconds to turn on the pump.

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The effect of Biofertilizer Application and Shoot Pruning on the Growth of chili plants on sandy media

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Abstract. This study aims to determine the effect of PGPR, *Trichoderma* sp and shoot pruning treatment on the growth and production of red chili plants. This study used a complete randomized block design (CRD) factorial consisting of 2 factors. The first factor was the provision of biological agents consisting of 4 levels of treatment: 1) control, 2) PGPR, 3) *Trichoderma* sp, and 4) PGPR and *Trichoderma* sp. The second factor was the time for cutting shoots, consisting of 3 levels of treatment: 1) without pruning; 2) Pruning shoots at the age of 14 days after planting, 3) Pruning shoots at the age of 21 days after planting in pots. The observation variables included plant height, fruit weight per sempel, number of fruits per sample, fruit length, and fruit diameter. The result shows of combination treatment PGPR and *Trichoderma sp* and pruning 14 DAP is the highest growth and production.

1. Introduction

Sandy medium has the characteristics of very fast soil drainage, very low salinity, low CEC, acidic to neutral pH, very low organic C, very low total N and moderate phosphate [1]. Therefore, it is necessary to optimize the use of sandy land to be used as a place for plant production with various applications of technology to create conditions that are conducive to plants, as well as to increase tolerance and adaptability of plants to stresses, including climate change [2].

Rhizobacter are included in the microbial group which is commonly known as PGPR. Several types of microbes included in the PGPR group are *Azotobacter sp., Azospirillum sp., Pseudomonas sp., Bacillus sp., And Acetobactersp* [3], PGPR has the ability to increase productivity and plant growth.

Trichoderma sp. is one of the useful microorganisms and is a symbiotic fungus that is not dangerous, even mutually beneficial between soil-borne fungi and plant roots. *Trichoderma sp.* Serves as a root growth stimulant, because *Trichoderma sp.* It has the ability to increase growth hormones in plants such as auxins and cytokinins [4]. Besides functioning to improve the root structure of plants, *Trichoderma sp*. Also has a role as an antagonistic fungi against pathogens. *Trichoderma sp.* can inhibit the growth of several disease-causing fungi in plants, including *Rigidiforus lignosus, Fusarium oxysporum, Rizoctonia solani, Sclerotium rolfsi* [5].

The phenomenon of growth in the shoots or canopy is more dominant than in the lateral or other parts influenced by the hormone auxin, causing the growth of lateral / axilary shoots to become dormant and stunted. The shoots will start their growth after the primary apical bud meristem has become a permanent organ, such as a flower or flowering meristem [6]. This has an impact on the low production

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per plant. Therefore, to stimulate the growth of lateral shoots, the effect of apical dominance needs to be inhibited [7] [8]. One way in which restricted lateral shoot growth can be increased is removal. Pruning aims to streamline plant growth and development in a more productive direction. Another goal is to increase the efficiency of nutrient use [9]. Pruning can encourage more rapid growth of new shoots, which have the potential to flower.

2. Material and Methods

2.1. Material

Chili seeds, organic fertilizers, anogranics, mulch, PGPR, *Trichoderma sp*. Ruler, calipers, scissors, colling box, calipers, stationery, sprinkler, cameras, wires, hoes, buckets, analytical scales, gauges and knives.

2.2. Methods

This study used a complete randomized block design (CRD)

Factor I : Pruning times :

P0 : Without Pruning
P1 : Pruning 14 Day After Planting
P2 : Pruning 21 Day After Planting

FactorII : Provision Biological Agents

H0 : Control
H1 : PGPR
H2 : *Trichoderma sp*
H3 : PGPR + *Trichoderma sp*

3. Result and Discussion

The results of observations and research data varieties of The effects of giving PGPRenriched and shooting Pruning on the growth and production of chili plants in sandy media can be seen in Table 1.

Tabel 1. Lists of various types of PGPR enrichment and pruning on plant height and number of chili branches

Source of Diversity	Plant height 2 WAP	Plant height 4 WAP	Plant height 6 WAP	Number of branch
P	ns	**	ns	**
H	ns	ns	ns	ns
P x H	ns	*	ns	ns

Noted: P = Pruning, H = PGPR enriched, * = Sgignificant, ** = Very Significant, ns = Non Significant
WAP = Week After Planting

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Table 2. Average Plant Height Effect of Pruning at Several Age Levels

Treatment	Plant Height (cm)		
	2 WAP	4 WAP	6 WAP
P0 (Without Pruning)	14,78 a	30,86 a	50,83 a
P1 (Pruning 14 day after planting)	13,93 a	25,89 b	58,38 a
P2 (Pruning 21 day after planting)	15,08 a	27,92 b	44,63 a

Note: The mean followed by the same letter is located in the same column, indicating that it is not significantly different at LSD 5% and the mean followed by different letters in the same column shows significant differences at LSD. %.

The test results of the mean high value of chili plants due to the effect of pruning in Table 2 showed a significant difference at the age of the plant at 4 WAP in treatment P0 with plant height of 30.86 cm, this is because pruning was not performed in P0 treatment, causing height in P0 plants. higher than other treatments. Pruning action has no significant effect on the growth of chili plants [10].

Table 3. Average Plant Height Effect of Biofertilizer at Several Age Levels

Treatment	Plant Height (cm)		
	2 WAP	4 WAP	6 WAP
H0 (Control)	14,80 ab	28,22 a	46,21 a
H1 (PGPR)	14,42 ab	26,34 b	44,36 a
H2 (*Trichoderma sp*)	15,14 a	29,42 a	64,88 a
H3 (PGPR+ *Trichoderma sp)*	14,01 b	28,92 a	49,67 a

Note: The mean followed by the same letter is located in the same column, indicating that it is not significantly different at LSD 5% and the mean followed by different letters in the same column shows significant differences at LSD. %.

Based on Table 3. the average plant height of the effect of biological fertilizers at several age levels showed significant differences at 2 WAP H2 treatment, namely the treatment of Trichoderma sp. has the highest plant height of 15.14 cm, this indicates that the Trichoderma gauze treatment can affect plant growth effectively. This is the same as the results of research by Sepwanti et.al, which showed that *Trichoderma harzianum* can increase the growth of chili plants [11].

Table 4. Average Number of Branches as a result of Pruning Effect

Treatment	Number of Branch
P0 (Without Pruning)	2,72 c
P1 (Pruning 14 day after planting)	3,36 b
P2 (Pruning 21 day after planting)	4,36 a

Note: The mean followed by the same letter is located in the same column, indicating that it is not significantly different at LSD 5% and the mean followed by different letters in the same column shows significant differences at LSD. %.

The average number of branches due to the effect of pruning is in Table 4. It shows that the P3 treatment, pruning 21 days after planting has the largest number of branches, this is because after the plants are pruned it will stimulate the growth of new shoots to grow, so that they can produce more branches, this will be followed by an increase in the productivity of the chili plant.

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Table 5. Average plant height resulting from the interaction of the effect of Pruning treatment and biofertilizer

Treatment	Average Pelant Height (cm)		
	2 WAP	4 WAP	6 WAP
P0H0	15,37	30,91 ab	50,10
P0H1	13,68	27,53 bcd	45,26
P0H2	15,37	31,33 ab	51,48
P0H3	14,70	33,64 a	56,49
P1H0	13,33	26,50 cd	45,72
P1H1	14,19	25,34 cd	43,77
P1H2	14,96	27,73 bcd	45,39
P1H3	13,23	23,98 d	44,44
P2H0	15,71	27,24 bcd	42,80
P2H1	15,40	26,16 cd	44,06
P2H2	15,11	29,16 cd	43,58
P2H3	14,09	29,13 bc	48,07

Note: The mean followed by the same letter is located in the same column which shows that it is not significantly different at DMRT 5% and the mean followed by different letters in the same column shows significant differences in DMRT 5%.

Table 5 shows that the interaction of pruning and application of biological fertilizers has a significant effect on the average plant height at 4 WAP, the highest average is in the P0H3 treatment of 33.64 cm, this is because without pruning in this treatment and the provision of PGPR + *Trichoderma sp.* can spur the growth of plant height better. This is the same as the research of Lisa et.al, that the provision of PGPR and Trichoderma has a significant effect on root wet weight, fruit weight per plant, number of fruit planted, and fruit diameter of chili [12].

4. Conclusion

In this study, it was concluded that the parameter of the treatment plant height had the highest average, P1 treatment, without pruning treatment with a height of 30.86 cm at 4 WAP. The biological fertilizer treatment showed significantly different results at 2 WAP on H2 treatment, by giving Trichoderma sp. Has a plant height of 15.14 cm. Then there was an interaction on the plant height parameters of pruning treatment and the provision of biological fertilizers, on the P0H3 treatment, without pruning and giving PGPR + Trichoderma sp. with a plant height of 33.64 cm.

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Improving quality of nickel post-mining soil using mycorrhiza and biochar made from oil palm empty fruit bunch

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Abstract. The physics and chemistry properties of post-mining soil needs to be improved. It is not suitable for agriculture, so alternative technology is required such us using biochar made from oil palm empty fruit bunch and mycorrhiza. This study aims to examine the effect of biochar made from oil palm empty fruit bunch and mycorrhiza to improve the nickel post-mining soil quality. This study randomized group design with 4 levels; B0 (0 t/ha), B1 (10 t/ha), B2 (20 t/ha), and B3 (30 t/ha) with 4 levels; M0 (0 t/ha), M1 (0.8 t/ha), M2 (1.6 t/ha), each treatment was repeated 3 treatments so that the total experiment was 36 units. The results showed that the use of bio-ameliorant waste from oil palm empty fruit bunch with dosage of 30 t/ha, significantly improved the chemical properties of nickel post-mining soil regarding the parameter of C-organic, pH, available phosphorus, cation exchange capacity, exchangeable aluminium, Ca-dd and Mg -dd. The treatment of mycorrhiza 4 g significantly affected the soil properties regarding improvement of soil chemical properties in available phosphorus to plants and exchangeable aluminium parameters. The treatment of biochar with dosage of 30t/ha of soil and mycorrhiza 1.6 t/ha (B3M2) of soil is the best interaction of mycorrhiza and biochar made from oil palm empty fruit bunch as amelioration material of post-mining soil which is characterized by the decrease of exchangeable aluminium. The application of biochar made from oil palm empty fruit bunch and mycorrhiza can improve the nickel post-mining soil quality.

Keywords: nickel post-mining soil, biochar, oil palm empty fruit bunch, mycorrhiza, exchangeable aluminium, phosphorus available

1. Introduction

The land resource potential in Indonesia are very supportive of the mining industry. Most of Indonesia consists of old soil that has ultimate weathering from the parent material. Exposure to climate that alternates between the rainy season and the dry season accelerates the process of parent material mineralization so that it has the potential to be further exploited. This area of advanced weathering is about 67% of the total land area in Indonesia. The nickel mine in Sorowako, East Luwu Regency, is one of the largest nickel mining locations in Indonesia and has been managed since the 1980s by several foreign companies until now under the management of PT. Vale Indonesia [1]. In the area of soil distribution in Sorowako, there is a Ni (II) content with a Ni (II) concentration between 3-5%. A concentration value which is an internationally recognized standard for Ni concentration. Nickel parent rock containing nickel according to international standards is found at a depth of 20-40 m below ground

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level. PT Vale Indonesia uses an open cast mining system. In general, the stages of mining activities carried out include land clearing, stripping of top soil where mining is carried out by cutting the side of the hill from the top to the bottom in accordance with its contour lines, so it can be called contour mining and overburden, the removal of soil and rock material to obtain a nickel-rich layer called saprolite. The top soil of excavation is dumped on the area around the mining area and will be backfilled after mining activities are completed [2]. However, in its mining activities PT Vale has started to carry out land rehabilitation starting from land clearing. The reclamation area in the post-mining land rehabilitation process is intended for revegetation and reforestation processes [3]. Mining activities cause changes in characteristics as a result of the dredging process so that the soil conditions become unstable, the soil texture and structure are poor in composition for growth. Allo (1] states that the condition of the soil after being mined makes it clear that the characteristics of the tailings soil (waste/residue) are macro-porous, the texture of sand or gravel, low nutrient content, dense when dry and poor consistency.

The use of biochar and compost can be used as materials for improving the soil post-mining. According to [4] biochar is black charcoal resulting from the heating process of biomass in a state of limited oxygen or without oxygen. Biochar can be produced from a variety of materials containing ligni-cellulose, such as wood, crop residues (rice straw, rice husks, oil palm empty bunches and sago waste) and manure. Unlike organic matter, biochar is composed of aromatic carbon rings so it is more stable and durable in the soil. Biochar maintains soil moisture so that the water holding capacity is high [5] and remediates soil contaminated with heavy metals such as (Pb, Cu, Cd and Ni). In addition, giving biochar to the soil can also increase growth and nutrient uptake in plants [6].

High rainfall is one of the factors influencing the soil formation process in Sorowako, which allows the alkaline breakdown intensively and leaves leaching-resistant minerals that usually accumulate in the soil surface layer. This affects soil chemical properties, including acidic soil, low organic matter content, low C/N ratio, very low available phosphorus, low CEC and very low calcium content. Neswati et al. [7] states that there is an increase in the degree of soil acidity which affects the availability of macro nutrients P. The use of biochar can also increase available P in alkaline soils because P reactivity with soil increases and forms insoluble compounds with Ca [8]. In contrast to other organic matter in the soil, biochar absorbs P nutrient more strongly.

Indonesia is known as a country with high metal mineral potential where most of the mining activities in Indonesia apply the open pit mining method. This method has caused land degradation, such as changes in topography, opening of forest areas, erosion, contamination of mining waste, and a decrease in the physical, chemical and biological qualities of the soil [1]. According to [2], ex-mining soil clearly shows that the soil is experiencing structural damage and compaction so that it has a negative effect on the soil system. The biological condition of the ex-mining soil is that it has decreased the number of soil microorganisms that occur due to physical changes in the soil (soil compaction) due to mining activities. Meanwhile, [9] states that the total number of microorganisms found in the soil is used as the fertility index, without considering other things. Fertile soil contains a number of microorganisms, this high population indicates a sufficient supply of food or energy plus a suitable temperature, sufficient water availability, other ecological conditions that support the development of microorganisms in the soil. Provision of biological agents in the form of mycorrhizae can overcome these problems. Therefore, mycorrhizae can be a source of microorganisms. According to Anne [10], this biological agent is able to increase nutrient and water uptake for plants and increase soil aggregate stability through the hyphal structure it forms. The use of biochar will also affect mycorrhizal growth in the soil. Because, biochar application can provide a good habitat for soil microbes that help in promoting nutrients so that these nutrients can be absorbed by plants. Based on this description, it is hoped that the provision of biochar and mycorrhizae can be an alternative for the improvement of ex-mining land. This study aims to explore the potential use of oil palm waste bio-ameliorant for the improvement of ex-mining soils, examine the use of mycorrhizae together with oil palm empty bunches biochar and its interaction as amelioration material for ex-mining soil and examine the effect of mycorrhizal and biochar interactions of oil palm empty bunches on soil quality improvement post nickel mining. Meanwhile, the use of this research is

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as a technological input for the improvement of land after nickel mining, utilizing palm oil waste as ameliorant and increasing the potential for using ex-mining land for agricultural production.

This study aims to explore the potential use of waste bio-ameliorant oil palm for ex-mining soil improvement, assessing shared mycorrhizal uses oil palm empty bunches biochar and its interaction as used soil amelioration material mining and studying the influence of mycorrhizal and biochar interactions of oil palm empty bunches on improving the quality of soil after nickel mining. Meanwhile, the usefulness of this research namely as a technological input for land improvement after nickel mining, utilizing palm oil waste becomes ameliorant material and increases the potential use of used land mine for agricultural production land.

2. Methodology

This research was conducted from April to August 2020 at the Green House Experimental Farm, Faculty of Agriculture, Hasanuddin University. Soil sample analysis was carried out at the Laboratory of Soil Fertility Chemistry, Department of Soil Science, Faculty of Agriculture, Hasanuddin University. Soil sampling location post nickel mining is in Sorowako Village, Nuha District, East Luwu Regency at the longitude 121°21'11,838"W and latitude 2°33' 0.965"S. The materials used in the research were post-mining soil, oil palm empty bunches, mycorrhiza, and biochar. While the tools used consisted of sampling tools on the ground, global positioning system (GPS), 10 kg pots, several laboratory equipments This research was conducted using a randomized block design with two factors. A factorial experiment is an experiment whose treatment consists of all possible combinations of levels of several factors. This experiment consisted of biochar factor as F1 with 4 levels, namely B0 (0 t/ha), B1 (10 t/ha), B2 (20 t/ha), and B3 (30t/ha) and mycorrhizal factor as F2 with 3 levels namely M0 (0 t/ha), M1 (0.8 t/ha), and M2 (1.6 t/ha). The observational parameters in the study included the parameters for observing soil properties (pH, cation exchange capacity, C-organic, exchangeable aluminium, and available phosphorus).

3. Results

The results of the post-nickel mining soil analysis before treatment (Table 1) show that the pH value is classified as acidic. This is in accordance with the opinion of [1] which states that the loss of soil solum and the leaching of the soil after nickel mining results in the loss of some cations in soil colloids so that the soil pH is low. This acidic reaction (pH) of the soil after nickel mining causes the soil CEC value to be classified as very low and affects the availability of the macro nutrient P which also decreases its availability in the soil. This is due to the fixation of free Al and Al oxy-hydroxide and forming insoluble Al-P. The results of this study were reinforced by [10] which showed that soil pH had a negative correlation with the amount of Al that binds P (Al-P). Likewise, the level of availability of the nutrient Ca at the analysed soil pH level is very low. It is clear that there has been a decrease in the content values of each macro P nutrient due to mining activities. Soil pH that reacts acidic indicates an increase in Al ions in the soil and need to be improved for physics and fertility properties.

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Table 1. Soil analysis result before treatments

Soil chemistry	Value	Criteria
C-Organic	0.93 %	*low
CEC	3.76 cmol/kg	*very low
Ca	1.95 cmol/kg	*very low
Mg	5.15 cmol/kg	*high
pH H_2O (1:2.5)	5.40	*acid
pH KCl (1:2.5)	5.20	*acid
P available	12.26 ppm	*medium
Al-dd	2.61cmol/kg	*very high

Source: *Balai Penelitian Tanah (2009) & Hill Laboratories (2018)

Table 2. Average of soil C-Organic with biochar treatment

Treatment	C-organic (%)
B0	0.90 [c]
B1	1.24 [b]
B2	1.19 [b]
B3	1.40[a]

Note: The numbers followed by the same letter (a, b, c, d) are not significantly different in the 5% BNJ level test

Table 2 shows that the treatment that had the highest C-Organic content was found in B3 of 1.40%. Treatment of B3 is significantly different from B0, B1 and B2. Based on the [12], the C-Organic content of 1% -2% is still low. When compared with the initial analysis of nickel post-mining soil before treatment (0.93%) there was an increase in C-organic. This is in accordance with the opinion of [13] which states that biochar is persistent in the soil because it contains high carbon (C), more than 50% and does not experience further weathering so that it is stable for decades in the soil. Biochar have a wide surface area and contains many pores so that it has a high density. This physical property allows biochar to have the ability to hold water and fertilizers which is quite high.

Table 3. Average of soil reaction (pH H_2O)

Treatment	C-organic (%)
B0	0.90 [c]
B1	1.24 [b]
B2	1.19 [b]
B3	1.40

Note: The numbers followed by the same letter (a, b, c, d) are not significantly different in the 5% BNJ level test

Table 3 shows that the highest soil pH was found in treatment B3 (5.86). Treatment of B3 is significantly different from B1 and B0, but not significantly different from B2. The pH value before treatment, which is 5.40 which is classified as acid, it indicates that the average pH of the treatment B1, B0, and B3 have increased so that the soil is classified into a slightly acidic. This is in accordance with the opinion of [14] that the 6 kg pyrolysis process produces 1.9 kg of biological charcoal where the pH value is 9. This is in line with the opinion of [15] which states that in general biochar is neutral to alkaline so it can be used for increase acid soil.

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As pH decreases, the solubility and toxicity of aluminium (Al) increases in the soil. Al-dd also correlate to the level of P available in the soil. The chemical process that occurs is Al and Fe oxides increase P retention. This reaction occurs depending on soil acidity, P is bound by strong absorption energies such as iron/aluminium oxides and Fe/Al hydroxides so that Al-P bonds occur (Ohno & Amirbahman, 2010).

Table 4. Average of available P

Treatments	P (ppm)
B0	6,71 ^{d}
B1	11,03 ^{c}
B2	14,34 ^{b}
B3	19,08 ^{a}

Note: The numbers followed by the same letter (a, b, c, d) are not significantly different in the 5% BNJ level test

Table 4 shows that the highest available P is in the M1 treatment with a value of 13.58 ppm. However, M1 treatment was not significantly different from M2. This is because these treatments differ only in dosage but give the same effect. However, M1 and M2 are significantly different from M0. This treatment was significantly different from treatment B0, B1 and B2. This is in line with decreasing Al-dd and increasing pH after treatment. This is in accordance with [1] opinion which states that a high soil pH indicates a decrease in Al ions in the soil so that the nutrient elements needed are in greater numbers. This is because these nutrients do not dissolve easily.

The interaction effect between biochar and mycorrhizae as shown in Table 5 shows that B3M2 treatment has the lowest exchangeable Al and was significantly different from other treatments. This is in line with the increase in pH after treatment which indicates a decrease in Al ions in the soil.

Table 5. Average exchangeable of Al (cmol kg^{-1}) from interaction biochar and mycorrhiza

Mycorrhiza	Biochar (t ha^{-1})			
(t ha^{-1})	B0	B1	B2	B3
M0	2.41^{bcd}	2.52^{ab}	2.39^{cd}	1.99^{g}
M1	2.54^{a}	2.50^{abc}	2.22^{e}	1.84^{h}
M2	2.38^{d}	2.36^{d}	2.10^{f}	1.58^{i}
NP BNJ $_{0.05}$		0.01		

Table 6. Average CEC (cmol kg^{-1}) from interaction biochar and mycorrhiza

Mycorrhiza	Biochar (t ha^{-1})			
(t ha^{-1})	B0	B1	B2	B3
M0	5.49^{f}	11.02^{c}	11.80^{c}	15.82^{a}
M1	7.95^{e}	11.51^{c}	13.13^{b}	16.24^{a}
M2	9.05^{d}	12.73^{b}	13.47^{b}	15.88^{a}
NP BNJ $_{0.05}$		0.83		

Furthermore, the results of this study also indicated that B3 treatment significantly increased soil CEC compared to other treatments (Table 6). The best interaction effect of the biochar and mycorrhizal treatment and significantly different from other interactions was found in B3M1 treatment that have 16.24 cmol kg^{-1}.

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4. Conclusion

- The use of oil palm empty fruit bunches bio-ameliorant at a dose of 30 t/ha soil significantly improves nickel post mining soil quality.
- Application of mycorrhizae 1.6 t/ha significantly improved soil chemical properties of available phosphorus parameters and decreased exchangeable aluminium.
- Interactions between biochar 30 t/ha and mycorrhizal 1.6 t/ha (B3M2) is the best interaction to decrease in the of exchangeable aluminium and increase availability of P in the nickel post-mining soil.

5. Acknowledgement

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Engineering Design Of Fuel Reactor Pirolysis Incinerator (IPFR) Processing Plastic Waste into alternative Fuel with Residual Oil Heating

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Abstract. In Indonesia, plastic waste has become an important problem at this time, because it causes environmental pollution problems. One of which is by converting waste into liquid fuel. Some types of rubbish that we often encounter are plastic bottles such as plastic cups, plastic bottle caps and others, which is one of the types of PP (polypropylene) waste. Polypropylene type plastic is the type of plastic that is most widely used in daily life because it has good mechanical properties with low density, heat and moisture resistance, and has good dimensional stability, Technology using the method of high temperature (Thermal Cracking). In this study, researchers designed a Thermal cracking device, namely an Incinerator, a plastic waste smelter with high temperature, where the modification of this tool is to use used fuel oil or residual oil. In this study, the researcher analyzed the burning time, the amount of waste mass needed for the melting process in the Incinerator. In this research, a fuel equivalent of 1.5 liters of premium fuel was produced with 10 kg of plastic waste burned in the incinerator with a burning time of 125 minutes of the pyrolysis process, with a combustion temperature of 180-250 degrees Celsius.

1. Introduction

In Indonesia, plastic waste has become an important problem at this time, because it causes environmental problems such as health and soil pollution. So many people do not use plastic waste to be processed again, but instead it is destroyed by burning which causes air pollution so that it can endanger the community.

Some types of waste that we often encounter are types of plastic bottles, for example plastic cups, plastic bottle caps, children's toys and margarines, etc., which is a type of PP (polypropylene) waste [1] [4] [7] [8]].

Polypropylene plastic is the type of plastic that is most widely used in everyday life because it has good mechanical properties with low density, heat and moisture resistance, and has good dimensional stability. [5] [7] [13]

Polypropylene PP plastic cracking process is one way to handle plastic waste. There are three types of cracking processes, namely the cracking process using hydrogen (hydro cracking), the cracking process using high temperatures (thermal cracking) and the cracking process using a catalyst (catalytic cracking).In this research, the researcher designed a tool for melting plastic waste, namely the Incinerator. The process used is still used the pyrolysis process. This Incinerator uses fuel from residual oil or used oil.

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2. Material and Methods

2.1. Research Methods

The method used in this study is to use experimental methods. The experimental method is a research method used to test the effect of a treatment carried out on the object under study by comparing it with no treatment. This experimental method can also mean comparing testing several variations of treatment with testing without variation as a comparison.

2.2. Incinerator Pirolisis

Incinerator is a furnace used to process solid waste into gaseous matter and ash (bottom ash and fly ash). Incineration of waste processing can reduce volume and mass and reduce the hazardous nature of infectious waste. Factors that play an important role in incineration are the combustion temperature and the burning time of the waste [14].

Utilization of incineration heat energy is identical to combustion, which can produce energy that can be utilized. An important factor that must be considered is the quantity and continuity of waste to be supplied. The quantity must be sufficient to generate energy continuously so that the energy supply is not cut off [14].

2.3. Incinerator Pirolysis Design

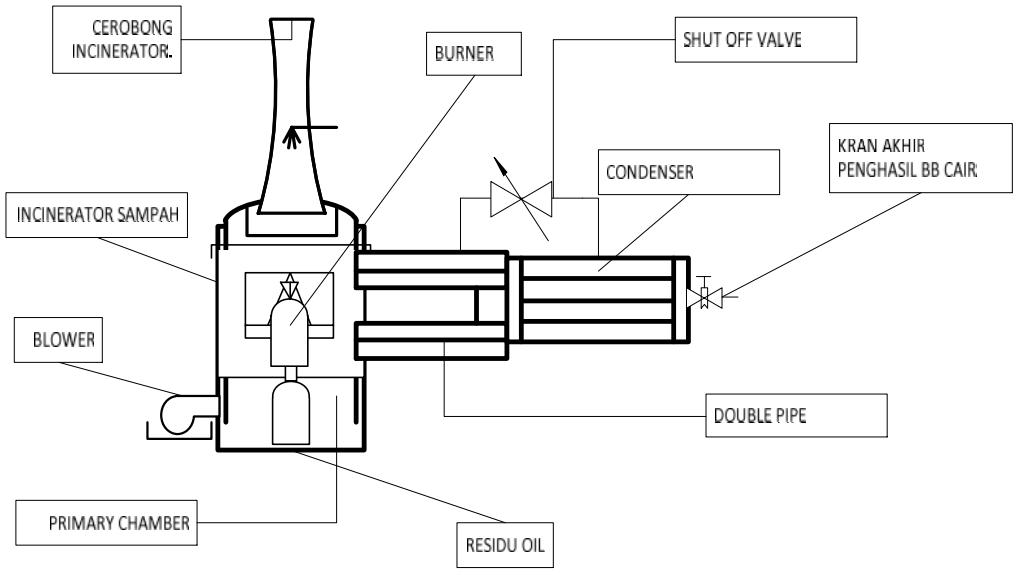

Figure 1 : Incinerator Pyrolysis Fuel Reactor

2.4. Residual Oil Heating

Lubricating oil is a petroleum product which includes a heavy distillate fraction and has a boiling point route of 300 ° C. Lubricating oil is a petroleum product. The functions of lubricating oils include: reducing friction and wear, cooling engine components, helping tighten compression and cleaning engine components. Lubricating oils used to lubricate machines have requirements, including: high temperature resistance, rust and corrosion resistance, being able to prevent foam and being able to flow at low temperatures. The selection of the lubricating oil viscosity that is not quite right can hinder engine work. Lubricating oil that is too thin will not function properly and if it is too thick it will hamper the engine because of high resistance.

It is feared that the burning of used lubricating oil directly will cause high air pollution. The process for burning used oil is very difficult, this is because the carbon bonds in used oil are long, making it

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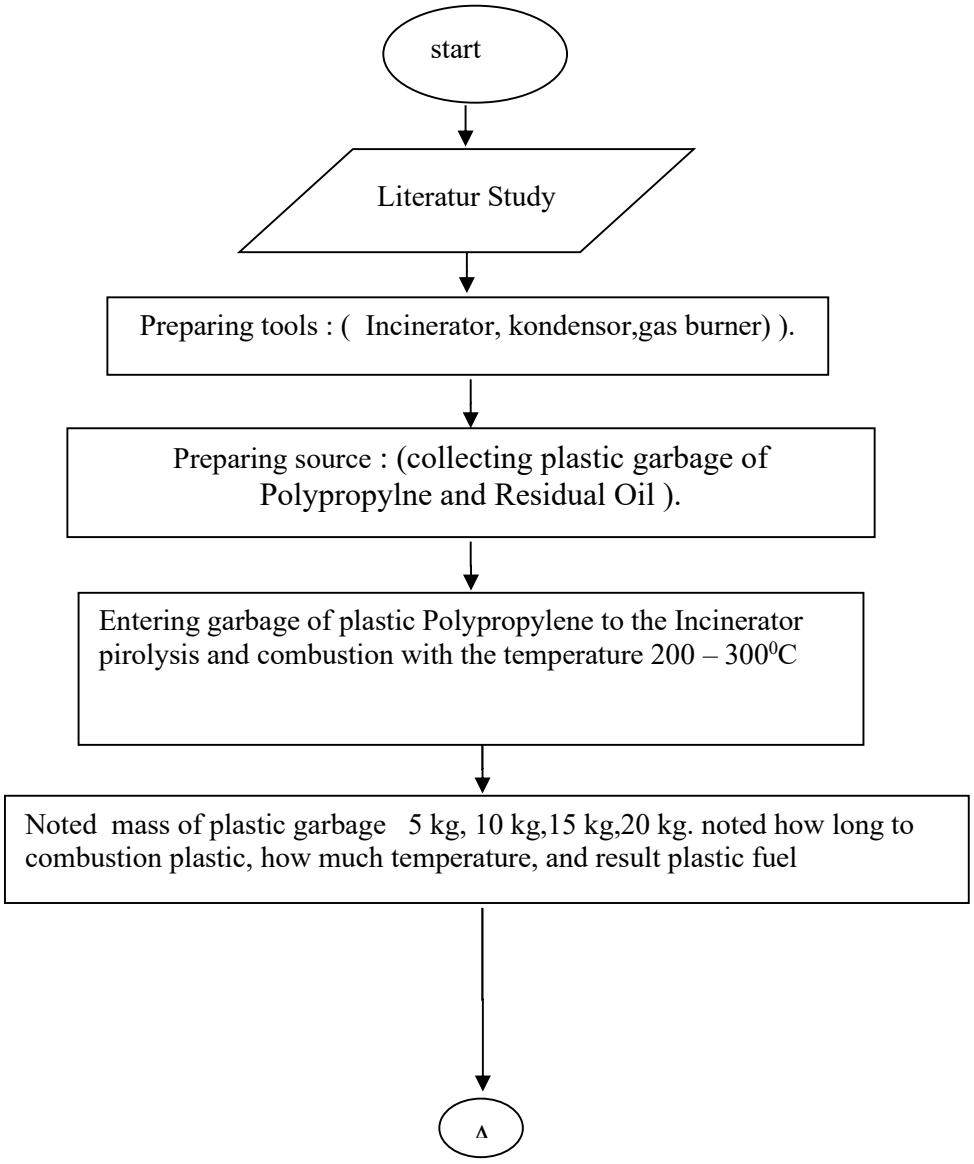
difficult to crack (cracking). In addition, used oil contains both physical contaminants (metal debris and ash) and chemically (solvents and water). One easy treatment process is to mix used oil with kerosene [15] [16].

3. Research Flowchart

In preparation for this research, the steps are formed in the flowchart as follows:



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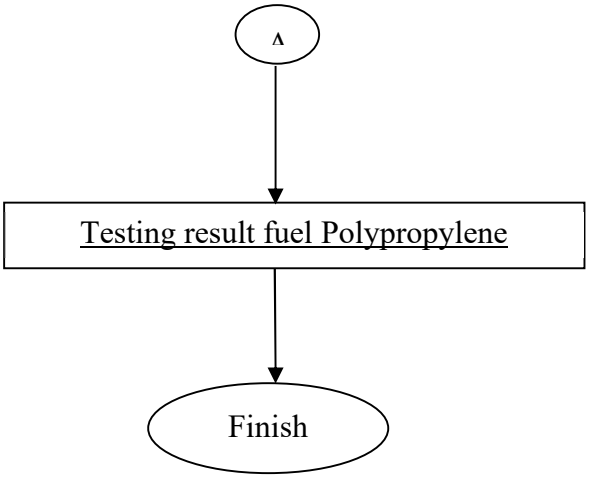

4. Parameter of measurement

4.1. Dependent variables and observed variables

4.2. Dependent Variables

- Volume of Polypropylene liquid fuel
- Fuel heating temperature
- Standar fuel like Premium, pertalite, Pertamax

4.3. Observed variables

- Mass of Plastic Garbage Polypropylene
- Temperature Heating for combustion
- Volume Liquid Fuel Polypropylene
- Calorific Value

5. Result and Discussion

The results of the Pirolysis Incinerator Design Fabrication are as follows Information:

- Pirolysis Incinerator Reactor
- Vacum Reactor
- Inlet Plastic Garbage
- Residual Oil Heating
- Pipe to Condenser tube
- Burner with combustion gas

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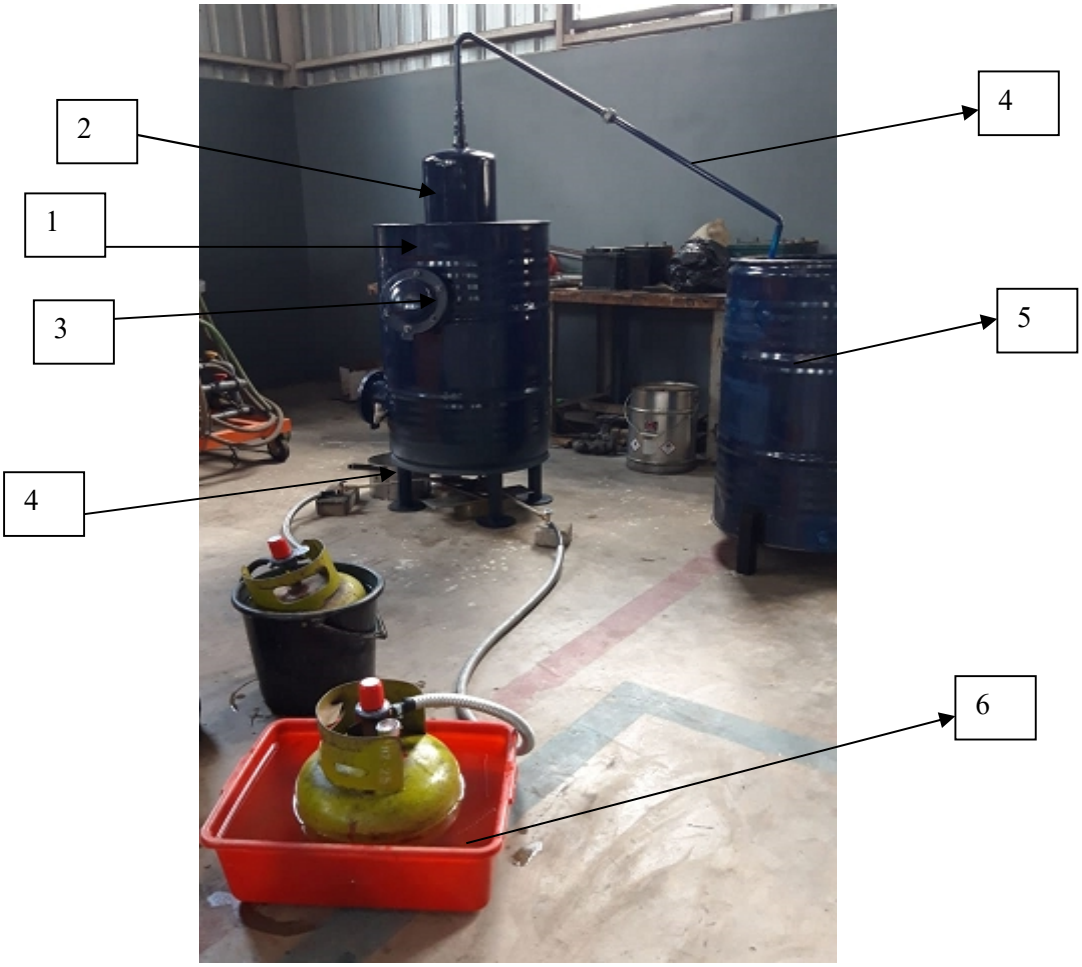

Figure 2. Incinerator Pirolysis Ready

5.1. Table

Table 1. Result Mass , Temperature, Time, Volume Of Polypropylene Fuel

NO	Mass Of Plastic Garbage	Time For Combustion	Temperature (Degree Of Celcius)	Volume Of Polypropylene Fuel
1	5 kg	100 minute	200	0,7 litre
2	10 kg	125 minute	210	1 litre
3	15 kg	200 minute	245	1,2 litre
4	20 kg	300 minute	270	1,7 litre

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5.2. Table

Table 2 . Octane and Calorific Value With Purification Tool

No.	Fuel	Octane Value/RON	Calorific value (gram/kalori)	Spesific Fuel Comsumption (second)
1	BBPP from Purifier wth temperature 80°C	93,5	16919,49	07:14
2	BBPP from Purifier wth temperature 100°C	93,3	10249,52	05:08
3	BBPP from Purifier wth temperature 120°C	92,8	10229,91	05:33

Note BBPP : Bahan Bakar Poly propylene

Figure 3.Polypropylene Fuel from Incinerator Pirolysis

5.3. Work Of Residual Oil Heating(accelerate the combustion)

When combustion uses oil residue, the oil residue is heated near the gas burner in the pyrolysis incinerator reactor, when the temperature reaches 150 ^{0}Celsius, the density of the oil residue increases as well as the viscosity, so that the gas pressure from the gas cylinder is helped by viscosity and the density of this oil residue. and will accelerate the increase in combustion temperature to 250 ^{0} Celsius and even up to 300^0 Celsius, so the function of this oil residue here is as a substance to accelerate the combustion reaction from the gas tube to the pyrolysis incinerator reactor.

From table 5.1 above it is known that to burn 5 kg of polypropylene plastic material it takes 100 minutes with a temperature of 200 degrees Celsius and produces 0.7 liters of liquid polypropylene fuel. And to burn 10 kg of plastic waste it takes 125 minutes with a temperature of 210 degrees Celsius and produces 1 liter of polypropylene liquid fuel. And to produce 1.7 liters of Polypropylene liquid fuel, it takes 20 kg of plastic waste, and it takes 300 minutes with a temperature of 270 degrees Celsius.

From table 5.2, after the fuel is produced by the Pirolysis Incinerator, the fuel is purified by a purifier apparatus as shown below:

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Figure 4. Purification Tool

After being put into the purifier and tested, it resulted that heating in the Purification Tool at a temperature of 80 degrees Celsius resulted in an octane value of 93.5, a calorific value of 16919.49 gr / calorie with a burning rate of 07.14 seconds.

6. Conclusion

Based on the results of research observations, testing the mixture of PP (Polypropylene) type liquid plastic fuel and data analysis that has been carried out in the previous chapter, it can be concluded that the following are:

- To burn 5 kg of polypropylene plastic it takes 100 minutes with a temperature of 200 degrees Celsius and produces 0.7 liters of liquid polypropylene fuel. And to burn 10 kg of plastic waste takes 125 minutes with a temperature of 210 degrees Celsius and produces liquid fuel polypropylene by 1 liter. And to produce 1.7 liters of Polypropylene liquid fuel, it takes 20 kg of plastic waste, and it takes 300 minutes with a temperature of 270 degrees Celsius.
- After being put into the purification tool and tested, it is produced that heating in the Purification Tool at a temperature of 80 degrees Celsius produces an octane value of 93.5, a calorific value of 16919.49 g / calorie with a burning rate of 07.14 seconds

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Improving service quality of refrigeration system with using 3R toreduce air pollution at "Udy Teknik" workshop in Balung Kulon Village – Jember Regency

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Abstract. Refrigeration system has an impact on air pollutin and depletion of the ozone layer due to refrigerant wich contains CFC (Chloro Flouro Carbon) example Refrigerant R22 (CFC 22). The leak occurs when doing the process filling and replacing the refrigerant from refrigerant system. The problem partners is that the tools used are inadequate for the process of filling and replacing refrigerant, only relying on a simple basis, with the help of making 3 R (Recovery, Recycle, Recharge) tools it is hoped that it can be more efficient and overcome leaks from refrigerants.Thus, customer confidence will increase with the performance of employees and supported by more adequate workshop infrastructure. To expand the customer area, the creation of the UdyTeknik Workshop website is a breakthrough in the era of digitalization so that it can provide information on workshop activities to customers while measuring workshop performance through the feed back column. One of the outputs of this activity is the existence of technological innovation for tools that are able to be operated by employees through training activities so that it has a positive impact on partners because it can increase productivity from an economic point of view and achieve a comfortable and safe atmosphere in working in a workshop which leads to increased customer trust.

1. Introduction

Air conditioning technology has a direct contribution to environmental damage including depletion of the ozonelayer and global warming through leakage and discharge of refrigerants (refrigerants) into the environment. BecauseRefigeran HCFC is an artificial chemical compound used for cooling systems or we often call refrigerants (refrigerants).There are many types of refrigerants used for cooling systems, one of which is the HCFC refrigerant (HydroChloro-Fluoro-Carbon) an example of this refrigerant is R22 (HCFC-22). These ozone-depleting chemicals are very stable, so they can reachthe stratosphere as a whole [2,3]. When in the stratosphere, these chemicals are converted by ultraviolet radiation fromsunlight and give off ozone-destroying chlorine atoms. Besides being able to destroy ozone, HCFCs also contribute toglobal climate change, because these compounds have global warming potential (GWP- Global Warming Potential)tall one. HCFCs are also one of the main contributors to greenhouse gases. Greenhouse gases are caused byincreasing concentrations of carbon dioxide (CO2) and other

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gases inatmosphere. So it is very necessary to reduce (prevent) environmental damage by providing knowledge to thecommunity, especially practitioners service to adopt environmentally friendly handling methods.

Udy Teknik Workshop is a business in the field of car repair and maintenance services, car air conditioningrepair, air conditioning rooms / buildings / agencies as well as refrigerators and display cooler. This workshop also providesmobile repair services or home service which will serve the repair and maintenance of refrigeration machines according to thelocation or place of residence of consumers by contacting via telephone. Udy Teknik's workshop was founded in 2012,located at Jalan Diponegoro No. 15 Balung Kulon, Balung District, Jember Regency, with a workshop area of 8 mx 12 m.

The number of employees is 8 people. Every day, on average, they receive repair services for 5 to 8 units of vehicles or airconditioners that must be resolved according to the level of the problem to be repaired. The Udy Teknik workshop has a verydifficult time meeting the criteria required by the ministry of industry and the environment for the repair and maintenance of airconditioners. This happens because during the process of filling and discharging the refrigerant the equipment used is verysimple, causing the refrigerant leak from the AC system and the freon in the tube to evaporate into the air because there is noinsulator that sends the refrigerant back to the exhaust tank which is very inefficient. As a result, the air in the work areasmells of refrigerant and pollutes the area. And this is the AC repair service belonging to the Udy Teknik Workshop has notreceived a recommendation to serve on a larger scale.

2. Method and material

Solutions for equipment that meet the standards of AC work are mandatory in order to meet the criteria set bythe government. Because the job of filling and filling refrigerants must not leak into the air which can damage theozone layer and can become toxic if inhaled by humans, the solution is made by a 3R machine / device (Recovery,Recycle, Recharge). Thus services to consumers are more secure, efficient and safe for the environment. Theprinciple of the 3 R tool that will be made is the process of recycling the refrigerant, so that it can be reused with goodquality [2].

Recovery: the process of transferring refrigerant in the form of vapor, liquid or mixed with other substances in the AC system tobe stored in a container outside the AC system. **Recycling:** the process of reducing refrigerant contaminants after use in an air conditioning system. This processinvolves separating the lubricating oil, removing and reducing moisture, acidity, and other particles from the refrigerant. **Recharging:** the process of charging refrigerant back to the car air conditioning system after the recovery and recycling process is carried out.

Figure 1. 3R Machine

After the 3R tool manufacturing process (figure. 1) , the next step is to test the tool for use in maintaining the customer'scar AC cooling system. For this reason, an analysis is needed using the method of Importance Performance Analysis (IPA)which aims to measure the level of service satisfaction service to customers by making a list of questions or questionnaires.

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The Importance Performance Analysis (IPA) method can be started by identifying the initial attributes, identifying the importance level (expectancy) of each attribute andidentifying the performance in each attribute [1,4]. Second, determine the advantages and disadvantages of service withquadrant analysis. Counting the number of incoming questionnaires. Test the reliability and validity of the items with theMicrosoft Excel tool. Determining the level of respondent's suitability. Determining the average score of the level ofexecution / satisfaction and importance level [6,7]. Determining X is the average of the average score of the level ofimplementation / satisfaction over all factors or attributes and Y is the average of the importance level score of all factorsthat affect customer satisfaction [5]. Elaborate the level of these elements into four parts of Cartesian diagram. Cartesiandiagram can be seen in Figure 2.

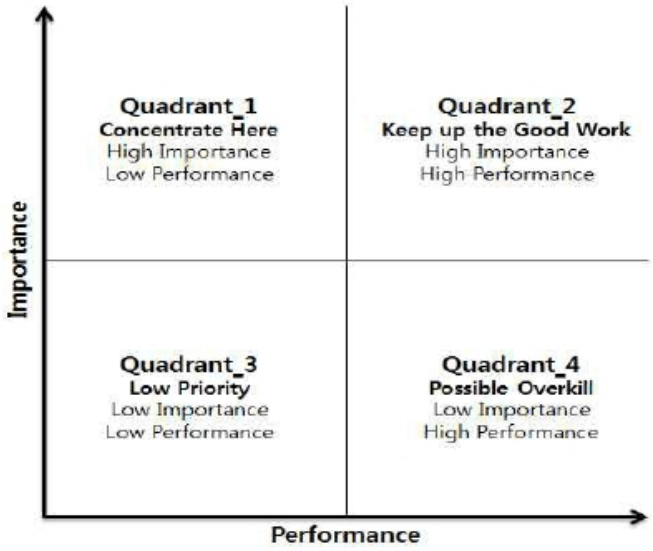

Figure 2. Cartesian diagram

The number of correspondents to be drawn is based on the following equation [1]:

$$n=\frac{N}{1+(N\times e^2)} \qquad (1)$$

Where :

n: number of respondents
N: Number of subscribers (N) average per month or week or day
Percentage rate of inaccuracy (e) is 10%

Because the 3R tool has just been tested and the data collection time is only 3 days with 12 customers / consumers,

$$n=\frac{12}{1+(12\times 0{,}1^2)} \qquad (2)$$

= 10,71 responden,

From the equation above, the number of respondents is 11 respondents.

3. Results and Discussion

Identification of attributes is done through literature study by looking for further research, conductinginterviews and distributing questionnaires given to customers of the Udy Teknik Workshop.

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Table 1. Initial Attribute Satisfaction User Service UdyTeknik Workshop

Dimensions	Code	No	Service Attribute	ΣẊip	ΣẎip	%	Gaps
Realibility	RE1	1	Service is carried out quickly according to the promised time	2,45	3,64	67,5%	-1,18
	RE2	2	Technicians / employees show their sincerityin dealing with customer problems	2,82	3,64	77,5%	-0,82
	RE3	3	Technicians / employees are able to easily explain products or defects that customers do not understand	2,27	3,27	69,4%	-1,00
	RE4	4	Technicians / employees always strive for error-free service	2,45	3,27	75,0%	-0,82
Assurance	A1	5	The ability of technicians / workshop employees to diagnose problem that complained customer	2,91	3,64	80,0%	-0,73
	A2	6	Feel safe to have used Udy Teknik's repair shop services because of authenticity spare parts	3,18	3,64	87,5%	-0,45
	A3	7	Customer feel believe leave his car at the time of doing service	3,00	3,36	89,2%	-0,36
	A4	8	Customers feel confident in the competence ofworkshop employees in fixing problems with their cars	2,73	3,18	85,7%	-0,45
	A5	9	Workshop employees are consistently courteous to customers	2,55	3,27	77,8%	-0,73
Tangibles	T1	10	The Udy Teknik workshop provides adequate parking space	2,27	3,64	62,5%	-1,36
	T2	11	The appearance of the technicians / employees of the Udy TeknikWorkshop is polite and neat	2,36	3,64	65,0%	-1,27
	T3	12	The waiting room facilities of the Udy Teknik Workshop are completeand clean	2,18	3,27	66,7%	-1,09
	T4	13	Udy Teknik workshop has complete vehicle service equipment	3,09	3,64	85,0%	-0,55
Empathy	E1	14	Technicians / employees provide individualized attention to customers	2,73	3,64	75,0%	-0,91
	E2	15	Technicians / employees workshop give ease of service to customers	2,55	3,64	70,0%	-1,09
	E3	16	Technicians / employees understand What that customer needed	2,36	3,27	72,2%	-0,91
	E4	17	Technicians / employeesgive convenience in communicating with customers	2,82	3,73	75,6%	-0,91
Responsiveness	R1	18	The speed of technicians / employees in handling complaints submitted by customers	2,45	3,64	67,5%	-1,18
	R2	19	Technicians / employees always responds to complaints customers quickly	2,82	3,64	77,5%	-0,82
	R3	20	Technicians / employeesalways ready to help customer requirements	2,82	3,27	86,1%	-0,45
	R4	21	Technicians / employees try to provide the best solution to customer complaints	2,91	3,73	78,0%	-0,82

Based on the Cartesian diagram figure 3, the image below which goes to quadrant 1 is a top priority where respondents feel the attributes are very important but feel dissatisfied with performance Udy Teknik Workshop. These attributes include the employees of the Udy Teknik Workshop in providing services, theUdy Teknik Workshop responds to requests and complaints quickly, and the Udy Teknik

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Workshop employees providesuggestions to consumers to choose the type of service that suits their needs.

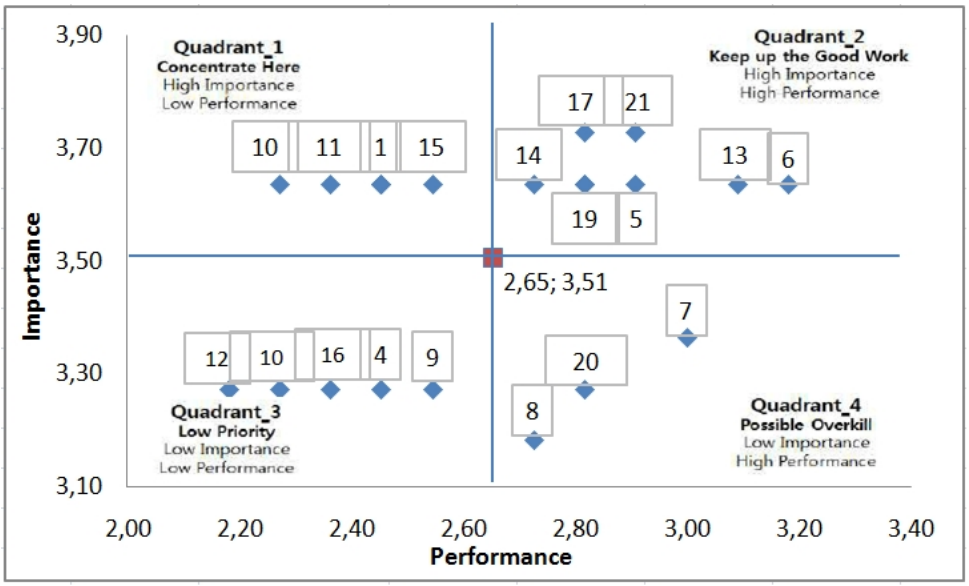

Figure 3. Diagram of Cartesian Importance Performance.

Whereas in quadrant 2 the customer considers the attributes in this quadrant to be very important and verysatisfying so that this attribute must be maintained which includes the results of the work in accordance with the initialagreement being reliable compared to similar competitors, the ease of obtaining information about damage to coolingengine components and services provided and consumers feel comfortable communicating with Udy Teknik's employees inanswering customer questions by providing the best solutions for customer complaints.

In quadrant 3, it can be seen that some of the attributes are less important and unsatisfactory, related toinadequate workshop places for car parking and less tidy workshop facilities and employees who do not applypoliteness to the customer.

Whereas in the last quadrant, namely quadrant 4, the customer assessed that the competence of employeesto handle problems in repairing and using workshop equipment was still inadequate and needed to be improved soas to support customer needs in repairing the AC cooling system.

The recommendation was given to the Udy Teknik workshop first to improve the performance of service qualityattributes that are considered important by users but the performance is still low, especially in quadrant A, which consists of4 attributes, so that customers do not feel disappointed and want to reuse the Udy Teknik Workshop.

4. Conclusion

From the Importance Performance Analysis (IPA) that the Udy Teknik workshop all attributes have a negative value, which means that each of these attributes have not met customer expectations, but have the best service attributes on consumer confidence to leave their vehicle safely (A3) 7 when it will be repaired with a score of 89 , 2%. Meanwhile, in the service attribute of providing parking space for customers, T (1) 10 is very important to do immediately because it has large gaps about -1.36.

Acknowledgments

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Antibacterial and Radiant Heat Absorbing Effects on TiO2 Based Resins

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Abstract. TiO2 (Titanium dioxide) is widely used as a nanomaterial for bacterial decontamination processes. TiO2 can provide a more decontamination effect when exposed to UV light. Ultraviolet light can be a trigger for Tio2 nanoparticles to inhibit bacterial growth. The specimen we tested was a mixture of clear resin with TiO2 0.01gr - 0.06gr (0% -10% of specimen weight) with an increase of 0.01gr each. From the results of research conducted by our research team it was found that the decontamination effect of Escherichia coli bacteria persists even after exposure to ultraviolet light is eliminated. The specimen is also capable of absorbing sunlight and radiant heat with a consistent increasing trend for each increasing variation of the mixture.

1. Introduction

In the construction industry, nanomaterials are widely used because of their characteristics such as thermal requirements, humidity, energy efficiency, air quality enhancement effects, self-cleaning, and antibacterial effects. Nanomaterials are used on a variety of surfaces such as walls, doors and roofs. On a fiberglass roof, for example, a transparent material with other particles, such as titanium dioxide (TiO2 nanoparticles is inserted2). TiO2 nanoparticles have photocatalyst and hydrophilic properties so they can be anti-UV and anti-fogging [1].

In the automotive sector, transparent materials have begun to be used as vehicle exteriors such as car windshields or helmet glasses. The material used is a mixture of resin with TiO2. With this mixture, the windshield of the vehicle is able to absorb ultraviolet light and self-cleaning antibacterial so that it has a better effect on the health of the driver's body.

Ultraviolet (UV) radiation from the sun for a long time can cause sunburn and skin cancer **[2]**. Therefore, to engineer a material that can scatter UV rays and transmit visible light is necessary. This can be done by inserting / coating a transparent material with other particles, such as Titanium Dioxide (TiO2) nanoparticles.

TiO2 nanoparticles have an energy gap of 3.2 eV so that they can scatter most of the UV and absorb some of the other and very little is transmitted. In terms of its toxicity, TiO2 is classified as safe or non-toxic with a chemical bond that is quite stable against UV rays **[3]**.

Photocatalyst is a process that is assisted by the presence of light on the catalyst material (in this case TiO2). The photocatalytic properties of TiO2 have the advantage that organic pollutants can be degraded into harmless compounds such as water and carbon dioxide, and are more efficient in their use of chemicals and energy **[4]**.

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Besides having photocatalytic properties, TiO2 also has hydrophilic properties. The hydrophilic properties of the TiO2 coated material were discovered in the 1990s, various types of functional materials began to be developed **[5]**.

The hydrophilic nature of TiO2 causes the surface of the material coated with TiO2 to be anti-fogging and self-cleaning because the contact angle of water droplets on the surface is only about 100 and will continue to decrease until it reaches 0 when exposed to ultraviolet light. This property is used to coat glass, so that the glass will be anti-fogging and self-cleaning.

The specimens produced can be developed into automotive glass mica or clear coatings in the paint industry which are useful as heat absorbers, antibacterial, scratch resistant and hardened layers. The food and plastic packaging sector can also take advantage of this material because of its self-cleaning antibacterial and heat absorptive properties.

Currently, the manufacture and use of biomaterials with antibacterial effects in medical treatment planning is rapidly developing. Manufactured products that contain antibacterial agents or coatings with antibacterial properties have become an interesting topic for research in the medical field. Various types of materials with antibacterial properties, and analyzed in the laboratory; some have even been marketed.

There are antibacterial agents that involve nanotechnology or what can be called nanotechnology. Nanotechnology in the medical field is proving to be a promising concept. Nanotechnology is a technology that involves materials in nano size **[6]**. In this study, researchers focused on the use of a nanomaterial known as TiO2 (titanium dioxide).

Titanium dioxide will be one of the ingredients in the resin in an effort to produce resin-based composites with antibacterial properties by adding titanium dioxide which is capable of having the short-term effect of an antibacterial agent.

In this study, the researchers aimed to review the effect of nanomaterials added to titanium dioxide resin-based composites for their antibacterial properties. Observations will be made by comparing the number of bacteria present in two different specimens through SEM tests to obtain images of the number of bacterial colonies present in the specimen. The specimens to be used in this study are resin specimens without a mixture of titanium dioxide and resin specimens with a mixture of 0.06gr titanium dioxide with several variations of treatment.

In this study, researchers made a specimen using a mixture of resin and titanium dioxide (TiO2). This specimen will be analyzed for its heat absorption ability using a digital thermometer, the ability to transmit light with a lumens meter, and the ability to inhibit bacterial life. The addition of 0.01gr, 0.02gr, 0.03gr, 0.04gr, 0.05gr, 0.06gr TiO2 in a resin will be the variety of this research. This study tries to develop a transparent anti-UV material and self-cleaning material, using resin as a transparent material. If the energy is greater than the material gap energy, absorption will occur and if it is smaller than the gap energy, it will be transmitted.

The addition of TiO2 nanoparticles to the resin is expected to increase the absorption of the material against UV radiation and is hydrophilic in nature so that the ability of transparent materials as UV protection and self-cleaning can be maximized, which can be seen from the absorption value of the material and the decrease in the value of the contact angle.

This study aims to modify the transparent material so that it provides protection against UV radiation and self-cleaning, namely by optimizing the ratio of TiO2 nanoparticle concentrations with polyester resin so that the anti-UV and self-cleaning capabilities of transparent materials can be maximized.

2. Methods

2.1. This research can be summarized briefly in the following stages:

2.2. Preparation: Covers the activities of studying the literature and formulating formulas for the composition of the mixture of resin and TiO2. Solid material specimens were made with a fixed volume of resin and varying the mass of TiO2.

2.3. Specimen Making: This study used 5 material samples where each material has the same shape but different TiOcontent2. Making specimens by printing on the molding provided.

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2.4. Testing: In this process, a measurement of heat absorption is carried out using a digital thermometer. Then tested the ability to transmit light using a lumens meter. After that, antibacterial testing is carried out by inserting the specimens that have been exposed to bacteria into a box that is exposed to sunlight and tested under a microscope to see how many bacterial colonies are still there.

Figure 1. Setting Apparatus

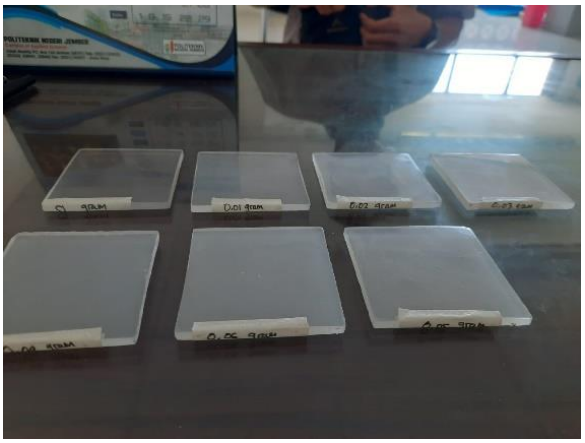

Figure 2. Specimens

Figure 3. SEM (Scanning Electron Microscope) Hitachi TM3030Plus

Figure 4. SEM (Scanning Electron Microscope) Hitachi Specimens Fitting Place.

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3. Result and Discussion

Table 1. Average Sun Light Intensity

TiO2 Weight (gram)	Average Sun Light Intensity Outside the Box (Lux)	Average Sun Light Intensity Inside the Box (Lux)
0	97300	88700
0,01	97400	70500
0,02	95700	55700
0,03	97500	54400
0,04	96000	47600
0,05	98000	42700
0,06	99300	40900

Table 2. Average Temperature (Sun)

TiO2 Weight (gram)	Average Temperature Outside the Box (°C)	Average Temperature Inside the Box (°C)
0	34,7	42,1
0,01	32,9	41,7
0,02	37,2	44,6
0,03	40,7	49,3
0,04	38,4	48,3
0,05	36,3	44
0,06	33,9	39,9

Table 3. Average Bulb Light Intensity (100W Bulb)

TiO2 Weight (gram)	Average Bulb Light Intensity Outside the Box (Lux)	Average Sun Bulb Intensity Inside the Box (Lux)
0	54700	49040
0,01	49700	41780
0,02	49900	39300
0,03	50600	37520
0,04	49900	36400
0,05	50700	35460
0,06	50300	33480

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Table 4. Average Temperature (100W Bulb)

TiO2 Weight (gram)	Average Temperature Outside the Box (°C)	Average Temperature Inside the Box (°C)
0	55,3	45,8
0,01	54,5	44,8
0,02	56,7	46,7
0,03	54,4	43,9
0,04	55,1	44
0,05	52,8	44,1
0,06	54,2	44,3

Table 5. Average Specimen Surface Temperature (Sun)

TiO2 Weight (gram)	Average Surface Temperature of Outer Specimens (°C)	Average Surface Temperature of Inner Specimens (°C)
0	36,8	35,5
0,01	38,2	37,5
0,02	37,7	36,5
0,03	37,1	35,6
0,04	39,1	36,2
0,05	38,8	37,4
0,06	38,3	36,7

Table 6. Average Specimen Surface Temperature (100W Bulb)

TiO2 Weight (gram)	Average Surface Temperature of Outer Specimens (°C)	Average Surface Temperature of Inner Specimens (°C)
0	54,8	41,1
0,01	55,1	43,1
0,02	53,7	41,7
0,03	56,9	42,7
0,04	55,8	42,3
0,05	56,2	44,5
0,06	57,9	43,7

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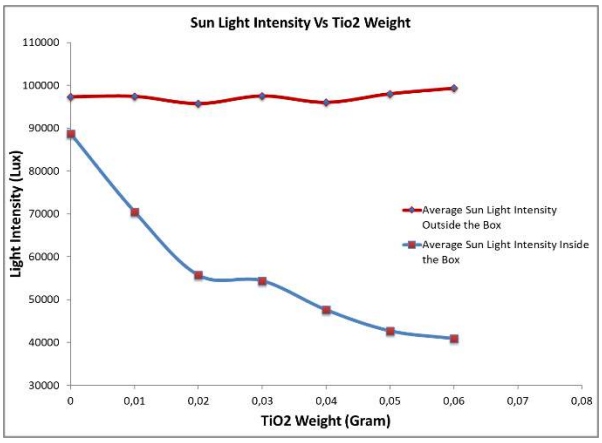

Figure 5. Average Sun Light Intensity

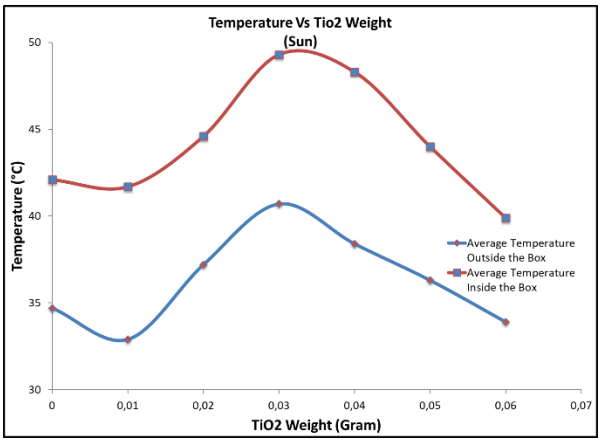

Figure 6. Average Temperature (Sun)

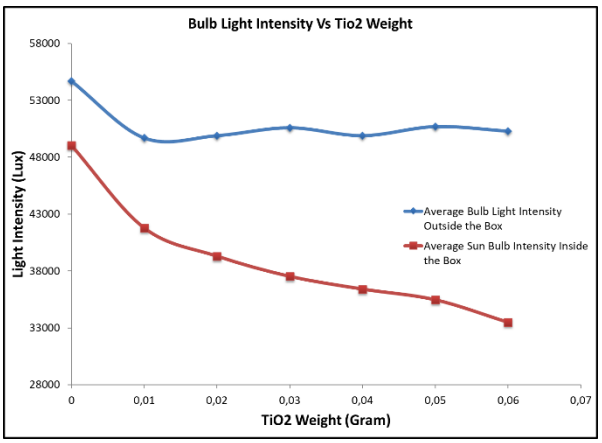

Figure 7. Average Bulb Light Intensity (100W Bulb)

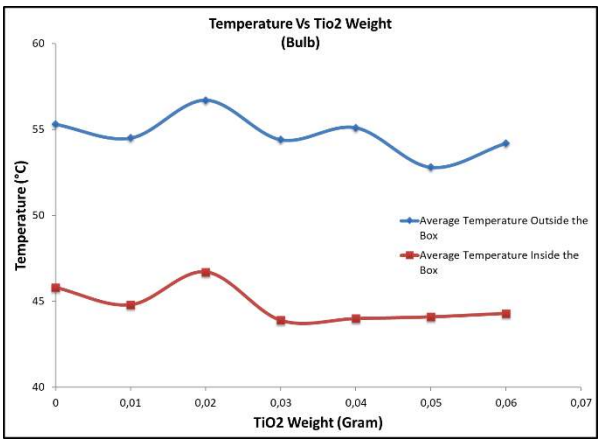

Figure 8. Average Temperature (100W Bulb)

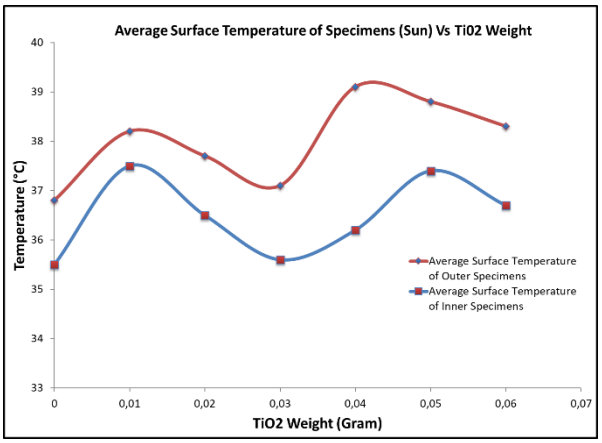

Figure 9. Average Specimen Surface Temperature (Sun)

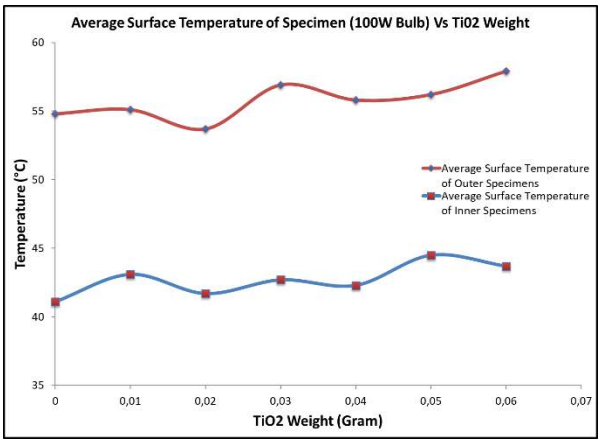

Figure 10. Average Specimen Surface Temperature (100W Bulb)

Based on the intensity data in Table 1,3 it can be seen that samples with a mass of 0.06 grams of TiO2 nanoparticles have a smaller intensity than other samples. This happens because sunlight is

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partially absorbed by the TiO2 nanoparticles. Besides, the reduction in light intensity after passing through the sample is also influenced by the attenuation coefficient (attenuation) of sunlight.

The smaller the sun intensity after passing the sample, the greater the attenuation coefficient. The amount of sunlight energy absorbed when light travels in a medium can be estimated from the total attenuation coefficient which is the sum of the absorption coefficient and the scattering coefficient by each particle in the material as the propagation medium.

A good lighting standard for a room ranges from 170 to 350 lux **[7]**, while some researcher say it ranges from 200 to 300 lux **[8]**. This light range is for normal conditions without normal activities or activities that do not require a degree of accuracy. If this material is applied as glass, the room will get sufficient lighting during the day without using lights as additional lighting.

Pure anatase phase TiO2 nanoparticles generally have an energy gap of 3.2 eV **[9]**, and they have a maximum UV absorption at a wavelength of 388 nm **[10]**. UV absorption of TiO2 nanoparticles increases with the amount of TiO2 content in the sample.

The inequality of the maximum UV absorption of TiO2 in the sample is because the size of the TiO2 nanoparticles used is not homogeneous, so that the energy gap is also not homogeneous, consequently affecting the absorption wavelength. Besides that, it can also be influenced by the level of purity of the TiO2 nanoparticles themselves, in other words the TiO2 nanoparticles used contain impurities.

Generally, in Figure 5 and 7, the higher the TiO2 content, the lower the transmission. So, it can be assumed that there is a bond between the Ti atoms of the TiO2 nanoparticles and the O atoms of the resin which have an effect on increasing the value of protection against UV radiation.

Based on the results of the research that has been done, the decrease in contact angle before and after the sample is exposed to sunlight is not too significant, this is because TiO2 nanoparticles do not work optimally on the sample. The absorption of TiO2 nanoparticle samples to UV light increases with the amount of TiO2 content in the sample. Meanwhile, the absorption of visible light is getting closer to zero as the TiO2 content is reduced, which means that most of the visible light is transmitted.

The addition of titanium dioxide to the epoxy resin can also increase the absorption of the material at short wavelengths. This indicates that the shortwave light transmission decreases. This epoxy resin and titanium dioxide nanocomposite material is transparent to wavelength or visible light, which means that the absorption of visible light is less.

Table 2 and Figure 6, it is found that the indoor temperature protected by titanium dioxide shows a higher temperature rise compared to the ambient temperature outside the box. Researchers assume this happens because of the accumulation of heat that occurs in the room due to exposure to sunlight and there is no ventilation to circulate heat outside the room.

From this assumption, the researcher then tries to make a data comparison by making a test using a 100 watt incandescent lamp (Bulb) as a heat source in the hope of getting a softer heat. This test data is presented in Table 3 and Figure 8. From the table and figure 8, it is found that the titanium dioxide mixture is able to reduce indoor heat by the heat emitted by incandescent lamps. The best heat dissipation recorded was given by the 0.06gr TiO2 mixture.

Data collection to determine the effect of using titanium dioxide in the room has been carried out by researchers, but how the performance of titanium dioxide to retain micro heat is not known. For this reason, the researchers took surface temperature data from the inner and outer specimens.

This test can show exactly how the conduction heat transfer process occurs in the specimen. the data from this experiment are presented in table 5,6 and figure 9,10. From the tables and figures, it is found that the specimens with a titanium dioxide mixture are able to absorb the penetrating heat. This is evidenced by the lower temperature on the inside of the specimen (the side that is not in contact with heat resource).

This indicates that the heat radiant transmission decreases. This epoxy resin and titanium dioxide nanocomposite material is transparent to heat radiant transmission, which means that the absorption of heat radiant is high.

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Table 6. E.Coli Bacteria Visualizations on the resin specimens with 2000x magnifying

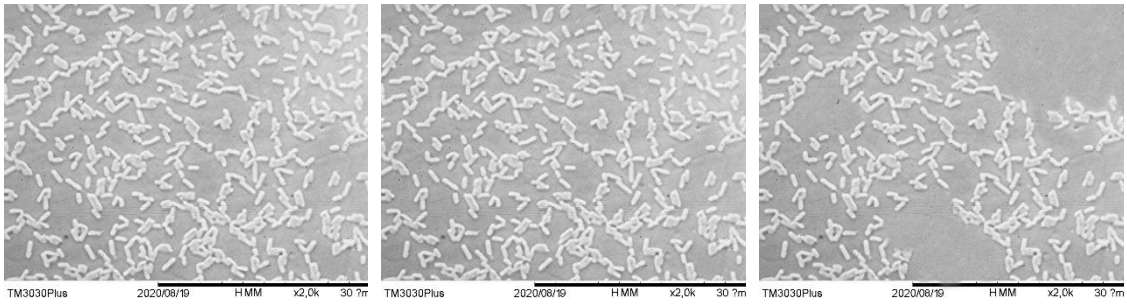
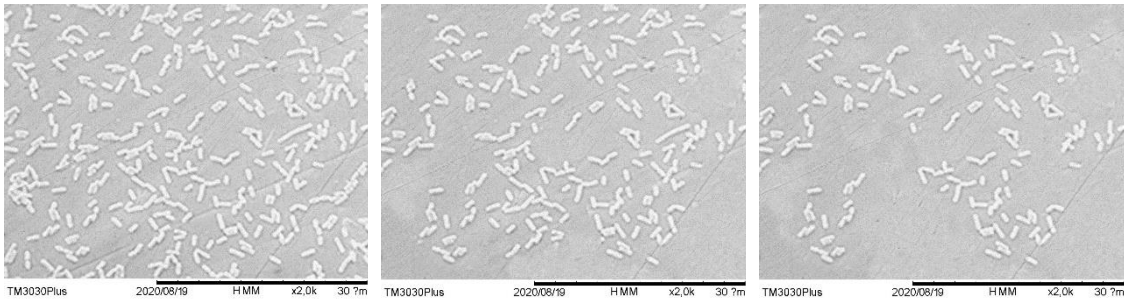
Specimens	Visualizations of E.Coli on the resin specimens		
	Without UV 0 Sec. In Room Temp.	**Without UV 3600 Sec. In Room Temp.**	**After UV 600 Sec.**
TiO2 0 gr			
Specimens	**Visualizations of E.Coli on the resin specimens**		
	Without UV 0 Sec. In Room Temp.	**Without UV 3600 Sec. In Room Temp.**	**After UV 600 Sec.**
TiO2 0.06 gr			

Table 6 is the visualization of bacteria with various treatments. White colour with a capsule shape is a visual of E. Coli bacteria.

By observing directly from the photo, it can be seen that the number of E. Coli bacteria attached to the specimen is reduced in specimens exposed to ultraviolet light and specimens mixed with titanium dioxide. This can be seen from the decrease in white colour.

In the resin specimens that were not mixed with titanium dioxide or in table 6, the Tio2 0gr specimen was written, the lowest number of E. Coli bacteria was visualized in the Tio2 0gr specimen that was exposed to ultraviolet light for 10 minutes. For Tio2 0gr specimens that received treatment, they were left at room temperature for 0 minutes and 60 minutes, recording the same values of E. Coli bacteria.

It was concluded that by using a resin without a mixture of titanium dioxide and left at room temperature, the E. Coli bacteria could survive. In contrast, resin without titanium dioxide mixture but exposed to ultraviolet light showed a reduction in the number of E. Coli bacteria that survived. In the resin specimens mixed with 0.06 g of titanium dioxide or in table 6, the 0.06 gr Tio2 specimen was written, the lowest number of E. Coli bacteria was visualized on the 0.06 g Tio2 specimen that was exposed to ultraviolet light for 10 minutes.

For the 0.06gr Tio2 specimen that received treatment, it was left at room temperature for 60 minutes, recording a lower value of E. Coli bacteria when compared to the 0.06gr Tio2 specimen that received treatment and was left at room temperature for 0 minutes. Although the 0.06gr Tio2 specimen left at room temperature for 60 minutes recorded a decrease in the number of bacteria, it was still unable to

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beat the decrease in the number of bacteria in the 0.06gr Tio2 specimen with ultraviolet irradiation for 10 minutes.

It was found that by using a resin with a mixture of titanium dioxide and exposed to ultraviolet light, showed a reduction in the number of E. coli bacteria that survived. The final conclusion that can be drawn is resin with a mixture of titanium dioxide is able to kill bacteria even without being exposed to ultraviolet light. If you want to get a better antibacterial effect, you can combine the method of mixing resin with titanium dioxide and the method of irradiating ultraviolet light.

4. Conclusions

The addition of titanium dioxide to the epoxy resin can also increase the absorption of the material at short wavelengths. This indicates that the shortwave light transmission decreases. This epoxy resin and titanium dioxide nanocomposite material is transparent to wavelength or visible light, which means that the absorption of visible light is less.

The heat radiant transmission decreases. This epoxy resin and titanium dioxide nanocomposite material is transparent to heat radiant transmission, which means that the absorption of heat radiant is high.

Resin with a mixture of titanium dioxide is able to act as an antibacterial agent, especially E. Coli bacteria and Ultraviolet light can act as a light capable of killing E. Coli bacteria.

Using a resin with a mixture of titanium dioxide and exposed to ultraviolet light, showed a reduction in the number of E. coli bacteria that survived. The final conclusion that can be drawn is resin with a mixture of titanium dioxide is able to kill bacteria even without being exposed to ultraviolet light. If you want to get a better antibacterial effect, you can combine the method of mixing resin with titanium dioxide and the method of irradiating ultraviolet light.

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Energy Efficient Smart Home Based on Solar Panels

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Abstract. Renewable energy has been and is still a hot issue today, especially in the era of the industrial revolution 4.0, where everything will be connected to the internet or the internet of things. The application of Internet of Things (IoT) to a system will require non-stop electrical energy to ensure the system can work properly. Various efforts have been made to find alternative energy sources that are sustainable and environmentally friendly to overcome the energy crisis that will hit the world. Solar energy is one of the renewable energies that is in great demand and is predicted to experience significant development compared to other renewable energy sources. Apart from being environmentally friendly, solar energy is also easy to maintain, install and is a sustainable source of energy. This paper will discuss the design and application of solar panels for a smart home to save electricity consumption. The saving percentage of electrical energy consumption after installing solar panels 1440 Wp in ideal conditions regardless of weather and other factors is between 54.91% - 60.84%.

Keywords—*renewable energy; smart home; smart home solar panels; energy efficiency; solar panels*

1. Introduction

The energy crisis that has hit the world has made research on the topic of energy, especially renewable energy, very interesting and attractive. Renewable energy has become a hot issue in the world lately, various efforts have been made to find alternative energy sources that are sustainable and environmentally friendly. Solar energy is one of the renewable energies that is in great demand and is predicted to experience significant development compared to other renewable energy sources. Apart from being environmentally friendly, solar energy is also easy to maintain, install and is a sustainable source of energy. One of the biggest investments in the utilization of solar energy is in the battery and its maintenance, therefore the proper controlling of the battery through monitoring and the use of smart control for setting the on-off level of the battery voltage is needed to keep the battery durable.

IoT allows objects to be controlled remotely through existing network infrastructure resulting in increased efficiency, accuracy and economic benefits in addition to reduced human intervention. This technology has many applications such as smart home, smart city, smart village and solar street light and so on [1]. Smart homes have been seen with increasing interest by both the home owner and the

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research community in recent years. One of the reasons for this development is the promising use of modern automation technology in homes and buildings energy savings that simultaneously reduces the operating costs of the home during its entire life cycle [2]. This research will focus on measuring and optimizing the energy efficiency of solar panel-based smart homes where the percentage of potential electrical energy savings will be investigated and calculated.

2. Related Works

The global energy crisis that has hit the world demands the search for new energy sources and the use of renewable energy that is environmentally friendly and sustainable. Solar panels are one of the innovations in renewable energy that are widely used because of their practicality and can be applied to areas that are not covered by the PLN electricity network [3]. A study on solar cell optimization for smart home design has been carried out by Zulfian Azmi et al., where the orientation of the solar cell to the direction of sunlight is carried out using a fuzzy logic system [4]. This research is motivated by the absorption of solar panels that are not optimal if they are not precise and focus on the projection point of the sun. The load tested in this study is only in the form of LED lights, while the orientation of the solar panel is carried out using a microcontroller where the LDR (Light Dependent Resistor) sensors are placed on the right, center and left of the solar panel. Design of the power monitoring system on solar panels has been carried out by Galih Irvan et al., where the solar panel system is only used as the main source of electrical energy in smart open parking only. In this study, the charging system design and power monitoring were carried out online and in real time. The system is integrated with a data base, connected to the internet and uses an Android application as a monitoring medium. The voltage sensor, ACS712 current sensor and DHT22 sensor are controlled by the Raspberry Pi3 connected to the converter for battery charging. The monitoring results showed that there were error measurements of voltage, current, and power of 0.12 V, 0.004 A, and 0.34 W, respectively. IoT based smart home using renewable solar energy has been applied by Princy S et al. by using Arduino and ESP8266 Wi-Fi module without mentioning the energy efficiency that has been achieved.

3. Methodology

The cost investment in installing solar panels is in batteries and inverters which will convert the DC voltage generated by the solar panels into AC electricity. In addition to the relatively expensive price, the two devices have a lifespan that is not long in the range of 5 years, and even then specifically for batteries, they must be regularly maintained. Meanwhile, an inverter that works non-stop 24 hours will certainly speed up its life time, especially if the load is overloaded. Because the air conditioner (AC) has a high starting wattage, the first step in conducting this research is to separate the power grid for the air conditioner load from the power grid for other loads. The next step is to calculate and analyse the amount of power from the installed load including lights, water pumps, koi pond pumps, washing machines, refrigerators, Wi-Fi adapters, fans, cell-phone chargers and sensors. Furthermore, the system and electricity network design will be carried out, at this stage the load location in the form of lights, pumps, sensors, battery, battery control regulator (BCR), ATS (Automatic Transfer Switch), maximum power point tracking (MPPT) solar charge controller and solar panels will be arranged in such a way. so that solar panel energy storage can be optimized. Testing of equipment such as solar panels, batteries, BCR, ATS, and sensors is carried out prior to system integration. The next stage is testing the installed system, monitoring the system and analysing data in the form of voltage, power, and current in the battery, on the loads.

4. The System Implementation

System implementation begins by calculating the total load or electrical power installed in the house. The next step is to separate the power grid for air conditionings (ACs) from other electrical loads. This step is taken to reduce the load on the inverter and extend its life time. The total power calculation is used to determine how much solar panel output power will be targeted, the number of solar panels and the design of the panel circuit. After that, the current and output voltage of the solar panels can be

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estimated. The amount of current and panel output voltage estimation is used to determine or select the control system components which include ATS, MPPT solar charge controller, BCR and relays and their miniature circuit breaker (MCB).

4.1. Total Electrical Loads

The following table lists the types of electrical loads, the total load and installed power in the house as a whole along with the approximate duration of working time per hour in a day.

Table 1. List of total electrical loads at home running per day

Load types	Load Numbers	Running Duration (Hours)	Wattage	
			Starting Wattage (Watt)	**Running Wattage** (Watt)
Lamps	1	12	11	11
	3	12	10	10
	2	12	9	9
	3	3	11	11
	7	3	10	10
	2	3	9	9
Water pump	1	2	150	125
Pond pump	1	24	38	38
Aquarium pump	1	24	18	18
Refrigerator	1	24	165	97
Electrical iron	1	1	350	300
Laptop	2	9	130	130
Computer	1	5	250	250
Washing machine	1	1	350	350
Air conditioner (AC)	2	10	395	389
Total			**2,551**	**2,396**
Total without AC			**1,761**	**1,618**

The total electric power of all the electrical loads installed at the house at the start of work is 2551 watts, while after running it will decrease by 155 watts to be 2396 watts. In designing an energy-efficient house based on solar panels, it is only intended for electrical loads other than air conditioner (AC). As seen in Table 1, the initial electricity load without AC is 1761 watts and after running it will drop to 1618 watts. The load in the form of lights will run at night, while the washing machine and iron even though it is used for only about one hour, the load may run simultaneously with other loads so that the load calculation is still included.

4.2. Electrical loads at the day

The calculation of the load without air conditioning and lights will eventually get the peak load of household electricity during the day of 1761 - 180 or 1581 watts where the overall lamp load is 180 watts. Meanwhile, the household electricity load when working is 1438 watts as shown in Table 2. Based on the habit of using washing machines and irons that are not used simultaneously, where the washing

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machine is always used in the morning while the iron is used during the day, the peak power load can be recalculated in detail. The total initial wattage when running with the washing machine without an iron and with the iron without the washing machine equals approximately 1,231 watts because both loads have the same power consumption at start-up. While the electric load when running with a washing machine without an iron is 1438-350 watts or 1088 watts, and when using an iron without a washing machine is 1138 watts.

Table 2. Electricity consumption at the day per day

Load types	Load Numbers	Running Duration (Hours)	Wattage	
			Starting Wattage (Watt)	**Running Wattage** (Watt)
Water pump	1	2	150	125
Pond pump	1	24	38	38
Aquarium pump	1	24	18	18
Refrigerator	1	24	165	97
Iron	1	1	350	300
Laptop	2	9	130	130
Computer	1	5	250	250
Washing machine (WM)	1	1	350	350
Total loads at the day			**1,581**	**1,438**
Total loads without iron			**1,231**	**1,088**
Total loads without WM			**1,231**	**1,138**

4.3. Electrical loads at night

Peak load and running load at night are calculated regardless of the load of washing machines and irons that are always used during the day, so the starting wattage values are 1761 - 700 or 1061 watts and 1618-650 or 968 watts when running. Table 3 shows a list of electrical loads that are active at night and a calculation of the total power consumption.

Table 3. Electricity consumption at a night per day

Load types	Load Numbers	Running Duration (Hours)	Wattage	
			Starting Wattage (Watt)	**Running Wattage** (Watt)
Lamps	1	12	11	11
	3	12	10	10
	2	12	9	9
	3	3	11	11
	7	3	10	10
	2	3	9	9
Water pump	1	2	150	125
Pond pump	1	24	38	38

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Aquarium pump	1	24	18	18
Refrigerator	1	24	165	97
Laptop	2	9	130	130
Computer	1	5	250	250
Total at night			**1,061**	**968**

So the largest peak power load during the day is 1231 watts and 1061 watts at night. The highest peak power load of 1231 watts is used as the basis for determining the power of the solar panels to be installed. Taking into account the decrease in power efficiency generated by solar panels, a solar panel with a power of 1440 watts was finally installed, consisting of 4 solar panels with a power of 370 wp per panel.

5. Results, Analysis and Discussions

Calculation of energy requirements can also be carried out in accordance with ISO standards Building energy performance - Calculation of energy use for heating and air conditioning [5], in which three alternative calculation methods are described: semi-stationary, simplified hourly dynamic method, and detailed dynamic method. Korjenic and Bednar [6] presented the concept of using dynamic simulations as instruments to improve total energy performance and conduct an HVAC system analysis in an office building. Research shows that preliminary information about establishing an energy demand profile including energy use for HVAC equipment is needed to predict energy consumption correctly and to get accurate results. The integrated simulation method can be divided into two groups: analytic and numerical which have been explained in detail by Clarke [7] and Underwood and Yik [8]. Although both of these methods have their advantages and disadvantages, both are suitable for evaluating building energy performance. However, in this study, the ISO standard has not been applied due to several considerations.

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Table 4. Electrical energy consumption per day based on starting wattage

Load types	Load Numbers	Running Duration (Hours)	Starting Wattage (Watt)	Energy	
				Energy Consumption at Night (KWh)	**Energy Consumption at the Day** (KWh)
Lamps	1	12	11	0.132	-
	3	12	10	0.36	-
	2	12	9	0.216	-
	3	3	11	0.099	-
	7	3	10	0.21	-
	2	3	9	0.054	-
Water pump	1	2	150	0.3	0.3
Pond pump	1	12/12[a]	38	0.456	0.456
Aquarium pump	1	12/12	18	0.216	0.216
Refrigerator	1	12/12	165	1.98	1.98
Electrical iron	1	1	350	-	0.35
Laptop	2	4/6[b]	130	1.04	1.56
Computer	1	3/5[c]	250	0.75	1.25
Washing machine	1	1	350	-	0.35
Total at night				5.813	-
Total at the day				-	6.462
Total energy					**12.275**
Total energy with AC					**20.175**

[a] 12 hours at night, 12 hours at the day.
[b] 4 hours at night, 6 hours at the day
[c] 3hours at night, 5 hours at the day.

The calculation of the potential savings in electrical energy after solar panels are installed can be estimated by separating the air conditionings (ACs) from the household electricity load list. Then, because the electric load at night and during the day is different, the calculation of the use of electrical energy at night and during the day will be carried out separately based on the starting wattage. So that the potential value of electrical energy savings during the day and night will be obtained. The sum of the potential values for saving electrical energy consumption at night with electrical energy consumption during the day is the total value of the potential value for electrical energy savings in one day. The calculation of energy consumption based on the starting wattage shows that the total energy consumption during the day is 6.462 KWh and 5.813 Kwh at night. So that the total amount of electricity consumption based on the starting wattage in a day is 12.275 KWh as shown in Table 4.

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Table 5. Electrical energy consumption per day based on running wattage

Load types	Load Numbers	Running Duration (Hours)	Running Wattage (Watt)	Energy	
				Energy Consumption at Night (KWh)	**Energy Consumption at the Day** (KWh)
Lamps	1	12	11	0.132	-
	3	12	10	0.36	-
	2	12	9	0.216	-
	3	3	11	0.099	-
	7	3	10	0.21	-
	2	3	9	0.054	-
Water pump	1	2	125	0.25	0.25
Pond pump	1	12/12[a]	38	0.456	0.456
Aquarium pump	1	12/12	18	0.216	0.216
Refrigerator	1	12/12	97	1.164	1.164
Electrical iron	1	1	300	-	0.3
Laptop	2	4/6[b]	130	1.04	1.56
Computer	1	3/5[c]	250	0.75	1.25
Washing machine	1	1	350	-	0.35
Total at night				3.93	-
Total at the day				-	5.546
Total energy					**9.476**

[a] 12 hours at night, 12 hours at the day.
[b] 4 hours at night, 6 hours at the day
[c] 3hours at night, 5 hours at the day.

The upper limit of the range of electrical energy consumption is obtained from the total energy consumption at starting wattage. After running for a while, the consumption of electrical energy on some equipment has decreased which then stabilizes at a certain value. The lower limit of the range of electrical energy consumption is obtained from the stable value of the total electricity consumption after electronic equipment has been running for a while (running wattage). The lower limit of the total range of electrical energy consumption per day is 9,476 KWh as shown in Table 5.

Based on the results of the calculation of energy consumption during initial starting and when it is running, it can be concluded that the potential for saving electrical energy after the installation of solar panels is between 9.476 KWh to 12.275 KWh per day.

The prediction of potential savings in electrical energy in each month in 2020 can be obtained by multiplying the number of days in the month concerned as shown in Table 6. The prediction of potential savings is a rough prediction that does not take into account weather factors that affect the intensity of solar radiation and other technical factors

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Table 6. Predictions of potential savings in electrical energy per month in a year.

	Number of days	Electrical energy consumption (Upper limit: 12.275 KWh)	Electrical energy consumption (Lower limit: 9.476 KWh)
January	31	380.53	293.76
February	29	355.98	274.80
March	31	380.53	293.76
April	30	368.25	284.28
May	30	368.25	284.28
June	30	368.25	284.28
July	31	380.53	293.76
August	29	355.98	274.80
September	30	368.25	284.28
October	31	380.53	293.76
November	30	368.25	284.28
December	31	380.53	293.76
Average		371.32	286.65
Total		4,455.86	3,439.79

6. Conclusion

Prediction data of potential savings in electrical energy in each day, month in one year are summarized in Table 7, where the average range of potential savings per day is 9.476 – 12.275 KWh. The average range of potential electrical energy savings in each month is 286.65 - 371.32 KWh. Meanwhile, the total potential for saving electrical energy in a year ranges from 3,439.79 - 4,455.86 KWh. The prediction of potential savings is a rough prediction that does not take into account the factors of weather changes, seasons that affect the intensity of solar radiation and the amount of output power of solar panels and other technical factors.

Table 7. Summary of potential saving of electrical energy in a day, per month and in a year.

Periods	Potential saving of electrical energy (KWh)
Every day	9.48 - 12.28
Every month	286.65 – 371.32
Year	3,439.79 – 4,455.86

The total amount of electricity consumption as a whole including the AC when starting is 20,175 KWh and after running it has decreased to 17,256 KWh. So that the percentage of electricity savings after installing solar panels in ideal conditions regardless of weather and other factors is between 54.91% - 60.84%.

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A Prototype car guidance system for automatic parking using the DT-Sense ultrasonic ranger

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Abstract. Damage to the car body is one of the things that a driver must avoid, especially when parking his car in a narrow space. This can be caused by the driver's limited vision at night towards the back of the car. This can be avoided if there is a guidence system for the driver. Therefore, in this study a guidance system for automatic parking using the DT-Sense ultrasonic ranger was developed. The sensor is used to measure the distance between the car and the wall surface of the parking area. The system is made based on a microcontroller 328. The novelty is the variation of tests carried out on the wall surface and the distance from the car to the parking area from 105 cm to 250 cm. The test results show that the error of measuring the distance of car with a flat surface is 4.26%, a convex surface is 2.82%, and a graded surface is 4.86%.

Keywords: Car guidance system, automatic parking, microcontroller 328, DT-Sense Ultrasonic ranger

1. Introduction

The number of vehicle volumes per year in Indonesia has increased from year to year, especially in big cities like Jakarta. According to data from the Central Statistics Agency (BPS), the number of vehicles in Indonesia is in the first place, namely motorbikes as many as 98.9 million units, then in second place, namely cars with 13.5 million units and finally public transportation as many as 9 million units [1]. The availability of parking space and the disproportionate number of vehicles, often drivers park their vehicles on the shoulder of the road, thus adding to a severe congestion. This issue is regulated by Law Number 43 of 1993 concerning road infrastructure and traffic.

The availability of parking facilities that are increasingly limited, especially in big cities, makes it difficult for persons with disabilities to park their vehicles in a narrow space, not a few motorists scratch walls and hit objects when reversing the car due to limited visibility and dark night conditions so they don't know the object that is being behind the car, the consequences of these limitations make the car owner not only suffer a loss to the car but can damage the object he hit. Therefore, a parking sensor device was made to help people with disabilities park their cars easily.

In previous research, the SR-04 ultrasonic sensor was used to measure the distance between the prototype car and the parking space installed on the front-left and rear. The use of fuzzy logic control is used to determine the ultrasonic sensor to detect parking spaces and to use the PID controller to adjust the rotation and direction of the servo motor as the steering prototype of the car [2]. In other studies with measurements with the ultrasonic sensor HC-SR04, it was shown that on 24 tests of distance measurements obtained an error value of 0% for a distance of 3cm-60cm and at a distance of 60cm-

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200cm with an error value of 1.78% [3]. Whereas the results of the study [4] showed that the detection distance of a spot with a length of 72 cm and a width of 40 cm with success rates of 75% and 75% for space detection.

2. Method

At this stage of making the system diagram, a system maintains the accuracy of the proximity sensor to the object received. The system can be translated into a sensor reading the object received by comparing the data entered. There are stages in a sequence that are made coherently and precisely in order to become a complete unity so as to form a system that is accurate and functions accordingly. expectations, namely as follows. In figure 1 show about block diagram system.

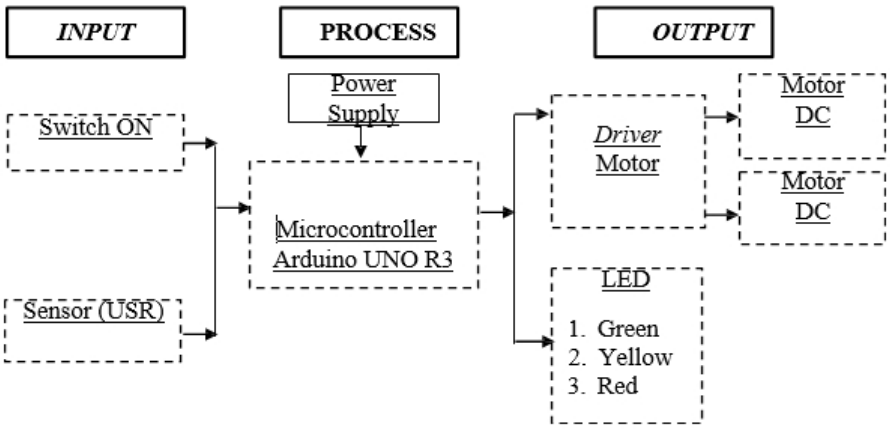

Figure 1. Overall Block Diagram System

2.1. Switch On

Switch On is an electronic component that functions to connect two or more points in an electronic circuit. One type of switch is the ON switch, which is a switch that will only connect two or more points when the button is pressed and when the button is not pressed it will decide two or more points in an electronic circuit. The Switch On is shown in Figure 2.

Figure 2. Switch On

2.2. DT-Sense Ultrasonic Ranger (USR) Sensor

The DT-Sense Ultrasonic Ranger (USR) sensor is a non-contact jatropha measuring module which is very easy to connect with different microcontroller based systems. To trigger and read measurement data, the DT-Sense Ultrasonic Ranger sensor only requires 1 microcontroller pin. In addition, a communication system is provided so that some of the DT-Sense Ultrasonic Ranger sensor modules and other equipment that supports the communication protocol can be used together with only 2 microcontroller pins. One of the specifications of the DT-Sense Ranger (USR) sensor is that it has a range: 2 cm to 300 cm [5]. The DT-Sense Sensor is shown in Figure 3.

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Figure 3. DT - USR ultrasonic sensor

2.3. Power Supply

The battery is a device that can convert the chemical energy it stores into electrical energy that can be used by an electronic device. Almost all portable electronic devices such as cellphones, laptops, flashlights or other electronic devices use their power source batteries. With the battery makes it easier to carry electronic devices. In this research, a battery with a capacity of 9 V. The power supply is shown in Figure 4.

Figure 4. Power supply

2.4. Microcontroller

The ATmega328 is an 8-bit microcontroller chip based on Atmel's AVR-RISC. This chip has 32 KB of ISP flash memory with read-write capability, 1 KB EEPROM, and 2 KB SRAM. From the 32 KB of Flash memory capacity, this chip is named ATmega328. Another chip that has 8 KB of memory is named ATmega8 and ATmega16 for those that have 16 KB of memory. The ATmega328 chip has many facilities and luxuries for a microcontroller chip. The chip has 23 general purpose I/O (input / output) lines, 32 registers, 3 timers / counters with comparison mode, internal and external interrupts, serial programmable USART, 2-wire serial interface, SPI serial port, 6 pieces. 10-bit channel A/D converter, programmable watchdog timer with built-in oscillator, and five power saving modes. The chip works on a voltage between 1.8V ~ 5.5V. The compute output can reach 1 MIPS per Mhz. Maximum operating frequency is 20 Mhz [6]. The microcontroller is shown in Figure 5.

Figure 5. Microcontroller

2.5. Motor DC

A DC motor in general is a motor that requires a direct voltage source in the armature coil and the field coil to be converted into mechanical energy. In a DC motor, the field coil which is energized by an electric current will produce a magnetic field that surrounds the armature coil in a certain direction. One type of DC motor is a brushed DC motor (brushed DC motor). Brushed DC motors are widely used in a variety of applications ranging from children's toys to driving the fins of a military rocket. Brushed

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DC motors are widely used because they are quite cheap, there are many size variants available and also because they are not too difficult to control.

DC motor specifications are as follows: Operating voltage 3 Volt - 6 Volt, Motor current 100 mA - 120 mA, Speed 120 RPM (3V) 185 (4.5V) and 250 (6V), and 50g DC motor weight. The motor DC is shown in Figure 6.

Figure 6. Motor DC

2.6. Driver Motor DC

To drive a DC motor, a driver is needed to adjust the direction of rotation of the motor. Each type of motorbike must have a different set of drivers. For brushed DC motors, the circuit most often used to move or adjust the direction of rotation is the H-bridge circuit [7]. The driver motor DC is shown in Figure 7.

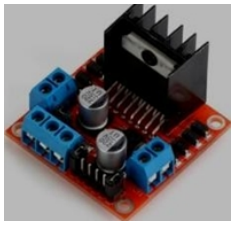

Figure 7. Driver Motor DC

2.7. LED

Light Emitting Diode or often abbreviated as LED is an electronic component that can emit monochromatic light when given forward current. LED is a family of diodes made of semiconductor materials. The colors of the light emitted by LEDs depend on the type of semiconductor material it uses. LEDs can also emit infrared rays that are not visible to the eye as we often encounter on TV remote controls or other electronic device remote controls. The LED is shown in Figure 8.

Figure 8. LED

2.8. Model back wall

In measuring the distance between the prototype car and the back wall, three areas are used, namely flat, convex and graded surface.

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(a) (b) (c)

Figure 9. model back wall. (a) flat surface, (b) convex surface and (c) graded

3. Results

As for the results of making portable cars with disabilities for parking automatic based on the Ardunino UNO R3 microcontroller using ATMega 328P DT-Senses Ultrasonic Ranger (USR) sensor as shown below:

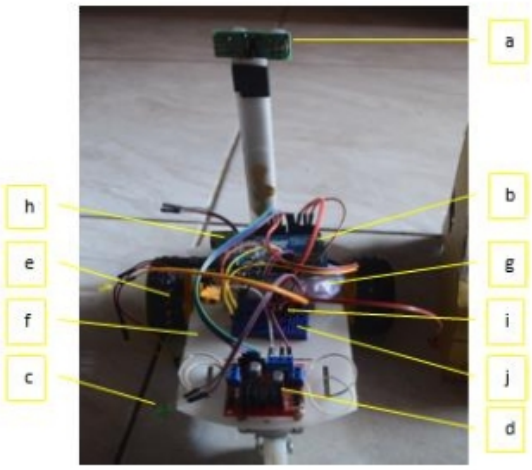

Figure 9. Prototype car

Information :

- DT-SENSE ULTRASONIC RANGER (USR) Sensor
- Ardunio UNO R3 ATMega328P
- 3 Color LED (Green, Yellow and Red)
- L298N motor driver
- 2 DC motors
- Cassis Robot Kit
- 9 Volt battery
- Cable
- Resistors
- Mini motherboard

The test results of the portable distance measurement of the car guidance system parking disabilities automatically using the DT-Sense Ultrsonic Ranger sensor (USR). The following is the path of the actual test measurements on the portable.

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3.1. Flat surface DT-USR sensor distance measurement

Table 1. The result of the distance measurement of the flat surface DT-USR sensor.

No.	Starting distance (cm)	Target parking distance (cm)	The distance measured (cm)	Error (%)
1	250		29	3.33
2	245		29.7	1
3	240		29.7	1
4	235		29.4	2
5	230		29.4	2
6	225		29.1	3
7	220		29.1	3
8	215		28.9	3.67
9	210		28.7	4.33
10	205		28.4	5.33
11	200		28.4	5.33
12	195		28.6	4.67
13	190		28.3	5.67
14	185		28	6.67
15	180	30	28	6.67
16	175		28.6	4.67
17	170		28.5	5
18	165		28.5	5
19	160		28.4	5.33
20	155		28.7	4.33
21	150		28.7	4.33
22	145		28.3	5.67
23	140		28.1	6.33
24	135		28.2	6
25	130		28.4	5.33
26	125		28.7	4.33
26	120		28.7	4.33
28	115		28.9	3.67
29	110		29.3	2.33
30	105		29	3.33
The Average error value				4.26

Table 1 shows the results of measuring distances on a flat surface. It can be concluded that the DT-USR sensor has the smallest error value, namely 1.00% and the largest error value is 6.67%. The next test, namely measurement of the distance on a convex surface is done to find out the sensor's ability to detect distance surfaces.

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3.2. A convex surface DT-USR sensor distance measurement

Table 2. The result of the distance measurement of a convex surface DT-USR sensor.

No.	Starting distance (cm)	Target parking distance (cm)	The distance measured (cm)	Error (%)
1	250		29	3.33
2	245		29.8	0.67
3	240		29.7	1
4	235		29.7	1
5	230		29.4	2
6	225		29.4	2
7	220		28.9	3.67
8	215		28.9	3.67
9	210		28.7	4.33
10	205		28.7	4.33
11	200		28.9	3.67
12	195		29.3	2.33
13	190		29.7	1
14	185		29.7	1
15	180	30	29.4	2
16	175		29.4	2
17	170		29.5	1.67
18	165		29.4	2
19	160		29.4	2
20	155		28.6	4.67
21	150		29.6	1.33
22	145		29.3	2.33
23	140		29.3	2.33
24	135		28.9	3.67
25	130		28.9	3.67
26	125		28.9	3.67
26	120		28.7	4.33
28	115		28.7	4.33
29	110		28.4	5.33
30	105		28.4	5.33
The Average error value				2.82

From table 2 shows the results of distance measurements can be concluded the ability of the DT-USR sensor to detect convex surfaces obtained a measurement value that is almost the same as the distance measurement where the actual measurements were made at the most surface convex and obtained the smallest error value, namely 1.00% and the largest is 4.67%.

3.3. A graded surface DT-USR sensor distance measurement

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Table 3. The result of the distance measurement of a graded surface DT-USR sensor.

No.	Starting distance (cm)	Target parking distance (cm)	The distance measured (cm)	Error (%)
1	250		29	3.33
2	245		29	3.33
3	240		28.7	4.33
4	235		28.7	4.33
5	230		28.7	4.33
6	225		28.5	5
7	220		28.5	5
8	215		28.5	5
9	210		28.3	5.67
10	205		28.3	5.67
11	200		28	6.67
12	195		28	6.67
13	190		28	6.67
14	185		28.7	4.33
15	180	30	28.5	5
16	175		28.5	5
17	170		28.7	4.33
18	165		28.7	4.33
19	160		28.9	3.67
20	155		28.9	3.67
21	150		28.4	5.33
22	145		28.4	5.33
23	140		28.7	4.33
24	135		28.7	4.33
25	130		29	3.33
26	125		29	3.33
26	120		28.5	5
28	115		28.5	5
29	110		28	6.67
30	105		28	6.67
The Average error value				4.86

From table 3 shows the results of distance measurements can be concluded the ability of the DT-USR sensor to detect dotted surfaces, although in testing there are some errors on the sensor, namely the error value the smallest was 3.33% and the highest was 6.67%.

4. Conclusions

Based on the manufacture of a portable guide system for disabled cars parking automatically and the results of measurements that have been made then it can conclusions are drawn namely:

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- A major step in manufacturing a portable guide car system for persons with disabilities to park automatically is a literature study namely, seeking references from research in advance, journals as well as books related to parking sensors and microcontroller. Continue to make wiring diagrams and make the concept of the arrangement of the components for the manufacture of portable cars, then do the programming according to the command then do testing.
- The total value of the error that occurs during the distance measurement test process at flat surface ie 4.26%, on convex surface which is 2.82% and on a terraced surface which is 4.86%.

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Polypropylene Fuel Utilization with Varying Additives for Motor Fuels

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Abstract. This research aims to develop polypropylene fuel as an alternative fuel. With the abundance of plastic waste around us, this waste can be used as raw material for alternative fuels by the pyrolysis process. This is done by using the hydrocarbon compounds in the plastic-forming polypropylene. In fact, without further processing, the fuel has not been able to provide optimal results when used. A simple attempt to increase polypropylene fuel capability by adding additives. In this polypropylene fuel tester, a gasoline-engined motorcycle is used which is tested for performance on a dynotest. The treatment in this test is in the form of mixing polypropylene fuel with general fuels and adding selected additives, including the R30 type and octane amplifier. In the fuel testing process, a single cylinder two-stroke gasoline engine is used. The two-stroke engine has a two stroke piston combustion system duty cycle. It can be said to have a four-stroke double cycle combustion system with the same operating time. With engine repair, it can improve performance. In research, polypropylene fuel is mixed with general fuels and added with a certain volume of additives. The additive fuel is used for the consumption of a motorbike engine that is tested for performance at the dynotest. By comparing the treatment with the addition of additives to the fuel, the results of this ability are not known.

Keywords: polypropylene fuel, two stroke gasoline engine, additives, dynotest.

1. Introduction

The performance of the motor fuel in the form of torque and power can be influenced by several factors, including the fuel used. The use of fuel is directly related to the combustion process in the engine cylinder. The use of fuel can also be varied by the addition of additives in order to increase the performance ability of the engine. Polyprophylene fuel has been studied by several researchers. One of the studies has been carried out by processing polypropylene (pp) plastic waste into fuel with the catalytic cracking method using synthetic catalysts [1]. Polypropylene or polypropene (PP) is a thermo-plastic polymer made by the chemical industry and used in a variety of applications [2]. It has been studied about the effect of a mixture of premium fuel and pyropylene plastic polypropylene (PP) on the calorific value of fuel [3]. Other studies suggest that plastics can be made from cheap and readily available hydrocarbons and reduce the amount of waste by examining the production of engine fuel from pyrolysis plastic waste and evaluating the performance of diesel engines [4]. Furthermore , polyprophylene fuel can be investigated its use as an alternative fuel in gasoline motors. In order to optimize engine performance, a better combustion process is needed. The combustion process can be improved by using fuel added with additives. The addition of additives is carried out with the intention

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of being an activator to increase reactive properties so that it is flameable. In general, additives can be divided into two, namely synthetic or artificial additives and natural additives. Additives are usually obtained from the metabolism of microorganisms as described in a study on bio-fuels made from microorganisms as anti-knock additives [5]. Additives are materials added to motor vehicle fuels, both gasoline and diesel engines [6] . One study on the use of additives has investigated the impact of several additives on gasoline motor performance [7]. The additives used in this study are divided into three, namely gasoline additive, gasoline booster and octane booster.

From the previous description, researchers are interested in focusing on knowing the performance of a motorcycle engine, namely power and torque using polypropylene fuel by being given several variations of a mixture of additives.

2. Research Methods

2.1. Types of Research

This research is included in experimental research, by making direct observations on the results of material testing. Research was carried out by comparing the results of performance of the engine based on the fuel consumption of a mixture of polypropylene with additives are varied (variation of volume and types of substances adatif).

2.2. Equipment

The machines and equipment used for research are as follows.

a. Honda Brand KW6 Type Two Stroke Engine
   1) Diameter x measures : 59 mm x 54.5 mm
   2) Cooling system : Liquid cooling (radiator)
   3) Electrical system : DC 12 V, 6.5 A
   4) Carburetor : Keihin SPJ 39 mm (pilot jet 55, main jet 160)
b. The dynamometer with the following specifications:
   1) Measurement item : Speed, RPM, Acceleration, Torque, Power
   2) Data transfer : RS232 - USB
   3) Maximum torque : 50 Nm
   4) Maximum RPM : 20,000 rpm
   5) Maximum power : 50 HP
   6) Maximum speed : 350 km / hour
   7) Roller diameter : 25 cm
   8) Roller weight : 154 kg
   9) Inertia roller : 1.2 Kg.m2
   10) Width : 97 cm
   11) Length : 195 Cm
   12) Applications to be used : Hofmann Werkstatt- Technik
c. Additives
   1) R-30 Rotary
   2) Octane Up (Octane Booster)
   3) Aceton 75%
d. Synthetic two stroke engine oil (lubrication oil)
e. The fuel used by VP Power and Polypropylene
f. Measuring cup

2.3. Research Procedure

All data retrieval is carried out on the *dynotest* equipment which is first positioned on the motorbike with the rear wheel directly above the roller and the body on the motorbike is secured by the fastening belt on the dynamometer.

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2.4. Research Preparation Stage

After the process of preparing the equipment and test the motor is mounted properly on dynamometer, carried out the process of checking on the condition of the motor mounting against the gauge and tachometer located on a dynamometer.

2.5. Research Stage

a. The process steps torsion test and power on the two stroke gasoline engine type 147cc clicking KW6 use the cylinder block model two holes exhaust fuel mixture VP- Power and polypropylene and lubrication oil :
   1) Using a two- hole exhaust cylinder block model on the engine.
   2) Using a mixture of VP-Power (2000ml), polypropylene (2000ml) and lubrication oil (40ml).
   3) Start the engine.
   4) Initiate the test or process of taking data for torque and power by the dynamometer.
   5) After knowing the torque and power, stop the data retrieval process on the dynamometer engine.
   6) Save the data obtained.
   7) Repeating steps 2 - 6 in succession for five data stores.

b. The process steps torsion test and power on the two stroke gasoline engine type 147cc , KW6 use the cylinder block model two holes exhaust fuel mixture VP- Power and polypropylene and additives (R30 Rotary):
   1) Using a two- hole exhaust cylinder block model on the engine.
   2) Using a fuel mixture of VP-Power (2000ml), polypropylene (2000ml) and additives (20ml).
   3) Start the engine.
   4) Initiate the test or process of taking data for torque and power by the dynamometer.
   5) After knowing the torque and power, stop the data retrieval process on the dynamometer engine.
   6) Save the data obtained.
   7) Repeating steps 2 - 6 in succession for five data stores.

c. The process steps torsion test and power on the two stroke gasoline engine type 147cc , KW6 use the cylinder block model two holes exhaust fuel mixture VP- Power and polypropylene and octanebooster (OctaneUp):
   1) Using a two- hole exhaust cylinder block model on the engine.
   2) Using a fuel mixture of VP-Power (2000ml), polypropylene (2000ml) and octanebooster (25ml).
   3) Start the engine.
   4) Initiate the test or process of taking data for torque and power by the dynamometer.
   5) After knowing the torque and power, stop the data retrieval process on the dynamometer engine.
   6) Save the data obtained.
   7) Repeating steps 2 - 6 in succession for five data stores.

d. The process steps torsion test and power on the two stroke gasoline engine type 147cc KW6 use the cylinder block model two holes exhaust fuel mixture VP- Power and polypropylene and acethon:
   1) Using a two- hole exhaust cylinder block model on the engine.
   2) Using a fuel mixture of VP-Power (2000ml), polypropylene (2000ml) and acethon (25ml) .
   3) Start the engine.
   4) Initiate the test or process of taking data for torque and power by the dynamometer.
   5) After knowing the torque and power, stop the data retrieval process on the dynamometer engine.
   6) Save the data obtained.
   7) Repeating steps 2 - 6 in succession for five data stores.

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e. The process steps torsion test and power on the two stroke gasoline engine type 147cc KW6 use the cylinder block model two holes exhaust fuel mixture VP- Power and polypropylene and mixtures of additives and acethon:
   1) Using a two- hole exhaust cylinder block model on the engine.
   2) Using a fuel mixture of VP-Power (2000ml), polypropylene (2000ml) and an additive mixture (20ml) and acethon (25ml).
   3) Start the engine.
   4) Initiate the test or process of taking data for torque and power by the dynamometer.
   5) After knowing the torque and power, stop the data retrieval process on the dynamometer engine.
   6) Save the data obtained.
   7) Repeating steps 2 - 6 in succession for five data stores.

f. The process steps torsion test and power on the two stroke gasoline engine type 147cc KW6 use the cylinder block model two holes exhaust fuel mixture VP- Power and polypropylene and mixtures of additives and octanebooster:
   1) Using a two- hole exhaust cylinder block model on the engine.
   2) Using a fuel mixture of VP-Power (2000 ml), polypropylene (2000ml) and an additive mixture (20 ml) and octanebooster (25 ml).
   3) Start the engine.
   4) Initiate the test or process of taking data for torque and power by the dynamometer.
   5) After knowing the torque and power, stop the data retrieval process on the dynamometer engine.
   6) Save the data obtained.
   7) Repeating steps 2 - 6 in succession for five data stores.

g. The process steps torsion test and power on the two stroke gasoline engine type 147cc KW6 use the cylinder block model two holes exhaust fuel mixture VP- Power and polypropylene and mixtures acethon and octanebooster:
   1) Using a two- hole exhaust cylinder block model on the engine.
   2) Using a fuel mixture of VP-Power (2000ml), polypropylene (2000ml) and the mixture acethon (20ml) and octanebooster (25ml) .
   3) Start the engine.
   4) Initiate the test or process of taking data for torque and power by the dynamometer.
   5) After knowing the torque and power, stop the data retrieval process on the dynamometer engine.
   6) Save the data obtained.
   7) Repeating steps 2 - 6 in succession for five data stores.

2.6. Research Data Collection

Data taken the form of input engine rpm, torque and power respectively by impulse is entered by each sensor which subsequently recorded in the internal memory to a dynamometer. The discussion is carried out by analyzing and comparing the data recorded on the dynamometer.

3. Results and Discussion

3.1. Research Result

This study aims to obtain a mixture of *polypropylene* fuel with various additives that improve engine performance. The data obtained are as follows:

3.1.1. VP-Power and Polypropylene Test Results Data and Side Oil

Standard test result data can be seen in Table 1. following:

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Table 1. Standard Test Results

Testing	Measurement Results				
	Engine power (corrected) (hp)	Engine power (measured) (hp)	Wheel power (measured) (hp)	Power losses (measured) (hp)	Torque (corrected) (kgm)(wheel)
Standart (1)	26,4	25,5	21,7	3,8 @ 92 (km/h) / 4113 (1/min)	39 @ 72 km/h / 3251 (1/min)
Standart (2)	28,7	27,5	18,9	8,6 @ 130 (km/h) / 5819 (1/min)	34 @ 89 km/h / 4005 (1/min)
Standart (3)	34,7	33,3	20,7	12,6 @ 128 (km/h) / 5730 (1/min)	41 @ 74 (km/h) / 3341 (1/min)
Standart (4)	28,2	27,0	17,6	9,4 @ 129 (km/h) / 5810 (1/min)	33 @ 71 (km/h) / 3206 (1/min)
Standart (5)	27,8	26,6	22,4	4,2 @ 95 (km/h) / 4248 (1/min)	38 @ 74 (km/h) / 3305 (1/min)

3.1.2. Data on VP-Power and Polypropylene Testing Results and Additive

Standard test data can be seen in Table 2. following:

Table 2. VP-Power and Polypropylene Test Results and Additives

Testing	Measurement Results				
	Engine power (corrected) (hp)	Engine power (measured) (hp)	Wheel power (measured) (hp)	Power losses (measured) (hp)	Torque (corrected) (kgm)(wheel)
Additive(1)	26,4	25,2	20,7	4,6 @ 87 (km/h) / 3907 (1/min)	43 @ 53 km/h / 2371 (1/min)
Additive(2)	30,1	28,7	22,5	6,2 @ 80 (km/h) / 3996 (1/min)	40 @ 89 km/h / 3987 (1/min)
Additive(3)	27,4	26,1	20,8	5,4 @ 96 (km/h) / 4320 (1/min)	43 @ 53 (km/h) / 2398 (1/min)
Additive(4)	27,3	26,0	20,4	5,6 @ 90 (km/h) / 4032 (1/min)	44 @ 55 (km/h) / 2470 (1/min)
Additive(5)	24,8	23,6	18,1	5,5 @ 116 (km/h) / 5191 (1/min)	32 @ 52 (km/h) / 2344 (1/min)

3.1.3. VP-Power and Polypropylene and Octanebooster Testing Results Data

Test result data can be seen in Table 3. following:

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Table 3. Results Testing VP-Power and Polypropylene and Octanebooster

Testing	Measurement Results				
	Engine power (corrected) (hp)	Engine power (measured) (hp)	Wheel power (measured) (hp)	Power losses (measured) (hp)	Torque (corrected) (kgm)(wheel)
Octane booster (1)	25,8	24,8	20,2	4,6 @ 106 (km/h) / 4712 (1/min)	34 @ 20 km/h / 907 (1/min)
Octane booster (2)	24,7	23,6	18,2	5,4 @ 101 (km/h) / 4544 (1/min)	58 @ 21 km/h / 952 (1/min)
Octane booster (3)	26,0	24,8	19,3	5,5 @ 89 (km/h) / 4014 (1/min)	46 @ 26 (km/h) / 1176 (1/min)
Octane booster (4)	27,2	26,0	20,4	5,6 @ 107 (km/h) / 4748 (1/min)	60 @ 20 (km/h) / 907 (1/min)
Octane booster (5)	26,7	25,5	21,1	4,4 @ 96 (km/h) / 4311 (1/min)	41 @ 75 (km/h) / 3377 (1/min)

3.1.4. VP-Power and Polypropylene and Acethon Testing Results Data

Test result data can be seen in Table 4. following:

Table 4. Results Testing VP-Power and Polypropylene and Acethon

Testing	Measurement Results				
	Engine power (corrected) (hp)	Engine power (measured) (hp)	Wheel power (measured) (hp)	Power losses (measured) (hp)	Torque (corrected) (kgm)(wheel)
Acethon (1)	22,5	21,5	15,8	5,6 @ 102 (km/h) / 4598 (1/min)	44 @ 26 km/h / 1176 (1/min)
Acethon (2)	24,2	23,1	17,3	5,8 @ 115 (km/h) / 5146 (1/min)	45 @ 26 km/h / 907 (1/min)
Acethon (3)	24,3	23,2	16,5	6,7 @ 129 (km/h) / 5784 (1/min)	35 @ 52 (km/h) / 2317 (1/min)
Acethon (4)	26,0	24,8	18,5	6,3 @ 112 (km/h) / 5011 (1/min)	34 @ 53 (km/h) / 2380 (1/min)
Acethon (5)	24,3	23,2	17,6	5,6 @ 114 (km/h) / 5101 (1/min)	35 @ 76 (km/h) / 3404 (1/min)

3.1.5. Data on VP-Power and Polypropylene Test Results and Additives plus Octanebooster

Test result data can be seen in Table 5. following:

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Table 5. Results Testing VP-Power and Polypropylene and Additives plus Octanebooster (Ad + Ob)

Testing	Measurement Results				
	Engine power (corrected) (hp)	Engine power (measured) (hp)	Wheel power (measured) (hp)	Power losses (measured) (hp)	Torque (corrected) (kgm)(wheel)
(Ad+Ob) (1)	28,4	27,1	18,4	8,7 @ 125 (km/h) / 5631 (1/min)	41 @ 31 km/h / 1410 (1/min)
(Ad+Ob) (2)	25,0	23,9	19,0	4,8 @ 94 (km/h) / 4212 (1/min)	45 @ 20 km/h / 916 (1/min)
(Ad+Ob) (3)	25,9	24,7	19,6	5,1 @ 92 (km/h) / 4122 (1/min)	46 @ 20 (km/h) / 907 (1/min)
(Ad+Ob) (4)	25,6	24,4	19,3	5,1 @ 108 (km/h) / 4850 (1/min)	39 @ 32 (km/h) / 1419 (1/min)
(Ad+Ob) (5)	25,7	24,5	20,0	4,5 @ 87 (km/h) / 3898 (1/min)	40 @ 56 (km/h) / 2515 (1/min)

3.1.6. VP-Power and Polypropylene Test Results Data and Additives plus Acethon

Test result data can be seen in Table 6. following:

Table 6. Results Testing VP-Power and Polypropylene and Additives plus Acethon (Ad + Ac)

Testing	Measurement Results				
	Engine power (corrected) (hp)	Engine power (measured) (hp)	Wheel power (measured) (hp)	Power losses (measured) (hp)	Torque (corrected) (kgm)(wheel)
(Ad+Ac) (1)	23,8	22,7	16,8	5,9 @ 89 (km/h) / 4014 (1/min)	37 @ 52 km/h / 2317 (1/min)
(Ad+Ac) (2)	22,4	21,3	18,6	2,7 @ 115 (km/h) / 5164 (1/min)	31 @ 34 km/h / 1518 (1/min)
(Ad+Ac) (3)	22,4	21,3	18,6	2,7 @ 115 (km/h) / 5164 (1/min)	31 @ 34 km/h / 1518 (1/min)
(Ad+Ac) (4)	21,9	20,9	14,2	6,7 @ 88 (km/h) / 3934 (1/min)	34 @ 29 (km/h) / 1302 (1/min)
(Ad+Ac) (5)	24,8	23,7	18,4	5,4 @ 106 (km/h) / 4778 (1/min)	34 @ 70 (km/h) / 3152 (1/min)

3.1.7. Data on VP-Power and Polypropylene Testing Results and Octanebooster plus Acethon

Test result data can be seen in Table 7. following:

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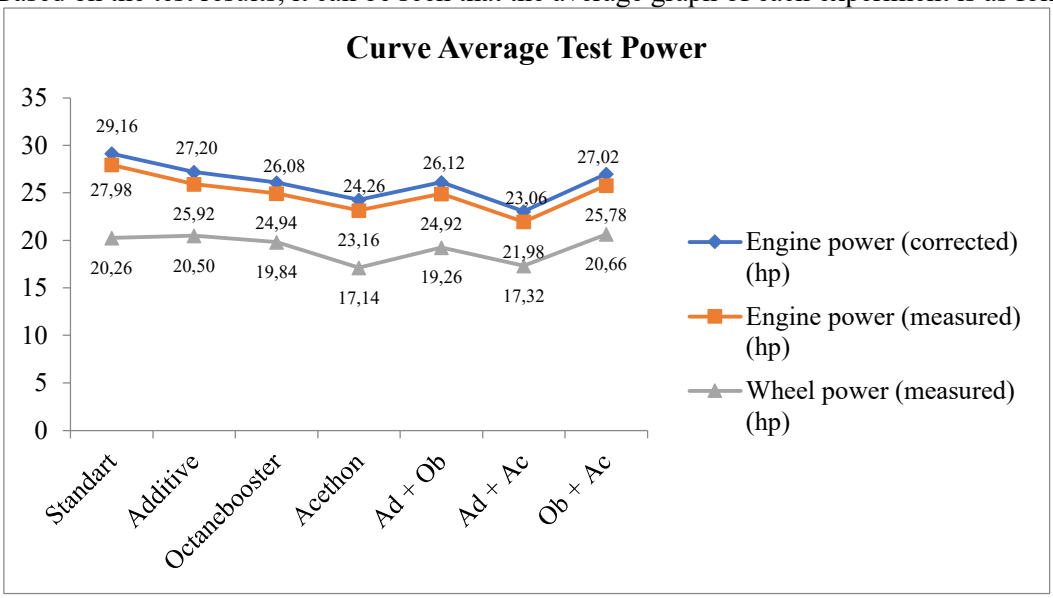
Table 7. Results Uji VP-Power and Polypropylene and Octanebooster plus Acethon (Ob+ Ac)

Testing	Measurement Results				
	Engine power (corrected) (hp)	Engine power (measured) (hp)	Wheel power (measured) (hp)	Power losses (measured) (hp)	Torque (corrected) (kgm)(wheel)
(Ob+Ac) (1)	27,5	26,3	21,5	4,8 @ 98 (km/h) / 4383 (1/min)	41 @ 52 km/h / 2326 (1/min)
(Ob+Ac) (2)	28,0	26,7	21,1	5,6 @ 89 (km/h) / 4014 (1/min)	56 @ 22 km/h / 970 (1/min)
(Ob+Ac) (3)	26,6	25,3	21,3	4,0 @ 90 (km/h) / 4041 (1/min)	38 @ 76 km/h / 3422 (1/min)
(Ob+Ac) (4)	27,6	26,3	20,5	5,8 @ 91 (km/h) / 4095 (1/min)	46 @ 54 (km/h) / 2425 (1/min)
(Ob+Ac) (5)	25,4	24,3	18,9	5,4 @ 77 (km/h) / 3467 (1/min)	39 @ 76 (km/h) / 3422 (1/min)

3.2. Discussion

The research was conducted to see the performance test results of a mixed fuel gasoline engine (standard fuel with plastic/ polypropylene waste). In addition, additional variations are used in the mixture used, in the form of additives, octanebooster, and acethon to find out how engine performance is. The weaknesses that were found in the implementation of this research were the lack of conditioning of the cooling system and the installation of a funnel in the exhaust that affected the resulting combustion gases.

Based on the test results, it can be seen that the average graph of each experiment is as follows.



Based on the graph the average power produced by each treatment, gained an average of the highest power in the treatment with the mixture of fuel VP-Power and polypropylene (PP) as well as side

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synthetic oil, with a mean value of 29.16 Hp. While the lowest average power occurs in the treatment with a mixture of VP-Power and polypropylene as well as additives plus acethon, with a mean value of 23.06Hp.

In the treatment of VP-Power + PP + synthetic oil obtained by the average power of 29. 16Hp with a peak power generated in the third data retrieval by 34.7Hp. The lowest power in this treatment was obtained at 26.4Hp in the first data collection.

In the VP + PP + Ad treatment, the greatest power was obtained worth 30.1Hp in the second repetition. While the lowest power is worth 24.6Hp in the fifth repetition. While on treatment of VP + PP + Ob largest power obtained 27.2 at the fourth repetition. The lowest value is 24.7Hp on the second repetition. In the treatment VP + PP + Ac obtained the greatest power amounting to 26.0Hp on repetition fourth. The lowest power value is 22.5Hp on the first repetition. In the treatment VP + PP + Ad + Ob obtained the highest power worth 28.4Hp, a repetition of the first. While lowest power obtained by power worth 25.0Hp, the second repetition.

In the treatment with a combination of VP + PP + Ad + Ac, the highest power was obtained at 24.8Hp in the fifth repetition. S edangkan lowest power amounted to 21.9Hp on repetition fourth. In combination VP + PP + Ob + Ac obtained the greatest power amounting to 28.0Hp on repetition second, lowest power obtained worth 25.4Hp on repetition fifth.

The test results with a mixture of VP-Power fuel with polypropylene and synthetic oil gave the greatest power, namely 34.7 Hp. This shows that with the addition of synthetic oil, polypropylene is able to provide good benefits for increasing engine performance. This is in line with the results of research which have concluded that a lubricating oil with a small kinematic viscosity and a large viscosity index will produce high power and torque (good engine performance) [8].

4. Conclution

Based on the results and discussion, it was concluded that the greatest power is obtained on testing the fuel mixture VP-Power with polypropylene and synthetic oil in the amount of 34.7Hp.

Acknowledgments

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Application of Solar Powered Wheelbarrow for Energy Saving Cooking Process

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Abstract. The development of solar energy to meet the various needs of human life is currently increasing. Solar Power Plant technology has also been widely introduced and applied in the community. The research is conducted to apply Solar PV technology which is used for energy-efficient cooking processes. Solar PV is the main component of the solar power plant that is used as an energy source to supply electricity to wheelbarrows. The dimensions of the wheelbarrow used are 180 cm long, 216 cm wide, and 150 cm high. The solar panel is monocristalline type with power capacity of 4 x 100 Wp. Other components includes 65 Ah VRLA Battery, 1000 W Inverter and 10 A Battery Control Regulator. This wheelbarrow has an electric stove and heater with an average 200 Watt power rating, also equipped with a 10 Watt lamp and a socket. This solar powered wheelbarrow is used for cooking approximately 6 hours with continuous use and longer for light or medium usage.

1. Introduction

Indonesia is a tropical country traversed by the equator which has a high irradiation rate. Solar irradiation in Indonesia averages 4.8 KWh/m^2 so that it has the potential to generate a total of 112,000 GWp. But the potential that is utilized is still little around 10 MWp [1]. However, many areas in Indonesia are not yet electrified, due to remote areas and not covered by PLN electricity distribution. So it need a power plant that is easy to build and easy to move, that is by implementing a Solar Power Plant (PLTS). PLTS is a power plant that converts photon energy from the sun into electrical energy. Electricity is generated using solar panels that work by utilizing the photovoltaic effect in the form of solar cells or solar cells made of single crystalline silicon. The electricity generated is in the form of DC voltage and current [2].

Food traders in Indonesia are very diverse, ranging from street food vendors, stalls to restaurants. The main equipment needed by food traders is a stove. The stoves generally use biomass charcoal and LPG gas, which is a type of fossil fuel. Fossil fuels are getting depleted and will run out in a certain period of time so that a solution is needed to replace fossil fuels in order to prevent energy crisis in the future. One of the solution is using renewable energy such as solar energy because it has unlimited amount of availability and it's environmentally friendly. In this modern era, electric stoves has been widely used for the cooking process especially in urban areas because of its practicality. However electric stoves require a lot of energy when operated, so they are less economical than fossil fuels. Therefore, the electric stove needs to be given a little modification to reduce the energy consumed. Solar energy that can be converted into electrical energy is suitable to supply electric stove and it can save more energy consumption. Utilization of solar energy can done using the panel solar (solar module). Solar panels will converting radiation from the sun into electrical energy directly, so it can be

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applied to meet household electricity needs [3]. The use of solar-powered electric stoves has also been used for written batik craftsmen by using two glow plug heaters, 4 solar panels with a capacity of 120 Wattpeak each [4].

The purpose of this study is to design and built solar powered wheelbarrow for energy saving cooking process application. The wheelbarrow is using electric stove and heater to serves various food and beverages that can be applied for the food trader. Hopefully with this research, the use of renewable energy, especially solar energy, can be developed continuously.

2. Research Method

The research will be carried out at the Jember State of Polytechnic and scheduled for four months with a following stages :

2.1. Calculation of cooking load

To calculate the total load energy requirements, the following equation can be used [5] :

$$W_b = P_b \times T_{lp} \quad \text{..... 1}$$

with :

W_b = Total Energy Load (kWh)

P_b = Power Load (watt)

T_{lp} = duration (hour)

2.2. Determine the dimensions of the wheelbarrow

The wheelbarrow is designed to have dimensions of length x width x height of 140 cm x 216 cm x 150 cm, as shown in Figure 1.

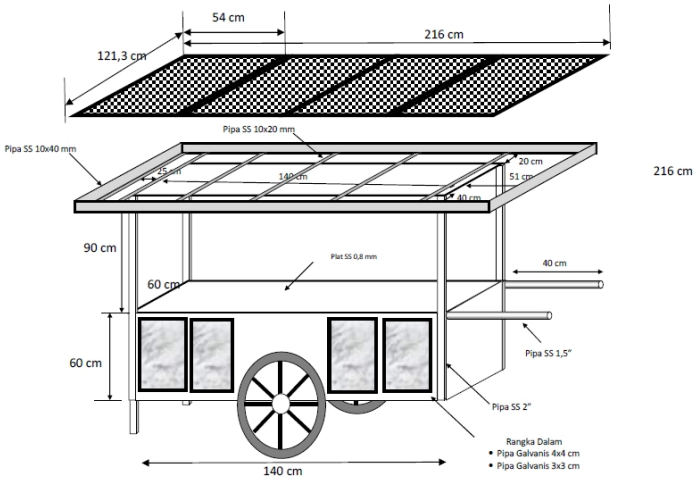

Figure 1. Wheelbarrow design

2.3. Install the appropriate Solar Power Plant

The type of Solar Power Plant installation is an Off-Grid system, where this system uses solar panels (photovoltaic panels) to produce electricity that is environmentally friendly and emission-free. The installation of this Solar Power Plant is based on the total electricity load that must be borne by the electric stove. The Solar Power Plant design include :

– Requirement of Batteries and Solar Panels

Batteries are used to store electrical energy from solar panels. To find out the battery requirements, it is necessary to determine the value of the power generated from the solar panels needed by using equation 2.

$$P_t = \frac{Wb\ (Wh)}{Tp\ (hour)} \quad \text{.....2}$$

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with :
Pt = Generated Power from solar panel (watt)
Wb = total energy load (Wh)
Tp = charging periode (hour)

Battery energy requirements are calculated using equation 3 :

$$Wbt = Wb \cdot \left(\frac{Tlp - Ts}{Tlp}\right) \quad \ldots\ldots 3$$

with :
Wbt = total battery energy usage (Wh)
Wb = total energy of load (Wh)
Tlp = using periode (hour)
Ts = charging periode (hour)

- Inverter Requirement
  Inveter changes the DC voltage of the battery to AC voltage, with the power requirement of 3 to 4 times the load power.
- Design of Solar Power Plant System
  The Solar Power Plant design is an Off Grid system with the main components including 100 Wp solar panels, BCR, batteries, inverters. BCR functions as a controller for the entry and exit of electrical energy into batteries and loads.

2.4. Functional and performance test

The functional test of the tool is carried out to determine whether the components of the Solar Power Plant as mentioned are functioning properly. While the performance test is to determine the level of efficiency of the tool. The material used in the testing tool is clean water for cooking. The parameters used in testing tools include:

2.4.1. The power that can be generated and the energy supplied by Solar Power Plant.

The power and energy produced by Solar Power Plant must be able to bear the energy needs for the heating process.

2.4.2. Battery life testing

This test is conducted to see the durability of the battery supplied by the solar panels to be able to overcome the energy load required.

3. Result

Research activities that have been carried out have obtained the following results:

3.1. Calculation of total load energy requirements:

It is known, the load power in the form of an electric stove and heater is 200 W and it is turned on for approximately 6 hours in one day for the needs of boiling water, so that the total energy required is calculated according to equation 1, which is 1200 Wh. The correction factor used is 15%, so the correction power becomes 1380 Wh or 1,38 kWh.

3.2. Wheelbarrows Dimensions

The wheelbarrow has been made to have dimensions of length x width x height of 140 cm x 216 cm x 150 cm. The solar panels are placed on the roof of the cart which also functions as a protection in case of hot sun or rain. The center of the cart is placed for cooking utensils and ingredients and an electric

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socket as a place for electrical terminals. The lower part is used to store the supporting components for PLTS such as batteries, inverters and solar controllers.

3.3. Determination of the Off Grid Solar Power Plant installation

- Requirement of Batteries and Solar Panels
  Batteries are used to store electrical energy from solar panels. The cooking process takes place with an average duration of 6 hours of use per day. It is assumed that the charging process is only 4 hours, so that if there is an overcharging the system will get additional power. The total power generated by solar panels is 345 W. The solar panels used have a maximum power of 100 Wp, so 4 solar panels are needed. The type of solar panel used is monocrystalline which has an efficiency of 20%. To maximize the power generated, 4 solar panels are installed in parallel, each having a power of 100 Wp. The total power of the solar panels used is 400 Wp, so the total energy that can be supplied by the solar panels with a 4 hour irradiation time is 1600 Wh.
- Battery energy requirements
  Calculation using the formula in equation 3 shows the battery energy requirement of 1600 Wh. Assuming the usage time (Tlp) is carried out for 6 hours, the charging time (Tp) is 4 hours, the total battery energy used is:
  $$Wbt = 1600\ Wh \cdot ((6\ h\text{-}4\ h)) / (6\ h) = 533\ Wh$$
  The battery used has a capacity of 12 V - 65 Ah which has a storage energy of 780 Wh. So the number of batteries used using equation 4 results:
  $n = Wbt / Wb = (533\ Wh) / (780\ Wh) = 0.68$ pieces ≈ 1 piece
  The battery used in this installation has a specification of 1 12 volts 65 Ah.
- Inverter Requirement
  The load power requirement used is 345 W so an inverter is used which has a power value above the load power value, which is 1000 W.
- The PLTS installation integrated with a wheelbarrow has the following specifications The 100 WP solar panels are 4 pieces, A Battery with capacity of 12 V - 65 Ah, The inverter which has a power of 500 Watts, and The solar controller that is capable of flowing currents of up to 10 A

The wheelbarrow that has been made is then integrated with the appropriate Solar Power Plant system so that the cooking process uses an electric stove and water heater with a source originating from Solar Power Plant, as shown in Figure 2

Figure 2. Solar Powered Wheelbarrow

The results of the functional tests that have been carried out show that all the components of this solar powered wheelbarrow are functioning properly. This cart is able to support the weight of the Solar

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Power Plant and the cooking utensils used. When pushed, the cart also remains stable and easy to move. The integrated Solar Power Plant system is also capable of supplying electricity for cooking utensils in the form of electric stoves and water heaters. The battery used is also capable of storing electrical energy generated by solar panels so that during cloudy conditions or at night when there is no sun it can still supply electrical energy.

The performance test results of the Solar Power Plant system that have been made are strongly influenced by the conditions of solar radiation intensity. Solar irradiation when testing the 400WP Off Grid Solar Power Plant can be seen in Figure 3.

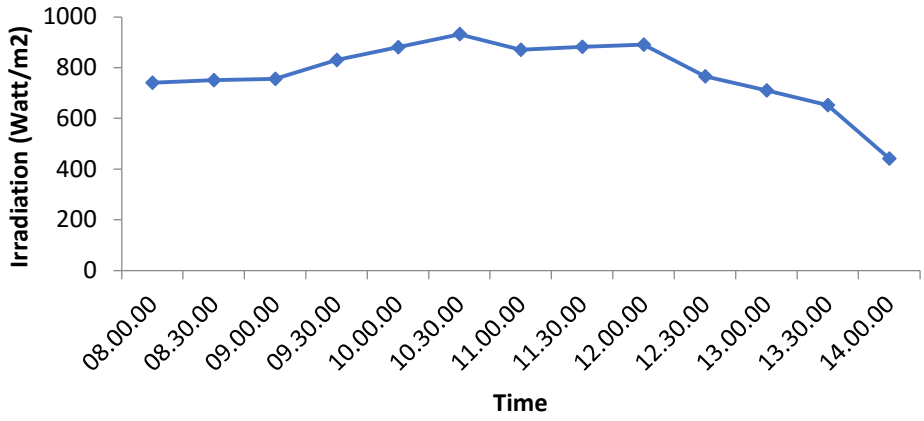

Figure 3 The radiation intensity at the time of measurement

The solar irradiation at the time of this test was classified as bright, it was possible that the solar panels could produce optimum electrical energy. The highest irradiation value was at 10:30 with an irradiation amount of 932 W / m² and the lowest irradiation value was at 14:00 with an irradiation amount of 442 W / m². The intensity of solar radiation in this test is quite good because it can be stable above 800 W / m² for about 3 hours.

The comparison of the energy produced by the 400WP Off Grid Solar Power Plant with the energy consumed by the electric stove and water heater for 6 hours of work can be seen in Figure 4.

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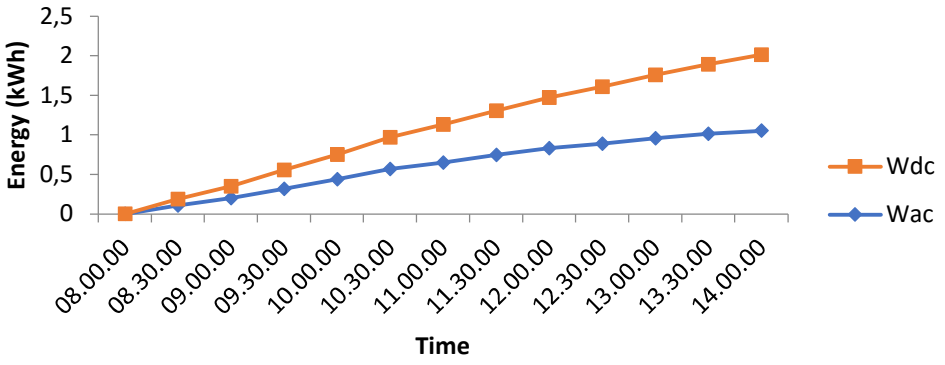

Figure 4. Comparison chart of energy produced by 400WP Off Grid Solar Power Plant with the energy used by electric stoves and heater

Figure 4 shows a graph of the energy produced by the 400 WP Off Grid Solar Power Plant and a graph of the electrical energy consumed by the electric stove and heater. The graph above shows that the energy produced by the 400WP Off Grid Solar Power Plant can exceed the energy used by electric stoves and heaters. Excess electrical energy generated by solar panels can be stored in batteries. Storage of electrical energy in batteries for backup energy on the next day of use in case of less sunny weather. So that the electrical energy stored in the battery can be used at that time. The electrical energy produced by the 400 WP Off Grid Solar Power Plant for 6 hours is 1.053 kWh and the electric energy needed by the electric stove for 6 hours is 0.96 kWh. The excess electrical energy produced by Solar Power Plant is 0.093 kWh and this electrical energy is stored in the battery. With these conditions, the electric stove and heater can produce heat as desired.

Testing the resistance of the battery on the 400 WP Off Grid Solar Power Plant can be seen from the results of the DC side inverter input voltage shown in Figure 5. It shows that Solar Power Plant can charge electrical energy to the battery.

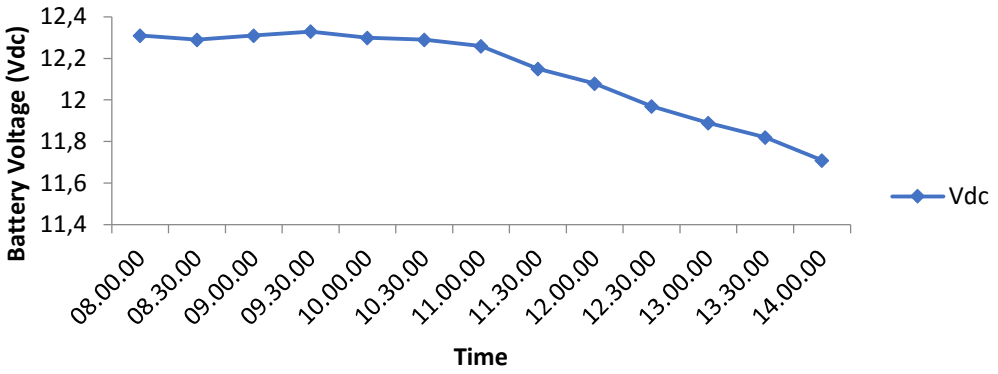

Figure 5 Graph of battery testing on the Solar Power Plant system

In Figure 5 it can be seen that the voltage on the battery is experience fluctuation. The battery voltage is greatly influenced by the output voltage of the solar panel, the greater the panel output voltage, the higher the battery voltage and vice versa. The inverter input voltage at 08:00 having a voltage of 12.47 volts and at 14:00 having a voltage of 11.74 volts. Charging the battery by the solar panel lasts until 11:30 a.m., where the inverter input voltage shows 12.15 Volt. After 6 hours the voltage has decreased until 11.74 Volt at 14:00 which is the lowest number, this is because the intensity of the sun has also decreased.

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4. Conclusion

Based on the results of the research that has been done it can be concluded that:

- The solar powered wheelbarrow is able to support the load of the Solar Power Plant components and the cooking utensils used, besides that the cart also remains stable and easy to move.
- The Solar Power Plant installation integrated with a wheelbarrow has specifications, including 4 solar panels of 100 WP, batteries with a capacity of 12 V - 65 Ah, inverters with a power of 500 watts, and a solar controller capable of flowing currents of up to 60 A.
- The energy produced by the 400WP Off Grid Solar Power Plant can exceed the energy used by electric stoves and heaters. Excess electrical energy generated by solar panels can be stored in batteries.
- The battery used can survive the cooking process for 6 hours of use in one day.

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Business Development through Economic Value Evaluation in the Rukun Makmur Tobacco Farmers Group in Jember Regency

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Abstract— This study aims to evaluate the Rukun Makmur tobacco farmer group's business development in terms of costs, income, profits, and efficiency of tobacco farming. The data used in this study are primary and secondary. Primary data is data obtained directly from research respondents, namely tobacco farmers Rukun Makmur Jember. The number of samples of this study consisted of 40 farmers. This study's data were collected using 3 techniques, namely field surveys, interviews, and documentation. The data analysis technique in this study uses the profitability method and efficiency method. The results showed that the average amount of production costs incurred by the Rukun Makmur Farmer Group was 1.41 billion, consisting of direct costs of Rp. 972.9 million and implicit costs of Rp. 437.1 million. Furthermore, the average income earned was IDR 1,869 billion. Thus, the average profit earned during 2018 and 2019 is IDR 459 million, with an R / C ratio of 1.32. Based on these results, it can be said that the farming business has been efficient and feasible to do.

Keywords— B/C ratio, efficiency, profitability

1. Introduction

Tobacco is a type of plantation crop that is widely developed in Indonesia. Tobacco is widely used as a raw material for cigarettes. However, the tobacco plant has many other benefits such as perfume, anesthetic, pesticides, cosmetics, and essential oils. Jember is one of the potential tobacco producers in Indonesia. Data from the Directorate General of Plantation in 2017 that Jember Regency is a producer of N.O. and the largest Kasturi in East Java with a total production of 2,056 and 1,537 tons, respectively.

The amount of tobacco production in Jember Regency has the largest amount because the number of tobacco farmers in Jember Regency is also huge. The Rukun Makmur tobacco farmer group is one of the farmer groups that operate tobacco plant farming in Jember Regency. The Rukun Makmur farmer group is a tobacco farmer group located in Sumbersari Subdistrict, Jember Regency, with the chairman of Mr. Nurkholis.

The Rukun Makmur farmer group consists of 40 tobacco farmers who have started their tobacco plant farming activities 24-25 years. This farmer group conducts N.O. tobacco farming activities. and

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VO Kasturi. The Rukun Makmur farmer group is currently selling tobacco plants to several places and companies, namely PT. Mayangsari for NO tobacco.

The Rukun Makmur farming group is able to produce 1.4 tonnes of tobacco for every Hectare of land it manages. However, in 2019, based on an interview conducted with the head of the Rukun Makmur farmer group, it was stated that at this time, the Rukun Makmur farmer group experienced large losses due to the low selling price of the tobacco produced. The selling price of NO tobacco in 2018 reached IDR 68,000 per kilogram, but currently, the selling price is only IDR 21,000 per kilogram. The selling price eventually caused the farmers to suffer losses because the farmers had to pay around Rp. 47,000,000 for each production of 1 hectare of NO tobacco.

Based on the previous explanation, this research was conducted based on the research problem such as (1) what are the production costs, revenues, and profits obtained from the Rukun Makmur tobacco farming business? And (2) what is the efficiency value of the Rukun Makmur tobacco farming business? The purpose of this study was to determine the costs, income, and profits obtained from Rukun Makmur tobacco farming and to find out the efficiency value of Rukun Makmur tobacco farming. Thus, this research can be used as a material for evaluating costs for Rukun Makmur tobacco farming. The novelty of this research is that this study wants to assess the business development of tobacco farmers in Jember.

2. Literature Review

2.1. Tobacco Farming

Farming is a collection of natural resources in a place needed to produce agriculture. Natural resources needed in farming include the body of soil and water, soil improvement, sunlight, and building facilities that are above the ground [1]. Tobacco farming is a business in the agricultural sector that produces tobacco plants. Tobacco is a type of plantation crop with the scientific name Nicotiana Tabacum L. Tobacco has the following characteristics [2]:

- Rooted riding with a length of about 70 cm
- Has an erect stem, hairy and light green
- Has a height of 58-101 cm
- The leaves are single and an average of 18-25 pieces
- Has compound interest.

Tobacco farming will be professional if tobacco intensification has been carried out. The intensification of tobacco includes: a) the seeds used are superior, b) the soil is processed according to tennis standards, c) regulated water and the climate is predicted, d) plants are fertilized, e) plant protection, f) harvest and post-harvest [3].

2.2. Concept of Cost, Income, and Profits

Every business that runs a business must pay for the process of producing a product. Cost is the sacrifice of economic resources measured in units of money, which has occurred or is likely to happen for a specific purpose [4]. Costs incurred by a business are intended to generate income from the products sold. Cost is the cost used to get revenue [5].

Costs have been incurred from the production process. Then, products are sold for income. Income is the gross revenue from all branches during the year, which is calculated from sales, exchange, or reassessment activities [6]. The income earned is then deducted from the costs previously incurred during the production process to determine the amount of profit earned. Profits are the net results obtained from income with all costs incurred during the production process [3]. The size of the profits obtained depends on the amount of income received and the costs incurred. The higher the income and the smaller the production costs, the greater the profits will be.

2.3. Efficiency

Every business wants to create high business efficiency. Efficiency is a maximization of the output produced by allocating input that is not too large [3]. Thus, the more efficient the business is carried out,

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the higher the maximum profit. The efficiency level of a business can be determined by calculating the R / C ratio. Return and Cost Ratio is the ratio of total revenue to total cost [1].

2.4. Previous Study

This research is based on the results of previous studies with similar themes. The previous research that became a reference in this study were:

Table 1. Previous Study

Name	Method	Result
Munawaroh (2012)	Descriptive Analysis	The results showed that the costs incurred were IDR 39,854,102 / Ha / MT with a profit of IDR 26,146,822 / Ha / MT and an efficiency of 2.12 so that the tobacco business had a competitive edge.
Setiawan et al. (2018)	Policy Matrix Analysis Method and competitiveness	Tobacco farming has comparative and competitive competitiveness; policies do not have a positive impact on tobacco farmers.
Putri et al. (2018)	Census method	The average value of profitability is 271.33%, which means that BRI's deposit and credit interest rates. This shows that partnering with PT Djarum is feasible to be granted a loan.

2.5. Framework of Thought

This research is based on the mindset that tobacco farming has two kinds of costs, namely, explicit and implicit costs. The costs incurred by the farm are then used as a deduction from the income earned to find out the resulting profit. If a farm costs less than the total revenue, the farm will get a profit. Farming businesses must also experience different levels of efficiency due to differences in production levels produced. Thus, the framework of research is as follows.

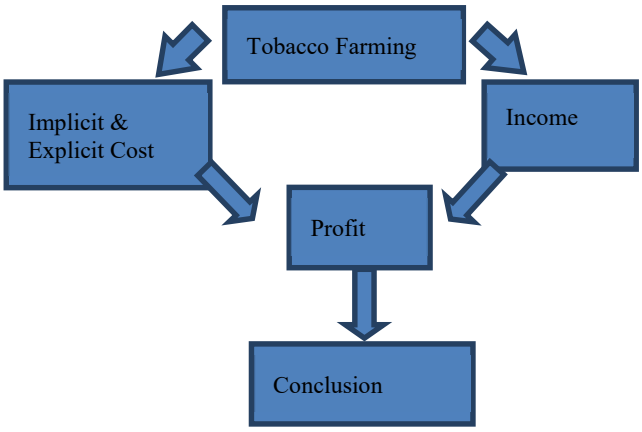

Figure 1. Framework of Thought

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3. Research Methodology

3.1. Location

This research will be conducted at the Rukun Makmur tobacco farmer group, Sumbersari District, Jember Regency. This farming group consists of 40 tobacco farmers and produces 1.4 tonnes/ha of tobacco.

3.2. Types and Sources of Data

The data used in this study are primary and secondary data. Primary data is data obtained directly from research respondents, namely tobacco farmers Rukun Makmur Jember. The number of samples of this study consisted of 40 farmers. This is because the minimum number of suitable samples for testing in a study is 30 (Singarimbun and Efendi, 1995). Furthermore, this study's secondary data came from the Department of Agriculture, Plantation, and Forestry of Jember Regency.

3.3. Data Collection Technique

The data used in this study were collected using several techniques. The techniques used to collect research data such as:

- Field Survey Methods. This method is used as an initial form to determine the condition and important information on the research location.
- Interview Method. The purpose of this method is to obtain information and facts as well as increase confidence and clarification of the findings obtained during field surveys.
- Documentation Method. The purpose of this method is to obtain data that can support the primary data. This method has been obtained from the implementation of the previous method.

3.4. Data Analysis

The data analysis technique in this study uses the cost, profitability, and efficiency method. The first method used in this research is the method of calculating the cost of Kasturi tobacco farming. The formula for calculating costs is as follows:

$$\mathbf{TC = EC + IC}$$

Information:
TC = Total Cost (Rp)
EC = Explicite Cost (Rp)
IC = Implcite Cost (Rp)

The second method is the calculation of farm profits. Before determining it, it is necessary to calculate the revenue for tobacco farming. There is an equation for determining acceptance, namely:

$$\Pi = TR - TC$$
$$TR = Q \times P$$
$$\Pi = (Q \times P) - TC$$

Information:
Π = Profit (Rp)
TR = Total Revenue (Rp)
TC = Total Cost (Rp)
Q = Quantity (Kg)
P = Price (Rp)

The next method is to determine the level of farm efficiency. The formula for calculating the efficiency of farming is as follows:

Efficiency = R / C

Information:
R = Revenue
C = Cost

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The determination of whether the farming is efficient or not will be determined from the calculated R / C value. The basis for making decisions on whether or not farming is efficient is as follows:

- If R / C > 1, then the farming is efficient.
- If R / C = 1, then the farm is at the break-even point.
- If R / C < 1, then the farming is inefficient

4. Results

The first step of the research results will explain the average amount of profits obtained by farming in 2018 and 2019. The calculation of the profits from farming begins by calculating the number of production costs. The production costs of farming for 2018 and 2019 are the same. Production costs consist of explicit and implicit costs. The following table 2 presents the production costs of Rukun Makmur tobacco farming.

Table 2. Rukun Makmur Production Costs

Cost Type	Cost every Hectare	Total
Explicit Costs		
Fertilizer costs	Rp8.486.931,-	254.607.930
Pesticide costs	Rp441.048,-	13.231.440
Outside labor costs	Rp22.892.337,-	686.770.110
Tax Cost	Rp97.290,-	2.918.700
Transportation Cost	Rp512.394,-	15.371.820
Total	**Rp32.430.000,-**	**972.900.000**
Implicit Cost		
Seeds	Rp1.107.320,-	33.219.600
Land rent	Rp7.043.138,-	211.294.140
Inside Labour	Rp383.191,-	11.495.730
Depreciation of Equipment	Rp1.784.825,-	53.544.750
Capital Interest	Rp4.251.526,-	127.545.780
Total	**Rp14.570.000,-**	**437.100.000**

Table 2 shows that the Rukun Makmur farming group's total production costs are explicit costs added to implicit costs, so the total production cost is IDR 1,410,000,000.

The next step to calculate the average profit of the Rukun Makmur farming group in 2018 and 2019 is to calculate the average income received by the Rukun Makmur farmer group for 30 hectares of managed land as follows:

Year 2018= 30 x 1.400 x Rp 68.000
= Rp 2.856.000.000
Year 2019= 30 x 1.400 x Rp 21.000
= Rp 882.000.000
Average = (Rp2.856.000.000 + Rp882.000.000): 2
= **Rp 1.869.000.000**

The results of the calculations that have been carried out show that in 2019 there has been a very significant decrease in income. The decline in income that occurred was more than 50%. This is because the selling price of tobacco in 2019 has decreased sharply to IDR 21,000 per kilogram. Therefore, the average income of the Rukun Makmur farming group in 2018 and 2019 is IDR 1,869,000,000.

The third step is to calculate profits by reducing the average income and production costs incurred by the Rukun Makmur Farmers Group. The profit calculations are as follows:

Average profit = Rp 1.869.000.000,-
(Rp 1.410.000.000,-)
Rp 459.000.000,-

The last step is taken in calculating the efficiency with the R / C ratio. The efficiency calculations are as follows.

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R/C = Rp 1.869.000.000,- : Rp 1.410.000.000,-
= 1,32

Based on the above calculations, it is known that the R / C ratio of tobacco farming in the Rukun Makmur Farmer Group is 1.32. This figure means that the farm is efficient to do. Efficient means that farming revenue received has been able to cover the amount of cost incurred. In addition, through Rp. 1,00 costs incurred by the rukun Makmur tobacco farmers, they are able to generate revenue of Rp. 1,32. This shows that although tobacco farming has experienced advantages and disadvantages. However, if the two conditions are averaged, it shows that farming is feasible to continue.

5. CONCLUSION

This study aims to determine the level of business feasibility of the Rukun Makmur tobacco group. Based on the results on tobacco farming in the rukun Makmur tobacco farmer group, the following conclusions are obtained :

- The average amount of production costs incurred by the Rukun Makmur Farmer Group was 1.41 billion, consisting of direct costs of Rp. 972.9 million and implicit costs of Rp. 437.1 million.
- The average income earned was IDR 1,869 billion. it was found that the average income in 2018 and 2019 was still greater than the expenses incurred
- Thus, the average profit earned during 2018 and 2019 is IDR 459 million,
- The R / C ratio for tobacco farming is 1.32. It means Rp. 1,00 costs incurred by the Rukun Makmur tobacco farmers, they are able to generate revenue of Rp. 1,32. the B / C ratio in this study is above 1. Based on these results, it can be said that the farming business has been efficient and feasible to do.

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Development of Leaf Color Level Sensors for Measuring the Nutritional Need of Chrysanthemum based on Raspberry pi

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Abstract. Chrysanthemum (Chrysantium Morifolium) is one of the most popular ornamental flower plants in Indonesia. The advantages of chrysanthemum include adjustable flowering properties so that they can be produced all year round with varied flowers and easier handling. Apart from being used as cut flowers, chrysanthemum plants can be used as traditional medicine and also as insect poison medicine. The quality of chrysanthemums is largely determined by external appearances such as stalks, leaves, and flower crowns. So that it takes an intensive maintenance effort from seeding to harvesting in order to obtain good flower quality. One of the factors that greatly influence the maintenance of chrysanthemum is the provision of nutrients or nutrients. Lack of nutrients in the chrysanthemum will inhibit growth so that it can reduce the quality of the flowers produced. In this paper, a camera-based sensor is developed to measure the color level of chrysanthemum leaves. Leaf color levels were measured through histogram processing on the raspberry pi device. Image processing results are compared with the standard Leaf Color Chart (LCC) to obtain accurate readings.

1. Introduction

Chrysanthemum (*Chrysantium morifolium*) is one of the most popular ornamental flower plants in worldwide and Indonesia [1] [2] [3] [4]. The advantages of chrysanthemum compared to other ornamental plants include adjustable flowering properties so that it can be produced all year round with varied flowers and easier handling [5]. Chrysanthemum flowers are considered important economically because of its various uses for example for landscaping and cut flowers for vases decoration, making wreaths and hair ornaments [6]. Apart from being an attractive potted plant and as a cut flower, chrysanthemum can be used as a traditional medicine and also as an insect poison medicine [7]. Research conducted by [8] on Chrysanthemum morifolium, showed that this type of chrysanthemum extract has a fairly high antioxidant content. This is also supported by research [9], showing that the essential oil contained in Chrysanthemum indicum flowers has the ability to inhibit the growth of 15 kinds of microorganisms and [10] the chrysanthemum plant is often used as a tea and anti-inflammatory in traditional Chinese medicine. The most popular type of chrysanthemum is the standard type of chrysanthemum [11]. Based on data [12], the harvested area for chrysanthemum is the largest compared to other ornamental plants in 2018, which is 1,110.52 ha followed by roses with a harvest area of 411.10 ha and the third place is tuberose plants with a harvest area of 309, 67 ha. This harvest area has decreased

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slightly compared to 2017 with a decrease of 4.56 percent, namely from 1,163.55 ha in 2017 to 1,110.52 ha in 2018. The total amount of cut chrysanthemum production in 2018 reached 488.18 million stalks, followed by roses with a production of 202.06 million stalks, and tuberose with a production of 116.91 million stalks. This production is expected to continue to increase in line with the increasing demand for chrysanthemum, thus requiring sustainable abundant and high quality crop production [13]. Increasing urbanization and human populations put continuous pressure on the industry as space in cities shrinks so people are forced to satisfy their gardening desires by planting crops in pots or on terraced buildings [14]. Chrysanthemum has wide adaptability for varying climatic and soil conditions [15]. The quality of chrysanthemum cut flowers is very much determined by the external appearance starting from the stalks, leaves and crown of the flower so that intensive maintenance efforts are needed from seedling to harvesting in order to obtain a good quality outer appearance. For maximization of yield and quality of flower crop, various management practices like proper dose of manures and fertilizers [16].
Lack of nutrients in chrysanthemum will cause obstacles in plant growth and development accompanied by other symptoms that can reduce the amount of production, appearance and quality of the flowers produced. On the other hand, excessive nutrient application will adversely affect plant growth [17]. Therefore, in this study, a portable sensor device was developed that can measure leaf color levels to determine the nutritional needs of chrysanthemum plants. The Raspberry Pi microcomputer based sensor device integrated with an RGB camera [18]. The output is based on the standard Leaf Color Chart (BWD). This research is expected to be able to determine the need for plant fertilizers in accordance with the conditions of plant needs which can eventually be converted into the fertilizer dose given to the chrysanthemum plant so that the fertilizer application is balanced.

One of the efforts to increase chrysanthemum production is by increasing the number of plant populations planted and increasing the number of flowers and the number of stalks planted. This increase can be obtained optimally if it is supported by the provision of balanced fertilizers because the need for nutrients for plants also increases along with the addition of the number of flowers so that plant quality is maintained in the hope that it will increase income for farmers because the selling price of chrysanthemum cut flowers is influenced by flower quality. produced [19]. The most widely felt benefits of fertilizers are providing the necessary nutrients for plants and helping to prevent the loss of fast-losing nutrients such as N, P, and K which are easily lost by evaporation or by percolation water. Several studies regarding fertilization applications have been carried out, including by [20], [21]; [22]. One of the possible applications of Precision farming technology, among others, is the management of leaf color images based on leaf color charts as an alternative in determining the dose and concentration of fertilization because the level of leaf color is strongly influenced by the amount of chlorophyll in the leaves, while the amount of chlorophyll is influenced by the availability of nutrients absorbed. by planting mainly nitrogen. Leaf color chart (BWD) was first developed in Japan, and later researchers from China's Zhejiang Agricultural University developed a better and calibrated BWD with indica, japonica and hybrid rice. This BWD is a suitable tool for optimizing the use of N, with various sources of N fertilizers, organic fertilizers, bio fertilizers, or chemical fertilizers. In the past, there has been a simple tool to determine the amount of chlorophyll in plant leaves called SPAD-52 (KONICA MINOLTA 1989), but this tool is still quite expensive. This tool digitally records the relative number of chlorophyll molecules, so it is very sensitive and accurate. The recording is called the SPAD value, calculated based on the amount of light transmitted by the leaf in two wavelength beams where the absorbance of chlorophyll differs. Research on the use of image processing in the analysis of fertilizer requirements using BWD on chrysanthemum has never been done before, but general image processing research [23] has been carried out, among others [24] who conducted research on automatic spray applications based on image processing of land images, [25] conducted research on the use of cell phone cameras to estimate the color of rice leaves such as when using a leaf color chart (BWD), [26] developed a leaf color level sensor device to determine fertilizer requirements for soybean crops and [27] through fertilization recommendations using BWD.

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2. Material and Sensing Process

2.1 Hardware Design

The prototype case is made using 3D printer technology. The prototype is designed with a size of 4x4x20cm. The device consists of a camera sensor box frame and a raspberry pi controller. The controller uses a 5 inch Raspberry HDMI LCD as a display. The system uses a power supply from a 5 volt power bank 2.1 A. The box design is designed using CAD which is then converted to * stl format. Figure 1 is a case design used as a measuring device for the intensity of leaf color. The tool uses a Pi Camera with a 5MP resolution as a leaf color intensity sensor. The next stage is carried out by making electronic circuits according to system requirements. Figure 2 is a system block diagram of the device created.

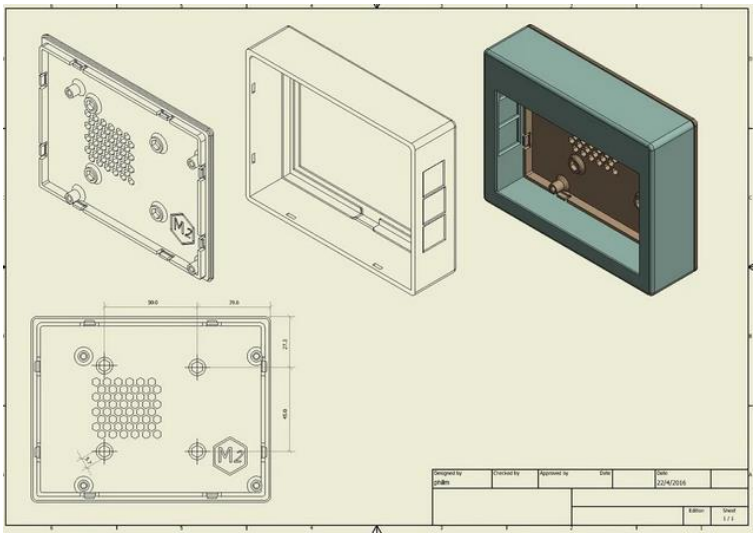

Figure 1. The case design used as a measuring device for the intensity of leaf color

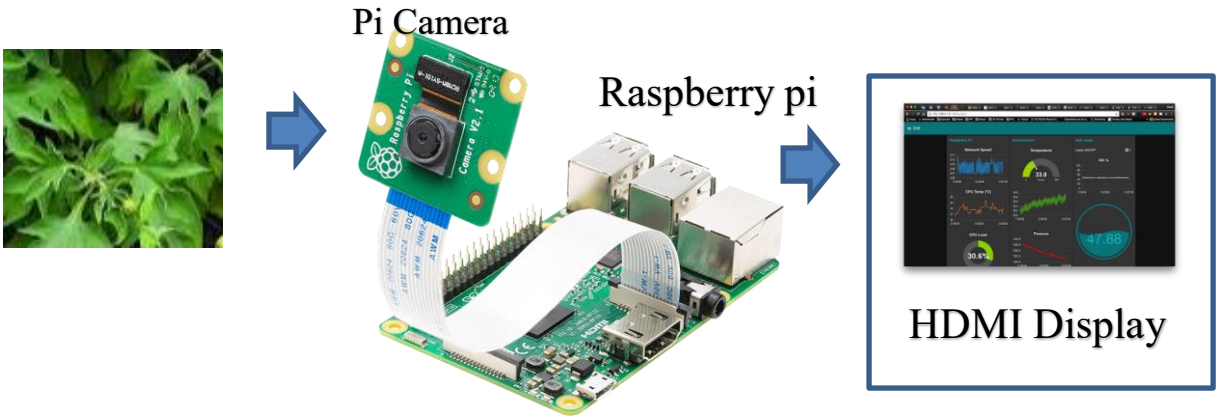

Figure 2. The system block diagram of the device created.

2.2 Software Design

The website was built using python software on a raspberry pi device. The device uses image data from the Pi Camera for processing leaf color intensity. After capturing the chrysanthemum leaves, then the RGB image is converted to HSV format to reduce noise in the image. Convert RGB to HSV using equation 1). Furthermore, to obtain the intensity level of the leaf color, the HSV image was processed using the histogram feature. The histogram will provide a data set of R, G and B values in a certain pixel area. The histogram equation is a method for processing images to adjust the contrast of an image by

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modifying the histogram intensity distribution. The objective of this technique is to assign a linear trend to the cumulative probability function associated with the image. Histogram processing using equation2. Figure 3 is a programming flowchart on Rasberry Pi using the Python language.

$$V = \max(R, G, B)$$

$$S = \begin{cases} \frac{V - \min(R,G,B)}{V}, jika\ V \neq 0 \\ 0 \end{cases} \quad \text{.....1)}$$

$$s - RGB(x, y) = I_R(x, y) + I_G(x, y) + I_B(x, y)$$

$$\text{mod}_{s-RGB} = \arg\max(histogram\_s - RGB) \quad \text{.....2}$$

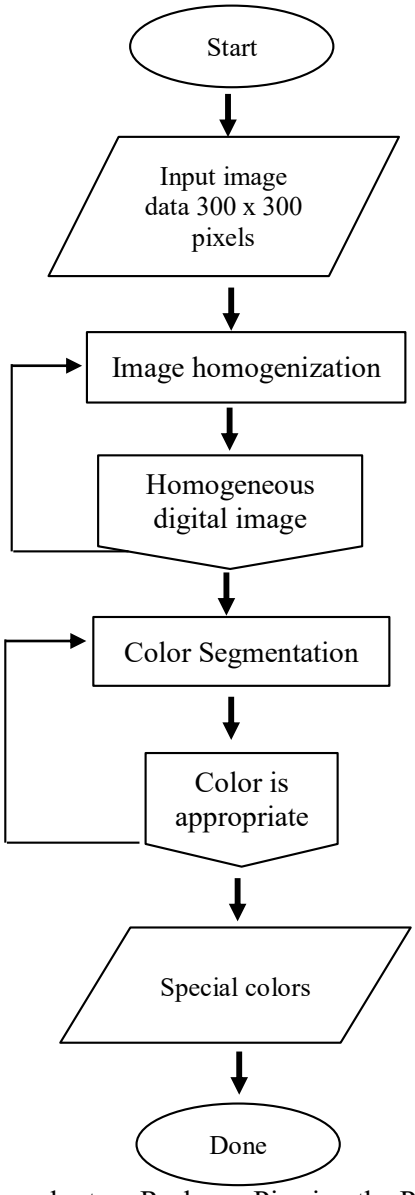

Figure 3. The programming flowchart on Rasberry Pi using the Python language

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3. Result and Discussion

3.1. System Realization

Power for the system using 2 batteries 85760 arranged in parallel. By using the balancer module, the battery can be recharged using a 5v usb charger. In addition to the electronic box which consists of several circuits, there are other parts that are related to and are still part of the electronic circuit, namely the sensor circuit. A sensor circuit like this consists of two slots as a place to place the sensor. This sensor circuit is connected directly with a cable to the i2c pin (SDA / SCL) of the microcontroller. The battery box and electronic circuit are designed separately to make recharging the device easier. The sensor box is equipped with an indicator LED as a sign that the sensor is working or dead. Figure 4 is the result of the form of the device used for the monitoring system.

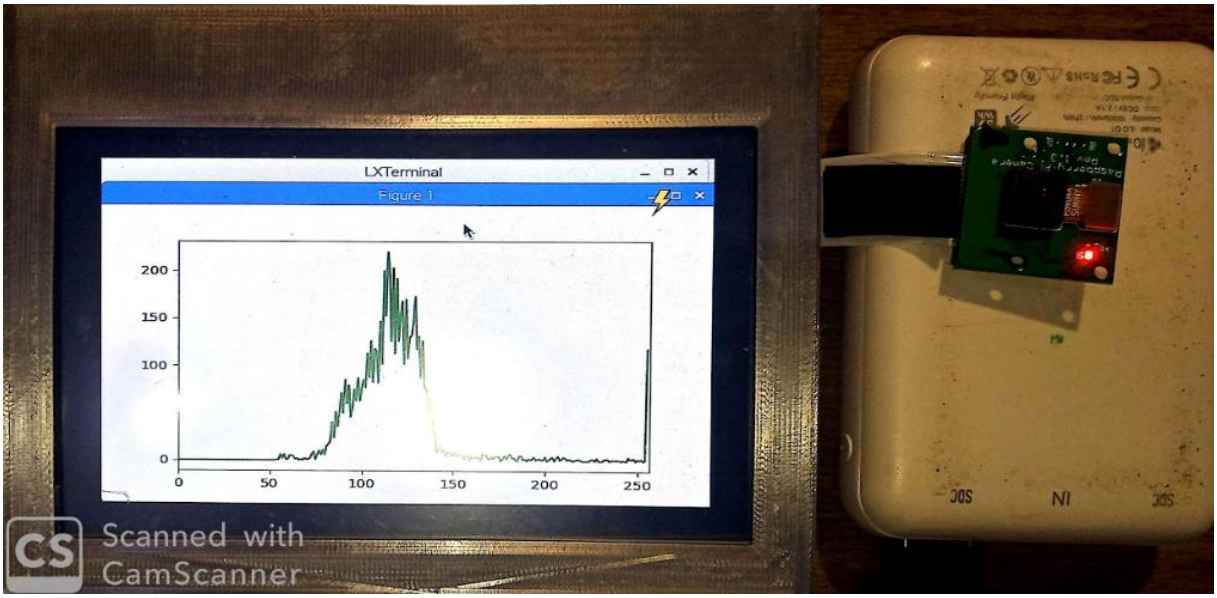

Figure 4. The form of the device used for the monitoring system

In the analysis of leaf image RGB data, the cumulative frequency distribution of the RMean, GMean and BMean components is generally assumed to follow the normal distribution. However, a recent study reported that the cumulative frequency distribution of leaf color followed an oblique distribution. For example, Wu et al. found that the cumulative frequency of tea leaf color had an oblique distribution, and the deviation with new and old leaves had a clear difference [27]. In addition, the humidity conditions on corn leaves were associated with deviation in the grayscale values in the RGB blade model [28]. The asymmetry of the skewed distribution can be explained by the partial frequency distribution of the slanted distribution curve. Several parameters that can be derived from the skewed distribution include mean, median, mode, skewness, kurtosis, and others.

The SPAD leaf chlorophyll meter is one of the most widely used handheld meter for rapid assessment and does not destroy chlorophyll content in many plants [29]. In this paper, the frequency distributions of the green, and gray scale channels in the RGB leaf image are analyzed. By extracting the relevant distribution parameters, a model was created for the correlation of the color characteristic parameters and the SPAD chlorophyll concentration values. When the inclination parameters were exploited, we found that the degree of installation and the prediction accuracy improved considerably. The proposed spatial model can more accurately predict SPAD values, and explain the physiological significance of leaf color change.

The main process carried out is calibration with the BWD table. In this case, the maximum pixel value on the histogram is adjusted to the color classification in the BWD. Nutrient table values are also entered into the python program. This will provide direct recommendations to the user when the tool

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hits the leaves. The processing features are illustrated in Figure 5.While the BWD table used in this study is shown in Figure 6.

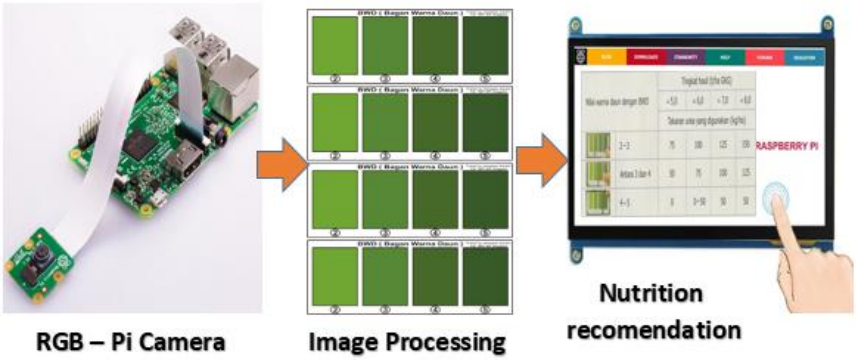


Figure 5. The processing features are illustrated

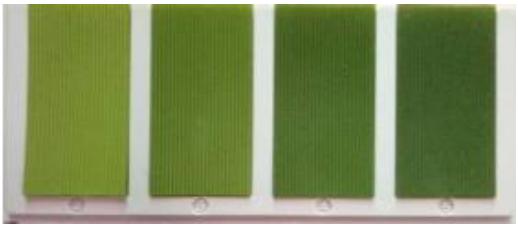
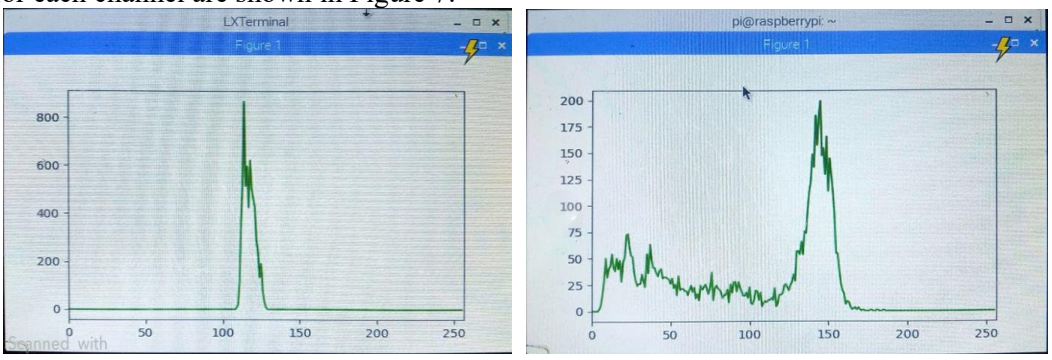


Figure 6. BWD table used

3.2. Testing result

Before conducting field testing, the histogram values on the R, G, B and Gray channels are displayed in graphic form. This is used to test the best channel for use as a parameter in leaf color classification. In this case, the green channel provides a responsive difference to the color of the leaves. This is because the color of the chrysanthemum leaves is predominantly green. The results of reading the Histrogram value for each channel are shown in Figure 7.



(a) (b)

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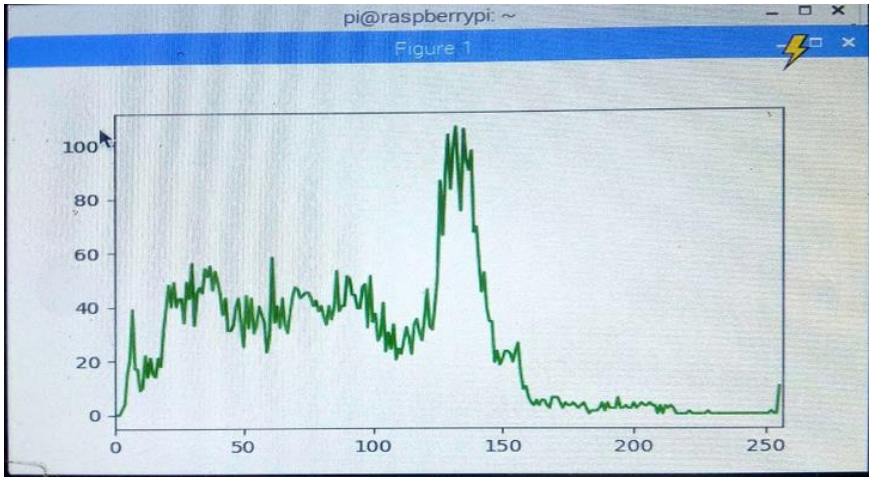

(c)

Figure 7. The results of reading the Histrogram value of a) scale 2-3, b) scale 3-4, c) scale 4-5

Furthermore, the data reading test was carried out on the leaf color directly. In this process, the readings are compared directly with manual measurements using the BWD table. Through a series of tests, the value is obtained according to figure 8.The level of readability is influenced by the light intensity in the environment. The brighter the light intensity in the surrounding environment, the lower the accuracy of reading the data. In normal light intensity, the color reading device has an accuracy of about 92%. In bright light intensity, the color reading device has a high accuracy of about 80%. The image resolution used in image processing is 320x240.

Figure 8. Testing result

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4. Conclusion

Based on the test results, it was concluded that the system could determine the intensity of leaf color well (92% accuracy) in normal light conditions. If the sensor detects a leaf color value on a scale of 2-3, it will give a recommendation of 75kg / ha (yield rate: 5t / ha). If the sensor detects a leaf color value on a scale of 3-4, it will give a recommendation of 50kg / ha (yield rate: 5t / ha). If the sensor detects a leaf color value on a scale of 4-5, it will give a recommendation of 0kg / ha (yield rate: 5t / ha). Meanwhile, if the light intensity of the environment is too bright, the accuracy will decrease. This is because the brightness level of the image can affect the maximum pixel value in the histogram processing. In future research, an LED light device will be added that can reduce the error of reading images caused by light interference from the environment.

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