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Drinking Water Supply Systems Modelling on Pamsimas Program in Kabupaten Mojokerto

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ABSTRACT

The program for water supply and sanitation community based, commonly known as PAMSIMAS program, which planning to involve the community with a need of response approach. As well as in the implementation, operation and maintenance administered and managed by the community. This program targets a village that has no 100% access to a safe drinking water and safe sanitation access, and is located in rural and suburban areas (peri urban).
Management of Water Supply System (SPAM) in the operation and maintenance is essential to the fulfillment of providing safe drinking water in a sustainable manner. SPAM sustainability indicators are functioning means, there are users and application fees. Based on data from the national Pamsimas program there are some number of SPAM that are not working, not fully utilized, and there are no dues.
Based on those problems, the risk analysis study using Water Supply System modeling (SPAM) and Pamsimas Program in Mojokerto need to be conducted. The cause of failure in rural SPAM sustainability were analyzed using Fishbone Analysis. While the main failure was analyzed by modeling method Failure Mode and Effect Analysis (FMEA). Risk analysis includes operational, external and Internal factors. Research was conducted on SPAM and grouped according to the source of water used, such as springs, groundwater and surface water.
Risk analysis results using Fishbone Analysis and FMEA obtained the main failure for SPAM that used groundwater as its sources, namely: (i) Pump Maintenance, (ii) Dues Determination, (iii) Technical knowledge of human resources.
KEYWORDS: Sustainability of Rural SPAM, Fishbone Analysis, FMEA

1. INTRODUCTION

Indonesia is one of the countries that have committed to participate in the global development agenda in the framework of Sustainable Development Goals (SDGs). Program For Water Supply And Sanitation Community Based (Pamsimas) is one of the national community empowerment program using responsive approach needs. Management of Water Supply System (SPAM) is built based on the proposals submitted and approved by the people in a participatory manner [1, 2, 3, 4, 5, 6]. The Electoral system and facilities that will be built, funding patterns and manner of governance are the decision made by community meetings, and a group of Drinking Water Supply System Management (commonly known as KPSPAM) was formed to manage SPAM.

SPAM management in terms of operation and maintenance is essential to the fulfillment of providing safe drinking water in a sustainable manner. Indicators of SPAM sustainability are (i) the functioning of SPAM, (ii) there are people as beneficiaries of SPAM, and (iii) Agreable fee between users and managers of SPAM on water usage.

Based on data from the Management Information System (MIS) of Pamsimas Program, nationally there are numbers of SPAM that are not working, not fully utilized, and there are no dues. The biggest challenge in this program is achievement of Pamsimas Program in sustainability. Risk analysis modeling of SPAM failure in targeted villages in Mojokerto is an effort to support the functioning of SPAM in a sustainable manner.

2. METHODOLOGY

2.1. Type of research

Modeling analysis used in this study is intended to analyze the risk in sustainability. In this research, using qualitative descriptive analysis and modeling in rural water supply system management in Mojokerto.

2.2. Data Collection and Processing Method

The primary data collection using questionnaires and interviews of KPSPAM and SPAM users in the targeted villages for Pamsimas Program in Mojokerto, while secondary data were obtained from data SIM (System Information Management) Pamsimas Program.

The method that were used in this research were the Fishbone Analysis and Failure Mode and Effect Analysis (FMEA). Determination of risk factors for the sustainability of SPAM using Fishbone Analysis, and prioritizing risk of failure using FMEA. Beneficiary of Fishbone Analysis is to help identify the possible causes of

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the problem and find the root of the problem [7, 8]. While FMEA was used because of the feasibility and effectivity, especially for more operational corrective actions [9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19].

3. ANALYSIS AND DISCUSSION

Based on data from questionnaires, interviews, and observations, Analysis Fishbone Diagram was compiled as shown in Figure 1 and the results obtained factors which influenced the sustainability of SPAM, as follows:

a. Operational: Piping, Pumping, SPAM Facilities, Operations and Maintenance Guide Book.
b. External: Dues, Accounting System, Fee Collection System.
c. Internal: Performance of SPAM, KPSPAM Organization, Human Resources.

The source of water used in SPAM is a spring (50.9%), ground water (47.3%) and surface water (1.8%).

SPAM sustainability factors were analyzed using FMEA, in order to obtain the main risk of failure that need to be solved [20, 21, 22]. FMEA results against SPAM that used ground water are as follows:

a. Piping: the mechanical joint between pipes is poor and underground pipes do not fit the criteria, those factors will affect the water discharge and reduced water pressure.
b. Pumping: improper use of pump stabilizers, the components of the pump already worn out, will cause the pump system disrupted and the pump effectiveness decreased.
c. SPAM FACILITIES: Irregularly maintaining and monitoring, will cause poor performance and reduced the quality of the water.
d. OPERATING AND MAINTENANCE GUIDE BOOK: unavailable guidebook or less simple, will cause operational and maintenance activities different from the procedure text.
e. DUES: dues that is collected can not cover the operational and maintenance cost, and there is no suitable amounts of fees, so it would cause lack of funds for operations and maintenance, and SPAM can not be developed.

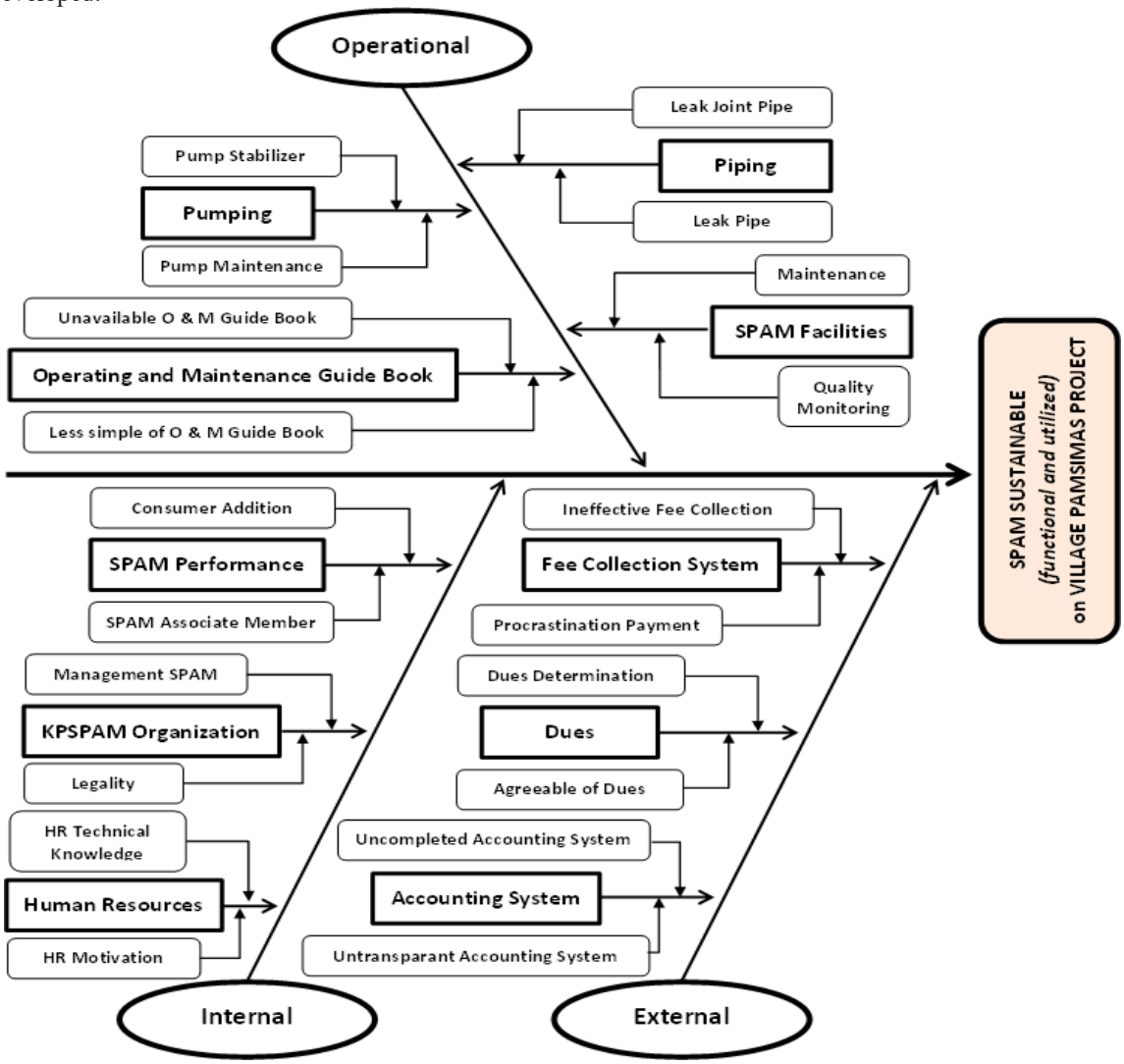

Fig. 1 Fishbone Diagram of the Sustainability SPAM

f. FEE COLLECTION SYSTEMS, caused by the clerk did not routinely collect and beneficiaries do not pay dues on time, so that dues are not collected as expected.
g. ACCOUNTING SYSTEM, lack of inadequate human resources and disorderly administrative ledger, it would affect to unknown finance condition whether is surplus or deficit, and the beneficiaries will lost trust to the management.
h. KPSPAM, the lack activities of KPSPAM, no legal support and recognition, will cause SPAM operational works not optimum and fail to carry the main duties and functions of KPSPAM.
i. SPAM PERFORMANCE, decreased SPAM Performance caused by KPSPAM did not have a work plan and less aware of the advantages of being a member of the KPSPAM, the absence of additional beneficiaries, lack of services development and not knowing the advantages of collaboration with other parties.
j. HUMAN RESOURCES, caused by a lack of human resources technical knowledge, lack of motivation, which resulting in less responsive to the problem.

4. CONCLUSIONS

Based on fishbone analysis and FMEA results, it can be concluded that the highest risk factors of SPAM uses groundwater as its source are:

a. Operational : Pump Maintenance
b. External : Dues Determination
c. Internal : Technical Knowledge of Human Resources

Ways to reduce failure based on the highest priority are:

a. Pump components must be maintained regularly to avoid pump components worn out and increased effectiveness and pump lifetime.
b. Discussion between managers and beneficiaries about amounts of dues, reducing maintenance and operating costs, budget reserves, as well as monthly administration fees apply.
c. Attend training and education program organized by Rural SPAM Association specially related to technical and financial administration.

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Study for Reclamation of Used Coal Mining Using Eucalyptus Plants

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ABSTRACT

The main purpose of this research is to make a study of reclamation of land used for coal mining for crop cultivation. The background of the research and identification of problems and the problem formulation were compiled. The discussion was focused on the following matters. Impact of coal mining activities, soil physical and chemical properties, loss of vegetation, reclamation and plants selection, and land suitability.

KEYWORDS: reclamation, coal mining, vegetation, eucalyptus plants

INTRODUCTION

According to Law Number 23 of 2014 concerning Regional Government, the authority to manage the mineral resource energy sector which was originally the authority of the Regency and City Governments is then transferred to the authority of the Provincial Government and the Central Government in accordance with their authority.

Based on Law No. 4 of 2009 concerning mineral and coal mining, the definition of mining is part or all of the stages in the framework of research, management and exploitation of minerals and coal which includes general investigation, exploration, feasibility studies, construction, mining, processing and refining, transportation and sales, and post-mining activities.

The problem of post-mining coal management through the reclamation of ex-mining land has become a national issue. One of the important things in the activities of the coal mining industry using the open pit method in Indonesia is how to do land reclamation and restore the preservation of the natural environment to be maintained [1].

Ex-mining mining land needs to be immediately reclaimed and replanted to restore the ecosystem and microclimate, soil fertility and water storage functions. Reclamation characteristics are open space, high light intensity, high temperature and extreme fluctuation, low pH and degradation of the number of species both flora, fauna and soil microorganisms. Such characteristics cause not all types of plants can live on the land [2].

One way to overcome this problem is by conducting a reclamation study of the former coal mining area using eucalyptus plants. Eucalyptus plants will be used as shrubs, selection of eucalyptus plants by considering ecological, economic and social aspects so that they can provide benefits to the economy of local communities and local governments in a sustainable manner. Ecologically the development of eucalyptus plants in degraded land is, among others, to support land conservation efforts and the use of marginal land into productive land. Economically the development of eucalyptus plants can be used as a household scale business up to a large scale and socially does not cause social complications.

Referring to the background of the research and identification of problems, the problem formulation was compiled, namely: How is the suitability of cultivated land on the former coal mining land?. The main purpose of this research is to make a study of reclamation of land used for coal mining for crop cultivation.

Impact of Coal Mining Activities

Coal mining systems in Indonesia are generally implemented by open pit mining with back filling methods which are adjusted to the reserve conditions and the quality of the existing geological structure of coal. The application of open mining method is adjusted with the calculation of coal reserves in layers with a certain slope, while the back filling method serves as an effort to minimize the area of open land because mining activities are still ongoing, so that landfilling activities are in line with the movement of active mines [3].

Open mining is more often done because the removal of land and overburden is cheaper compared to underground tunnels. Open pit mining is a type of track mine where minerals are deep in the ground as in coal mines and can occur in every excavation and construction activity there are also special impacts on coal mining activities [3]. The use of heavy equipment in coal mining activities is also known to result in large cavities that have a depth of up to 3 to 4 meters [3].

The stages of open pit mining activities include the stages of activities starting from clearing vegetation, stripping the top soil, and the disclosure of rocks that cover coal minerals and coal mining, these activities use

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heavy equipment. According to Rustam [4] An important impact that might result from coal mining in the pre-mining stage is land clearing due to land clearing. This will lead to further impacts such as a reduction in erosion resistance, changes in infiltration characteristics that will affect groundwater recharge, changes in water balance composition, changes in landscape and land use, and deterioration in land quality due to erosion. At the mining stage, an important impact that arises is the change in the landscape due to stripping or excavation of topsoil, overburden and coal. The possibility of acid mine drainage occurs if the runoff reacts with the overburden that has the potential to form acid, there may be landslides on the overburden in both outside the mine area and the former mine.

Visual appearance seen in the field on ex-mining land, the land becomes bare and looks arid because there is no vegetation that has a function as a cover (top soil). The most obvious change is the change in the shape of the earth's surface topography. Changes occur to the slope of the slope from the initial shape of 2 to 6% to 45 - 90%, surface appearance can be in the form of bumps or landfills and opening holes with a diameter of 300 - 700 m slope shape as described above, it will be difficult to withstand scour surface water (run off) as well as at the bottom of the sloping opening hole will occur puddles. If such conditions occur for a long time, it will result in soil damage [5].

According to Ahyar et al. [6], damage due to mining can occur during mining and post-mining activities. The environmental impact is closely related to the mining technology and techniques used. While mining technology and techniques depend on the type of mineral and the depth of mining material, coal mining is carried out by an open pit system, which is a dumping system (a way of mining coal by peeling the surface of the ground) the impact of coal mining activities is a decrease in physical and chemical properties of the soil, changes in land topography, loss of natural vegetation, loss of wildlife, besides the impact of causing damage to the ecosystem. Based on the explanation above, the most impacted coal mining activities such as the decrease in physical and chemical properties of the soil, changes in topography and loss of vegetation.

Decreased Soil Physical and Chemical Properties

Mining activities cause physical and chemical changes in the soil, thereby reducing the quality of the soil. In general, coal excavated soil is stacked on productive soil, with an inverted arrangement from the initial arrangement, top soil. In the first few years the area of the former coal mining is difficult to grow vegetation. This is caused by several factors, namely soil that is too dense, soil structure is not stable, bad aeration and drainage and soil is slow to absorb water. There are also chemical constraints such as extremely acidic pH and low soil fertility [7]. This phenomenon is in line with Hardjowigeno [8] changes in physical chemical properties of soil that occur such as changes in texture, structure consistency, boundaries between soil layers, while changes in soil chemical properties such as changes in nutrient content in the soil, C-organic, soil pH, conditions like this causing former mining land becomes difficult to grow a variety of plants including agricultural activities due to plant growth is hampered and soil productivity decreases.

According to Cooke and Johnson [9] shows that post-coal mining land is generally characterized by a very rough and varied physical texture, from clay to sandy loam. At some mining sites it appears rocky, and in very fine textiles it has no organic material content, is very compact, and the infiltration rate is very low. In general, mined land has very low macro-nutrient content, especially N, P, K, Na and Ca contents, as well as soil acidity pH and low Cation Exchange Capacity (CEC). In addition, soil microorganisms which are very helpful in stabilizing soil structure, the contribution of inorganic minerals, or their contribution in growth regulating substances, are also very low [3].

Loss of Vegetation

Qomariah research results [10] concluded that, land appearance in locations where there is a former coal mining land was not followed by land rehabilitation treatment until the tenth year, the condition of the ex-mining land showed that plant species would be difficult to live and there were almost no signs of a sign of vegetation can grow. In the process of land rehabilitation, the vegetation element is very necessary, because in addition to its function of securing the soil surface from erosion it also functions as a source of nutrients.

According to Barrow [11] in the natural ecosystem cycle one component is vegetation, including biotic components that have functions such as prevention and control of erosion such as protecting the surface of the ground from the destructive power of falling raindrops, and can control to hold surface water scour (run off). The function of vegetation can also improve the physical properties of soil through biological activities carried out by bacteria, fungi, fungi, insects and earthworms that can improve soil aggregate porosity and stability [12].

Ecologically revegetation is part of the mine land reclamation program. In the implementation of revegetation of mining areas often experience difficulties due to the physical and chemical nature of the soil. The absence of topsoil is a common feature in mining areas. Even if there is a nitrogen content that is so low that it does not meet the needs for plant growth. This situation is due to the absence of soil organic matter available by weathering dead plant material. In addition, the lack of soil microflora limits the decay of plant material.

Conditions are also exacerbated by rocky surface layers, which complicates the development of vegetation due to low infiltration rates and water retention [13].

Reclamation

Understanding reclamation according to Law No. 4 of 2009 concerning mineral and coal mining, it is stated that reclamation is an activity carried out throughout the stages of the mining business to organize, restore, and improve the quality of the environment and ecosystem so that it can function again in accordance with its designation.

Reclamation aims to improve or organize the use of disturbed land as a result of mining business activities, so that it can function and be efficient according to its purpose. Reclamation of ex-mining land in addition to an effort to improve post-mining environmental conditions, so as to produce a good ecosystem environment and also strived to be better than the initial baseline, is carried out by considering the potential of leftover minerals.

According to Sitorus [14] a strategic step to repair the damage caused by an open mining system is to return the remaining mining results into the holes in the mine opening (inpit filling). Re-vegetation by paying attention to the waste (tailings) that contain toxic materials. In post-coal mining land, land reclamation is an effort / effort to create so that the land surface can be stable, can sustain itself in a sustainable manner (self-sustaining). This former mining land can be used to produce again, starting from the relationship between land and vegetation, as a starting point for building new ecosystems. Reclamation of post-coal mining land which is associated with revegetation is basically to overcome the continued damage to land and create a process of nutrient formation through weathering falling leaf litter. These activities are expected to be sustainable and can form new ecosystems.

Reclamation activities are the end of mining activities which are expected to return the land to its original state, even if possible it can be better than the condition before mining. Reclamation activities include restoration of ex-mining land to repair ecologically disturbed land and prepare ex-mining land that has been ecologically improved for future use. The final goal of the reclamation is to improve the former mining land so that conditions are safe, stable and not easily eroded so that it can be reused.

Technically, the mining land reclamation business consists of recontouring / regrading / resloping ex-mining holes. Besides making drainage channels to obtain the shape of the region with a stable slope. Top soil spreading activities to meet the requirements as plant growth media, so as to improve the soil as a planting medium. Revegetation is carried out using fast-growing plants, local native plants and introduced forestry plants. It is also necessary to plan the development of food crops, estate crops and / or industrial forest plants, if land use planning is possible [15].

Plant Selection as Vegetation of Coal Mining Areas

Based on Minister of Energy and Mineral Resources Regulation number 18 of 2008 concerning Mine Reclamation and Closure. The definition of reclamation as an activity aimed at repairing or staking land that is disturbed as a result of mining business activities, so that it can function and be efficient in accordance with its designation. In accordance with its definition, the main purpose of reclamation is to make damaged areas better and more useful for humans. Reclamation aims at revegetation, which is replanting on ex-mining land so that it is beneficial for the ecology, economy and social, especially for the community around the mine.

According to Minister of Forestry and Plantation Decree number 146 of 1999, revegetation definition is a business or replanting activity on ex-mining land. Revegetation is carried out through the following stages of activity: the stages of the preparation of the plant's technical design, field supply, seedlings / nursery procurement, implementation of planting and maintenance of plants.

Revegetation is replanting activities on ex-mining land in an effort to avoid land erosion, build habitat for wildlife, biodiversity, improve soil productivity and stability and improve environmental conditions. Ecologically, plant species can adapt to the local climate but not soil conditions. For this reason, it is necessary to choose suitable species, with local conditions, especially for fast-growing species, which can change the microclimate on the former mining land. To support the success in restoring ex-mining land, steps such as improvement of pre-planting land, selection of suitable species, and use of fertilizer are carried out. To evaluate the success rate of plant growth on ex-mining land can be from the percentage of growth power, the percentage of canopy closure, growth of root growth, addition of species on the land, increased humus, reduced erosion and function as a natural filter. In this way it can be seen how far the level of success achieved in restoring ex-mining land [2].

Revegetation is a post-mining area planting activity with selected plants. Revegetation begins with planting cover crops and trees, and maintaining plants [3]. The success of revegetation on ex-mining land is very much determined by many things including aspects of landscape structuring, fertility of planting and planting media and crop maintenance. Landscape management is closely related to aspects of soil and water conservation and land use planning for mines.

Eucalyptus is a small trunked tree plant. Its branches hang down. The name eucalyptus refers to the white bark, layered with a peeling surface, taper leaf shape, with leaf bones parallel to like a spear, the flowers are white.

According to Brophy and Doran [16] mention that eucalyptus spread naturally in the Maluku islands, East Island, northern and southwestern Australia. This species grows at an altitude of 5 to 400 m above sea level, with an average rainfall of 1,300 to 1,750 mm per year. The forestry research and development agency in the introduction to eucalyptus cultivation states that in general eucalyptus is relatively easy to plant, coinciding with grumosol, latosol and regosol soils.

Eucalyptus is able to grow both on marginal lands and in areas of swamps and water puddles, able to adapt to soils with poor drainage, fire resistance and tolerance to soils with low to high salinity. Eucalyptus in a variety of site conditions, both in the highlands and lowlands bordering coastal forests and growing monoculture. In addition, eucalyptus is resistant to heat and fire. Eucalyptus can live and grow again in 1 year with the condition of the leaves that can be picked. Eucalyptus roots consist of taproots, lateral roots, and secondary roots. The roots are straight and grow downward, lateral roots grow in the neck of the roots at the beginning of growth. Secondary roots spread at a depth of about 20 cm below the surface of the soil [17].

The white wooden trunk is round and straight with a slight branching. With good growth conditions, eucalyptus can grow into trees with a height reaching 35 m and a diameter reaching 100 cm [17]. However, eucalyptus can grow into shrubs if the growth conditions are lacking, besides the growth of eucalyptus can be manipulated to get the shape of shrubs by picking the dau since the plant is still young. Eucalyptus bark white or brownish white consisting of thin sheets that are easily peeled off, the flaking, does not interfere with the growth of eucalyptus [17].

In the book introduction to eucalyptus plants explained that eucalyptus leaves are green with thick appearance, not shiny and hairy. The leaves are straight or curved with a length of between 5 to 10 cm and a width of between 1 to 4 cm and with 7 leaf bones with a length of between 3 to 11 cm on each leaf blade. The young shoots are covered by thick, soft feathers and spread out in lengths between 0.3 to 2 mm.

In the book introduction of eucalyptus plants also mentioned that eucalyptus plants are types of plants that have quite an important role, among others in the eucalyptus essential oil industry produce eucalyptus oil obtained by distilling . The main ingredient contained in eucalyptus oil is a sineol content that contains drugs. It is a potential plant for land rehabilitation activities from both ecological and economic aspects. Ecologically the development of eucalyptus plants in degraded land is, among others, to support land conservation efforts and the use of marginal land into productive land. Economically the development of eucalyptus plants can be used as a business / industry both for household scale up to large scale. Wood from eucalyptus plants can be used as building material. Eucalyptus includes strong grade wood with a durable class, in the area of South Kalimantan and South Sumatra the type of eucalyptus subspecies cumingiana is known as galam and the wood is widely used as building material.

Selection of eucalyptus species for post-mining revegetation activities refers to three (3) variables, namely analysis of land suitability of eucalyptus plants on ex-coal mining land, financial analysis of the feasibility of eucalyptus cultivation as well as an analysis of people's perceptions of the planting of eucalyptus on ex-coal mining land.

Land suitability

The issue of land suitability is something that needs attention in an effort to use more optimally. Land use is a direction of land use based on land capability. So that the reclamation activity can run well, it must know the suitability of the land to the allotment to be carried out, such as allotment for plantations, forestry, agriculture and so on. At pre-mining it is necessary to consider and make plans that show the post-mining land arrangements.

Sofyan [18] said that land characteristics are the characteristics of recognition or attributes of a plot of land. Land characteristics for land evaluation purposes, namely: topographic maps, soil maps, and climate and rainfall data.

Land evaluation is done by comparing or matching land characteristics with land use requirements / plant requirements. For example the suitability of plants to the height of the place, where tea and quinine plants are more suitable in cold regions (highlands), while rubber, palm and coconut are more suitable in lowland areas.

Important aspects of spatial planning, regional spatial planning is an effort to formulate efforts to use space optimally and efficiently and sustainably for human business activities in order to realize the level of community prosperity to be achieved within a certain period of time.

Suitability of land to plant species, selection of plant species (trees) is the main key in determining the success rate of revegetation. The selection of vegetation to achieve new ecosystem conditions with low erosion rates, optimal productivity and a sustainable environment needs to be done selectively with the right types of plants, so that ecosystem components as producers (flora), consumers (fauna), and decomposers can be formed immediately [19].

Conclusion

In an effort to plant can grow well, the soil conditions must be ideal according to the needs of plants so that land suitability needs to be done according to the type of plant. Evaluation can be done by distinguishing

between classes of land that are classified as suitable (S = Suitable) and land that is not suitable (N = Not - Suitable). To find out how the suitability of land using eucalyptus plants on ex-coal mining land, land suitability analysis is needed, the results can be used to support the main objective of the study, namely the study of reclamation of ex-coal mining land using eucalyptus plants.

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The Analysis of the Effect of Environmental Factors on Fish Species in Maro River, Merauke Regency

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ABSTRACT

This study aimed to determine the fish species caught and analyze the effect of environmental factors on the presence of fish in Maro Estuary. The data were collected by identifying the caught fish to determine their species. While the measurement of environmental parameter data was done by directly measuring the temperature, salinity and pH of water. Furthermore, the data were analyzed using a regression model to determine the effect of oceanographic factors on the catches. The results showed that the species of fish caught were *Polydactylus plebeius*, *Mugil cephalus*, *Argyrosomus amoyensis*, *Cinetodus froggatti*, *Lates calcarife*, *Eleutheronema tetradactylum and Pampus argenteus*. The environmental factors that influence the presence of fish in the waters of the Maro Estuary in Merauke Regency were salinity and pH of water.

KEYWORDS: *Maro estuary, fish species, environmental parameter*.

INTRODUCTION

Geographically, Merauke Regency is in a strategic area which is located in the southern part of the island of Papua and facing directly to the Arafura Sea and is influenced by the pattern of current movement that moves from the northern part of the Arafura Sea at certain season. In addition, a large land area with dense forests and mangrove ecosystems that are still well organized and well maintained is a potential for supplying nutrients into the waters [1].

The potential of the fisheries sector in Merauke Regency is promising both in marine and freshwater fisheries. The data from the government of Merauke Regency showed that the fish production for local consumption by species in 2013 has a total of 6,192,824 kg with a production valued IDR 161,376,50,000 [2].

The characteristics of the organisms that inhabit the Maro Estuary are very specific and are typical to study. The underwater conditions are mostly sedimentary mud and sand that cause several environmental factors also has an effect on the life of organisms within. At the front side of the Maro Estuary, the existence of aquatic biota in the area are very unique, this is due to the bottom of the waters which is only in the form of desert and mud, so that it is thought that the existence of these biota is caused by abundant food given the increasing run-off from the mainland which supplies nutrients to the sea or by other environmental factors [1].

There have been some studies conducted related to the composition of the fish species in catches, such as studied [3] in the Musi River Downstream in April, with a total of 67 fishes found with a total of 24 species and in June with a total of 106 fishes found with a total of 25 species. Another study [4] that caught 17 species of fish in Maro River, Gudang Arang area, Maro Village, Merauke Regency, namely: *Kurtus gulliveri, Eleutheronema tetradactylum, Polydactylus plebeius, Cinetodus crassilabris,Cinetodus froggatti, Argyrosomus amoyensis, Mugil cephalus, Megalops cyprinoides, Thryssa scratchleyi, Lebtobrama sp, Lates calcarifer, Marilyna meraukensis, Scomberomorus commerson, Nibea squamosal, Rhinoptera javanica, Harpadon microchir, Datnioides Campbelli.* However, there were no data shown from the study on fish species in Maro Estuary related to environmental factors using a regression model.

To answer this problem, it is necessary to conduct a study on the composition of fish species and the influence of environmental factors on catches in the Maro Estuary, Merauke Regency, which later provides a justification on the species and environmental factors that have an effect on fish in Maro Estuary, Merauke Regency.

METHODS

This study was conducted in Maro Estuary for 3 months, starting from October – December 2015. While the field sample analysis was carried out in the laboratory of the Department of Aquatic Resources Management, Faculty of Agriculture of Musamus University [4]. The selection of research implementation at the Maro estuary was due to

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the fact that the area is an area with environmental conditions that fluctuate annually and the fishing base in the Maro River is carried out by local fishermen in Merauke Regency.

Figure 1. Map of research location

In this study, tools and materials used were: gill net, fishing boat, *thermometer*, *refractometer*, pH meter, fish identification book, camera, cool boxe, SPSS software, scale, fish samples, tissue papers and stationery. This study examined the composition of species and the influence of environmental factors on the presence of fish in the waters of the Maro Estuary. To answer these problems, this study used an approach by analyzing environmental factors (physical and chemical) on the catches. Furthermore, the data were analyzed using a regression test where the X variables are the environmental factors (temperature, salinity and pH) and the Y variable is the catches. The results of data analysis of the two variables were used to predict the effect of the relationship between environmental factors on the existence of fish in the Muro Estuary. The data were collected from direct measurements on the field of fishing operations including the species of the catches. The fishing gear used was *gill net*. The measurement of physical factors was conducted using a thermometer, refractometer and pH meter for measuring temperature, salinity, and pH, respectively.

The data were analyzed using regression model by grouping field data into two variables, Y as catches and X as environmental factors. Regression analysis was used to determine the dependent variable where Y (catch) on the measurement results of the independent variables of temperature (x1), salinity (x2) and pH (x3). Furthermore, the data were processed using SPSS (*Statistical Product and Service Solution*) software.

RESULTS AND DISCUSSION

A. The Composition of Fish Catches

The composition of the fish catches in the study conducted for 3 months can be seen in Figure 2 below:

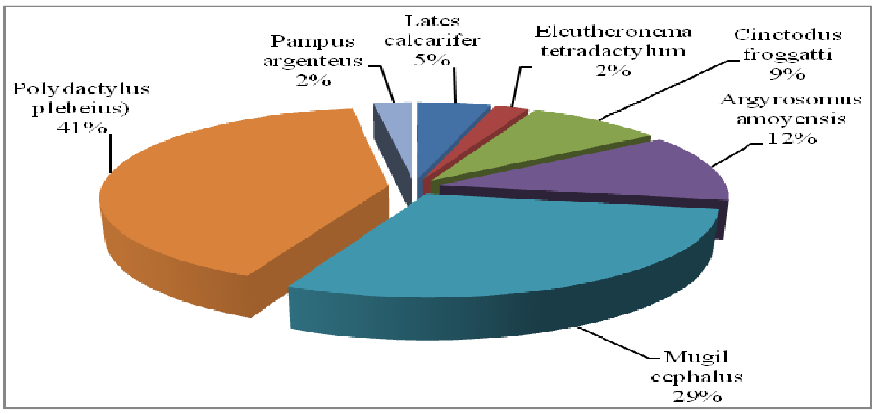

Figure 2. The percentage of the composition of fish catches

As seen in Figure 2 above, it is known that the highest percentage in the composition of fish catches in the Maro Estuary is *Polydactylus plebeius*, with 41 %, followed by *Mugil cephalus*, with 29 %, *Argyrosomus amoyensis*, with 12 %, *Cinetodus froggatti* with 9%, *Lates calcarifer*, with 5%, *Eleutheronema tetradactylum*, with 2 % and *Pampus argenteus*, with 2 %.

Based on the 7 species of fish found, according to the results of previous study, [5] the number was lower allegedly due to prolonged drought resulting in changes in environmental factors so that catches decreased in numbers and fishermen were rarely fishing on that month. The highest percentage was *Polydactylus plebeius*. According to the results of the study, it was allegedly caused by the ability or high level of adaptation. *Polydactylus plebeius* can live in estuary areas with changing environmental conditions such as salt levels which at a certain time when there is a tide, the mass of water will move towards the inner river to carry the mass of salt water and other environmental factors. *Polydactylus plebeius* habitats are mainly found in waters that are still affected by fresh water discharges and are found in river mouths with shallow water depths. With a percentage of 29%, the *Mugil cephalus* is thought to be caused by the ability of this type of fish to be able to tolerate fluctuating salt levels in the estuary area. The type of fish of *Mugil cephalus* is indeed a type of explorer fish that can enter into rivers or swamps with low salinity or visit river mouths with salinity which tends to be high due to the ability to adapt to environmental factors. [6] *Mugil cephalus* species have a percentage of life 80% by which they can live in fresh waters even though some species of fish can live 100% in fresh water because they are tolerant to low salinity and at high tide they often go up to rivers in which the waters tend to be fresh. *Argyrosomus amoyensis* can indeed adapt to waters with high environmental factor changes such as in river mouths. They can live and have habitats on shallow beaches, estuaries or in rivers.

The *Lates calcarifer*, *Eleutheronema tetradactylum* and *Pampus argenteus* were found with low percentage due to environmental conditions that tend to be inconsistent with the optimum conditions, so that they were found with a low percentage or also caused by the abundance of the fish in which these fish species migrate frequently in the waters. The discovery of these fish species at the Maro Estuary is thought to be caused by the estuary waters being the entry point for fish that have a tolerance level on environmental factors. [7] that environmental parameters determine the presence of *Eleutheronema tetradactylum* fish in the waters becomes the fishing destination. [6] the species of brackish water fish are very diverse because the fish in the area come from the sea and also the rivers that have tolerance to moderate salt levels. Furthermore, [8] estuary is the entrance/exit for fish from coastal waters into/out from a river body.

From the composition of the catches, it is suspected that the existence of fish in the area of the Maro Estuary is a type of migratory fish which in certain seasons enter estuary waters and in certain seasons will come out then move to move to find the suitability of the desired environmental factors. [9] the fish in estuary waters in certain months, both for freshwater and seawater fish. Both estuary and migratory fish are very tolerant towards changes in salinity and other factors such as temperature, pH and so on.

B. The Effect of Environmental Factors on the Presence of Fish

The environmental factors analyzed in this study were the physical (temperature) and chemical (salinity and pH) factors.

1. Temperature

One of the environmental parameters analyzed to justify the effect of environmental factors on catches in the Maro Estuary was temperature. Figure 3, shows the relationship between temperature and fish catches in Maro Estuary.

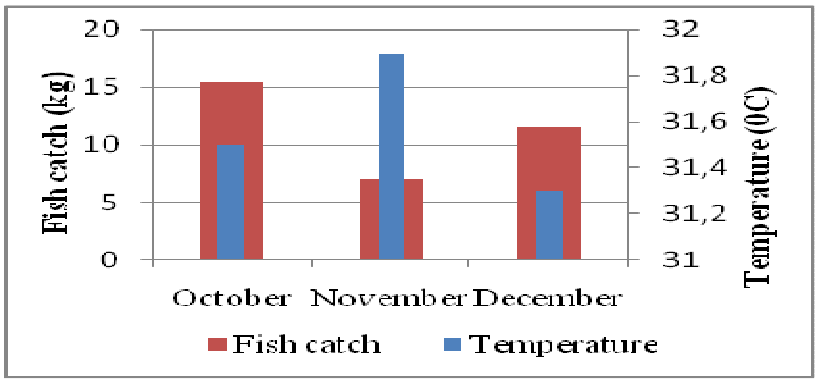

Figure 3. The relationship between temperature and fish catches

As shown in Figure 3, it can be seen that the average temperature in October was 31.5 °C with an average catch of 15.5 kg and the average temperature in November was 31.9 °C with an average catch of 7 kg. The average temperature in December was 31.3 °C with an average catch of 11.6 kg. This shows that, in October with an average temperature of 31.5 °C and an average catch of 15.5 kg, and in November with an average temperature of 31.9 °C, there was an increase of 0.4 °C in temperature from the previous month then the catch also decreased by an average of 7 kg. Then, in December with a temperature of 31.3 °C or a decrease of 0.6 °C from the temperature in November, there was an increase in catch with an average of 11.6 kg.

In relation to environmental factors, namely temperature, the increase in temperature in the period of data collection was caused by changes in the season, namely the dry season which was longer than usual, as in November and December, which should have been marked by the incentive to start the rain but this has not happened, so it was suspected that the increase in the temperature of the water was caused by the intense sunlight that illuminated the body of water so that the temperature of the waters in the Maro Estuary increased.

To determine the effect of environmental factors, namely temperature on catches, a statistical test was conducted using the T test. The test results showed a significant value of 0.066 and the value was greater than the probability value of 0.05 (0.066 > 0.05), then H1 is rejected and Ho is accepted. Thus, the temperature has no effect on fish catches in the Maro Estuary. It was caused by the inability to achieve optimum conditions, namely temperature as an environmental parameter that determines the existence of fish in waters as a fishing destination. According to the results, the average temperature was in the range of 31.3 – 31.9 °C and the temperature is higher than the ideal value for fish in the estuary of the river. [9] who conducted a study at Pami Estuary in Manokwari, shows that the temperature was thought to have an effect on the composition of fish species at 28 – 30 °C. From this comparison, it is shown that if there is an increase in temperature about 1.3 °C, the response would be different to fish in the waters to move to find more suitable environmental conditions and this would have an effect on the catches. [11] the fish will live well in temperatures ranging from 25–29 °C, while the minimum temperature limit ranges from 16–17 °C. Extreme temperature changes will have adverse effect on fish resulting in stress and various other physiological disorders. If the water temperature decreases, it will result in low oxygen uptake caused by a decrease in heart rate. [12] temperature also has an effect on the growth rate of fish. The low temperature will inhibit he growth rate of fish as a result of low temperatures which disrupt the metabolic processes in the fish's body where the metabolic process will take place slowly. The temperature must be suitable with an optimum range of 25-30 °C. High water temperature causes fish to move actively and metabolism increases and oxygen demand increases but oxygen availability decreases, causing fish to be deprived of oxygen in the blood resulting in stress.

2. Salinity

One factor that is thought to influence the presence of fish in the Maro Estuary is salinity. To see the relationship between salinity and fish catches, it can be seen in Figure 4 below.

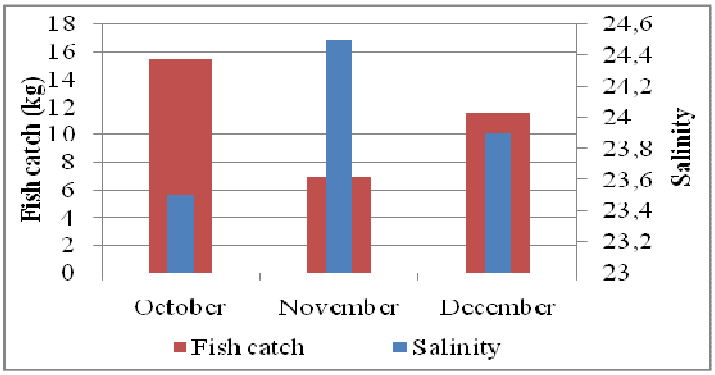

Figure 4. The Relationship between salinity and fish catches

As shown in Figure 4, it is known that the average salinity in October was 23.5 ppt with an average catch of 15.5 kg. In November, the average salinity was 24.5 ppt with an average catch of 7 kg, and in December the average salinity was 23.9 ppt with an average catch of 11.6 kg. From the data, it shows that in October – December, the salinity that dominates the Maro River Estuary is coastal salinity with a salinity of less than 32 ppt. [13] salinity less than 32.0 ppt is coastal water. The low salinity in the Maro Estuary was caused by the still high water debit of the Maro River entering the estuary, although in that month was marked by the dry season, but the water intensity was

still high and carried fresh water mass resulting in dilution and this was thought to result in a decrease in salinity value.

To determine the effect of environmental factors, namely salinity, on catches, a statistical test was conducted. The T test results showed a significant value of 0.001. This significant value is lower than the probability value of 0.05, that is 0.001 < 0.05, then H1 is accepted and H0 is rejected, thus, salinity has an effect on fish catches in the Maro Estuary.

From the results of statistical tests the effect of salinity was caused by the achievement of optimum conditions for fish in the waters of the Maro Estuary which supported their presence in the waters. From the average data on salinity, it shows that the average salinity was 23.5 - 24.5 ppt. The value is still suitable for tolerable salinity for fish that live in river mouths. [10] the salinity of 18-27 ppt is thought to have an effect on the composition of fish species. The decrease in salinity in the waters will change the composition and dynamics of the organism's population. The response of organisms to salinity is different for each species.

3. Acidity (pH)

To find out the relationship between pH and fish catches in relation to the effect of environmental factors on the existence of fish, it can be seen in Figure 5 below.

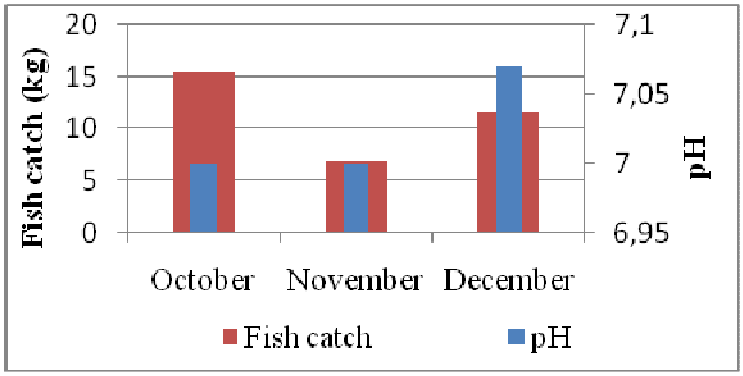

Figure 5. The Relationship between pH and fish catches

In Figure 5, it can be seen that the average pH in October was 7 with an average catch of 15.5 kg, in November, the average pH was 7 with an average catch of 7 kg, and in December the average pH was 7.07 with an average catch of 11.6 kg. According to these data, the pH in October – December wasin the normal pH range and supported the existence of living organisms within. The pH condition at the normal range is thought to be caused by the confluence of water from the river with slightly acidic conditions but when it enters the river mouth as it will mix with sea water in the river mouth as a strong base, resulting in pH levels in the normal direction.

The T test results to determine the effect of environmental factors, namely pH, on the catches, showed a significant value of 0.000. This significant value was lower than the probability value of 0.05 (0.000 < 0.05), then H1 is accepted and H0 is rejected. Thus, pH has an effect on the catches in the Maro Estuary.

From the results of statistical tests the effect of pH was caused by the achievement of optimum conditions for organisms in the waters. Thus, the effect of pH was caused by pH value in accordance with field data with an average value of 7 - 7.07 and was referred to as normal pH. [9] that a pH value ranging 6-7 is thought to have an effect on the composition of the species of fish caught at the Pami Estuary in Manokwari.

Based on the results of statistical tests of all variables, namely temperature, salinity and pH, it is known that the relationship value is 0.784. This value can be interpreted that the relationship between the two research variables on the correlation is very strong. [14] the correlation with a value of 0.75-1 is categorized as strong. Whereas R *square* or coefficient of determination which shows how good the regression model is formed by the interaction between the independent and dependent variables. The value of R *square* obtained was 0.615 and the so-called coefficient of determination means that the independent variables such as temperature, salinity and pH (X) have a contribution of 61.5% to the Y variable, namely the catches, while the rest can be explained by other factors than the X variables.

Basically, the value of R *square* is in the range of 0-1 with the sense that the smaller the number of R *square*, the weaker the influence of the two variables. From the results of the R *square* above, it is shown that the contribution of variable X is 61.5% and given that this study was conducted in nature with various variables that were difficult to control and manage such as season, time of fishing, number of trips and various other factors, then the value is considered capable of explaining the effect of the two variables namely the X variables (temperature, salinity, pH) on Y variable (catches).

While the regression equation of statistical test results produces a formulation model for all variables such as temperature, salinity, and pH, as follows:

$$Y = b0 + b_1X_1 + b_2X_2 + b_3X_3$$

$$Y = 0{,}922 + 0{,}526X_1 + 1{,}380X_2 + 8{,}094X_3$$

Furthermore, the results of the analysis using the analysis of variance or F test obtained the F hit of 14,535 with a significance level of 0,000. Since the probability of 0,000 is still below 0.05, it means that this regression model can be used to predict fish catches in the Maro Estuary. Thus, all independent variables, namely temperature, salinity, and pH, have an effect on the dependent variable, namely catches.

CONCLUSIONS

Based on the results, it can be concluded as follows:

1. The composition of fish catch species in the Maro Estuary in October - December 2015 consisted of *Polydactylus plebeius*, *Mugil cephalus*, *Argyrosomus amoyensis*, *Cinetodus froggatti*, *Lates calcarifer*, *Eleutheronema tetradactylum* and *Pampus argenteus*.
2. The environmental factors that have an effect and support the existence of fish in Maro Estuary were salinity and pH.

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Dıseases of Tomato Plant and Dynamıcs of Theır Spreadıng ın Azerbaıjan

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ABSTRACT

The purpose of the presented work has been dedicated to study species composition and spread degree of disease created on tomato plant cultivated in open and covered conditions in the Absheron Peninsula of the Republic of Azerbaijan. Became clear that on the tomato plants were bserved some diseases like spots, fades, flour dew and others, and in their formation were involved 15 species of fungi and fungi-like organisms. During the research was not met the epiphytotic situation created by this or that pathogens. However, it has been shown that alternarios, septoriosis, and phytophthora have a relatively high spread rate (4.5-7.5%) in open, but verticilliosis in covered conditions (1,8%). In addition, during the research were also recorded pathologies such as flour dew (0.27%), dry decay(0.22%) etc. Although the phytosanitary situation for the cultivation of tomato plant in the Absheron Peninsula is not dangerous but determined that it is necessary to carry out preventive, more accurate preliminary measures.
KEYWORDS*:* tomato, phytopathogenic fungi, diseases, spread rate.

INTRODUCTION

One of the actual problems of the modern era is the development and implementation of efficient technologies for the cultivation of agricultural crops. So that, since the second half of the last century, the world's population has begun to face with manifestations of shortages of raw materials for energy, nutrition, as well as for various production areas. Among the reasons for this is the constant increasing in number of the world population in the fixed area, and as the result of this, traditional food sources are not able to meet the current demand. The solution of these issues naturally puts important tasks in front of modern sciences, primarily in agrarian and biological sciences. The research conducted in this direction, mainly covers two aspects, namely the creation of new sources or to improve the efficiency of using existing sources. Against the background of the research carried out in both directions special attention is paid to providing the population of the world with agricultural products, first of all, with vegetable crops [16]. So, it is no secret that plant origin foods are an indispensable component of human nutrition. Therefore, in studies carried out to provide the population with fresh vegetable products have been created high-productivity plant varieties that currently obtaining targeted products from them is considered as a serious result in the direction of elimination of food shortages. Despite this, every year, a certain portion of the obtained product is losses for a variety of reasons which among of those reasons diseases caused by various living beings takes an important place[13-14]. It is no coincidence that today all over the world is being carried out extensive research to prevent this. In general, solving this issue is no longer a task of any particular country, at least because combating these diseases requires a comprehensive approach and the spread of those diseases does not recognize the boundaries. Among of diseases caused by fungi[3, 8], takes importance place, at least because the loss of product during the ephytotic of the disease caused by this or another fungus may increase up to 50%[14] and every year, the loss of yields caused by fungi diseases are measured in million tonnes. Naturally, for the prevention of diseases caused by fungi are necessary to carry comprehensive research, to study extensively the growth and development, the spread of regularity of fungi and to take effective measures against them. The first step towards solving these tasks is, of course, the identification of the species of the disease-makers.

Although the Azerbaijan Republic is among the traditional oil countries to taking an important part in its economy of agrarian sector and wide-ranging cultivation of various vegetable plants[15] allows us to note that the mentioned issues are not strange to our country. Thus, the richness of nature and the variety of natural climatic in Azerbaijan have led to the spread of fungi which cause diseases and has been conducted much considerable research on their study[6]. Most of the carried research were covered to study of pathogenic fungi that cause disease mainly on fruit plants, and on the main forest-forming tree species. Although research on the study of mycobiota of vegetable plants have been started for a long time, the results of researches done so far do not allow for

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generalization not only the mycobiota of vegetable crops grown widely in Azerbaijan, as well as the mycobiota of a specific species.

Tomato one of the plants that are in the attention of center in this aspect and belongs to the juicy, tasty and aromatic fruity vegetable group, and is a product that has enough of the essential ingredients for the nutrition of people[18]. It is one of the most produced vegetable products in most countries, as well as in our country. Thus, the annual amount of the product produced in Azerbaijan is between 450-500 thousand ton[15].In culinary it is used in the preparation of more than 100 dishes. It was determined that a person should eat 40-60 g of tomatoes per day. Its main usefulness is containing biologically active ingredients (lycopene, beta-carotene, etc.) and rich with mineral salts[18].

Taking into account the above mentioned, the presented work was dedicated to the evaluation the species of microorganisms, first of all, of the fungus species that caused this or that pathology, and the extent of the disease spread in tomatoes grown in Azerbaijan.

MATERIAL AND METHODS

The researches carried out in the Absheron Peninsula of Azerbaijan Republic. For this purpose, samples were taken from vegetative and generative organs of tomato grown in open and covered conditions that were supposed to be microorganism. During taking samples, we have used methods of planned route and selection of permanent areas for stationary observations which were widely used in the analogous studies. Taking of samples was also carried out on the seasons. During the research, more than 500 samples were taken from the studied plant and analyzed according to the purpose of the study.

For the purpose of the study in the analysis of collected samples, were used from the modern mycology and phytopathological methods and approaches[7, 9].

For taking pure culture of fungi located on studied plants used nutrient medium, such as malt juice agar (MJA), rice agar(RA), starchy (SA) and potato agar(PA), Chapek agar (CA), and Capek-Doks agar (CDA). Preparation, sterilization and to pour of medium to the Petri dishes were performed according to known methods[9] in microbiology. The identification of fungi was carried out by microscopic and macroscopic symptoms of strains isolated in pure culture during research which, that time were used from the determinants prepared on the based of cultural-morphological and physiological symptoms of microorganisms [10-11, 17, 20], as well as from the[12] basic information of the International Association of Mycology.

The rate of spread of diseases caused by fungi were calculated by formula $P = 100 (n / N)$ which here, P- the random frequency of fungi on the samples(or spread rate of disease caused by pathogen-%), n - the number of plants infected by disease in the studied areas, with number, N - the total number of plant species in the studied areas.

RESULTS AND THEIR DISCUSSION

As noted, tomato -*Lycopersicum esculentum*(syn. *Solanum lycopersicum* and *Lycopersicon lycopersicum*) contains enough ingredients for the feeding of microorganisms [18] and, therefore, the presence of microorganisms on them should be regarded as an ordinary reality and the studies that we have carried out confirms this. Thus, from the research it became clear that various pathologies have been observed in tomatoes cultivated in either indoor or outdoor conditions in Azerbaijan, and in their formation participates following species:

1. ***Alternaria solani (Ellis & G. Martin) L.R. Jones, Bull. Torrey Bot. Club: 353 (1896) [MB#216613].*** **Syn.*:*** Macrosporium solani Ellis & G. Martin, the American Naturalist 16: 1003 (1882) [MB#246331]; Alternaria americana Sawada, Report of the Department of Agriculture Government Research Institute of Formosa 51: 117 (1931) [MB#256637]; Alternaria porri f.sp. solani (Ellis & G. Martin) Neerg., Danish species of Alternaria and Stemphylium: 260 (1945) [MB#351636].

These fungi, which cause alternarios or dry stain disease in tomatoes, in the course of research for the first time, were found in samples taken from the leaves (12.06.2015, Pirshakhi) of the tomato plant that cultivated in open conditions. Those fungi in the next course of the research were also found on tomatoes cultivated in covered condition. The fungi except for root also meet in other organs of the plant (trunk, leaf, flowers, and fruits).

The disease is initially observed in the lower leaves of the plant as dark brown spots, and the spots are relatively large (diameter up to 1.3 cm). Over time, a combination of spots occurs which at the end causes dry and fall of the leaf. This causes a decrease in the total surface area of the plant where occurring photosynthesis which also leads to a reduction in the overall productivity of the plant.

Studies have shown that the degree of spread of the disease caused by the fungi depends on the cultivation condition of tomato (open or closed). Thus, the spread degree of fungi in field conditions is varies 5.5-7.5% and in covered conditions – 1.1-1.6%.

One of the hazardous features of this fungi is that similar pathologies meet among the other plants widely cultivated in Azerbaijan, as well as in Absheron and it has been confirmed in a number of studies namely [6], fungi are a universal phytopathogen.

2. ***Fusarium moniliforme J. Sheld., Annual Report of the Nebraska Agricultural Experimental Station 17: 23 (1904) [MB#142842]. Syn.:*** Oospora verticillioides Sacc., Fung. Ital.: fig. 789 (1881) [MB#171298]; Alysidium verticilliodes (Sacc.) Kuntze (1898) [MB#522294]; Fusarium celosiae Abe, Mem. Coll. Agric. Kyoto Univ.: 51-64 (1928) [MB#260213]; Oospora cephalosporioides Luchetti & Favilli, Ann. Fac. Agrar. R. Univ. Pisa N.S.: 399 (1938) [MB#492231].

Spread of this fungus which is one of the creators of disease of fusariosis in the course of research first time (12.06.2015, Fatmai), was found on the sample taken from the tomato plant that cultivated in open conditions. Interestingly, in the causing of that disease also takes part 2 more species of Fusarium which in the process of occurrence of the disease they are involved with various combinations.

The species of Fusarium which causes more dangerous diseases on grains also causes disease on tomato and its spread degree in the open condition contain 3.4-4.6% and in covered conditions 0.5-1.1%. This indicator in generally reflects on itself the degree of the general spread of diseases causes by species of Fusarium in various combinations.

3. ***Fusarium oxysporium Schltdl., Flora Berolinensis, Pars secunda: Cryptogamia: 139 (1824) [MB#218372***]. Syn.: Fusarium bulbigenum Cooke & Massee, Grevillea 16 (78): 49 (1887) [MB#199976]; Fusarium vasinfectum G.F. Atk., Bulletin of the Alabama Agricultural Experiment Station: 28 (1892) [MB#225413]; Fusarium dianthi Prill. & Delacr., Compt. Rend. Acad. Sc.: 744-745 (1899) [MB#232504]; Fusarium lini Bolley, Proceedings of the Annual Meeting of the Society for the Promotion of Agricultural Science 22: 42 (1901) [MB#229618]; Fusarium orthoceras Appel & Wollenw., Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft 8: 152 (1910) [MB#221977]; Fusarium citrinum Wollenw., Bull. Maine Agric. Exp. Sta.: 256 (1913) [MB#194950]; Fusarium angustum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 203 (1915) [MB#158669]; Fusarium oxysporum var. longius Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 223 (1915) [MB#138127]; Fusarium lutulatum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 209 (1915) [MB#239320]; Fusarium lutulatum var. zonatum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 214 (1915) [MB#139136]; Fusarium bostrycoides Wollenw. & Reinking, Phytopathology 15 (3): 166 (1925) [MB#258714]; Diplosporium vaginae Nann., Atti Reale Accad. Fisiocrit. Siena: 491 (1926) [MB#281287].

Those fungi as other species of Fusarium which cause the same named disease are found in tomato grown in both open and covered conditions. This fungus which is one of the creators of disease of fusariosis in the course of research first time (12.06.2015, Fatmai) was found on the sample taken from the tomato that cultivated in open conditions.

4. ***Fusarium solani (Mart.) Sacc., Michelia 2 (7): 296 (1881) [MB#190352].*****Syn.**: Fusisporium solani Mart., Die Kartoffel-Epidemie der letzten Jahre oder die Stockfäule und Räude der Kartoffeln: 20 (1842) [MB#194746]; Fusarium solani (Mart.) Appel & Wollenw., Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft 8: 64-78 (1910) [MB#515978]; Neocosmospora solani (Mart.) L. Lombard & Crous, Studies in Mycology 80: 228 (2015) [MB#810964]; Fusarium martii Appel & Wollenw., Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft 8: 83 (1910) [MB#249096]; Nectria cancri Rutgers, Ann. Jard. Bot. Buitenzorg, II: 59 (1913) [MB#145963]; Fusarium striatum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 255 (1915) [MB#240201]; Fusarium solani var. minus Wollenw., Fusaria Autographice Delineata 1: 403 (1916) [MB#185066]; Fusarium solani f. 2 W.C. Snyder, Zentralblatt für Bakteriologie und Parasitenkunde Abteilung 2 91: 174 (1934) [MB#494337]; Cylindrocarpon vaginae C. Booth, Y.M. Clayton & Usherw., Proceedings of the Indian Academy of Sciences (Plant Sciences) 94 (2-3): 436 (1985) [MB#105231].

This fungi like the other two species of Fusarium cause the same named disease and this situation is observed in the tomato plant that cultivated in both open and covered condition. This fungus in the course of research first time (12.06.2015, Zira) was found on the sample taken from the tomato that cultivated in open conditions.

5. ***Septoria lycopersici Speg., Anales de la Sociedad Científica Argentina 12 (3): 115 (1881) [MB#222927].***

This fungus, which belongs to the anamorphs of sack fungi cause septoriosis or white stain diseases in tomato. The disease in the course of the research first time (17.05.2015, Zira) was found on the tomato cultivated in open conditions. The disease caused by fungus is also met in covered conditions.

The first observed place of this disease is the lower leaves of the plant that the observed spots are numerous and small diameter (0.1-0.2 mm) with dirty gray color. There were also slightly combination of stains. In the center of the spots are formed, black pycnidium with a smaller size which over time, here is formed conidium of fungus and namely conidium are involved at the mainly spread of the fungus.

Analysis of samples taken from the tomato plant cultivated in open and covered conditions also showed that the spread degree of the disease caused by the fungus varies depending on the cultivation conditions. In this case, has been determined that the spread degree of the disease created by the fungus in open condition contained 5.1-6.9% and in covered conditions 1,0-1,4%.

6. ***Phytophthora infestans (Mont.) de Bary, Journal of the Royal Agricultural Society of England 12: 240(-242) (1876) [MB#232148].*** **Syn.** Botrytis infestans Mont., Bulletin de la Société Philomatique de Paris 13: 313 (1845)[MB#226630];
   Peronospora infestans (Mont.) Casp. (1852) [MB#179737].

This fungus, which belongs to fungi-like organisms and creator adventitious pathology, the first time(17.07.2015, Low Guzdak) was found on the sample taken from the fruit of the tomato plant cultivated in open conditions.

Although phytophthora is one of the most dangerous diseases of tomatoes, its spread in Absheron is not so high so that its spread in open conditions contain up to 3.2%, and in covered conditions – 0.7%.

7. ***Verticillium dahliae Kleb., Mycologisches Centralblatt 3: 66 (1913)[MB#196942].Syn.:*** Verticillium albo-atrum var. dahliae (Kleb.) R. Nelson, Verticillium wilt of Peppermint: 110 (1950) [MB#352579]; Verticillium tracheiphilum Curzi, Nuovo Giorn. Bot. Ital.: 394 (1925) [MB#280463]; Verticillium ovatum G.H. Berk. & A.B. Jacks., Scient. Agric.: 261 (1926) [MB#273159].

This fungus, which causes disease verticellulose, the first time(12.04.2015, Zira) was found on samples taken from the tomato plant cultivated in covered condition and were identified after taken to the pure culture.

Though it is considered one of the most dangerous diseases of tomatoes, the spread degree of the disease caused by fungal in open conditions in the Absheron region is considered 4.4-5.1% and in covered conditions 1.0-1.3 %. One of the dangers of this disease that it does not have a gradual impact on the particular organ of the plant, such as the others, that is, the plant or its specific organ which cause disease in generally does not perform its functions.

During the carry out of the research was not found ephytotic of any disease caused by fungi on the tomato plant in the condition of Absheron.

It should be noted that in the course of research has also been observed other diseases on the tomato plants grown in Absheron from which can be noted diseases like as floury dew (causing by *Erysiphe communis (Wallr.) f. solani-lycopersici Jacz.*), brown stain(causing by *Cladosporium fulvum Cooke*), gray decay(causing by *Botrytis cinerea Pers.*), anthracnose(causing by *Colletotrichum lage-narium Ell. et Halst.*) and others. Due to the fact that the spread degree of these diseases is relatively small (0.02-0.27%), today, their danger may not take into consideration so seriously. Despite this, due to the fact that they are cause pathology on tomatoes grown both in open and covered condition their development dynamics should be kept in the center of attention.

As a result of studies conducted in Absheron, in generally 15 species of fungi were found on tomato plants that were cultivated in open and covered conditions, which the spread degree of disease created by them contain maximum up to 7.5% in open, and up to 1,8% in covered condition. Compared to studies carried out in other regions it should be noted that Absheron is more favorable for the cultivation of tomatoes, which is probably due to the relatively droughty condition of Absheron. Thus, for the development of phytopathogenic fungi, in addition to heat, the high humidity is considered to be one of the most favorable indicators.

It should be noted that microorganisms, including fungi, not only creates disease in vegetables like as on tomatoes, but also enrich them with their metabolites [2, 4, 19]. More precisely, although tomato one of the important plant with the nutrient is also characterized as a carrier of substances that can cause disease and food poisoning[1, 5, 21]. Therefore, it is necessary to keep always in the center of attention of plants ühich have nutritional value and hold preventive measures and the areas where we conducted research are no exception.

The tomato plant, cultivated in open and covered conditions in Absheron Peninsula of the Republic of Azerbaijan is one of the settlements of fungi. So, their activities cause to apparent different, primary diseases such as dry and white spotting, fusariosis, fading, and phytophthora. İn the appearance of these diseases involved 12 species

of fungi and fungal-like organisms. During the research was not met the epiphytotic situation created by this or that pathogens. However, it has been shown that alternarios, septoriosis, and phytophthora have a relatively high spread degree (4.5-7.5%) in open, but verticilliosis in covered conditions (1.8%). In addition, in the course of the research were also recorded pathologies such as flour dew, dry decay, and so on. Although phytosanitary conditions are not dangerous for the cultivation of tomato in the Absheron Peninsula, prophylactic, more accurate preliminary measures are essential.

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The Strategy of Handling Slums as an Effort to Create a Healthy Housing and Settlement Environment in the City of Merauke

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ABSTRACT

Housing and settlements are the basic human needs and is an important factor in enhancing the dignity and quality of a prosperous life in a just and prosperous society. Housing and settlements are also part of national development that needs to be continually improved and developed in an integrated, directed, planned and sustainable manner. Housing is one of the main issues in the development of Papua Province in particular, as well as in Indonesia in general. The high number of savings guarantees, the number of uninhabitable houses that triggered the development of slums, are some of the fundamental problems in the field of housing in various areas, especially in urban areas. Housing development with the principle of meeting the needs for decent housing is basically the responsibility of the community itself. The government is only the party that supports the process through the creation of climate that allows the independent community to meet the needs of livable homes and through the provision of infrastructure and facilities that enable ongoing life and livelihood activities in the environment. Housing and settlements that are less integrated, directed, planned, and have less consideration to the completeness of basic infrastructure and facilities such as clean water, sanitation, waste management systems, and rainwater drainage, will tend to experience degradation in the quality of the environment or later to be defined as the "Slums" .

KEYWORDS: slum, housing, settlement.

INTRODUCTION

Housing and settlements are one of the basic human needs and are important factors in improving human dignity and quality as well as the quality of a prosperous life in a just and prosperous society. Housing and settlements are also part of national development that needs to be continually improved and developed in an integrated, directed, planned and sustainable manner.

Housing is a group of houses that functions as a residential environment that is equipped with environmental infrastructure and facilities, intended to make the environment a healthy, safe, harmonious, and orderly environment and function as expected. While settlements are part of the environment outside the protected area, both in the form of urban and rural areas that function as residential environments and places of activity that support life and livelihoods [1].

Settlement can also be defined as an area dominated by a residential environment with the main function as a residence that is equipped with environmental infrastructure and facilities and workplaces that provide services and employment opportunities to support life and livelihoods so that the housing functions can be efficient and effective.

Housing and settlement problems are endless problems. The housing problem for humans is always an endless conversation but even in the small town the housing and settlement problem is the subject of discussion. Housing and settlement issues are related to the development process, and are often a reflection of the impact of general underdevelopment. Housing and settlement problems appear because:

1. Lack of control over housing and settlement development that has led to the emergence of slums in several parts of the city that have an impact on reducing the carrying capacity of the environment.
2. Limited capacity in the provision of livable housing and settlements that by the government, private sector and the community.
3. Development of human resources and community institutions that are still not optimal, especially about the awareness of the importance of healthy living.
4. Lack of understanding of the technical criteria for the use of residential land and housing, especially those based on the threshold of environmental carrying capacity and space capacity.

The development of housing and settlements that are less integrated, directed, planned, and has less attention to the completeness of basic infrastructure and facilities such as clean water, sanitation (latrines), waste management

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systems, and rainwater drainage systems, will tend to experience degradation in environmental quality or later to be defined as "Slums".

Even though the slum area is an unwanted problem [2,3], it must be recognized that its existence in the development of regions and cities cannot be avoided. Therefore, in order to minimize the appearance of slums, it is necessary to make comprehensive efforts concerning various aspects that are able to prevent the emergence of slum areas.

METHODS

a. Research Location

The location of the research was in the City of Merauke, in 1. Seringgu Jaya village, 2. Rimba Jaya village. 3. Kelapa Lima village.

b. Research method used

The method used in this research was descriptive survey method, which aimed to examine the problems that occur by collecting, compiling and classifying data, then they were analyzed. The data collection techniques used were:
Field Study, Interview, Documentation Study, Literature Study, and Data Analysis Techniques. In addition, the analysis of the area and Regional Planning was carried out. Systematic analysis was carried out by reviewing aspects;
1) Social-Population Development,
2) Prospects for Economic Growth,
3) Physical and Environmental Carrying Capacity.

Community-based development is development with an optimal orientation to the empowerment of the community, both directly and indirectly, the community is given the opportunity to actively aspire and contribute to formulating building and environmental programs that are appropriate to the level of their needs [4,5].

The stronger attractiveness of the city coupled with the existence of various economic limitations in rural areas, has pushed most rural residents to try their luck in urban areas. The rapid development of the city [6,7], which functions as a center of activity and provides primary and secondary services, has invited residents from rural areas to come to the city in the hope of getting a better life and various other facilities including employment, resulting in less attention to the development of the housing and settlements as well as economic activities. The condition has caused:

1. The occurrence of population growth is faster than the government's ability to provide adequate housing and other primary services;
2. The development of less livable residential areas and settlements, which in various regions tend to develop into slums, and no longer in accordance with the standards of a healthy settlement environment;
3. Lack of community attention/participation in the utilization of settlement environmental infrastructure and facilities for the comfort and ease of supporting economic business activities.

Dense population and limited space (for ventilation of light, air, sanitation, and open fields). Existing conditions often have harmful impacts on human life (e.g. fire and crime) as a result of a combination of various factors.

RESULTS AND DISCUSSION

a. Research results

Table 1: Seringgu Jaya Village

NO	Field condition	Description
1	Location	RT/RW
2	Slum area	± 1 hectare
3	Number of houses	50 unit
4	Number of heads of family	100
5	Average of Basic coefficient of building	70 – 90 %
6	House condition	Houses in the settlement were almost all made of house material of houses on stilts. And some were made of stone material.
7	Social condition	The tribe that inhabits this settlement was the Asmat tribe.
8	Economy condition	All residents who inhabited the settlement did not have permanent jobs, one example of work was the laborer with the most income of 100,000 per day
9	Facility condition	Accessibility lane limitations
10	The cause of slums	Community ignorance of environmental conditions
11	Sanitation of buildings	• The source of clean water in this settlement was not from the PDAM (local water company) and only relied on wells • Dirty water Disposal in the settlement was not well managed by the community

Table 2: Rimba Jaya Village

NO	Field condition	Description
1	Location	RT/RW
2	Slum area	± 1 hectare
3	Number of houses	40 unit
4	Number of heads of family	80
5	Average of Basic coefficient of building	70 – 90 %
6	House condition	The houses in this area were makeshift houses made from used and improper materials such as; broken boards and rusty roofs.
7	Social condition	The tribes that inhabited this settlement were the Asmat, Marind, and Mappi tribes
8	Economy condition	People who live in the settlement on average worked as laborers with a daily income of Rp. 100,000
9	Facility condition	Easily accessible because the settlement position was near the road
10	The cause of slums	The level of public concern for the environment was still very low
11	Sanitation of buildings	Poor health and sanitation conditions, usually characterized by a dirty physical environment and the spread of infectious diseases.

Table 3: Kelapa lima village

NO	Field condition	Description
1	Location	RT 12 /RW 03
2	Slum area	± 1 hektar
3	Number of houses	120 unit
4	Number of heads of family	240
5	Average of Basic coefficient of building	70 – 90 %
6	House condition	
7	Social condition	The tribes that inhabited this settlement were the Asmat, Marind, and Mappi tribes
8	Economy condition	People who live in the settlement on average worked as laborers with a daily income of Rp. 100,000
9	Facility condition	The road was difficult to be accessed by 2 and 4-wheeled vehicles, causing people to have to walk to travel
10	The cause of slums	The actions and concerns of the community towards the environment and the place of residence was still very minimal
11	Sanitation of buildings	Residents who lived often suffered from diseases because the community did not have clean water sources and building sanitation that supported the community

b. DISCUSSION

Slum area management strategies must be based on efforts to overcome the factors that cause slums, both direct and indirect factors. Basically, slum environment problems cannot be solved by one unit or department, but requires the integration of activities from each department that will have an impact on the improvement of the slum environment [8,9]. Some programs as an effort to control slum environment are as follows:

- Environmental Health Education
- Guiding the environmentally conscious community
- Public Infrastructure Development
- Community Economic Empowerment
- Improving the Quality of Community Education
- Management of Bantaran / Sempadan Areas (Rivers, Beaches, Lakes, etc.)
- Improvement of Public Health

The conclusion is the condition of soil sigma in the three villages were muddy so that the design solution made was in the form of a stilt house and it has many openings so that it can regulate the temperature in the room to make it comfortable. With such land conditions, the community often experiences health problems so that the design solutions are expected to be able to maintain public health..

In this case the government must provide clean water tanks in an area so that the community can manage them. Because of the condition of the people who live there still have a shortage of clean water and frequent occurrence of health problems.

CONCLUSION

The development of housing and settlements that are less integrated, directed, planned, and give less attention to the completeness of basic infrastructure and facilities such as clean water, sanitation (latrines), waste management systems, and rainwater drainage systems, will tend to experience degradation in environmental quality or later to become "Slums". Factors that cause the appearance of slums (slum and squatter) can be divided into 2 (two), namely direct and indirect factors. Slum area management strategies must be based on efforts to overcome the factors that cause slums, both the direct and indirect factors. Basically, the resolution of slum environment problems cannot be done by one unit or department, but it requires the integration of activities from each department that will have an impact on the improvement of the slum environment. In this case, it is hoped that the Regional Government makes a list of houses and slums in the city of Merauke, to be later confirmed by the government. With this form of communication, it is expected that a partnership will take place to protect the building of a clean, healthy community life that has a decent area to live in. Do not allow demolition to occur, especially to the point where there is damage to buildings and residences occupied by the community..

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Management of Silvicultural Tropical Forests in Central Kalimantan

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ABSTRACT

The purpose of this paper study is to formulate the problem of forest management activities. Likewise a study of the impact of timber harvesting resulted in damage to residual stands, openness of forest areas and damage to land. Discussion concerned on tropical forest, tropical forest biomass, and carbon dioxide emission. In conclusion, tropical forests have a very important role in suppressing global climate change.
KEYWORDS: Management, silvicultural tropical forest, timber harvesting, biomass, carbon dioxide

INTRODUCTION

Human activities have a very large role in increasing GHG emissions in the atmosphere, including the use of fuel oil for various human activities, especially in industrial processes, transportation, forest clearing, intensification of crop cultivation and waste production. Indonesia in 2020 committed to reduce GHG emissions by 26% on its own capacity and 41% with the assistance of international cooperation through Business As Usual (BAU) emissions and to place the forestry sector as the main target of emission reduction [1]. Forests have a very important role in suppressing the increase in GHG emissions, especially CO2. Vegetable compilers of forest stands utilize CO2 from the atmosphere and water from the soil with the help of sunlight to produce oxygen and carbohydrates through photosynthesis. The results of photosynthesis are then converted into biomass stored in stems, twigs, leaves, fruit and roots in the soil. On the other hand, forests are also a source of GHG emissions in the event of forest damage due to errors in forest management that have an impact on increasing GHG emissions.

The cause of forest destruction that occurred in Indonesia is deforestation and forest degradation activities. Deforestation activities include the conversion of forests into plantations, mining, industry, agricultural land and fisheries. While forest degradation activities include illegal logging, mistakes in forest management activities and forest fires. Purbawiyatna *et al.* [2] concluded that globally deforestation and forest degradation activities in Indonesia contribute around 17.4% of GHG emissions.

One of the activities that cause forest degradation in Indonesia is forest management activities carried out by companies holding Timber Forest Product Utilization Permit (IUPHHK). National Forestry Plan Data for 2011-2030 in Purbawiyatna et al. [2], around 34 million ha of forests in Indonesia are under the management of natural forest and plantation forest IUPHHK holders.

The purpose of this paper study is to formulate the problem of forest management activities carried out by IUPHHK-HA with a silvicultural system. Likewise a study of the impact of timber harvesting resulted in damage to residual stands, openness of forest areas and damage to land.

Tropical forest

Forests are plant communities that are controlled or dominated by trees that have different environmental conditions than those outside the forest [3]. Tropical forests are forests that are always wet or moist, can be found around the equator. According to Forest Watch Indonesia [4], Indonesia is a country that has the third largest area of tropical forest in the world after Brazil and Democratic Congo.

Tropical forests are climax ecosystems, plants that are in this forest never shed their leaves simultaneously. According to Forest Watch Indonesia [4], the characteristics of tropical forests are that they have high rainfall intensity, are exposed to sunlight at any time, have high humidity, consist of high trees

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ranging from 40-60 m, have a wide canopy of vegetation and vegetation always green. Tropical forests have direct or indirect benefits. The direct benefits are as a producer of wood and non-timber forest products, while the indirect benefits are as environmental services, water regulators, aesthetic functions, oxygen providers and carbon sinks. Suhendang [5] found the potential for carbon storage in Indonesia's tropical forests is around 15.05 billion tons of carbon.

Impact of Timber Harvesting

Timber harvesting is one of the activities in forest management by utilizing forest products in the form of wood in production forests carried out by companies that have a Timber Forest Product Utilization Business License (IUPHHK). The stages of timber harvesting activities in tropical natural forests include planning, clearing of forest areas (PWH), felling, skidding, transportation and final landfilling [6].

Timber harvesting activities cause forest damage in the form of logged-over areas whose conditions vary. Ex-logging areas or secondary forests are forests that are undergoing a secondary succession process after timber harvesting. The Indonesian Selective Cutting and Planting (TPTI) silvicultural system in the Regulation of the Director General of Forestry Production Development [7], stands of forest compilers in logged-over areas are residual stands that must be carried out in guiding activities such as tidying, clearing, enriching, maintaining. Standing lives in logged-over areas based on their level of growth include seedlings, saplings, poles and trees.

The impact of wood harvesting activities on environmental damage is unavoidable. Elias [8], the component of timber harvesting activity that is estimated to be the most dominant against environmental damage (openness of forest, land, residual and hydrological stands) is PWH activities, especially in the construction of road networks, transportation, skidding and logging. The most dominant damage due to wood harvesting activities occurred in the residual stand which included damage to the tree, changes in the structure and composition of the stand, distribution of tree species, community similarity and diversity of species.

The degree of damage to the residual stand is very dependent on the wood harvesting and silviculture system used. Elias [9], damage to the residual stand with TPTI silviculture system for seedling rate of 30.02%, sapling 27.17% and mast level 24.60% and trees 21.96%. Damage to residual stands in natural forests due to timber harvesting activities with Conventional Logging system is caused by skidding activities, namely 88.32% felling trees, 4.47% skew, 4.47% stem / skin cuts, canopy, buttresses and stems 2, 74%. Some research results from damage to residual stands due to timber harvesting activities were 25-45% and area openness by 20-35% [8,10].

Timber harvesting activities in tropical forests affect the amount of carbon stored in the forest. Lasco [11], wood harvesting activities play a role in reducing carbon stocks above the soil surface at least 50% and in tropical forests in Asia the carbon stock decreases due to wood harvesting activities ranging from 22-67%.

Estimation of Tropical Forest Biomass and Carbon

Biomass is the total amount of living organic matter expressed in oven dry weight tons / ha [12]. Kusmana *et al.* [13], biomass is the weight of organic matter per unit area that exists in several components of the ecosystem at a particular time stated in general terms in terms of dry weight or some that give the term free ash dry weight. Forest biomass is the overall volume of living creatures of all species at any given time and can be divided into 3 main groups namely trees, shrubs and other vegetation [14].

Biomass can be divided into 2 categories, namely above ground biomass (below ground biomass) and below ground biomass. Kusmana *et al.* [13], aboveground biomass is the weight of organic matter per unit area above the soil surface at a certain time that is connected to a function of the productivity system, stand age and organic distribution. Hairiah *et al.* [15], aboveground biomass consists of trunks, trees, branches, leaves on surviving trees, creeping plants, climbing plants, undergrowth and epiphyte plants including litter. Below the surface biomass is all biomass from living plant roots, meaning this root applies to a certain diameter size specified. The method of estimating forest biomass consists of 4 main ways, namely (a) Sampling with harvesting / destructive sampling (b) Sampling without harvesting / non-destructive sampling with in situ data collection (c) Estimation through remote sensing and (d) Model making. Each of the methods above uses allometric equations to extrapolate the data snippet to a wider area.

Carbon is one of the natural elements which has the symbol C with an atomic value of 12 and is one of the main elements forming organic matter including living things [16]. Naturally, forest vegetation processes photosynthesis by utilizing CO2 from the atmosphere and converting it into organic carbon (carbohydrates) and stored as biomass. Forest biomass plays an important role in the biogeochemical cycle, especially the carbon cycle. About 50% of the total forest carbon is stored in forest vegetation [15]. Tropical forests contain large

amounts of biomass so that it is a very large store of carbon in the world [5]. The carbon content stored in the forest at any time can be emitted due to natural processes (due to human activities) such as the fall of trees because they are old and then decomposed (the impact is not large), while the process due to human activity is the logging of forests / trees on a large scale (the impact very large) which will have an impact on forest degradation and deforestation [1]. Brown [12], forest carbon potential can be estimated by multiplying the value of biomass with a conversion factor of 0.5. The 0.5 factor means that forest biomass contains about 50% carbon.

Carbon dioxide emissions

Carbon dioxide (CO2) is one of the greenhouse gases (GHGs) whose increase in the atmosphere is very rapid. Mudiyarso [17], in the last decade, CO2 emissions have more than doubled from 1,400 million tons / year to 2,900 million tons / year. In addition, CO2 has the highest contribution to global warming compared to other GHGs.

Sources of CO2 gas emissions include the use of fuel oil for various human activities, especially in industrial processes, transportation, forest clearing, intensification of crop cultivation and waste production. Agus and Van Noordwijk in Hairiah [18], burning of natural forests on peatlands causes the release of 734 tons of CO2 emissions / ha from C stored in vegetation of 200 tons / ha. Purbawiyatna et al. (2012), globally deforestation and forest degradation contribute 17.4% to GHG emissions. Carbon dioxide has a longer residence time in the atmosphere compared to other GHGs, which is around 5-200 years resulting in the accumulation of large amounts of CO2 [17].

Conclusion

Tropical forests have a very important role in suppressing global climate change. Forest ecosystems are able to absorb greenhouse gases by transforming CO2 from the air into carbon deposits in components of the forest ecosystem such as trees, plants and soil.

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Analysis Strategy of Developing Livestock Business Based on Cattle in Merauke City

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ABSTRACT

Breeders contribute 99% of the main supply of beef cattle in Merauke city, with a self-help system or assistance from the government in the form of a herd of livestock has been established. Various kinds of obstacles faced by people's farms, such as knowledge about mastery of technology, lack of information about the progress of livestock, production that is not optimal. The breeders have the hope that raising cattle can make an increase in welfare for their families. However, the fact that the goals have not been achieved is influenced by many factors. Therefore, the aim of this research is to develop an appropriate strategy for mapping business models conducted by community breeders in Merauke city. Strategies for developing smallholder breeder are carried out using Strengths, Opportunities, Weakness, and Threats (SWOT) analysis tools and analyzed descriptively. Data obtained from identifying the environment as many as 4 districts, expert hearings. This study uses 1 expert from government agencies, 1 academician and 4 breeders with predetermined criteria. The SWOT analysis results show that there were 11 internal factors and 15 external factors. Internal and external factors produce market strategies and production development, strategies are established through the development of forage, fermentation, fattening and livestock breeding businesses.

KEYWORDS: strategy, livestock, business, cattle

1. INTRODUCTION

Merauke city with abundant natural resource potential in the form of forage in the rainy season, making Merauke a beef cattle breeding area in eastern Indonesia based on the 2016 regulation of the Director General of Animal Husbandry and Animal Health 2016. The population of cattle in Merauke city has decreased from year to year since 2012 -2017 because of that the need for meat in the Papua region has not been fulfilled. The cattle population in Merauke city mostly comes from rural and suburban areas, up to 95% more. According to [10-12] that local beef supply comes from small-scale community breeders. The people's cattle breeders are currently workers for the development of a national scale livestock business. The government has basically provided infrastructure assistance in the form of slaughterhouses and artificial insemination (AI) programs in the form of all mandatory breeding for pregnant women (SIWAB) and policies to increase population by prohibiting slaughtering of productive female cattle. However, this has not been able to optimally increase the local cattle population. Determining the success of the national scale livestock business at this time depends on the people's livestock, most of the community livestock entrepreneurs only keep 2-4 cattle for the purpose of savings and side businesses. According to [5] in addition to family savings and livestock farming processes are used to fulfill family nutrition. In addition, beef cattle business is used as a side business by farmers and one of the factors is the very limited ability of livestock farming. If farmers are able to master technology, but most farmers do not apply to their farms, one of the examples is the processing of fecal waste, the use of feces can be processed into organic fertilizer which has the potential as a business branch. The formation of livestock groups is actually an effort to meet the needs of the population. The purpose of forming livestock groups is to form groups of breeding activities in a professional manner.

The livestock group business in Merauke city basically has its own business selling cattle to collectors or slaughterers and individuals. This shows that among the livestock group members basically has not gone well, this can happen because the (HR) of each group is different. Therefore a business model is needed in the form of business mapping for the steps in carrying out the strategy of developing livestock groups in the Merauke Regency in the hope that the planned objectives can be achieved such as increasing livestock population, meat production and improving livestock welfare.

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2. METHODOLOGY

This research was conducted in January to March 2019, the study was conducted in four districts, each district there is one group, and in each group will be identified internal and external factors. The site selection is done purposively by considering the potential of the location based on the large number of livestock and active groups. Development of business strategies that are applied in accordance with the potential possessed by each group. The development of a cattle group-based cattle breeding business strategy is needed, for the process of developing a beef cattle business group, internal and external indicators need to be identified which can be transformed into alternative strategies for the development of cattle groups in the Merauke city. SWOT analysis is used for business strategy development and AHP is used to get the priority value of the best strategy that will be applied to small-scale cattle breeding groups.

2.1. Data types and sources

The data used are sourced from the results of interviews directly to respondents, the respondents in question are members of livestock groups, the livestock service and animal health services, direct observation is primary data. Primary data collection aims to classify internal and external factors that function for the development of community farms. Secondary data were obtained from related institutions in the form of results reports, documentation and results of previous studies, the Central Statistics Agency.

2.2. Sampling Method

The respondents used were experts consisting of eight experts in their fields, covering the animal husbandry and animal health service 1 person, each group leader from four districts 4 people, 1 academic person. Selected respondents have the ability to formulate group policies, formulate business development strategies for livestock groups.

2.3. Data analysis method

This research was conducted with descriptive analysis, for data processing using SWOT, SWOT matrix calculation adopted [7]

3. RESULTS AND DISCUSSION

The four districts in this study include Naukenjerai, Semangga, Tanah Miring and Kurik. The most common types of ruminant livestock are cattle and buffaloes. The results of research on the characteristics of herd groups in the four districts show varied values such as history, group members, average education and main occupation of the farmer as in table 1. This is in line with [4] that the traits displayed by community farms are related to aspects of work including education level, experience of raising livestock. The relationship between cattle population and education level is very closely related to the knowledge of farmers about cattle breeding period. According to [6] the average level of knowledge of breeders and when cattle are ready to be mated is quite low.

Table 1. Characteristics of Cattle Groups in four Districts

No	Criteria	Livestock groups in four districts			
		Naukenjerai	Semangga	Tanah Miring	Kurik
1	Since	2010	2008	2005	2005
2	Village	Nasem	Tomer	Semangga jaya	Muram sari
3	Business form	Not yet incorporated	Not yet incorporated	Not yet incorporated	Not yet incorporated
4	Number of Members	15	20	25	15
5	Education	Junior high school	vocation high School	vocation high School	vocation high School
6	The main job	farming	farming	farming	farming

The average age of each group member is 30-55 years and some have been doing business raising cattle from a young age between 10-15 years, breeding knowledge is not only obtained during full education, especially vocational agriculture, also the experience of raising livestock. This experience is very helpful for farmers in developing their group organizations. According to [2] the influence of Education influences the ability to manage livestock businesses. Cattle ownership comes in part from the business of buying and inheritance from parents. The average number of cattle is between 2-4 cattle per person, but some people in the naukenjerai district have a very large number of cattle averaging 100-300 cattle per person with a cattle breeding system in shepherds in the forest and extensive maintenance systems. Such a maintenance system will make it difficult for breeders to control and record. According to [1] the weakness of the extensive breeding system is the difficulty of getting accurate data related to cattle production. Cattle production in Merauke has increased until 2018, this

is inseparable from the role of the government by providing health services in the form of animal health workers (animal health) and animal health posts in each research district.

3.1. Analysis SWOT

Internal factors owned by the four herds groups are almost the same, based on the results of interviews and questionnaires obtained internal factors from the four herds of cattle such as table 2. Strengths and weaknesses of each group have the same indicators as the default. given starting from 1.0 (most important) up to 0.0 (not important). In addition, the calculation of the rating on each factor by giving a scale value of 4-3 for the strength factor and 2-1 for weakness.

Table 2. Internal factor evaluation matrix in four districts

No	Internal Factors	Average weight	Livestock groups in four districts							
			Naukenjerai		Semangga		Tanah Miring		Kurik	
			Rating	score	Rating	score	Rating	score	Rating	score
1	Knowledge held by livestock groups	0.097	3.000	0.261	4.000	0.319	4.000	0.347	4.000	0.321
2	Number of males owned	0.088	3.000	0.277	4.000	0.327	4.000	0.314	4.000	0.344
3	Feasibility of a cage	0.098	2.000	0.154	3.000	0.214	3.000	0.216	3.000	0.210
4	Shepherd's land ownership	0.098	4.000	0.341	4.000	0.379	4.000	0.381	4.000	0.371
5	administration	0.084	2.000	0.159	2.000	0.115	2.000	0.109	2.000	0.119
6	Group legality	0.072	1.000	0.030	1.000	0.100	1.000	0.050	1.000	0.070
7	Reproduction rate	0.095	3.000	0.282	3.000	0.216	3.000	0.217	3.000	0.218
8	The level of learning will	0,085	4.000	0.371	4.000	0.373	4.000	0.321	4.000	0.341
9	Communication between group members	0.089	3.000	0.291	3.000	0.227	3.000	0.246	3.000	0.241
10	Collaboration between group members	0.085	3.000	0.283	4.000	0.317	4.000	0.322	4.000	0.302
11	Responsibilities in groups	0.088	3.000	0.245	3.000	0.221	0.300	0.218	4.000	0.311
Total		0.979		2.694		2.700		2.741		2.848

The results showed that internal factors in the herd group had a score above 2.5, meaning that the entire research group was able to utilize the strengths and be able to withstand the current shortcomings. According to Suardi (2018) that the value of internal factors above 2.5 characterizes the group able to cultivate its strengths to deal with deficiencies.

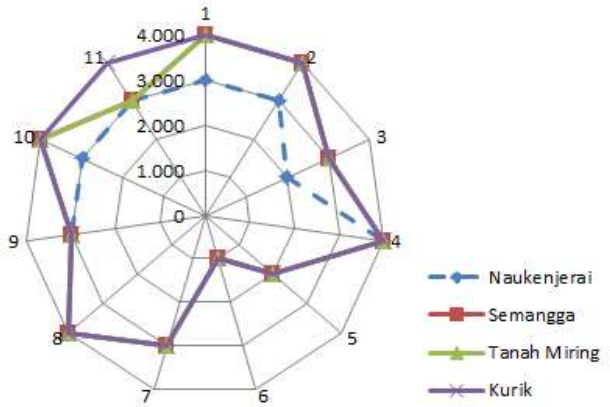

Figure 1. Internal Factor Diagrams of herds in four districts

1. Breeding knowledge owned, 2. Number of males owned, 3. Feasibility of the cage, 4. Shepherd's land ownership, 5. Administration, 6. Group legality, 7. Reproduction rate, 8. Level of learning will, 9. Communication between group members, 10. Cooperation between group members, 11. Responsibility in groups (Note: Figure diagrams numbers 1-11 correspond to the description on the right)

The diagram in Figure 1 shows that there is the lowest to highest value in internal factors, a rating value of 3-4 shows the strength possessed by a group of people's herds, and a value of 2-1 shows the weakness of a group of herds, in this study it can be seen that there are differences in each indicator of strengths and weaknesses. Knowledge indicators become a strength factor, one of which is about understanding the latest information technology, in line with the opinion of [9] stating that knowledge is positively correlated with the strength indicator. This is supported by education status. In addition, the level of reproduction knowledge, such as knowledge of lust detection and knowledge of artificial insemination technology, has a positive impact. According to [6] that the level of education has an influence on knowledge about the detection of lust in cattle. Knowledge of breeders in making fermented feed, fattening and breeding processes provide new opportunities and new strengths.

External factors are part that discusses the factors that support and inhibit the group of cattle in four districts can be seen in table 3.

Table 3. external factor evaluation matrix in four districts

No	External Factors	Average weight	Livestock groups in four districts							
			Naukenjerai		Semangga		Tanah Miring		Kurik	
			Rating	score	Rating	score	Rating	score	Rating	score
1	Government guidance and assistance	0.085	3.000	0.201	3.000	0.168	3.000	0.128	3.000	0.278
2	Corporate agency collaboration	0.078	2.000	0.075	2.000	0.030	2.000	0.071	2.000	0.152
3	Competition between members	0.070	2.000	0.180	2.000	0.167	2.000	0.121	3.000	0.203
4	Epidemic of a disease	0.098	1.000	0.006	1.000	0.015	1.000	0.025	1.000	0.011
5	Availability of animal health workers	0.080	2.000	0.120	2.000	0.121	2.000	0.141	2.000	0.106
6	Market Network	0.075	2.000	0.173	2.000	0.152	3.000	0.162	3.000	0.112
7	Price stability	0.095	3.000	0.228	2.000	0.285	2.000	0.205	2.000	0.185
8	Market demand	0,085	3.000	0.162	3.000	0.180	3.000	0.120	3.000	0.220
9	Availability of feed and water	0.094	3.000	0.240	3.000	0.252	3.000	0.212	3.000	0.228
10	Environmental safety	0.085	3.000	0.270	2.000	0.260	2.000	0.240	2.000	0.263
11	Availability of labor	0.070	2.000	0.187	2.000	0.183	2.000	0.173	2.000	0.181
12	Animal group communication	0.075	3.000	0.269	3.000	0.278	3.000	0.228	3.000	0.285
13	Willingness to breed for generasi muda	0.075	2.000	0.193	2.000	0.203	2.000	0.193	2.000	0.123
14	The existence of AI technology	0.078	2.000	0.103	2.000	0.203	2.000	0.103	2.000	0.094
15	Climatic conditions	0.080	1.000	0.067	1.000	0.017	1.000	0.097	1.000	0.071
Total		1.000		2.473		2.311		2.219		2.512

The results showed that external factors in the herd group had a score below 2.5 meaning that the entire research group was able to take full advantage of the opportunity, but in the kurik district livestock group a score above 2.5 meant that the group was able to take advantage of strengths and be able to withstand the deficiencies that existed at the time this. This is in line with [3] states that external factors have a significant impact on cattle business patterns.

4. Conclusions

The conclusion results show that the analysis of internal and external factors in each group of cattle farms specifically for cattle found that each indicator is the same, but there are several different score scores. The highest score on internal factors is in the group of young livestock, while other indicators such as the level of knowledge of the highest score are found in the welfare group. The same value is also found on external factors, the highest score obtained by the group of young working cattle and the lowest is the welfare group. The results of interviews and analysis showed that farmers needed training and skills in the form of making alternative feed fermentation of feed, fattening models of livestock and breeding.

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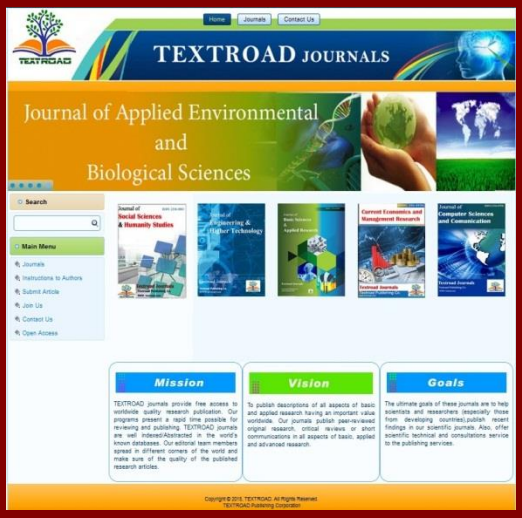

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