



Study Application Of Soil Conservation Techniques Along Highway Openings

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Abstract. *The objective of this research is to find out the methods used in soil conservation along the opening of the Tibar-Ermera highway and to find out the types of plants used in implementing soil conservation along the opening of the Tibar-Ermera highway. This research uses a descriptive or exploratory method referring to the method created by Vogel (1987) and Rugayah, et al (2004). This exploratory research will be carried out along the highway, to observe what soil conservation methods are used. Based on the results of observations along the opening of the highway, soil conservation techniques are applied along the Tibar-Gleno road, it is known that there are two methods, namely vegetative methods and mechanical methods or civil engineering methods. The vegetative method applied is planting vetiver grass, elephant grass, gamal and dadap hijo and the mechanical method is bench terraces and civil engineering methods are retaining walls and channels. And the types of plant species used in soil conservation include *Vetiveria zizanioides* L Nash, *Pennisetum purpureum*, *Gliricidia maculate*.*

Keywords: *Application of Soil Conservation Methods*

INTRODUCTION

The main natural resources, namely land and water, are easily damaged or degraded. Soil has two main functions, namely, as a source of nutrients for plants and as a matrix where plant roots are anchored and ground water is stored. These two functions can decrease or disappear, the loss or decline of this soil function is usually called soil damage or soil degradation. The loss of the function of soil as a source of nutrients for plants can be continuously renewed with fertilization, but the loss of the function of soil as a place to anchor roots and store ground water is not easily renewed because it takes a long time for soil formation. Water damage takes the form of loss or drying up of water sources and decreased water quality. The loss or drying up of water sources is closely related to erosion, while the decline in water quality can be due to sediment content originating from erosion or material content from industrial/agricultural waste (Agoestiawan, M. 2012)

Land and water are the main natural resources that have a big influence on human life. Human need for natural resources will increase along with the development of the population, while the supply of natural resources is increasingly limited. The situation of these two conflicting things will increase human pressure on natural resources excessively and tend to be destructive, thereby reducing the quality of existing natural resources. To overcome the decreasing quality of natural resources, measures are needed to prevent the activation of factors that cause soil damage.

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Geomorphology in its application emphasizes the study of how to plan good land use in the sense of adjusting land use according to its capabilities (Verstappen, 1983 in Tri Wibowo, 2005). To achieve this target, erosion prevention, critical land management and improvement of soil conservation techniques can be achieved.

In the Development Arrangement Process in Timor Leste, especially in distributing development to the regions, the National Government has opened the construction of the Tibar – Gleno highway. During the opening of the highway, problems naturally occurred in the process of dredging the land to widen the highway. This dredging activity certainly causes landslides to occur both at the top and bottom of the roadside. To find out this impact, this research was carried out as a study to find out what land conservation techniques were applied during the implementation of the opening of the Tibar-Gleno highway.

RESEARCH METHODOLOGY

1. Research methods

This research uses a descriptive or exploratory method referring to the method created by Vogel (1987) and Rugayah, et al (2004).

This exploratory research will be carried out along the Tibar-Gleno highway, to observe what soil conservation methods are used.

2. Method of collecting data

This research uses primary and secondary data. Primary data is data collected by survey. Secondary data is data obtained from literature and agencies related to the problems raised.

A. Primary data

Primary data is data that can be obtained directly in the field, through observation and documentation.

a. Interview

Interviews were conducted in depth, semi-structured using an interview guide which contained a list of questions adapted to the position/status of the informant.

b. Observation

In-depth observations to find out soil conservation methods along Ermera-Gleno

B. Secondary Data

Secondary data is taken through communication studies, namely, secondary data collection seeks information from real and flexible data and is continued by refining the author's data to take data directly from related agencies such as: Forest Service and National NGOs operating in the agricultural sector, especially the forestry sector.

3. Data analysis

To obtain complete data and information, use the descriptive analysis method, namely non-statistical analysis or in the form of descriptions that do not use numerical calculations but are descriptive. Data obtained through observation techniques and interviews, literature study.

RESULTS AND DISCUSSION

Based on the results of observations along the opening of the Tibar-Gleno highway, the soil conservation techniques used are known to be two methods, namely vegetative methods and mechanical methods or civil engineering methods. The vegetative method applied is planting vetiver grass, elephant grass, gamal and green dadap and mechanical methods are contour planting and barrier dams, civil engineering methods are retaining walls and channels. And the types of plant species used in soil conservation such as *Vetiveria zizanioides* L Nash, *Pennisetum purpureum*, *Gliricidia maculate*

1. Vegetative Method

The vegetative method is the use of plants or plants and their remains to reduce the destructive power of falling rainwater and reduce the amount and destructive power of surface erosion. It can be seen that several vegetative methods in soil and water conservation strategies are managing plants in such a way as to reduce the rate of erosion and surface runoff (Seta, 1987), whereas according to Arsyad (2010), vegetative methods are the use of plants and plants or their parts. parts of plants or their remains to reduce the impact force of falling rain, reduce the amount and speed of surface runoff, ultimately reducing soil erosion. Natural resources in the form of vegetation and its types, namely in the form of forests, plantations, mixed gardens with integrated farming patterns and so on, must be considered and developed in accordance with their role, namely as the best soil protector, as long as they are in an intact ecosystem. (Sarief, 1986).

A. Vegetative Soil Conservation with Gamal According to Strips

Soil conservation using gamal is one part of soil conservation using vegetative methods, which is very good and easy and can be done by everyone because it is easy to plant. It can be seen that gamal plants have been widely developed in various countries in order to reduce the rate of erosion and increase conservation efforts. land and water. Because it is easy to take seedlings and grows easily or quickly with more shoots so it can hold raindrops and can reduce water flow.

Alley cropping (Strip/alley cropping) is a farming and soil conservation system where rows of legume shrubs are planted closely (10-25 cm apart) according to contour lines

(mountain weeds) as hedges and annual plants are planted in the aisles between the hedges. Implementing alley planting on sloping land is much cheaper than making bench terraces, but is effective in preventing erosion. After 3-4 years since the hedge grows, a terrace will form. The formation of terraces is natural and gradual, so they are often called credit terraces. The gamal planting technique according to strips (strip cropping) is a planting system, where plant types are planted based on the contour direction. According to (FAO, 1976) planting according to strips (strip cropping) is a planting system, where in one plot of land plants are planted with certain spacing and alternating with other types of plants in the direction of the contour. For example, planting corn in one strip in the direction of the contour with a strip width of 3-5 m or 5-10 m depending on the slope of the land, on the lower slope peanuts are planted using the same system as planting corn, grass strips or other ground cover crops.

The steeper the slope, the narrower the strip will be so that the alternating plant types appear denser. This system is very effective in reducing erosion by up to 70-75% (FAO, 1976) and the vegetation planted (from the legume type) will be able to improve soil properties even though there is a reduction in the area of the main crops by around 30-50%.

This system is usually applied in areas with hilly to mountainous topography and is usually combined with other conservation techniques such as hedgerows, drainage channels, etc. Planting according to strips is a plant arrangement business so it does not require large capital.

B. Soil Conservation with Vetiver Grass

Soil conservation using vetiver grass is one part of soil conservation using the vegetative method, which is very good and easy and can be done by everyone because it is easy to plant. Vetiver grass plants have been developed in various countries to reduce the rate of erosion and increase soil and water conservation efforts. Based on several research results in several African, Asian and American countries, through proper cultivation, steep areas near river flows and terraces can be planted with vetiver grass to overcome erosion (Astuti, 2009).

C. Soil Conservation with Elephant Grass

Soil conservation using elephant grass is one part of soil conservation using vegetative methods, which is very good and easy and can be done by everyone because it is easy to plant. And it can be used as feed for cows and buffalo. Elephant grass plants have been developed in various countries in order to reduce the rate of erosion and increase soil and water conservation efforts. Based on several research results in several African, Asian and American countries, through proper cultivation, steep areas near river flows and terraces can be planted with elephant grass to overcome erosion (Astuti, 2009).

Vegetative soil conservation techniques are any use of plants/vegetation or plant remains as a medium to protect the soil from erosion, inhibit surface flow rates, increase soil moisture content, and improve soil properties, both physical, chemical and biological. Plants or plant remains function as soil protectors against the hitting force of raindrops and the carrying capacity of surface water (runoff), as well as increasing water infiltration into the soil.

Vegetative soil conservation techniques such as reforestation, agroforestry, including alley cropping, strip cropping, grass strips, rows of crop residues, cover crops crop), the application of planting patterns including crop rotation, intercropping.

The advantages obtained from this vegetative system are that it is easy to implement, helps preserve the environment, prevents erosion and blocks surface runoff, can improve soil properties from returning organic plant material, and increases added value for farmers from the by-products of these conservation plants. Vegetative land management can ensure the continued existence of land and water because it has the following properties:

- a. Maintaining the stability of the soil structure through the root system by increasing soil granulation.
- b. Covering land with litter and canopy reduces evaporation.
- c. In addition, it can increase the activity of microorganisms which results in increased soil porosity, thus increasing the amount of infiltration and preventing erosion.
- d. Another function of vegetation in the form of forestry plants which is no less important is that it has economic value so that it can increase farmers' income (Hamilton, et.al., 1997).

2. Mechanical Method

Mechanical methods are all physical and mechanical treatments given to the land and the construction of buildings to reduce surface flow and erosion and increase the ability to use soil. Several soil conservation techniques are applied in soil conservation along the opening of the Tibar-Gleno highway.

The mechanical method is a way of managing moorland (land) using physical facilities such as soil and stones as a means of soil conservation. The aim is to slow down the flow of water on the surface, reduce erosion and accommodate and channel surface water flows (Seloliman, 1997). This includes mechanical methods for soil and water conservation, including tillage. Tillage is any mechanical manipulation of the soil necessary to create good soil conditions for plant growth. The main purpose of tilling the soil is to prepare a place for seedlings to grow, create a good root area, bury plant residues and eradicate weeds (Arsyad, 1989).

A. Land processing according to contour

Cultivating land according to contours is carried out by plowing to form paths that follow the contour or cut the slope, thus forming pieces of soil and furrows that follow the contour or cross the slope. Cultivating land according to contours will be more effective if followed by planting according to contour lines. Cultivating land according to contours is one part of soil conservation using mechanical methods. Mechanical / civil engineering method, a form of soil conservation method using physical facilities (soil, stone, etc.) as a means of building soil conservation. This method works for

- a) slow down surface flow,
- b) accommodate and channel surface runoff with non-damaging force. Some recommended methods:
 - a. Minimum tillage
 - b. Tillage according to contour
 - c. Construction of bunds and terraces
 - d. Making a waterfall
 - e. Making rorak / Dead end channels.

With the aim of inhibiting the speed of surface flow, increasing the infiltration of surface water into the ground, saving costs, energy and time, but with technical prerequisites:

1. On land that has a slope of 3 – 6%, the recommended contour planting should not exceed 100 m in length, it is important to pay attention to drainage channels.
2. On land that has a slope of more than 8%, it is recommended that the length does not exceed 65 m, it is important to pay attention to drainage channels.
3. Contour planting is not effective on land that has a slope of less than 3% and more than 8% to 25%.
4. Based on research results, planting in the direction of the contour on a slope of 4 – 6% can reduce erosion and run-off by 50% (FAO, 1976).

B. Inhibitory Dam

Blocking dams (check dams), balloons/reservoirs, rorak, and embankments are structures that can be used as mechanical techniques in soil and water conservation. Apart from reducing the amount and speed of surface runoff, these buildings also force water into the ground and underground water. It can be seen that the blocking dam, Rorak (silt pit) was created to capture water and eroded soil, thereby allowing water to enter the soil and reduce erosion.

Blocking dams are made by installing boards, bricks, stones or mounds of earth in grooves or ditches so that the speed of water is hampered and soil is deposited in that place. To overcome ditch erosion, barrier dams are also used which consist of piles of branches and twigs.

CLOSING AND RECOMENDATION

Conclusion

Based on this research, the author can conclude that the absorption of soil conservation along the opening of the Tibar-Ermera highway uses Vegetative conservation methods with mechanical conservation methods or civil engineering.

Recomendation

Implementation of development activities related to Soil and water conservation should involve workers who are professional in the field of soil and water conservation, to provide good direction and techniques to workers who carry out conservation activities in the field.

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