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Analysis of Trouble in Dry Land Management and Hills in Ngada District, East Nusa Tenggara Indonesia

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ABSTRACT: The district of Ngada is a high plain of hills and mountains with a very diverse topophysiography. There are some fertile areas, but there are also areas that are dry. In mountainous areas, crops such as coffee, coconut, strawberries, cocoa, and horticultural crops, food crops, and livestock. On dry land, it is difficult for plants to rejuvenate due to rainfall and water availability. Sustainable agriculture should be supported, in particular, with regard to the management of dry land in the region. The purpose of this research is to identify the obstacles that occur in dry land with a dry climate, so it is easier to find solutions to problems or obstacles occurring in the dry land and hills (hill area) of the district of Ngada. The research method used is a library approach by scanning and exploring several journals, books, and documents, as well as other sources of data or information considered relevant to the research. The results of the library show that there are some problems that often arise in the process of dry land management in the district of Ngada, namely the decline in soil fertility due to erosion and water laundering, very steep topography, water availability, and problems in production. Based on these obstacles, alternative solutions can be applied, such as using vegetative or mechanical soil management methods, increasing rainwater harvesting, managing water resources thoroughly, and growing drought-resistant crops.

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INTRODUCTION

Indonesian bio-physical and environmental characteristics vary widely, especially in the context of agriculture, i.e., the diversity of raw materials, soil types, climate, and topography. In addition to biophysical factors, land use and development are also influenced by social, economic, and local intelligence factors. (Alim et al., 2022).

A landslide that is not saturated or water-filled most of the time of the year is called dry land. This land comes from the low plains (0–700 m dpl) to the high plains (lebih dari 700 m dpl). However, the form of the hill country consists of intrusion hills, volcanic spice coves, karst mountains, elongated hills with sedimentary rocks, and hills of height between 50 and 500 m with a slope between 7% and 20% (Noywuli, 2023).

Dry land use usually occurs on land, dry land, or untreated land. A rainfall system is the use of agricultural land that relies on rain as a water source or guarantees water availability. Upland is a territory that is located in the high plains or above 700 m2 geographically (Notohadinegoro, 2000). Dry land is a type of land where water has not been stagnant for more than a year. (Alim et al., 2022).

The district of Ngada is a high plain of hills and mountains with a very diverse topophysiography. Therefore, the cultivation of agriculture in the highlands requires management and a strategic position in national agricultural development. Highlands are crucial to preserving the environmental function of the river-flowing area (DAS) and the sanitation of the area below it, in addition to providing benefits to millions of farmers. (Noywuli, 2019 and 2020).

In the mountains are plants of coffee, coconuts, strawberries, cacao, and all kinds of fruit. In the hill country, there are a variety of crops, plantations, food, and livestock. (Noywuli et al., 2018).

Sustainable agriculture should be supported, in particular, with regard to the management of dry land. Sustained farming on dry land to exploit limited water resources without the use of dangerous cultivation techniques or excessive pasture that jeopardizes marginal land. (Solowey et al., 2013).

This research is conducted to analyze the problems that exist in the dry climate region of Ngada district and the long-term development of dry land agriculture. This practical management approach is an iptek that looks at the environment of the land. The purpose of this research is to identify the obstacles that occur in dry land with a dry climate, so it is easier to find solutions to problems or obstacles occurring in the dry land and hills (hill area) of the district of Ngada.

RESEARCH METHOD

The method used in this research is the library research approach. The use of library study as an activity relating to the method of collecting library data, reading, recording, and processing research material. Data collection in the research is carried out by exploring several journals, books, and documents (both printed and electronic), as well as sources of data and other information considered relevant to the research or study.

RESULT & DISCUSSION

1. Dry Land and Hills

According to the Central Statistical Bureau of East Nusa Tenggara (2022), currently the district of Ngada has a land area of 1.620.92 km2, consisting of dry land of 91.815 ha spread over various areas. Mountainous land is vulnerable to dew and erosion due to its slopes, relatively higher rainfall, and unstable soil. If the originally covered mountain land forests are opened for seasonal crop farming without applying soil and water conservation practices, or if the mountain lands are converted into recreational areas with environmentally unfriendly facilities.

The conditions of mountainous dry land result in greater evapotranspiration than rainfall, but planting trees should be done periodically. In addition to being associated with land degradation, dry land is also often linked to water shortages. Population growth, unconserved farming practices, and excessive pasture are other factors that contribute to dry land. (Solowey et al., 2013; Alim, 2023). But some dry lands in the Ngada district are not suitable for agriculture because of the shallow soil and the very steep slopes. Of a total of 1.620.92 km2, only about 91.815 ha (56%) are suitable for agriculture in the lowland and highland.

Increasing production through agricultural development is a strategic option that can support national food sustainability. Basically, productivity on dry land is still quite low, except on land used as an annual crop. (Abbas et al., 2019).

2. Barriers in Dry Land and Hills

Problems that occur during the production process are known as barriers. Mechanical manipulation of the soil is called forging. (Arsyad, 2010). Problems arising on dry land and hills hinder the cultivation and processing of agriculture. In dry land management, there are several frequent challenges, such as decreased soil fertility due to erosion and basal washing, very steep topography, and low water levels, which hamper agricultural production.

2.1 Soil Fertility

The ability of the soil to provide sufficient and balanced amounts of material to ensure optimal growth and production of plants is known as soil fertility. (Ceunfin et al., 2022). In addition to nitrogen (N), phosphorus (P), and potassium, soil chemical components include organic material, nutritional range, nutrient reserves, ground reactivity (soil pH), KTK, base saturation, and availability for plant growth (Sitorus et al., 2018).

Soil fertility and soil physical and chemical properties are usually better in dry and wet soil. There is a lot of heat, and the pH is neutral to alkaline. In land with a dry climate, the main obstacle is the limited availability of water, which is caused by low rainfall and long rainy seasons, so evaporation occurs more than rainfall. As a result, low rains lead to relatively low harvesting.

There is a possibility that, as a result, the alkalinity and salinity, as well as the balance of heat, will be disrupted. In the rainy season, soil erosion is very sensitive; although it does not last long, its intensity can disperse soil particles. Factors that can hinder harvest due to short planting times are dry climates with short wet months (3–4 months) and long dry months (6–9 months), as well as high and unstable rainfall fluctuations. (Wahyunto & Shofiyati, 2004).

In a dry and wet climate with high rainfall, most of the cations and hares are washed intensively. Erosion and high surface flows also reduce soil physicochemical fertility. Dry soils with wet climates most often face problems because of their low productivity levels. Complex and constantly changing organic matter comes from the remnants of plants and animals in the soil. Organic matter improves soil fertility by altering its physical, biological, and chemical properties. Moreover, organic material can increase soil porosity.

A minimum of 1,500 millimeters of rainfall per year is required on dry land. The soil in this area is largely composed of ultisols and oxisols, which have a low pH, low nutrients, low organic content, high iron and manganese content, and aluminum content that exceeds plant tolerance limits. In addition, the soil is very vulnerable to erosion. Planting patterns that do not match the potential and soil conditions will increase the susceptibility to erosion and result

in low fertilization efficiency due to the N and K of the easy-to-wash fertilizer, so that P is fixed by iron and aluminum. (Wahyunto & Shofiyati, 2004).

In the Atlas of Land Resources of Indonesia Exploration, on a scale of 1:1.000.000 (Land Research and Development and Agroclimate Centre, 1993), plants are grouped according to the level of soil acidity, resulting in the spread and area of dry land of 102.8 million hectares. This grouping is based on seasonal crops and annual crops or suitable plantations in wet and dry climate areas, as well as in high plains and low plains.

In addition to overall structural improvements, improvements in porosity, aeration, infiltration, ability to hold water and water available, permeability, and other physical properties will be included in aggregate improvements.Organic matter can also enhance soil chemistry. The process of mineralization and decomposition occurs on the organic material added.Decomposition and mineralization are accompanied by the release of the hares, which increases the cation tular capacity (CTK). As a result, the organic acids produced from the decomposition increase the quantity and availability of hares in the soil. (Wawan, 2017).

2.2 Topography

Wet climate Dry soils have a fairly high erosion potential due to their steep slopes. Wet climates have a relatively high potential for erosion (slopes). Very sensitive to erosion, especially during the high rainy season. Farming is generally done on rather flat land with slopes of more than 15%. However, land with topographic conditions like this is more suitable for annual crops. (Abdurachman et al., 2008).

On dry land, where the climate is dry and the annual rainfall is low, there is a lot of muddy land. As a result, in addition to a shortage of water, the potential for erosion is also high. The number of land losses (TSL) or erosion permitted in East Nusa Southeast ranges only from 1.12 to 2.24 tons/ha per year, as the majority of the territory is hilly and mountainous with slopes of more than 30%. Some agricultural commodities are difficult to grow and develop, so many livestock fields are only recovered in deposits suitable for farming development.

According to the International Institute of Rural Reconstruction (2002), the following are some of the most common soil problems occurring on dry land:

a. High surface flows caused by slopes, low infiltration, poor soil water, hardening and compression of soil, as well as soil hardenings and compressions.
b. Low soil moisture due to low soil coverage, low penetration, and increased soil flows and evaporation.
c. Poor soil structure due to poor organic material, soil surface erosion, and laundering of land elements.

Hills with sloping topography can experience surface scraping of the upper ground layer. Erosion and washing can lead to a decrease in the content of organic matter, the number of granular structures, and the level of soil harvesting. Continuous terraces and individual terraces should be made in areas with sloping or mountainous topography. This will reduce the risk of erosion and preserve the soil so it can store water well.

Figure 1: Dry land of hills and slopes in Ngada District

Water availability

Because of the limited amount of water in dry land and hills, farming work throughout the year cannot be done with a plantation index <1.50. Rain patterns and variable spatial and temporal distributions are the causes. (Abdurachman et al., 2008). There are two important relationships between water and soil, namely:

a. One of the obstacles to the agricultural production system is water because of its limited and/or unbalanced distribution in both time and space.
b. Dry land, on the contrary, is one of the components of water resource control and retention, as most of the dry land is located in the DAS region.

c. Although high soil fertility and limited water resources in dry climates do not provide much opportunity for farmers, they often do not want to seriously develop crop cultivation and are even neglected as unproductive land. In this situation, resource management is necessary.

2.3 Production Availability

The physical conditions of land (relatively shallow soil depths, drought, partially lost horizons A and B due to erosion, steep slopes, weak conservation techniques, and a lack of capital for the recommended technology application) are production limits on slum land. Low land production is the result of these physical, technological, and socio-economic challenges. (Idjudin & Marwanto, 2008).

CONCLUTION

The dry land conditions of the hills and slopes in the district of Ngada, water shortages, and land degradation are still taking place. Population growth, unconserved farming practices, and excessive shepherding are other causes of dry land. Proper management can improve the function of dry land and make dry land climate dry as a productive medium for growing crops.

Mechanical soil conservation is any mechanical physical treatment and building construction aimed at reducing surface flow, reducing erosion, and improving the capacity of soil to support sustainable agriculture. To prevent erosion, mechanical conservation must always be followed by vegetative methods. Some of the conservation methods that also control erosion are bench terraces, reels, individual terraces, and garden terraces.

To support sustainable agriculture, dry land management must be sustainable. There are some problems that often arise in the process of dry land management, namely decreased soil fertility due to erosion and water drainage, very steep topography, water availability, and problems in production. Based on these obstacles, alternative solutions can be applied, such as using vegetative or mechanical soil management methods, increasing rainwater harvesting, managing water resources thoroughly, and growing drought-resistant crops.

REFFERENCES

1. Abdurachman, A. A., Dariah, and A. Mulyani. (2008). Dry land management strategies and technologies support national food procurement. *Journal of Agriculture*, 27 (2): 43–49.
2. Abbas, A. (2019). *The Role of Islamic Marketing Ethics Towards Customer Satisfaction*.
3. Abdurachman, A., Wahyunto, and R. Shofiyati, 2004. *The idea of controlling the conversion of arable land in the framework of national food sustainability*. Providing multifunctional seminars on agriculture and conservation of land resources Bogor, December 13, 2003.
4. Alim Nurmaranti, Marulam MT Simarmata Bambang Gunawan, Tioner Purba, Nirmala Juita Jajuk Herawati, Refa Firgiyanto, Junairiah, and Astrina Nur Inayah. (2022). *Dry Land Management*. Foundations We Write: Fields.
5. Arsyad, S. (2010). *Land and Water Conservation*, Second Edition, IPB Press, Bogor.
6. BPS NTT (2022). *Statistics of Pertnian Ngada*. Central Statistical Bureau of the Province of East Nusa Tenggara. Kupang.
7. Ceunfin S., Prajitno D., Suryanto P., Son of ETS, 2017. Assessment of competition and profit yields from soya corn under the white wood. *Savana Cendana*, 2 (1):1-3.
8. Harahap, F.S., Arman, I., Wicaksono, M., Mico, W.T., Rauf, A., and Walida, H. (2019). Provision of organic material on coconut slopes against soil chemical analysis. *Agrica Ekstensia*, 13(2), pp. 47–54.
9. Idjudin, A. A., & Marwanto, S. (2008). *Reform of dry land management to support food security.*
10. International Institute of Rural Reconstruction. (2002). *Managing Dryland Managing Dryland Resources*: A Manual for Eastern and Southern Africa.
11. Juhadi. (2007). *Patterns of land use and environmental degradation in mountainous areas*. Semarang: Department of Geography, Faculty of Social Sciences, State University of Semarang.
12. Notohadinegoro, T. (2000). *Physical and chemical diagnosis of land damage Asmendep I Habitat/Bapedal*. 1-3 July 1999: Yogyakarta.
13. Noywuli, N., Sapei, A., Pandjaitan, NH., and Eriyatno. (2018). Sustainability assessment on watershed management in the Aesesa Flores Watershed, East Nusa Tenggara Province of Indonesia. *Journal of Sustainability Science and Management (JSSM)-Malaysia*, Vol. 13, No. 2.
14. Noywuli, N., Sapei, A., Pandjaitan, NH., and Eriyatno. (2019). Assessment of watershed carrying capacity for the Aesesa Flores Watershed Management, East Nusa Tenggara Province of Indonesia. *Environment and Natural Resources Journal (ENRJ)—Thailand*, Vol. 17, No. 2.
15. Noywuli, N. (2020). *Sustainable River Flow Area Management Policy Model Study; Aesesa Flores DAS Case Study*. CV publisher: Amerta Media, Banyumas.
16. Noywuli, A. (2023). *Approaches to Conservation in Agriculture Management*. ISSN: 2985-7074; 2: 16–27.

17. Land and Agroclimate Research Center, 1993. *Technical Guidelines and Land Evaluation*. National Agricultural Research and Development Project, Agriculture Research and Development Agency, 38.
18. Sitorus, A., Sitoros, B., & Sepiring, M. (2018). Survey of Soil Fertility on Agriculture Land in Subdistrict Lumban Julu, District Toba Samosir. *Journal of Agroecology*, 6(2), 225–230.
19. Solowey, E. M., Amede, T., Evans, A., Boelee, E., & Bindraban, P. (2013). Chapter 6: Drylands.
20. Wawan. (2017). *The Organic Material Management Teaching Book*. University of Riau.