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Dry Land and Mountains Management Study in the Aesesa Flores River Flow Area, East Nusa Tenggara

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ABSTRACT: Aesesa Flores (AF) River Flow Area (RFA) is a natural landscape. Its headquarters are in Bajawa, Ngada Regency, and its remnants are in Nagekeo Regency. The peaks of the mountains hold rainwater and flow it naturally into the sea through the rivers. The land area concerned is the water capture area. This ecosystem consists of natural resources (land, water, and vegetation) and human resources that exploit natural and artificial resources. The state of RFA will be of great in the planning and policy of sustainable AF management. The aim of this study is to find out the level of vulnerability of dry land resources. The study will give special attention to the area of the AF river stream, the biophysical picture of dry ground in the river flow area, the vegetation, the water system of Aeseza Flores, and the role of dryland agriculture and hills in food production. The method used in this study is a library approach. The results show that the soil type in the RFA Aesesa Flores includes five soil types: aluvial, grumosol, latosol, and mediterranean. Aesesa Flores is categorized into five critical level of land, i.e., rather critical, critical potential, critical, highly critical, and non-critical. The level of density of the river intersection in a RFA and Sub-RFA region indicates the level of contribution of the RFA to the threat of flooding that may arise if the regional balance is disturbed. In the northern part of Nagekeo district, the river level is higher on steep land.

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INTRODUCTION

Indonesia has huge agricultural potential to develop. Despite this, productivity remains very low, except in dry-land farming systems that are used for annual crops and plantations. Dry farming is a type of seasonal farming that has low production and faces socio-economic problems such as conflict and increased population addition, especially biophysical conditions (Syam, 2003).

Based on the analysis of air temperature data over the last about forty years, climate variability scenarios predict that temperatures will rise between 1.30 and 4.600 Celsius by 2100, with a trend of 0.100 to 0.440 Celsius per year (IPCC, 2007).

Increased evapotranspiration will follow an increase in temperature, which directly affects the hydrological cycle balance and water availability. (Gain, 2012 et al.; Swandayani, 2010; The Energy and Resources Institute, TERI, 2009). If global temperatures rise, the hydrological cycle will become more intense. This will cause the dry season to become more dry and the rainy season to become more wet, which then increases the risk of flooding and drought.

The remaining natural resources in the *River Flow Area (RFA)* area are used rationally, thus producing maximum output in an unlimited amount of time and minimizing land degradation. The goal of RFA management is to produce sustainable RFA where the relatively high incomes of citizens, tidal technology, and available natural resources are used efficiently. (Sukri et al., 2008).

It is vital to give global attention to water management problems and solutions because water scarcity is a very important problem in dry areas around the world. Since there is no way to increase water supply in dry regions, finding solutions is a challenge. To maintain or increase land productivity and its impact on better RFA management, water and land use must be managed simultaneously (Kenneth and M'Hammed, 2002).

Given that RFA is a natural ecosystem consisting of natural resources and human resources, the venue of hydrological bio-physical processes and complex socio-economic activities of communities, the management of RFA requires greater attention and understanding. Furthermore, this particular attention is directed toward a more comprehensive management paradigm shift involving every component that is included in it. For years, natural resources management has ignored conservation principles and eliminated local communities (Faham et al., 2008).

Several factors, especially an increase in the population that will also directly exploit natural resources, could potentially affect the RFA, leading to declining RFA quality, such as landslides, erosion, sedimentation, droughts, and floods. Of the 17,076 RFA in Indonesia, 14,927 RFA were preserved, and 2,149 RFA were recovered. There are 15 national priority RFAs and 9 disaster-prone RFAs in the 2015–2019 MN RPJ. NTT has 306 RFAs with an area of 4,735,000 hectares, with RFA Aesesa on the island of Flores (Aesesa Flores) becoming one of the most important RFAs (Pujiono dan Setyowati, 2015).

The efforts that have been made to preserve soil and water are still restricted to pollination, planting, and opening reservoir wells in several locations. The additional effort that has been made by both the government and public institutions is to inform the authorities, especially the public, that the beautiful and natural resources of RFA AF are the primary capital that can generate benefits for the region and the community. On the contrary, if these resources are not properly managed, the dangers of disasters will threaten, and the benefits of natural resources will not be sustained. (Noywuly et al., 2017).

Aesesa Flores (AF) River Flow Area (RFA) is a natural landscape (wilayah daratan atau wilayah). Its headquarters are in Bajawa, the capital of Ngada County, and its remnant is in Mbay, Nagekeo County. The peaks of the mountains hold rainwater and flow it naturally into the sea through the rivers. The land area concerned is the water capture area. This ecosystem consists of natural resources (land, water, and vegetation) and human resources that exploit natural and artificial resources. The biogeophysical, socio-economic, and institutional characteristics of the RFA AF indicate its existence. The RFA condition will be of great help in the planning and policy of sustainable RFA AF management.

The objective of this study is to determine the level of vulnerability of dry land resources. The study will give special attention to (1) the Aesesa Flores river stream area; (2) the biophysical picture of dry ground in the river flow area; (3) the picture of vegetation; (4) the Aeesa Flores RFA water system; and (5) the picture about the role of dryland agriculture and hills in food production.

METHOD

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

RESULT AND DISCUSSION

1. Aesesa Flores (AF) River Flow Area (RFA)

The Aesesa Flores (AF) River Flow Area (RFA) is undergoing rapid and dynamic change along with growth and time travel. Some of the factors that led to this change include the increase in population, the development of various areas, and the rapid implementation of regional autonomy. RFA AF has an area of 129.005 ha and consists of Ngada District and Nagekeo District, each in the central area of Flores Island, NTT Province. Ngada district has a total area of 49,313 ha, while Nagekeo district is 79,692 ha.

RFA AF consists of three regions, or zones, or ecosystems. The first part, which covers part of the Bajawa, South Golewa, Golewa, and North Bajava districts, Wolomeze, and the Soa district in Ngada district; the second part in the middle, which covers some of the Volomeze district of Ngada district, Boawae district, and some of Nangaroro district in Nagekeo district; and the last part is the later, in which the RFA Authority of the AF has not only decided on the shape and function of RFA hydrologically, but it has also agreed on the similarity in terms of land use and vegetation cover, rainfall, elevation, and population. (Asdak, 2010).

The main region is at the coordinate point 120 569.209E, 84739.959 S, covering 43.052 ha with elevations between 600 and 1,600 Mdpl. The central region is at the coordinate point 121 8’52.887”E, 841’25.092”S of 52.520 ha with elevations between 300 and 900 Mdpl. Whereas the latter region is in the coordinates point 121, 17’57.719”E, 829’36.963” The area is 33,433 ha, with altitudes between 25 and 300 m (BPRFA BN, 2013).

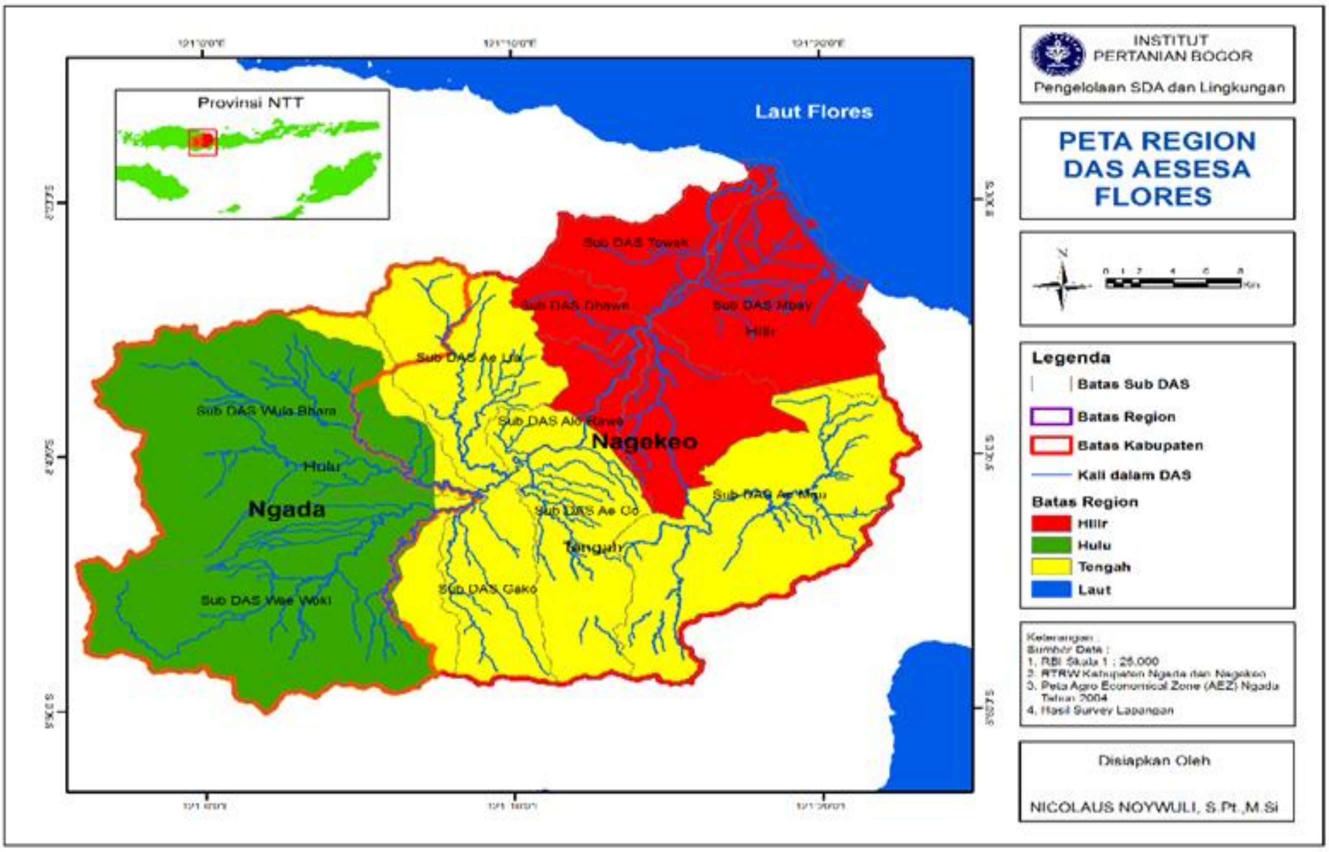

Figure 1. Aesesa Flores RFA Division Map

2. Biophysics of Dry Ground in RFA Aesesa Flores

Soil types in RFA Aesesa Flores include five soil types: aluvial, grumosol, latosol, and mediterranean. The facility of infiltration and percolation of rainwater in the RFA AF is heavily affected by this type of soil. Table 1 shows the distribution of soil types in the RFA AF.

Table 1 shows that the Mediterranean land type has the largest area, covering 50.919 ha, and is followed by the Grumosol land type of 48.986 ha, which is scattered throughout RFA Aesesa Flores. The Mediterranean soil type comes from hard limestones and sediment rocks; it is brownish and very fertile, making it suitable for agriculture.

Table 1. Area (ha) of the Aesesa Flores RFA section, by RFAallow land type.

Description	Downstream	Upstream	Middle	Total
Aluvial	11.545			11.545
Grumusol	124	29.394	19.469	48.986
Latosol	9.120		8.431	17.551
Mediterranean	12.645	13.659	24.620	50.919
Total	33.433	43.053	52.520	129.005

Source: Results of Map Analysis of AEZ District of Ngada 2004

3. Vegetation

One of the main problems in the management of RFA AF on the mainland is the lack of supporting facilities and supplies, poor quality and quantity, especially clean water, inadequate human resources and low PDAS institutional capacity, lack of institutional management and use of PDAS information and technology systems, reduced water reservoir function due to reduced vegetation in the water capture area, and lack of coordination and coherence in PDAS.

To improve RFA AF water yield for certain rainfall, vegetation can be well managed to preserve existing water supplies. Irrigation methods are more efficient and support plants with low consumptive use. Plants with low water requirements are adapted to the region and species. One way to increase water yields is by reducing forest coverage, replacing rooted species with more shallow species, and replacing species that lose interception and transpiration with species that have low evapotranspiration losses (Kenneth and M'Hammed, 2002).

Based on the results of map analysis and field surveys, RFA Aesesa Flores is categorized into five (5) categories of level of land criticism, i.e., rather critical, critical, potential critical, highly critical, and non-critical. Before manipulating vegetation to enhance water yields, there are several factors to bear in mind: there must be several ways to capture increased water yields; a reservoir must be sufficient to accommodate any water output; and it must be close to an RFA outlet. The best chance for this approach is high ground in the RFA area dedicated to water supply right above the tank (Kenneth and M'Hammed, 2002).

4. RFA Aesesa Flores Water System

RFA Aesesa Flores affects the flow patterns of the river as well as the strength of the top discharge of the flood. According to BPRFA BN (2013), RFA Aesesa Flores has an area of 129.005 ha with a rounded shape, according to image analysis. Sub RFA-Sub RFA in the region of RFA AF mostly has a leaf-like shape according to the shape of the flow area. The rounded RFA shape causes a high peak discharge, resulting in an increase in the volume of sediment carried by the flow. As a result, the rainfall that becomes the drain is rapidly accumulated and can reach the outlet quickly.

The flow pattern of the river and the power of the peak discharge of the flood are influenced by the shape of the RFA. According to BPDAS BN (2013), RFA Aesesa Flores has an area of 129.005 ha with a rounded shape, according to image analysis. Sub RFA-Sub RFA in the area of RFA AF mostly has a leaf-like shape according to the shape of the flow area. The rounded RFA form causes a high peak discharge, resulting in an increase in the volume of sediment carried by the flow. As a result, the rainfall that becomes the drain is rapidly accumulated and can reach the outlet quickly.

The flow patterns of rivers relate to the forms of river intersection, both permanent and seasonal, forming the flow pattern of the river. The level of river confinement density in a RFA and/or Sub-RFA region indicates the level of contribution of the RFA or Sub- RFA to the threat of flooding that may arise if the regional balance is disturbed. In the southern part of the RFA Aesesa Flores, the river level is relatively low. In the northern part, in the northeast part of Nagekeo district, the level of river levels is higher along with the steep ground.

5. The Role of Dry Land and Mountain Farming in Food Production.

One of the strategic elements for the development of the national economy is the agricultural sector. The development of agriculture in Indonesia plays an important role because of the huge and diverse potential of natural resources. (Abbas et al., 2019).

About 50% of Indonesia's agricultural land is potentially dry land used for national food production. Harvest yields are around 1.04 percent per year, whereas for the meadow, they are about 1.22 percent a year, and the rate of growth of non-meadow or food crops increases by 0.34 percent annually. Efforts to improve food sustainability in dry land areas are the use of low rainfall in a relatively short time with wet climate ecosystems and rainfall of about 750 mm/year, where the duration of rainfall is relatively long so that increased intensity on crops (Kasryno dan Hayono, 2008).

Dry land utilization with water and soil conservation technology. The annual rainfall intensity of dry land conditions is high enough that the annual rate is more than 20%, so dry land management planning is less accurate. Where river water flows are still very short of rainfall sources in the Highlands, they cannot be compared with the annual river flows from the Highlands in wet climates. With dry land conditions, the crop yield will vary from zero to three times the average. (Kasryno dan Hayono, 2008).

The development of dry land farming is done with a sustainable farming system (sustainable agriculture system). Let consideration of land conditions, socio-economic population, and physical environmental conditions support national food independence through short- and long-stage programs (Wahyunto dan Rizatus, 2008).

Rice is a raw material found in technical irrigation fields with a fairly high level of fertility. In order to optimize the national food supply, increased use of dry land, whether it has formed land or not, Sometimes policymakers still ignore the use of dry land for agriculture because they are more interested in increasing rice production in the wilderness. But the potential of dry land can produce sufficient nutrients, not only gogo beans but also other nutrients such as corn cultivation, strawberries, green beans, sorgum, and soybeans. Therefore, the use of dry land needs to be managed using appropriate technology and development. (Abdurachman, dkk 2008).

Dry land agricultural development projects that have already been implemented are becoming more and more lagging behind because of the lack of independent development of communities and sustained construction, especially in the RFA region of the former part. There have been inequalities in the management and handling of dry land problems. (Ijudin and Marwanto, 2008).

CONCLUTION

RFA AF management institutions have poor performance due to the absence of specialized institutions responsible for the management of RFA AF. It requires the presence of a formal institution capable of accommodating the interests of stakeholders and responsible for the management of RFA AF. The River Flow Area (RFA) is an area where there are natural resources of stock with a variety of ownership that have sources of interdependence between the compensators and between the above actors of the hydrological process and can produce products of goods and services for human well-being. Dry land management in an area of the

RFA subregion without considering the protection of soil and water will result in a decline in a decline in land productivity due to erosion processes.

Dry soil has a dry climate; low rainfall leads to relatively low clearance; and it has better physical and chemical properties than dry soil with a wet climate. High saturation and base content with a neutral to alkaline pH. The problem with dry land and a dry climate is that the availability of water is still limited due to low rainfall and long rainy seasons, which cause more evaporation than rainfall. As a result, the alkalinity and salinity of the balances are disturbed. Soil sensitivity to erosion is quite great in the rainy season, despite the high intensity of dispersed soil particles. Short wet months (3–4 months) and long dry months (6–9 months), as well as high and uncertain precipitation fluctuations, are a barrier to failure to harvest. The dominant soil types are verstisols, mollisols, entisols, inceptisols, and alfisols. This soil has volcanic material with a low washing rate, so it contains a saturation of >60% (eutric), calcareous material, sediment, and clay. Generally speaking, this soil has a better fertility rate than dry soil with a wet climate.

REFERENCES

1. Abdurachman, A., A.Dariah and A.Mulyani (2008) “Dry Land Management Strategies and Technologies Supporting National Food Procurement”. *Agriculture Journals*.
2. Abbas, B., Darma., and M. Dailami (2019) “*Agriculture Systems in Ecosystem Perspective*”. Monokwari: Postgraduate Program of the University of Papua.
3. Asdak, Chay. (2010). *Hydrology and Management of River Water Stream Region: Fifth Revision Edition.* Yogyakarta: Gadjah Mada University Press Yogyakarta.
4. Barus, A. and Syukri. 2008. *Agroecology of Fruit Plants*. USU Press.Medan.
5. BPDAS Benain Noelmina. (2013). *Integrated RFA management plan of RFA Aesesa province of NTT*. Kupang: BPDAS Benain noelmina
6. Gain, A. K., Giupponi, C., and Renaud, F. G. (2012). Cl ima t e chan g e adapt a tio n a nd vulnerability assessment of water resources systems in developing countries: a generalized framework and a feasibility study in Bangladesh. *Water*, 4(2), 345-366; doi:10.3390/w4020345.
7. Idjudin, A., & Marwanto, S. (2008). *Dry Land Management Reforms to Support Food Base*, 2(2), 115–125.
8. IPCC. (2007). *Summary for policy makers:Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Intergovernmental Panel on Climate Change.* In Parry, M.L. Canziani, O.F., Palukof, J.P., van der Linden, P.J., and Hanson, C.E. (Eds). Cambridge: Cambridge University
9. Kasryno, F and Hayono, S (2008) “Dry Land Farming as a Solution to Achieving Future Food Independence”. *Agriculture Journals*.
10. Kasryno, F and Hayono, S (2008) “Dry Land Farming as a Solution to Achieving Future Food Independence”. *Agriculture Journals*, pp. 11-33.
11. Kenneth, N. B and M’Hammed, T (2002) “*Planning and Manging Soil and Water Resources in Drylands: Role of Watershed Management*”. St.Paul: University of Minnesota.
12. Noywuli N, Rachman LM, Sapei A, Knight H. (2017) “*The Prerequisites for the Preparation of the Integrated Management Policy and Continuation of RFA Aesesa Flores Province NTT*. Prosiding of the National Seminar on Integrated River Flow Area Management (RFA). UNRI LPP.
13. Pujiono, E. & Setyowati, R., (2015). Assessment of Water Resource Vulnerability to Climate Variability in RFA Aesesa, Flores Island, East Nusa Tenggara. *Journal of Social and Forestry Economic Research*, XII(3), pp. 177-195.
14. Syam. A. (2003). Effectiveness of Organic and Inorganic Fertilizers on Padi Productivity in the Land. *Agrivigor Journal*. 3(3) : 232-244.
15. Swandayani, T.H. (2010). *Mapping the vulnerability of communities to climate change and adaptation based on forest ecosystems (RFA Ciliwung case study).*
16. TERI [The Energy and Resources Institute]. (2009). *Climate change and water vulnerability: strategies and practices for emerging water management and governance challenges - executive summary.* The Energy and Resources Institute TERI in collaboration with Yale University to be released duringthe15th Conferenceof Parties tothe United Nations Framework Convention on Climate Change UNFCCC, 7–18 December 2009, Copenhagen, Denmark.