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Erosion Prediction and Soil Conservation Planning in Krueng Seulimum Watershed Aceh Province, Indonesia H Akbar1, K Murtilaksono2, N Sinukaban2, S Arsyad 2 1Agroecotechnology Study Program, Faculty of Agriculture, University of Malikussaleh, 2Department of Soil and Land Resources, Faculty of Agriculture, Bogor Agricultural University ABSTRACT The of into land the of on without considering the capability and suitability of land will result breakdowns on Krueng Seulimum Watershed.

This obviously to attrition, land in upstream, , high fluctuation the study aimed 1) the of on watershed land unit in Krueng Seulimum Watershed and 2) determine the appropriate agro technology (soil and water conservation) cocoa to erosion erosion <). method in study a method the steps: the phase, a survey, a primary and data and presentation.

The of performed each unit and cocoa farming (Cocoa, + Areca and + using USLE. results that greatest prediction on shrub dry farming use. predictive values the use shrub, land and forest from - tons -1 year-1 31.50 40.96 ha -1 year-1), - tons ha-1 year-1 39.11-40.96 ha -1 year-1), tons -1 year-1 - 62.98 tons ha-1 year-1 22.16 24.20 tons ha-1 year-1), 1.31 6.94 ha -1 year-1 23.98 29.28 ha -1 year-1), The technologies soil water that be on dry (cocoa, cocoa areca and + are provision a fertilizer % bunds terracing + grass planting to amplify the terrace (14% slope) and bund terracing + grass planting to amplify the terrace + mulching 6 tons ha -1 (21% The land is to as while the shrub land use is recommended for cocoa farming.

Keywords: Erosion, land use, watershed, agro-technology INTRODUCTION Land use changes along the watershed have been increasing due to the construction activities and a high population growth rate. It is proven that the changes of land use from forest

into other land uses have created negative To it when particular land is urgently needed, the conversion of forest cannot be avoided. In Aceh province, until 2009, there had been approximately hectares forest damaged due to illegal logging 1.

According to Walhi Aceh (2012) 2 the loss of forests in Aceh province is now at about 23,124.41 hectares year -1 from the total forest area of 3.3 million hectares due to illegal logging and forest conversion. deforestation also the sustainability the watersheds sub-watersheds in Aceh. In efforts to save the watersheds in Indonesia, the Ministry of Forestry has set 108 watersheds as the top to managed the 5 (2010 2014), Krueng is of 16 located Sumatra is into watershed groups in Indonesia and the top priority in handling (BPDAS Aceh, 2009). Krueng (25,444.35 which one of the sub-watershed of Krueng Aceh watershed has experienced extensive of into agricultural In the area Krueng Seulimum was ha in 1987 declined 11, ha and 2002 Indian Journal of Public Health Research & Development, December 2018, Vol. 9, No. 12 209 it until ha 3.

In 2011, the remained forest area in Krueng Seulimum watershed was 7,000.01 ha (27.51%) 4. This study aims to: 1) predict the amount of erosion on every land unit in Krueng Seulimum watershed and 2) the agro (soil water conservation techniques) for cocoa-based farming to suppress erosion (erosion < ETol).

RESEARCH METHOD Venue and time This was in Seulimum watershed which is administratively located in the sub- districts of Seulimum and Lembah Seulawah in Aceh Besar regency, Aceh province from January to August 2011. Materials and Equipment The used maps soil topographic maps, earth maps, land use maps, rainfall data, demographic data, and certain chemicals for laboratory analyses.

Equipments used in the research are for equipments soil characteristics in the field and laboratory, stationery, working maps, GPS, GIS software, a digital camera, and a computer. Research Method This used survey consisting four namely: preparation, survey, main survey, and data analyses as well as result presentation. Erosion Prediction Erosion prediction on a piece of land is a method to estimate the rate of erosion that will occur on the land used within a land use.

The measurement of erosion was performed on each land unit by using the Universal Soil Loss Equation (USLE) 5 : A = R x K x L x S x C x P ..... (1) Where: A = the amount of erosion (tons ha-1 year-1), R = rainfall erosivity index, K = soil erodibility factor, L = slope length factor (m), S = slope factor (%), C = crop management factor and P = conservation treatment factor.

Rainfall Erosivity (R) Rainfall erosivity is the amount of rainfall erosion index unit which is

the product of the kinetic ener gy (E) with the maximum rainfall intensity for 30 minutes (I30) annually. As the daily rainfall data from the automatic measuring tool were unavailable, the value of rainfall erosivity (R) was calculated based on the Lenvain equation6: EI30 = 2.21 (CHm) 1.36..... (2) Where: EI30 = the maximum rainfall intensity in 30 minutes, and (CHm) = monthly rainfall Thus, the amount of rainfall erosivity factor (R) is the sum of the values of monthly rainfall erosion index and is calculated by the following equation: 12 R = S (EI30) I .....

(3) i = 1 in which R is the rainfall erosivity factor. Soil Erodibility (K) Soil erodibility value was calculated using the formula of Wischmeier and Smith (1978)11: 100K = {1.292 (2.1 M 1.44 (10 -4) (12 - a) + 3.25 (b - 2) + 2.5 (c - 3)} ..... (4) 210 Indian Journal of Public Health Research & Development, December 2018, Vol. 9, No.

12 where: K = soil erodibility, M = soil texture grade (% silt + % dust) (100 - % clay), a = percentage of organic matter, b = the soil structure code, and c = permeability code of the soil profile. Length and Slope Factors (LS). Length and slope factors can also be calculated directly with the following equation: LS = ...(5) Where: X = the length of the slope (m) and S = the slope (%).

Plant Factor and Management (C) The value of C factor is the ratio between the land losses due to erosion in an area unit (tons ha-1) in the land culti - vated with a certain management system and the land loss from the standard plot in adjacent places. Conservation Treatment Factor (P) The value of P factor is the ratio between the land losses due to erosion in an area unit (tons ha-1) in the land using a specific soil conservation technique and the land loss from the standard plot in adjacent places.

Tolerable Erosion (ETol) Tolerable erosion (ETol) was calculated based on the equation proposed by Wood and Dent (1983)7. Tolerable erosion also take into account the minimum soil depth, soil formation rate, equivalent depth, and land resource life in the following equation: ETol = ...

(6) Where: ETol = tolerable erosion (mm year-1), DE = equivalent depth {effective soil depth (mm) x soil depth factor based on sub-soil order}, Dmin = minimum soil depth (mm), UGT = soil age, and LPT = soil formation rate. 2 00138 . 0 00965 . 0 0138 . 0 (S S X + + RESULTS AND DISCUSSION Land Use Land use in Krueng Seulimum watershed is currently dominated by secondary forest land use for an area 7,001.01 followed scrub of ha, dry land farming area of 5,631.19 ha, pasture area of 5,033.27 ha, rice field area of 1,455.15 ha, and residential area of 335.58 ha.

In detail, from the total area of Krueng Seulimum (25,444.35 the use dry land farming commonly found is the cocoa-based farming without soil and water conservation treatments (Table 1). Table 1. Land use in Krueng Seulimum watershed No Types of Land Use Area Ha % 1 Settlement 335.58 1.32 2 Rice field 1,455.15 5.72 3 Grazing lands 5,033.27 19.78 4 Scrub lands 5,988.15 23.53 5 Dry Land Agriculture 5,631.19 22.13 6 Secondary Forest 7,001.01 27.51 Total 25,444.35 100.00 Sources: 4 , Field Analysis (2012).

LPT UGT D DE + - min Indian Journal of Public Health Research & Development, December 2018, Vol. 9, No. 12 211 Erosion Prediction Erosion Prediction in Krueng Seulimum watershed was on land (LU) multiple parameter using USLE. The and observation results indicated that the parameter value of every sample point in each land unit showed significantly varied erosion values Sufficiently agricultural can continuously be maintained if erosion on each land unit smaller the erosion and erosion greater ETol, land will immediately decline, so that high production can only be maintained for just a few years and eventually the agricultural land becomes unproductive or even a critical land.

On the basis of the differences of the mixed planting density and cover crop characteristics, the erosion prediction is by value C level of plant management) namely the value of C factor for which values cocoa (C) cocoa banana and + nut are 0.206, 0.119 and 0.114 respectively, while the value of P soil treatment) 1.0 obtain the erosion prediction value on the type of cocoa-based mixed farming (Table 3 and Figure 1). Table 2.

The Summary of the Predictive Erosion Condition Existing in Krueng Seulimum watershed LU Land Use Type Area (Ha) Value CP Erosion (A) (tons ha-1year-1) Total Erosion (tons year-1) 1 Grazing Land 847.68 0.100 29.65 25,137.16 2 Scrub Land 972.13 0.300 87.98 85,524.70 3 Dry Land Agriculture (CA) 889.54 0.300 105.30 93,670.51 4 Secondary Forest 398.79 0.005 1.51 603.87 5 Grazing Land 2,716.15 0.100 12.48 33,885.21 6 Scrub Land 4,301.19 0.300 30.71 132,084.45 7 Dry Land Agriculture (C) 2,671.05 0.300 27.60 73,711.46 8 Secondary Forest 2,502.72 0.005 1.31 3,286.70 9 Grazing Land 834.81 0.100 9.92 8,278.30 10 Dry Land Agriculture (C) 1,687.23 0.300 29.88 50,412.49 11 Grazing Land 166.14 0.100 45.37 7,538.03 12 Scrub Land 174.09 0.300 135.39 23,569.79 13 Secondary Forest 419.87 0.005 1.26 531.07 14 Grazing Land 546.47 0.100 62.98 34,418.03 15 Scrub Land 267.87 0.300 190.63 51,064.94 16 Dry Land Agriculture (CB) 295.94 0.300 118.19 34,977.93 17 Secondary Forest 1,559.24 0.005 2.64 4,118.27 18 Secondary Forest 285.84 0.005 4.49 1,284.05 19 Scrub Land 192.59 0.300 292.98 56,424.77 20 Secondary Forest 550.12 0.005 4.87 2,677.19 21 Secondary Forest 498.09 0.005 3.68 1,833.17 22 Secondary Forest 876.06 0.005 6.94 6,078.12 Total Erosion 731,110.19 212 Indian Journal of Public Health Research & Development, December

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12 Table shows the prediction of cocoa-based farming slopes 14% 21% are above ETol Therefore, achieve sustainable cocoa-based farming in Krueng Seulimum watershed, it is crucial to implement agro technologies. Table 3. Prediction of erosion on each type of cocoa-based mixed farming in Krueng Seulimum watershed Slope (%) Farming Types CP Value Erosion (ton ha -1year-1) ETol (ton ha -1year-1) 7 Cocoa Monoculture (C) 0.206 33.41 39.11 Cocoa + Banana (CB) 0.119 19.30 39.11 Cocoa + Areca nut (CA) 0.114 18.49 39.11 14 Cocoa Monoculture (C) 0.206 98.27 39.78 Cocoa + Banana (CB) 0.119 56.77 39.78 Cocoa + Areca nut (CA) 0.114 54.38 39.78 21 Cocoa Monoculture (C) 0.206 135.89 40.96 Cocoa + Banana (CB) 0.119 78.50 40.96 Cocoa + Areca nut (CA) 0.114 75.20 40.96 The technologies can applied both are fertilizing and soil and water conservation.

Complete fertilization conducted C, and to increase production, so that the desired farm income can be achieved. Figure 1. Erosion Prediction on various types of cocoa-based farming and land slopes. To achieve high productivity in line with the genetic potential, is major especially on the balance dose and fertilizer type, but not on a high level dose (Thong and Ng, 1978) 8.

The agro for and water applied cocoa (C), Cocoa+Banana and nut are fertilization, terracing terrace plants 14%) bund with Indian Journal of Public Health Research & Development, December 2018, Vol. 9, No. 12 213 strengthening plants added with 6 tons of mulching ha -1 year-1 21%) that erosion is than equal ETol = Bund on of was to the from 98.27 39.36 ha -1 year-1 54.38 27.91 ha-1 year-1 (CA) from to tons -1 year-1 (CB) (Table 4). Table 4.

Erosion on the cocoa-based farming after the application of agro-technologies in Krueng Seulimum watershed Slope (%) Farming Types CP Value Erosion ETol (tons ha-1year-1) 7 Cocoa Monoculture 0.206 33.41 39.11 Cocoa and Banana 0.119 19.30 39.11 Cocoa and Areca nut 0.114 18.49 39.11 14 Cocoa Monoculture 0.103 39.36 39.78 Cocoa and Banana 0.060 38.64 39.78 Cocoa and Areca nut 0.057 27.91 39.78 21 Cocoa Monoculture 0.031 16.33 40.96 Cocoa and Banana 0.018 16.03 40.96 Cocoa and Areca nut 0.017 11.58 40.96 Bund (P 0.5) 6 ha -1 year-1 = on 21% can the from to tons -1 year-1 from to 11:58 ha -1 year-1 and 78.50 16.03 ha-1 year-1 (CB) (Table 4). Bund terracing with grass planting for terrace strengthening can technically be done in the research location.

The purpose of this planting is to make terrace not easily slide by rainwater collision or runoff. Setaria spacelata grass species can be grown as terrace amplifier plant because this grass has low, tied and spread growth, as well as dense fibrous roots so that it can

reduce runoff, and soil carried runoff, reduce erosion, while other uses of Setaria spacelata grass is as a provider of feed ingredients for cattle.

Bund terracing plus mulching of 6 tons ha -1 year-1 slope 21% protect the soil surface from direct blows of rain droplets so that it can reduce the occurrence of splash erosion in addition to reduce the rate and volume of surface runoff 1981) 9. Abdurachman and Sutono (2002) 11 also added that the role of mulch in suppressing the erosion rate is determined by the mulch material, percentage of ground cover, mulch layer thickness and mulch resistance to decomposition.

CONCLUSIONS The predictive values several land uses in Krueng Seulimum watershed occur in scrub land use (30.71 - 292.98 tons ha -1 year-1) and in dry land agriculture (27.60 - 118.19 tons ha -1 year-1) . The erosion prediction values on pasture and forest land uses ranged from 9.92 - 62.98 tons ha -1 year -1 and 1.26 - 6.94 tons ha-1 year-1 .

suggested technology soil water at 14% is terracing grass planting for terrace strengthening that can reduce the erosion prediction rate to be lower than that of the ETol tons -1 year-1) is tons -1 year- 1 for the monoculture, tons -1 year -1 for cocoa + areca nut, and 38.64 tons ha -1 year-1 for cocoa + banana farming, while the suggested agro technology for soil and water conservation at the 21 % slope is bund terracing + grass planting for terrace strengthening + the provision of 6 tons mulching ha-1 year-1 that can also reduce the erosion prediction rate to be lower than that of the ETol (40.96 tons ha -1 year-1) that is 16.33 tons ha -1 year-1 for the cocoa monoculture, 11.58 tons ha -1 year -1 for cocoa + areca nut, and 16.03 tons ha -1 year-1 for cocoa + banana farming.

Conflict of Interest: Nil Source of Funding: Self Ethical IJRISE Journal Reviewer Committee 214 Indian Journal of Public Health Research & Development, December 2018, Vol. 9, No. 12 REFERENCES 1. Fauna dan Flora International, Degradasi Hutan Aceh Ancam Proses Rekonstruksi. Harian Suara Pembaharuan 2009. 2. Wahana Aceh. Tahun Kehilangan 2012. 3. Wahyuzar Perubahan Guna terhadap Debit Puncak Di DAS Krueng Seulimum , Universitas Syiah Kuala, Banda Aceh.2005. 4.

Baplan Dephut,Badan Planologi Departemen Kehutanan. 2011. Citra Landsat Aceh 2011 5. Weischmeier WH and Smith DD. Predicting Rainfall Erosion Losses. A guide to conservation planning. USDA-SED Agric. Handbook No. 537, 1978. 6. Asdak C. 2010. Hidrologi dan Pengelolaan Daerah Aliran Sungai. Gadjah Mada University Press. Yogyakarta. 7. Wood SR and Dent FJ. A land evaluation computer system AGOF/INS/78/006. 5 version 1.

Ministry of Agriculture Govern of Indonesia corporation UNDP FAO. 1983. 8. Thong and Ng and Consumption of Monocorp Cocoa Plant in Island Malaysia Soil. Int. Cocoa Coconut Conf. Kuala Lumpur. 25p. 1978. 9. Suwardjo. Sisa-sisa dan Konservasi dan dalam Tanaman [Disertation]. : Pascasarjana, Institut Pertanian Bogor. 1981. 10. Badan Pusat Statistik Aceh Besar. Aceh Besar dalam Angka 2004/2005. 11. Abdurachman dan Pengendalian Erosi Lahan Berlereng, hlm.

103- 145 dalam Abdurachman, A. Mappaona dan Asril Saleh Teknologi Lahan Pusat dan Tanah Agroklimat. 2002. 12. Arsyad S. tanah air. : Pustaka IPB Press, 2010.

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