ABSTRACT

Merawu watershed is the biggest sediment producer in upper Serayu watershed. It delivers about 1,450,000 m^3 sediment every year. High sediment production is triggered by compositions of land use that is dominated by agricultural areas which have thin vegetation covers such as vegetation croplands and agro-forestry. This research was mainly aimed to assess the impact of land use change on soil erosion in Merawu watershed during the last 20 years. Land use change assessment was conducted by using images of Landsat TM 1994, Landsat ETM 2002 and Landsat OLI 2014. The result of land use change was used as inputs for soil erosion analysis. Soil erosion analysis was performed by using the Watem/Sedem erosion model. This study also analyzed tolerable soil loss and the effect of soil loss on crop productivity. Tolerable soil loss was assessed by using local farmers' knowledge on depth of soil to produce optimum crop yield and annual soil erosion in periods of 400 and 25 years. The effect of soil loss on crop productivity was assessed based on farmers' perception on their annual crop yield the last 20 years.

The analyses results showed that Merawu watershed was dominated by agricultural area; agro-forestry in the middle parts, vegetable cropland in the Northern part, plantation of salak (*Salacca zalacca*) and paddy field in the middle and the Southern parts of the basin. Since 1994, 50% of the land use has changed. Most changes took part within agricultural areas, from agro-forestry to vegetable cropland and vice versa. The Watem/Sedem simulation showed that the highest sediment occurred in 1994 (3,018,582 ton), the lowest occurred in 2002 (1,229,729 ton). In 1994, sediment delivery rose again up to 1,348,185 ton. The worst erosion occurred in range of 100 ton/ha/year to 500 ton/ha/year and > 500 ton/ha/year and appeared in the Northern and middle parts; in Pejawaran, Wanayasa, Batur, and Karangkobar Sub districts that were occupied by vegetable cropland and agro-forestry. The result of tolerable soil loss assessment showed that the tolerable soil loss was dynamic following annual soil erosion rate. Based on 400 years of erosion period, 25% area of Merawu watershed experienced intolerable soil loss. Most of the catchment area was dominated by tolerable soil loss in range of 2.6 mm/year to 5 mm/year. Meanwhile, based on 25 years of erosion period, it was only 2.5% of the catchment area that experienced intolerable soil loss. The watershed area was dominated by tolerable soil loss in range of 20.1 mm/year to 40 mm/year. Meanwhile, the result of the assessment of the effect of soil loss on crop productivity revealed that farmers in Merawu watershed had not found the decline in crop productivity despite the intolerable soil loss occurences.

Key words: land use change, soil erosion, tolerable soil loss, crop productivity

INTISARI

DAS Merawu merupakan penghasil sedimen terbesar di bagian hulu DAS Serayu. Lebih kurang 1.450.000 m^3 sedimen dihasilkan setiap tahunnya. Hal ini dipicu oleh komposisi penggunaan lahan di DAS Merawu yang didominasi oleh lahan pertanian dengan tutupan lahan tipis seperti lahan pertanian sayur-sayuran dan kebun campur. Penelitian ini bertujuan untuk mengetahui dampak perubahan penggunanan lahan terhadap bahaya erosi di DAS Merawu. Perubahan penggunaan lahan dianalisis menggunakan Citra Landsat TM (tahun 1994), ETM (tahun 2002) dan OLI (tahun 2014). Hasil monitoring perubahan penggunaan lahan menjadi input untuk analisis dinamika erosi menggunakan model erosi Watem/Sedem. Penelitian ini juga menganalisis tingkat erosi tanah terbolehkan dan efek erosi tanah terhadap produktivitas hasil pertanian. Erosi tanah terbolehkan dianalisis dengan menggunakan persepsi petani setempat tentang kedalam tanah yang dibutuhkan untuk tanaman mereka dan erosi tahunan dalam jangka waktu 400 tahun dan 25 tahun, sedangkan pengaruh erosi tanah terhadap produktivitas hasil pertanian dianalisis dengan menggunakan perspektif petani berkaitan dengan hasil pertanian mereka 20 tahun terakhir.

Hasil penelitian menunjukkan bahwa secara umum DAS Merawu didominasi oleh lahan pertanian; kebun campur di bagian tengah DAS, pertanian sayur-sayuran di bagian Utara, kebun salak dan persawahan di bagian tengah dan Selatan. Sepanjang 1994 sampai dengan 2014, 50% dari penggunaan lahan di DAS Merawu telah berubah. Hasil simulasi Watem/Sedem menunjukkan bahwa sedimen tertinggi terjadi di tahun 1994 (3,018,582 ton), dan terendah di tahun 2002 (1,229,729 ton). Pada tahun 2014, sedimen di DAS Merawu meningkat lagi sebanyak 1,348,185 ton/ha. Erosi terparah kisaran 100 ton/ha hingga di atas 500 ton/ha muncul di bagian Utara dan tengah wilayah DAS yaitu di Kecamatan Pejawaran, Wanayasa, Batur, dan Karangkobar yang diisi oleh tanaman sayur-sayuran dan kebun campur. Erosi terbolehkan menunjukkan dalam periode 400 tahun, 25% wilayah DAS Merawu mengalami erosi yang melampaui batas toleransi (0 mm toleransi), sedangkan sebagian besar DAS Merawu didominasi erosi terbolehkan pada 2,6 – 5 mm/tahun. Pada periode 25 tahun, hanya 2,5% DAS Merawu yang mengalami erosi yang melampaui batas toleransi (0 mm/tahun toleransi), dan pada periode ini Merawu didominasi oleh erosi terbolehkan pada kisaran 20.1- 40 mm/tahun. Hasil analisis pengaruh erosi tanah terhadap produktivitas pertanian menunjukkan bahwa petani DAS Merawu tidak merasa hasil pertaniannnya mengalami penurunan selama 20 tahun terakhir.

Kata kunci: perubahan penggunaan lahan, erosi tanah, erosi terbolehkan dan produktivitas pertanian.