Available online at:
http://journal.unila.ac.id/index.php/tropicalsoil
DOI: 10.5400/jts.2011.16.2.175

Application of a Multispectral SPOT Image for Land Use Classification in Sampean Watershed

Januar Fery Irawan[1] and Indarto[2]

Research Center of Water Resource Development, Research Insitute, University of Jember. Jl. Kalimantan No. 37, Kampus - Tegalboto, Jember 68121, e-mail: januar_ir@yahoo.com[1] and ppsa@lemlit.unej.ac.id[2]

Received 14 May 2009 / accepted 10 May 2011

ABSTRACT

This article described the process of land use classification at Sampean Watershed. The research was conducted in Sampean watershed to calculate the land use area using a multispectral SPOT image. Two SPOT image scenes were used to identify and classify the main nomenclature of land use. The research applied level 2A of SPOT image raw data which were obtained during 2004. Research methodology consisted of geometric correction of Image; image enhancement using high sharpen filter; un-supervised classification and supervised classification. The classification algorithm used the maximum likelihood in which pixels was classified based on their spectral signature. Several training areas were identified to define the region area. Supervised classification could classified 9 class of land uses, the classification of land use consist of irrigated paddy field (56.05%), rain fed paddy field (0.89%), forest (10.75%), urban area (8.69%), plantation (4.22%), barren land (11.19%), river (0.05%), cropland (7.98%), and bushes (0.19%). The overall classification accuracy was 84.21%. This work will be useful for hydrological modelling and management planning of the Watershed.

Keywords: Classification, supervised, Sampean watershed, SPOT Image, unsupervised

INTRODUCTION

In the watershed areas, water resources management is related to the information of land use in watershed area themselves. Land use change occurred on the area may have effect on the runoff discharge flowing into the water courses region. Therefore, the rigorous land use map should be demanded in taking policy for watershed management. SPOT image has high resolution and it can cover plane section widely, so that it is able to be used for land use classification process either using multispectral or panchromatic channel. Studies and printed works concerning land use classification have been done by some researcher such as Hill and Sturm (1991); Liew *et al.* (1998); Lohnertz (2006); Atkinson *et al.* (1997); Kanello Poulos *et al.* (1992); Cross *et al.* (1991); Kang *et al.* (2001); and Zhao *et al.* (2003).

According to Curran (1985), land use classification method can be performed by using likelihood maximum algoritm which assumes that the probability of all class have the same chance. In fact, not all class can be treated with equal probability to be viewed on the image. A training cluster which has much smaller one than other training clusters will have lower probability to appear, so that it needs a burden factor for every class coming up on the image. This small training cluster can be applied into a lower value comparing with other clusters. Decision maker which takes maximum likelihood classifier into account can be expressed by the following equation:

$$D = \ln(a_c) - \left[0.5 \ln\left(\left|Cov_c\right|\right) - \left[0.5 (X - M_c)^T \left(Cov_c^{-1}\right)(X - M_c)\right]\right] \quad (1)$$

where, D = distance with probability; C = a certain class; X = classified pixel vector; M_c = mean vector of class sample; a_c = percentage of probability for any pixel to be a member of class c, which is default value is 1.0 from assumed information, Cov_c = covariant matrix of pixels on class sample c; $\left|Cov_c\right|$ = determinant; = matrix inverse of Cov_c .

By using equation (1), one pixel will be included as class c, if D value for class c is the lowest one. Theoritically, this maximum likelihood algoritm will work well, if the histogram shape of every channels involved in the classification process presents the normal distribution appearance, since this algoritm considers the most statistic variable than other techniques. In its practice other than its histogram shape factor, the training cluster shape