



UNIVERSITI PUTRA MALAYSIA

**COMPARISON OF MULTIPLE FILTERING TECHNIQUES ON ALOS
PALSAR IMAGE FOR DETECTION OF AGRICULTURAL LAND
ABANDONMENT**

SITI HENDON MD YUNOS

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PALSAR IMAGE FOR DETECTION OF AGRICULTURAL LAND
ABANDONMENT**

BY

SITI HENDON BINTI MD YUNOS

**A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia,
in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award
of the degree of Bachelor of Agricultural Science**

Faculty of Agriculture

University Putra Malaysia

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CERTIFICATION FORM

This project entitled “Comparison Of Multiple Filtering Techniques On Alos Palsar Image For Detection Of Agricultural Land Abandonment is prepared by Siti Hendon Binti Md Yunos and submitted to the Faculty of Agriculture in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture Science.

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ABSTRACT

Land use is related to human activity or economic function in a specific piece of land such as for residential, recreational, industrialization and agriculture. Land use for agricultural activities are important to ensure sufficient food supply for human population that increases every day. Discrimination of agricultural land use abandonment essential to study the conversion of agricultural land to other land use activities. Besides, it is crucial to differentiate among the vegetation crops in agricultural land because each crop plays different economic and social values. In Malaysia, Department of Agriculture produces land use classification maps for every two years by using soil survey, optical satellite image interpretation, digitizing and ground verification through the optical satellite imagery. However, optical satellite images are usually suffered by cloud coverage that may decrease the accuracy of satellite image if atmospheric condition is not being eliminated from the image data. The cloud covers problem, however, can be reduced by using SAR image since it is not affected by atmospheric condition. SAR image can be more efficient after having filtering technique applied since it can enhance textural effect of various agricultural lands. Therefore, research objectives of this study are to determine which filtering technique and window size that results in the best discrimination of agricultural land use and abandonment from ALOS PALSAR images. The study area is located in the Sungai Siput, Perak Darul Ridzuan. Standard filtering techniques such as Bit Error Filter, Frost Filter, Gamma Filter, Kuan Filter, Lee Filter, and Local Sigma Filter were performed in ENVI5 software with different window sizes (3x3, 5x5 and 7x7) prior to discrimination of agricultural land use and abandonment. From the study, the best filtering techniques to identify paddy land use and abandonment was Bit Error (3x3, 5x5 and 7x7 window sizes). Meanwhile, rubber area identification would be more effective after the images being filtered with Lee and Local Sigma (5x5 and 7x7 window sizes). On the other hand, the best filtering techniques used for identification of oil palm land use and abandonment was Gamma (7x7 window size).

ABSTRAK

Guna tanah adalah berkaitan dengan aktiviti manusia atau fungsi ekonomi di atas sebidang tanah tertentu sebagai kediaman, kawasan rekreasi, perindustrian dan pertanian. Penggunaan tanah untuk aktiviti pertanian adalah penting untuk memastikan kecukupan sumber bekalan makanan untuk populasi manusia yang kian bertambah setiap hari. Diskriminasi penggunaan tanah pertanian dan peninggalan tanah pertanian adalah penting untuk mempelajari pertukaran tanah pertanian kepada aktiviti kegunaan tanah yang lain. Selain itu, ianya juga penting untuk membezakan jenis tanaman dalam tanah pertanian kerana setiap tanaman memainkan peranan berbeza pada ekonomi dan nilai sosial. Di Malaysia, Jabatan Pertanian telah menghasilkan peta pengelasan penggunaan tanah setiap dua tahun melalui kajian tanah, penelitian gambar satelit, pendigitalan dan pengesahan gambar satelit optik. Walau bagaimanapun, gambar satelit optik kebiasaanya mengalami masalah liputan awan yang boleh mengurangkan ketepatan gambar satelit sekiranya keadaan atmosfera tidak dibuang dari data rajah. Masalah liputan awan, bagaimanapun boleh dikurangkan dengan menggunakan gambar SAR kerana ianya tidak dipengaruhi oleh keadaan atmosfera. Rajah SAR akan lebih berkesan selepas teknik penapisan dilakukan untuk meningkatkan kesan tekstur pelbagai tanah pertanian dan tanah peninggalan pertanian. Oleh itu, objektif kajian ini adalah untuk mengenal pasti teknik penapisan dan saiz tettingkap yang memberikan keputusan terbaik dalam membezakan guna tanah pertanian dan tanah peninggalan pertanian dari rajah ALOS PALSAR. Kawasan kajian adalah di Sungai Siput, Perak Darul Ridzuan. Teknik penapisan biasa adalah seperti Bit Error, Frost, Gamma, Kuan, Lee dan Local Sigma yang telah dijalankan dalam perisian ENVI5 dengan saiz terttingkap berbeza (3x3, 5x5 dan 7x7) untuk diskiminasi guna tanah pertanian dan tanah peninggalan pertanian. Hasil kajian, teknik penapisan terbaik untuk mengenalpasti kawasan tanaman padi adalah Bit Error (3x3, 5x5 dan 7x7 saiz terttingkap). Manakala, pengenalpastian kawasan getah akan lebih berkesan selepas menggunakan panapisan Lee dan Local Sigma (5x5 dan 7x7 saiz terttingkap). Teknik penapisan terbaik untuk pengenalpastian kawasan kelapa sawit adalah Gamma (7x7) saiz terttingkap).

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CHAPTER 1

INTRODUCTION

Land use is related to human activity or economic function in a specific piece of land such as residence, recreation, industrialized and agriculture. Rapid changes for urban fringe have reduced the number of land for agriculture thus increasing demand on remaining land (Wang *et al.*, 2007).

Agricultural land use is important to ensure enough food supply for human population that increases every day. In Malaysia, the human population is about more than 30 million of people (Malaysia Statistics Department, 2014). Classification of agricultural land use is important because it shows the changes of actual agricultural land to another land use activity. Agricultural activities were divided into several subsectors that important to national economic income. Examples of agricultural subsectors are vegetation crops, livestock, fisheries and forestry/ logging. The biggest area of Malaysia agricultural land use is for oil palm vegetation that is about 5.1 million hectare, meanwhile rubber plantation used about 46.9 thousand hectare (Department of Statistics, 2010) and livestock area in Peninsular Malaysia used 39.7 thousand hectare only (Department of Statistics, 2008).

It is crucial to differentiate the vegetation crops in agricultural land because each crop plays different economic and social values. Industrial crop like oil palm and rubber are important crop for economic value. Oil palm production contribution in GDP for 2010 is 16,993.7 million tonnes metric while rubber, the second largest plantation in Malaysia has contributed about 939.3 million tonnes metric. Paddy contribution 2,548.0 million tonnes metric, fruits produce about 1,767,800.0 tan

metric and vegetables 534,370.0 tan metric (Agro-food Statistics, 2010, MOA). Agricultural sector contribution to GDP is about 7.3% from other economic activity such as mining and quarrying, manufacturing, construction and services (Department Statistics, 2010).

On the other hand, agricultural land abandonment depicts the declines of traditional agricultural practices. Study of land abandonment in Malaysian context has found the factors that lead to land abandonment problem are soil ecology and socio- economy. Soil ecology factors such as slope and fertility lead to land abandonment. Meanwhile, research also found that socio- economy is drivers of abandonment such as migration, market incentives and rural depopulation. Land abandonment in agricultural activities causes loss of environment capital that eventually affecting the socio- economic. The management strategies and policies to prevent the loss of environment capital need to be developed and applied to stop the continuing of agricultural abandonment (Benayas *et al.*, 2007, MacDonald *et al.*, 2000). One of the management strategies is through monitoring activities of land used changes over the year with satellite imagery analysis.

Remote sensing can be used not only to distinguish agricultural and other land use activities through land classification or land mapping but also differentiating between land abandonment classes. Remote sensing is widely used for land use mapping because it provides information on the ground without direct physical contact with it (Jensen, 2009). The practicing of remote sensing have given many advantages such as reduce labour power and productive time used for land mapping compare with ground survey to produce land maps.

The attention on land cover classification based on remote sensed since the launch of Landsat in 1970s (Li *et al.*, 2012). The used of remote sensing optical data have been proved to be very efficient for land cover classification or land mapping and have been practiced in precision agricultural system (Wickramasinghe *et al.*, 2012). Used of radar or SAR image in land mapping in persistent cloudy condition area was important because the ability to penetrate cloud and atmospheric condition due to present of larger wavelength characteristic (Wang *et al.*, 2007). For instance, the rice mapping is crucial during growing season because of frequent cloud cover and rainfall. However, by using SAR images the rice mapping become effective due to its special ability penetrates the atmospheric condition. Additionally, the lower frequency (L-band) is easy to penetrate deeper into paddy canopy and overall plant biomass (Zhang *et al.*, 2009).

1.2 OBJECTIVES

- I. To determine filtering technique that results in best identification of agricultural land use and abandonment classes from ALOS PALSAR images
- II. To determine window size that results in the best identification of agricultural land use and abandonment classes from ALOS PALSAR images

1.3 SCOPE OF STUDY

- I. This study is to identify agricultural land use and abandonment on area of study by comparing with different filtering technique on ALOS PALSAR images
- II. The area of study is located in Sungai Siput District, Perak Darul Ridzuan, Malaysia
- III. The agricultural land use and abandonment is focused only for paddy, rubber and oil palm

CHAPTER 6

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