

# Application of SPOT Quicklook satellite images to identify and delineate the changing of land use in the coastal zone of Camau Peninsula, Vietnam

Võ Quang Minh, Nguyễn Thị Hồng Diệp, Nguyễn Thị Đuộm

GIS/RS Lab, College of Agricultural and Applied Biology, Cantho University, Cantho, Vietnam

Tel: 071-831005, Fax: 071-830814, Email: [VQMINH@CTU.EDU.VN](mailto:VQMINH@CTU.EDU.VN)

## ABSTRACT

In this study, Spot quicklook multispectral imageries are used, collected from CRISP (Centre for Remote Imaging, Sensing and Processing), Singapore. Those are covering Camau peninsula, including Baclieu, Camau, Soctrang provinces.

Spot Quicklook satellite images can be used to delineate the major landuses in Camau peninsula, which showing the changing of shrimp culture, rice cultivation, and forest within the region since 1998. This result gives promising ability in using of Spot quicklook satellite images to identify and delineate the major land use in the future. Due to low resolution, detail of land use could not be identified, since it needs higher resolution.

**Keywords:** Satellite image, quicklook, spatial, landuse, peninsula

## 1. Introduction

Information on the existing land-use pattern, the spatial distribution and its changes is required for planning, utilization and formulation of policies and programe for sustainable development (Kale, 1992)

This study presents the result of identification and delineation of land-cover/land-use with the aid of satellite remote sensing data and geographic information systems (GIS). Recently, remote sensing with multi-temporal satellite data has become a strong tool for monitoring aspects such as vegetation cover, soil degradation, urban expansion and more generally for most types of land-cover/land-use (LC/LU) changes.

The ground station at the Centre for Remote Imaging, Sensing and Processing (CRISP), Singapore has acquired numerous SPOT images of the region (Liew et al, 1998) with almost complete coverage of the Camau peninsula, Mekong delta, Vietnam. Mosaics of the SPOT quicklook images have been generated to provide a synoptic view of the areal extent of the land uses area. The total area of research area is about 1 million hecta.

## 2. The study area.

The CaMau Peninsula is located in the Southern part of Mekong Delta of Vietnam and composed of 5 provinces, namely, Kiengiang, Haugiang, Soctrang, Baclieu and Camau. It lies between latitude of 8°40' S and 10°40' N and longitude of 104°10' W and 107°10' E.

## 2. Methodology

Spot Quicklook satellite data from 1998, 2003 and 2005, collected from CRISP (Singapore), are the main data for land use change detection (Table 1). The quicklook scenes have a sampling interval of about 100-m. Each quicklook scene was accompanied by a set of metadata giving the locations (longitude/latitude) of the four corners, sensor gains, date and time of acquisition, sun azimuth and elevation angles, and other information.

The first step in processing the SPOT imagery was to make the various multi-temporal scenes spatially comparable. The 1998 image was orthorectified first using the scan-maps; all the other images were then orthorectified to this geometricmaster scene.

The image processing system ERDAS Imagine, and Idrisiw were used in processing and classifying the acquired images. Geo-referencing of images was executed on the basis of ground control points, derived from 1:100,000 scale topographical maps. An unsupervised classification of images was done first for identification of land use patterns grouping, and for growth truthing for training site selection. A supervised classification of images was carried out using the maximum likelihood method. This decision rule is based on the probability that a pixel belongs to a particular class with the highest probability among several possibilities.

Spot Quicklook satellite images are used in the image classification. The actual land use classification of the area was divided into the following classes: Forest, Aquacultural, Others

**Table 1** : Spot satellite data in the research area (collected from CRISP)

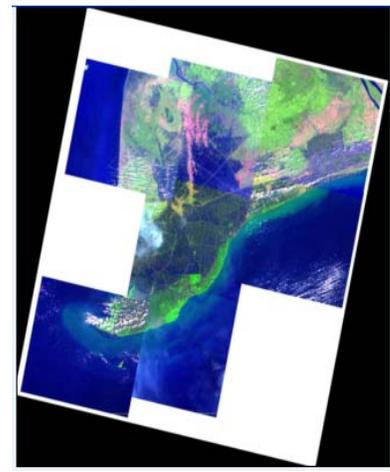
Year	Date	Scene ID	Sensor		
1998	1998-01-22	22743319801220338441X	SPOT 1	HRV 1	Mode X
	1998-01-22	22753319801220338432X	SPOT 2	HRV 2	Mode X
	1998-01-23	12733319801230347432X	SPOT 1	HRV 2	Mode X
	1998-01-22	22743339801220339011X	SPOT 2	HRV 1	Mode X
	1998-01-22	22743329801220338531X	SPOT 2	HRV 1	Mode X
	1998-01-22	22753329801220338512X	SPOT 2	HRV 2	Mode X
	1998-01-18	12753329801180343512X	SPOT 1	HRV 2	Mode X
2003	2003-04-05	22743320304050319301X	SPOT 2	HRV 1	Mode X
	2003-04-05	22743330304050319381X	SPOT 2	HRV 1	Mode X
	2003-04-05	22753320304050319282X	SPOT 2	HRV 2	Mode X
	2003-04-05	22743310304050319211X	SPOT 2	HRV 1	Mode X
	2003-04-05	22753310304050319202X	SPOT 2	HRV 2	Mode X
2005	2005-01-05	52743310501050340031J	SPOT 5	Instr 1	Mode J
	2005-01-05	52743330501050340201J	SPOT 5	Instr 1	Mode J
	2005-01-05	52743320501050340111J	SPOT 5	Instr 1	Mode J
	2005-01-26	52733330501260336252J	SPOT 5	Instr 2	Mode J
	2005-01-21	52753320501210332251J	SPOT 5	Instr 1	Mode J
	2005-01-17	42743310501170337311I	SPOT 4	HRV 1	Mode I



**1998**



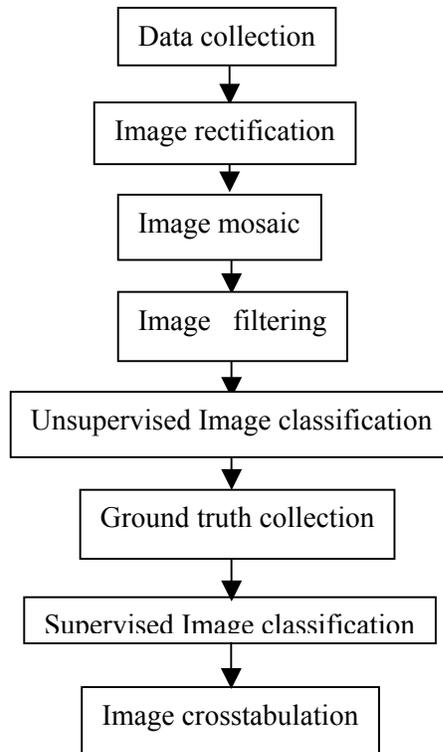
**2003**



**2005**

**Figure 1** : Quicklook image cover the Camau peninsula, Mekong delta, Vietnam (1998, 2003. and 2005)

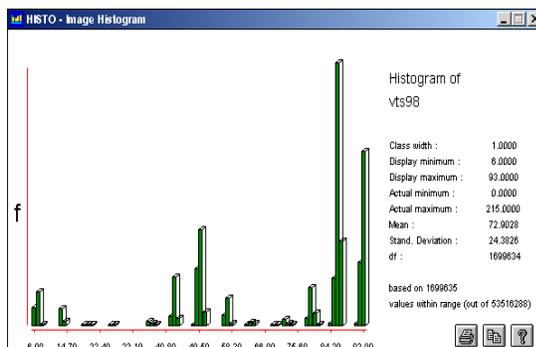
The steps for data collection and image processing shows in figure 2.



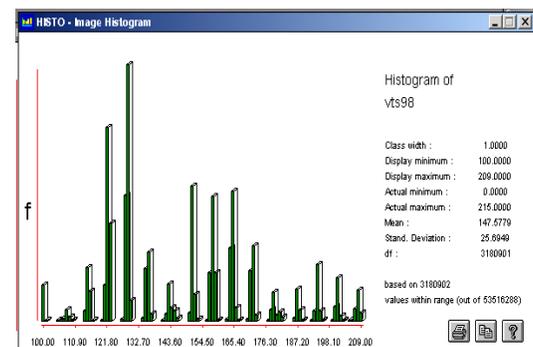
**Figure 2** : Steps for image processing

### 3. Results

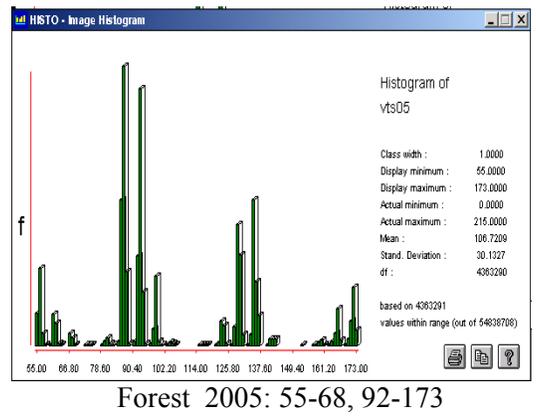
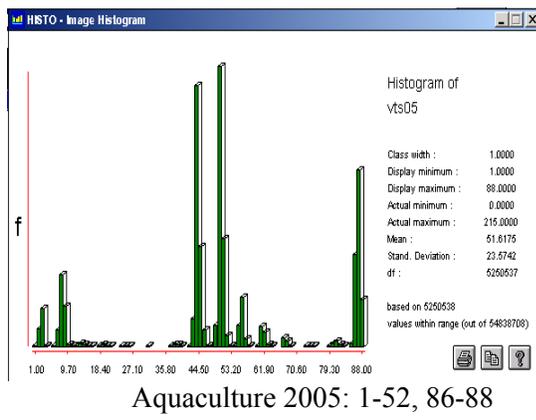
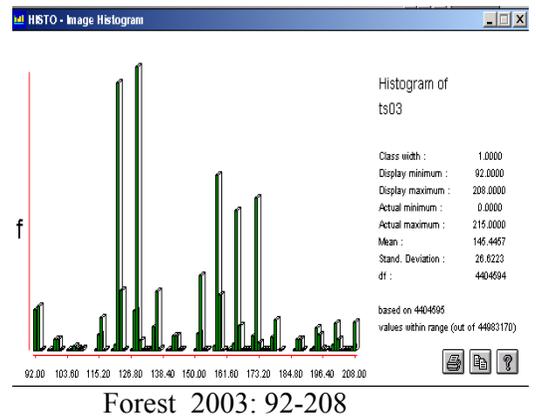
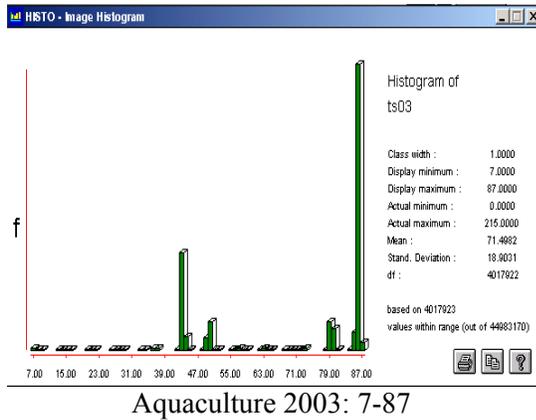
Manual interpretation and classification was performed to classify the land use areas into three classes: (1) forest, (2) aquaculture and (3) other vegetation types which were mainly rice and uncultivated or harvested rice. The forest lands could be distinguished by the dark red color like features which were probably Mangrove concentrated along the coast of the tip of Camau, while Melaleuca located in the Uminh Ha zone of Camau province. The histogram of digital number (DN) for forests ranging from 100-209 in 1998, 92 to 208 in 2003, and 55 to 173. While aquaculture were characterised by their dark gray or dark blue appearance. The histogram of digital number (DN) for aquaculture ranging from 9 to 93 in 1998, 7 to 87 in 2003, and 1 to 88 in 2005. Other objects should be rice, or harvested rice (Figure 3). The landuse types could also be checked against existing landuse maps.



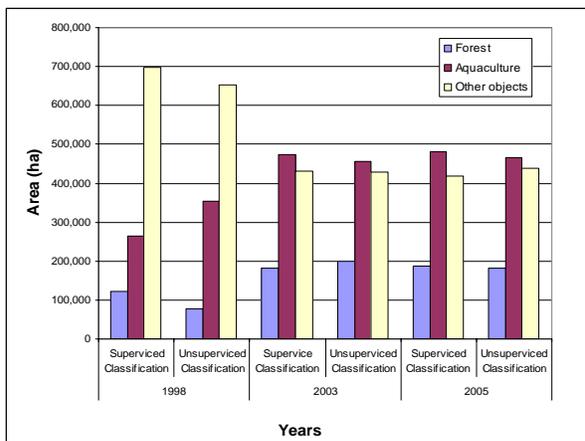
Aquaculture : 1998: 6-93



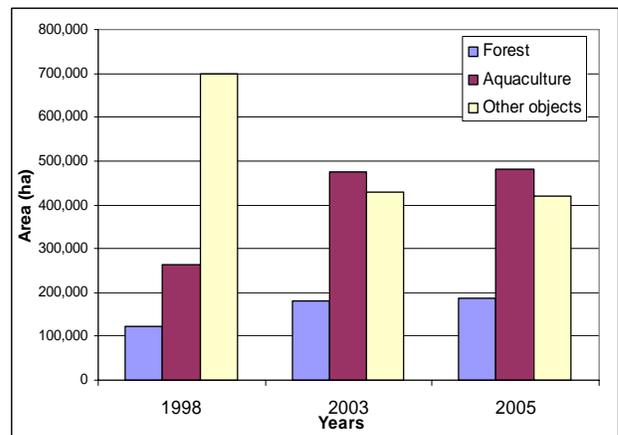
Forest 1998: 100-209



**Figure 3** : Histogram of forest, and aquaculture patterns in three Spot images

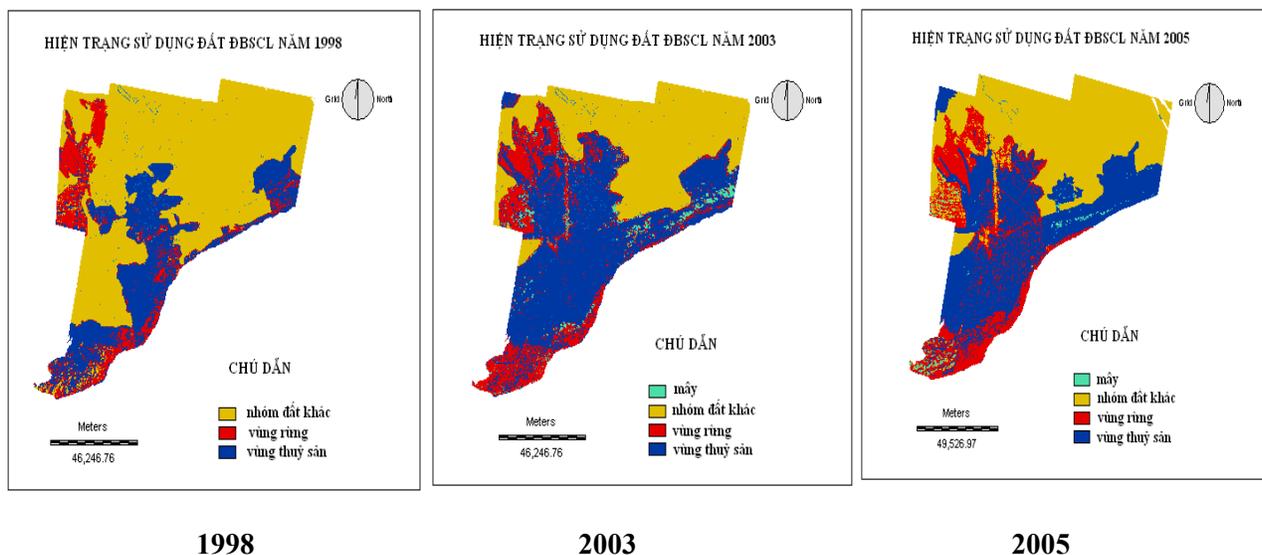


**Figure 4** : Diagram showing differences in supervised and unsupervised classification methods



**Figure 5** : Extent of land uses from 1998 to 2005

Figure 4 showing that, difference classification of land use, forest, aquaculture and others, give little differences. This explain that the clear differences of objects emission in three years, in which aquaculture give the lower emission than forest and others land uses. Because, aquaculture, such as shrimp, crab, or fish must be raised in flooded fields of saline water during the dry season.



**Figure 6:** Spatial distribution of land use zones in the research area

Figure 5 and 6 show the land use and land cover change matrix from 1998 to 2005. From the table, it is clear that there has been a considerable change during the 7-year period. Aquaculture have increased in area (by 122,587 to 185,765 ha) from 1998 to 2005, however it seems to be the same in 2005, this can be due to the stabilized of the suitable area, and the market. The same situation for forest, its area increased from 1998 to 2003 (by 264,498 to 481,073 ha), due to at this time the development of forest area from government policy. Others land use has decreased in the research area area (by 698,632 to 418,881 ha). This is explain that in Camau peninsula, the rapidly development of aquaculture by shifting rice cultivation to aquaculture, which give high income.

In the Camau peninsula, the forest areas were concentrated in the coastal areas along the Province of Camau, Bac lieu, and Soctrang. While aquaculture concentrated inland of Camau, Bac lieu, and Soc trang, much of the previous rice cultivation had been converted to aquaculture lands. Since the area of aquaculture increased, while rice cultivation decreased.

#### 4. Conclusion.

Precise results in this area are still lacking, but it seems that the rice cultivation and others land use areas have decreased and the land under aquaculture and forest have increased. However, it has to be noted that since the form of aquaculture with many patterns practices, such as shrimp, fish, crab, the changes from rice cultivation to aquaculture are difficult to distinguish from Spot quicklook satellite data.

Spot quicklook satellite imagery data and GIS methods have proved to have great potential for studies of the land use changes in the Camau peninsula. The data acquired so far and the results derived from it will form a useful geographic database for future research and governmental planning activities in the area, but at the broad extend For more detailed on land use patterns and more accuracy, higher resolution must be used.

#### References

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