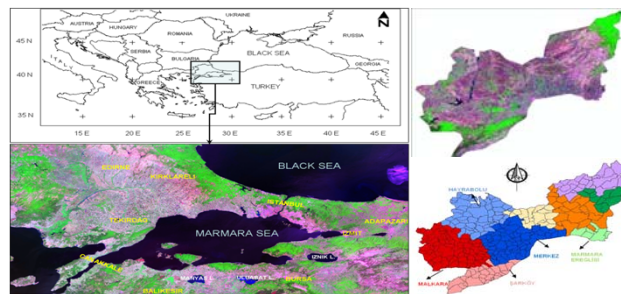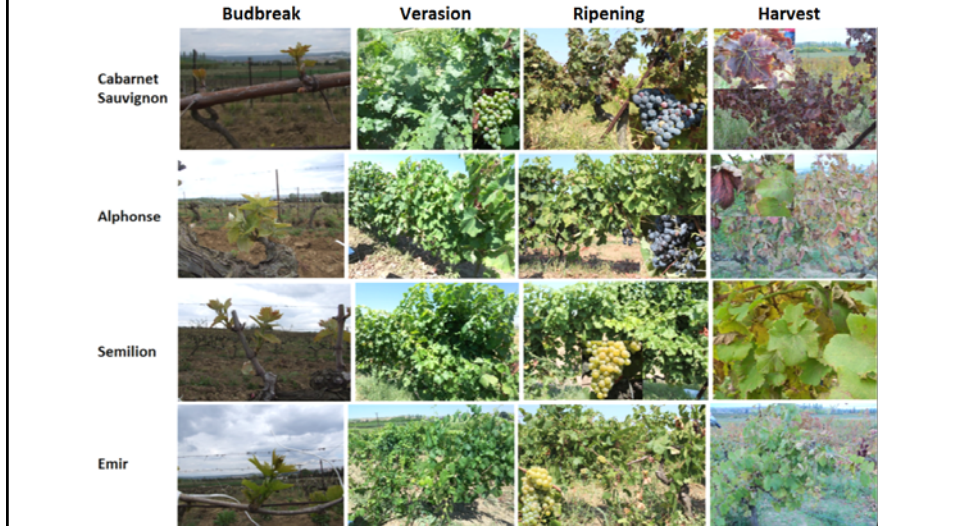# INTRODUCTION

- This study is a part of a research project supported by the Scientific and Technological Council of Turkey (TUBITAK) entitled "**Using Remote Sensing Technologies to Identify Grape Diversity and to Determine The Spatial Distribution of Vineyard Areas**".

- Some of the objectives of this project;
    - ✓ To conduct a pilot research to determine the spatial distribution of vineyard areas in Tekirdağ city,
    - ✓ To identify the grape diversity in Şarköy district,
    - ✓ To determine the boundaries, spatial and textural distributions of vineyard areas in Tekirdağ city,
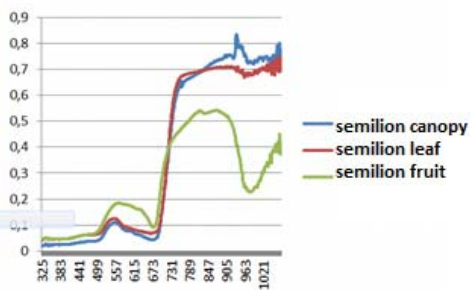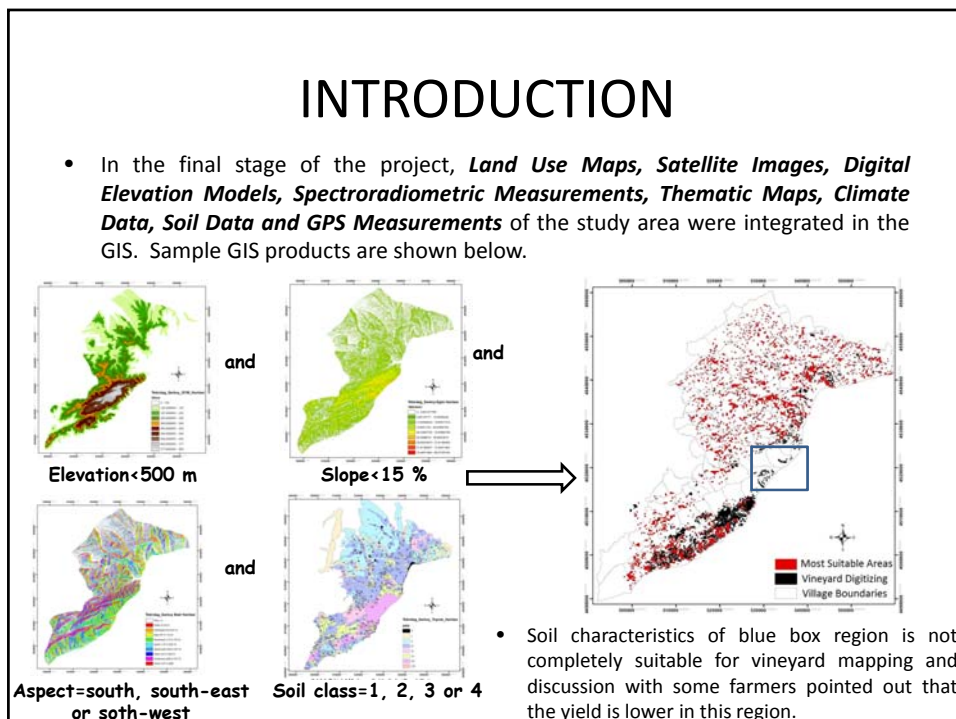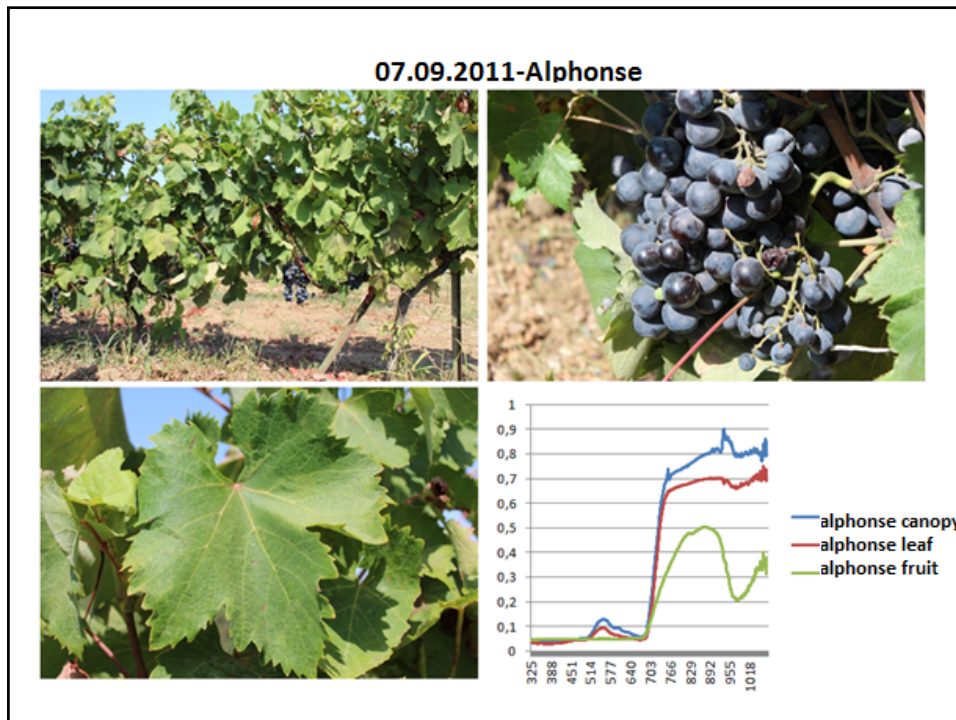
INTRODUCTION

- To make multitemporal spectroradiometric measurements and spectral libraries for economically valuable 38 different grape types of all phenological stages.

07.09.2011-Alphonse

INTRODUCTION

- In the final stage of the project, *Land Use Maps, Satellite Images, Digital Elevation Models, Spectroradiometric Measurements, Thematic Maps, Climate Data, Soil Data and GPS Measurements* of the study area were integrated in the GIS. Sample GIS products are shown below.

Elevation<500 m   and   Slope<15 %   and

Aspect=south, south-east or soth-west   and   Soil class=1, 2, 3 or 4

- Soil characteristics of blue box region is not completely suitable for vineyard mapping and discussion with some farmers pointed out that the yield is lower in this region.
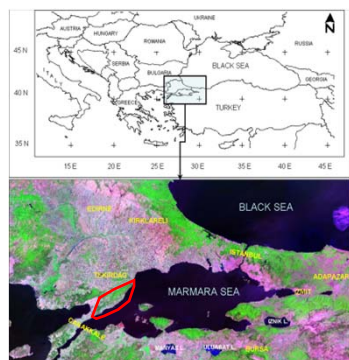
INTRODUCTION

- Remote sensing technology can be used to derive information about vineyard areas regularly, rapidly and cost-effectively.
- Spatial information about vineyard areas could be valuable input for vineyard management, precision viticulture and farmer registries.

- In this study:
  - ➢ Investigate the usage of different satellite images having different spatial resolutions namely SPOT-5 (2.5 m pan-sharpened), IKONOS (1 m pan-sharpened) and Worldview-2 (50 cm pan-sharpened) for vineyard mapping,
  - ➢ Examine the impact of spatial resolution on vineyard parcel identification and,
  - ➢ Propose the most appropriate data for vineyard applications.

Study Area

- The study area is located in Sarkoy, Tekirdag, lying on northwestern part of Turkey and northern part of the Marmara Sea.
- Sarkoy has an area of 555 km^2 providing the highest amount of grape production in Tekirdag city.
- Sarkoy has a mild climate near the shores of the Sea of Marmara.
- Yearly grape production for winemaking is around 52.000 tones and for table fruit the production is approximately 12.000 tones/year.

- Several grape types have been growth in Sarkoy district.
  - ➢Alphonse,
  - ➢Cinsault,
  - ➢Sauvignon Blanc,
  - ➢Semillon,
  - ➢Gamay,
  - ➢Riesling,
  - ➢Cardinal,
  - ➢Merlot and
  - ➢Shiraz

Data

- 30.07.2011 dated Worldview-2
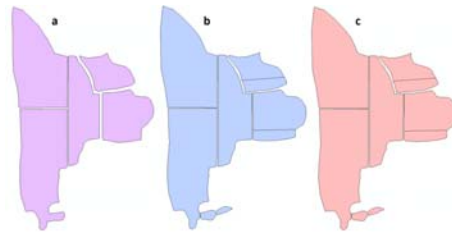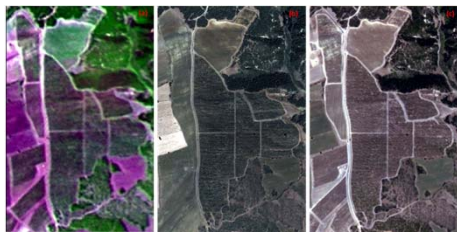- 13.08.2011 dated SPOT-5
- 05.2007 dated IKONOS

- Also a Digital Elevation Model of the study area resampled to 5m was created from 60 topographic maps with the scale of 1/25.000. ASTER GDEM digital elevation model was used to cover a small part (~ 8 % of the study area).

Methodolgy

- IKONOS image obtained from the Ministry of Agriculture has an average horizontal accuracy of 1 m since it was orthorectified using high precision Digital Elevation Model (DEM) and Ground Control Points collected via Differential Global Positioning System technique.
- This image was used as reference to orthorectify SPOT-5 and Worldview-2 data.
- In addition to GCPs obtained from IKONOs image, a (DEM) generated from 1/25.000 scaled topographic maps was used for the orthorectification of SPOT-5 and Worldview-2 images.
- Root Mean Suare error of geometric corrections were 2.5 m from SPOT-5 and 2 m from Worldview-2 image. All images were registered into Universal Transversal Mercator (UTM) projection system and zone 35 North.
- After geometric correction of satellite images three test sites were selected from all images to analyze the impact of spatial resolution on vineyard parcel identification.
- Vineyard boundaries were digitized from these three images for the related test sites to examine the performance.

Results

- Figure below illustrates vineyard parcels from the first study site.
- There are five big vineyard parcels with the areas changing from12 da to 40 da and two small parcels of 0.6 and 1 da.
- Digitization of three different images showed that although bigger parcels could be identified from three images, two small parcels could be only identified from Worldview-2 and IKONOS images but not from SPOT-5 image. These two small parcels seemed as the part of a big parcel within SPOT-5 image.
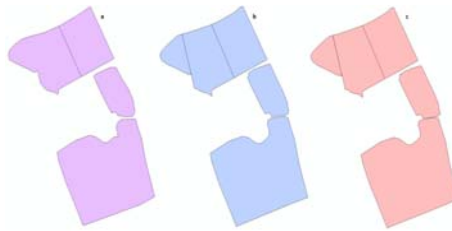

First test site a-)SPOT-5 data, b-)IKONOS data, c-) Worldview-2 data

Results

The second test site.

- Areas of the vineyard parcels obtained from digitization illustrated that there are linearly planted parcels of 1.6 to 15 da within this site.
- Although all of these parcels could be individually identified from IKONOS and Worldview-2 data, the smallest parcel of this region with 1.6 da area could not be identified from SPOT-5 and this small parcel was identified as the part of the closest bigger parcel from this satellite image.
- However, total area of two parcels identified as only one parcel in SPOT-5 was found as 6.2 da which was smaller than those obtained from IKONOS and Worldview-2 data (total of two parcels were approximately 6.6 da from both images).

Second test site a-)SPOT-5 data, b-)IKONOS data, c-) Worldview-2 data

Results

The third test site;

- All of the vineyards parcel planted in this region were either distributed or grid wise. Therefore the geometric distribution and texture of these parcels were different from the first two sites.
- Most of the parcels could not be identified individually from SPOT-5 data in this study area due to the texture but not size of the vineyard parcels. Even bigger parcels compared to the first and second site could not be extracted from SPOT-5 data due to the complex vineyard textures.
- Two or three individual parcels were labeled as only one parcel from this image.
- On the other hand, each individual vineyard parcel having areas between 0.5 to 12 da could be extracted from Worldview-2 data although their complex textures.
- Most of the individual parcels could be identified from IKONOS image however for two different parts of this site two parcels were identified as one parcel.

Results

Third test site a-)SPOT-5 data, b-)IKONOS data, c-) Worldview-2 data

Conclusions

- Overall results showed that all of three images (2.5 m SPOT-5, 1m IKONOS and 0.5 m Worldview-2) could be used for vineyard parcel identification; however, planting type and parcel size of vineyard parcels have significant importance for the parcel extraction.

- SPOT-5 data was successful to extract linearly planted vineyard parcel having size of 1 da or more as shown in the first and second test sites. However, for the third test site where most of the vineyard parcels were planted distributed or grid wise, SPOT-5 data was not successful to identify individual vineyard parcels due to their complex texture although most of the parcels had an area of 4 da or more.

- IKONOS data could produce significant results for linear planted vineyard parcels; however, there are some minor problems for the identification of distributed or grid wise parcels.

- Worldview-2 data was successfully used to distinguish all parcels of three different sites whatever the size and the texture of the vineyard parcels.

- The results of this study illustrated the importance of remote sensing technologies to monitor and map vineyard areas accurately and emphasized the impact of spatial resolution on vineyard parcel identification.

- Also, spatial information about vineyard areas derived from satellite images could be valuable input for vineyard management, precision viticulture and farmer registries.

- *Thank you...*

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ITU, Istanbul Technichal University – Turkey