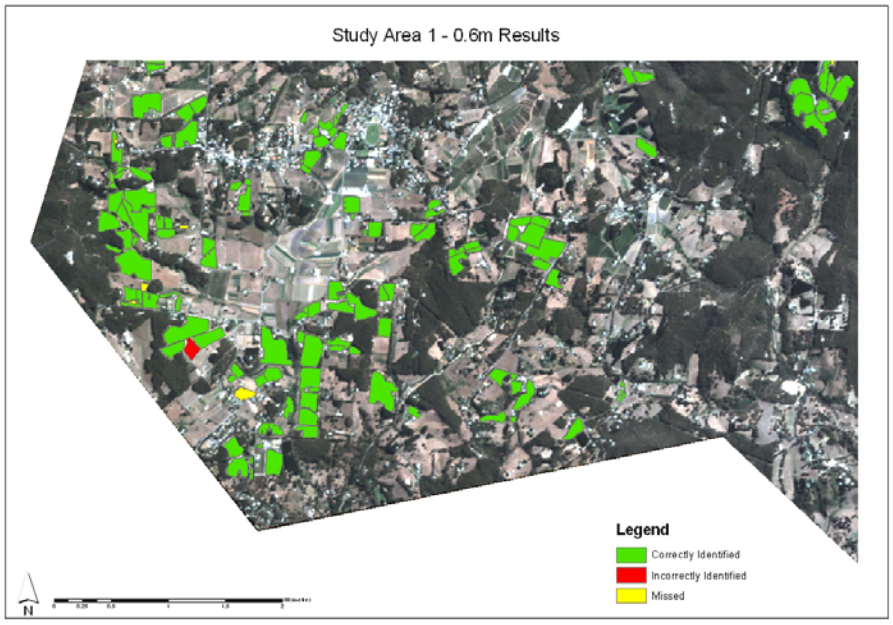
Phylloxera and Grape Industry Board of South Australia

Australian Government
Grape and Wine Research and Development Corporation

AN INVESTIGATION INTO THE FEASIBILITY OF ESTABLISHING A NATIONAL VINEYARD DATABASE USING SATELLITE IMAGERY



FINAL REPORT to
GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: **PGI 05/02**

Principal Investigator: **Karen Hansen**

Research Organisation:
Phylloxera and Grape Industry Board of SA

Date: **7 July 2006**



Phylloxera and Grape Industry Board of South Australia

AN INVESTIGATION INTO THE FEASIBILITY OF ESTABLISHING A NATIONAL VINEYARD DATABASE USING SATELLITE IMAGERY

July 2006

Report prepared by the Phylloxera and Grape Industry Board of SA
By K Hansen, M Nolan and P Hackworth

TABLE OF CONTENTS

ABSTRACT....3
EXECUTIVE SUMMARY....4
BACKGROUND....5
PROJECT AIMS AND PERFORMANCE TARGETS....8
METHOD....9
RESULTS....14
DISCUSSION....17
CONCLUSION....19
RECOMMENDATIONS....19
APPENDIX A - Abbreviations, Acronyms, and Terms....21
APPENDIX 1: COMMUNICATIONS....22
APPENDIX 2: INTELLECTUAL PROPERTY....23
APPENDIX 3: REFERENCES....24
APPENDIX 4: STAFF....25
APPENDIX 6: BUDGET RECONCILIATION....26

ABSTRACT

Research was undertaken to evaluate the effectiveness of satellite imagery to differentiate vineyards from other horticultural production. Imagery was captured at 3 spatial resolutions (0.6m, 2.4m and 4.8m) of the Adelaide Hills, a wine region where a high degree of diverse row crops is known to exist. Datasets of vineyard boundaries were created using manual heads-up digitising and the accuracy of each dataset (0.6m, 2.4m and 4.8m) was assessed against a known highly accurate vineyard dataset (The Phylloxera and Grape Industry Board of South Australia's vineyard register). The study confirmed that an accurate vineyard dataset could be established using satellite imagery at a resolution of 0.6 m or better. Recommendations for creating a national vineyard dataset were made based on the findings of this study.

EXECUTIVE SUMMARY

The Australian wine industry has indicated for a number of years that a national vineyard database could assist industry planning and management. In 2005, the *Rural and Regional Affairs and Transport References Committee of the Australian Senate* in its report, *The Operation of the Wine-Making Industry (2005)*, recommended the establishment of a national register of vines.

An accurate record of national wine grape plantings (including geographic locations) could assist in pest and disease management, estimating grape supply, infrastructure planning and environmental management.

The project objectives were:

- Identify the most cost effective resolution of satellite imagery that can be used to create an accurate database of vineyard boundaries
- Estimate the cost to create a national vineyard geographic database

The project was conducted in the Adelaide Hills in South Australia, which was chosen due to the variety of trellised row crops such as apples, pears, cherries and flowers in proximity to the vineyards.

Imagery was supplied by the DigitalGlobe, Quickbird satellite at two ground resolutions, 0.6 and 2.4 ms. The 2.4 m imagery was re-sampled to 4.8m. Vineyards were identified from satellite imagery and created manually using heads-up digitizing. Once a vineyard was identified, the block boundaries were manually digitized, ie drawn on screen and saved in a GIS vector file.

The digitised vineyard blocks identified from the satellite imagery were compared to a highly accurate vineyard database. A measure of accuracy was calculated using the following formula and represented as a percentage in the results section.

$$\text{Accuracy} = \frac{\text{Correctly identified vineyards} + \text{omitted vineyards}}{\text{Total vineyards}}$$

Project Results

0.6m Image Resolution
Accuracy for correct vineyard identification from the 0.6m imagery was averaged at 96 percent. At this resolution, visual identification was significantly assisted by the ability to distinguish and measure row widths.

2.4m Image Resolution
Accuracy for correct vineyard identification from the 2.4m imagery was 61 percent.

4. m Image Resolution
The 4.8m imagery was too coarse for visual identification.

Project Conclusion

The establishment of a national vineyard dataset using very high-resolution satellite imagery as a means of base information to capture vineyard boundaries is feasible at 0.6 m resolution. However, unless additional information can be provided to refine the GI region capture area,

the cost is very high. Given the existence of government and industry-owned datasets that contain vineyard location data, reducing the capture area is possible if all parties are committed to a national vineyard dataset. The dataset would enable the Australian wine industry to accurately measure the total area under vines and to map the location of at least 98% of vineyards.

Recommendations

The authors believe that the construction of national dataset of vineyards, utilising satellite imagery, is realistic only if the target area for capture can be significantly reduced by the use of existing data sources.

The final dataset would include vineyard boundaries and an accurate measurement of the vineyard area. It would not include varietal type or property ownership details. These could be added as a later enhancement

The issues of ownership, ongoing maintenance and project stakeholders of a national vineyard dataset will need to be considered.

A two-stage process is recommended for achieving a national vineyard dataset. Progress to the second stage would only occur with the consent of the project partners.

Stage One - Scoping Study

1. Identify existing data sources which will assist refining the area of interest. These include
    a. All publicly and privately held datasets containing property use information that identifies the location of vineyards. The cost to use these datasets will need to be determined. If a truly national project, the dataset owners may be willing to provide access as an in-kind contribution.
    b. Aerial and satellite imagery of the wine regions (may also be contributed in-kind).
2. Prepare preliminary maps of the refined imagery capture area and check against local knowledge (this has the added benefit of engaging local industry in the project).
3. Finalise imagery capture area.
4. Identify partnering opportunities for acquiring new imagery. These may include government land management authorities, local government and vineyard owners and wine companies.
5. Prepare a report with an estimate of the cost to:
    a. Acquire and process imagery
    b. Construct the dataset.
    c. Maintain and manage the dataset

The estimated cost for this stage is $70,000

Stage Two - Dataset Construction

1. Secure use of publicly and privately held datasets for the project
2. Purchase ortho-rectified satellite imagery

3. Define methodology for dataset construction
4. Create dataset of vineyard boundaries
5. Verify by ground-truthing status of properties where land use is unclear
6. Create final dataset

Cost estimation of this stage is not possible without stage 1 results.

BACKGROUND

The Australian wine industry has indicated for a number of years that a national vineyard database could assist industry planning and management. In 2005, the *Rural and Regional Affairs and Transport References Committee of the Australian Senate* in its report, *The Operation of the Wine-Making Industry (2005)*, recommended the establishment of a national register of vines.

An accurate record of national wine grape plantings (including geographic locations) could assist in pest and disease management, estimating grape supply, infrastructure planning and environmental management.

Two current examples of vineyard datasets are:

- In 2003, the European Community funded a research and development project ('Bacchus') with the aim of providing vineyard management organisations with a solution to meet their information requirements based on the use of very high-resolution imagery and Geographical Information Systems (GIS). (Aranda & Martinez, 2003).
- In Australia, the Phylloxera & Grape Industry Board of South Australia (PGIBSA) is unique in maintaining a register of South Australian vineyards greater than 0.5 hectares. Information captured includes owner contact details, planting details such as area, variety, rootstock and year planted. Vineyard boundaries are also mapped using Geographic Information System (GIS) technology and aerial imagery.

Given current availability of very high-resolution satellite imagery, it is now more feasible to utilise spatial technology to establish a nationwide vineyard boundary dataset. This project, 'An investigation into the feasibility of establishing a national vineyard register using satellite imagery', had the following objectives:

- Identify the most cost effective resolution of satellite imagery that can be used to create an accurate database of vineyard boundaries
- Estimate the cost to create a national vineyard geographic database

PROJECT AIMS AND PERFORMANCE TARGETS

The project objectives were:

1. Identify the most cost effective resolution of satellite imagery that can be used to create an accurate database of vineyard boundaries
2. Estimate the cost to create a national vineyard boundary database.

Output and performance targets 2005-2006

Outputs	Performance targets
1. Identify and map vineyard boundaries (digitize) from the study region using satellite imagery at three spatial resolutions (0.6 m, 2.4 m and 4.8 m)	April 2006- Obtain satellite imagery at the test spatial resolutions (0.6 m, 2.4 m, 4.8 m) May 2006- Map vineyard boundaries at the different spatial resolutions. June 2006- Compare the accuracy of each test resolution with a known highly accurate vineyard register. (PGIBSA's vineyard register).
2. Final report	July 2006 Complete time/accuracy analysis and measured against imagery acquisition costs. July 2006 Extrapolate results to estimate cost of creating a national vineyard register.

METHOD

Project Area

The project was conducted in a 25km²section of the Adelaide Hills in South Australia (Figure 1). This region is predominately used for horticulture and was chosen due to the variety of trellised row crops such as apples, pears, cherries and flowers in proximity to the vineyards. Such an area was required to accurately assess the potential to distinguish vines from other forms of agriculture at various image resolutions.

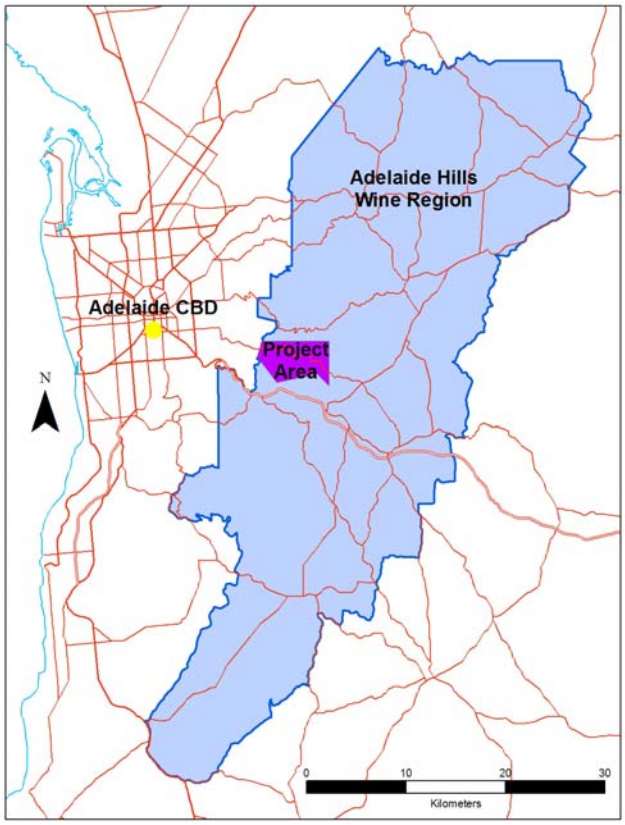


Figure 1: Project area in the Adelaide Hills wine region, South Australia.

Satellite Imagery

Three spatial resolutions were originally proposed for the project: 5m, 2.5m and 0.6m.

Resolution refers to the image pixel size. The higher the resolution, the more detail is captured; this is represented by a numerically smaller pixel size. The cost of capturing data also increases with increasing resolution

Imagery was supplied by the DigitalGlobe Quickbird satellite at two ground resolutions:

- 0.6m natural colour composite (0.6m panchromatic (Pan) merged with 2.4m multispectral (MS) also referred to as Pan-Sharpened (PanSh) (Figure 2)
- 2.4m MS. (Figure 3)

The 2.4m imagery was re-sampled (geometrically transformed) to 4.8m to provide the third level of resolution for analysis. (Figure 4)



Figure 2: QuickBird 0.6 m colour composite imagery used in the project. This image also illustrates the variable land use in the study area – only one vineyard can be found in this scene as bounded in white.[1]



Figure 3: QuickBird 2.4m colour imagery in the same area.

[1] This report includes satellite imagery from © 2006 Digital Globe, Inc. ALL RIGHTS RESERVED.



Figure 4: QuickBird 4.8m re-sampled colour imagery in the same area.

Imagery for the project was located to its correct spatial location and orientation on the earth for use as a backdrop in GIS using the Universal Transverse Mercator projection (Zone 54) and Geocentric Datum of Australia 1994. This process is known as geo-rectification.

While geo-rectification locates the image on the earth surface it does not correct additional distortion in the imagery due to topographical variations in the earth surface and satellite tilt. The process of ortho-rectification removes this distortion, but adds significantly to imagery cost and is not necessary to distinguish grapevines from other row crops (as required for this project). However, ortho-rectification is essential if accurate boundaries and vine area are required.

Imagery for the project was supplied geo-rectified but not ortho-rectified and as a result the ground accuracy of each pixel is estimated at +/- 15-30 metres allowing for satellite tilt and terrain variation.

Software

Software utilised for the project:

- ESRI ArcView 8.3 (Geographic Information System)
- Leica Geosystems Imagine8.x (Image Processing software)

Vineyard identification and dataset construction

Vineyards were identified from satellite imagery and created manually using heads-up digitizing. Heads-up digitizing is the processes of visually identifying vineyards from imagery and manually 'tracing' perimeters on screen using ArcView 8.3 GIS software.

While automatic and semi-automatic image classification tools are available and were investigated using 4.8m resolution imagery (refer below), manual classification has been shown to be more accurate and faster. Freeman, J. (2005) and (Aranda & Martinez, 2003).

Heads-up digitizing of vineyard block boundaries was completed using ESRI ArcView 8.3 and involved reviewing imagery to visually identify vineyard blocks. Once a vineyard was identified, the block boundaries were manually digitized, ie drawn on screen and saved in a GIS vector file (Figure 5).

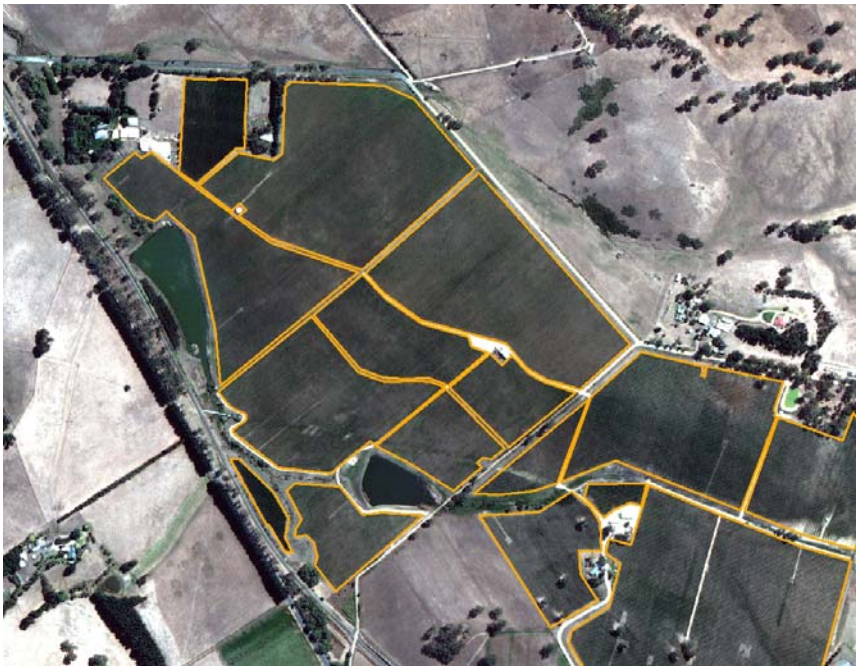


Figure 5: example of digitized vineyard boundaries

Operators

Two operators, one with two years and the other 3 months related experience, undertook the identification of vineyards. Training in vineyard identification was provided to the less experienced operator.

Distinguishing vineyards from other like crops

The study area was selected due to its considerable agricultural diversity. Pattern recognition of row plantings along measurement of row widths were the primary methods used to differentiate vineyards from other trellised and/or row crops. Apples, pears, cherries and flowers have a similar appearance to vines from the air (Figure 6) but vineyard row widths are narrower, generally 2.5 to 3.5 metres in the Adelaide Hills region.





Figure 6: Typical orchard in the study area with similar row plantings to vines as seen on the ground and from the air.

Accuracy Assessment

The digitised vineyard blocks identified from the satellite imagery were compared to the PGIBSA GIS vineyard database in order to confirm/refute their vineyard status. The PGIBSA vineyard database was audited using imagery and from ground verification in 2005 and was considered the most accurate database available. Correct and incorrect vineyards were determined and tallied. A measure of accuracy was calculated using the following formula and represented as a percentage in the results section.

$$Accuracy = \frac{Correctly\ identified\ vineyards + omitted\ vineyards}{Total\ vineyards}$$

RESULTS

0.6m Image Resolution

Accuracy for correct vineyard identification from the 0.6m imagery was averaged at 96 percent (Table 1).

Table 1: Results of vineyard identification for 0.6m imagery

Operator	Vineyards correctly Identified	Vineyards incorrectly Identified	Vineyards missed	Total vineyards in study area	Identification Accuracy	Time (minutes)/ km^2
1	132	1	6	138	**95%**	**3**
2	143	1	3	146	**97%**	**3**

The average time taken to identify and digitise vineyards in the project area was three minutes/km².

The value of 'Total vineyards in study area' values (see table 1) vary due to the way in which each operator defined individual vineyard blocks. For example a vineyard headland may or may not be perceived to divide a vineyard for different operators.

At this resolution, visual identification was significantly assisted by the ability to distinguish and measure row widths. Due to the low spatial accuracy, the measured row widths did contain error, contributing to some uncertainty at the extremes of this width range and accuracy would have been improved with the use of more spatially accurate (ortho-rectified) imagery.

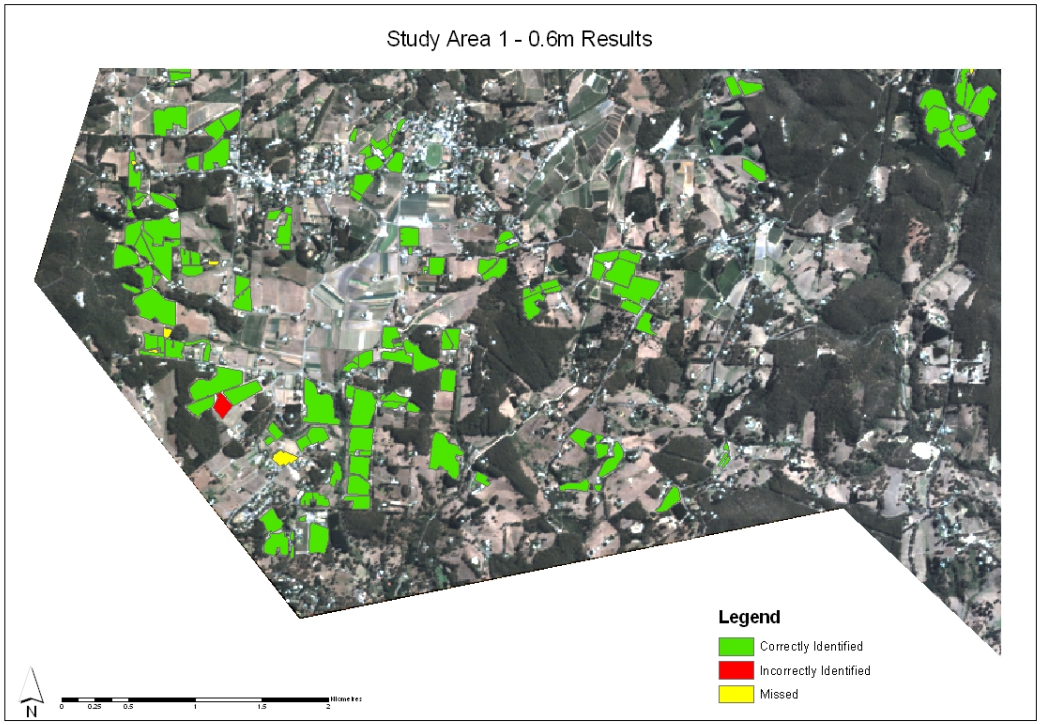


Figure 7: Study area 1 - Vineyard identification accuracy obtained from the 0.6m resolution imagery by operator 1

2.4m Image Resolution

Both operators found visual identification using the 2.4m imagery significantly more difficult than using 0.6 m imagery as rows could not be distinguished or measured at this scale. Each image pixel is 2.4m wide which is comparable to the width of a vineyard row; as a result information seen in each pixel is a mixture of vine foliage and inter-row detail (Figure 3) Identification was therefore based on the assumption that any square or oddly shaped block was a vineyard. Many features were incorrectly identified at this resolution (Figure 8).

Accuracy for correct vineyard identification from the 2.4m imagery was 61 percent. (Table 2). Time taken to process one square kilometre was 6 minutes.

Table 2: Results of vineyard identification for 2.4 m imagery

Vineyards correctly Identified	Vineyards incorrectly Identified	Vineyards missed	Total vineyards in study area	Identification Accuracy	Time (minutes/km^2)
135	44	14	149	**61%**	**6**

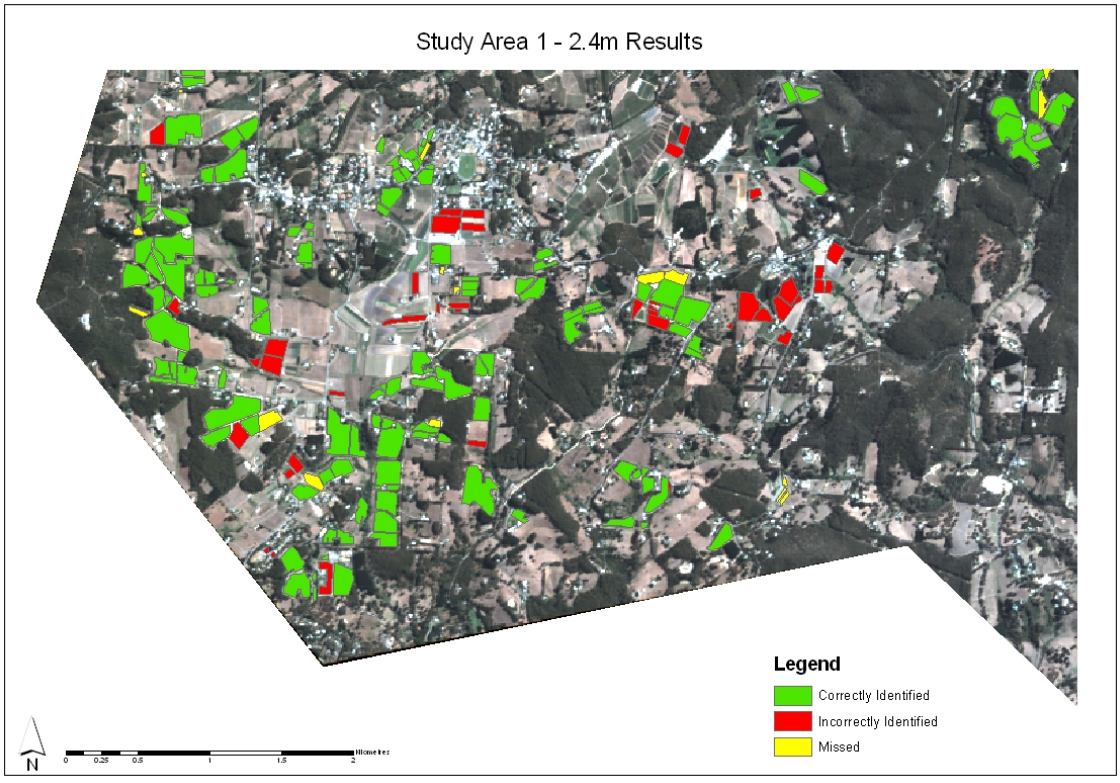


Figure 8: Study area 1 - Vineyard identification accuracy obtained from the 2.4m resolution imagery.

4.8m Image Resolution

The 4.8m imagery was too coarse for visual identification (Figure 4). A semi-automated method of vineyard classification was applied to the 4.8m imagery using specialist image processing software. Image classification is best applied to coarse resolution imagery as pixel 'noise' is reduced. The supervised (Maximum Likelihood) classification of the imagery was performed using ERDAS Imagine software. Statistics were collected over sites with different land cover such as pasture, water, bare earth, and native vegetation and spectral signatures

extracted. A spectral signature is a reflectance value of a feature on the land recorded by the satellite. This information was used in the classification algorithms to allocate each pixel in the image to the most likely class represented by the training sites.

Figure 9 illustrates the results of the image classification with a majority filter applied. Green areas were determined to be vineyard by the process while red boundaries indicate actual vineyard location. This process could not accurately discriminate vineyards from other vegetation because of the similarities in the 4-band spectral signatures of vine and non-vine crops.

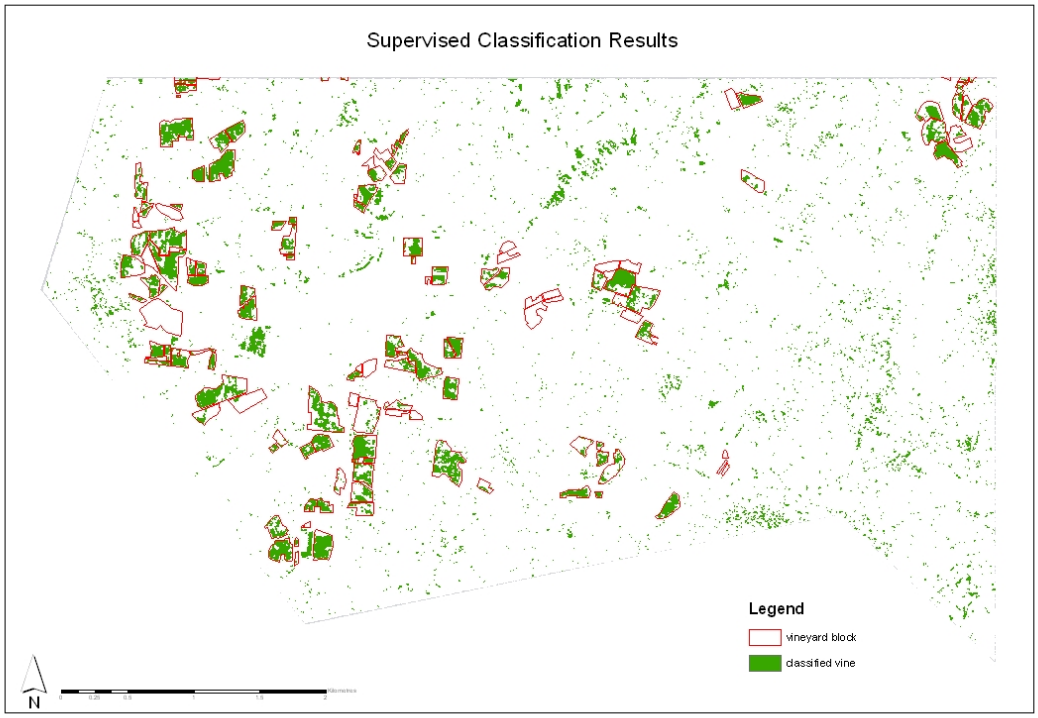


Figure 9: Results of image classification

DISCUSSION

This study demonstrates that satellite imagery can be an effective tool for identifying vineyards. However, very-high resolution imagery of 0.6m is required to reliably distinguish and accurately capture vineyard boundaries and distinguish them from other crops and horticulture. Vineyard cannot be accurately identified from 2.4m or 4.8m resolution imagery.

When using imagery at 0.6m resolution to identify and capture vineyard boundaries an accuracy of 96% was achieved. The results were similar regardless of operator experience, suggesting that highly technical expertise is not required.

Ortho-rectification of imagery was not necessary to achieve the outcomes of this project, but would be if the desired outcomes were the production of accurate maps and accurate measurement of vineyard area. Ortho-rectification adds approximately 30% to the cost of acquiring satellite imagery.

At 0.6m resolution, vineyard row widths can be readily distinguished from other row crops regardless of the time of year, even imagery of defoliated vines could be used. This opens the opportunity to use archived satellite imagery, which is sold at a significant discount to custom flown.

This project utilised a known data source to determine discrimination accuracy. Where such a data source is unavailable a verification process, ground truthing, would be required.

The study area contained a diverse array of horticulture with row plantings. In regions where vineyards are the dominant land-use, identification accuracy and timing would be further improved, as it would be less difficult to distinguish vines from other agriculture.

Cost estimate and implications of the establishment of a national vineyard dataset

Figure 10 illustrates all Geographical Indications (GI) for Australia, which covers some 332,000km^2 (33,200,000Ha). It is estimated that less than 0.5 percent of this land area is actually under vine however unless additional information can be sourced to refine specific locations of vines, imagery must be acquired for this entire area.

The imagery could cost between $4.5 - $5.5 million and extracting the vineyards would take, we estimate, 16,000 hours at a cost of approximately $400,000 (Table 3) based on project results.

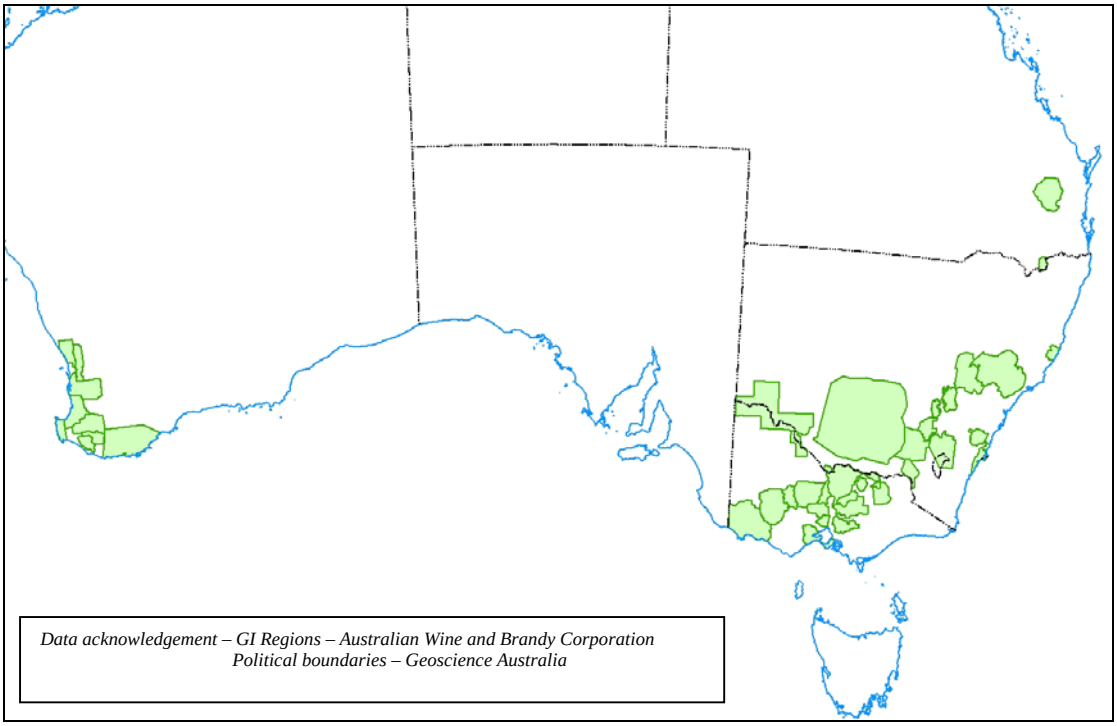


Figure 10: Geographical Indications for Australian winemaking regions excluding South Australia.

Table 3 Indicative costs to purchase imagery with a ground resolution of 1m or less for all GI Region extents in Australia (excluding South Australia).

Item	Indicative Cost	Comment
IMAGERY		**Excludes South Australia**
***Imagery option* – QuickBird 0.6m (3 band) colour imagery**	Based on 332,000km2	• Pan-Sharpening processing costs included
• Custom Capture OR	$5,570,000 (indicative pricing only) OR	• Can specify when imagery is captured and guaranteed to only receive imagery with <20% cloud cover.
• Archive	$4,560,000 (indicative pricing only)	• No guarantee that scenes will be free of cloud.
Additional data and processing costs to ortho-rectify imagery	Add approximately 30% to above costs	• The GCP and DEM information is only purchased once. It can then be used again for all subsequent image capture projects.
Labour to extract vineyard boundaries	$400,000	• Based on 16,000 hours @ $25/hour

While the cost could be reduced by up to 20% by using archived imagery, major savings will only come from reducing the area captured. This can be achieved by using:

- Local, State and Federal spatial datasets relating to land ownership and use.
- Datasets owned by wine companies. A number of the larger wine companies have created GIS datasets of both their own and contracted vineyards
- Aerial image archives held by private and government agencies acquired of vineyard regions
- Local knowledge from industry professionals

CONCLUSION

The establishment of a national vineyard dataset using very high-resolution satellite imagery as a means of base information to capture vineyard boundaries is feasible at 0.6m resolution. However, unless additional information can be provided to refine the GI region capture area, the cost is very high.

Given the existence of government and industry-owned datasets that contain vineyard location data, considerable reduction of the capture area is possible if all parties are committed to a national vineyard dataset.

The dataset would enable the Australian wine industry to accurately measure the total area under vines and to map the location of at least 98% of vineyards. The dataset would also be a major asset for infrastructure planning, research and mapping disease.

RECOMMENDATIONS

The authors believe that the construction of national dataset of vineyards, utilising satellite imagery, is realistic only if the target area for capture can be significantly reduced by the use of existing data sources. The dataset would include vineyard boundaries and an accurate measurement of the vineyard area. It would not include varietal type or property ownership details. These could be added as a later enhancement

The issues of ownership, ongoing maintenance and project stakeholders of a national vineyard dataset will need to be considered.

A two-stage process is recommended for achieving a national vineyard dataset. Progress to the second stage would only occur with the consent of the project partners.

Stage One - Scoping Study

1. Identify existing data sources which will assist refining the area of interest. These include
    a. All publicly and privately held datasets containing property use information that identifies the location of vineyards. The cost to use these datasets will need to be determined. If a truly national project, the dataset owners may be willing to provide access as an in-kind contribution.
    b. Aerial and satellite imagery of the wine regions (may also be contributed in-kind).
2. Prepare preliminary maps of the refined imagery capture area and check against local knowledge (this has the added benefit of engaging local industry in the project).
3. Finalise imagery capture area.
4. Identify partnering opportunities for acquiring new imagery. These may include government land management authorities, local government and vineyard owners and wine companies.
5. Prepare a report with an estimate of the cost to:
    a. Acquire and process imagery
    b. Construct the dataset.

c. Maintain and manage the dataset

The estimated cost for this stage is $70,000

Stage Two - Dataset Construction

1. Secure use of publicly and privately held datasets for the project
2. Purchase ortho-rectified satellite imagery
3. Define methodology for dataset construction
4. Create dataset of vineyard boundaries
5. Verify by ground-truthing status of properties where land use is unclear
6. Create final dataset

Cost estimation of stage 2 is not possible without stage 1 results.

APPENDIX A - Abbreviations, Acronyms, and Terms

Abbreviations and Acronyms, contains a listing of the abbreviations and acronyms and their associated meaning as used in this document.

Abbreviation or Acronym	**Meaning/Definition**
PGIBSA	Phylloxera & Grape Industry Board of SA
MS	Multispectral
Pan	Panchromatic
PanMS	Panchromatic and Multispectral
PanSh	Pan-sharpened Natural Colour or Colour Infrared
GIS	Geographic Information System
SIS	Spatial Information Systems
GI	Geographical Indication
GCP	Ground control points – accurate coordinates on the earth that can be related back to the image.
DEM	Digital elevation model
Pixel	Picture Element – smallest element comprising a digital image.
Spatial Resolution	Image pixel size. Eg. a 1 metre pixel size represents 1m resolution.
Multispectral	Imagery with data recorded in 4 discrete spectral bands.
Remote Sensing	The measurement or acquisition of data about an object by an instrument not in contact with the object. Satellite imagery, aerial photography, and radar are all types of remote sensing.
Spatial Dataset	Database containing both textual and geographic (map) information of features on the earth.
Spectral signature	A reflectance value of a feature on the land recorded by a remote sensor such as a satellite.

APPENDIX 1: COMMUNICATIONS

The results of this project will be reported to the wine industry via articles submitted to *Australian Viticulture, National Grapegrowers and Australian Grapegrower and Winemaker.*

APPENDIX 2: INTELLECTUAL PROPERTY

Any intellectual property created from this project is for public domain use

APPENDIX 3: REFERENCES

Montesinos Aranda, S. & Bea Martinez, M. (2003) Methodological approach for vineyard inventory and management. Bacchus project. Presented at the 6th Inter-Regional Conference on Environment-Water, 3-5 September 2003. ISBN: 84-688-3144-1 pg 1-9

Freeman, J (2005) Pragmatic Remote Sensing. Position – The Australasian Magazine of Surveying, Mapping and GeoInformation. 19: 51-53.

APPENDIX 4: STAFF

The following people contributed to this project:

- Karen Hansen, GIS Project Officer, Phylloxera and Grape Industry Board of SA
- Martin Nolan, GIS Project Officer, Phylloxera and Grape Industry Board of SA
- Peter Hackworth, Chief Executive, Phylloxera and Grape Industry Board of SA

APPENDIX 6: BUDGET RECONCILIATION
GRAPE & WINE RESEARCH & DEVELOPMENT CORPORATION

Statement of Receipts and Expenditure - **FORM B**

Reconciliation Funding for 2005/06

Trust Fund :	RESEARCH TRUST FUND	FUNDING	$
Project No:	PGI 05/02	Salaries	7,325
Grantee:	Phylloxera and Grape Industry Board of SA	Travel	
Title of Project:	AN INVESTIGATION INTO THE FEASIBILITY OF ESTABLISHING A NATIONAL VINEYARD DATABASE USING SATELLITE IMAGERY	Operating	12,675
		Capital	
		Total Funding	20,000

EXPENDITURE										
	Salaries		Travel		Operating		Capital		Total	
	$	¢	$	¢	$	¢	$	¢	$	¢
A Uncommitted (c/f 1 July)										
B Outstanding Commitments (c/f 1 July)										
C Refunds of funding										
D Cash Received From Trust Fund										
E Approved transfers (from Form C)										
F Cash available (A+B-C+D±E)										
G Expenditure	8,951				10,876				19,827	
H Outstanding Commitments (30 June)										
I Total funds Committed (G-H)										
J Uncommitted (30 June) (F-I)										
K Other income (Paid to Trust Funds)										

Note : *Row B should be the same as Row H from the previous year and Row A the same as Row J from the previous year.*

I hereby certify that this statement of expenditure is correct.

……. ……. …….

Signature Printed Name Date