

Industry allocated project number

PHI allocated project number

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*Indicate (X) client(s) to whom this concept project proposal is submitted. Replace any of these with other relevant clients if required.*

**NB: The instructions in red, throughout the template, should be omitted from the final document.**

## FINAL REPORT (Type reporting year)

### 1. PROGRAMME AND PROJECT LEADER INFORMATION

	Research Organisation Programme leader	Research Team Manager	Project leader
<b>Title, initials, surname</b>	Prof. Gerhard Pietersen	Prof. Gerhard Pietersen	Prof. Gerhard Pietersen
<b>Present position</b>	Specialist Scientist and Extra-Ordinary Professor	Specialist Scientist and Extra-Ordinary Professor	Specialist Scientist and Extra-Ordinary Professor
<b>Address</b>	ARC-PPRI, c/o Dept. of Microbiology and Plant Pathology, University of Pretoria, 0002	ARC-PPRI, c/o Dept. of Microbiology and Plant Pathology, University of Pretoria, 0002	ARC-PPRI, c/o Dept. of Microbiology and Plant Pathology, University of Pretoria, 0002
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### 2. PROJECT INFORMATION

<b>Research Organisation Project number</b>	PPRI 11-16
<b>Project title</b>	Dissemination of information on Grapevine leafroll disease control
<b>Short title</b>	Leafroll technology transfer

<b>Fruit kind(s)</b>	Wine grapes		
<b>Start date</b> (mm/yyyy)	April, 2012	<b>End date</b> (mm/yyyy)	April, 2015

<b>Key words</b>	Grapevine leafroll disease, technology transfer, presentations
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Approved by Research Organisation Programme leader (tick box)

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### 3. EXECUTIVE SUMMARY

*This must report on the **ENTIRE** project. Address the objectives and milestones of the project as well as the impact of the study on the industry.*

### 4. PROBLEM IDENTIFICATION AND OBJECTIVES

Research data which addresses an industry problem is of limited use if it is not disseminated to producers, where the information needs to be applied. In this project our objective is to introduce, to a wide audience of producers, consultants, viticulturists, estate owners and policy makers, new information on the field of grapevine leafroll disease, focussing primarily on control.

### 5. WORKPLAN (MATERIALS AND METHODS)

The following aspects will be addressed:

1. One popular article will be prepared annually for Winelands on an aspect of grapevine leafroll disease control.
2. Three oral presentations will be presented annually on aspects of grapevine leafroll epidemiology and control at farmer days, Vinpro road shows, producer study groups or industry workshops.
3. Information sheets on aspects of leafroll will be updated, if needed (new information available) or once during the course of this project.
4. Viticulturalists, estate owners and managers will be consulted on a regular basis on aspects of grapevine leafroll control on their estates. Help to analyse their leafroll situation and provide input on control strategies.
5. International research on grapevine leafroll will constantly be assessed through study of scientific literature on an ongoing basis, and determine what can be applied, or requires investigation locally.
6. One international specialist conference on Viruses of Grapevines, including grapevine leafroll scheduled for the first year (2012) of this project will be attended.
7. Any information gleaned from collaboration on leafroll control strategies being conducted in New Zealand will be adopted for local use.
8. Meetings of specialist committees involved in research or application of grapevine leafroll controls (eg. Vine Improvement Association) will be attended annually.
9. Winetech funded studies done thus far on leafroll will be published.

### 6. RESULTS AND DISCUSSION

Technology transfer of leafroll control achieved in this truncated, 3-year project by; 1) preparing one popular article, and having interviews for a further four popular articles on this topic, 2) This document is confidential and any unauthorised disclosure is prohibited

present 17 oral presentations on aspects of leafroll control to producers, related industries and consultants, 3) Consult widely when requested for assistance in setting up leafroll control strategies on estates, 4) Attend two international conferences and give presentations on leafroll control, 5) stay abreast with literature on leafroll control, 6) publish three articles on aspects of leafroll control, and 7) write 12 brochures on aspects of leafroll control for popular consumption.

**7. COMPLETE THE FOLLOWING TABLE**

Milestone	Target Date	Extension Date	Date completed	Achievement
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<p>1. One popular article annually</p>			<p>PIETERSEN, G., SPREETH, N., OOSTHUIZEN, T., VAN RENSBURG, A, VAN RENSBURG, M., TOOTH, D LOTTERING, D., AND ROSSOUW, N. 2012. Towards eradication of grapevine leafroll disease on Vergelegen, 2002 – 2011. Wynboer Technical Yearbook 2012. Page 85-86</p> <p>Conduct interviews for various popular articles on leafroll control, 2 written by Edo Heyn, one for “Tong” magazine, Netherlands, one in New Zealand, One at University of Pretoria Website, one for Farmers Weekly.</p>
<p>2. 3 oral presentations annually</p>			<p><b>2012</b></p> <p>PIETERSEN, G., 2012 Continued Research on grapevine leafroll disease. Winetech Virus day presentation. 29 May, 2012 Stellenbosch</p> <p>PIETERSEN, G. Spread and control of Grapevine leafroll disease in South Africa Caymus Winery, Napa Valley, Ca., 13 October, 2012 to c.20 Viticulturalists.</p> <p>PIETERSEN, G., 2012. Early intervention to minimize the impact of leafroll virus. Romeo Bragato Conference, 2012. Blenheim, New Zealand, 23-25 August, 2012.</p> <p>PIETERSEN, G., 2012. Grapevine leafroll disease control: The South African experience. Romeo Bragato Conference, 2012. Blenheim, New Zealand, 23-25 August, 2012.</p> <p>PIETERSEN, G. AND WALSH, H.A., 2012. Development of a LAMP technique for the control of grapevine leafroll associated virus type 3 (GLRaV-3) in infected white cultivar vines by roguing. Proceedings of the 17<sup>th</sup> Congress of the International Council for the study of Virus and Virus-like diseases of the Grapevine (ICVG), Davis, California, 8th to 11th October, 2012, pg 50-51.</p> <p><b>2013</b></p> <p>PIETERSEN, G., JOOSTE, E.,</p>

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				<p>WAYLAND, J. 2013. Development of a wide-spectrum, grapevine virus detection method for use in the South African wine grape certification Scheme. Winetech Virus day presentation (SASEV 15/11/2013).</p> <p>PIETERSEN, G. 2013. Leafroll control, a reality. 35<sup>th</sup> South African Society for Enology and Viticulture International Conference. Somerset West, South Africa 13 – 15 November 2013</p> <p>PIETERSEN, G. 2013. 10 year synthesis of research on spread and control of grapevine leafroll disease in South Africa. 4 Vinpro Lectures (14, 15, 16, 17/04/2013)</p> <p>PIETERSEN, G. 2013. Leafroll control, a reality. Presentation to Accolade Producers (23/8/2013), Laborie, Paarl</p> <p>WALSH, H.A., AND PIETERSEN, G., 2013. Development of a Loop-mediated amplification (LAMP) detection system for Grapevine leafroll associated virus type 3 to contribute to the control of Grapevine Leafroll disease in white cultivars in South Africa. South African Society for Microbiology 2013 Conference. 24-27 November, 2013, Bela-Bela, South Africa.</p> <p>2014</p> <p>PIETERSEN, G. 2014. 10 year synthesis of research on spread and control of grapevine leafroll disease in South Africa. Presentation to table grape producers, Windmeul, South Africa 24 April, 2014.</p> <p>PIETERSEN, G. 2014. Leafroll Control, Vergelegen 2014. Presentation to Vergelegen personnel and neighbours 25 August, 2014, Vergelegen.</p> <p>PIETERSEN, G. 2014. Rolblaar, Hoe gaan ons herbesmetting van jong bloke keer: Stap-vir-stap beheer. Vinpro presentation 26 August, 2014 and 3 September, 2014.</p>
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				<p>PIETERSEN, G. 2014. Grapevine leafroll Control, Vergelegen 2014. Presentation to New Zealand Virus Elimination Program members, Havelock North, New Zealand 17 September, 2014.</p> <p>PIETERSEN, G., JOOSTE, E., and WAYLAND, 2014. Development of a wide-spectrum, grapevine virus detection method for use in the South African wine grape certification Scheme, 2014. Winetech Virus day presentation 3 October, 2014.</p> <p>PIETERSEN, G., and HARRIS, M., 2014. Detection of grapevine leafroll associated viruses on Vitis rootstocks. Winetech Virus day presentation 3 October, 2014.</p> <p>PIETERSEN, G., 2014 Rolblaar Virus en Shiraz siekte by wingerd.: Impak op opbrengs en kwaliteit van droogdruif cultivars asook beheer maatreels. Upington, 25 November, 2014.</p>
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<p>3. Consult with viticulturalists, estate owners and managers</p>			<p><b>Consultation:</b>  <b>2012</b>                  Vergelegen May 2012;                  Simonsig May 2012;                  Lombardi June 2012                  Benchem, June 2012.                  Caymus Winery, Napa Valley, Ca., 13 October, 2012.</p> <p><b>2013</b>                  Vergelegen May 2013;                  Simonsig May 2013;                  Springfield May, 2013,                  Anwilka, May, 2013                  Klein Constantia May 2013.                  Field various phone calls, give advice and guidance</p> <p><b>2014</b></p>
<p>4. Stay abreast of international research on LR</p>			<p>Read literature Read latest relevant publications.                  Review manuscripts on leafroll control (Aust. J of Grape and Wine Research).                  Exam one PhD thesis on GLRaV-3                  Read latest relevant publications.                  Supervise and direct one PhD thesis on mealybugs and GLRaV-3 control (V. Bell)</p>
<p>5. Attend international specialist conference</p>			<p>Attend Romeo Bragato Conference, Blenheim, New Zealand . 23-25 August, 2012</p> <p>Attend 17<sup>th</sup> Congress of the International Council for the study of Virus and Virus-like diseases of the Grapevine (ICVG), Davis, California, 8th to 11th October, 2012</p>
<p>6. Adopt for local use collaborative work in New Zealand</p>			<p>Supervise completed PhD study on mealybug survival, dispersal and leafroll transmission in the root zone, with a number of facts pertinent to SA industry becoming apparent. Conduct Proof of concept study in New Zealand on using red indicator cane grafted on white cultivars for LR detection. Shown to work well for leafroll detection in New Zealand.</p>
<p>7. Serve on specialist</p>			<p><b>2012</b>                  Meeting of Winetech Project committee Biotechnology; Plant</p>

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<p>committees</p>			<p>Improvement Program Meeting of VIA technical committee. Meeting of Winetech Project committee Biotechnology; Plant Improvement Program 15 and 17 May, 2012. Provide comments for above two subcommittee meetings September, 2012. Meeting of VIA technical committee. 26 July, 2012; 7 September, 2012 and 1 Nov., 2012</p> <p><b>2013</b> Meeting of Winetech Project committee Biotechnology; Plant Improvement Program, Stellenbosch, 15 May, 2013 and 28 August, 2013. Unable to attend any meetings of VIA technical committee or phytosanitary requirements committee, with apologies</p> <p><b>2014</b> Meeting of Winetech Project committee Biotechnology; Plant Improvement Program, Stellenbosch, 20 May, 2014 and 11 September, 2014.</p> <p>Meeting with Winetech re Leafroll technology transfer. Paarl, 24<sup>th</sup> July, 2014.</p> <p>Institute for Grape and Wine Science meeting, Paarl, 26 August, 2014. Leafroll technology transfer</p> <p>VIA technical committee meeting 24 July, 2014. Contribute with written submission to meeting of 31 January, 2014</p>
<p>8. Publish all Winetech funded studies</p>			<p>PIETERSEN, G., SPREETH, N., OOSTHUIZEN, T., VAN RENSBURG, A, VAN RENSBURG, M., LOTTERING, D., ROSSOUW, N., AND TOOTH, D., 2013. A case study of control of Grapevine Leafroll Disease spread at a commercial Wine Estate in South Africa. <i>American Journal of Enology and Viticulture</i>. 64:296-305 doi:10.5344/ajev.2013.12089</p>

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				<p>ALMEIDA, R.P.P, DAANE, K.M., BELL, V.A., BLAISDELL, G.K., COOPER, M.L., HERRBACH, E., PIETERSEN, G., 2013. Ecology and management of grapevine leafroll disease. <i>Frontiers in Microbiology</i> doi: 3389/fmicb.2013.00094</p> <p>WALSH, H.A., AND PIETERSEN, G., 2013. Rapid detection of Grapevine leafroll-associated virus type 3 using a reverse transcription loop-mediated amplification method. <i>Journal of Virological Methods</i> 194: 308- 316</p>
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<p><b>9. Update information sheets</b></p>			<p>Plan, Write and Assist in production of IWWW fact sheets on leafroll (only those prepared within this project below:</p> <ol style="list-style-type: none"> <li>1 Cause of leafroll disease</li> <li>2 Recognizing grapevine leafroll disease symptoms in South Africa</li> <li>3 Recognizing grapevine leafroll disease symptoms in South Africa</li> <li>4 Disorders that can be confused with leafroll - Nutritional disorders</li> <li>5 Disorders that can be confused with leafroll - Other diseases</li> <li>6 Spread of leafroll disease in South Africa - Clumps of leafroll infected grapevines</li> <li>7 Spread of leafroll disease in South Africa - Leafroll along the edges of vineyards</li> <li>8 Spread of leafroll disease in South Africa - Random occurrence of leafroll</li> <li>9 Alternate control strategies</li> <li>10 Creation of healthy planting material</li> <li>11 Categorize vineyards for leafroll control strategies</li> <li>12 Control of leafroll spread by removing individual infected grapevines (roguing)</li> <li>13 Replacing whole, highly leafroll infected vineyards with new healthy vineyards</li> <li>14 Control of leafroll from external sources</li> <li>15 Examples of control of leafroll in the South African wine industry</li> </ol>
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**8. CONCLUSIONS**

All aims and objectives of project met. Large effort put into technology transfer of leafroll control on a number of fronts.

**9. ACCUMULATED OUTPUTS**

Provided in table above.

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**a) TECHNOLOGY DEVELOPED, PRODUCTS AND PATENTS**

Provided in table above.

**b) SUGGESTIONS FOR TECHNOLOGY TRANSFER**

Entire project has the above goal.

**c) HUMAN RESOURCES DEVELOPMENT/TRAINING**

Student Name and Surname	Student Nationality	Degree (e.g. MSc Agric, MComm)	Level of studies in final year of project	Graduation date	Total cost to industry throughout the project
Honours students					
Masters Students					
PhD students					
Vaughn Bell	New Zealander	PhD		2014	None
Postdocs					
Support Personnel					

**d) PUBLICATIONS (POPULAR, PRESS RELEASES, SEMI-SCIENTIFIC, SCIENTIFIC)**

See table above

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PIETERSEN, G., SPREETH, N., OOSTHUIZEN, T., VAN RENSBURG, A, VAN RENSBURG, M., TOOTH, D LOTTERING, D., AND ROSSOUW, N. 2012. Towards eradication of grapevine leafroll disease on Vergelegen, 2002 – 2011. Wynboer Technical Yearbook 2012. Page 85-86

PIETERSEN, G., SPREETH, N., OOSTHUIZEN, T., VAN RENSBURG, A, VAN RENSBURG, M., LOTTERING, D., ROSSOUW, N., AND TOOTH, D., 2013. A case study of control of Grapevine Leafroll Disease spread at a commercial Wine Estate in South Africa. *American Journal of Enology and Viticulture*. 64:296-305 doi:10.5344/ajev.2013.12089

ALMEIDA, R.P.P, DAANE, K.M., BELL, V.A., BLAISDELL, G.K., COOPER, M.L., HERRBACH, E., PIETERSEN, G., 2013. Ecology and management of grapevine leafroll disease. *Frontiers in Microbiology* doi: 3389/fmicb.2013.00094

WALSH, H.A., AND PIETERSEN, G., 2013. Rapid detection of Grapevine leafroll-associated virus type 3 using a reverse transcription loop-mediated amplification method. *Journal of Virological Methods* 194: 308– 316

## **e) PRESENTATIONS/PAPERS DELIVERED**

### **2012**

PIETERSEN, G., 2012 Continued Research on grapevine leafroll disease. Winetech Virus day presentation. 29 May, 2012 Stellenbosch

PIETERSEN, G. Spread and control of Grapevine leafroll disease in South Africa Caymus Winery, Napa Valley, Ca., 13 October, 2012 to c.20 Viticulturalists.

PIETERSEN, G., 2012. Early intervention to minimize the impact of leafroll virus. Romeo Bragato Conference, 2012. Blenheim, New Zealand, 23-25 August, 2012.

PIETERSEN, G., 2012. Grapevine leafroll disease control: The South African experience. Romeo Bragato Conference, 2012. Blenheim, New Zealand, 23-25 August, 2012.

PIETERSEN, G. AND WALSH, H.A., 2012. Development of a LAMP technique for the control of grapevine leafroll associated virus type 3 (GLRaV-3) in infected white cultivar vines by roguing. Proceedings of the 17<sup>th</sup> Congress of the International Council for the study of Virus and Virus-like diseases of the Grapevine (ICVG), Davis, California, 8th to 11th October, 2012, pg 50-51.

### **2013**

PIETERSEN, G., JOOSTE, E., WAYLAND, J. 2013. Development of a wide-spectrum, grapevine virus detection method for use in the South African wine grape certification Scheme. Winetech Virus day presentation (SASEV 15/11/2013).

PIETERSEN, G. 2013. Leafroll control, a reality. 35<sup>th</sup> South African Society for Enology and Viticulture International Conference. Somerset West, South Africa 13 – 15 November 2013

PIETERSEN, G. 2013. 10 year synthesis of research on spread and control of grapevine leafroll disease in South Africa. 4 Vinpro Lectures (14, 15, 16, 17/04/2013)

PIETERSEN, G. 2013. Leafroll control, a reality. Presentation to Accolade Producers (23/8/2013), Laborie, Paarl

WALSH, H.A., AND PIETERSEN, G., 2013. Development of a Loop-mediated amplification (LAMP) detection system for Grapevine leafroll associated virus type 3 to contribute to the control of

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Grapevine Leafroll disease in white cultivars in South Africa. South African Society for Microbiology 2013 Conference. 24-27 November, 2013, Bela-Bela, South Africa.

2014

PIETERSEN, G. 2014. 10 year synthesis of research on spread and control of grapevine leafroll disease in South Africa. Presentation to table grape producers, Windmeul, South Africa 24 April, 2014.

PIETERSEN, G. 2014. Leafroll Control, Vergelegen 2014. Presentation to Vergelegen personnel and neighbours 25 August, 2014, Vergelegen.

PIETERSEN, G. 2014. Rolblaar, Hoe gaan ons herbesmetting van jong bloke keer: Stap-vir-stap beheer. Vinpro presentation 26 August, 2014 and 3 September, 2014.

PIETERSEN, G. 2014. Grapevine leafroll Control, Vergelegen 2014. Presentation to New Zealand Virus Elimination Program members, Havelock North, New Zealand 17 September, 2014.

PIETERSEN, G., JOOSTE, E., and WAYLAND, 2014. Development of a wide-spectrum, grapevine virus detection method for use in the South African wine grape certification Scheme, 2014. Winetech Virus day presentation 3 October, 2014.

PIETERSEN, G., and HARRIS, M., 2014. Detection of grapevine leafroll associated viruses on Vitis rootstocks. Winetech Virus day presentation 3 October, 2014.

PIETERSEN, G., 2014 Rolblaar Virus en Shiraz siekte by wingerd.: Impak op opbrengs en kwaliteit van droogdruif cultivars asook beheer maatreels. Upington, 25 November, 2014.

## 10. BUDGET

### a) TOTAL COST SUMMARY OF THE PROJECT

YEAR	CFPA	DFTS	Deciduous	SATI	Winetech	THRIP	OTHER	TOTAL
2012					<u>R50000</u>		<u>R17000</u>	<u>R67000</u>
2013					<u>R50000</u>		<u>R19000</u>	<u>R69000</u>
2014					<u>R60000</u>		<u>R20000</u>	<u>R80000</u>

### b) FINAL BUDGET/FINANCIALS OF PROJECT

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Project duration	Proposed budget	Actual cost incurred	Variance	Notes
<b>TOTAL INCOME</b>				
Industry Funding	160000	160000	0	Utilization of funds for technology transfer actions (Personnel costs, travel)
PHI Funding				
Other Funding (ARC-PPRI)	56000	56000	0	Partial funding by PPRI
<b>TOTAL EXPENDITURE</b>	216000	216000	0	
<b>Running Expenses</b>				
General operating costs (printing, communication, etc.)	4000	4000	0	
Local Travel	52000	52000	0	
Publication costs				
Lab Analysis				
Lab Consumables				
Other				
<b>Running expenses SUB-TOTAL</b>				
<b>HR Administration and Project Management</b>				
HR Technical				
HR Research	116000	116000	0	
Student Bursaries				
<b>HR SUB-TOTAL</b>				
<b>OTHER EXPENSES</b>				
<b>Overheads</b>	44000	44000	0	
<b>SURPLUS / DEFICIT</b>	0		0	

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