

Greenhouse model of excellence for the vegetable industry

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Virginia Horticulture Centre Inc

Project Number: VX00028

VX00028

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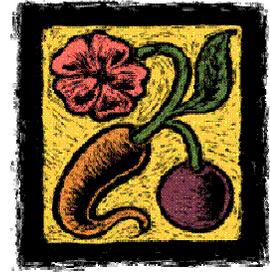
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VIRGINIA
HORTICULTURE CENTRE
SOUTH AUSTRALIA

Greenhouse Model of Excellence For The Vegetable Industry

**Horticulture Australia Limited
Project VX00028**

**Milestone 12 Report
FINAL REPORT**

April 2008

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Due date: 1st September 2004

Description

Final Report

Criteria

- Final report delivered
- Financial Audit report

****Note**

The Final Report for the Greenhouse Modernisation Project was previously submitted for consideration in September 2004, unfortunately it appears to have been lost in transit. This report has been reconstructed from notes and interviews. Since this date, there has been considerable additional work completed at the project site, and impacts of the project on the Adelaide Plains greenhouse industry. Information about these additional outcomes are provided in this report.

Executive Summary

- The Greenhouse Modernisation Project (GMP) was established at a high visibility site at the corner of Old Port Wakefield and Angle Vale Roads at Virginia.
- Israeli greenhouse manufacturer Azrom Industries was the initial company to provide a 1,000 sq metre demonstration greenhouse at the site.
- The French greenhouse company Richel subsequently partnered HAL and Virginia Horticulture Centre (VHC) in the construction of a 3,400 sq metre greenhouse.
- Ancillary greenhouse management equipment, hydroponic, irrigation, water management and plant training equipment has been obtained from a range of companies. The Greenhouse Modernisation Project site provides local growers with a showcase for a wide range of greenhouse equipment from numerous manufacturers. This equipment continues to be demonstrated through numerous field days and training sessions.
- The greenhouse growing space has been used to demonstrate a wide range of crops, varieties and growing techniques. The greenhouses have also been used for evaluating varieties, soil and nutrient treatments, hydroponic systems, pollinator bees, IPM pest and disease management systems etc.
- The site has been used for a number of associated outdoor demonstration projects including use of native vegetation for areas around greenhouses, water management systems, and new types of outdoor vegetables.
- VHC established a Registered Training Organisation that is now providing horticulture training programs nationally. The Greenhouse Modernisation Project facility is the focal point for greenhouse training.
- An advanced group of Hydroponic growers was formed in 2004 as part of the project. The group have developed “low technology” hydroponic systems, and gone on to develop new businesses.
- VHC has established a demonstration and pilot packing facility in close proximity to the Greenhouse Modernisation Project. This enables greenhouse vegetable growers to develop new product packaging systems and products to suit their business and customers.
- Grow SA is a new marketing chain established by VHC that links Adelaide Plains vegetable growers with supermarkets. Greenhouse growers associated with this program have used the Greenhouse Modernisation Project to assist in the selection of new varieties better targeted to consumer needs and development of new products.
- The Greenhouse Modernisation Project has provided many growers with new ideas and experiences, and provided the confidence to invest in modern, more productive structures and equipment. The capacity of the Greenhouse Modernisation Project to train greenhouse workers played an important role in attracting the new \$32 m, 8 ha hydroponic tomato greenhouse facility opened by Timbercorp near Two Wells in December 2007.



The additional 3456m² Richel greenhouse being constructed alongside the 1000m² Azrom greenhouse.

Establishing the Greenhouse Modernisation Site

The GMP is an exciting industry development project run by the VHC on the Northern Adelaide Plains 30km north of Adelaide in South Australia. Central to the GMP is demonstration, trialing and training by being a focal point to assist the greenhouse industry to become globally competitive by retaining and growing its market share.

Currently the greenhouse industry on the Northern Adelaide Plains is the largest and most concentrated greenhouse area in Australia with in excess of 750ha of protected cropping. It is a major employer in the region.

In its first two years of operation the GMP became one of the most significant projects of its sort in Australia. It was established on a very prominent 2 ha of land at the corner of Old Port Wakefield and Angle Vale Roads at Virginia.

The GMP put in place a water use system that capture all rainwater runoff from the greenhouse rooves and from the rest of the site. This was achieved by accurate laser guided drainage of the entire site and containment of all excess rainwater on site, so no water received on the site leaves the site. The water captured on site is used for irrigation or to recharge the underground aquifers.

With a total of 4456m² of modern greenhouse space, the GMP was positioned with the size and scale to attract manufacturers to demonstrate new equipment and greenhouse systems such as efficient heating and carbon dioxide enrichment, hanging gutter, hydroponics, harvesting equipment, etc.

The GMP used two very different greenhouses –

- The Azrom (Israeli design) insect screened, single film, 5m high, 1000m² Israeli plastic house with roll-up sides and roof ventilation was the first constructed.
- The Richel (French design) double film inflated, 7m high, hinged roof vented, 3456m² French plastic house.

Both greenhouses are original designs and able to provide considerable information on what is likely to be suitable greenhouses for the Australian greenhouse industry. For example is insect exclusion more important than ventilation (climate) and thermal efficiency of greenhouses more important for biological control and vegetable production in South Australia.

The GMP site was formally opened by the Deputy Premier of South Australia, the Hon. Rob Kerin on 20th April 2001.



The third Azrom tomato variety trial in the soil and hydroponics.



The double-skin Richel greenhouse alongside the original insect-proof Azrom greenhouse.

Crop Management in the Greenhouses

As major focus of the GMP has been introduction of IPM systems. This was driven by the major threat Western Flower Thrip (along with higher chemical use) poses to the Adelaide Plains protected cropping industry. IPM biological control systems were introduced at the start of the project. These relied on a combination of vent screens, temperature and humidity management, and biological control agents. These proved very successful on the Azrom house with numbers of white fly kept at a minimum and WFT being brought down to almost zero.

In the Richel house this was more difficult to achieve due to its structural design with temperature and humidity controlled by top vents which allowed some pests to enter the greenhouse.

Good ventilation and temperature management were found to be critical for effective pest and disease management. Getting these right enabled chemical use to be almost zero.

Important partnerships were developed with a range of irrigation (Amiad, Netafim, T Tape, WRSV/Tyco), fertiliser (Haifa Chemicals, Multifert Agencies, Jeffries Garden Soils), seed (Rijk Zwaan, Syngenta) and other supply companies. Not only did they have an opportunity to showcase their products, but they were actively involved in education programs.

Flooding of the site with the Gawler River floods in November 2005 demonstrated the value of hydroponic systems. It was possible to get hydroponic systems back into production rapidly rather than wait 2 months for waterlogged soils to dry.

Several other crop management related projects have been run at the GMP site. This includes:

- Revegetation by Design, a project examining the use of local-native plants in controlling pest species such as western flower thrips. This project involved City of Playford Parks and Environment, SARDI, and Roseworthy TAFE.
- Use of waste hydroponic water for irrigating other crops (potato).
- Development of native bees as pollinators for greenhouse tomatoes (University of Adelaide).
- Evaluation and diversification to alternative new vegetable crops.



Revegetation by Design site 19-02-04 with one month of growth

Training and Skilling

The participatory action learning approach of the GMP is ideally suited to technology transfer in the Australian greenhouse industry. Traditionally many greenhouse growers have been recent migrants to Australia with English language difficulties and cultural issues that make them more likely to participate in activities that are more hands-on. If growers are to adopt new greenhouse technologies it is important that they have the opportunity of seeing first hand how the technology work and having the technology prove itself before adopting it.

The skilling and adoption program addresses the key concerns of growers to create six key streams:

- Soil management – managing soil and crop nutrients to improve crop performance and long term sustainability.
- Disease management – adopting disease prediction techniques and improved control measures.
- Greenhouse environments – managing them to optimise crop performance minimise pest and disease problems
- Integrated pest management – advanced skills in monitoring and managing IPM systems
- Product and market development – planning production seasons, adopting quality management and new value added products to maximise returns.
- Business management – business performance monitoring based around improved records and an understanding of costs and returns.

Initially a 7-seminar program was conducted in the Azrom greenhouse over a 14 week period from March through to May 2002. These seminars were presented in two sessions on each day, one in English and the other with a Vietnamese translator. A broad range of topics were covered by guest speakers from a diversity of backgrounds. The topics covered included –

- Dealing with supermarkets – Wayne Lyods of Marc Makrid & Associates.
- Greenhouse integrated pest management – Tony Burfield, SARDI.
- Crop selection – Peter March of Syngenta Seeds.
- Soil and Plant Nutrition – Rod Kargar, PIRSA Rural Solutions



Wayne Lyods conducting the marketing seminar in the Azrom greenhouse.

- Irrigation & Hydroponic Management –Matt Thomas, Multifert Agencies
- Cool-chain handling, packaging & distribution – Adrian Dahlenburg, SARDI
- Greenhouse systems – Elan Kanety, Azrom Australia

With VHC becoming accredited as a Registered Training Organisation, the array of training being delivered has grown. Programs have evolved to serve a group of growers keen to take their hydroponic production skills to a higher level. Larger greenhouse businesses in the region have used the training services of VHC along with the facilities at the GMP to train their staff in greenhouse crop management techniques.

Central to the training program being developed by the VHC is a Greenhouse Management Manual. This was developed in collaboration with Torrens Valley TAFE, SARDI and a number of outside training providers and experts in specialist fields associated with greenhouse crop production.



WELL funding was obtained to translated the following training materials into Vietnamese:

- Greenhouse Hydroponic systems
- Greenhouse Structures and Environment management
- Greenhouse Organic growing
- Fumigation Manual

During May/June 2002, VHC took a group of Australian greenhouse growers on a tour of the greenhouse industry in Southern France and Holland. During the time in Europe the tour was hosted by the French greenhouse manufacturer Richel and in Holland by Bosch Inveke.

A series of information days have been held at the GMP site. They generally have involved themes such as IPM, soil management, hydroponics, spray equipment performance assessment etc.

To assist community capacity building and the industry to successfully adopt new more productive technology, the marketing & business management training will link financial management with practical day to day crop and business management.

Marketing & Product Development

A business skilling training course delivered by Mr Tony Moore encouraged growers to undertake some market research and investigate niche marketing opportunities. Participants visited the Pooraka markets to investigate exclusive variety rights for tomatoes.

Subsequently linkages have been established, with independent retailers and the Foodland group of supermarkets. Over time, the Grow SA brand and marketing strategy has been developed, and growers have established supply contracts with this small supermarket group. This has resulted in “whole of supply chain” trading arrangements, moving growers away from being “price takers” and being appropriately rewarded for high quality product.

To support the need for developing new products, VHC in conjunction with City of Playford has established a demonstration packing operation. This provides grower access to a range of wrapping and filling equipment and support expertise. Growers can use this to develop new packed and wrapped products, and commence pilot marketing of new products before deciding to invest in their own wrapping equipment.

Outcomes for the Community

The GMP project has a series of outcomes for the Adelaide Plains community, including:

- Some growers (eg major fresh herb producer) invested directly by purchasing greenhouses available from the manufacturers involved in the project.
- Other growers and local greenhouse builders copied the designs demonstrated by Azrom and Richel. This has resulted in a revolution in new greenhouse construction. Many growers are now building 3-4 m high structures with improved ventilation instead of 2 m high structures. This has provided better temperature management in the crop growing environment and has significantly improved product quality.
- Presence of the project in the region and its capacity to train greenhouse staff has contributed to a decision by Timbercorp to invest \$32m in a major new 8 ha controlled environment greenhouse structure and packing operation that employs 100 people and will have an annual turnover of \$20m. Stage 1 of this project was opened in December 2007, and planning is underway for a further 8 ha Stage 2 of this development.
- When the GMP project commenced, the Adelaide Plains greenhouse industry was under serious threat from Western Flower Thrip and white fly. IPM techniques introduced to growers by this project have enabled effective control of these pests, reduced use of chemicals, and a safer working environment for all people employed in the greenhouse industry.
- The project has introduced hydroponic techniques to the community. This technology is critical for future survival of the greenhouse industry as soil fumigants are phased out.
- The project has improved the skill levels of growers and several hundred employees in the greenhouse industry. The improved capacity means businesses are growing and contributing to the regional economy.
- Groups of growers who originally came together for technical skilling have now moved on to have a greater focus on business management. This has resulted in cooperative business management and marketing ventures. New product development and marketing ventures have been emerging over the past 4 years. These are contributing to improved profitability of businesses.

FINANCIAL AUDIT REPORT

Virginia Horticulture Centre

Greenhouse Modernisation Project

Profit & Loss Statement

01/07/01 through 30/06/02

Income	2002	2001
HAL Contribution	\$455,520.00	\$67,000.00
COWIPP	\$72,000.00	\$0.00
RIADF Contribution	\$0.00	\$154,150.00
RAP Funding	\$44,000.00	\$44,000.00
Sponsorships	\$35,245.60	\$0.00
Produce Sales	\$8,993.82	\$0.00
Reimbursements	\$0.00	\$5,000.00
Bank Interest	\$39.99	\$171.58
Total Income	\$615,799.41	\$270,321.58
Expenses		
Voluntary Contribution HA	\$90,049.00	\$0.00
Advertising & Marketing	\$620.76	\$0.00
Vehicle/tractor Expenses	\$92.83	\$2,490.54
Casual Labour	\$55,455.10	\$9,939.27
Recruitment	\$0.00	\$7,279.99
Superannuation & WorkCover	\$2,700.72	\$0.00
Project Officer	\$73,504.58	\$42,099.97
Bank Charges - Bendigo	\$1,115.37	\$51.03
Water & Power + connection	\$3,761.20	\$10,573.96
Insurance - Site	\$249.20	\$962.03
Security - Site	\$3,273.78	\$0.00
Site Office/workshop	\$0.00	\$8,686.36
Repairs & Maintenance	\$2,614.27	\$0.00
Site Lease	\$5,782.49	\$5,625.00
Toilet Hire/chemicals	\$1,915.00	\$0.00
Chemical/Fertilizer/seed	\$1,402.12	\$0.00
Minor Equipment	\$2,803.72	\$1,034.85
Site Development	\$2,582.86	\$9,956.82
AZROM Greenhouse Installation	\$35,060.78	\$90,242.62
Irrigation Equip & Install	\$57,312.40	\$41,868.55
Travel and accommodation	\$0.00	\$1,745.08
Meetings & Liaison	\$103.64	\$812.12
Computers / IT Equip	\$3,530.33	\$515.09
Postage & Courier	\$116.90	\$319.32
Printing/stationery/photocopy	\$295.55	\$210.49
Subscriptions	\$67.29	\$0.00
Administrative Support	\$12,500.01	\$9,375.00
Audit & evaluation	\$2,170.00	\$0.00
Market Development (RAP)	\$45,000.00	\$0.00
Purchase of Richel GHouse	\$243,000.00	\$0.00
Legal fees and bookkeeping	\$0.00	\$1,606.40
Total Expenses	\$647,079.90	\$245,394.49
Net Profit/(Loss)	(\$31,280.49)	\$24,927.09

Virginia Horticulture Centre

Greenhouse Modernisation Project

Profit & Loss Statement

01/07/02 through 30/06/03

	2003	2002
Income		
HAL Contribution	\$259,205.00	\$455,520.00
COWIPP	\$8,000.00	\$72,000.00
RAP Funding	\$0.00	\$44,000.00
NABCWMB	\$55,000.00	\$0.00
Sponsorships	\$7,800.00	\$35,245.60
Produce Sales	\$14,206.40	\$8,993.82
GMP Training Income	\$4,454.56	\$0.00
Bank Interest	\$8.78	\$39.99
Total Income	\$348,674.74	\$615,799.41
Expenses		
Voluntary Contribution HA	\$86,000.00	\$90,049.00
Advertising & Marketing	\$820.40	\$620.76
Vehicle/tractor Expenses	\$49.78	\$92.83
Casual Labour	\$74,563.07	\$55,455.10
Superannuation & WorkCover	\$10,963.65	\$2,700.72
Project Manager	\$64,222.29	\$73,504.58
Bank Charges - Bendigo	\$102.84	\$1,115.37
Water & Power + connection	\$1,758.69	\$3,761.20
Insurance - Site	\$1,114.31	\$249.20
Security - Site	\$1,220.27	\$3,273.78
Repairs & Maintenance	\$5,582.04	\$2,614.27
Site Lease	\$9,958.08	\$5,782.49
Toilet Hire/chemicals	\$2,062.10	\$1,915.00
Chemical/Fertilizer/seed	\$18,667.38	\$1,402.12
Minor Equipment	\$12,055.58	\$2,803.72
Site Development	\$0.00	\$2,582.86
AZROM Greenhouse Installation	\$17,671.80	\$35,060.78
Irrigation Equip & Install	\$47,671.32	\$57,312.40
Crop Support/consultancy	\$1,250.14	\$0.00
Meetings & Liaison	\$0.00	\$103.64
Computers / IT Equip	\$0.00	\$3,530.33
Postage & Courier	\$198.50	\$116.90
Printing/stationery/photocopy	\$0.00	\$295.55
Subscriptions	\$0.00	\$67.29
Administrative Support	\$6,000.00	\$12,500.01
Audit & evaluation	\$2,240.00	\$2,170.00
Market Development (RAP)	\$1,818.18	\$45,000.00
Purchase of Richel GHouse	\$0.00	\$243,000.00
Richel construction	\$82,842.38	\$0.00
GMP Training Expense	\$2,463.64	\$0.00
Legal fees and bookkeeping	\$2,252.50	\$0.00
Total Expenses	\$453,548.94	\$647,079.90
Net Profit/(Loss)	(\$104,874.20)	(\$31,280.49)

Financial Reports

Greenhouse Demonstration Site Balance Sheet

June 2005

Assets	Notes	2005	2004
Cheque Account - Bendigo		\$6,550.21	\$6,546.93
Petty Cash		\$300.00	\$300.00
Trade Debtors		\$1,650.00	\$38,039.24
Total Assets		\$8,500.21	\$44,886.17
Liabilities			
Trade Creditors		\$0.00	\$2,587.20
Accruals		\$2,717.00	\$5,513.07
GST Liabilities		-\$97.00	\$2,551.29
Employee entitlements		\$8,947.91	\$0.00
Loan - VHC	I	\$63,456.80	\$98,465.94
Total Liabilities		\$75,024.71	\$109,117.50
Net Assets		-\$66,524.50	-\$64,231.33
Equity			
Retained Earnings		-\$64,231.33	-\$111,227.60
Current Earnings		-\$2,293.17	\$46,996.27
Total Equity		-\$66,524.50	-\$64,231.33

NOTES

I. The Loan to the VHC reduced from \$98,465.94 in 2004 to \$66,231.33 during 2004/2005

Greenhouse Demonstration Site Profit & Loss Statement

1/7/04 through 30/6/05

	2005	2004
Income		
HAL Contribution	\$0.00	\$144,545.00
Workforce Development Funds	\$59,546.88	\$0.00
NABCWMB	\$0.00	\$55,000.00
Aus-Industry Mentoring Project	\$12,500.00	\$0.00
Sponsorships	\$48,768.60	\$31,600.00
Produce Sales	\$84,246.83	\$55,656.95
GMP Training Income	\$21,888.10	\$70,433.12
Insurance recovery	\$0.00	\$1,000.00
Bank Interest	\$3.28	\$3.27
Total Income	\$226,953.69	\$358,238.34
Expenses		
Voluntary Contribution HA	\$5,500.00	\$79,500.00
Advertising & Marketing	\$0.00	\$171.18
Provision for Annual Leave	\$8,947.91	\$0.00
Casual Labour	\$71,649.67	\$65,554.55
Superannuation & WorkCover	\$6,662.30	\$8,143.06
ADPP Manager	\$47,992.15	\$53,107.15
ADPP - Training Consultancy	\$4,681.82	\$0.00
Vet Coordinator Wages	\$16,097.89	\$0.00
Water & Power	\$1,694.03	\$1,597.15
Insurance - Site	\$1,224.55	\$1,224.55
Security - Site	\$1,447.47	\$1,541.44
Repairs & Maintenance	\$9,254.82	\$11,498.41
Site Lease	\$8,492.66	\$6,208.70
Toilet Hire/chemicals	\$2,551.68	\$2,357.29
Chemical/Fertilizer/seed	\$11,043.41	\$16,068.72
Equipment	\$26,296.33	\$28,581.97
Crop Support/consultancy	\$586.93	\$991.00
Mobile Phone	\$986.20	\$1,005.32
Administrative Support	\$0.00	\$2,500.00
Audit	\$2,470.00	\$4,702.00
GMP Training Expense	\$0.00	\$25,015.00
Vehicle/tractor Expenses	\$1,667.04	\$1,474.58
Total Expenses	\$229,246.86	\$311,242.07
Net Profit/(Loss)	(\$2,293.17)	\$46,996.27



VIRGINIA
HORTICULTURE CENTRE
SOUTH AUSTRALIA

THE VIRGINIA HORTICULTURE CENTRE INC



Greenhouse Modernisation Project (GMP)

**“The most significant commercial
greenhouse technology transfer project
in Australia”**



GREENHOUSE MODERNISATION PROJECT - WORLD'S BEST

The Greenhouse Modernisation Project (GMP) will be the most significant commercial greenhouse technology transfer project in Australia. It has attracted the World's best, the Azrom Australia (Azrom) and Richel Serres De France (Richel) design, greenhouse technologies and practices to be demonstrated on site. The Azrom and Richel greenhouses are split into a soil based production system using drip irrigation and a sophisticated hydroponic trough system using state of the art computer controls. The Azrom greenhouse has a computer control system on fertigation and climate control using the Eldar Shany PC based controller supplied by Netafim. The Richel greenhouse has a computer control system on the fertigation by Amiad and climate control by Maxclim 2003.



The hydroponic variety trial area of the Azrom greenhouse. Plasticised corrugated troughs with scoria and peat make up the plant support system

By developing best practice procedures and demonstrating the best available sustainable technologies, the GMP is expected to become a reference point for the South Australian greenhouse industry. As a reference point the GMP will enable growers to confidently make the changes required to implement more profitable greenhouse systems and technologies. The GMP will help maintain and grow South Australia's position as the most significant producer of greenhouse grown tomatoes, cucumbers and capsicums in Australia. Currently the industry base is made up of 700 ha of greenhouses and 1200 people employed in the greenhouse industry.



The large volume of the Azrom greenhouse six weeks after planting the Syngenta and Rijk Zwaan tomato variety trials.

SUPPORTING THE GREENHOUSE INDUSTRY

- Inviting the best we can find in greenhouse technology to demonstrate their products on site
- Act as a reference point for growers to confidently adopt change
- Facilitate the transfer of technology through demonstration and training. Attract the world's best greenhouse related industries to South Australia
- Demonstrate best commercial practices
- Trialling of new greenhouse produce
- Facilitate the adoption of environmentally sound and economically sustainable practices

GREENHOUSE SKILLING & TECHNOLOGY ADOPTION PROGRAM

The Greenhouse Modernisation Project will at all times endeavour to demonstrate and promote technologies and practices that are economically viable, but at the same time environmentally sustainable.

This program is called the Greenhouse Skilling and Technology Adoption program and will be funded by FarmBis. The training program was developed after extensive discussions with greenhouse growers who had identified that they need to develop skills to better control and manage their greenhouse businesses. This program will involve the delivery of a series of modules associate with;

- Soil management
- Disease management
- Greenhouse environments
- Integrated pest management
- Product and market development
- Business management

BIOLOGICAL CONTROLS



One of the more exciting aspects of the GMP will be the demonstration that biological control of greenhouse pests is possible in a commercial greenhouse. Regular introductions and monitoring of a number of insect predators such as *Encarsia formosa* wasps for white fly control, Aussie mites and Aussie victoriensis against thrips and two spotted mites, will establish biological control within the greenhouse. The bio-control will be maintained by excluding harmful chemicals

from the greenhouse. It is anticipated that production of pesticide-free greenhouse produce will become the norm in the near future, as more markets demand fresh eaten produce to be free of harmful chemicals.

ON BEHALF OF THE VIRGINIA HORTICULTURE CENTRE WE THANK THE SPONSORS OF THE GREENHOUSE MODERNISATION PROJECT

- Northern Adelaide & Barossa Water Catchment Management Board
- Richel Serres De France
- Azrom Australia
- Amiad Irrigation
- Netafim Australia
- WRSV
- Syngenta Seeds
- Rijk Zwaan
- Jeffries Garden Soils
- Primary Industries & Resources SA
- Horticulture Australia Ltd
- Biological Services

WHERE IS THE GREENHOUSE MODERNISATION SITE?

