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case study 8

ガーベラの地熱温室栽培

Geothermal Hot House for Gerberas

リサ リンド (GNSサイエンス), ダイアン ブラッドシャウ (GNS サイエンス), ジョー ベル

「プレンティーフローラ」のガーベラは地熱を利用した温室ハウスで育てられています

ロトルアにある「株式会社プレンティーフローラ」のガーベラ栽培者，ハラルド エセンダムさんとコニー エセンダムさんにとって，地熱の利用は厳しい冬から花たちを守る掛替えのない条件になっています．

「商業・販売用のガーベラを上手に育てるためには，気温の変化で生育が落ちこんだり，反対に伸びすぎたり，咲き過ぎたりを避けなければなりません．ガーベラは南アフリカ原産の亜熱帯植物なので，温室で亜熱帯の環境を作ってやることが必要不可欠です．」

「私達は本当に幸運です．だって花たちにとって最高の環境を作ってあげられる“地熱”を簡単に利用出来るんですから．」ハラルドさんはそう言います．

ニュージーランドでの商業用ガーベラの栽培は主にオークランドで活発ですが，ハラルドさんはオークランドのガーベラ栽培者たちの悩みをよく耳にするそうです．「温室の温度を上げるための維持費が大変だ」と．オークランドはロトルアより暖かい地域なのに，です．

「というのは，ニュージーランドのほとんどのガーベラ栽培地では，グリーンハウスの温度維持に石油を使っているからなんです．」

ところが，プレンティーフローラの温室は，石油ではなく，浅い二つの地熱井戸からの熱で温められています．

以前から使っていた旧型の地熱井戸は，摂氏 100度の地熱水をくみ上げています．この100度の地熱水はヒートエクスチェンジャーに送られ，ガーベラ栽培設備に接して循環している金属パイプ中の水を温めています．

2年前に掘られた最新の地熱井戸は，温室に直接利用できる「摂氏65度の地熱水」をくみ上げます．この65度の流体は温室の天井を循環して温室内の空気を温めています．そして施設内を循環し終わった“温度の下がった水”は地下の地熱地帯に送り戻されます．

加えて，必要なときには，バイオディーゼルを使ったファンコイル装置上のピークヒーティングシステムが，施設内の空気を温めることもできます．

利点：

- ガーベラ栽培に必要な“最低でも摂氏１４度”を優に上回る室内温度を地熱で保てる
- 暖房システムの維持費を格段に下げることができる

特徴：

- 年間６０万本以上ものガーベラ栽培がプレンティーフローラでは可能
- 二つの地熱井戸が年間を通して温室に適温を供給している

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この地熱井戸が100度の水をくみ上げ，　ヒートエクスチェンジャーを通り，　温室内を循環する暖房システムを温めます．

温水は金属製のパイプを通り，ガーベラ栽培の環境温度を保ちます．

地熱は理想的な温度供給であり，ガーベラ栽培のベースラインの"最低でも摂氏14度以上"という温度条件を優に上回った形で施設を温め続けています．

ハラルドさんにとって，　温室栽培における最大の敵は，温室ガラスの壁から熱が逃げてゆく「ヒート　ロス」だそうです．「夜間の外気の温度が -3度や-4度になる冬でも，ガーベラにとっては室内は最低14度を保ってなければいけません．ヒート　ロスが多い真冬には，14度を一定に保つことに技術を要しますね．」　とハラルドは言います．

プレンティー　フローラは標準サイズのガーベラ，近年流行のミニサイズガーベラもあわせて年間　60万本以上のガーベラの切花を出荷しています．花の色は60色以上ものバラエティーに富んでいます．

ガーベラは切って収穫されるのでは　なく，引き抜いて収穫されます．そしてラッピングされ箱に入れられニュージーランドの北島内の　60件あまりの花屋に送られます．余ったガーベラがあれば，ウェリントンで行われるフラワー　オークションに送られます．

「我々は主に，　タウポやタウランガ，ハミルトン，ホークスベイ，ワカタネ，パーマストンノース，ウェリントンの花屋にガーベラを卸しています．」

ハラルドさんは１９８０年からオランダでガーベラ栽培を勉強してきました。ハラルドさんは奥さんのコニーさんと家族とで１９９０年半ばにニュージーランドに移民し、トコロアとロトルアのカーター　ホルト　ハーピーで働きます。２００２年、ついに現在の温室を購入してオーナーとなりました．

「この温室は以前はランの栽培に使われていました。だから購入してから内装の隅から隅までをガーベラ栽培用に建て直しました。中央通路や給水システムも設置しました。ガーベラ栽培設備は、最新の切り花栽培技術を使い作業に便利な高さにつり下げられています。現在はシステムはコンピューター化されて、水や肥料など花たちに必要なものは最適の条件でガーベラに供給されています」

ハラルドさんは、将来、現存の地熱システムを新たな形で、より効率よく温室に利用したいと考えています。「私達は本当にラッキーです。ここにやってきたときには既に地熱井戸があって、自分たちは必要に応じてその地熱をするだけでいいんですから。」

「私達は本当に幸運です。だって花たちにとって最高の環境を作ってあげられる"地熱"を簡単に利用出来るんですから。」ハラルドさんはそう言います．

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Plenty Flora tm

ニュージーランドは将来にわけて、安全で効率がよく、再生できるエネルギーを必要としています。より高まる再生エネルギーの需要に備えて、ニュージーランド政府はGNSの活動をサポートしています。政府はエネルギー対策として、地熱の直接利用を２０１５年までに年間１２ペタジュール（PJ）以上にすることを目標に掲げています。

より詳しくお知りになりたい方は是非GNSのウェブサイトをご覧ください：
www.gns.cri.nz/earthenergy

or contact us:
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PlentyFlora's gerberas are grown with the help of geothermal energy utilised to heat the greenhouse.

Geothermal Hot House for Gerberas

For Rotorua gerbera growers, Harald and Connie Esendam of PlentyFlora, making use of the area's geothermal energy is key to offsetting the harsh winter conditions.

"To grow gerberas successfully for a commercial operation a main requirement is to avoid too many, or too fast, fluctuations in temperature. Gerberas are a sub-tropical plant from South Africa so creating a similar climate in the greenhouse is vital."

"We are fortunate to have ready access to geothermal energy which assists in creating the right environment for the flowers," says Harald.

Commercial gerbera growing operations are mainly in Auckland and while Harald says they too require heating, there it is not as cold as in Rotorua.

"The majority of other gerbera glasshouses around New Zealand would use waste oil as the source for their heating requirements."

PlentyFlora's greenhouse is heated by geothermal energy from two shallow geothermal bores.

KEY BENEFITS:

- Geothermal energy provides heat to keep the temperature above the minimum essential temperature of 14°C
- Reduced cost for heating requirements

KEY FEATURES:

- More than 600,0000 gerberas grown annually at PlentyFlora
- Geothermal heating has been used year round since business commenced in 2002
- A shading/energy system prevents heat loss during the night
- Second bore drilled in 2009

This geothermal bore produces 100°C water that is fed through a heat exchanger, heating water circulated in an internal closed heating system.

Water is circulated in small iron pipes adjacent to the plants to provide heat to the plants.

"WE ARE FORTUNATE TO HAVE READY ACCESS TO GEOTHERMAL ENERGY WHICH ASSISTS IN CREATING THE RIGHT ENVIRONMENT FOR THE FLOWERS."

The original, older bore produces 100°C geothermal fluid. This fluid is fed through a heat exchanger, heating water that is circulated through small iron pipes adjacent to the plants in an internal closed heating system.

The new bore, drilled in 2009, produces 65°C geothermal fluid that is used directly in the greenhouse, predominantly for air heating in an overhead system. This system helps prevent the humidity increasing above 90%, which means that fungal spores (like botrytis) cannot germinate on the flowers and cause dark spots. Cooled geothermal water is then injected back into the shallow geothermal reservoir from both bores.

Geothermal energy is an ideal base load provider and most of the time it is sufficient to keep the temperature above the minimum essential temperature of 14°C.

Harald says a big challenge with glasshouses is the heat loss through the glass.

"At night we require the temperature to remain at 14 degrees in the glasshouse and frequently during winter it can be as low as -3 or -4 degrees outside. So while geothermal can heat the glasshouse up, it is difficult to keep it at the set temperature." A shading/energy system has been installed to prevent heat loss during the night.

Each year PlentyFlora produce more than 600,000 cut-flower gerberas of both standard size and the more recently developed mini-gerberas, with more than 60 colour varieties available.

The gerberas are harvested by being pulled out rather than cut. They are then sleeved, boxed and sent directly to 60 florists around the North Island. Any surplus stock goes to flower auctions in Auckland and Wellington.

"We predominately supply florists locally and in the Taupo, Tauranga, Rotorua, Hamilton, Hawkes Bay, Whakatane, Palmerston North, Taranaki and Wellington areas."

Harald was involved with breeding of gerberas in Holland in the 1980s. With his wife and family, he immigrated to New Zealand in the mid-1990s and worked for Carter Holt Harvey in Tokoroa and Rotorua. In 2002 the opportunity to purchase the glasshouse arose.

"It had previously been used for orchids, so we have had to build everything internally from scratch to make it suitable for growing gerberas in a commercial setting.

"We have set up tables and a watering system. The gerbera plants are hanging in tables at convenient heights according to the latest cut-flower growing technology. We now have the system fully computerized with the latest New Zealand made flower growing computers so the flowers receive the appropriate water and fertiliser, or feed, depending on requirements in the best suitable climate for plant-growth."

In the future Harald is keen to better utilise the geothermal energy he has available and is always looking at new options for increasing the efficiency of his glasshouse. In recent years they optimised the energy output by injecting compressed air into the main bore. This gave a marked increase in available volume of hot water.

"A great benefit for us was the geothermal bore that was already in existence when we came here so it was a matter of tapping into this and utilising it for our needs."

Plenty Flora

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New Zealand requires reliable, renewable energy sources into the future. The Government is supporting GNS Science in fostering increased use of renewable resources. By 2025, the Government's Energy Strategy aims for direct use of geothermal energy to account for more than 12 PJ/year.

For more information visit our website:
www.gns.cri.nz/earthenergy
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TECHNOLOGY:

The systems in the glasshouse are fully automated and controlled by NZ made hard- and software.

Climate systems:

Heating:
100% geothermal.
PlentyFlora is the only geothermal flower grower in New Zealand.

Heat is extracted from 2 separate hot water bores:

Bore 1: 85°C - hot water goes through heat exchange and heats up the lower pipe system in glasshouse.

Bore 2: 60°C - used directly in the higher heating pipes, keeping the crop dry.

Together the systems enable us to maintain a minimum temperature of 14°C in our glasshouse, even on frosty nights.

Vents: the vents open and close automatically, triggered by wind strength and direction, rain and temperature

Shade screen: our screen has two functions: shading and heat retention.

Fans: regulate the air movement in the glasshouse

Humidifiers: the misting option built in the fans is automatically activated when the humidity in the glasshouse falls below pre-set settings.

Feeding system:

Pre-set solar counts will trigger the feeding system. Nutrients will automatically be added to the main feeding tank and when the desired PH and CF-levels have been reached, the system will start feeding out to the plants. All plants have been planted in single pots with their own feeding dripper.

TIPS FOR A LONG VASE LIFE:

- Keep flowers out of direct sun light;
- Keep flowers away from draughty areas;
- Always use clean vases/buckets and clean water
- Put gerbera stems only in about 2 inches(5cm) of water. If stems are fully emerged in water, the stems will go slimy and won't be able to take up the water
- Re-cut stems and refresh water every couple of days
- If stems go soft and floppy, re-cut stems and put stems in lukewarm water

Plenty Flora LTD
For the love of Gerbera

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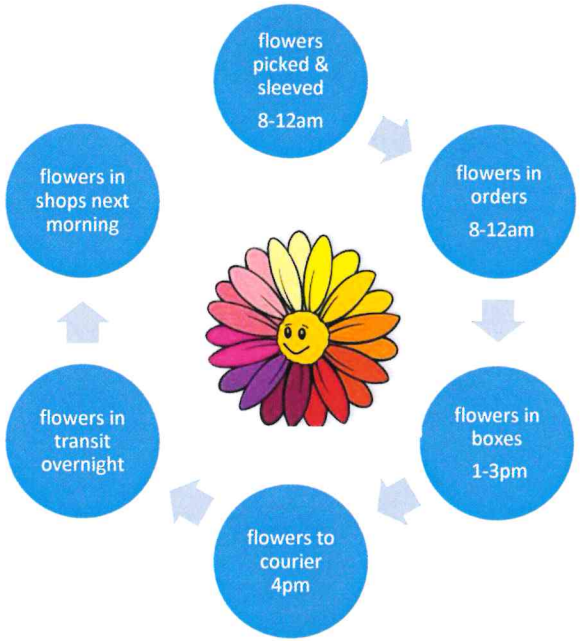
WELCOME TO PLENTYFLORA'S GERBERA WONDERLAND

Plenty Flora
For the love of Gerbera

INTRODUCTION:

PlentyFlora, the only geothermal flower grower in New Zealand, was founded in 2002 by Harald and Connie Esendam (Dutch immigrants).
The glasshouse is about 2500m² in size and houses 14,000 gerbera plants, which produce around half a million flowers in total on an annual basis.
The feeding and climate systems are 100% computerised. We sell all our flowers to the New Zealand market (florists and general public).

Process from picking to customer



"Fresh is Best"

GERBERA FLOWERS:

Minis: diameter 6-8cm
Production: ±75 flowers per plant per year
(= 1 flower every 4 days)

Standards: diameter 10-12cm
Production: ±30 flowers per plant per year
(=1 flower every 10 days)

GERBERA PLANTS:

Origin: the original wild gerbera plants come from the region Barberton in South Africa, hence the name "Barberton Daisy".

Breeding: The breeding is done in the Netherlands, where we buy our plants. The plants are imported as sterile rooted tissue culture (lab) plantlets and start their journey in NZ in nurseries in Auckland. When they have established a good root system, the little plants are planted in our glasshouse. From then it takes 6-8 weeks before they start producing their first blooms.

Commercial plant life cycle: 2-3 years

Selection: criteria for commercial gerbera growing are colour, productivity, expected bloom size, stem length and vase life

Growing medium: Coconut fibre, a natural fibre extracted from the husk of a coconut. The fibre has a well-draining quality, which is important for gerberas. Gerbera plants do not like wet feet.

Nutrients: pre-mixed special gerbera recipe

PICKING OF GERBERAS:

Gerberas are picked by twisting and snapping the bottom of the stem. This way both the stem and the plant stay sealed, not allowing rot to develop. We manually put a sleeve over the ripe blooms while we pick, to protect the petals in the buckets and in transport.

When is a gerbera ready to pick?
A mature gerbera flower consists of female stigma and male stamen. A flower is ripe, when a full ring of male stamen has developed around the female stigma.

POST HARVEST:

All ripe flowers are being put in buckets with water for the daily orders. The daily orders are being packed in boxes and couriered overnight. Most flowers that are being picked are sent the same day and in the shop the next morning.
We use the existing reliable courier systems.
In Rotorua we do our own deliveries.

MAIN INSECTS & DISEASES:

Mite, White Fly and Thrips, Botrytis, Mildew, Pythium and Phytophthora.
We keep a regular spraying regime to avoid infestations.

OUR MARKETS:

*New Zealand florists
*NZ flower auctions in Auckland and Wellington.
***Directly to the general New Zealand public**

Please visit our website **info@gerbera.co.nz**, to view our different varieties. Orders can be made through our website or by email/phone. We can deliver overnight, nationwide at your doorstep (non-rural delivery addresses only).