

Horticultural and Controlled Environment Department



Controlled Environment and Glasshouse Facilities at Rothamsted Research

Aerial view of the site



Introduction

Rothamsted Research is an internationally recognised facility. It is a primary source of world-class scientific research and new knowledge for policies, products and practices that underpin the economic, environmental and societal value of agricultural land

The Horticultural and Controlled Environment Department at Rothamsted Research is responsible for providing plants, for research, grown in glasshouses and controlled environments.

A team of 9 (7 FTE) staff are responsible for growing a wide range of plant material, mainly crop species such as oilseed rape, cammelina, potatoes, wheat and barley. Over 500,000 plants are raised per annum for a variety of research purposes, including insect food, nutrition studies, plant physiological processes and genetic transformation studies. In addition, a wide variety of plants grown in the grounds are used for sourcing and rearing insects as well as experimental plant material.

Glasshouses Facilities at Rothamsted

The glasshouse facilities presently (January 2021) consist of 42 glasshouses with 152 compartments and a total area of 3,515 m², representing 1,452 m² of growing space. In addition there are 5 poly tunnels with 450 m² of growing space and 3 sand bed/hard standing areas with 405 m² of growing space.

Glasshouse facilities

Glasshouse 25 (Cambridge, 1978/2003, 50 m², 2 comp. each 10 m² bench area)

These compartments have automatic vents and fans, low-pressure hot-water heating, 235 watt LED lighting and manual blinds. The Climate Controls control system is fitted to both compartments. Double-entry doors and insect-proofing is fitted for quarantine work. Fan ventilation is provided for Insect Behavioural studies.

Glasshouse 27 (Cambridge, 1982/2007, 450 m², 5 comp. 28,50,32,32,16 m² bench area)

These compartments have automatic vents and blinds, low pressure hot water heating and 186/230/400 watt LED lighting. The glasshouse was reglazed in 2007 with polycarbonate cladding. Some compartments have flood bench irrigation systems. The Climate Controls control system is fitted to all compartments.

Glasshouse 28 (Cambridge, 1982/2000/2007, 400 m², 8 comp 12, 3x15, 4x16 m² bench area)

These compartments have automatic vents, automatic blinds, low-pressure hot-water heating and 186/235 watt LED lighting. Four compartments have refrigeration (heat pumps) and are clad in polycarbonate, able to maintain 20°C in high ambient conditions. The Climate Controls control system is fitted to all compartments. All eight compartments are suitable for work on genetically-modified plants, having suitable screening and secured access. One of the refrigerated compartments is further compartmented with HEPA filtration fitted to ensure no pollen escapes.

Glasshouse 29 (Cambridge, 1995, 248 m², 15 comp. 14x5, 1x11.3 m² bench area)

Thirteen compartments are automatically heated and cooled using heat pumps, with supplementary 420 watt LED lighting and fan ventilation through HEPA filters. Automatic blinds are fitted and the compartments are computer controlled using Climate Controls controllers. The glasshouse is polycarbonate clad to provide good insulation and to minimise gaps and risk of breakage. This house is used as a C2 quarantine area.

Glasshouse 30 (Cambridge, 2000, 174 m², 8 comp. 8x8 m² bench area)

Glasshouse 31 (Cambridge, 2000, 248 m², 12 comp. 4x11, 8x5 m² bench area)

These compartments are computer controlled (Climate Controls system) with automatic blinds, automatic irrigation, supplementary 230 watt LED lighting, fan ventilation through pollen filters (positive and negative pressure) and are fitted with heat pumps to provide cooling and heating. Carbon Dioxide monitoring is fitted with an option for control being available. The glasshouse is polycarbonate clad to provide good insulation and to minimise gaps and risk of breakage. These glasshouses are used for work on genetically-modified organisms and Class C2 work on plants requiring plant health licences.

Glasshouse 32 (Cambridge, 2000, 248 m², 14 comp 2x11, 12x5 m² bench area)

These compartments are computer-controlled (Climate Controls system), with automatic blinds, automatic irrigation, automatic side and top vents, low-pressure hot-water heating and supplementary 230 or 235 watt LED lighting. Carbon Dioxide monitoring is fitted with an option for control being available.

Glasshouse 33 (Cambridge, 2000, 174 m², 7 comp 1x17, 6x8 m² bench area)

Three compartments are computer-controlled (Climate Controls system), with automatic blinds, automatic irrigation, automatic side and top vents, low-pressure hot-water heating, and supplementary 230 or 235 watt LED lighting. Four compartments are computer-controlled (Climate Controls system), with automatic blinds, automatic irrigation, supplementary lighting, fan ventilation through pollen filters (positive and negative pressure) and are fitted with heat pumps to provide cooling and heating. The glasshouse is polycarbonate-clad to provide good insulation and to minimise gaps and risk of breakage. Carbon Dioxide monitoring is fitted with an option for control being available.

Glasshouse 34 (Cambridge, 2000, 248 m², 14 comp 2x11, 12x5 m² bench area)

These compartments are computer-controlled (Climate Controls system), with automatic blinds, automatic irrigation, automatic side and top vents, low-pressure hot-water heating and 400w LED supplementary lighting. Carbon Dioxide monitoring is fitted with an option for control being available. One compartment is fitted with a computer-controlled misting system for propagation.

Glasshouse 40 (Cambridge, 2001, 240 m², 16 compartments each 5 m² bench area)

Twelve compartments are computer-controlled (Climate Controls system), with automatic blinds, automatic irrigation, automatic side and top vents, low-pressure hot-water heating and supplementary LED lighting. Four compartments are computer-controlled (Climate Controls system), with automatic blinds, automatic irrigation, supplementary lighting, fan ventilation through pollen filters (positive and negative pressure) and are fitted with heat pumps to provide cooling and heating. The



**Plan of Glasshouses, Polytunnels, Cages, Hard standing areas and Buildings containing Controlled Environments.
January 2021**



G28. Polycarbonate clad, air conditioned.

glasshouse is polycarbonate clad to provide good insulation and to minimise gaps and risk of breakage. This glasshouse is rated at containment level 2.

Glasshouse 41 (Cambridge, 2001, 382 m², 10 compartments each 21.5 m² bench area)

Glasshouse 42 (Cambridge, 2001, 288 m², 8 compartments each 19 m² bench area)

Glasshouse 43 (Cambridge, 2001, 230 m², 4 compartments each 33.5 m² bench area)

These compartments are computer-controlled (Climate Controls system), with automatic blinds, automatic irrigation, automatic side and top vents, low-pressure hot-water heating and supplementary ILED lighting. These compartments are extra high (4 metres) to accommodate taller crops.

Glasshouses 51-60 (Elite 2005 each 1.5m². 10 glasshouses)

Glasshouses 61-64 (Elite 2005 each 8m². 4 glasshouses)

Glasshouses 65-79 (Elite 2007 each 1.5m². 15 glasshouses)

Domestic glasshouses fitted with an auto vent. Glasshouses 65-79 fitted with polycarbonate and insect screening. Used for Insect studies and producing weed seeds in semi isolation.

Cage, Sandbed and Polytunnel facilities

Glasshouse 35 (Clovis Lande, 2000, 137 m², 39 sandbeds)

This cage area, with 39 sandbeds either 4.2 m² or 2.4 m², is used primarily for weed studies and has an automatic irrigation system.

Glasshouse 38 (Clovis Lande, 1999, 70 m², 1 compartment)

This polytunnel is used for pheromone work during the summer months and is fitted with fans to provide a uniform air flow.

Glasshouse 39 (Clovis Lande, 1999, 70 m², 1 compartment)

This polytunnel is used for work during the summer months requiring higher than ambient temperatures but with no specific control requirement, and for overwintering temperate plants with a low temperature requirement. Power and gas heating are available.

Glasshouse 44 (Clovis Lande, 2001, 100 m², 1 compartment)

This covered cage area is used for work requiring ambient temperatures, but also requiring cover from rain.

Glasshouse 36 (CLM, 2000, 30 m², 1 compartment)

This double-skinned polytunnel is used for drying and storing roots.

Glasshouse 50 (Clovis Lande, 2005, 100 m², 1 compartment)

This poly tunnel is fitted with fans to provide a uniform air flow

Area 1 (RES 2003) 30 m² (Sand bed)

Sand bed "between G29 and G38"

Area 2 (RES 2004) 168 m² (12 Beds)

Hard standing in compound adjacent to B37, automatic drip irrigation, used primarily

Compartment in G34, naturally ventilated, showing Kropstek 400 watt LED lamps



Typical Glasshouse compartment with adjacent Climate Controls controller.



Air conditioned compartment from G31. Note polycarbonate cladding and air conditioning unit



Corridor in G34



Covered cage G44



Cage area with sand beds (G35)

for propagation and screening of willows and miscanthus.

Glasshouse monitoring and control systems

Over 120 glasshouse compartments controlled by a glasshouse environmental control system. The Climate Controls units are stand-alone microprocessor-based controllers, able to monitor and control temperature, lighting, CO₂ humidity and watering. Over 300 control parameters allow quite complex control algorithms, limited only by the effectiveness of the various actuators. The controllers are fed from an independent power supply, which is battery-backed to ensure continuity of monitoring in the event of mains power interruptions. Units are linked via an RS 485 network back to a PC which is network accessible. In addition there is a wireless monitoring system (Monnit) providing independent acquisition of temperature humidity and light.

Lighting

LED lighting is used throughout the facilities. Plessey 230 w LED lighting is used in G27, G28, G32 Kropstek 186 and 400w LED lighting is used in G32 to G34 and G40 to G43. Indo 235 w lighting is used in G25, G32 to G33. Lighting levels of 300 $\mu\text{mol m}^{-2} \text{sec}^{-1}$ can be maintained at bench level in most compartments. Light levels are computer controlled to maintain daylength, as well as to switch off lighting when ambient light levels are high enough.

Energy usage

The glasshouses are monitored for electricity, gas and water usage. Control strategies to minimise energy usage include light level control, shading(to reduce solar heat loads in summer as well as dead bands set to exploit high solar gain. Where specific temperatures are required as a research necessity these can be achieved $\pm 1^\circ\text{C}$. LED lighting is used throughout the facilities. Typically energy costs range between 15p (1 kWh) and £5.25. (35 kWh) per square metre of bench space used, per day, with an annual daily average of 75p (5 kWh).

Glasshouse Support Areas

B10 Soil Store

The soil store B10 has facilities for storing up to 120 cubic metres of soil or compost in 7 bins. Mixing facilities are available and loads of up to 1.5 tonnes can be transported using a forklift or Bobcat. A standard prescription mix, supplied by Petersfield Growing Mediums, is used for almost 70% of the 500,000 pots used every year and 2 bins are dedicated to storing this mix. A grit and loam mix is also stored. Various bagged loads of peat, John Innes mixes, various grades of sand, attapulgate clays, vemiculite and perlite are also stored in this area.

B54 Glasshouse header area

This area provides support facilities and access for G29 to G34. The header area dedicated to G29 to G31 is a secure quarantine area and contains a vernalisation facility, as well potting, plant handling and autoclaving facilities. Additional security is provided in this area to meet the requirements for plant health safety. The header area supporting G32 to G34 contains a potting area as well as a temperature controlled low humidity seed storage room, small potato chitting cabinet and staff rest room facilities.

B56 Glasshouse header area

This area supports work in G40 to G43. In addition to a laboratory support area and 2 potting areas, there is a dedicated soils washing area for soils, root and nematode work, -20°C seed storage room, vernalizing chamber and a spray application facility.

There are a variety of sheds and containers and a locked compound available for storage of materials, machinery and various pieces of experimental equipment used in the glasshouses. A row of compost bins adjacent to B54 allow used soil and green waste from the glasshouses to be composted and recycled as topsoil and general soil improver on the laboratory grounds.



B54 Potting area



CE building (B57)

Controlled Environment Facilities at Rothamsted

The Rothamsted Controlled Environment facilities are housed in 4 areas, B24, B25, B57 and B63. In total, there are 27 walk-in plant growth rooms, 63 plant growth cabinets. And 3 controlled environment storage rooms. These facilities provide a wide range of environments of varying degrees of sophistication and quality. A Monnit wireless monitoring system monitors temperature, light and humidity in B63, B57, B24 and B25. The Sanyo Gallenkamp (Weiss) units in B57 and B63 are monitored and controlled via a Eurotherm software package.

Main Controlled Environment Building B57

Built in 2000/1, this building houses 16 Gallenkamp 228 cabinets, 4 Weiss HGC 1514 cabinets, 4 Gallenkamp Large rooms, 4 Gallenkamp Medium rooms, 1 'RES' Cereal production room, 2 Snijders MD1400 (low temperature) and 2 Sanyo MLR cabinets. A cold room, laboratory area and monitoring room are located in the building.

Gallenkamp 228 cabinets (Sanyo, 2001, 1.68 m², 16 units, C 1-16)

These cabinets have a growing area of 1.68 m² and growing height of 1.4 metres. Temperature control is provided in the range 5°C to 30 °C ± 0.3°C with lights off and 7°C to 35 °C ± 0.3°C with lights on. Humidity control is in the range 65% to 95% ± 5% in the range 15°C to 25°C. CO₂ monitoring (Vaisalla GMT 222) and control is fitted in 10 cabinets. Lighting is provided by T5 49 watt fluorescents providing up to 900 µmol m⁻² sec⁻¹ at 300 mm from the lights, dimmable from 100% to 10%. A 10% mix of tungsten lighting is provided. A Eurotherm 2704 controller, linked to a SCADA package, provides control.

Gallenkamp large growth rooms (Sanyo, 2001, 8 m², 4 units, R 5-8)

These rooms have a total area of 16 m², with a growing area of 8 m² spread over 8 trolleys and growing height of 3 metres. Temperature control is provided in the range 5°C to 30 °C ± 0.3°C with lights off and 7°C to 35 °C ± 0.3°C with lights on. Humidity control is in the range 65% to 95% ± 5% in the range 15°C to 25°C. CO₂ monitoring (Vaisalla GMT 222)



Gallenkamp 228 cabinets



Gallenkamp growth rooms

and control is fitted. Lighting is provided by 650W Heliospectra LED lamps, providing up to $1000 \mu\text{mol m}^{-2} \text{sec}^{-1}$ at 1000 mm from the lights, dimmable, from 10 to 100%. A 10% mix of far red LED lighting is provided. One room is fitted with Heliospectra 420w Dyna lighting capable of providing a variable adjustable spectrum., A Eurotherm 2704 controller, linked to a SCADA package provides control.

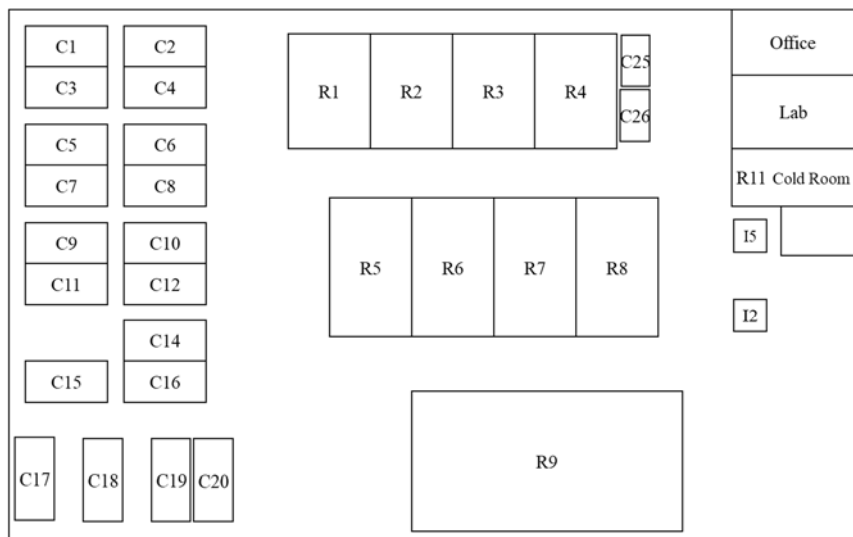
Gallenkamp medium growth rooms (Sanyo, 2001, 6 m², 4 units, R 1-4)

These rooms have a total area of 12 m², with a growing area of 6 m² spread over 6 trolleys and growing height of 2.5 metres. Temperature control is provided in the range 5° C to 30 °C ± 0.3°C with lights off and 7°C to 35 °C ± 0.3°C with lights on. Humidity control is in the range 65% to 95% ± 5% in the range 15°C to 25°C. Lighting is provided by 650W Heliospectra Mitra LED lamps, providing up to $1000 \mu\text{mol m}^{-2} \text{sec}^{-1}$ at 1000 mm from the lights, dimmable, in 4 stages, from 100% to 30%. A 10% mix of Far red LED lighting is provided. A Eurotherm 2704 controller, linked to a SCADA package provides control.

Cereal growth room (Watford Refrigeration, 2000, 25m², 1 unit, R 9)

This room has a total area of 32 m², with a growing area of 25 m² on automatically-irrigated mobile benching. Temperature control is provided in the range 15°C to 30 °C ± 1.0°C with lights off and 15°C to 30 °C ± 1.0°C with lights on. Lighting is provided by 400 watt HQI lamps, providing up to $500 \mu\text{mol m}^{-2} \text{sec}^{-1}$ at 1000 mm from the lights. Air inlets and outlets are HEPA filtered. The room is optimised to produce Cereal Donor material for Genetic Transformation studies but has been used for bulking up GM cereal, linseed and Oilseed Rape seed.

Sanyo MLR cabinets (Sanyo, 1996, 0.6 m², 4 units, I 6-7)



Plan of B57

These cabinets have a growing area of up to 1.0 m^2 , spread over 5 trays and growing height of 0.2 metres. Temperature control is provided in the range 7°C to $30^\circ\text{C} \pm 1.0^\circ\text{C}$ with lights off and 10°C to $35^\circ\text{C} \pm 1.0^\circ\text{C}$ with lights on. Vertically-mounted lighting is provided by T12 36 watt fluorescent lamps, providing up to $200 \mu\text{mol m}^{-2} \text{sec}^{-1}$ at the centre, dimmable in 5 steps from 100% to 20%.

[Snijder MD1400 low temperature cabinet \(Snijders, 2021, \$0.82 \(1.64\)\text{m}^2\$, 2 units, C 21 and C22\)](#)

This cabinet has a growing area of 0.82 m^2 in single tier mode and in 2 tier mode 1.64 m^2 and growing height of 1200 cm and 58 cm. Temperature control is in the range of -10°C to $30^\circ\text{C} \pm 0.2^\circ\text{C}$ with lights off and -5°C to $35^\circ\text{C} \pm 0.2^\circ\text{C}$ with lights on. Humidity control is in the range 40% to 90% $\pm 5\%$ in the range 15°C to 25°C . . Lighting is provided by Valoya BXDNA120 LED lamps with far red, providing up to $600 \mu\text{mol m}^{-2} \text{sec}^{-1}$ at 300 mm from the lights, dimmable from 100% to 10%. .

[Weiss HGC 1514 cabinets \(Weiss 2017, \$1.5 \text{ m}^2\$, 4 units, C 17-20\)](#)

These cabinets have a growing area of 1.5 m^2 and growing height of 1.9 metres. Temperature control is in the range -10°C to $30^\circ\text{C} \pm 0.3^\circ\text{C}$ with lights off and -10°C to $35^\circ\text{C} \pm 0.3^\circ\text{C}$ with lights on. Humidity control is in the range 65% to 95% $\pm 5\%$ in the range 15°C to 25°C . CO_2 monitoring and control is fitted in 10 cabinets. Lighting is provided by Valoya B200 LED units providing up to $1000 \mu\text{mol m}^{-2} \text{sec}^{-1}$ at 300 mm from the lights, dimmable from 100% to 10%. . A ProFace controller, linked to a SCADA package, provides control.

The 28 Weiss (Gallenkamp) cabinets and rooms are controlled using chilled water at 2 to 5°C from 3 York chiller units. The same units maintain the building at a constant $22^\circ\text{C} \pm 2^\circ\text{C}$ with cold water or hot water (recovered from chiller units) as required. The remaining rooms and cabinets are temperature controlled with individual 'DX' units.

Controlled Environment Service Building B25

Built in the early '70s, this building houses 7 'RES' Simple rooms, 1 Seed storage facility, controlled environment r culture/storage rooms, 2 Arabidopsis rooms containing 10 CLF 'Grobanks' (24 cabinets), 4 Conviron Adaptis Cabinets, 7 Weiss SGC 110 Cabinets, 3 Snijders MD1400 cabinets and 1 Sanyo 600 (66)cabinet. The 7 simple rooms are chilled water cooled units whilst the remaining rooms and cabinets are on individual 'DX' chillers.

Arabidopsis Rooms (Adcock's Refrigeration 2006 20 m², 2 units, R 15-16)

'Grobank' cabinets (CLF 2006, 1.3 m² (shelf), 6 x 2 shelf and 4 x 3 shelf units, C60-83)

Two rooms with air conditioning, lockable doors, and a negative filtered air extract. Temperature control is provided in the range 15°C to 30°C ± 1.5°C. The 'Grobank' cabinets are either 3 shelf units or 2 shelf units, each shelf with a growing area of 1.3 m² and growing height of 45 cm and 70 cm respectively on each shelf with separate day/night temperature control using ambient room air for cooling. Lighting provided by 58W dimmable fluorescent lamps, giving up to 250 μmol m⁻² sec⁻¹ at shelf level.

RES simple rooms (RES, 2010, 2.4 & 4.8 m², 7 units, R 60-66)

These rooms have a total area of 5 m², with a growing area of 2.4 m² or 4.8m² spread over 2 sets of single or two-tiered benching and growing height of 1.8 or 0.8 metre.

Temperature control is provided in the range 10°C to 30 °C ± 1.0°C with lights off and 13°C to 35 °C ± 1.0°C with lights on. . Lighting is provided by 80 watt T5 fluorescent lamps, providing up to 500 μmol m⁻² sec⁻¹ at 800 mm from the lights. Each room has an entrance lobby to facilitate containment. One room is fitted with a HEPA filtered extract system

SGC 110 Cabinets (Weis Gallenkamp, 2008/10/13 0.9m² 5 units C 31-34 and 45)

These cabinets have a growing area of 0.9m² and a growing height of 1.5 metres, with shelves the growing area is doubled to 1.8m² and growing height reduced to 0.7m. Temperature control is in the range 5 to 35°C ± 1% with lights off and 10 to 35°C ± 1% with lights on. Lighting with fluorescent lamps provide 400 μmol m⁻² sec⁻¹ at 300m from the lights.

Fisons 600H cabinets (Fisons, 1970, 0.72 m², 1 unit, C 47)

These cabinets have a growing area of 0.72 m² and growing height of 0.8 metres. Temperature control is provided in the range 5°C to 30 °C ± 0.2°C with lights off and 7°C to 35 °C ± 0.2°C with lights on. Humidity control is in the range 60% to 95% ± 7% in the range 15°C to 25°C.. Lighting is provided by 55 watt fluorescents, providing up to 380 μmol m⁻² sec⁻¹ at 300 mm from the lights. A 10% mix of tungsten lighting is provided.

Conviron Adaptis cabinets (Conviron, 2010,2011, 0.6 m², 4 units, C 50-53)

The cabinets have a growing area of 0.6 m² and growing height of 1.1 metres. Temperature control is provided in the range 5°C to 30 °C ± 0.2°C with lights off and 5°C to 35 °C ± 0.2°C with lights on. Humidity control is in the range 60% to 90% ± 7% in the range 15°C to 25°C. Lighting is provided by 39W T5HO/840 fluorescent lamps providing up to 600 μmol m⁻² sec⁻¹ at 300 mm from the lights.

Culture Rooms (RES 1980 4 m², 2 units, GR 2-3)

Simple temperature control from 5°C to 28°C ± 2°C with shelving in one unit and either benches or shelving lighting can be installed in the other. Used for a variety of work, in-

cluding controlled temperature storage and insect studies

Seed Storage and Rooms (Weiss 2013, 25m², 2 rooms, R67 A-B)

Two humidity/temperature rooms for seed storage 100m² shelving per room. Set at 6°C/20% humidity and 15°C/15% humidity respectively. There is a small temperature controlled laboratory attached.

Sanyo MLR cabinets (Sanyo, 1993, 1996, 2009, 2011, 0.6 m², 3 units, I 1-3)

These cabinets have a growing area of up to 1.0 m², spread over 5 trays and growing height of 0.2 metres. Temperature control is provided in the range 7°C to 30 °C ± 1.0°C with lights off and 10°C to 35 °C ± 1.0°C with lights on. Vertically-mounted lighting is provided by T12 36 watt fluorescent lamps, providing up to 200 µmol m⁻² sec⁻¹ at the centre, dimmable in 5 steps from 100% to 20%.

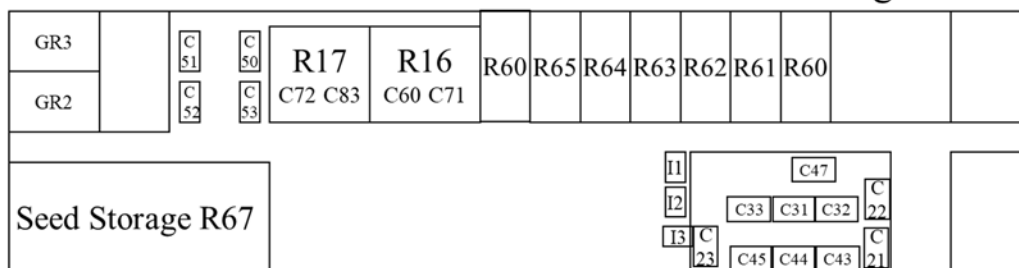
SGC 110 Cabinets (Weiss, 2015 0.9m² 2 units C 43 and 44)

These cabinets have a growing area of 0.9m² and a growing height of 1.5 metres, with shelves the growing area is doubled to 1.8m² and growing height reduced to 0.7m. Temperature control is in the range 5 to 35°C ± 1% with lights off and 10 to 35°C ± 1% with lights on. Lighting with Heliospectra R20 LED lights provide 400 µmol m⁻² sec⁻¹ at 300mm from the lights.. These lights are able to produce a variable programmable light spectrum.

Snijder MD1400 low temperature cabinet (Snijders, 2021, 0.82 (1.64)m², 3 units, C 23 to C25)

This cabinet has a growing area of 0.82 m² in single tier mode and in 2 tier mode 1.64 m² and growing height of 1200 cm and 58 cm. Temperature control is in the range of -10°C to 30 °C ± 0.2°C with lights off and -5°C to 35 °C ± 0.2°C with lights on. Humidity control is in the range 40% to 90% ± 5% in the range 15°C to 25°C. . Lighting is provided by Valoya BXDNA120 LED lamps with far red, providing up to 600 µmol m⁻² sec⁻¹ at 300 mm from the lights, dimmable from 100% to 10%. .

B25 Controlled Environment Service Building





CLF 3 tiered cabinets



Convicon Adaptis cabinets



Weiss SGC 110 Cabinet

Cereal Transformation Building B24

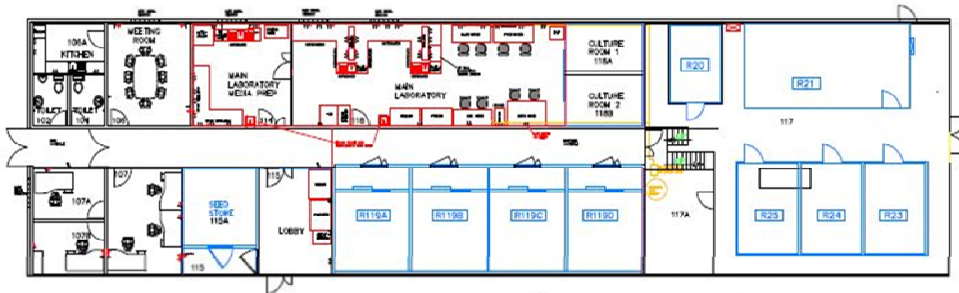
This building as well as contains 4 large rooms dedicated to growing cereal plants for Cereal transformation studies and a vernalisation room. This building also contains 4 temperature controlled insect or invertebrate behaviour rooms.

Cereal growth rooms (Weiss, 2019, 8.0m², 4 units, R)

These rooms each have a growing area of 6m² on automatically-irrigated mobile benching. Temperature control is provided in the range 15°C to 30 °C ± 1.0°C with lights off and 15°C to 30 °C ± 1.0°C with lights on. Lighting is provided by 80 watt Fluorescent lamps providing up to 600 μmol m⁻² sec⁻¹ at 1000 mm from the lights. These rooms are optimised to produce cereal donor material for Genetic Transformation studies.

Vernalisation room (Watford Refrig., 1998, 9.6m², 1 unit, R 20)

This room has an area of 16 m², with a growing area of 9.6 m², split on two levels. Temperature control is provided in the range 4°C to 10 °C ± 2.0°C with lights off and 5°C to 10 °C ± 2.0°C with lights on. Lighting is provided by 70 watt fluorescent lamps, providing up to 150 μmol m⁻² sec⁻¹ at 300 mm from the lights.



Jenkinson Building B63

The Jenkinson Building contains a range of Controlled Environment facilities.

Containment rooms, tiered (Weiss Gallenkamp, 2008, 24.5 m², 2 units, R 40 & 42)

These rooms have a growing area of 24.5 m² over 3 shelves and growing height of 0.6 metres. Temperature control is provided in the range 10°C to 30 °C ± 0.2°C with lights off and 10°C to 35 °C ± 0.2°C with lights on. Lighting is provided by 55 watt fluorescents, providing up to 380 μmol m⁻² sec⁻¹ at 300 mm from the lights. A 10% mix of tungsten lighting is provided. Positive humidity control in the range 60 to 90% ± 5% is provided. These rooms have a lobby, HEPA filtration and are negatively pressured to provide a level of containment to HSE CAT 3.

Containment rooms (Weiss Gallenkamp, 2008, 9.8m², 2 units, R 41 & 43)

These rooms have a growing area of 9.8 m² and growing height of 1.6 metres. Temperature control is provided in the range 10°C to 30 °C ± 0.2°C with lights off and 10°C to 35 °C ± 0.2°C with lights on. Lighting is provided by 55 watt fluorescents, providing up to 380 μmol m⁻² sec⁻¹ at 300 mm from the lights. Positive humidity control in the range 60 to 90% ± 5% is provided. These rooms have a lobby and HEPA filtration and are negatively pressured to provide a level of containment to HSE CAT 3.

Rice rooms (Weiss Gallenkamp, 2008, 6m², 2 units, R 50-51)

These rooms have a growing area of 6 m² and growing height of 2.2 metres. Temperature control is provided in the range 10°C to 35 °C ± 0.2°C with lights off and 10°C to 35 °C ± 0.2°C with lights on. Lighting is provided by 55 watt fluorescents, providing up to 480 μmol m⁻² sec⁻¹ at 300 mm from the lights. Positive humidity control in the range 60 to 90% ± 5% is provided. These rooms have reinforced floors to facilitate the study of columns of soil.

Sanyo MLR cabinet (Sanyo, 2009, 1.0 m², 2 units, I 8 & 9)

This cabinet has a growing area of up to 1.0 m², spread over 5 trays and growing height of 0.2 metres. Temperature control is provided in the range 7°C to 30 °C ± 1.0°C with lights off and 10°C to 35 °C ± 1.0°C with lights on. Vertically-mounted lighting is provided by T12 36 watt fluorescent lamps, providing up to 200 μmol m⁻² sec⁻¹ at the centre, dimmable in 5 steps from 100% to 20%.

Conviron Adaptis cabinets (Conviron, 2012, 0.5 m², 1 units, C 54)

This cabinet has a growing area of 0.5 m² and growing height of 1.1 metres. Temperature control is provided in the range 5°C to 30 °C ± 0.2°C with lights off and 5°C to 35 °C ± 0.2°C with lights on. Humidity control is in the range 60% to 90% ± 7% in the range 15°C to 25°C. Lighting is provided by 39W T5HO/840 fluorescent lamps providing up to 600 μmol m⁻² sec⁻¹ at 300 mm from the lights.

Cold rooms (Watford refrigeration, 2008, 5m², 5 units, R102 a-d)

These rooms provide storage for field samples. Two units are kept at 5°C/20% humidity, one at -4°C and two at 4°C. Control is at ± 2°C and ± 5% where humidity is controlled.



B63



Containment rooms B63



Containment rooms tiered



Rice room

Building 54

Sanyo MIR 154 cabinet (Sanyo 2009, 0.6m², 1 unit, I124)

This cabinet has a growing area of up to 0.6 m², spread over 3 trays and growing height of 0.2 metres. Temperature control is provided in the range 5°C to 30 °C ± 1.0°C with lights off and 5°C to 35 °C ± 1.0°C with lights on. Lighting is provided by T12 fluorescent lamps, providing up to 150 μmol m⁻² sec⁻¹ at the centre. This cabinet is used for chitting potatoes.

Building 56

Cold Storage Rooms. There are 4 cold storage units, 3 small (5m²) and 1 large 25m² - 25°C room. In addition there is a vernalisation cabinet.

Cold Room Cambridge 2001 5m² 2 units 102,112. Room designed for sample storage at +4°C

Cold Room Adcock 2012 5m² 1 unit w 102.

Freezer Room Adcock 2012 155m² 1 unit 104.

Vernalisation cabinet, Williams 2010 1.5m² 1 unit.

Standard cold cabinet set at 4°C with IKEA grow LED lighting providing 100μmolm⁻² sec⁻¹

Rothamsted Growing medium supported

Here are the growing medium commonly supported by H&CE for plant growth and research. We supplied other type of medium that not listed here. Please contact one of our staff to discuss your needs.

Weed Mix Details

Composition

- 80% Sterilised Screened Loam
- 20% Grit (3-6mm Screened, Lime Free)

Nutrients added - 2.0kg Osmocote Exact 5-6 month per m³

Nutrients	Osmocote Exact 5/6 months
N (total)	16%
NO3-N	8.4%
NH4-N	8%
P2O5	8%
K2O	11%
MgO	2%
Bo	0.02%
Mo	0.02%
Cu	0.05%
Mn	0.06%
Zn	0.015%
Fe (Total)	0.40%
Fe (Chelated)	0.20%

Dried

silica sand

Sieve size (mm)	Average % passing
3.35	100
2.80	99
2.36	84
2.00	55
1.70	23
1.40	3
1.18	1
1.00	0

6/14 Sand

Sieve size (mm)	Average % passing
1.00	100
0.71	96
0.50	47
0.355	10
0.25	1
0.18	0

2EW Sand

Rothamsted Standard Compost Mix

Composition

- 75% Medium grade (L&P) peat.
- 12% Screened sterilised loam
- 3% Medium grade vermiculite
- 10% Grit (5mm screened, lime free)

Nutrients added - 3.5kg Osmocote Exact 3/4 month per m³ or 0.5kg PG mix per m³

Nutrients	Osmocote Exact 3-4 months	PG Mix
N (Total)	16%	14%
NH ₄ -N	8.4%	8.5%
NO ₃ -N	7.6%	5.5%
P ₂ O ₅	11%	16%
k ₂ O	11%	18%
MgO	3%	0.80%
Bo	0.02%	0.03%
Mo	0.02%	0.20%
Cu	0.047%	0.15%
Mn	0.06%	0.16%
Zn	0.015%	0.04%
Fe (Total)	0.40%	0.09%
Fe (Chelated)	0.20%	-

Seed and Modular + Sand (F2S)

A fine grade growing media with added horticultural grade sand for seed sowing and direct rooting of cuttings in modules, trays or small pots up to 7cm. A medium Nitrogen growing media ideal for general seed sowing. Once established feeding is recommended.

Pot and Bedding: High Nutrient (M3)

A medium structured high nutrient growing media designed for bedding and pot plants requiring high feed levels. Controlled release fertiliser is not recommended for use with this product.

Nematode Mix

80% Sterilised Loam, 15% 2EW Sand, 5% Lime Free Grit (5mm).

Rothamsted Pots Supplied

Here are the pots commonly supplied by H&CE for plant growth and research. We can supply other types of pots not listed here. Please contact one of our staff to discuss your needs.

Reference	Type	Diameter (cm)	Height (cm)	Volume (ltr)
55L (Tiny Round)	Tiny 8° Tall Pots	5.5	5	0.08
VCC13 (Round)	5° Tall Pots	13	11.3	1.05
VCD14 (Round)	5° Dwarf Pots	14	9	0.95
VCC15 (Round)	5° Tall Pots	15	13.1	1.55
VCC21 (Round)	5° Tall Pots	21	18.3	4.5
VTD9 (Round)	8° Tall Pots	9	6.8	0.27
VTD105 (Round)	8° Tall Pots	10.5	8.1	0.44



Reference	Type	Pot Size (cm)	Volume (ltr)
V11PP (Square)	Square Pots	11 x 11 x 12	1
V91PP (Square)	Square Pots	9 x 9 x 10	0.59
V778PS (Square)	Square Pots	7 x 7 x 8	0.23
VQ22 (Large Square)	Square Pots	22 x 22 x 23	11

Reference	No. of Cells	Tray Size (cm)	Cell Size (cm)
C15 (Inserts)	15	36.2 x 22.7	6.5 x 6.3
C24 (Inserts)	24	36.2 x 22.7	5.0 x 4.8
C40 (Inserts)	40	36.2 x 22.7	4.0 x 3.8
C60 (Inserts)	60	36.2 x 22.7	3.2 x 3.0



Reference	External Size (cm)	Volume (ltr)
Half Seed Tray	22.7 x 17.3 x 5.5	1.7
Standard Seed Tray	37.3 x 24.5 x 5.5	3.85

Reference	No. of Cells	Cell Shape	Tray Size (cm)	Tray Depth (cm)	Cell Size (cm)	Cell Volume (ml)
P104 (Plug)	104	Round	53 x 31	5.3	3.5 x 3.5	38
P286 (Plug)	286	Square	53 x 31	3	2.0 x 2.0	9.5
P576 (Plug)	576	Square	53 x 31	3	1.45 x 1.45	3.5

H&CE Staff

Rothamsted Research Tel: **01582 763133 Reception**

Fax: **01582 461618**



Head of Department

Fiona Gilzean Ext: 2800 or 07305 805397

e-mail: fiona.gilzean@rothamsted.ac.uk



Deputy Head of Dept.

Jill Maple Ext: 2688

e-mail: jill.maple@rothamsted.ac.uk



Horticultural Consultant

Julian Franklin Ext: 2690 or 07968062168

e-mail: julian.franklin@rothamsted.ac.uk

H&CE Team

Andrea Arvai
Lawrence Mudd
Mark Preston
Jack Turner
Angela Westrup
Jordan Yaxley



Julian Franklin July2021