

HDC Research and Knowledge Transfer Strategy

2013

Executive summary

The HDC's purpose is to help British horticulture become increasingly efficient, competitive, resilient and sustainable by funding applied research and knowledge transfer activities. With increasing global demand for high quality horticultural produce, given suitable investment in research and innovation, the British horticulture industry should be expand its supply to the UK market, develop export markets, increase production and make an increasing contribution to UK GDP.

To achieve this, the industry needs state-of-the-art production methods and facilities, a highly educated professional workforce and a self-sustaining community of applied scientists and technologists capable of driving continual innovation and development. The HDC will work towards this vision over the coming decades in partnership with others. A five-year rolling R&KT strategy will shape future HDC levy investment through seven broad programmes of activity.

1. **Genetics** – The HDC will work with applied scientists, plant breeders, consultants and growers to enable growers to exploit and manage high-performance crop varieties suited to British growing conditions and market needs.
2. **Substrates** – The HDC will work with applied scientists, other levy bodies, consultants and growers to increase understanding of soil fertility, develop and facilitate industry uptake of good rotational and soil management practices, and participate in co-funded initiatives addressing Defra policy on responsibly sourced substrates in England.
3. **Inputs** – The HDC will work with applied scientists, engineers, other levy bodies, suppliers, consultants and growers to optimise crop nutrient and water use, improve understanding and management of the rhizosphere, minimise surface water contamination, optimise the use of energy in protected crop production and minimise associated greenhouse gas emissions.
4. **Crop protection** – The HDC will work with applied scientists, manufacturers, suppliers, consultants and growers to devise and facilitate industry uptake of innovative and resilient integrated management systems to protect horticultural crops against diseases, pests and weeds that are decreasingly reliant on plant protection products.
5. **Cropping systems** – The HDC will work with applied scientists, engineers, manufacturers, consultants and growers to develop and maintain state-of-the-art production systems utilising the latest technologies and precision tools to maximise efficiency and sustainability.
6. **Value** – The HDC will work across supply chains with applied scientists, engineers, consultants, and growers to maximise the efficiency of post-harvest storage and processing, minimise waste, and demonstrate the vital contribution that horticulture makes to the British economy and the health and wellbeing of British society.
7. **Cross-cutting themes** – The HDC will work with key stakeholders to maximise the uptake of new knowledge, devise ways of measuring the impact and value of all HDC activities, and work with educators, trainers and other levy bodies to continually improve the capabilities of all those working in British horticulture.

The strategy will be implemented through integrated research and knowledge transfer programmes addressing sector and strategic needs and priorities. Strategic cross-sector work will be procured proactively by competitive tendering through the HDC Board. HDC Sector Panels will procure sector/crop-specific tactical work by competitive tendering or in response to external proposals from researchers addressing published Sector Panel needs.

Vision

The HDC's purpose is to help British horticulture become more efficient, competitive, resilient and sustainable by funding applied research, knowledge transfer and supporting activities.

With increasing global demand for high quality horticultural produce, given suitable investment in research and innovation, the British horticulture industry should be able to increase its supply to the UK market, develop export markets, increase production and make an increasing contribution to UK GDP.

To achieve this, the industry needs state-of-the-art production methods and facilities, a highly educated professional workforce and a self-sustaining community of applied scientists and technologists capable of driving continual innovation and development through targeted applied research and knowledge transfer programmes.

The HDC will work towards this vision over the coming decades in partnership with growers, supply chains, other research funders (BBSRC, Defra, ESRC, NERC, EU, TSB), the research and consultancy community and the producers/suppliers of seeds and plants, fertilisers, plant protection products and machinery.

R&KT strategy

Rationale

The only public funding now available for applied horticultural research in the UK is that provided by the HDC and the Technology Strategy Board (TSB), together with the small amount of Defra funding committed to completing the Horticulture Link programme. It is of paramount importance that the strategies of all R&KT funders, including BBSRC, Defra, the EU, NERC, TSB and private industry are aligned to maximise their collective impact and value.

This strategy provides a unifying framework for all HDC funded activities. Indicative goals are specified when possible. It will be reviewed and revised in the light of progress and changing circumstances every five years.

Approach

The strategy has three overarching aims: (1) *optimisation* – balancing inputs and outputs to give the most efficient and sustainable outcomes; (2) *additionality* – complimenting the activities of other funders and industry; (3) *impact* – providing the best possible outcome and value for levy payers.

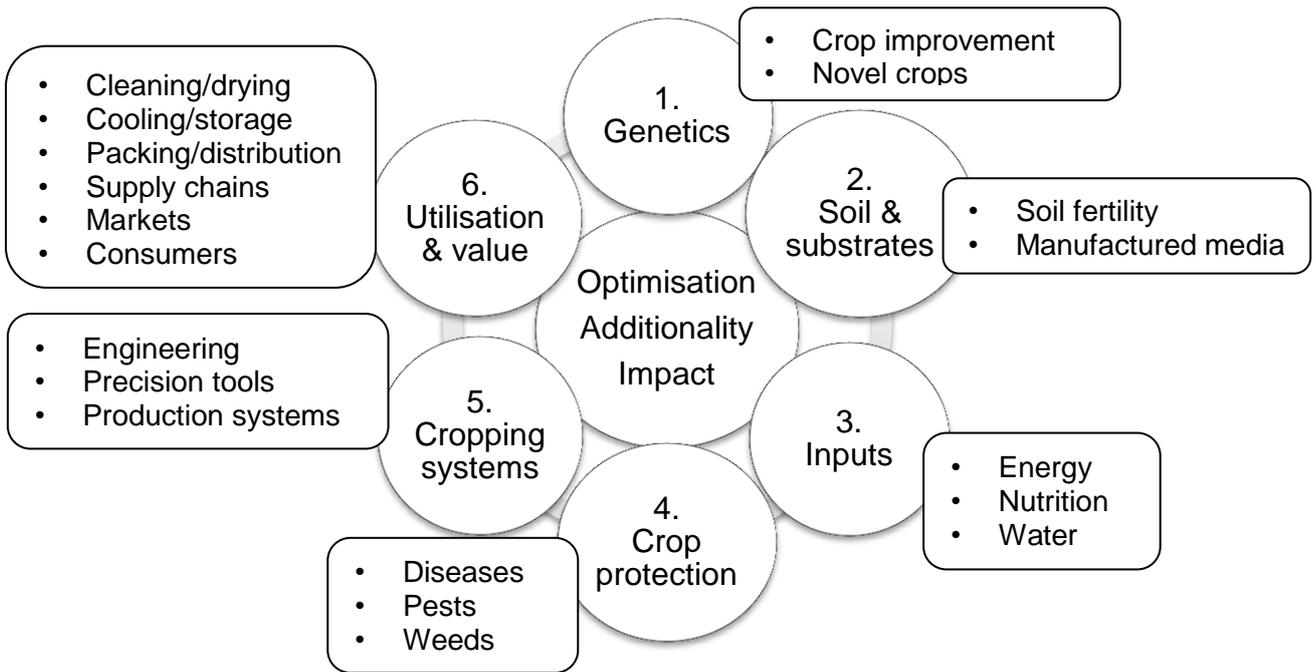


Figure 1. HDC Strategic Development Framework

Optimisation means balancing the components that determine crop genetic potential, crop output, input utilisation and value (Figure 2) to achieve the best outcome possible under the prevailing conditions.

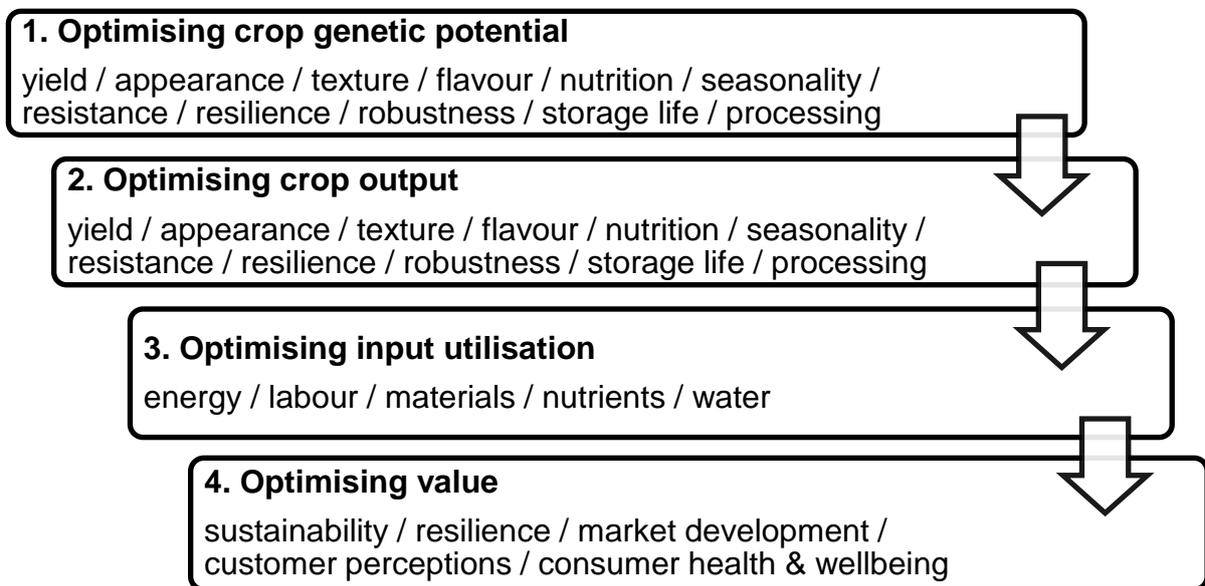


Figure 2. Optimising horticultural production systems

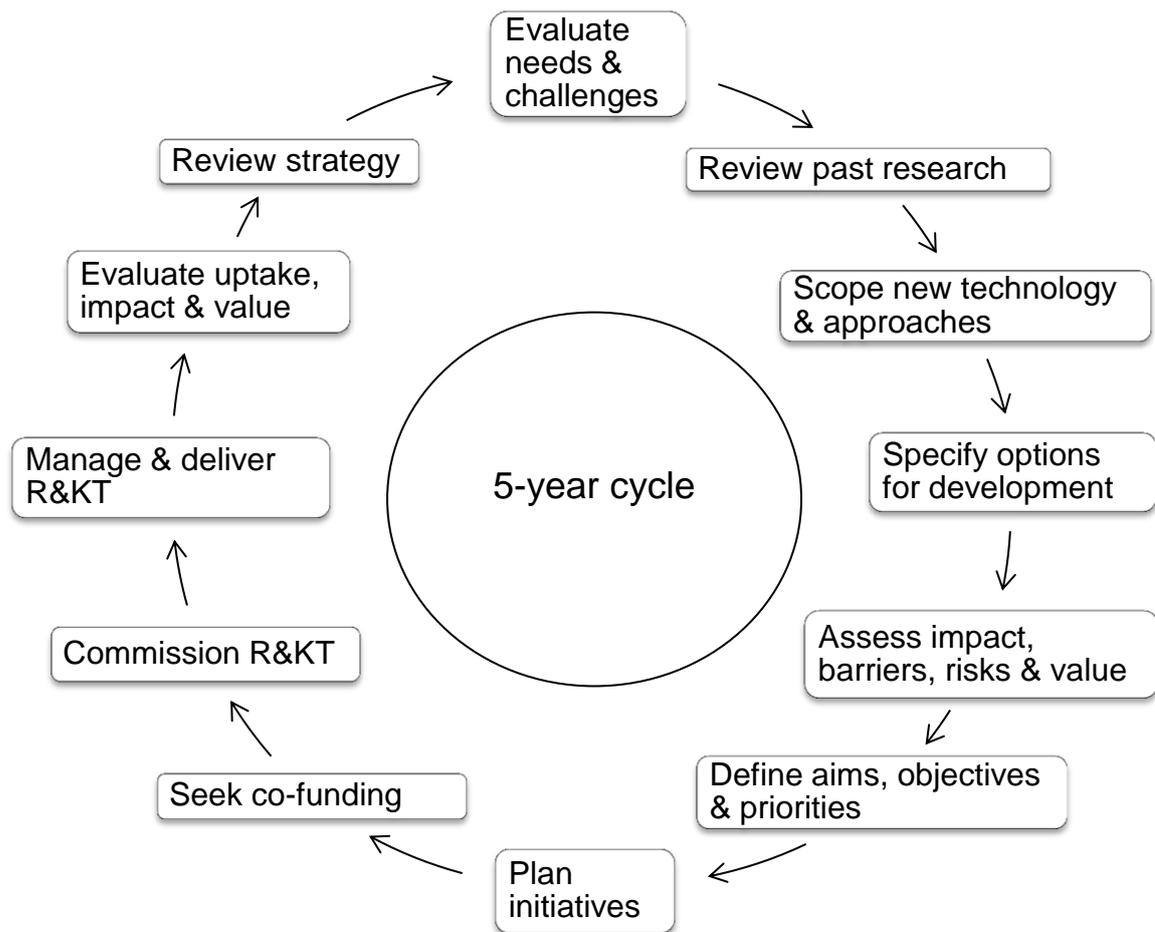


Figure 3. HDC R&KT strategy implementation cycle

The strategy will be implemented by funding integrated programmes of applied research and knowledge transfer activities, devised in consultation with the industry to ensure that they properly address sector and strategic needs and priorities and potential barriers to progress. The main aims of HDC research will be to fill gaps in knowledge, translate the findings of basic research into forms exploitable by industry, and evaluate and exploit potentially relevant overseas research findings. HDC knowledge transfer activities will focus on assimilating, interpreting and communicating to growers all relevant knowledge gained in the form of best practice guidelines.

Strategic cross-sector work will be procured proactively by competitive tendering under the direction of the HDC Board. Sector/crop-specific tactical work directed by the Sector Panels will continue to be procured both proactively by competitive tendering and in response to external proposals from researchers addressing those needs specified in the published Sector Panel strategies.

HDC strategic priorities

1. Genetics

The HDC will work with applied scientists, consultants and growers to enable growers to exploit and manage high-performance crop varieties suited to British growing conditions and market needs.

Assumptions

1. BBSRC-funded research will continue to improve understanding of crop plant genetics and gene-environment interactions.
2. Increasingly affordable, rapid DNA sequencing will enable existing germplasm collections to be fully mapped and exploited.
3. Development of marker genes will enable faster incorporation of genes associated with desirable phenotypic traits into commercial breeding lines.
4. Production of genetically modified crops in the EU is unlikely to be approved in the near future.
5. Genetic Improvement Networks (GIN's) additional to the existing ones for brassicas, onion, carrot and lettuce may be created for other crops.
6. Varietal development will increasingly be driven by large commercial plant breeders operating internationally with limited interest in the particular needs of UK producers.

Goals

Primary goals	Target		Importance to:	
	Indicators	Date	Industry	HDC
1. Edible crops to have improving germination rates, vigour, nutrient and water utilisation characteristics, potential yield, quality (including nutritional or aesthetic attributes), resistance and tolerance to key pests and diseases, and improved ability to tolerate key components of environmental stress (drought, water-logging, temperature extremes, wind-blow, extremes in pH, soil nutrient deficiency).	(To be devised.)	-	H	H/M/L ¹
2. Increasing hectarages of novel/exotic crops to be grown to exploit changing seasonal weather conditions and new commercial opportunities.	(To be devised.)	-	L	L

HDC priorities

2012-17	Priority	
	Board	Sectors
1. Evaluation/development/exploitation of strategically important traits in pre-commercial breeding material.	-	H/M/L
2. Evaluation/development/exploitation of novel/exotic crops.	-	L

¹ Multiple priority ratings indicate the range if sectors differ.

2. Substrates

The HDC will work with applied scientists, other levy bodies, consultants and growers to increase understanding of soil fertility, develop and facilitate industry uptake of good rotational and soil management practices, and participate in industry-led initiatives addressing government policy on responsibly sourced substrates in England.

Assumptions

1. Applied research on soil fertility/health will be co-funded with HGCA and PCL.
2. Basic scientific research on soil fertility/health/biodiversity will be funded by BBSRC/NERC.
3. Defra policy on responsibly sourced substrates will be unchanged.
4. Further research on responsibly sourced substrates will be co-funded by government and manufacturers and suppliers of growing media.

Goals

Primary goals	Target		Target	
	Indicator	Date	Industry	HDC
1. Key rhizosphere functions and the factors responsible for soil health/fertility to be increasingly well understood.	(To be devised.)	-	H	H
2. Good rotational and soil management principles to be applied in field crop production.	(To be devised.)	-	H	H
3. Horticultural growing media composition to comply with Defra policy (England).	Growing media sales to growers.	2018	M	M

HDC priorities

2012-17	Priority	
	Board	Sectors
1. Facilitate and co-fund with BBSRC and other AHDB sectors projects on soil fertility/health.	H	H/M/L
2. Develop tools for better understanding and managing spatial and temporal variability in soil health/fertility.	H	H/M/L
3. Facilitate (with other AHDB sectors) industry-wide discussions about the need for a long-term UK soil fertility database and, if supported, how one might be created.	L	H/M/L
4. Facilitate R&KT on growing media.	M	H/M/L

3. Inputs

The HDC will work with applied scientists, engineers, other levy bodies, suppliers, consultants and growers to optimise crop nutrient and water use, improve understanding and management of the rhizosphere, minimise drinking water contamination by the industry, optimise the use of energy in protected crop production and minimise associated greenhouse gas emissions.

Assumptions

1. Defra voluntary targets for GHG emissions reductions will remain unchanged.

2. Investment in GPS and other precision application technologies by equipment manufacturers will continue.
3. Growers will be able to obtain the capital funding and planning consents necessary to purchase and install on-site renewable energy systems, precision scanning/sensing/GIS/GPS technology and on site water storage facilities.
4. Applied research on crop nutrient and water utilisation will be co-funded with HGCA and PCL.
5. Basic research funded by BBSRC and others will continue to underpin the development of crops with genetically reduced requirements for energy, nutrients and water, and the development of agronomic practices that will further improve the utilisation by plant roots of nutrients and water in the rhizosphere.
6. Use of processed waste water for irrigation may become feasible.

Goals

Primary goals	Target		Importance to:	
	Indicator	Date	Industry	HDC
1. Energy utilisation associated with heating and lighting of protected edible and ornamental crops to be improved and GHG emissions reduced proportionately.	(To be devised.)	-	H	H
2. Energy to be derived from renewable sources	(To be devised.)	-	H	-
3. Crop fertiliser use to be optimised using spatial soil sampling and analysis, remote or in-field scanning/sensing and precision GIS/GPS application systems.	(To be devised.)	-	H	H
4. Crop irrigation to be optimised using remote or in-field scanning/sensing and GIS/GPS application systems.	(To be devised.)	-	H	H
5. Rainfall capture/retention for field crops and protected crops to be increased.	(To be devised.)	-	H	-
6. Water utilisation efficiency in field crops and protected crops to be increased.	(To be devised.)	-	H	H
7. Extracted irrigation water to be replaced using processed waste water if feasible.	(To be devised.)	-	H	-

HDC priorities

2012-17	Priority	
	Board	Sectors
1. Disseminate best practice guidelines on energy saving and GHG emissions reduction practices (GrowSave).	-	H
2. Co-fund BBSRC HAPI projects on energy, nutrient and water utilisation.	H	-
3. Commission work to scope and evaluate novel energy-saving technologies.	-	H
4. Commission work to scope and evaluate precision nutrient & water management technologies.	M	H/M/L
5. Develop and disseminate best practice guidelines on crop nutrient (to succeed RB209) and water utilisation.	H	H

4. Crop protection

The HDC will work with applied scientists, manufacturers, suppliers, consultants and growers to devise and facilitate industry uptake of innovative and resilient integrated management systems to protect horticultural crops against diseases, pests and weeds.

Assumptions

1. Until effective alternatives have been developed for the control of key diseases, pests and weeds, plant protection products will remain a primary method of control for many crops.
2. Enough new plant protection products with novel modes of action will be released by the crop protection industry to enable the effective management of resistance.
3. Regulatory barriers to the registration/approval of bio-control agents, bio-pesticides and other bioactive substances may remain a key constraint.
4. Applied research on major diseases, pests and weeds affecting arable and horticultural crops will be co-funded with HGCA and PCL.
5. Basic research funded by BBSRC and others will continue to improve the genetic understanding needed to develop commercial crop varieties with increasing resistance/tolerance to diseases and pests.
6. The production of genetically modified crops is unlikely to be approved by the EU in the near future.
7. Growers will be able to obtain the capital funding needed to invest in precision crop protection tools.

Goals

Primary goals	Target		Importance to:	
	Indicator	Date	Industry	HDC
1. Use of plant protection products on major crops in all sectors to be optimised.	(To be devised.)	-	H	H
2. Effective, resilient pesticide resistance management strategies to be used to optimise pesticide performance against major diseases, pests and weeds.	(To be devised.)	-	H	H
3. Effective, resilient control measures and strategies to be used to control invasive diseases, pests and weeds.	(To be devised.)	-	H	H
4. Resistance/tolerance to key fungal and bacterial diseases, insect, mite, nematode and slug pests of major crops to be developed.	(To be devised.)	-	H	H
5. Naturally occurring or introduced biological control agents to be used to manage key diseases, pests, and weeds of major crops.	(To be devised.)	-	H	H
6. Semiochemicals, sterile insect release or other methods of pest behaviour manipulation to be used to manage key insect, mite, nematode and slug pest species of major crops.	(To be devised.)	-	H	H
7. Cultivations, rotation or other agronomic control measures to be used to manage	(To be devised.)	-	H	H

key diseases, pests, and weeds of major crops.				
8. Disease, pest and weed management to be optimised on increasing hectares of horticultural field crops using remote or in-field scanning, sensing, diagnostics and precision GIS/GPS systems.	(To be devised.)	-	H	H

HDC priorities

2012-17	Priority	
	Board	Sectors
1. Evaluate new plant protection products, other active substances and integrated management systems for major diseases and pests with diverse host ranges and major weeds, and disseminate findings.	H	L
2. Evaluate new plant protection products, other active substances and integrated management systems for key diseases and pests with narrow host ranges, and disseminate the findings.	-	H
3. Support applications for Extensions of Authorisations for Minor Uses (EAMU's) as and when necessary.	-	-H

5. Cropping systems

The HDC will work with applied scientists, engineers, manufacturers, consultants and growers to develop and maintain state-of-the-art production systems utilising the latest technologies and precision tools to maximise efficiency and sustainability.

Assumptions

1. Labour will become less available and more expensive.
2. Advances will continue to be made in genetics, crop breeding, soil and growing media management, heating and lighting, resource use efficiency, crop protection, harvesting and post-harvest management and precision management tools.

Goals

Primary goals	Target		Importance to:	
	Indicator	Date	Industry	HDC
1. Labour use associated with the production of major field and protected crops to be reduced.	(To be devised.)	-	H	L
2. Waste output associated with the production of major field and protected crops to be reduced.	(To be devised.)	-	H	L
3. Efficiency and output of production to be increased.	(To be devised.)	-	H	L
4. Significant volumes of produce to be grown in ultra-high efficiency units.	(To be devised.)	-	H	L

HDC priorities

2012-17	Priority	
	Board	Sectors
1. Commission work on production system development for all major crops and disseminate and exploit the findings.	-	H
2. Commission/co-fund exploratory pilot work on ultra-high efficiency production systems.	M	-
3. Commission/co-fund exploratory pilot work on automation, precision management and robotics.	M	H/M/L

6. Value

The HDC will work across supply chains with applied scientists, engineers, consultants, and growers to maximise the efficiency of post-harvest storage and processing, minimise waste, and demonstrate the vital contribution that horticulture makes to the British economy and the health and wellbeing of British society.

Assumptions

1. Advances will continue to be made in genetics, crop breeding, soil and growing media management, heating and lighting, resource use efficiency, crop protection, harvesting, post-harvest management and precision management tools.
2. The UK Horticulture Innovation Partnership will receive adequate long-term support from all key stakeholders.
3. The food industry will continue to make consumers aware of the financial, social and environmental benefits of buying UK horticultural produce.

Goals

Primary goals	Target		Importance to:	
	Indicator	Date	Industry	HDC
1. Post-harvest labour use associated with major field and protected crops to be reduced.	(To be devised.)	-	H	L
2. Waste associated with post-harvest processing of major field and protected crops to be reduced	(To be devised.)	-	H	L
3. Post-harvest process efficiency and output to be improved.	(To be devised.)	-	H	H
4. UK and overseas sales of UK horticultural produce to increase.	(To be devised.)	-	H	H
5. Robust consumer understanding of the merits of UK horticultural products and production systems to be achieved.	(To be devised.)	-	H	L

HDC priorities

2012-17	Priority	
	Board	Sectors
1. Commission work on post-harvest system development for key outdoor and protected edible and ornamental crops and fully disseminate and exploit the findings.	-	H
2. Consider options for improving consumer understanding of UK horticultural products and production systems.	L	-
3. Participate in or support campaigns aimed at improving consumer understanding of horticulture.	L	-

7. Cross-cutting themes

The HDC will work with key industry stakeholders to maximise the uptake of new knowledge, devise ways of measuring the impact and value of all HDC activities, and work with educators, trainers and other levy bodies to continually improve the capabilities of all those working in British horticulture.

Assumptions

1. The impact and value of HDC activities can be meaningfully measured and assessed.
2. Funding provision for industry training by BBSRC, Defra, RDPE, RERAD, or others is maintained at current levels or increased.
3. UK Universities/colleges generate enough graduates and postgraduates capable of, and interested in, taking up employment opportunities in horticulture.
4. Core UK horticultural research providers will remain viable and able to respond to initiatives intended to fill gaps in capability/capacity and address threats to succession in key disciplines.

Goals

Primary goals	Target		Importance to:	
	Indicator	Date	Industry	HDC
1. Targets defined for high priority goals.	List on HDC website	2015	H	H
2. Targets defined for other goals.	List on HDC website	2016	L	L
3. Technical/managerial skills required by industry defined and documented.	(To be devised.)	-	L	L
4. Technical/managerial training needs of industry defined and documented.	(To be devised.)	-	H	L
5. Technical/managerial skills of industry improved.	(To be devised.)	-	H	L
6. UK R&KT capability/capacity gaps and succession threats assessed and documented (by UKHIP partners).	(To be devised.)	-	H	H
7. Extant R&KT institutions financially secure.	(To be devised.)	-	H	H
8. High priority capability/capacity gaps filled and succession threats addressed by R&KT providers.	(To be devised.)	-	H	H

HDC priorities

2012-17	Priority	
	Board	Sectors
1. Devise SMART targets and indicators for as many strategic goals as possible in consultation with industry, define assessable metrics and devise appropriate methods of assessment.	H	H/M/L
2. Commission pilot studies on new approaches to KT/training.	H	H/M/L
3. Fund/co-fund HDC PhD Studentships.	H	H
4. Fund student bursaries (e.g. MSc Lancaster University).	H	H
5. Co-fund new EMT/HDC/HTA Fellowships.	H	H
6. Participate in BBSRC ATP's, RDPE training framework programme & other relevant training/CPD programmes	H	H/M/L

Feedback

The HDC is keen to receive feedback on this strategy or its implementation from levy payers or other key stakeholders at any time. If you have any comments you wish to make, please address these to:

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