Scottish Government Rural Affairs, Food and Environment Portfolio

Strategic Research Programme
1 April 2016- 31 March 2021

The James Hutton Institute

Alison Lees

Background

2011-16 Programme saw

- James Hutton Institute Merger
- Centres of Expertise and Strategic Partnerships
  links with SG policy teams, HEIs and industry
- Underpinning capacity – e.g. CPC, Pest & Pathogen collections, CSC.

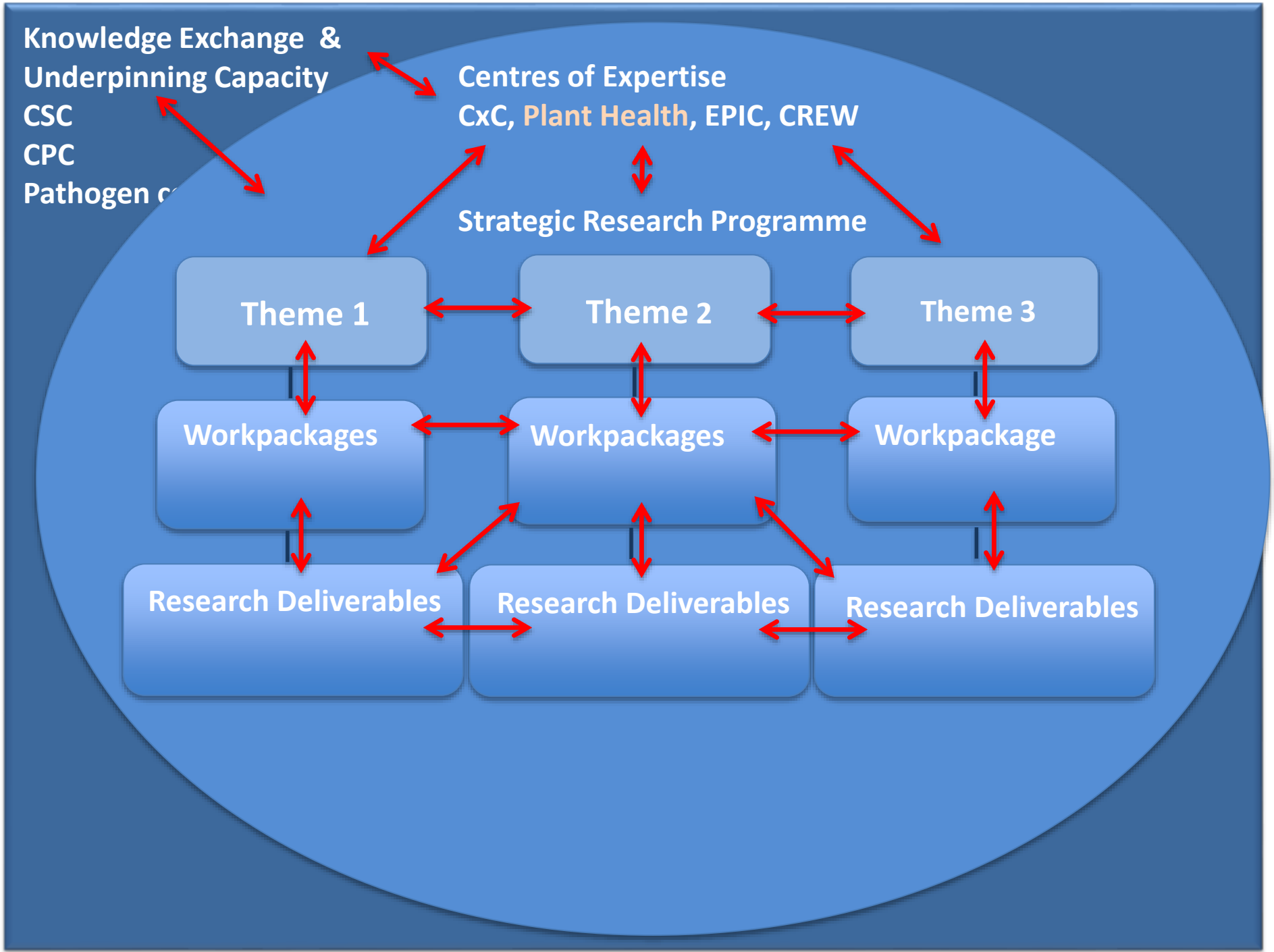
Remaining challenges: Climate change, flooding, competing land use, growth of the rural economy

New challenges: food provenance and security, sustainable intensification, circular economy to address waste

Partnerships with public bodies, Govt depts, EU etc.

Key features of 2016-21 SRP

- ‘Integrate evidence base to underpin development and implementation of complex policies in areas such as Climate Change, Land use and Food & Drink’
- Three Themes
- Cross-MRP working
- Knowledge Exchange remains critical – centralised KE function.


Knowledge Exchange &
Underpinning Capacity
CSC
CPC
Pathogen c
Centres of Expertise
CxC, Plant Health, EPIC, CREW
Strategic Research Programme
Theme 1
Theme 2
Theme 3
Workpackages
Workpackages
Workpackage
Research Deliverables
Research Deliverables
Research Deliverables

Theme 1: Natural Assets

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- WP1.1 Soil
  RD1.1.1 Soil & its ecosystem functions
  RD1.1.2 Soil resilience to change
  RD1.1.3 Soil & net GHG emissions
  RD1.1.4 Soil Management

- WP1.2 Water Resources and Flood Risk Management

- WP1.3 Biodiversity and Ecosystems

- WP1.4 Integrated and Sustainable Management of Natural Assets

Theme 2: Productive and sustainable land management and rural economies

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- WP2.1 Crop & Grassland Production and Disease control*

  RD 2.1.1 Genetic Diversity of Crops
  RD 2.1.2 Crop Genetic Improvement
  RD 2.1.3 Plant-pest interactions
  RD 2.1.4 Plant-pest epidemiology
  RD 2.1.5 In-field detection
  RD 2.1.6 IPM
  RD 2.1.7 Plant-soil-water interactions (Philip White)
  RD 2.1.8 Novel crops (Pete Iannetta)

- WP2.2 Livestock production, health, welfare & disease control

Theme 2: Productive and sustainable land management and rural economies

- WP2.3 Agricultural systems and land management

  RD2.3.2 Protecting genetic diversity

  RD2.3.3 Disease Threats in the environment (Nicola Holden)

  RD 2.3.4 Sustainable soil and water management (Tim George)

  RD2.3.9 Integrated management systems (Cathy Hawes)

  RD 2.3.11 Trade-offs between productivity and sustainability

  RD2.3.12 Increasing uptake of best practice (Katrin Prager)

- WP2.4 Rural Industries

Theme 3: Food, Health and Wellbeing

- WP3.1 Improved food & drink production* (Derek Stewart)
  RD3.1.1 Improving Scottish primary production (Derek Stewart)
  RD 3.1.2 Improving food & drink production (Gordon MacDougall)
  RD3.1.3 Food safety (Nicola Holden)
  RD3.1.4 Preventing food waste
  RD3.1.5 Food ethics

- WP3.2 Healthy diets and dietary choice* (Derek Stewart)

- WP3.3 Food security
  RD3.3.1 Food trade and consumption
  RD3.3.2 Enhancing Food security
  RD3.3.3 Local Food

Theme 2: Productive and Sustainable Land Management and Rural Economies

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- WP2.1 Crop & Grassland production and disease control

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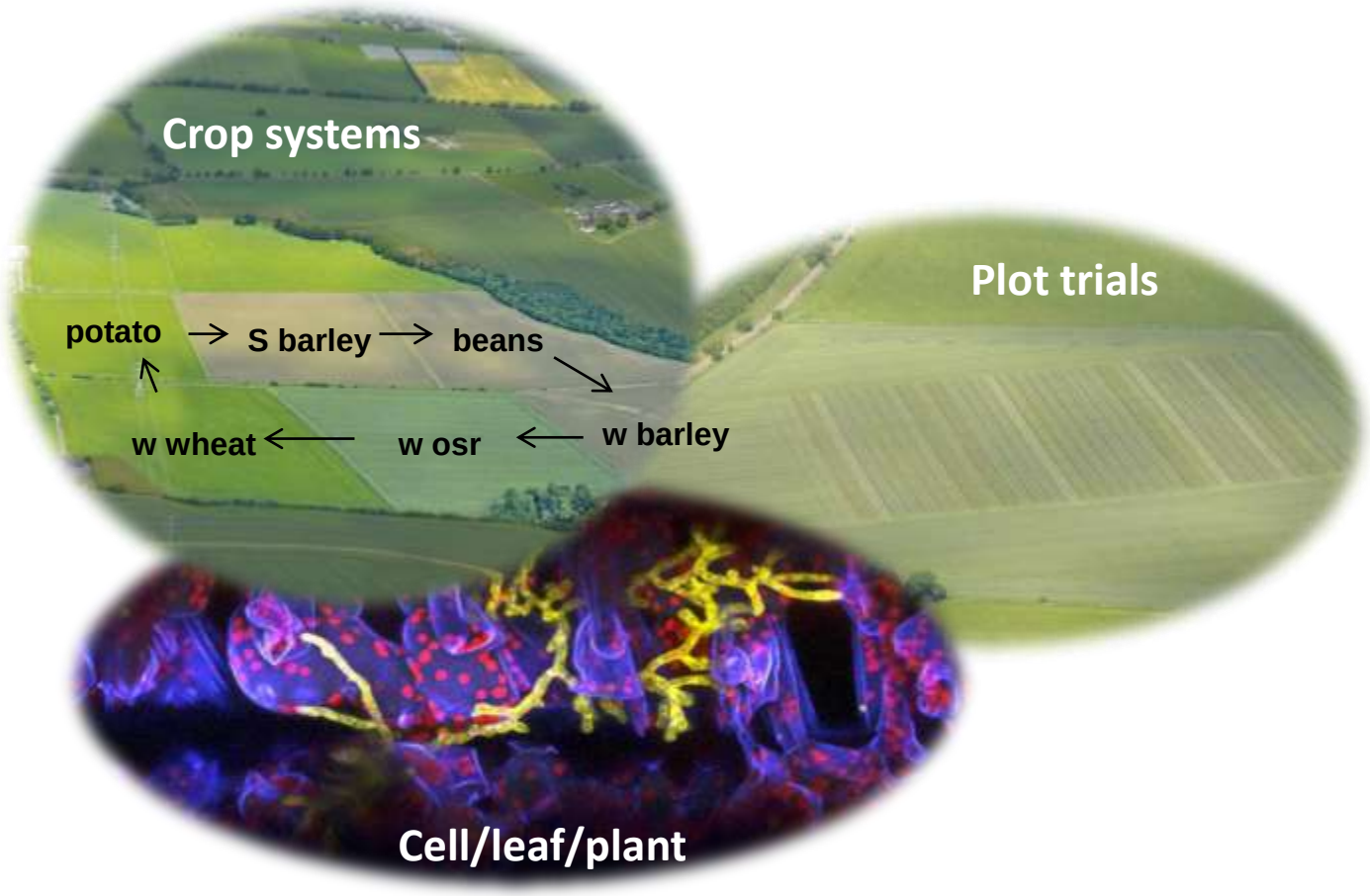
RD 2.1.6 IPM
RD 2.1.7 Plant-soil-water interactions

- Builds on CWP5.2, 6.4

Global – Food Security, Sustainability, Climate Change, Biodiversity

- Reduced pesticide use – environmental concerns & availability
- Alternatives to conventional pesticides
- Sustainable Use of Pesticides Directive - IPM National Action Plans



Genome Analysis → Tools & Resources → Basic Mechanisms → Integrated Approaches → Delivery to end users

Key aims WP2.1

- ‘To deliver, against a background of environmental change, to sustainable intensification, food security and improved agricultural practice through’:

- Provision of crop cultivars and varieties with improved quality, yield and resource efficiency traits, which are resilient to key biotic and abiotic stresses.

- IPM systems which translate an understanding of plant-pest interactions, host resistance, epidemiology and new disease threats, supported by the use of monitoring, modelling and diagnostic technologies to improve crop performance.

- Outputs that contribute to more efficient production systems, healthier soils and more sustainable rotations delivered through the uptake of best practice.

- Research underpinned by the best use of resources and technologies including germplasm and pest collections, computational analyses, statistical modelling, diagnostics, and metagenomics.

Key areas (potato)

- **RD2.1.1 Genetic Diversity of Crops** (Glenn Bryan)
- **RD2.1.2 Crop Genetic Improvement** (Mark Taylor)
- Development and acquisition of improved germplasm resources.
- Establishment of a potato core collection from a diverse genebank.
- Development of Backcross Inbred Line (BIL) populations for potato.
- Phenotyping of CPC core and other populations for abiotic stress and resistance traits.
- Phenotyping of potato populations for key quality and developmental traits.
- Potato: genotyping resources for assessing diversity
- Potato tuber dormancy
- Potato tuber greening
- Biotic stress in potato

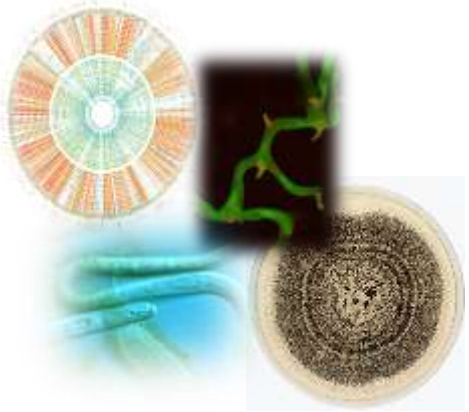
'Key outputs will be genetic markers, genes and germplasm that can be exploited by plant breeders to the benefit of Scottish agriculture and its dependent downstream processing industries.'

RD2.1.3 Plant –pest interactions (John Jones)

- **Pathogen biology**
  Functional analysis of effector-host interactions
  Exploiting pest infection biology for novel control targets
- **Plant Response**
  Achieving sustainable resistance under abiotic stress

- Main potato targets: PCN, Late Blight, aphids

- Identify and characterise key factors that define the outcome of plant-pest interactions and establish how host-pathogen interactions are likely to be affected by temperature and other stresses.
- 'Research from this deliverable will provide targets for improving pest and disease resistance and novel control methods.'

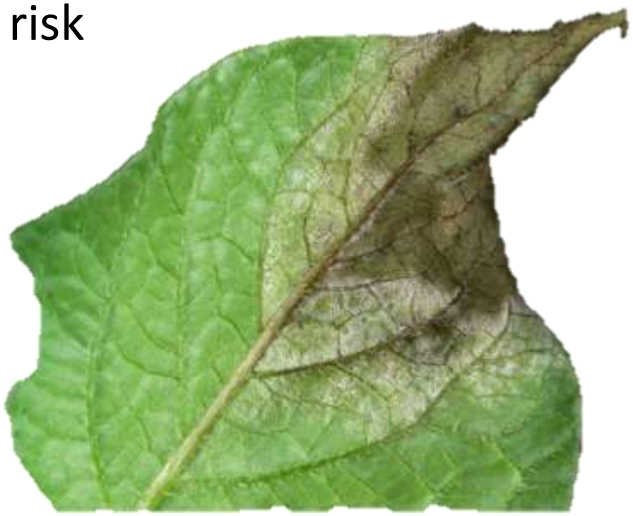


2.1.4 Plant –pest epidemiology (Adrian Newton)

- **Epidemiological modelling**
- **Pathogen populations**
- **Inoculum sources**

- Potato Targets: Late Blight, PCN, Pectobacterium, aphids

- ‘Through an understanding of key epidemiological parameters and optimal ways of manipulating them, risk management and control of plant diseases can be improved.‘



2.1.5 In-field detection (Jennie Brierley)

- **In-field diagnostics for soil-borne pests** (tuber blemish, FLN)
- **In-field diagnostics for air-borne pests** (Alternaria, Late Blight)
- **Improved application of sensors and satellite imaging for early warning**
- **In-field detection of important pathogens of rotational crops**
- **Novel genome-based methods for the development of molecular diagnostics** (Bacteria)
- **New and emerging threats**

- 'New developments in pest diagnosis will results in diagnostics that are both relevant to stakeholder needs and fit for the future.'
- 'The primary outcomes of RD 2.1.5 will be to improve decision making for growers and control recommendations and to inform policy and statutory recommendations, leading to improved disease control.'

2.1.6 IPM (Nick Birch)

- **Consolidate/Disseminate IPM methods to deliver best practice**
- **Quantification and ranking of disease risk modifiers**
- **Develop/improve decision support systems**
- **Identify new crop protection tools**: targeted use of pesticides in response to thresholds and predictions; biological control agents including predators, parasitoids and phages; host resistance elicitors and plant defence primers; biopesticides; semiochemicals; host plant resistance etc.
- **Evaluate and combine IPM tools and evaluate efficacy in improving control**
- **Potato IPM 'Toolbox'**

- 'RD2.1.6 will integrate contributions from other RDs (new varietal resistance, monitoring and forecasting tools) and will work closely with stakeholders to prioritise IPM research for each crop system and promote the uptake of best practice for farmers.'

Stakeholder engagement

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‘KE remains a critical deliverable and a responsibility at all levels of the programme funding’

‘Co-construction of research and KE activities with a wide range of stakeholders is an integral part to the planning an delivery of research and KE’

- Early involvement in framing questions and outputs
- Ongoing communication
- Improvements in practice, policy and industry

Contacts

- Theme 2 – Ian Toth

- WP2.1 - Alison Lees (Diseases), Mark Taylor (Crops)

- Thanks to stakeholders who have already responded to requests for feedback.
- Still a chance to influence content, experimentation and delivery/uptake of results.