HotSol

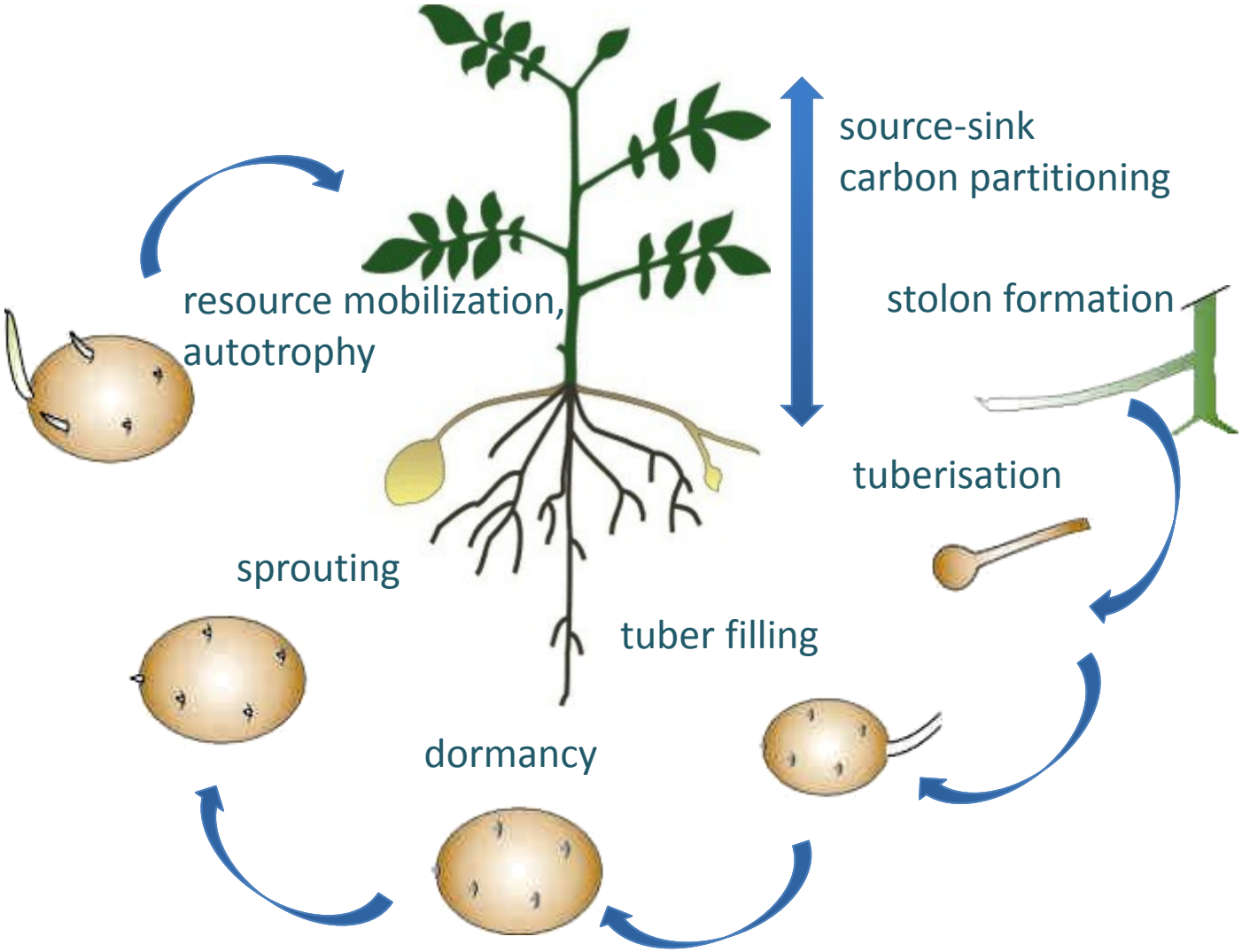
Christian Bachem, WUR, NL

WAGENINGEN UR
For quality of life

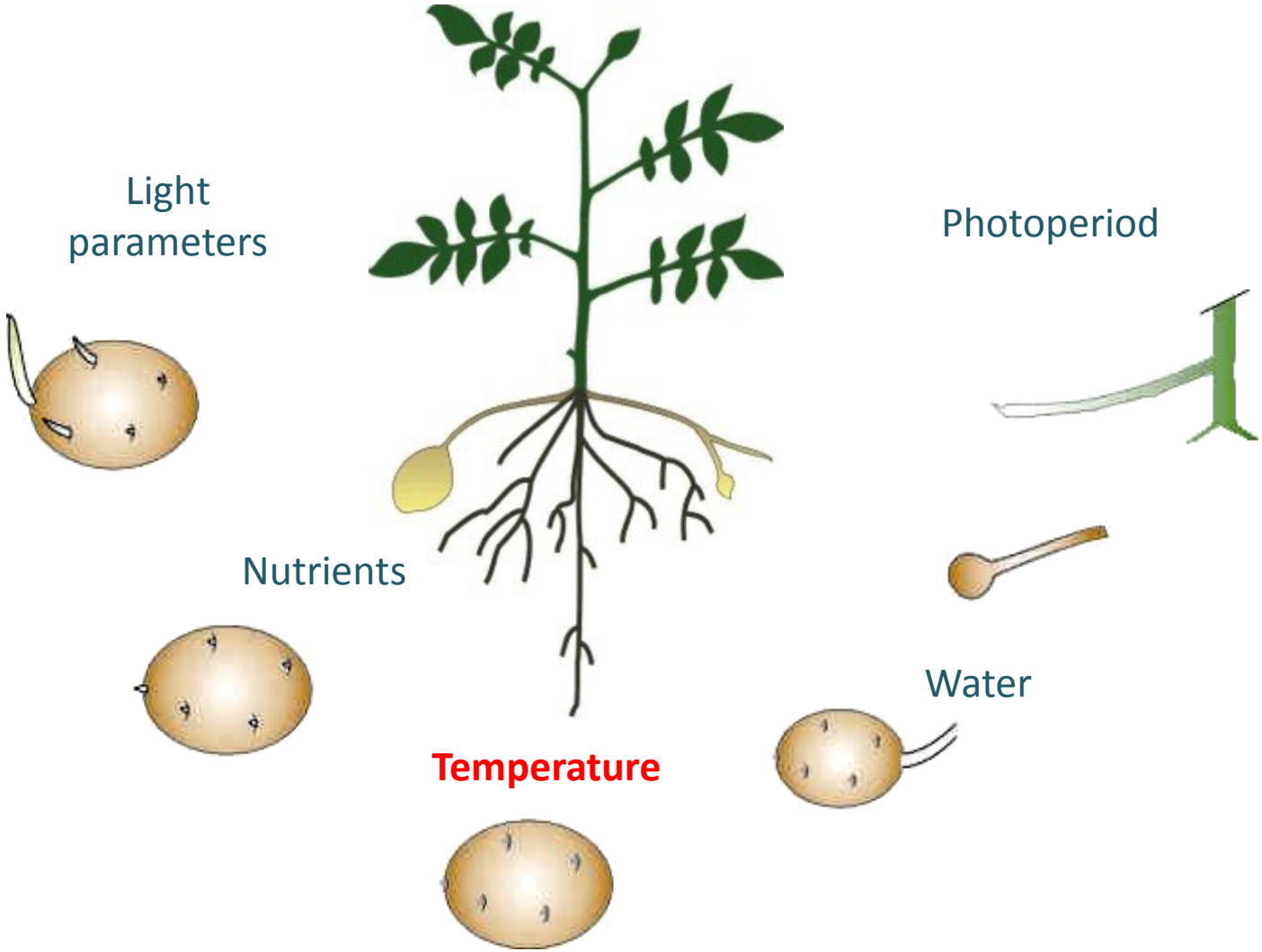
ERA-CAPS

ERA-NET for Coordinating Action in Plant Sciences

Potato tuber life-cycle



Environmental factors

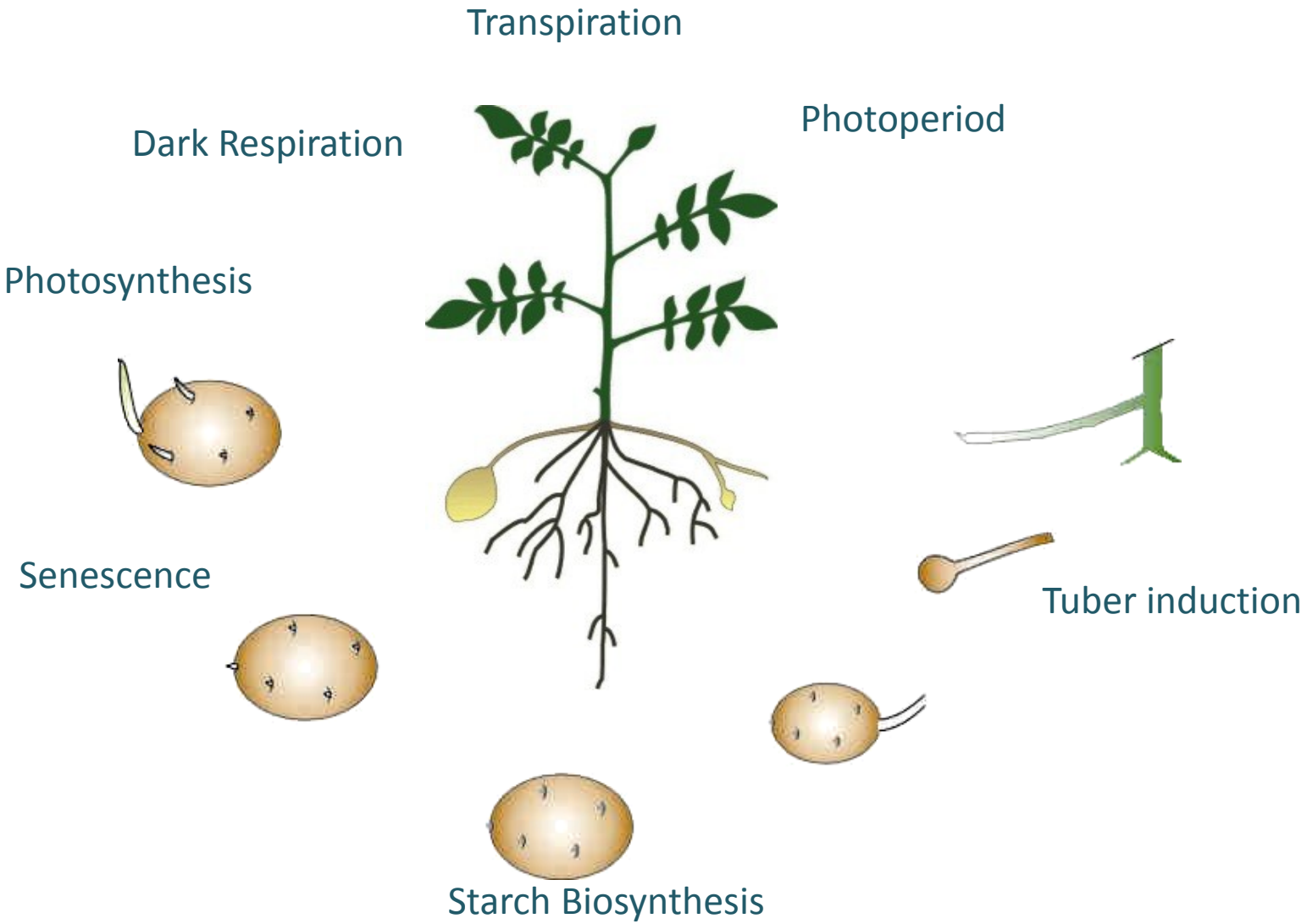


The problem & rational

- Potato is a major food crop
- Potato production is rapidly increasing
- Climate change is leading to higher temperatures
- potato development is negatively affected by high temperature
- Commercial cultivar yield is optimal in range of 14 to 22°C
- Tuber yield falls sharply above optimum temperatures
- Temperature dependent quality issues
- Urgent need to understand the mechanisms underlying heat tolerance

- Recent breakthroughs in the understanding of tuber life cycle
- New tools are available to unravel mechanisms for heat tolerance

Temperature effects on plant development



Temperature effects on tuberisation

Beginnender Durchwuchs an den Augen

Durchwuchs mit Knollen- & Sprossbildung

Durchwuchs mit Kindelbildung

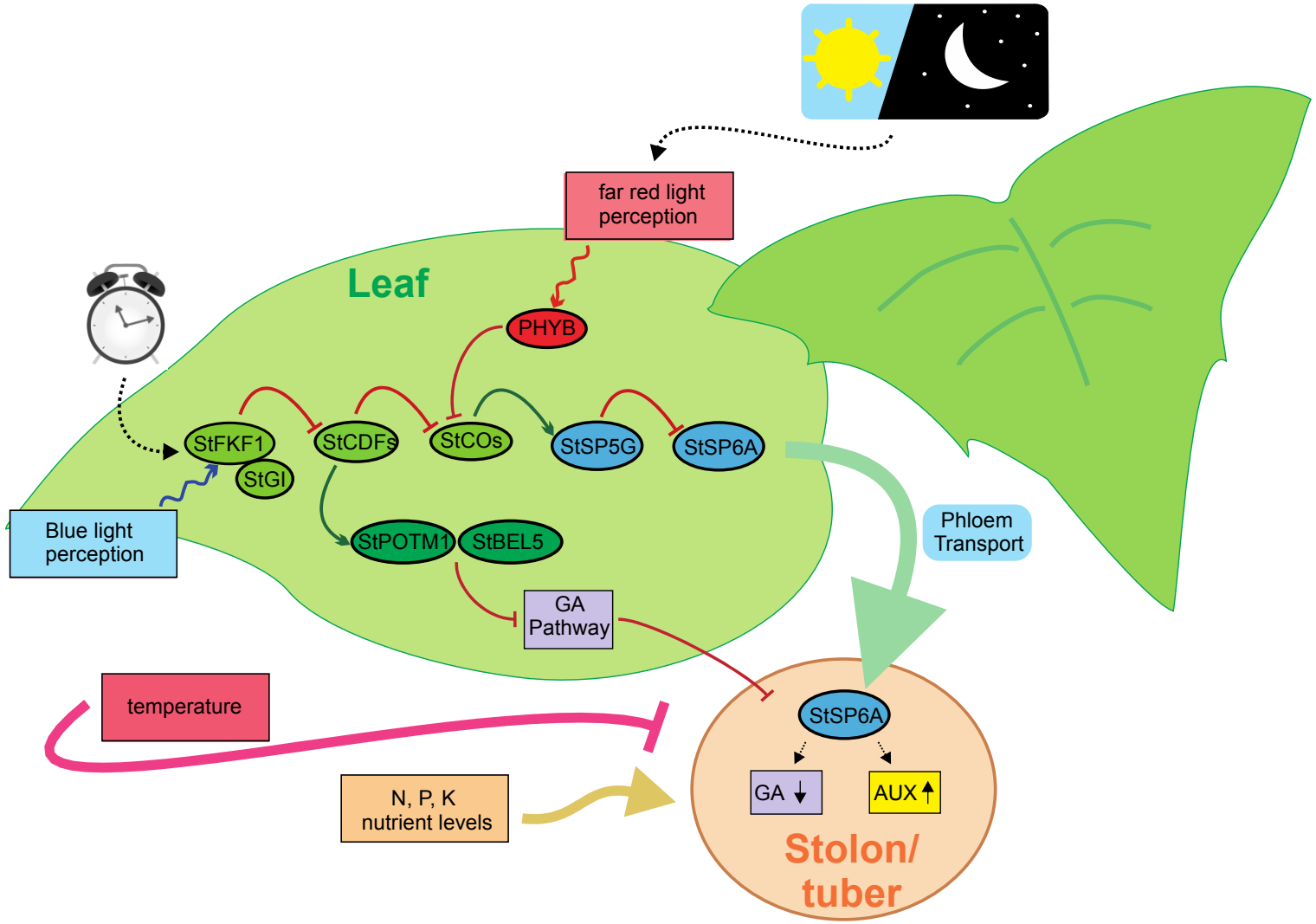
Durchwuchs mit Kettenbildung

Durchwuchs mit Sprossbildung

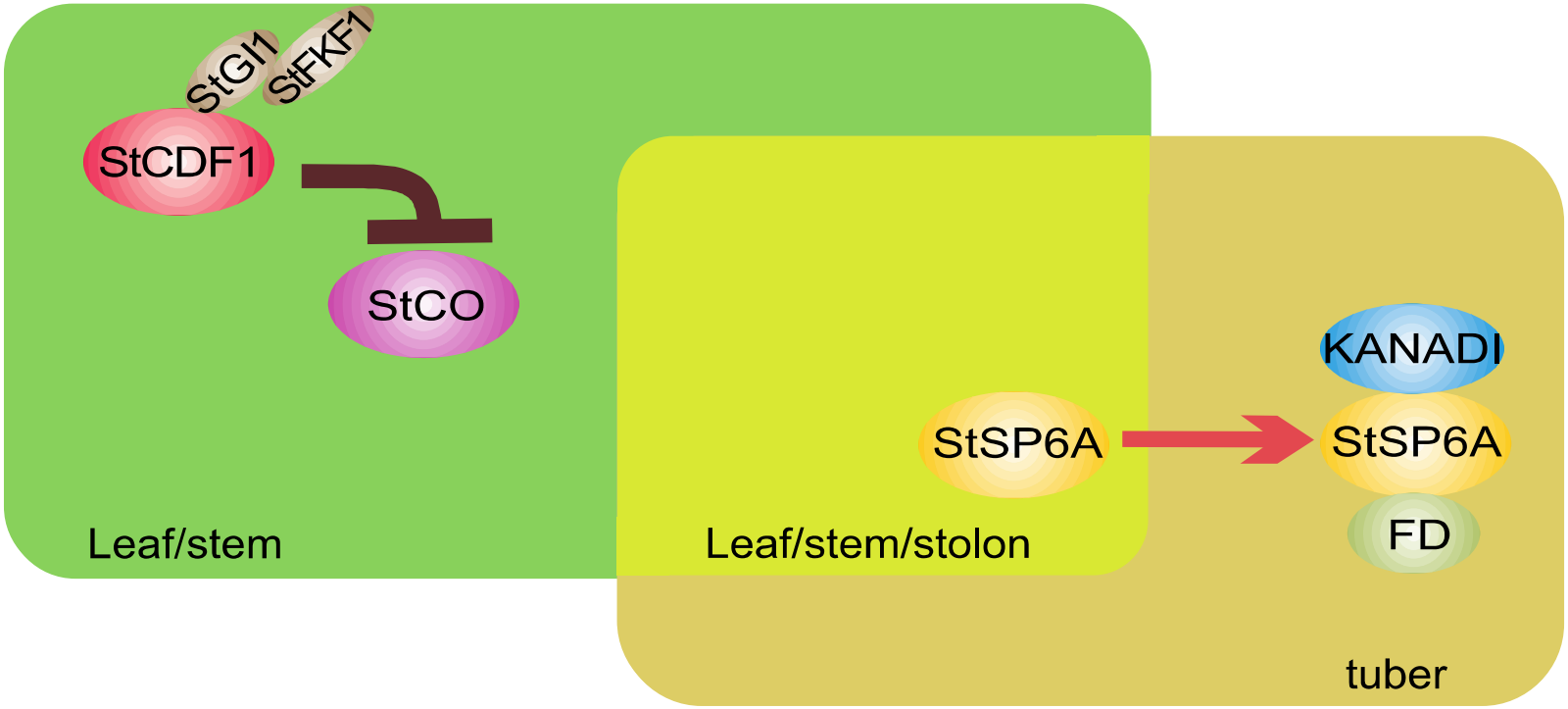
Zwiewuchs am Kronenende (= Puppigkeit)

Fotos: BENKER 2010

Genetic regulation of tuberisation



Genetic regulation of tuberisation



Key questions

- How do temperature/day length/light quality interact?
- What are the genes/proteins/metabolic signals that impact on TLC?
- Which key TLC points are sensitive to environmental signals – tuberisation/dormancy/sprouting?
- How are tuber development and metabolism (= tuber quality parameters)
- coupled?
- Can we identify genetic variation/genes/alleles associated with heat tolerance?
- Can we translate this research into breeding tools for improved cultivars?

The Partnership

Partners:

- Uwe Sonnewald, FAU, Erlangen, Germany (coordinator)
- Christian Bachem; WUR, Wageningen, Netherlands
- Lesley Torrance; University of St Andrews, UK

The Partnership (cont.)

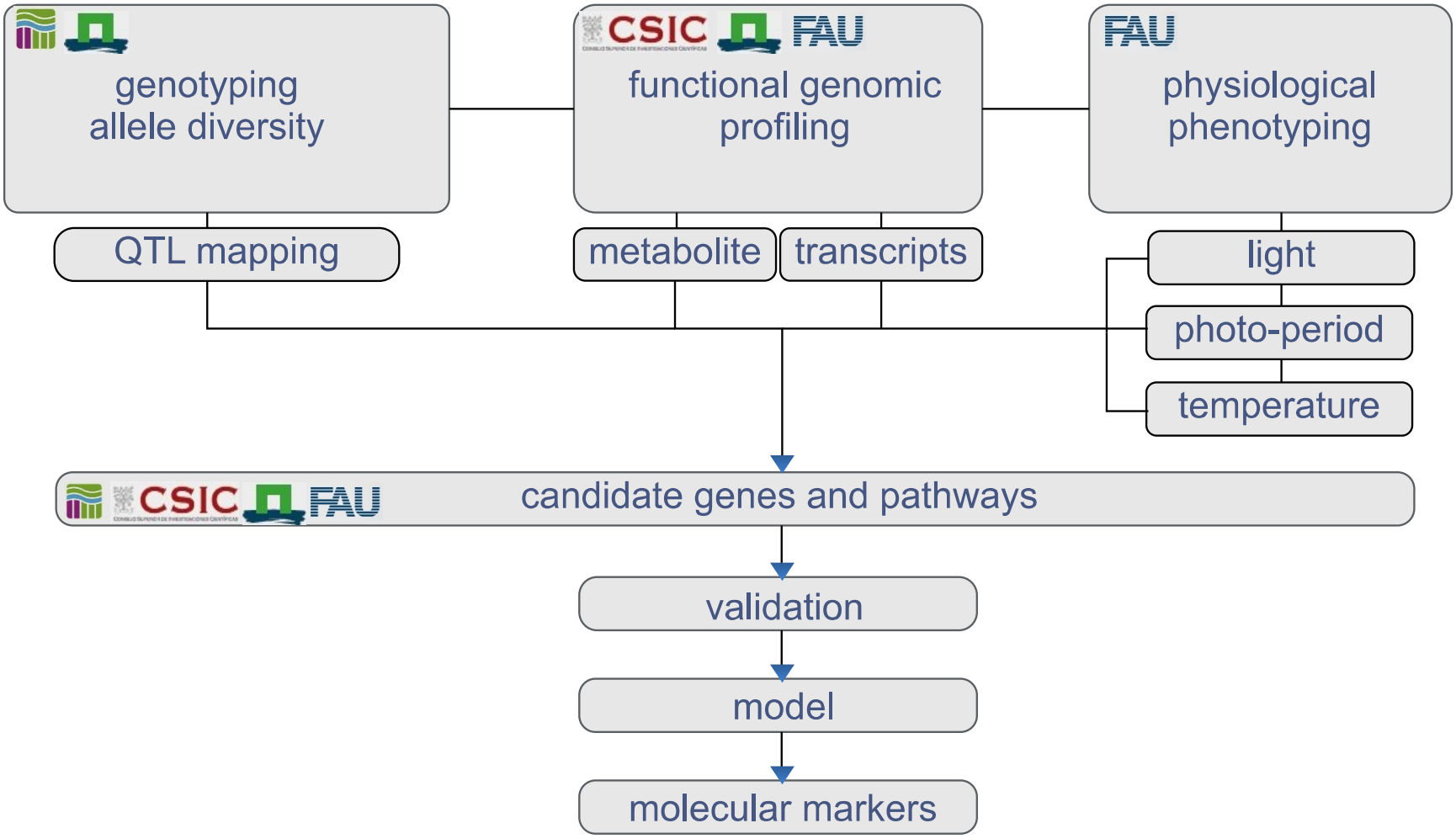
Associated academic partners:

- Mark Taylor; JHI, Dundee, Scotland
- Salomé Prat; CSIC, Madrid, Spain
- Merideth Bonierbale; CIP, Lima, Peru

Industrial Partners:

- HZPC Holland BV
- KWS Potato BV
- Meijer BV
- Solana Pflanzenzucht GmbH & Co. KG

Project structure

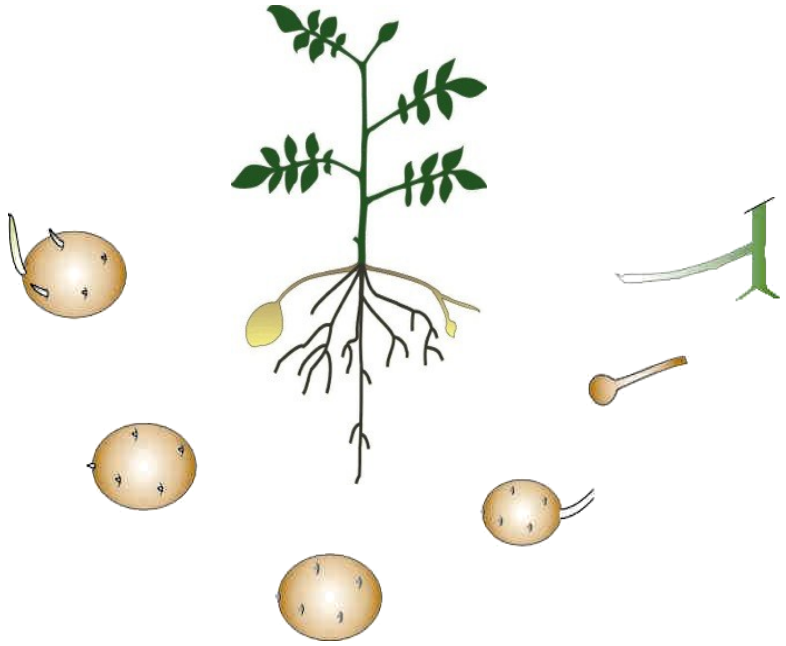


Experimental rational

high temperature

- Transcriptional changes
- post-transcriptional changes
- metabolic changes
- Signaling interactions
- genetic diversity

biological process



Model

Expected out-puts

- discover physiological and molecular mechanisms related to heat stress
- generate candidate genes that play pivotal roles in mediating heat stress responses
- uncover allelic diversity linked to heat stress
- map QTLs for high temperature tolerance
- develop a model for explaining the phenotypic effects resulting from high temperature during potato life cycle
- deliver markers for candidate genes involved in tolerance and sensitivity

Thank you for your attention!

ERA-CAPS

ERA-NET for Coordinating Action in Plant Sciences