Tackling malaria with fast track plant breeding
CNAP Artemisia Research Project
CNAP (Centre for Novel Agricultural Products)
University of York

40 people divided into teams:

- Molecular Biology
- Heteroduplex Mapping (HDM)
- Phenotyping
- Plant Breeding and Genetics
- Bioinformatics
- Horticulture and Field Trialling
- External Communications / IP / Admin

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Aim of CNAP Artemisia Research Project

To produce a cost-effective plant product which will stabilise supply and reduce production costs of artemisinin for artemisinin combination therapies.

High yield A. annua → Sustainable supply of cheap artemisinin → ACTs for treatment of malaria in the developing world
Aims of CNAP Artemisia Research Project

- To identify plants of *A. annua* with increased yield of artemisinin.
- To field trial plants, confirm heritability of high yield trait and select the best lines.
- To develop robust and stable high yield varieties which will slot into the current supply chain for ACT’s.
- To deliver high yielding seed to the ACT supply chain in as short a timeframe as possible.
- To reduce the cost of ACT’s.
Scientific strategy

Possible strategies to increase artemisinin production:

• Increase amount of artemisinin / trichome
• Increase the number of trichomes / leaf
• Increase the number of leaves on a plant
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**THE CNAP ARTEMISIA RESEARCH PROJECT**

- **Metabolites**: Artemisinin
  - Trichome
    - Size
    - Number
    - Density
  - Leaves
    - Leaf area/shape
    - Leaf to stem ratio
  - Biomass
    - Leaf dry weight
    - Whole plant dry weight
  - Plant architecture
    - Height
    - Branching
    - Number of nodes
  - Flowering time

**Traits of interest**
Roll out of the new variety: principles

Reduced production costs → reduced price of artemisinin
- sufficient high yield Artemisia to be cultivated to meet demand
- new varieties not to be used in the production of sub-standard drugs

- Field trials in major growing regions of the world
- Pharmaceutical user tests of suitability for ACT production
Field trial partners

- AVT Natural Products – India
- Guilin Pharma – China
- Botanical Extracts, EPZ – Kenya
- Afro Alpine – Uganda
- Bionexx - Madagascar
Benefits of delivery

- less plant waste generated
- improved crop
- reduced incentive to produce counterfeit drugs
- lower transportation requirement
- less solvent used for extraction
- higher purity
- improved stabilisation of supplies
- cheaper artemisinin
- more affordable malaria drugs

Key:
- ● benefits to malaria sufferers
- ■ benefits to ACT supply chain
- ○ benefits to the environment
- ★ benefits to growers

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DELIVERY - 2011

Minimum target yield improvement is double the yield of Artemis

Potential High Yielder identification

Hybrid seed production

Commercial Field Trials

Elite Parent selection for hybrid seed production

Hybrid seed production

Experimental Field Trials

Heritability testing/Backcrossing

Potential yield known

Hybrid yields verified

2007 2008 2009 2010 2011 2012
Next Steps

• Publication of scientific data from the project later this year
• Currently identifying experienced seed producers for contracted production for field trials
• Working with Dalberg Global Development Advisers to identify potential commercialisation partner(s), aim to have agreement in place by end 2010
• Systems to track seeds, ensuring use for production of high quality ACTs
• Looking for models and systems that best fit the existing supply chain – welcome views and discussion
Thank you!