Mzima Cow Project

A Transgenics Approach to Introducing Resistance to Trypanosomiasis
Translating Genetic Research to Adoption and Social Value

The Challenge

Bovine Trypanosomiasis (sleeping sickness) is a significant health and economic issue, especially in sub-Saharan Africa. In Africa, the disease vector is the Tsetse fly:

- The "Tsetse belt" of sub-Saharan Africa has effectively been closed to mixed agricultural development, because cattle do not thrive, and therefore have not been available for traction, fertilisation and food
- There is no innate resistance in cattle. One variety (N'dama) is trypano-tolerant, but this is a complex trait that conventional techniques cannot successfully breed into other varieties
- Drugs are available, but are toxic and expensive and, like anti-tsetse programmes, have to be maintained, not providing a long-term solution

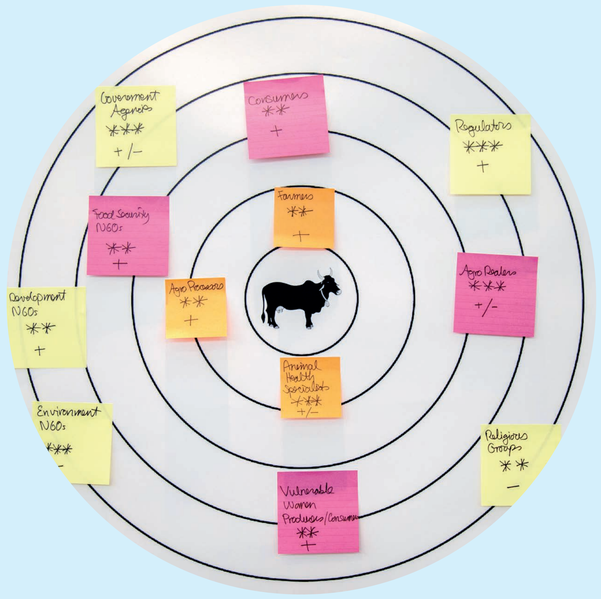
Ground-breaking Science

There is now the potential to produce cattle with 100% resistance to trypanosomiasis (sleeping sickness)

- Some primate hosts (including humans) are resistant to trypanosomes. Genes encoding a protein (ApoL1) which confers total resistance have been identified by Prof Jayne Raper, City University of New York (CUNY)
- Introgression of a synthetic 'construct' of these genes has been demonstrated to confer resistance in mice
- Profs Raper and Kemp saw the potential of this approach for livestock early on and since then the partnership between CUNY, the International Livestock Research Institute (ILRI) and the Centre for Tropical Livestock Genetics & Health (CTLGH) has been evolving in order to take this further
- ILRI has now developed the skills and infrastructure to undertake this work in Africa, and has successfully produced Tumaini (*'Hope'*), the first cloned bull in Africa, as a first step

The Challenge of Adoption

- The scientific research elements of this programme are increasingly well developed and understood
- The programme team are aware of the complexities of introducing new technologies into general use
- Animal biotechnology is a novel area particularly for African regulators
- Starting the change programme early is laying the way for the eventual smooth uptake of these animals by the wider, target society and stakeholders
- There has been a significant broadening in focus as the team grows to include broader programme management, social science and adoption of innovation expertise



Regulators, policy makers and stakeholders at the Mzima Cow Strategy & Theory of Change workshop 26-27th February at ILRI Nairobi, Kenya

Developing a Theory of Change

- A first step in establishing a programme aiming to have a positive impact on animal and human wellbeing is the construction of a Theory of Change: defining the goals, actors and paths to success
- Our first workshop was held in January 2017 with stakeholders representing the following domains: *agricultural economics, anthropology, veterinary science, public health, pastoralist, national parks, biosafety regulation, genetics, parasitology, science communication, land owners, agricultural marketing, small holders, community driven programmes*
- The participants investigated the issues of the burden of trypanosomiasis, stakeholder and power mapping, impact analysis of Mzima Cattle and the challenges and the priorities for action

Defining the Testing Routemap

- "*Systems Change at the Speed of Trust*": Establishing trust is key to regulatory progress and the eventual adoption and understanding of these Mzima cattle
- Setting up a comprehensive and transparent testing schema, or routemap, is the first step in building the knowledge to provide confidence in the viability and safety of these cattle
- A workshop was held in February 2018 to gain multiple perspectives on the domains of *trypanosome resistance, animal welfare, human welfare and environmental welfare*
- In addition, we addressed issues of *containment* and *alignment with (emerging) National Biosafety Guidelines*
- At this workshop were Kenyan and international experts on issues relating to biosafety and animal welfare
- The report from this workshop is available from the meeting organisers and at [sti4d.com/mzima]

Next steps

- Consolidating the testing routemap: defining the plan
- Producing the first transgenic Boran calves (Late 2018/Early 2019)
- Securing funding for and implementing:
  - Further Theory of Change and regulatory workshops
  - Field trials
  - Development and implementation of communications and monitoring & evaluation strategies
  - Impact modelling
  - Expanding to more breeds in more centres
  - Development a rapid field-testing kit for the transgene and its product
  - Workshops and planning for introduction of cattle to markets
  - Expanding the programme to Mzima Goats (which due to cost, size and breeding speed could have benefits for both the research programme as well as consumers)

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