



Genetic analysis of heat tolerance in crossbred dairy cattle performing in sub-Saharan Africa

Dooso, R.^{1,2}, Ekine-Dzivenu, C.², Mrode, R.², Ojango, J.², Kipkosgei, G.², Gebreyohanes G.², Bennewitz, J.¹, Okeyo, M.², and Chagunda, M.^{1,3}

¹ University of Hohenheim, Stuttgart, Germany; ² International Livestock Research Institute, Nairobi, Kenya; ³ Centre for Tropical Livestock Genetics and Health, University of Edinburgh, Roslin Institute, Edinburgh, United Kingdom

Outcomes

- ❖ The reaction norm functions can be used to quantify heat tolerance in cattle
- ❖ Individual animals showed varying responses in milk yield to increasing heat load
- ❖ Zebu genes confer heat tolerance advantage in dairy cattle
- ❖ Heat tolerance in cattle is heritable (h^2 of 0.15 - 0.25) and can be improved through genetic selection
- ❖ Heat-tolerant cattle maintain stable milk production regardless of heat load levels

Next steps

- ❖ Development of a multi-trait selection index for simultaneous improvement of heat tolerance and milk production of cattle in SSA
- ❖ Promoting the breeding of both heat-tolerant, productive cattle within SSA's production systems

Partners

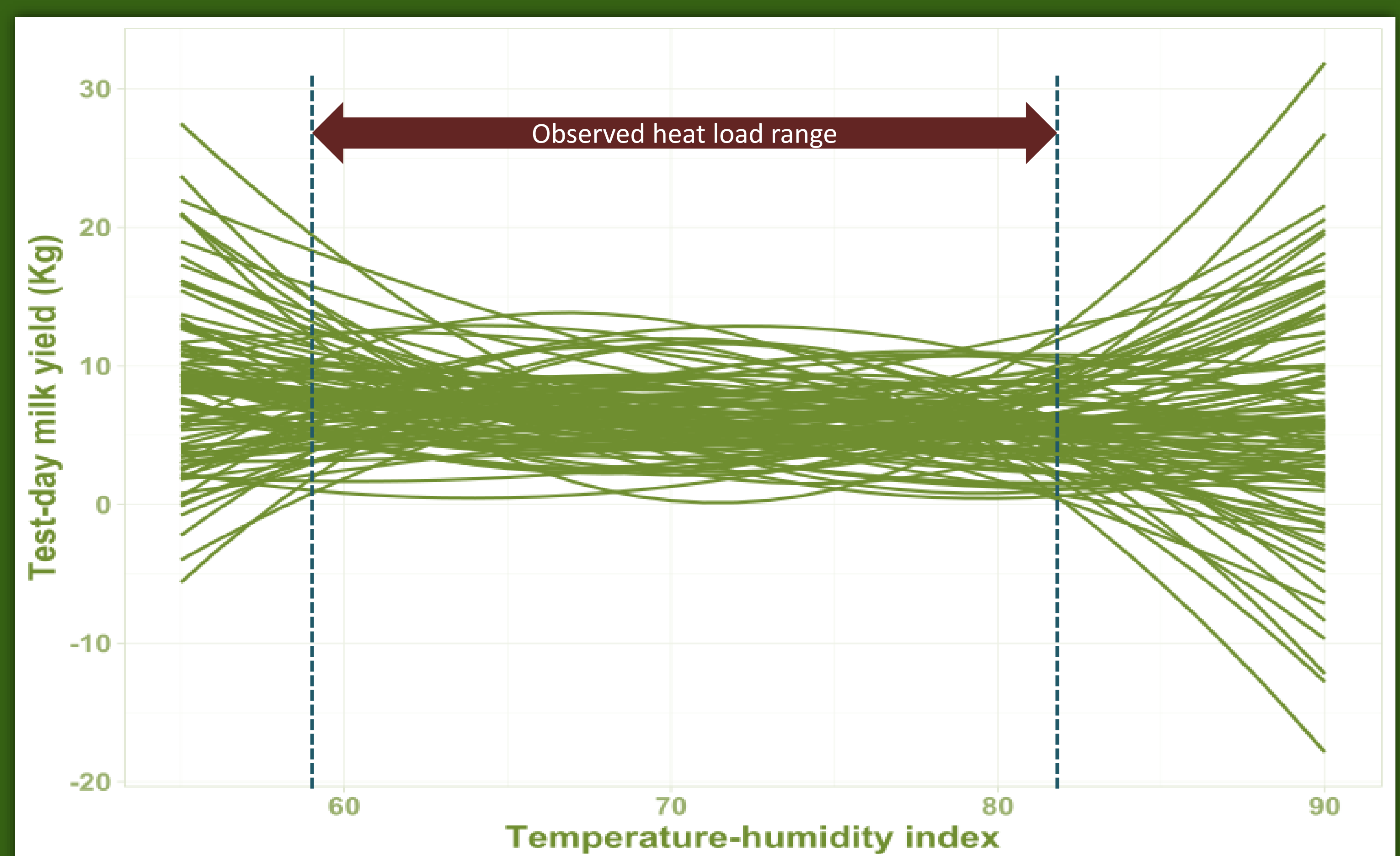


The challenge

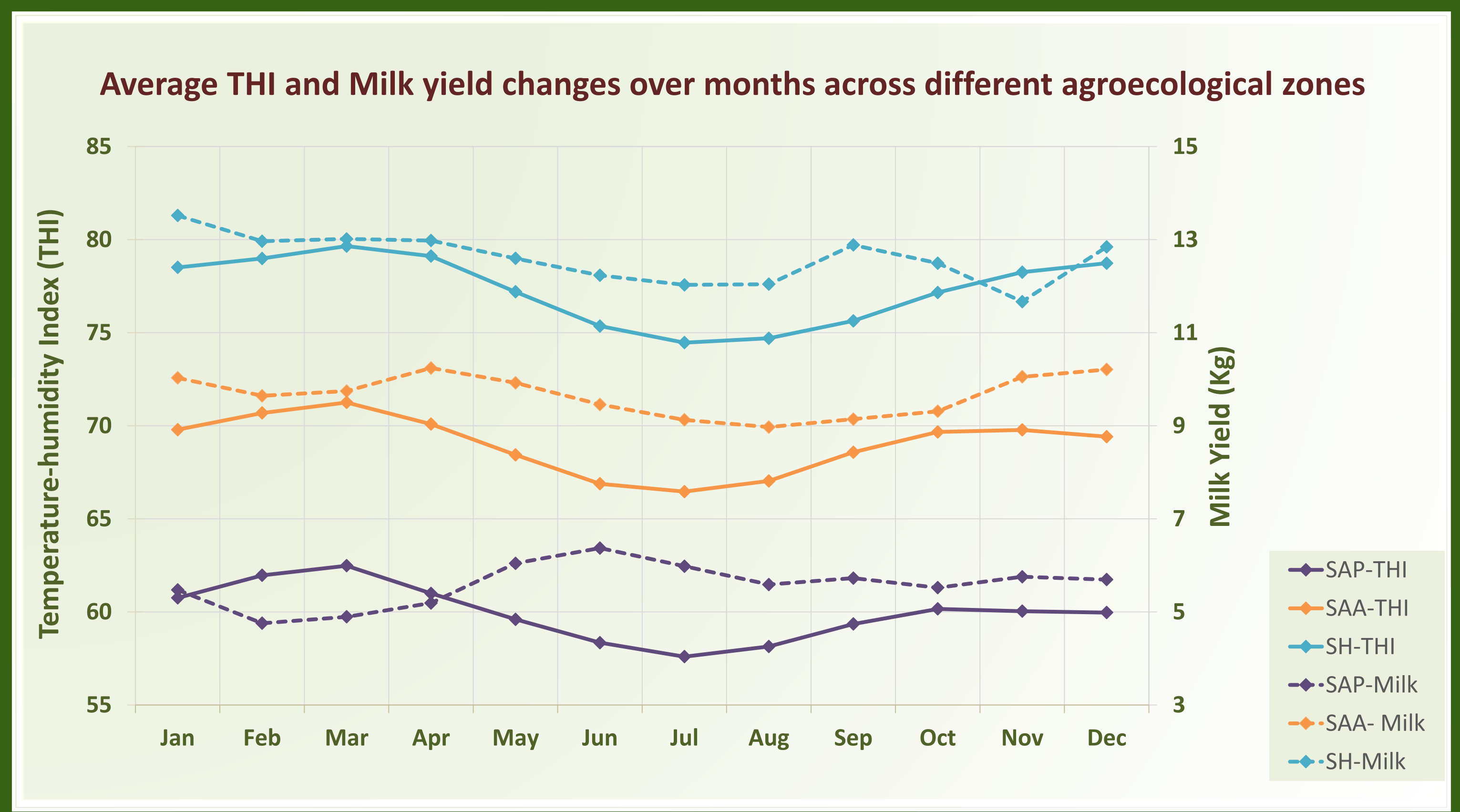
- Heat stress significantly impacts dairy production in Sub-Saharan Africa (SSA)
- Studies on genetic improvement for resilience to rising temperatures in dairy cattle are limited
- Indicators for heat tolerance in animals raised under SSA's production systems have not yet been established

Our innovative approach

- Temperature-humidity index (THI) was used to measure heat stress
- 65,261 milk yield records from 1,547 crossbred cows in semi-arid pasture-based (SAP), semi-arid arable (SAA) and semi-humid (SH) regions of Kenya were analyzed
- Reaction norm models were used to quantify two heat tolerance indicators:
 - ✓ Directional change in milk yield due to heat stress
 - ✓ Stability of milk production during heat stress



Individual reaction norm showing changes in 7-day milk yield (test-day milk yield, Kg) in response to temperature-humidity index (THI) for a random sample of 100 dairy cattle



Richard Dooso Oloo
 r.dooso@cgiar.org
 richard.ooloo@uni-hohenheim.de