Scaling up Maize Production through Weather Resilient Processes

Examples from Sub-Saharan Africa

Rodney Witman Lunduka, (PhD).

Africa Food Security Conference and Agro-Exhibition

October 12 – 13, Crowne Plaza Hotel

Nairobi, Kenya

Climate Change Impact is Here

The Genetic Response

The Agronomic Response

Scaling Up and Out

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Crop Insurance

Sample Success Story

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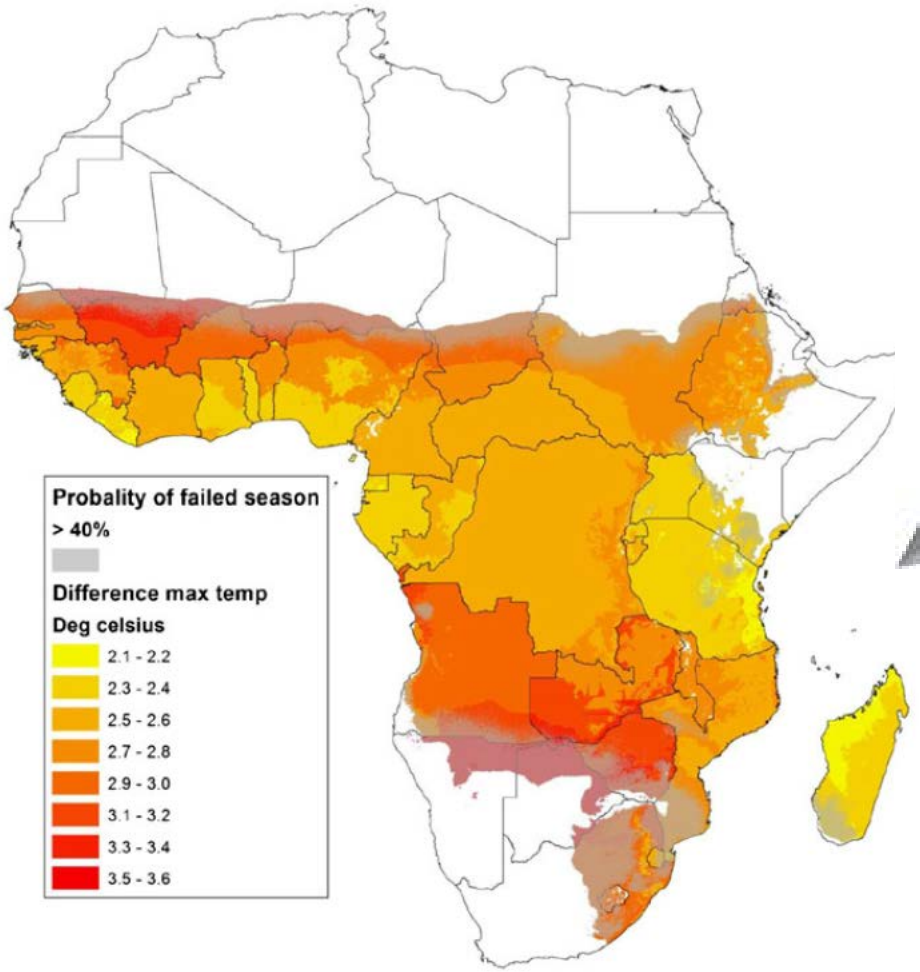
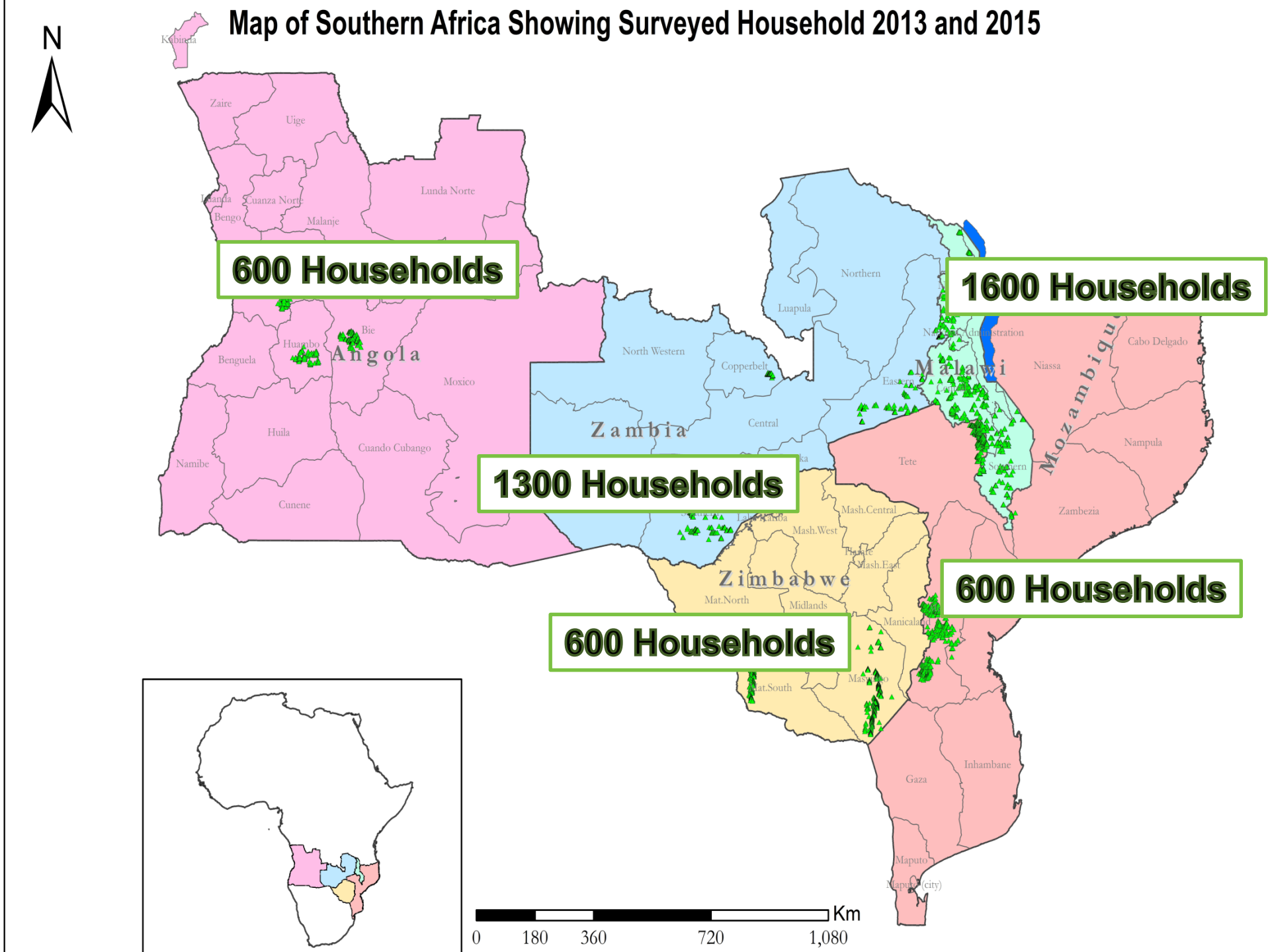
Increase in temperature in maize mega environments:
The Double-edged sword!



Maize yield losses double under drought stress when temperatures exceed 30°C

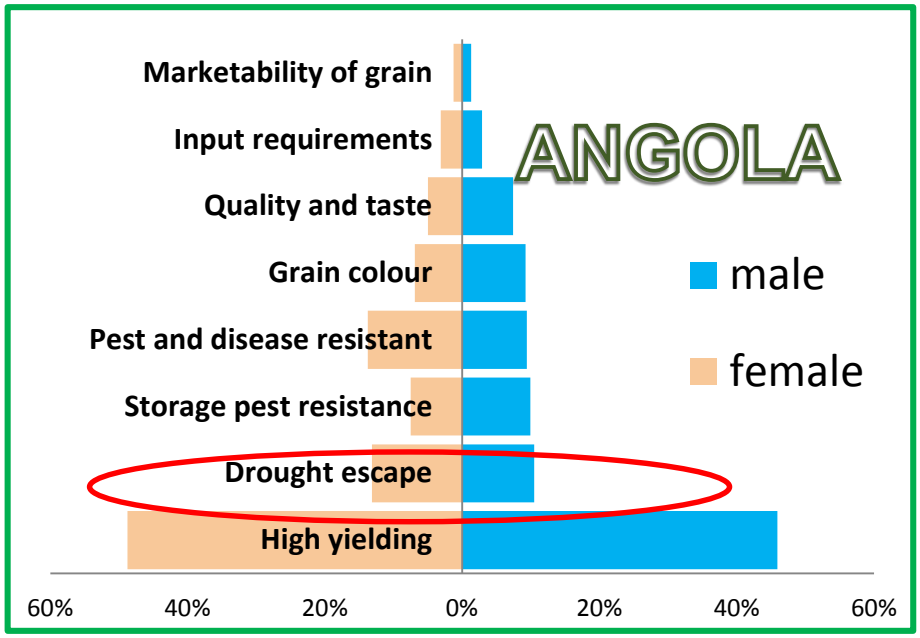
Cairns et. al., 2013

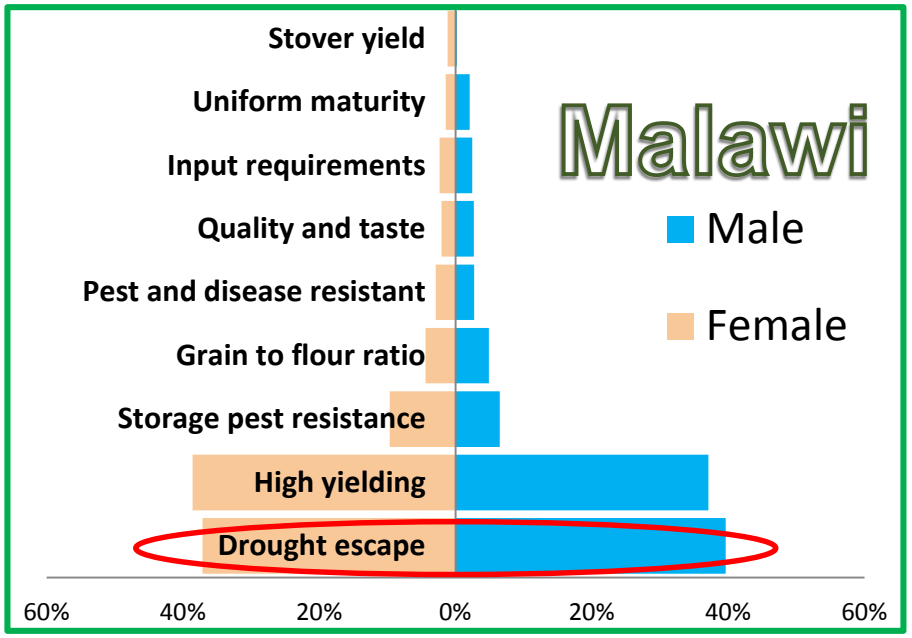
Map of Southern Africa Showing Surveyed Household 2013 and 2015



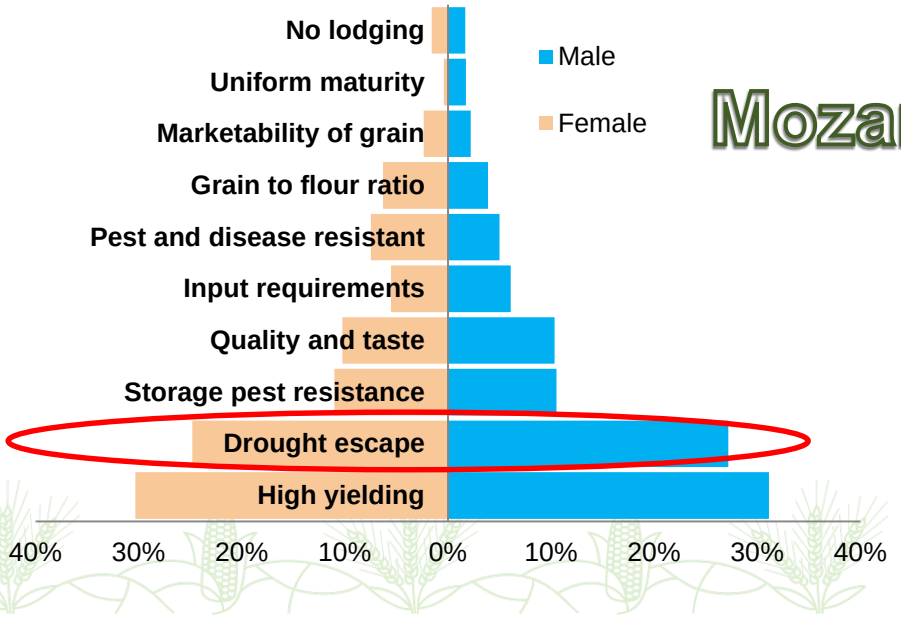
Survey Question to Farmers:

List the three most important variety characteristics you consider when selecting maize seed





Response



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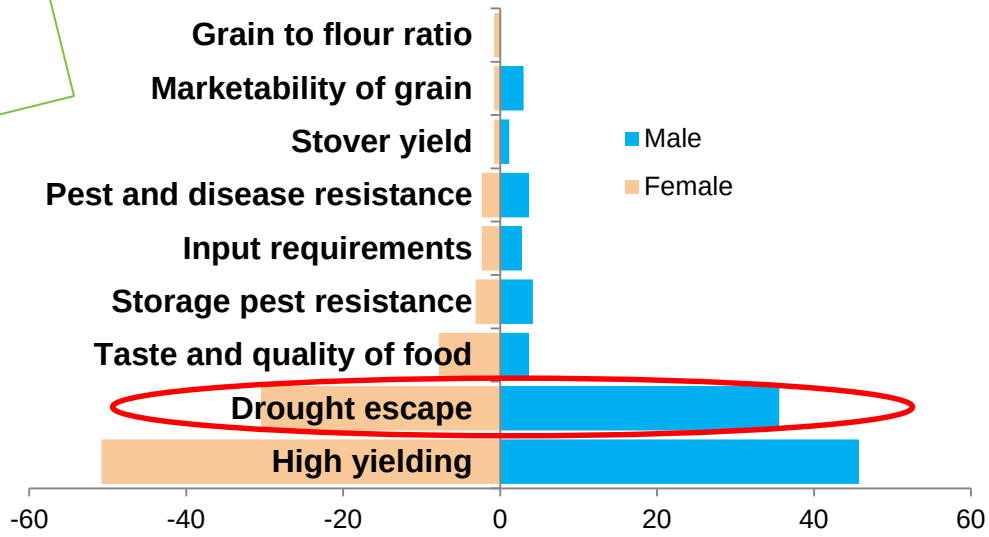
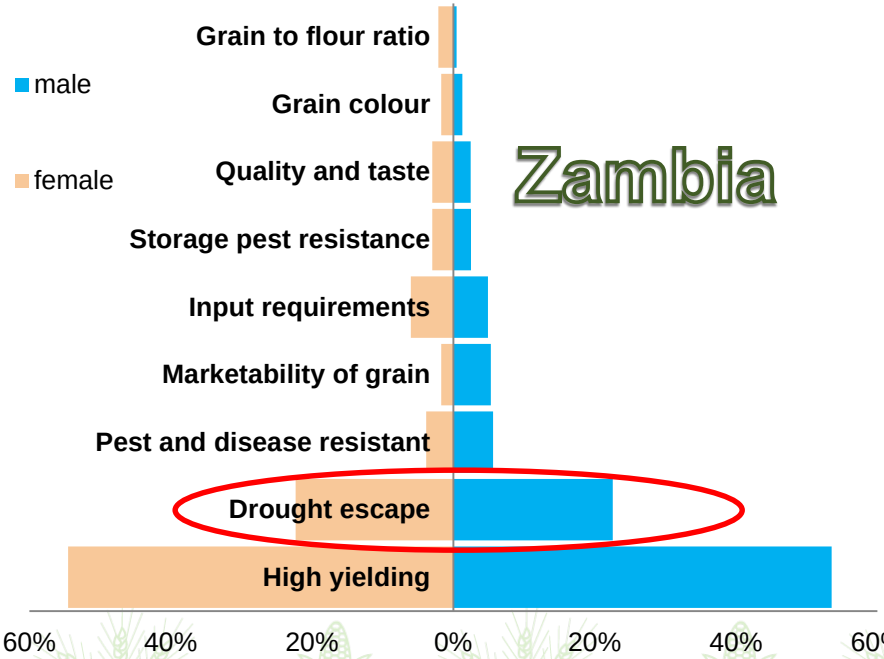
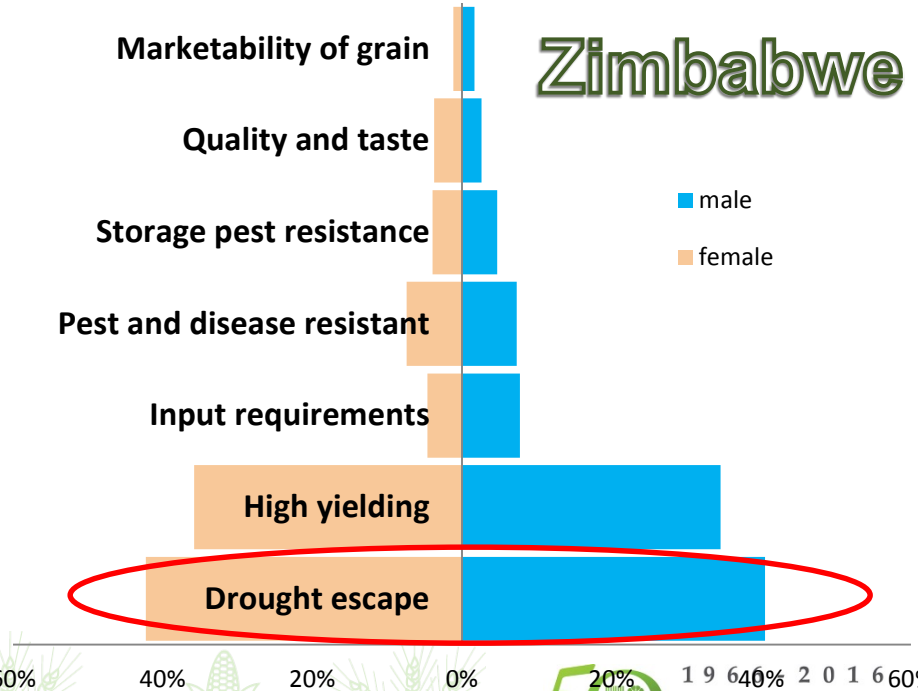
Response



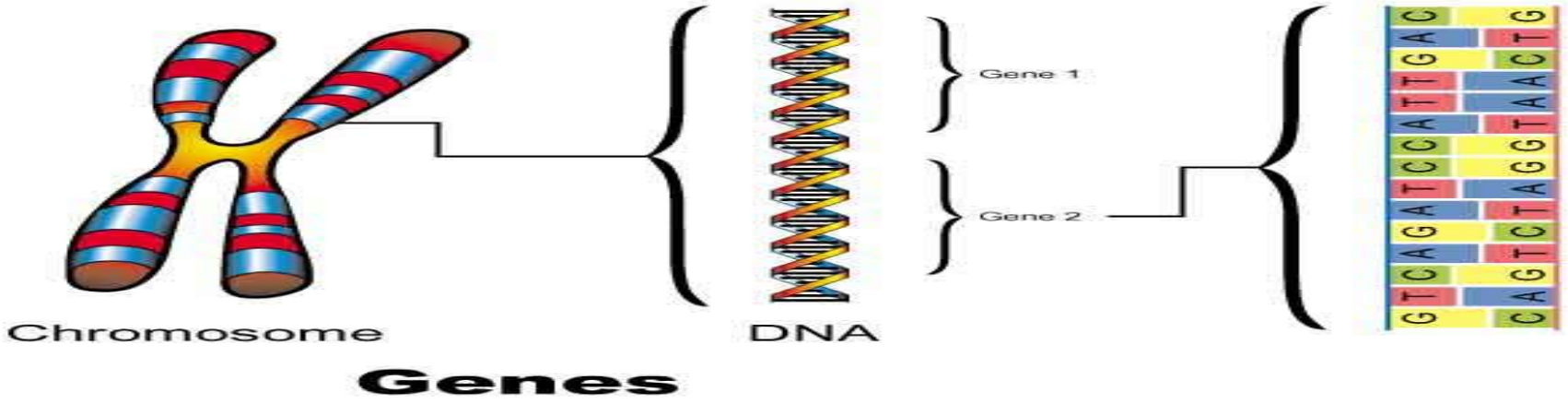
Kenya



Zambia



Zimbabwe



The Genetic Response:
New Maize Varieties

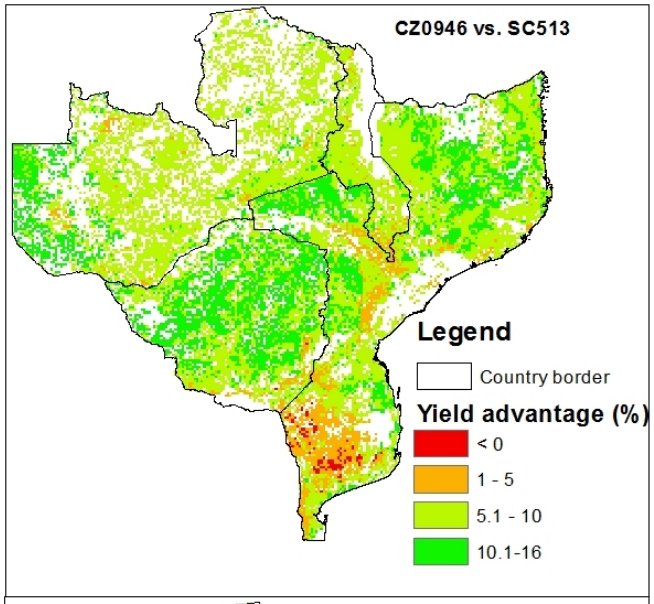
DROUGHT TOLERANT VARIETIES

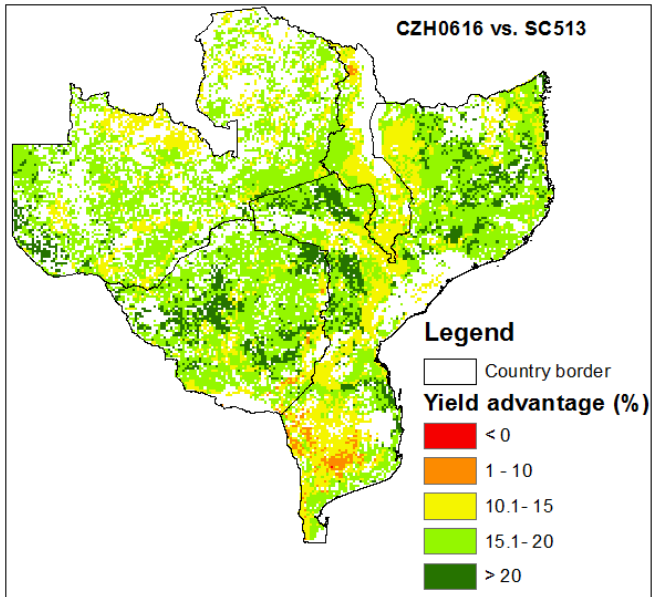
Varieties that can survive at least 6 weeks during flowering period with little or no rain.

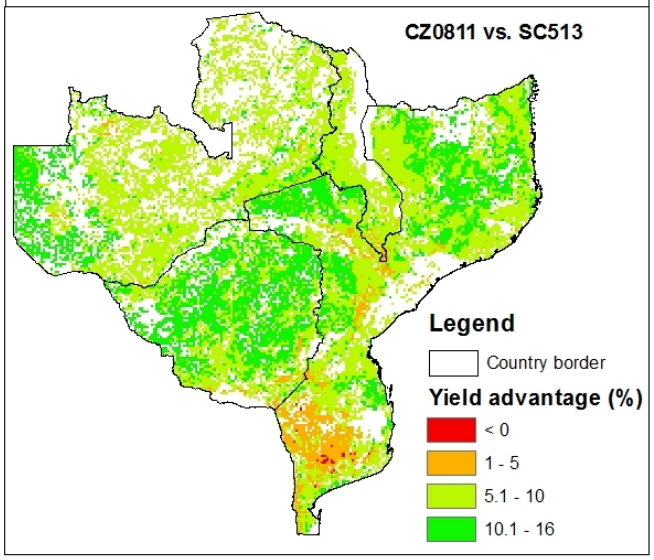
Country	Number of Varieties			*Varieties with additional traits*		
	Hybrid	OPV	Total	*Striga* tolerant	NUE	QPM
Zambia	20	7	27	0	5	2
Nigeria	11	14	25	18	4	3
Benin	1			19	7	2
Ghana	16	7		16	2	5
Zimbabwe	19	3				1
Tanzania	17					2
Malawi	15	3				1
Kenya	12	5				0
Uganda	14	1	15			0
Ethiopia	6	5	11	0	0	4
Angola	3	8	11	0	0	0
Mali	8	2	10	8	4	0
Mozambique	5	4	9	0	0	0
Total	**147**	**86**	**233**	**61**	**23**	**20**
Percentages	**63.1**	**36.9**	**100.0**	**26.2**	**9.9**	**8.6**

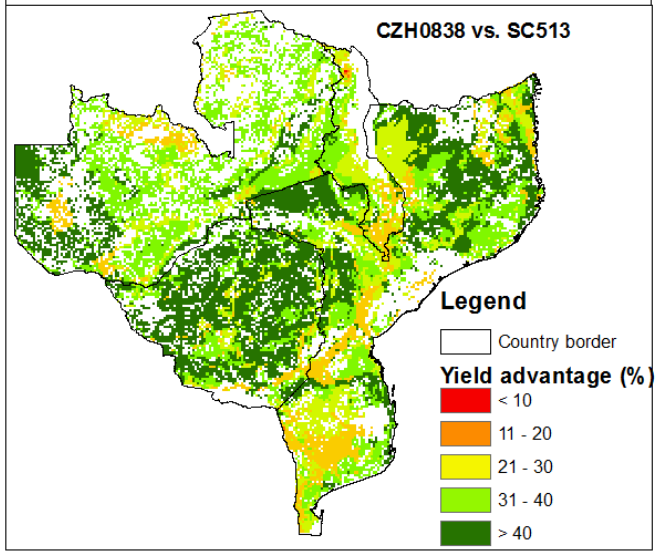
Over 230 new varieties developed

Performance of new DT varieties









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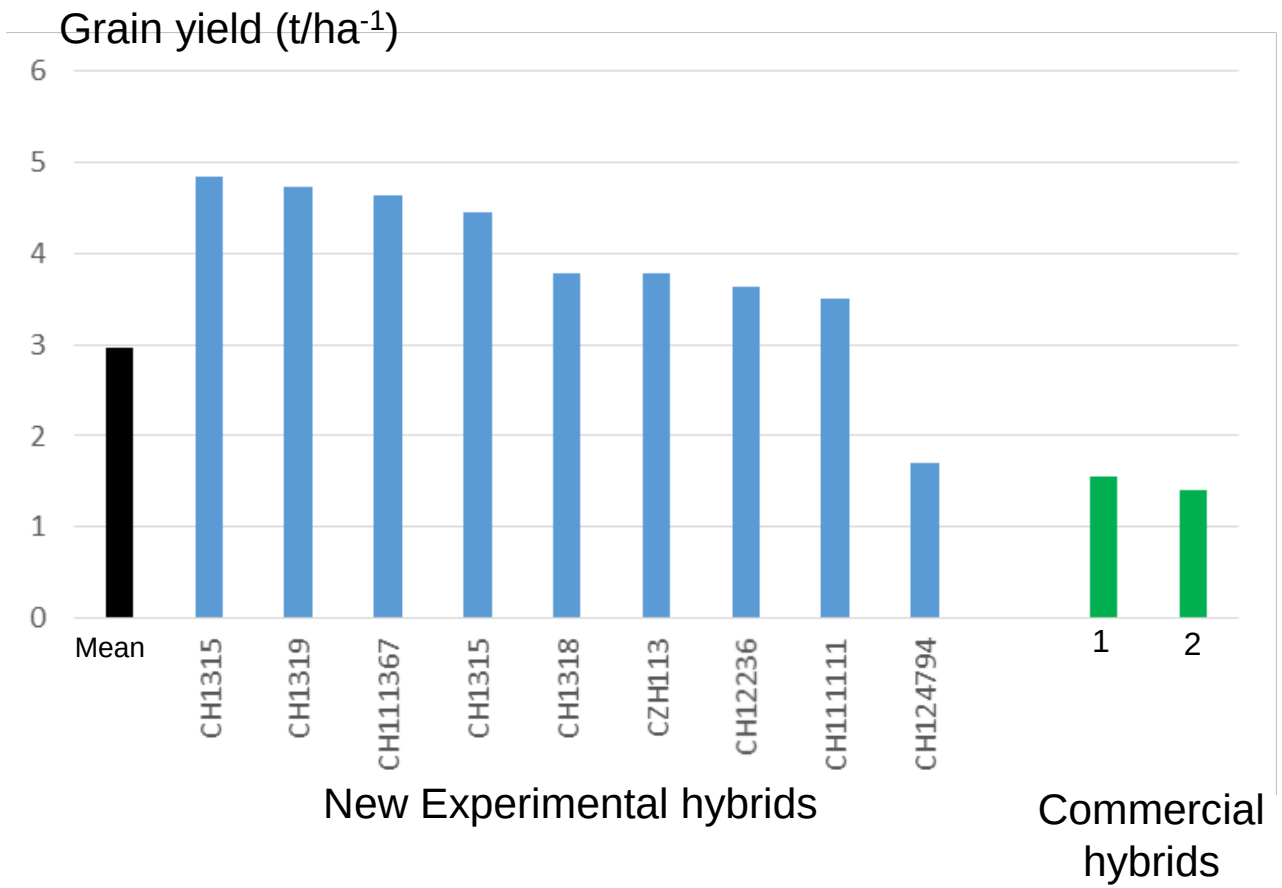
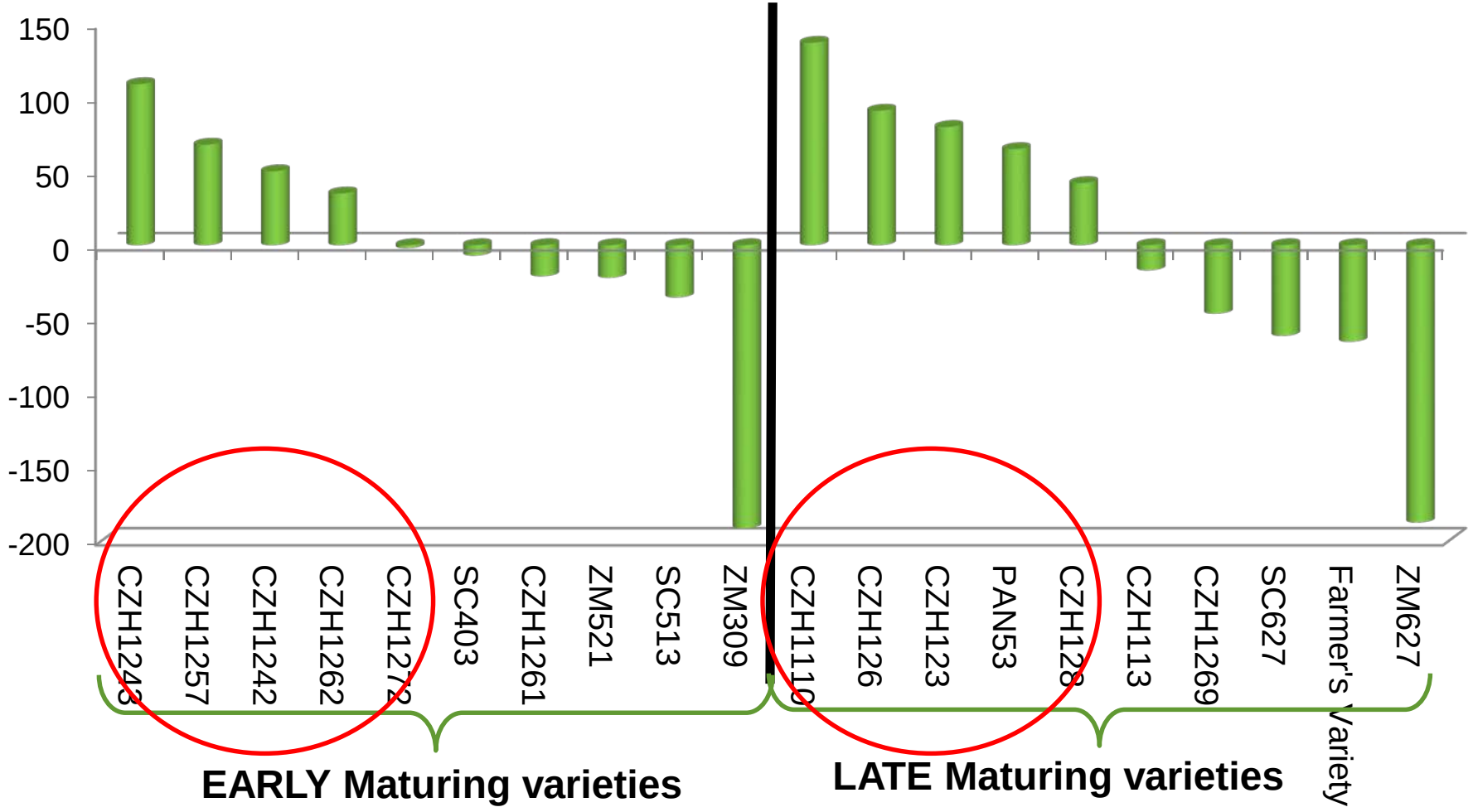
Heat stress performance of new varieties



Magorokosho *in prep.*

Farmers' grain quality preferences:

New vs. Commercial Maize Varieties



BOTH EARLY and LATE MATURING DT VARIETIES PREFERRED BY FARMERS

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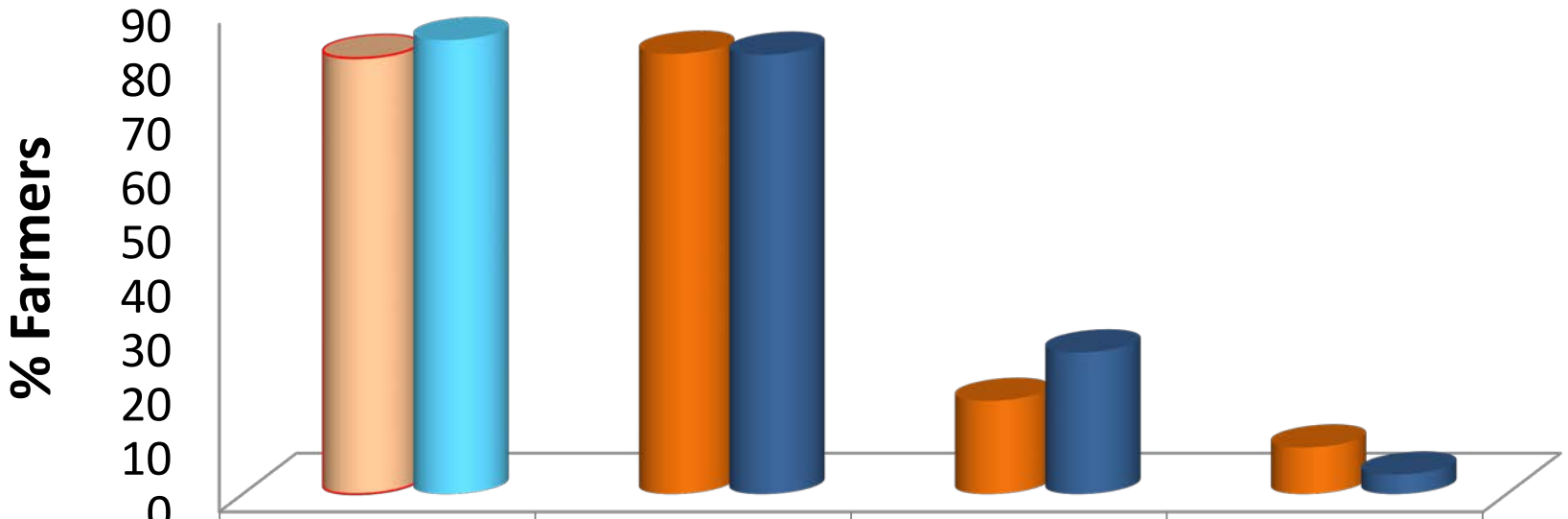
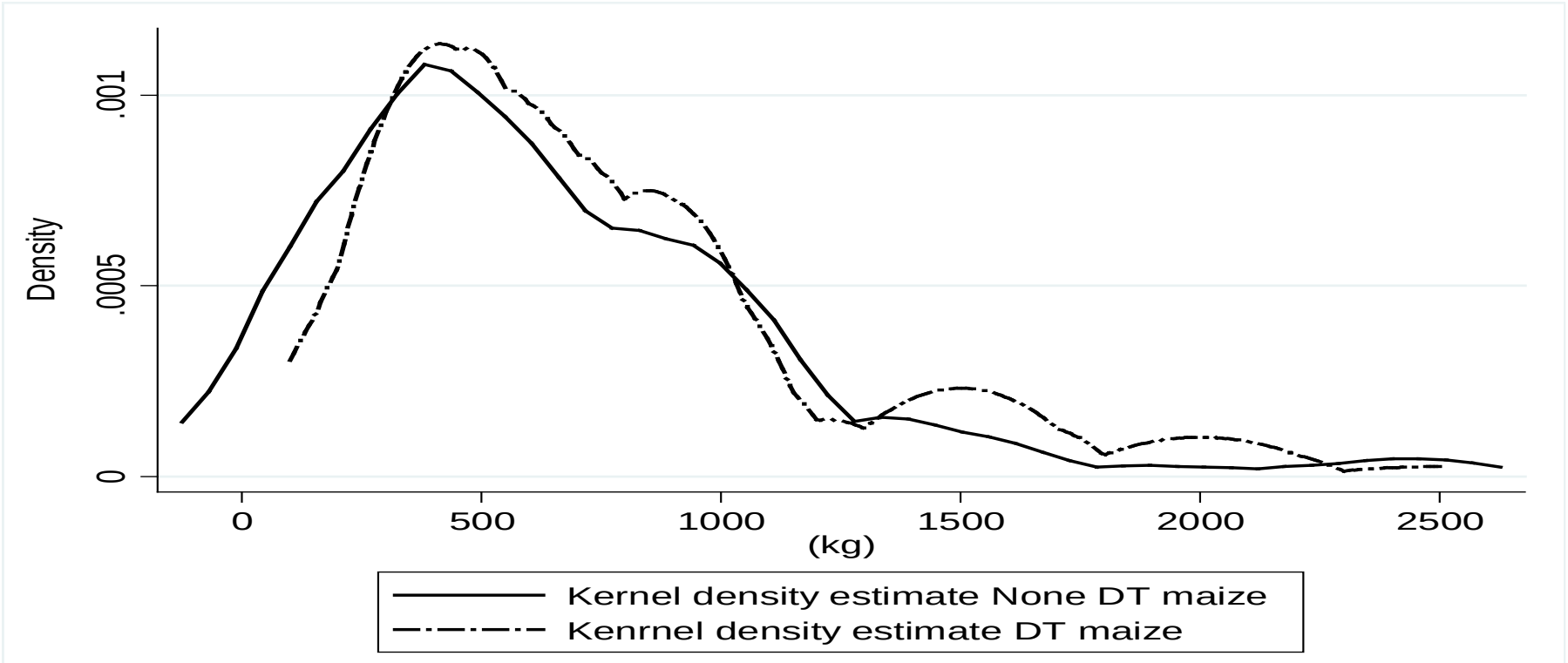
Nutritional preferences:
Pro-Vitamin A Maize vs. White Maize *Sadza* (*Ugali*)



	Prefer orange Sadza	Better taste and flavour	Better smell	Better texture
Female	80.47	81.25	17.19	8.59
Male	83.78	81.08	26.13	3.6

Impact of DT varieties on maize production. (Case of Zimbabwe, household survey)



Kernel Density Estimates of DT and non-DT maize production at household level

A change from non-DT maize varieties to DT maize varieties can increase total maize production by 270kg/acre (670kg/ha).

Reasons for low adoption of DT varieties

Government Policies affecting Supply/ Demand

- Public agriculture input subsidy programs (Malawi)

Market Penetration: Old and Big vs. New and Small Producers

- "Cash cows"

Step-wise Adoption Patterns

- Zambia, Zimbabwe and Kenya.
- Local varieties ⇒ OPV ⇒ Hybrids

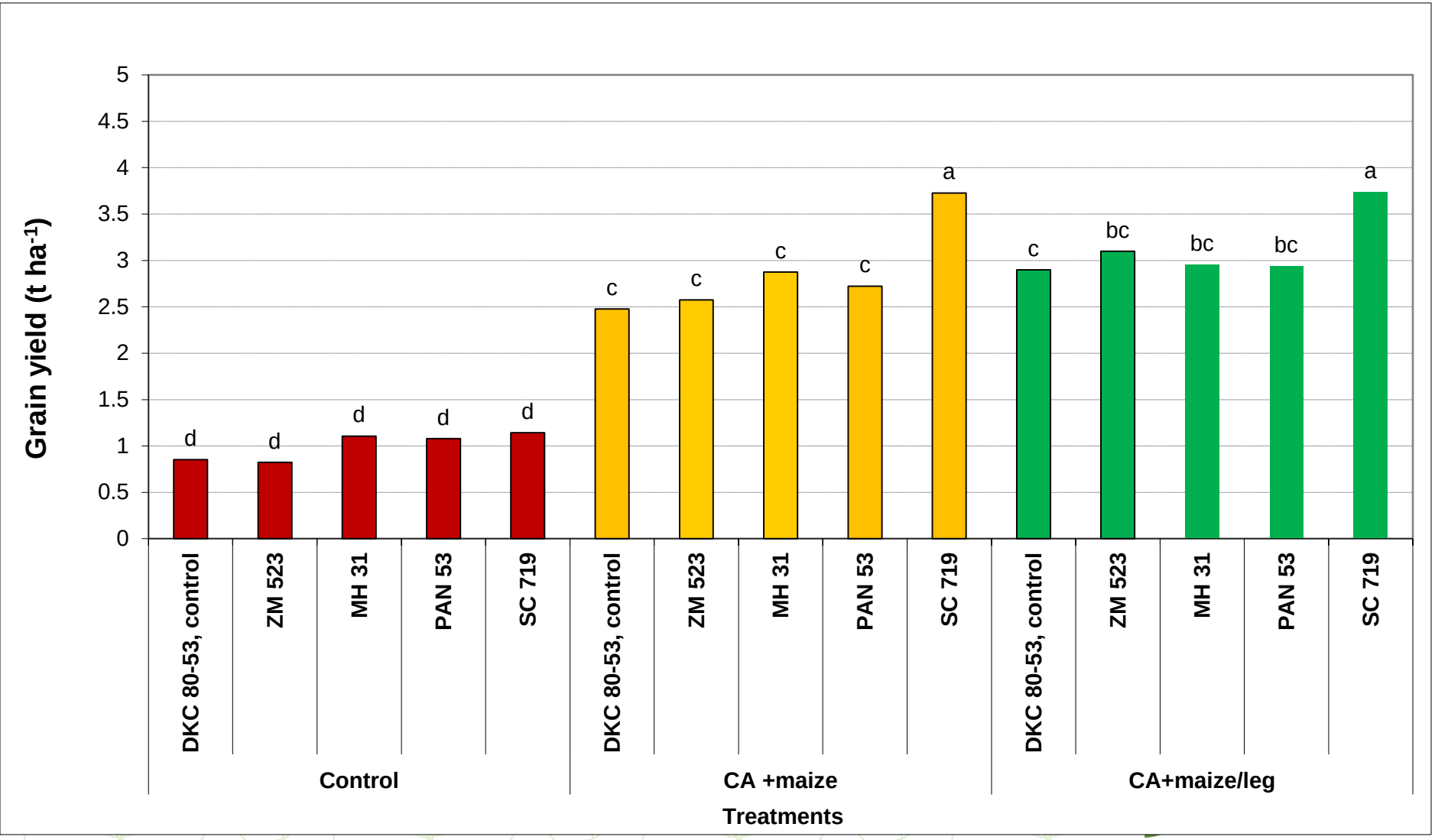
Increasing Frequency of Drought

- The "good" evil?

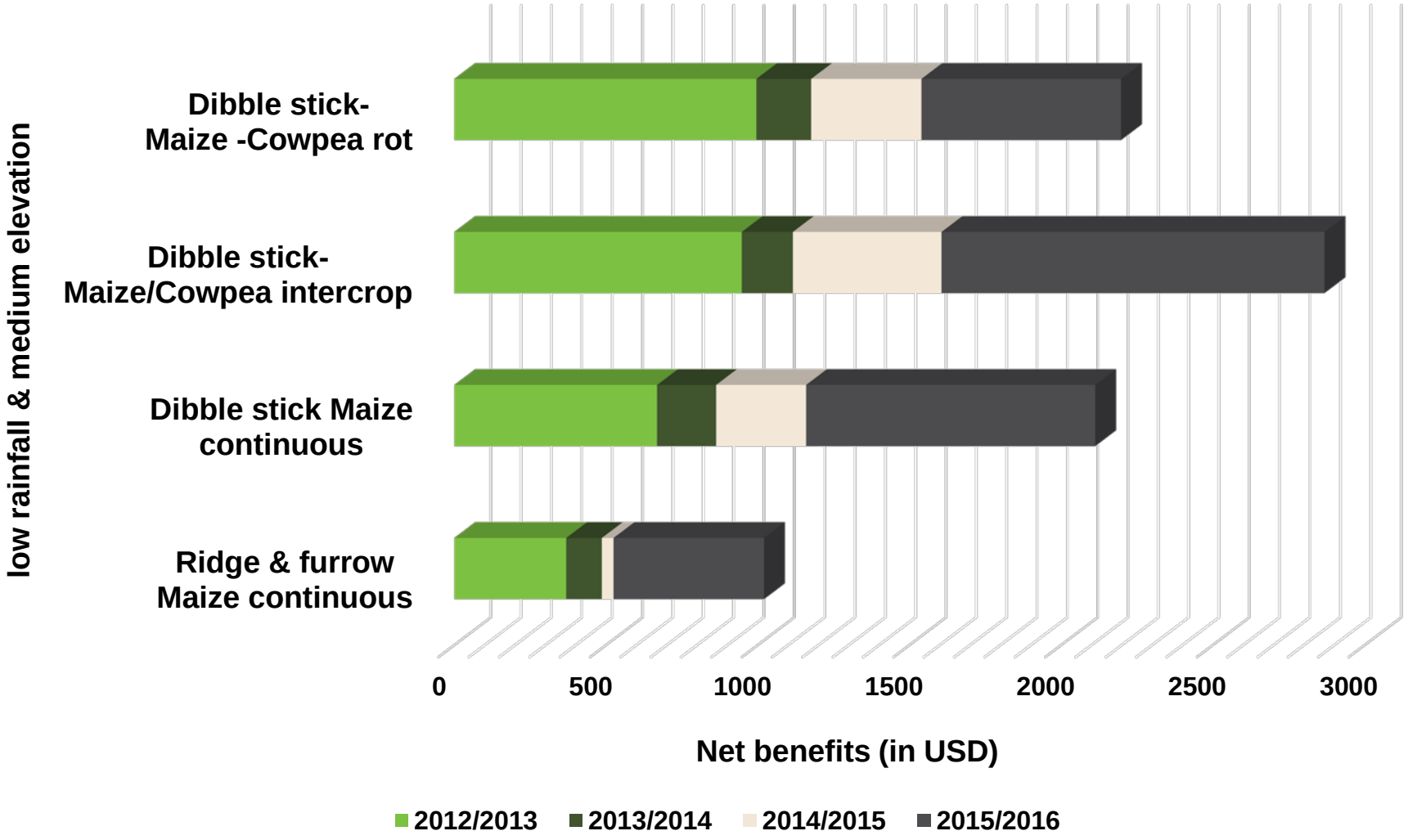
The Agronomic Response: Better Management

Performance of DT Maize + Conservation Agriculture

(2005-2015, Malawi)



Manual Sustainable Intensification Practices: Net Benefits (2012-2016), Eastern Zambia



Mutenje et al. 2016

Scaling up uptake of DT maize varieties and good agronomic practices.

CIMMYT Current Approaches to Reducing Risk in Maize Production

1. **Scaling up production and supply of new varieties**
   - Support to public and private producers
   - Training of producers and agro-dealers

2. **Inducing and increasing demand of the new varieties by smallholder farmers**
   - Mounting extensive demonstration plots
   - Providing information on the benefits of DT maize varieties
   - Direct-to-farmer information (Fliers, posters, SMS, etc.)

CIMMYT Current Approaches to Reducing Risk in Maize Production

3. **Adding good agronomic management to varieties**
   - Training producers, dealers and extension agents
   - Direct-to-farmer information (fliers, posters, SMS, e.t.c)

4. **Bundling the DT maize varieties with weather index insurance** (pilot: 2015-18)
   - Mozambique
   - Tanzania

3 Prong approach

Improved Genes

+

Good agronomic practices

Improved Genes (DT)

+

Good Agronomic practices

Crop Insurance??

Mrs. Miriam Phiri of Chifwiti Village, Chief Nyampande, Petauke, Zambia with her full granary Drought Tolerant Maize (Pan 53).
A bumper harvest even in a drought year 2015/16 season.

Thank you for your interest!

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