FARM D Forum for Agricultural Risk Management in Development

Session 1 – Climate Change Trends and Implications for Agricultural Risk Management

Presentation by James Kinyangi, International Livestock Research Institute (ILRI)

Climate Change Trends; Implications for Agricultural Risk Management

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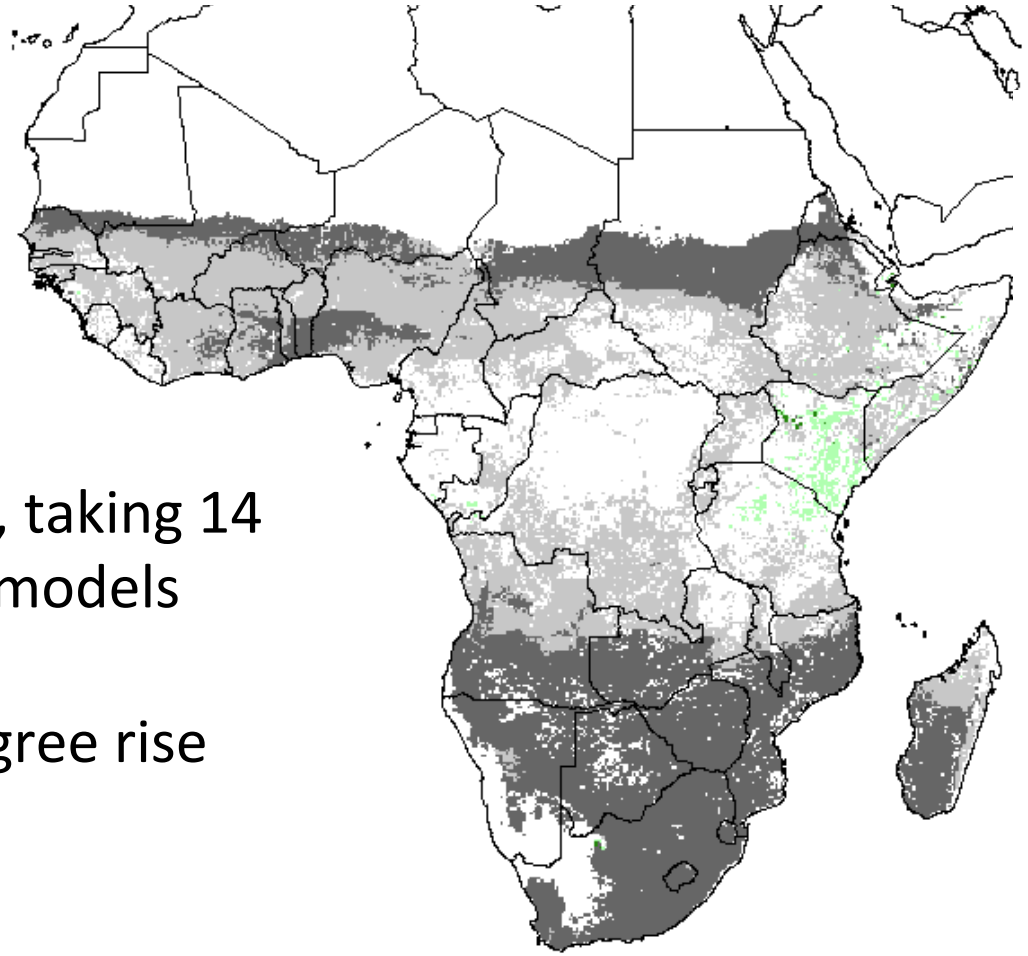
Climate challenge for Africa; Length of growing season is likely to decline..



Length of growing period (%)

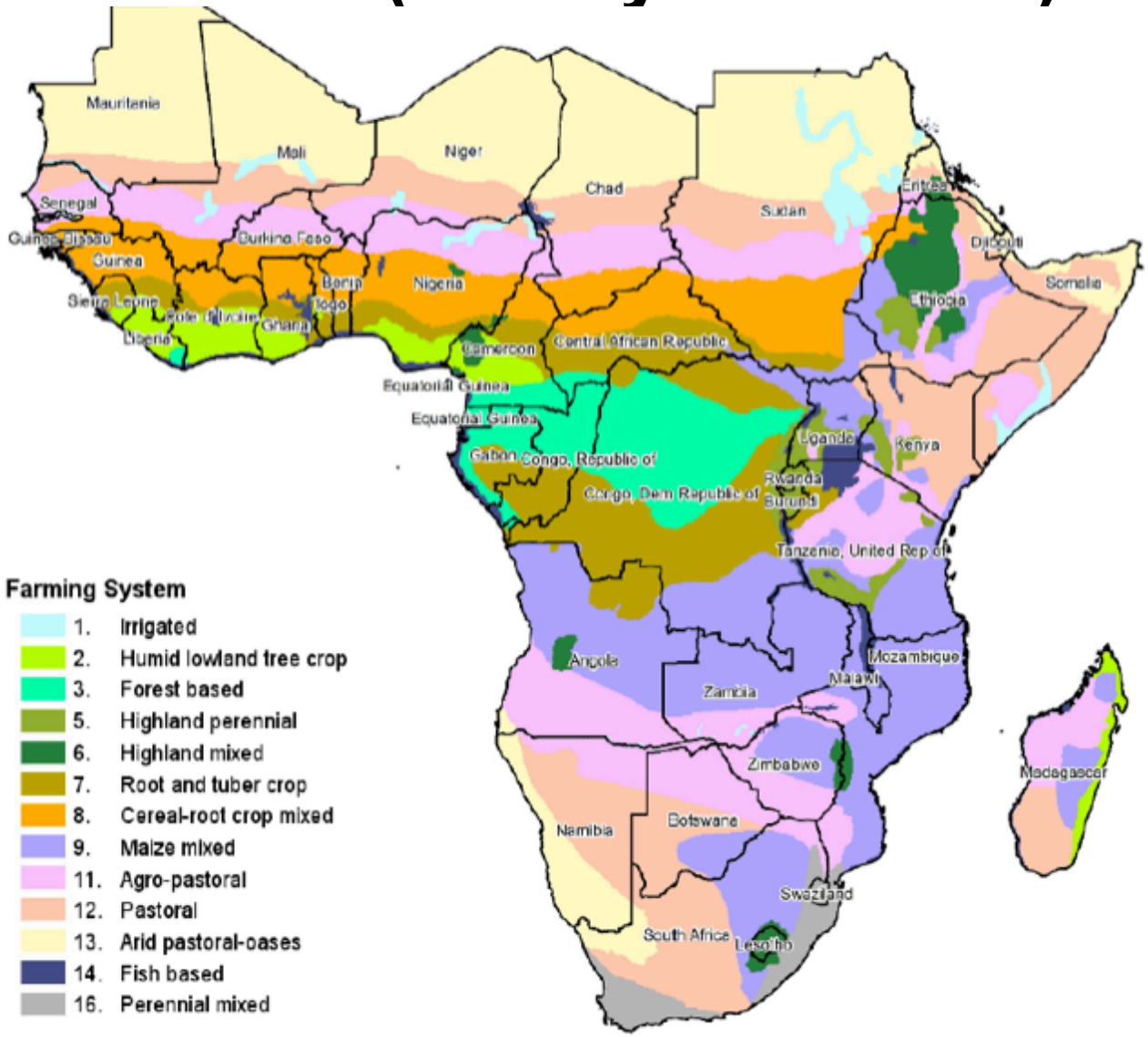
- >20% loss
- 5-20% loss
- No change
- 5-20% gain
- >20% gain

To 2090, taking 14 climate models

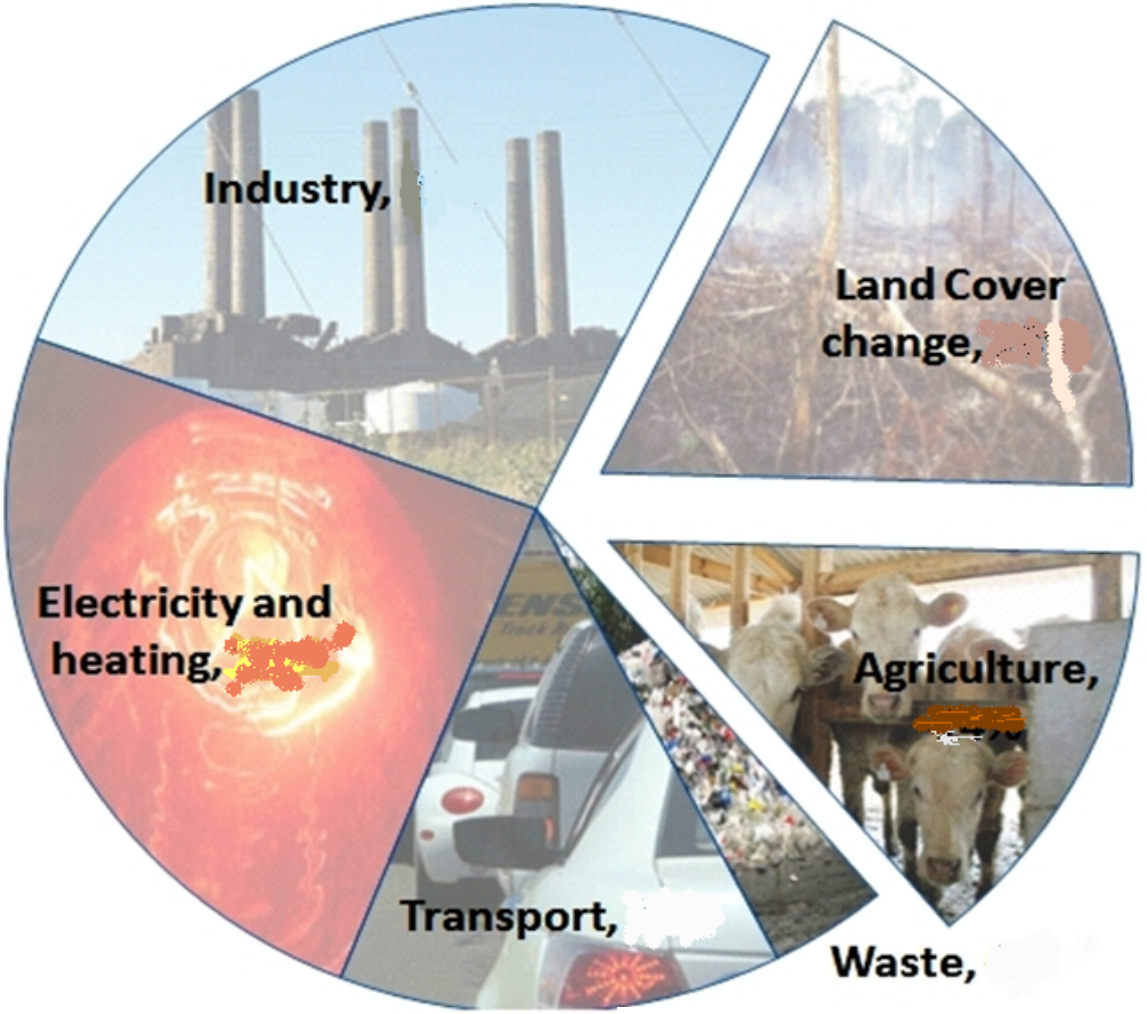
Four degree rise

Thornton et al. (2010) Proc. National Academy Science

The Farming Systems of Africa are diverse (Garrity et al 2012)



Africa to build a better adapted agriculture



19-29% global GHGs from food systems

Vermeulen et al. 2012
Annual Review of Environment and Resources

Adaptation choices for Africa

- **Adaptation**: resilience, *IPCC AR5 emphasizes focus on food and farming for half a billion small scale croppers, livestock keepers and fishers*

Africa's mandate as expanded by the AU:

- Food security
- Jobs, Income, well-being of > 1 billion people
- Sustainable development while reducing poverty and enhancing equity; as high 55-70% poverty rates in rural Africa

Land use choices for Africa

- **Land**: current status, *23.6 million sq km of land; 6.6 million sq km under some forest cover,10 million sq km cultivated land [world bank estimates, 2009]*

Existing and future changes in land use:

- Pressure for additional land for cultivation to meet food security demand because past gains in production were from expansion of agricultural land
- But there are limits on available land, currently 0.6 ha available per person and projected to decline

Land use limits for Africa

- **Degradation**: will be exacerbated by changing climate, *physical soil loss through erosion, soil fertility loss due to nutrient mining and nutrient loss, desertification and salinization. 45% of land vulnerable to desertification affecting 485 million people [UNEP, 2006]*

Additional limits imposed by :

- Protected forests to halt deforestation since agriculture is major driver of loss of forest
- Declining water for agriculture [only 14% of Africa free from moisture stress]

Land use limits for Africa

- **Degradation**: will be exacerbated by changing climate,

Additional limits imposed by :

- Technological advances in expansion of irrigated land, intensified crop and livestock production as well as aquaculture systems
- Tenure rights, land reform and governance; pressure for allocation of land other than for food production, such as for biofuels and export commodities

A future of Land use for Africa

- **Sustainable Land Management**: *Framed as a pathway to ensure food security, avoid famine and address poverty; also achieve growth through climate smart agriculture initiatives that progressively reduce the GHG emissions intensities of future food systems*

Current learning experiences: TerrAfrica Partnership of the World Bank

- Ethiopia; Project builds on the outputs of the watershed management project focusing on smallholder driven SLM practices - See more at: http://www.terrafrica.org/projects/#sthash.OfJOSDzS.dpuf

- Mali; Project expands the adoption of SLWM in targeted communes through the implementation of an ecosystem-based adaptation approach… - See more at: http://www.terrafrica.org/projects/#sthash.OfJOSDzS.dpuf

Big problems: Big Opportunities

1. Large yield gaps in all crops is an opportunity for meeting food demand in future even in the face of increasing climatic risks.
2. In short-term, several options relating to technology transfer and adoption can help improve adaptive capacity. Later, better adapted breeds and crop genotypes will be needed.
3. Climate change may provide new opportunities for growing crops in regions/periods not considered suitable earlier. Need to manage them through better CIS.
4. Problems related to poverty, governance, institutions, and human capital limit agriculture growth today and can also limit adaptation to increasing climatic risks.

Climate Risk Approach in Lower Nyando, Kenya

Climate risk contributes to chronic poverty, food insecurity and vulnerability amongst smallholder farmers.

NMSs focus mainly on seasonal climate forecasts and updates.

Their products are :-

- **Very coarse spatial resolution**
- **Not easily understood**
- **Poorly disseminated**

- **Climate information is key to managing current climate risks and adapting to a future climate.**

Smallholder farmers do not use CIS adequately => unable to manage risks

Information reduces uncertainty and eases decision making

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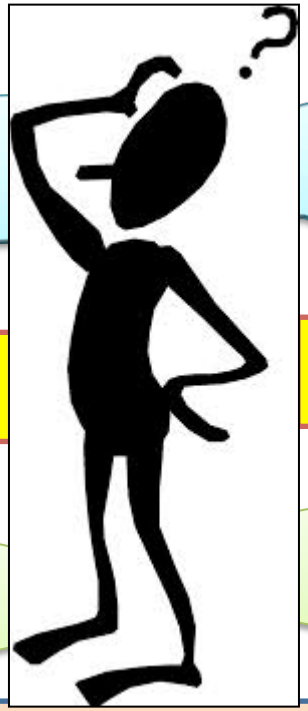
Future

Past



Weather forecasts?

historical climate?

future markets?

past markets?

Pests/Diseases?

Pests/Diseases?

soil fertility?

crops requirements?

CLARIFY QUANTIFY APPLY

Seamless suite of localized climate information

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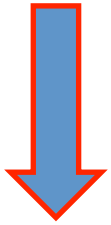

Analysed Historical Data	Seasonal Climate Forecast	Projections of future climate
1960s to 2013	**3 months**	**2030, 2050, 2100**

We work with County Met Offices to develop products

Supporting farmer decision making

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Long Before the Season

Historical Climate Data

Participatory Planning

Just Before the Season

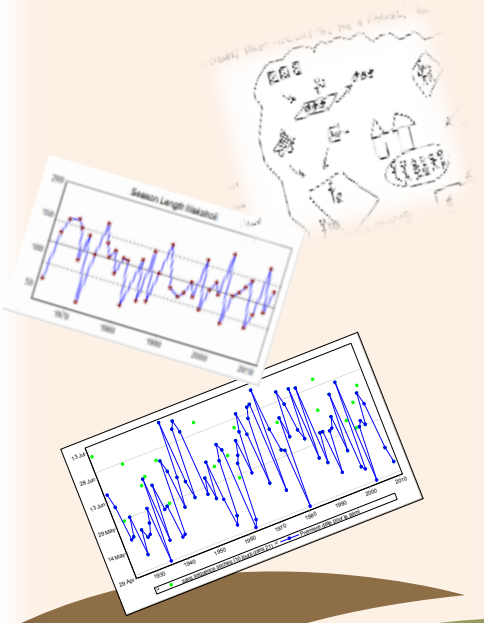
Seasonal Forecast & revisit plans

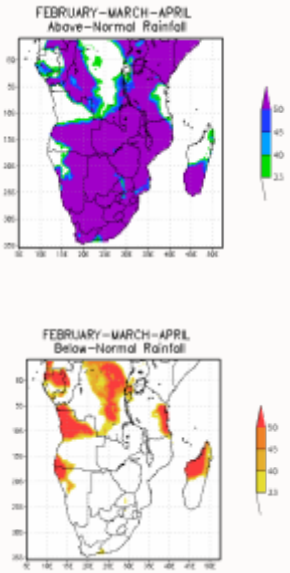
During the Season

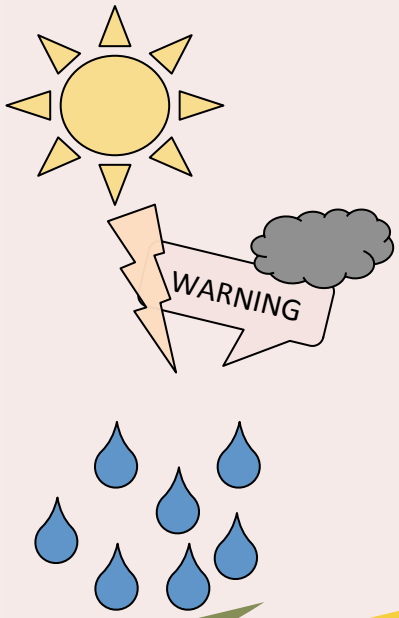
Short-term Forecast & Warnings

Shortly After the Season

Review weather, production, forecasts & process



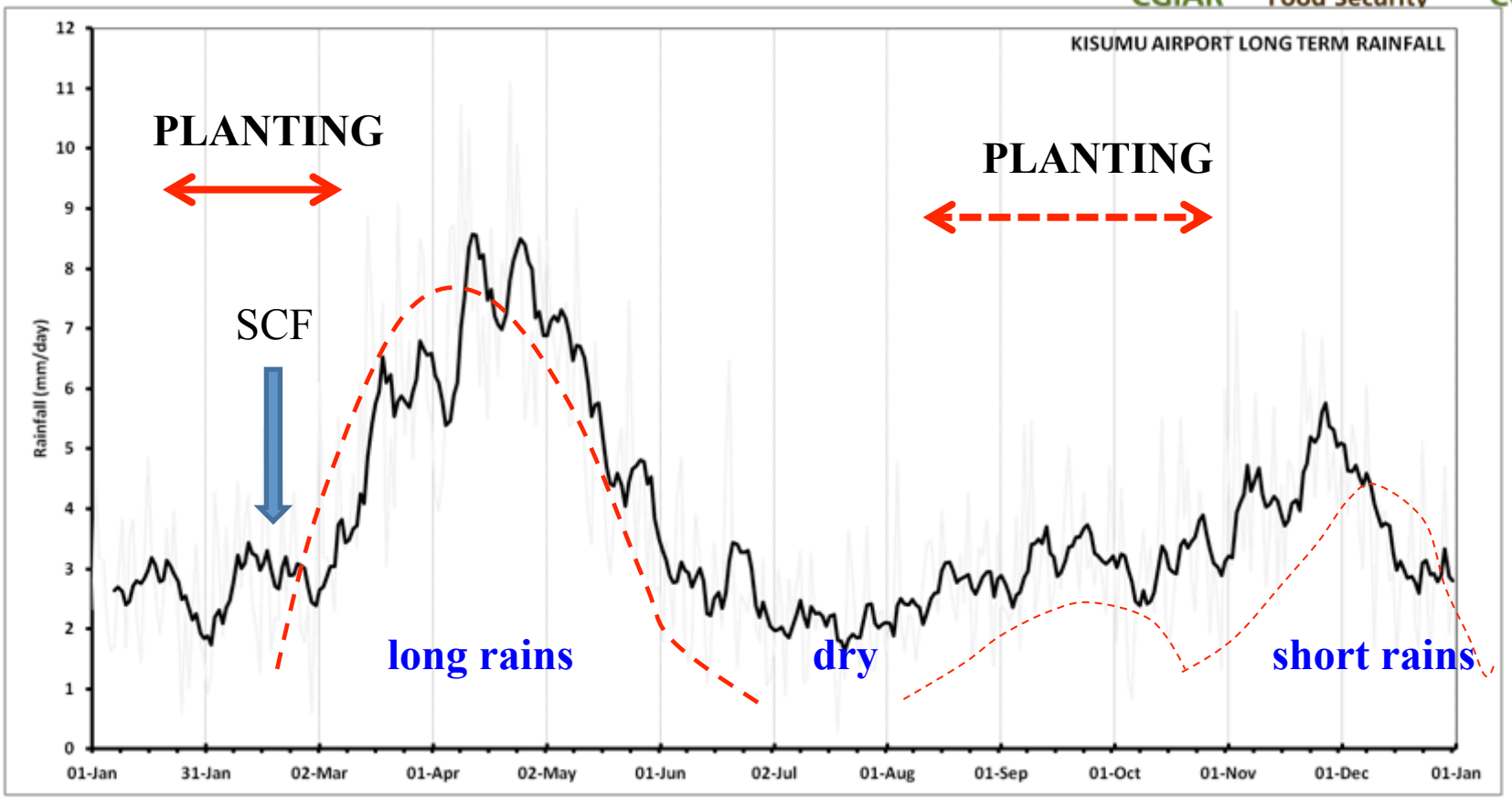




Seasonal Forecasts from http://rava.qsens.net/themes/climate_template/seasonal-forecasts/

Analysis of Climate Risks

Historical climatic data



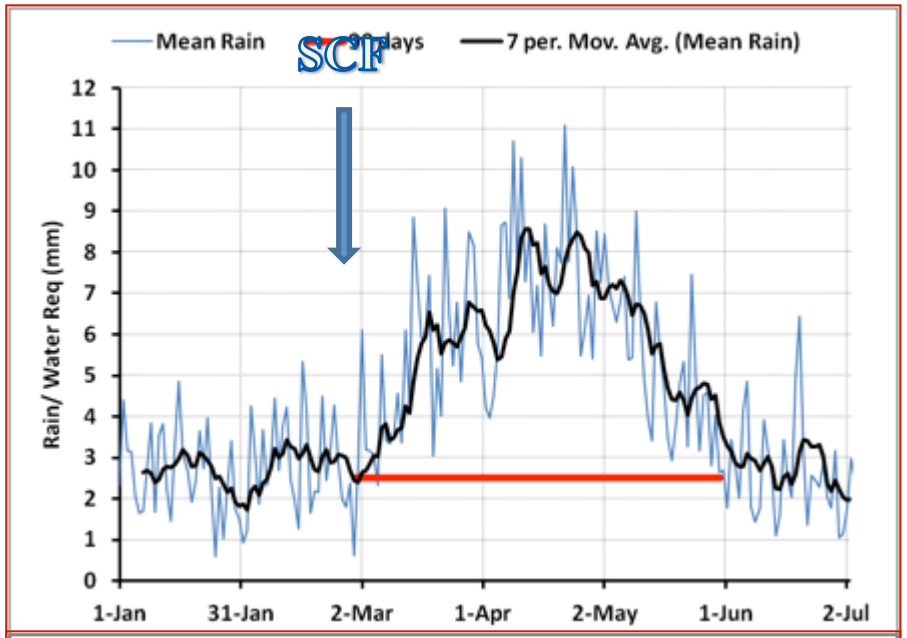
Long rains start early March till end June; maize does well only in this season , sorghum is planted in February using pre-season rains. Short rains start early October till mid-December; there is a weak intermediate season in August and September and farmers respond to this by planting short season, drought tolerant in early August.

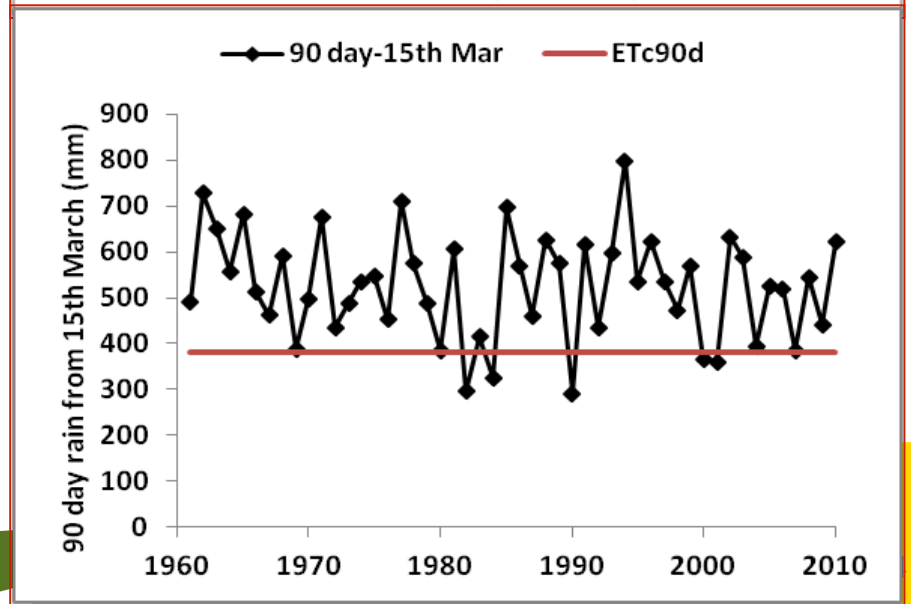
Closer look at MAM Season

Season length 90-110 days

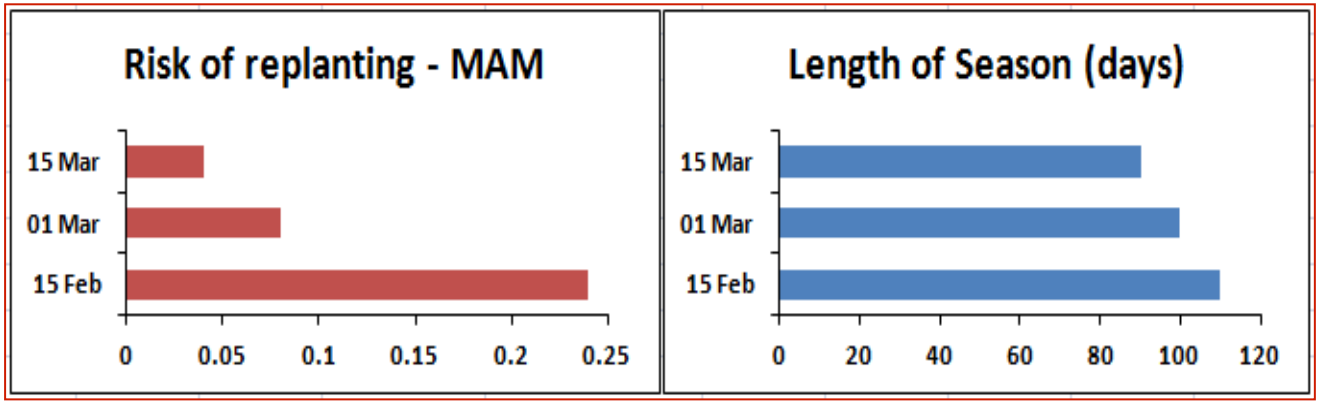
Planting Feb to Mid-March

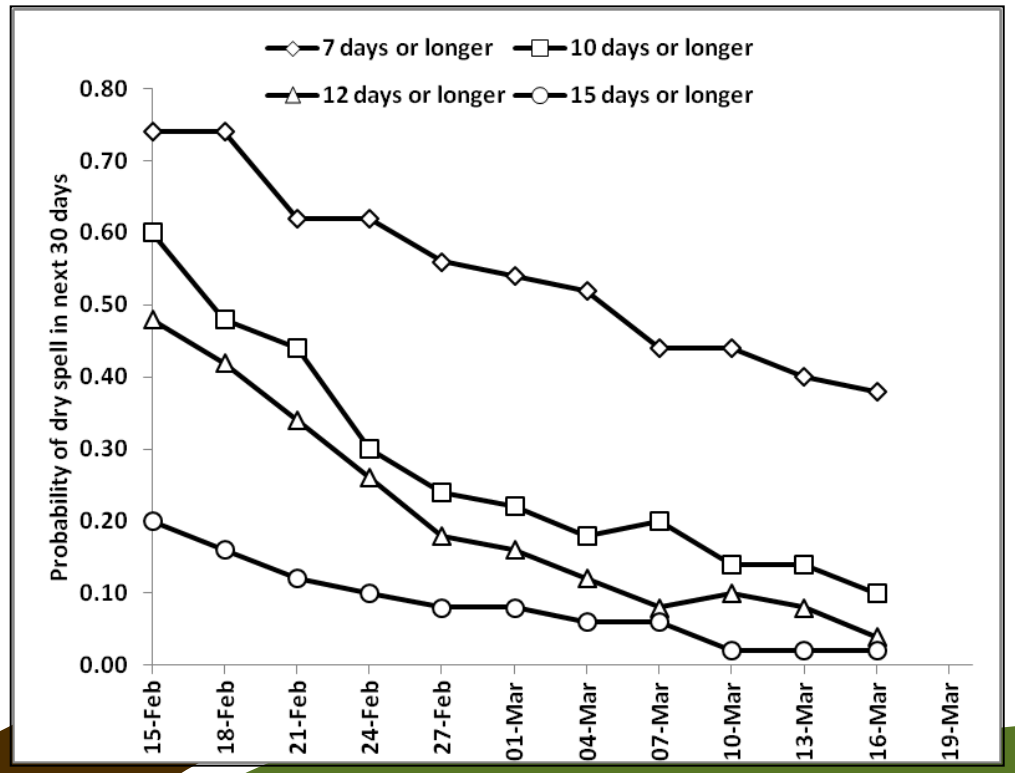
- Using Kisumu Met data, FAO CROPWAT model gives seasonal crop water requirement ETc of:
  - 270 mm for 60-day crops,
  - 380 mm for 90-day crops and
  - 490 mm for 120-day crop
  - ETc ≈ 4.2x (days to maturity).
- The 90 day seasonal rainfall total < 380 mm for 1/10 years => seasonal rainfall total not a constraint to crop production if short duration varieties are selected (up to 105 days).
- Low yields may be attributed to poor rainfall distribution = this needs further study.





Seasonal Variability





- Planting window is from mid February to mid March.
- The chance of dry spells is higher if planting is in February, however
- The length of the season can be longer by up to 20 days if planting is done in February.

Participatory climate risk assessment

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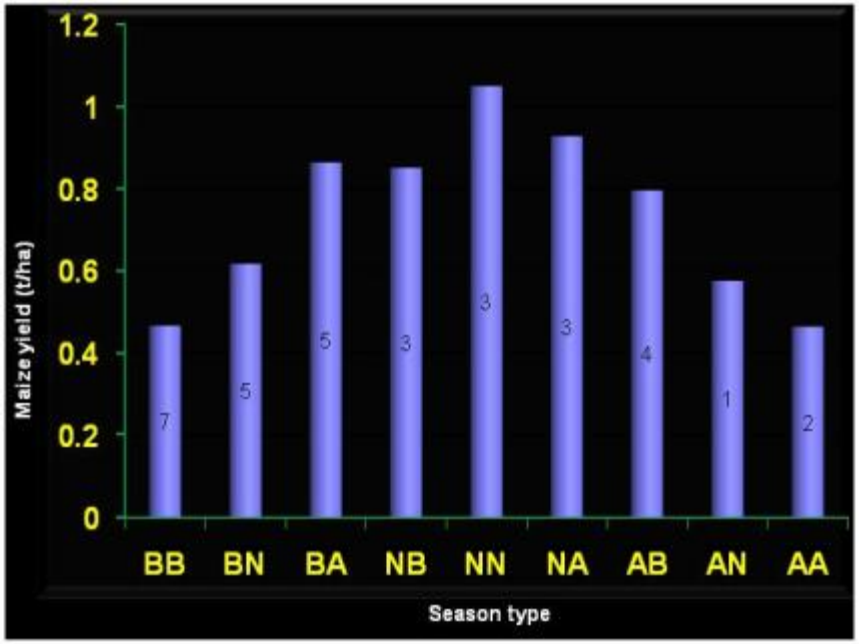
CROP	VARIETY	DAYS TO MATURITY	RAINFALL MM	TEMPER-ATURE °C
MAIZE	**SHORT DURATION**	**90-120**	**300-600**	**15-35**
SORGHUM	MTAMA 1	90-105	250-450	25-35
SORGHUM	SERENA	90	250-450	
BEANS	**GENERAL**	**60-110**	**300-400**	**20-32**
BEANS	KAT B1	75	300	
BEANS	KAT B9	75-90	300	
BEANS	KAT X16	60-90	250	
BEANS	X69	60-90	250	

Understanding Farmer Perceptions

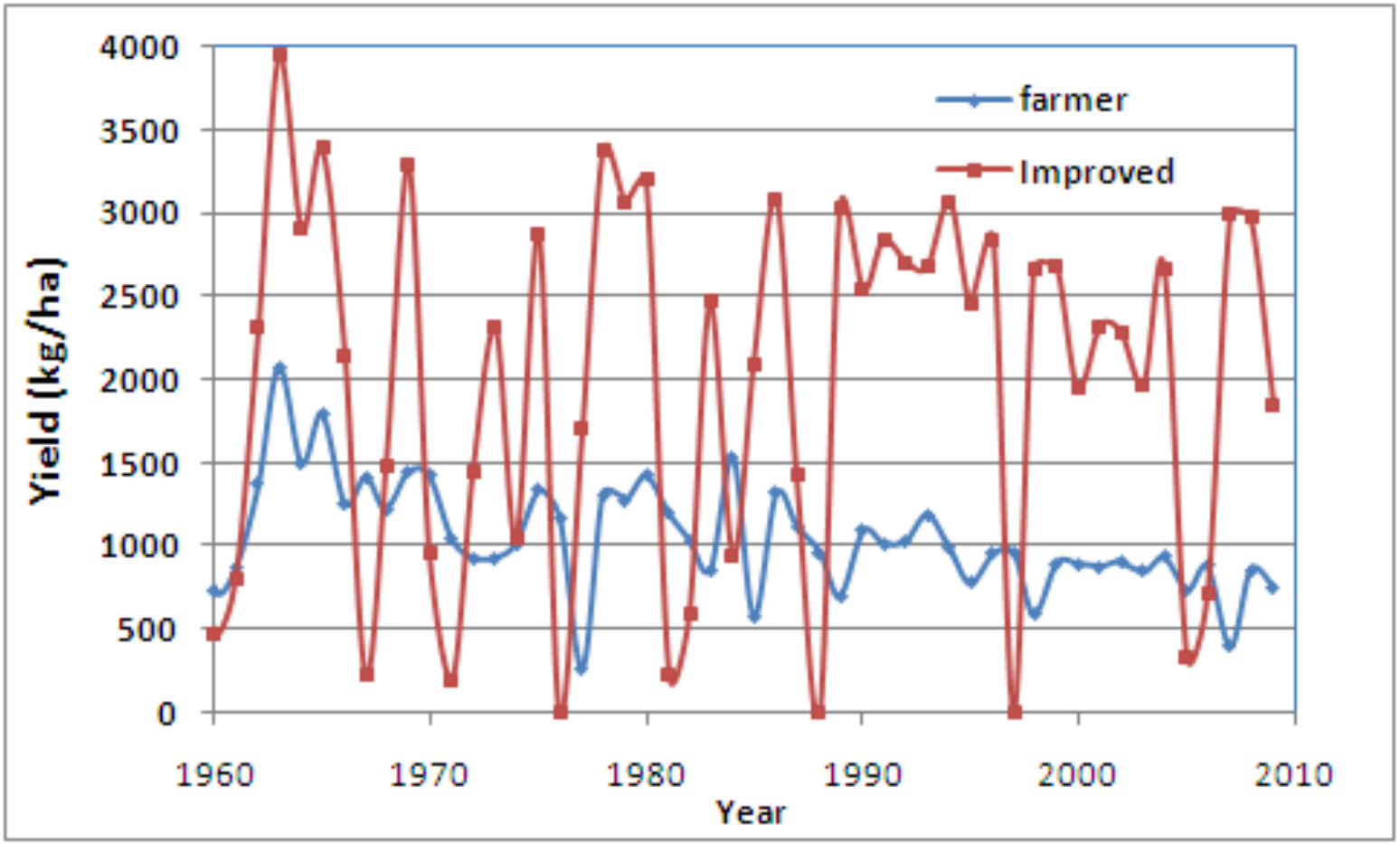
Season type	Kitui		Mwingi		Mutomo	
	FA	Cli	FA	Cli	FA	Cli
Good	34	73	19	51	23	60
Average	37	12	32	24	28	9
Poor	29	15	49	24	49	32

- Farmers tend to overestimate the risk

- Farmers generally adopt risk averse technologies



Variability in yields - Katumani



Risk and return on investment

Location	Years (%) with VC ratio >1	Years (%) with VC ratio >2
Kitui	97	97
Mwingi	82	44
Mutomo	81	36
Katumani	69	56
Makindu	64	51

Prices: CAN - 3500/50 kg, Mulch – 1500/T; and Maize - KSh 2800/90 kg bag

Effective risk management strategies are a pre-requisite for increased uptake of technologies

Risk Management Options

- *Ex-Ante* options - Better preparedness
  - Tactical decisions based on risk and return
  - Forecast based farming
  - Diversification
  - Microdosing and other low cost technologies
- *In-season* options - Better management
  - Adjustments to water management
  - Seed priming for delayed onset
  - Fertilizer application
- *Ex-post* options - Better recovery
  - Insurance
  - Aid
  - Migration

What Changes are Farmers making that require partnerships for risk management in Africa?

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