Towards Forecast based Action and Impact based Forecasting: Experience from ForPAc project in Kenya

Kenya Meteorological Department

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Towards Forecast based Action and Impact based Forecasting: Experience from ForPAc project in Kenya

Objective 1: BETTER FORECASTS
Improved weather/climate Forecasts over seamless lead times, with explicit analysis of forecast skill

Objective 2: BETTER, EARLIER ACTIONS
Systematic approaches to early action based on forecast probabilities i.e. Forecast based Action
Kenya is a (~) ‘sweetspot’ of predictability

Seasonal averages and lead times

Short Rains

Long Rains

Ensemble mean hindcast correlation

Sub-Seasonal averages and lead times
Kenya is a (~) ‘sweetspot’ of predictability

Seasonal averages and lead times

Sub-Seasonal averages and lead times

How can we use such climate forecast information better in Kenya Drought EWS?
**The Kenya national Drought EWS**

- Based on **monitoring** biophysical and food security indicators
- A RESPONSIVE ‘food security’ impact EWS

<table>
<thead>
<tr>
<th>Type of indicator</th>
<th>Indicator</th>
<th>Threshold and Trigger level</th>
</tr>
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<tbody>
<tr>
<td><strong>Biophysical</strong></td>
<td>Rainfall Performance</td>
<td>80-120% of normal</td>
</tr>
<tr>
<td></td>
<td>Vegetation Condition</td>
<td>VCI&gt;35</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>Livestock</td>
<td>Good smooth appearance body condition</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Price of food commodities</td>
<td>Maize: &lt;KSh.33, 33-37, 38-42, &gt;42</td>
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<tr>
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<td>Milk: &lt;KSh.60, 60-64, 65-69, &gt;69</td>
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<td>Livestock price</td>
<td>Goat: &gt;KSh.3,000, 2,500-2,999, 2,000-2,499, &lt;2,000</td>
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<td>Cattle: &gt;KSh.25,000, 23,000 – 24,999, 20,000 – 23,999, &lt;20,000</td>
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<td><strong>Utilisation</strong></td>
<td>Malnutrition status among children</td>
<td>Total children at risk (MUAC &lt;135mm): 10-12%, 13-15%, &gt;15%</td>
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Rainfall and satellite vegetation index (VCI) and rainfall are key trigger for:
- Drought response/mitigation actions
- Finance through the Drought contingency fund (DCF)
### The Kenya national Drought EWS

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**County drought phase classification**

- Based on monitoring biophysical and food security indicators
- A RESPONSIVE ‘food security’ impact EWS

- Can we make the Drought EWS more anticipatory?
  - Longer lead times (1-6 months) could enable:
    - More **efficient** and **effective** risk management systems

Rainfall and satellite vegetation index (VCI) and rainfall are key trigger for:

- Drought response/mitigation actions
- Finance through the Drought contingency fund (DCF)
Possible entry points for experimental ForPAc-KMD products

Livestock pastures and water access
Food stocks
Farming activity
Drought EWS and county planning activities
Current seasonal forecasts
New ForPAc ‘Seamless’ forecasts

Long Rains
- Livestock
- Pasture and water access
- Farming activity

Skill of long-lead OND forecasts

Short Rains
- Assessments (SRA)
- (OND Rainfall & MAM Outlook)

Contingency Planning
- (based on status Alert, Alarm etc)
- (VCI & SPI)

Long Rain Assessment (L.R.A)
- (MAM Rainfall & OND Outlook)

Rapid Assessment (upon CSG request)

GHACOF, NCOF, COUNTY: MAM

GHACOF, NCOF, COUNTY: OND

Monthly update forecasts
Long Lead OND Forecast
Optimised county OND
Monthly update forecasts

End of season drought risk

Good to Fair
Fair
Good
Very Good
Poor
Good
Fair
Good
Very Good
Very Good
Very Good
Moderate
Low
Very Low
High
Moderate
Low
Very Low
Very Low
Moderate

Harvesting
Land Preparation
Planting
Weeding, Growth and Maturity

Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Food stocks
- Harvesting
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GHACOF, NCOF, COUNTY: OND

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End of season drought risk
End of season drought risk

GHACOF, NCOF, COUNTY: OND
Possible entry points for experimental ForPAc-KMD products

- **Livestock pasture and water access**
- **Food stocks**
- **Farming activity**
- **Drought EWS and county planning activities**
- **Current seasonal forecasts**
- **New ForPAc ‘Seamless’ forecasts**

### Long Rains

- **March**
  - **Good**
  - **Good to Fair**
  - **Fair**
- **April**
  - **Poor**
  - **Good**
  - **Fair**
  - **Good**
  - **Very Good**
- **May**
  - **Very High**
  - **High**
  - **Moderate**
  - **Low**
  - **Very Low**

### Short Rains

- **June**
  - **Fair**
  - **Good**
  - **Good**
  - **Fair**
- **July**
  - **Good**
  - **Good**
  - **Fair**
  - **Fair**
- **August**
  - **Fair**
  - **Good**
  - **Good**
  - **Fair**
  - **Very Good**
- **September**
  - **Very High**
  - **High**
  - **Moderate**
  - **Low**
  - **Very Low**
- **October**
  - **Very Low**
  - **Very Low**
  - **Moderate**
  - **Low**
  - **High**
- **November**
  - **Moderate**
  - **Low**
  - **High**
  - **Moderate**
  - **Low**
- **December**
  - **Low**
  - **High**
  - **Moderate**
  - **Low**
  - **Very Low**

### Drought Early Warnings (DEWS) and Monthly Bulletins

- **GHACOF, NCOF, COUNTY: MAM**

### SCENARIO PLANNING

- **Based on status Alert, Alarm etc**
  - **(VCI & SPI)**

### Assessment (L.R.A)

- **(MAM Rainfall & OND Outlook)**

### Rapid Assessment (upon CSG request)

- **GHACOF, NCOF, COUNTY: OND**

### Monthly update forecasts

- **End of season drought risk**
- **End of season drought risk**

### Optimised county OND

- **Long Lead OND Forecast**
- **Monthly update forecasts**

### ForPAc ‘Seamless’ forecasts

- **KMD products**

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**Skill of long-lead OND forecasts**

**New optimised seasonal forecast for Kitui**

**Probability of OND rainfall below 300mm**
Possible entry points for experimental ForPAc-KMD products

- Livestock pasture and water access
- Food stocks
- Farming activity
- Drought EWS and county planning activities
- Current seasonal forecasts
- New ForPAc ‘Seamless’ forecasts

Long Rains

<table>
<thead>
<tr>
<th>Time of Year</th>
<th>Rainy Season</th>
<th>Livestock</th>
<th>pasture and water access</th>
<th>Farming activity</th>
<th>New ForPAc 'Seamless' forecasts</th>
</tr>
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Harvesting

Land Preparation

Planning

Drought Early Warning System (DEWS)

Monthly Bulletins, inc. county classification (Normal, Alert, Alarm, Emergency, Recovery)

- Short Rains Assessments (SRA) (OND Rainfall & MAM Outlook)
- SCENARIO PLANNING
- CONTINGENCY PLANNING (based on status: Alert, Alarm, etc.)
- VCI & SPI

- Long Rain Assessment (L.R.A) (MAM Rainfall & OND Outlook)
- Rapid Assessment (upon CSG request)

- GHACOF, NCOF, COUNTY: OND Forecast
- GHACOF, NCOF, COUNTY: OND

- Drought EWS and county planning activities
- Monthly update forecasts
- End of season drought risk

Merged observed/forecasted 10-month Standardised Precipitation Index (SPI-10)

<table>
<thead>
<tr>
<th>observed</th>
<th>Sept.</th>
<th>forecasted</th>
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Example: issue early Oct

- Probability of SPI-10 1 in 10 year event (2016)

- Observed food security: orange = crisis; red = emergency.

New optimised seasonal forecast for Kitui

- Optimised county OND Monthly update forecasts
- End of season drought risk

- Possible entry points for experimental ForPAc-KMD products

- Livestock pasture and water access
- Food stocks
- Farming activity
- Drought EWS and county planning activities
- Current seasonal forecasts
- New ForPAc ‘Seamless’ forecasts
Possible entry points for experimental ForPAc-KMD products

**Forecasting crop yield & WRSI using the Tamsat-Alert System**

Crop model calibrated over Kenya/GHA (0.25 degree grid)

Run each day to end of season driven by (observations weighted by) climate forecasts

Output: evolving probabilistic forecast of risk of crop failure

Seasonal and sub-seasonal climate forecasts

(Note how the forecast drought risk probabilities ‘evolve’ over the season)

GHACOF, NCOF, COUNTY: MAM

LONG RAINS

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
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<tbody>
<tr>
<td>Good</td>
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<td>Fair</td>
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<td>Good</td>
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SHORT RAINS

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<td>Moderate</td>
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**Drought Early Warnings (DEWS)/Monthly Bulletins, inc. county classification (Normal, Alert, Alarm, Emergency, Recovery)**

**Short Rains Assessments (SRA)**

(OND Rainfall & MAM Outlook)

**Scenario Planning**

(based on status Alert, Alarm etc)

**Contingency Planning**

(VCI & SPI)

**Long Rain Assessment (L.R.A)**

(OND Rainfall & MAM Outlook)

**Rapid Assessment (upon CSG request)**

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Optimised county OND Monthly update forecasts

End of season drought risk

Monthly update forecasts

End of season drought risk

Probability of SPI-10 1 in 10 year event (2016)

**Observed food security:**
orange = crisis; red = emergency.
Potential for Impact based Forecasting

- Rich datasets on both static and dynamic exposure and vulnerability exist
- DEWS monitors multiple measures of vulnerability from NDMA sentinel sites
- KRCS are generating database on static exposure and vulnerability
- Many challenges remain
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Potential for Impact based Forecasting

• Rich datasets on both static and dynamic exposure and vulnerability exist.
• DEWS monitors multiple measures of vulnerability from NDMA sentinel sites.
• KRCS are generating a database on static exposure and vulnerability.
• Many challenges remain.

Hazard forecasts

- KRCS are generating a database on static exposure and vulnerability.
- Many challenges remain.
Conclusions

• ForPAc aims to enhance government EWS (more anticipatory)
  • Kenya has well developed Drought EWS
  • ForPAc targets entry points for weather/climate forecasts into EWS
    • Seamless lead times; probabilistic; skill assessed (to support FbA)
    • Pilot: ‘Shadow’ forecasts for shadow actions

• Simultaneously supporting Kenya Red Cross Society FbF initiatives (inc DREF)

• Appetite exists for:
  • Improving forecasts products and services at KMD and ICPAC
  • More anticipatory Drought EWS

• Challenges exist in institutionalising new concepts, information and products
  • DEWS not currently configured around FORECASTS
  • Entry points: we can forecast biophysical not socio-economic indicators
  • Technical capacity in organisations limited
  • Institutional inertia
  • National and county level governance and resources
  • Will take time for new innovations to be adopted

• Opportunities for IbF and FbA
  • Humanitarian organisation can help drive innovations