THE STATE OF CROP FORECASTING IN KENYA

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DEPARTMENT OF RESOURCE SURVEYS & REMOTE SENSING





Institutional and Human Capacity



Fleet of Aircraft

DRSRS acquired a new survey aircraft

Cessna with modern intercom
Aircraft arrived on 16-7-2011

N3041E



RC 30 Survey Camera

- Black and white film
- Colour film



DRSRS STRUCTURE





DEPARTMENT OF RESOURCE SURVEYS AND REMOTE SENSING (DRSRS)

VISION

DRSRS strives to be a national centre of excellence in geo-information services on earth-based natural resources for sustainable development

MISSION

"To generate, provide and promote geo-information on earth-based resources in support of planning, management and decision-making for sustainable

MANDATE

DRSRS is mandated to capture, store, update, analyze and disseminate geo-spatial data and information on earth-based natural resources/environment to enhance spatial planning and decision making for sustainable development

Data collected and generated form the basis for research, development of management plans and formulation of land use policies

DRSRS Methods of Data Acquisition

Multi-Stage Sampling Concept

Stage 1: Remote Sensing Approach Orbiting Space Satellite (3,000 - 35,000) km)

Scale

Advantages: Acheap, faster, covers

wide area and

Stage 2: Aerial Survey

- Low-High Flight Aircraft
 - Aerial Photography (100-3,000m)
 - Animal Census (100-200m) Costs Implication: Dependent on size

of

area, sampling resolution and efforts Scale

Stage 3: Ground Surveys/Measurement

Attribute identification, scale accuracy and socio-economic surveys Cost Implication: Often expensive and time CONSUMING NO Crop Yield Fore



Vethods



Overview of Crop Monitoring in Kenya

- Started in 1984 following prolonged drought episode
- The impact was
 - Famine and hunger affected 60% of the population
 - Over 17% of livestock were decimated

• The cost incurred affected normal Government development plan



Impacts of Drought

Example: Year 2000 Drought Devastation

• The government declared the episode a national disaster

WFP incurred US\$ 102 million on food relief in 2000 -2001
Example: Year 2008/9 Drought Devastation
Government spent in excess of US \$. 169 million on relief food to combat the drought emergency



STRATEGY

 Launched a crop monitoring programme using remote sensing techniques

•The Department of Resource Surveys and Remote Sensing (DRSRS) was tasked to undertake this exercise

•DRSRS mandated to provide statistical estimates on area and yield under crop



Overview of Crop Forecast in Kenya

 Maize and wheat are the main staple food in Kenya accounting for over 80 percent of total cereals used at a household level

Rice is the third most consumed cereal

 Each year the Food Steering Committee (FSC) of the Office of State, Special Programmes require information on Area, Yield and Production of these cereals



Overview of Major Food Crops in Kenya





Population growth and Shrinking land base of Kenya





Changes in population demography (1948-2009)



Kenya's projected rural and urban population, 1950-2050



Users of maize and wheat crop data







- Crop area stratification
- Estimation of area crop using vertical aerial photography
- Determination of crop yield per hectare
- Computation of crop production
- Computation of consumption



Agriculture expansion between 1990's and 2000's



• Population of Kenya in 2009 census = 38,610,097 people

•20 % of Kenya support crop cultivation significant to the economy

•Kenya requires approx 31 - 34 million bags of maize and 9 -11 million bags of wheat annually

•Balance in food deficit met by substantial quantities of rice, potatoes and pulses produced locally and also from imports



Satellite Data for Determination of Crop Strata



Satellite Data for Determination of Crop Strata



Workshop on Crop Yield Forecast: 12-14/10/2011: INRA, Rabat, Morocco

DIRSIRS

METHODS: ESTIMATION AREA







Aircraft: •High winged twin or single engine (P68 or Cessna) •Flying height of 488 m (1600 ft)

Camera: •A 35 mm camera, 20 mm wide-angle lens

GPS: Set to UTM WGS 84 datum or Geographic

Photographs:
Vertical
Scale is approx. fixed at 1:22,000
Area on ground 46 ha

orecast: 12-14/10/2011: INRA, Rabat, Morocco



Sample Dot-Grid for Vertical Photograph



Photo Interpretation: Dot-Grid technique





- 100 Dot grid



Photo Interpretation: 100 Dot-Grid





Photo Interpretation: 150 Dot-Grid





Photo Interpretation: 200 Dot-Grid





Accuracy levels in Photo Interpretation



Area of Crop

S.F = Ορ/η Where:

- S.F = Sampling Fraction of the strata
- Op = Total No. of sample (points) photos observed with crop
 - η = Total No. of Points (photos) taken in district strata

Where:

- A = Area of survey stratum (ha)
- S.F = Sampling Fraction of the strata
- **Op** = Total No. of sample photos observed with crop
 - n = nth photo in the strata
 - i = ith photo in the strata



METHODS: DETERMINATION OF CROP YIELD

Tektronix J16 digital radiometer

Applies Remote Sensing Techniques a ratio of nearinfrared and red band reflectance (NIR-VIS)/(NIR+VIS) is a surrogate for primary production

Tussled maize





Relationship between Yield and ratio of R/IR – Embu District in 1984



Regression in Maize yield vs Production in selected districts 2004-07



Regression.....Cont'd





Collateral Information



Crop calendar

Wheat	LR				LP-P	LP-S	P	W	G	TF	Μ	Н	H/CM
Maize	SR	Μ	Н						LP-P	LP-S	Р	\mathbf{W}	G
	LR	LP-P	LP-S	Р	W	RW	G	TF	Μ	Н	Η	H/CM	LP-P
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Abbreviation	Activity	Abbreviation	Activity
LP-P	Land preparation - Primary	TF	Tussling/Flowering
LP-P	Land preparation - Secondary	Μ	Maturing/Matured
Р	Planting	Н	Harvesting
W	Weeding	СМ	Crop Marketing
RW	Re-Weeding	SR	Short Rain
G	Growing	LR	Long Rain



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SPOT 4 NDVI images showing rainfall variability within a period of three years 1998 to 2000

Workshop on Crop Yield Forecast: 12-14/10/2011: INRA, Rabat, Morocco

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Prediction of Crop Production

• Production = Area * Yield



Maize consumption/Production 1985-2010



Average consumption rate being 98 Kg per person per year (FEWSNET, 1997)

Source: Situma and Agastiva, 2010)



Wheat



Conclusion

The area and yield under maize and wheat can reliable be predicted from vertical aerial photography and radiometers as a rapid method of crop assessment



PRODUCTION & STORAGE



END

MERCI THANK YOU ASANTE SANA

