

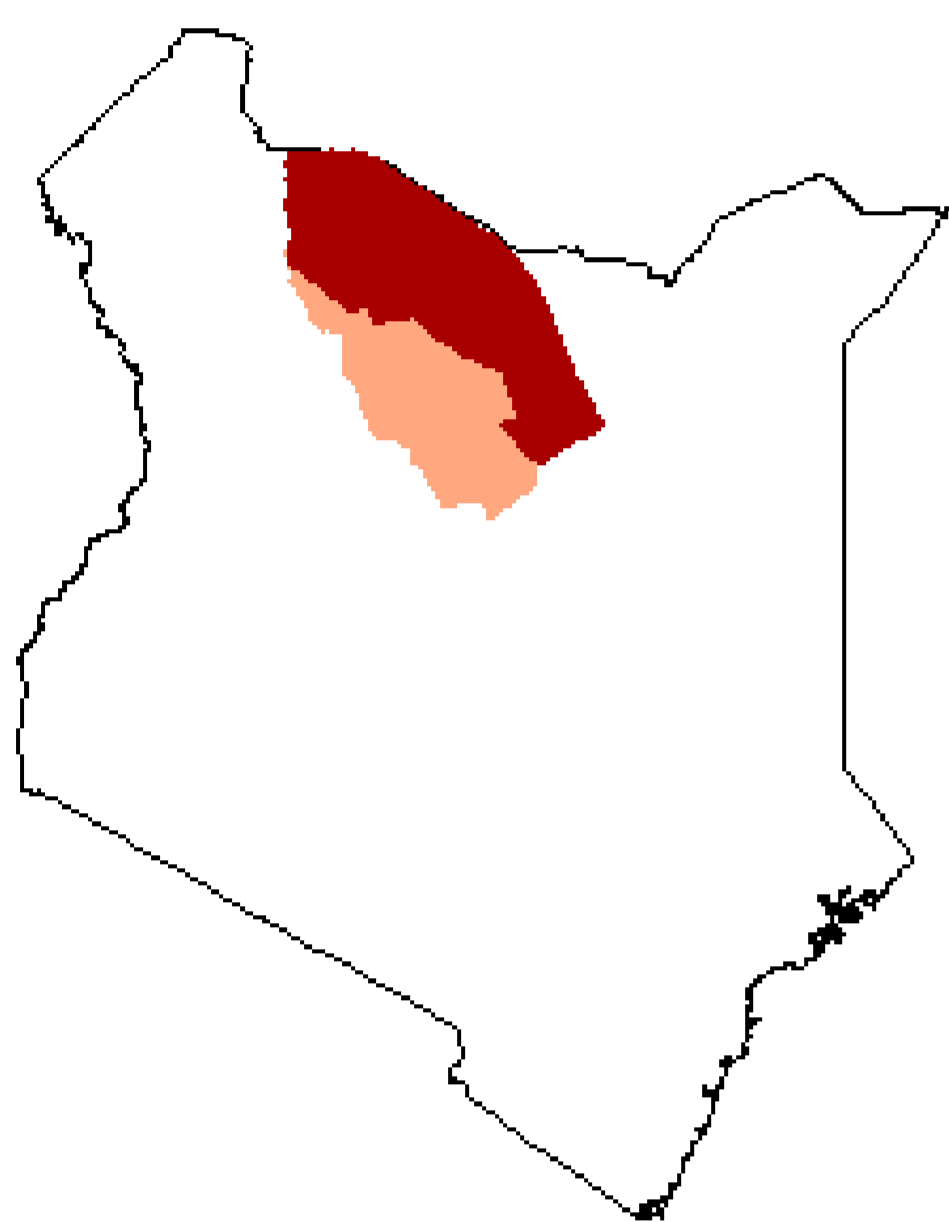
Abstract




The International Livestock Research Institute (ILRI)'s Index-Based Livestock Insurance project (IBLI) is a project aimed to deliver to arid and semi arid lands' pastoralists an index based insurance product that covers drought related livestock mortality. In the pilot project, which was first commercially launched in Marsabit District, Northern Kenya, in January 2010, livestock mortality is predicted using freely available remotely sensed NDVI data (which represent the amount and vigour of vegetation that will be grazed by livestock). The study that will be presented here focused on the impact of the different land cover and land use classes present in the area on the mortality index and on the possibility to improve the mortality prediction by masking the pixels corresponding to certain land cover classes.

Keywords: Livestock, Mortality, NDVI, Land Cover, Insurance, Index

Livestock Mortality Index

Pilot project area



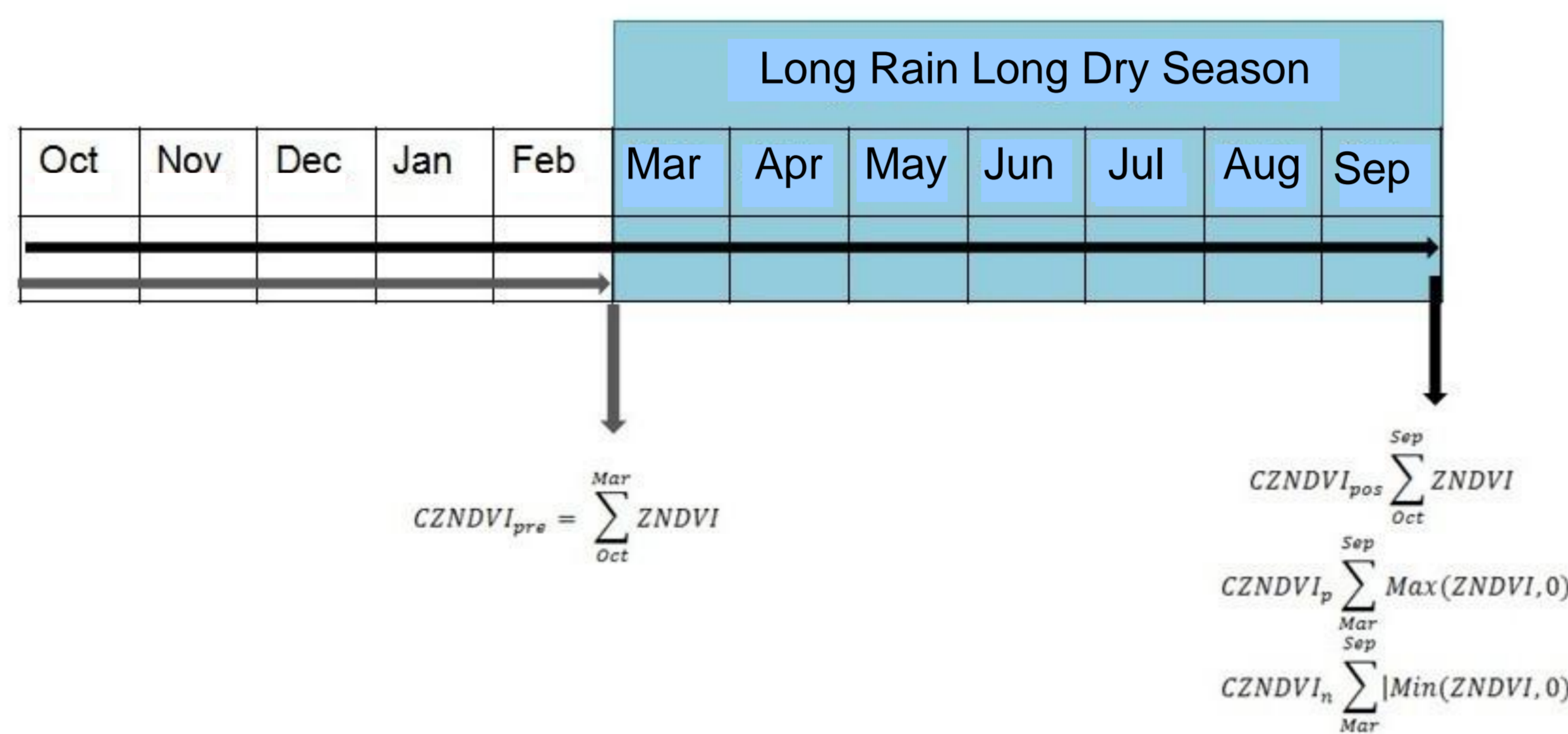
-  Kenya
-  Upper Marsabit
-  Lower Marsabit

The current mortality index

- Source of data: MODIS 16-day maximum value composite NDVI.
- Mortality data for calibration of the index: Government of Kenya's Arid Land Resource Management project (ALRMP), monthly, from 2000 to present, location –level.

Livestock mortality index:

$$M = a \times CZNDVI_{pre} + b \times CZNDVI_n + c \times ZNDVI_p + d$$



		UPPER MARSABIT	LOWER MARSABIT		
a	Good regime	-0.00104	0.00128		
	Bad regime	-0.01366	-0.01619		
b	Good regime	0.00926	0.00177		
	Bad regime	0.01521	0.01970		
c	Good regime	0.00064	0.00199		
	Bad regime	-0.01878	-0.01008		
d	Good regime	0.00000	0.02452	0.00000	0.00533
	Bad regime	0.00000	0.11922	0.00000	-0.00963

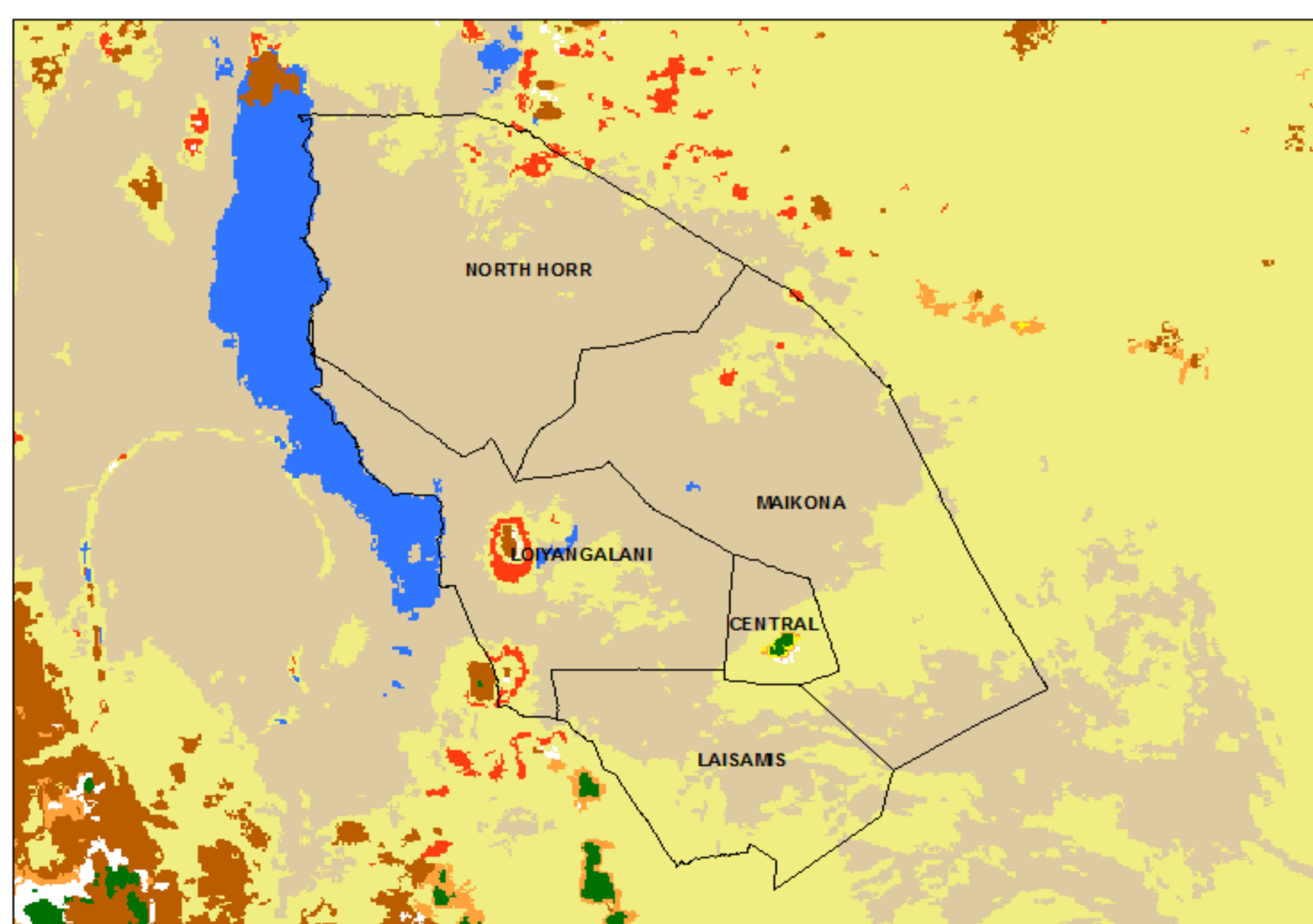
LRLD * SRSD LRLD SRSD











$CZNDVI_{pos}$ = threshold for regime switch (if >2.5, good regime, if <2.5, bad regime)

* LRLD = Long Rain Long Dry Season
SRSD = Short Rain Short Dry Season

Land Cover Analysis

Characterization of vegetation cover



-  Marsabit District
-  Water
-  Tree Cover: broadleaved; evergreen
-  Tree Cover: broadleaved; deciduous; closed
-  Mosaic: Tree Cover / Other natural vegetation
-  Shrub Cover: closed-open; deciduous
-  Herbaceous Cover: closed-open
-  Sparse herbaceous or sparse shrub cover
-  Cultivated and managed areas
-  Mosaic: Cropland / Shrub and/or grass cover

Division	LAV cover (%)
North Horr	98.58
Maikona	99.33
Central	94.28
Laisamis	100
Loiyangalani	93.84

Livestock available vegetation (LAV): herbaceous cover, shrub cover, sparse vegetation cover.

Results of land cover analysis

Results of Student's T test on NDVI (up) and Livestock mortality (down): comparison between division overall mean (OM) and Livestock available vegetation areas (LAV)

Division	Mean	SD	N	t	p	
NH	OM	0.163	0.058	468	59.09 *	0.00
	LAV	0.159	0.057			
Mai	OM	0.179	0.064	468	24.59 *	0.00
	LAV	0.178	0.063			
CG	OM	0.266	0.095	468	57.29 *	0.00
	LAV	0.224	0.084			
Lai	OM	0.199	0.061	468	-	-
	LAV	0.198	0.060			
Loi	OM	0.173	0.046	468	77.00 *	0.00
	LAV	0.149	0.039			

Difference significant at the 5% confidence level for all divisions

Division	Mean	SD	N	T	p	
NH	OM	0.206	0.105	24	1.75	0.09
	LAV	0.204	0.104			
Mai	OM	0.212	0.079	24	1.15	0.26
	LAV	0.210	0.080			
CG	OM	0.140	0.083	21	4.13*	0.00
	LAV	0.128	0.078			
Lai	OM	0.130	0.103	24	-	-
	LAV	0.130	0.103			
Loi	OM	0.138	0.096	24	5.44 *	0.00
	LAV	0.128	0.091			

Difference significant at the 5% confidence level for Loiyangalani and Central divisions

Conclusions and Perspectives

- Once the area covered by vegetation that is not available for livestock reaches a certain threshold (in our case about 7%), the impact of those areas on the mortality index is significant.

→ Masking those areas when extracting the NDVI should improve the prediction of livestock drought related mortality.

- Remaining question: among livestock available vegetation classes, how to assess the impact of non edible vegetation on NDVI and mortality index?

- Future research: - Expansion of project (IBLI phase 2): 11 districts in Kenya and 1 study site in Southern Ethiopia.

- Improvement of Index (SPOT and MODIS vegetation indices, meteorological data, water holes data, improvement of statistical treatment ...).