

CLIMATE CHANGE PROJECTION OVER ETHIOPIA

Fikadu Getachew

fikeget@gmail.com

Ethiopian Institute of Agricultural Research
(EIAR)/Melkassa Agricultural Research Centre
(MARC)

11, November 2010



Ethiopian Institute of
Agricultural Research(EIAR)

Out lines

- ▣ Introduction
- ▣ The General Circulation models(GCMs)
- ▣ Global and National Climate change
- ▣ Objective of the study
- ▣ Data and methodology
- ▣ Result and discussions
- ▣ Conclusion
- ▣ Potential adaptation options
- ▣ Recomendations



Ethiopian Institute of
Agricultural Research(EIAR)

Introduction

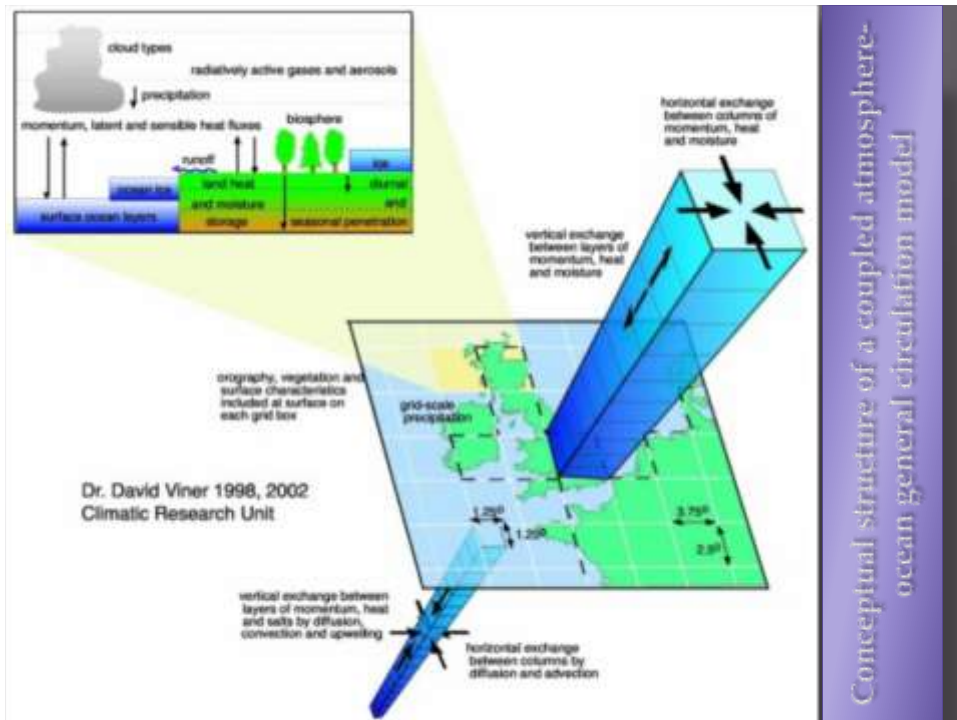
- ▣ Global climate change is real & universally accepted as an anatomy of the silent crises.
- ▣ A recent mapping on vulnerability and poverty in Africa *categorizes Ethiopia into the group of most vulnerable countries to climate change*
- ▣ Ethiopia's dependence on agriculture makes the country particularly vulnerable to the adverse impacts of climate change on crop and livestock production
- ▣ Therefore one needs to have a clear and quantified measure of the climate change at local scale
- ▣ The only means available to quantify the non-linear climate response is GCMs



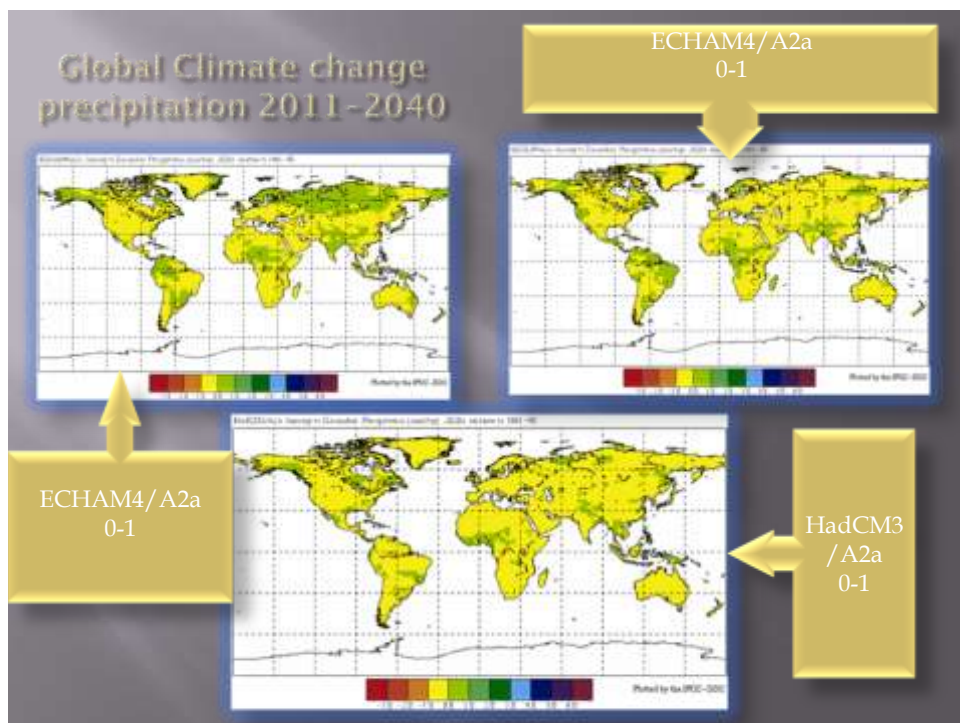
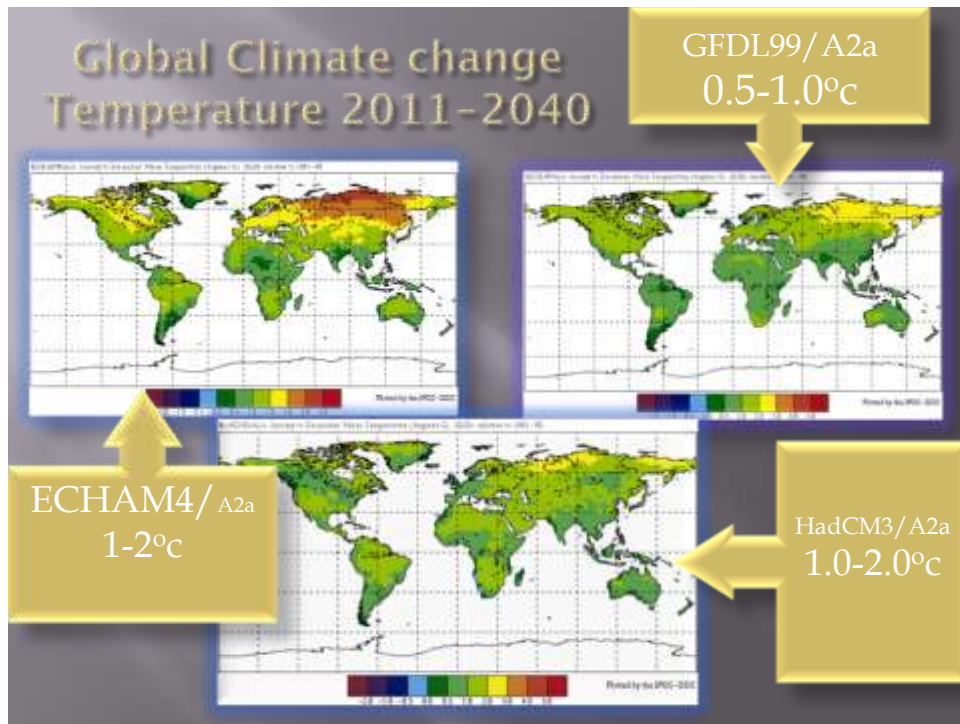
Ethiopian Institute of
Agricultural Research (EIAR)

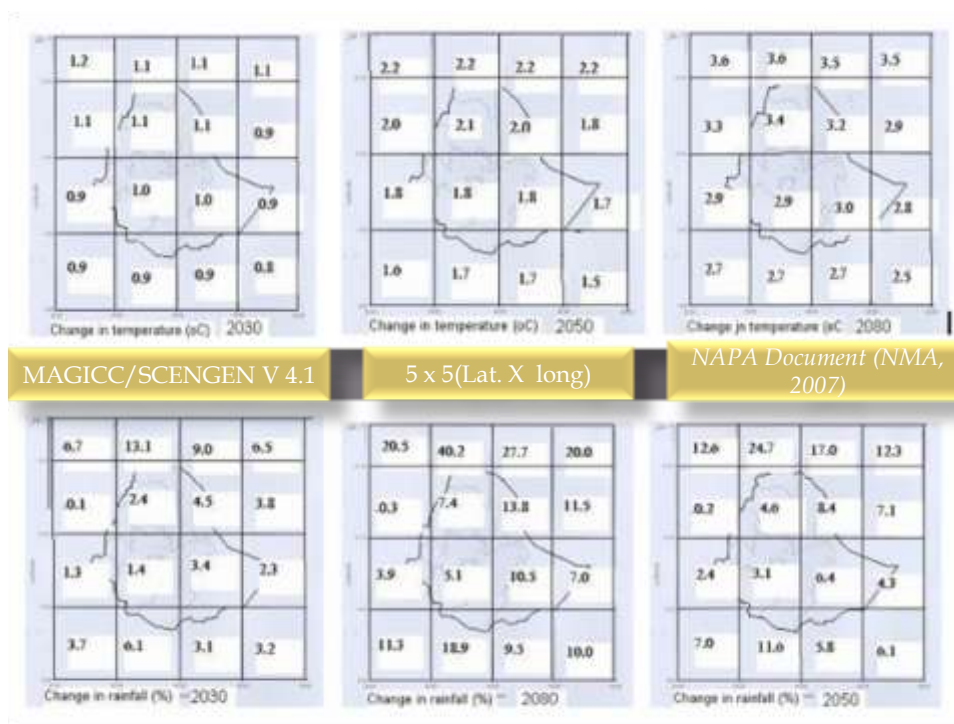
The GCMs

- ▣ Numerical models (General Circulation Models or GCMs), representing physical processes in the atmosphere, ocean, cryosphere and land surface
- ▣ The most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas
- ▣ They depict the climate using a three dimensional grid over the globe



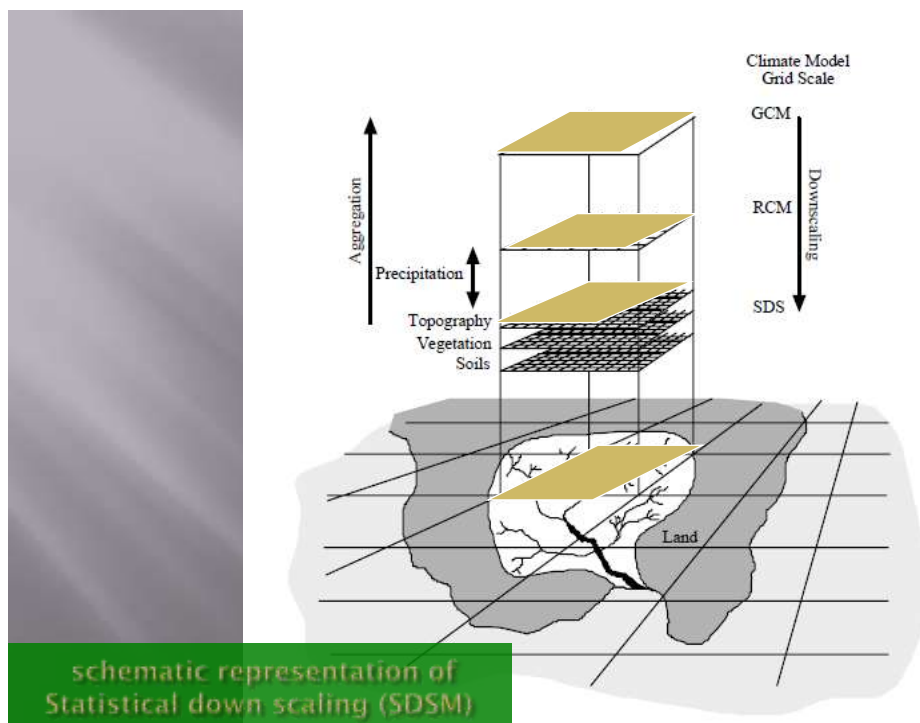
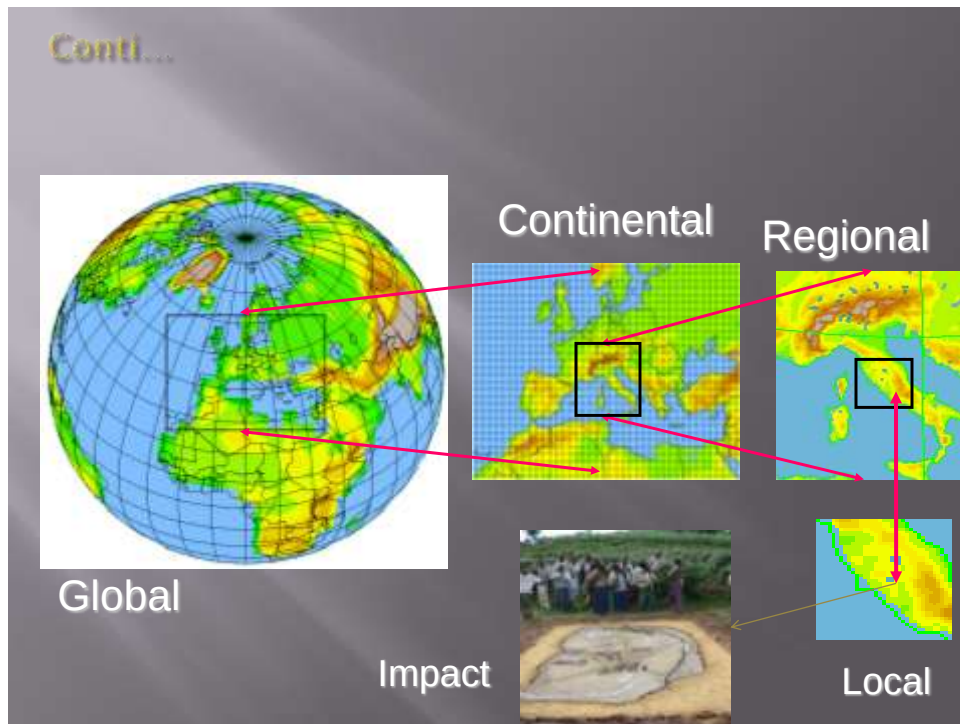
Global and National Climate change





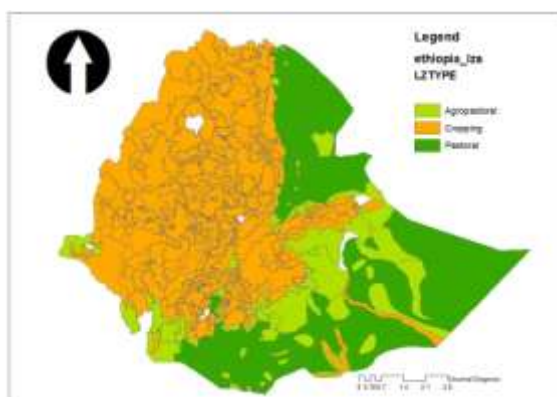
Conti...

- ❑ Even though GCMs can provide high quality temporal data
 - Low spacial resolution
 - inability to resolve important sub-grid scale features such as clouds and topography
- ❑ Impact assessment requires high temporal and spacial resolution like Crop simulation modeling



Objective of the study

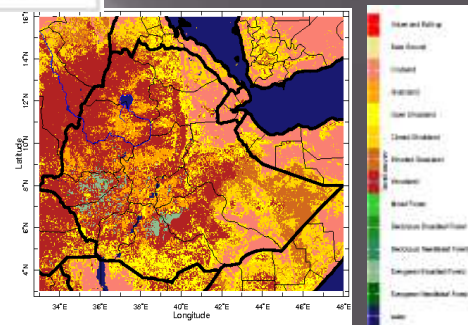
- ▣ To assess the possible climate change projections over the three Livelihood Integration Unit(LIU) of Ethiopia
- ▣ To give the possible adaptation options to the prevailing climate change



Livelihood Zone Map for Ethiopia

USAID Ethiopia Livelihoods Integration Unit, Contract No. 663-N013-3-05041

Land use land cover map of Ethiopia
<http://iridl.ldeo.columbia.edu/expert/SOURCES/NOAA/NCEP/CPC/CAMS/mean/>



Data and Methodology

- ▣ Observational meteorological data 50 stations
- ▣ The SDSM predictor data files(HadCM3)
<http://www.cics.uvic.ca/scenarios/sdsm/select.cgi>



The African Continent Window with 2.5° latitude x 3.75° longitude grid size from which the grid box for the study area is selected



**Ethiopian Institute of
Agricultural Research(EIAR)**

Conti...

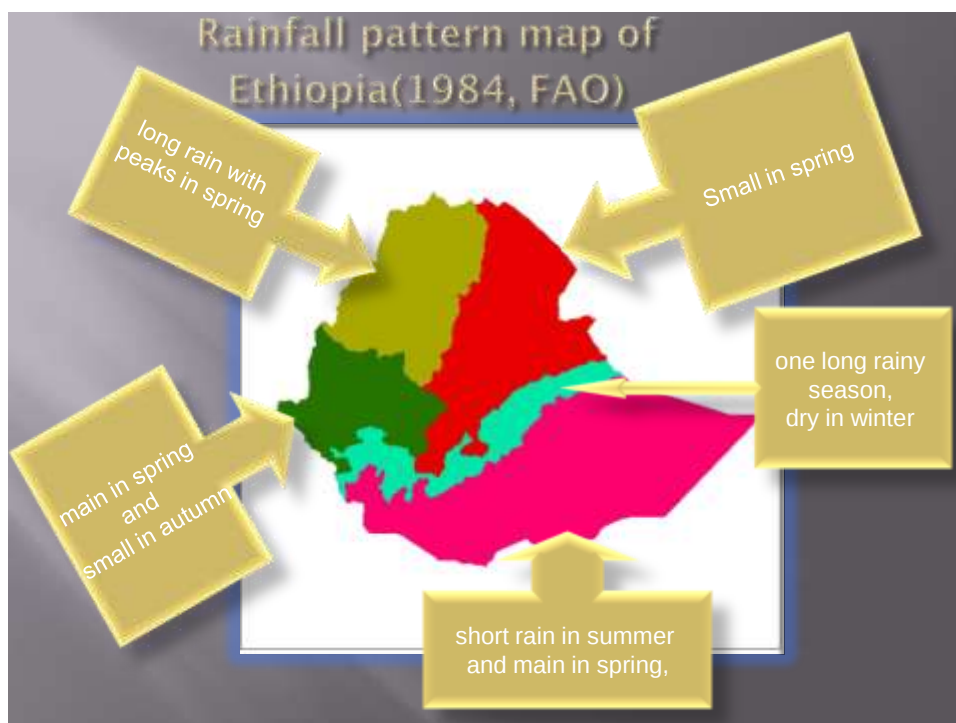
- ▣ The spatial and temporal resolution gap on what **climate modellers** are currently able to provide and what **impact assessors** require can be bridged through the application of “downscaling” techniques (Wilby and Dawson 2007)
 - Dynamical or
 - Statistical downscaling technique
- ▣ Here we have used the statistical down scaling method using SDSM v 4.2
- ▣ The tool facilitates the rapid development of multiple, low-cost, **single-site** scenarios of daily surface weather variables under current and future climate forcing

Rainfall pattern of Ethiopia

- ▣ To develop the downscaling maps, first the most representative rainfall regimes map of Ethiopia was selected
- ▣ The 1984 FAO rainfall pattern map was adopted as it shows mainly the seasonal rainfall pattern of the country

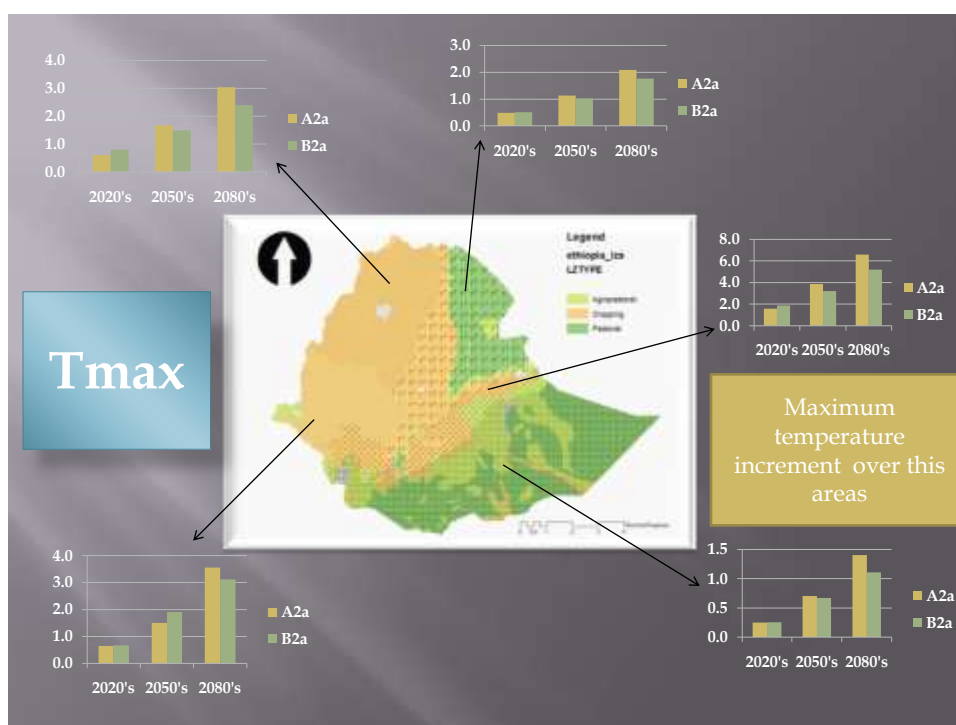


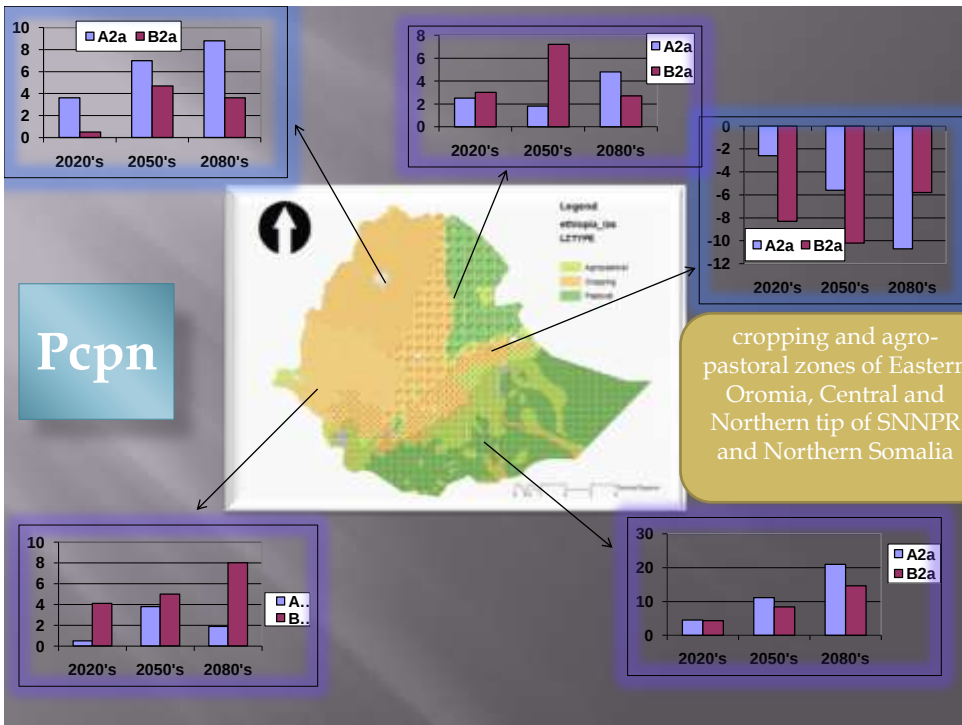
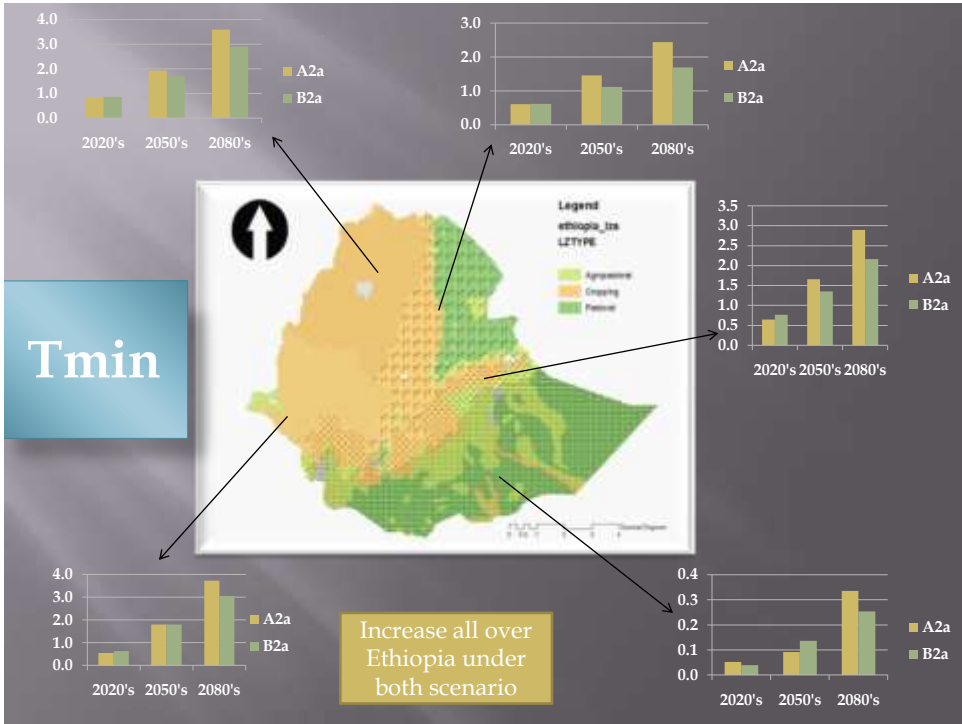
Ethiopian Institute of
Agricultural Research (EIAR)

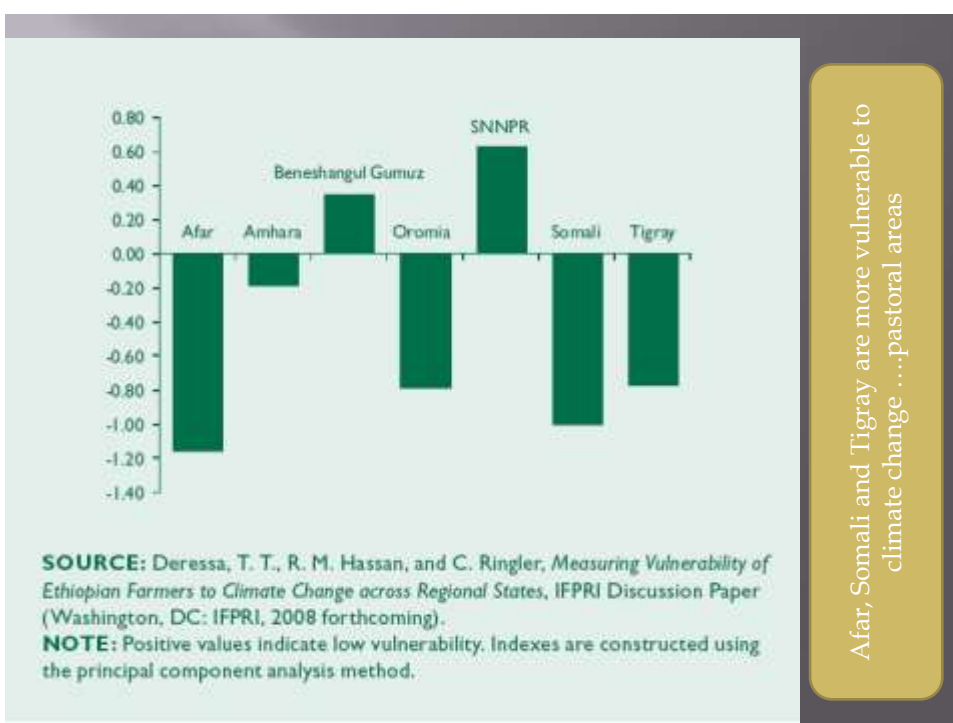
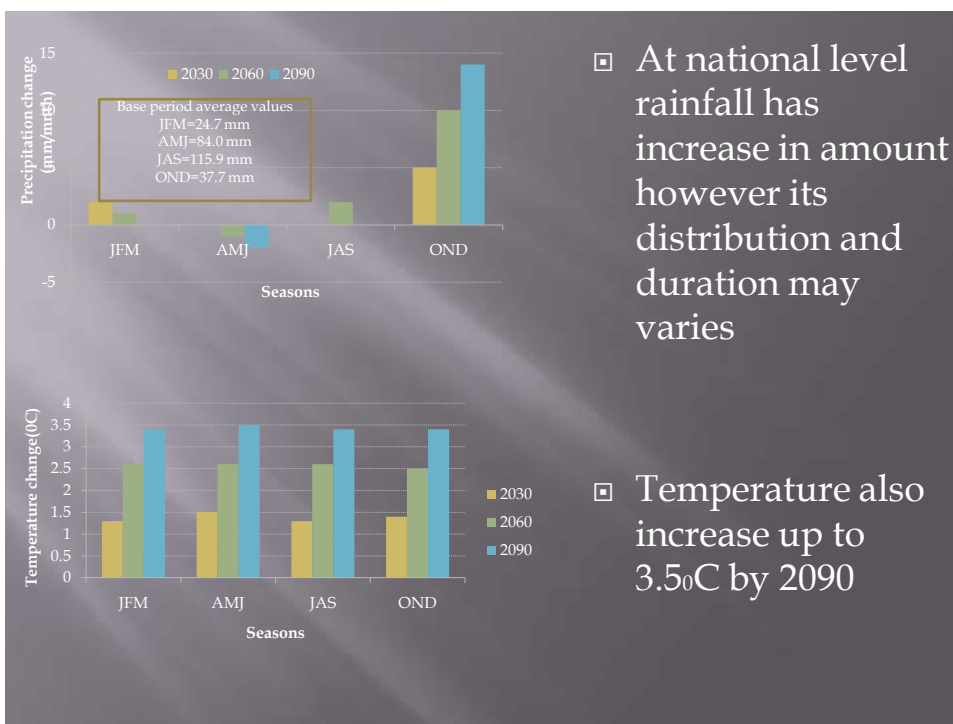


Results and discussion

Climate change projection over the three LIU of Ethiopia







Conclulusion

- ▣ The statistical downscaling results showed that rainfall as well as temperature (maximum and minimum) is likely to increase
- ▣ Rainfall is projected to decline by 0.8% under B2a scenario by 2080's for cropping and agro-pastoral North Somalia, some part of Southern Oromia and Central and Northern part of SNNP

Conti...

- ▣ North Somalia, some part of Southern Oromia and Central and Northern part of SNNP has got an increment in temperature and a decrease in rainfall hence it could be this areas where CC vulnerability is high as compared the rest part of Ethiopia
- ▣ Pastoral and Agro-pastoral areas of Afar and Somali are more vulnerable to prevailing climate change (Temesgen T. Deressa, 2008)

Potential adaptation options

- ▣ Expanding the quality and quantity of agricultural packages
- ▣ Expand the size of water harvesting and small – scale irrigation
- ▣ Improved land management, moisture & soil conservation & flood control method in both the high & lowland areas
- ▣ Create awareness about natural resource management, conservation and rational use & environmental protection

Thank you!

General Remarks

- ▣ This result is based on the HadCM3 GCM projection using Statistical downscaling method; for deductive conclusion other GCMs should be incorporated to see all the possible scenarios
- ▣ It should be noted that a scenario is not a *forecast* but a coherent, internally consistent, and plausible description of a possible future state of the world (IPCC 2001)

THANK YOU