Social ‘tipping points’ under climate/environmental change

Pierre Ozer[1,2], Ouango Koala[1], Luc Clervil[1], Gracia Joseph Gracius[1], François Gemenne[2,3], Tim Lenton[4], Richard Betts[4] & Florence de Longueville[2,5]

1 Arlon campus environnement – LIÈGE université

2 The Hugo Observatory, Environment, Migration, Politics – LIÈGE université

3 SciencesPo. Paris

4 University of Exeter

5 Université de Namur, Géographie

IMPACTS WORLD 2017

Potsdam, Germany, 11 - 13 October 2017

Social ‘tipping points’ under climate/environmental change

I could have talked about…

Social ‘tipping points’ under climate/environmental change

I could have talked about Nouakchott, Mauritania where small rainfall perturbations can have big effects including migration


3/6/2014
03-06-2014
100 m


11/7/2014
11-07-2014
100 m


22/7/2014
22-07-2014
100 m


10/8/2014
10-08-2014
100 m


14/9/2014
14-09-2014
100 m


3/10/2014
03-10-2014
100 m

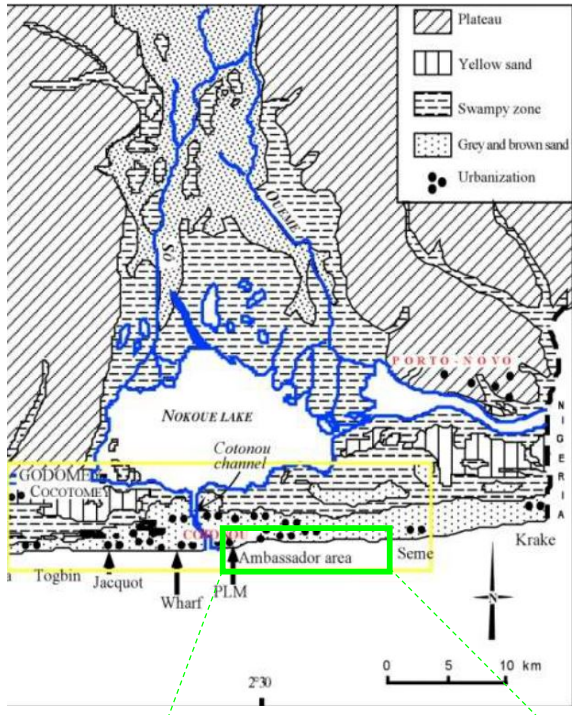

30/4/2016
30-04-2016
100 m

Social ‘tipping points’ under climate/environmental change

I could have talked about Cotonou, Benin, where ‘immobility’ of trapped population has a huge impact on precarity

Study area


Mediterranean
Strait of Gibraltar
Madeira (PT)
Canary Islands (ES)
Atlas Mountains
MOROCCO
TUNISIA
ALGERIA
LIBYA
WESTERN SAHARA
SAHARA
MAURITANIA
MALI
NIGER
CHAD
Lake Chad
Niger
SENEGAL
GAMBIA
GUINEA-BISSAU
GUINEA
BURKINA FASO
NIGERIA
CÔTE D'IVOIRE
GHANA
TOGO
BENIN
SIERRA LEONE
LIBERIA
Mt Cameroun 4100 m
CAMEROON
CENTRAL AFRICAN
EQUATORIAL GUINEA
Congo
GABON
CONGO
SÃO TOMÉ AND PRÍNCIPE


Plateau
Yellow sand
Swampy zone
Grey and brown sand
Urbanization
PORTO-NOVO
NOKOUE LAKE
Cotonou channel
GODOMEY
COCOTOMEY
Ambassador area
Seme
Krake
Togbin
Jacquot
Wharf
PLM
0 5 10 km


Nokoue Lake
Cotonou, Bénin
12 km
Safiato groyne
Cotonou chenal
Gulf of Guinea
Harbour zone

Two processes of habitats' loss

18/12/2002

25/03/2004

08/11/2011

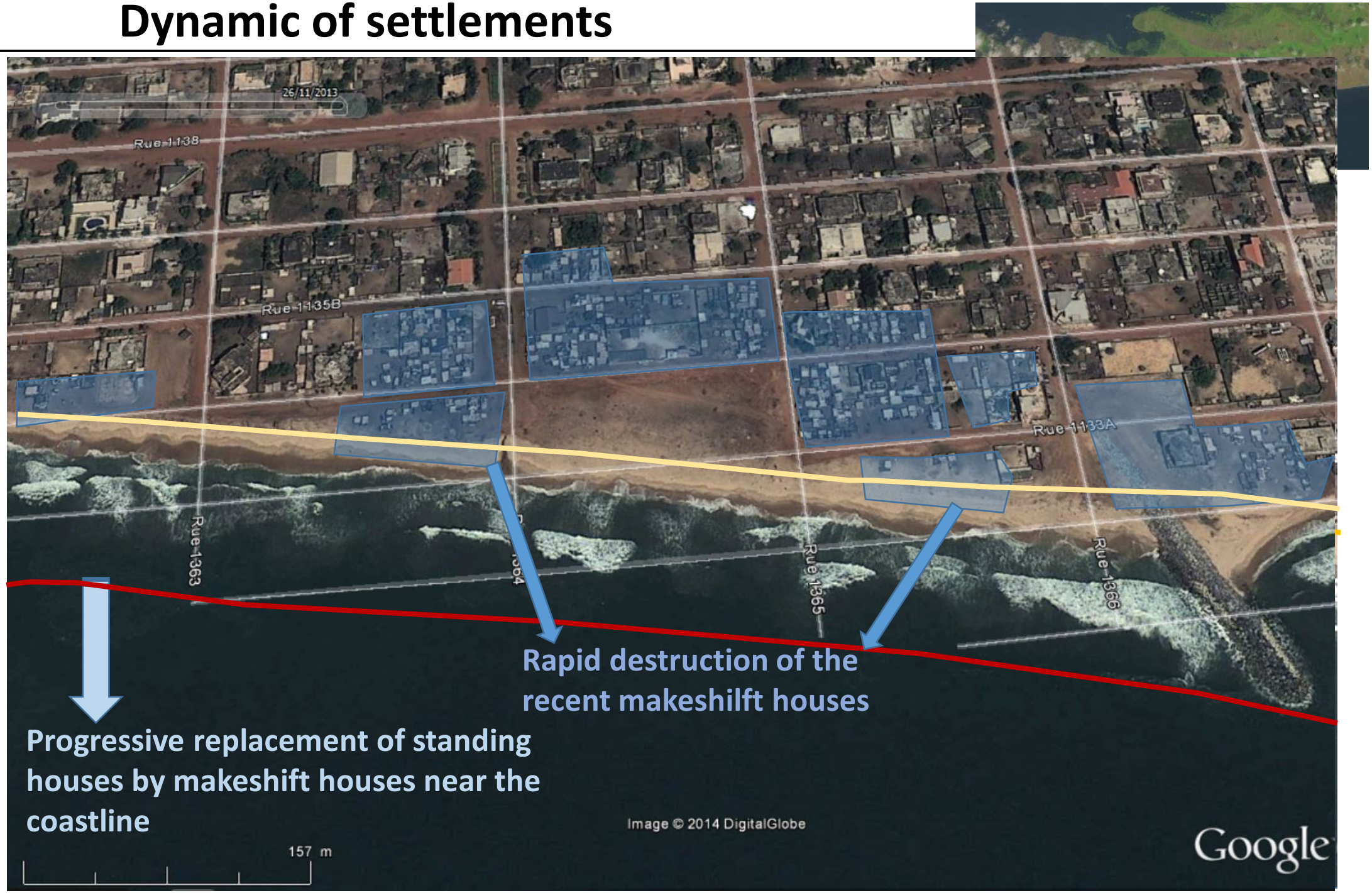
26/11/2013

Dynamic of settlements

18/12/2002

08/11/2011

26/11/2013




18/12/2002
POINT 2
POINT 3
POINT 4
POINT 5
POINT 1
Rue 1451
100 m
Image © 2015 DigitalGlobe
Google earth
2002
Date des images satellite : 18/12/2002


19/9/2014
POINT 2
POINT 3
POINT 4
POINT 5
POINT 1
130 m
108 m
100 m
Rue 1451
Image © 2015 DigitalGlobe
Google earth

New habitat on the lake is yearly exposed to floods


dit SOMAZE

Social ‘tipping points’ under climate/environmental change

I also could have talked about Cap-Haïtien, Haïti, where a mix of social inhabitability lead to a long-term maladaptation mechanism to climate change

Cap-Haïtien, Haïti

Cap-Haïtien, Haïti


29-10-2004
200 m


25-01-2010
200 m


26-02-2013
200 m


24-11-2013
200 m


15-11-2014
200 m


01-01-2016
200 m


01-01-2016
200 m

Social ‘tipping points’ under climate/environmental change

I will talk about Niger, to question the immunity of the ‘system’

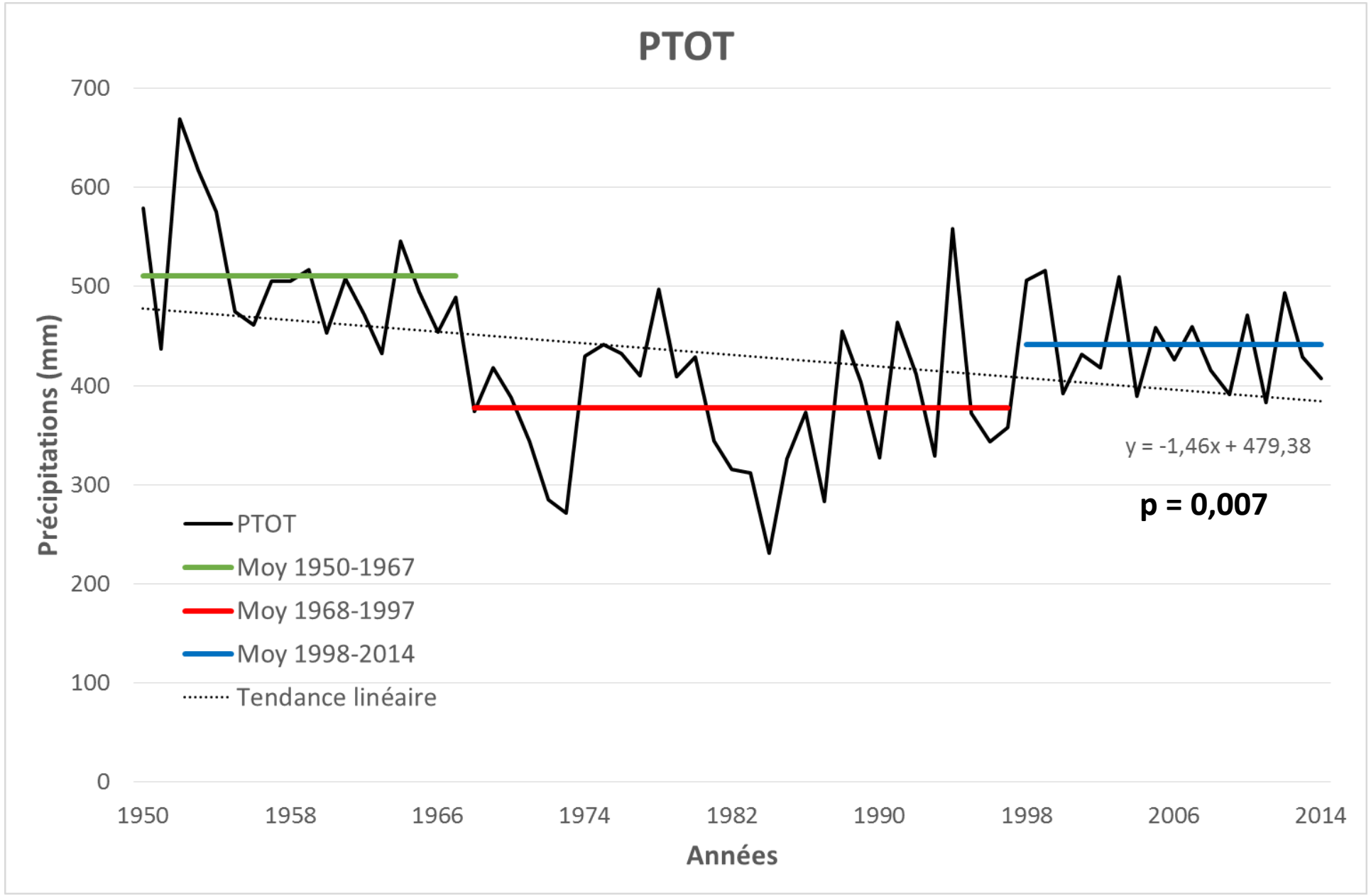
Perception of climate change (rainfall)

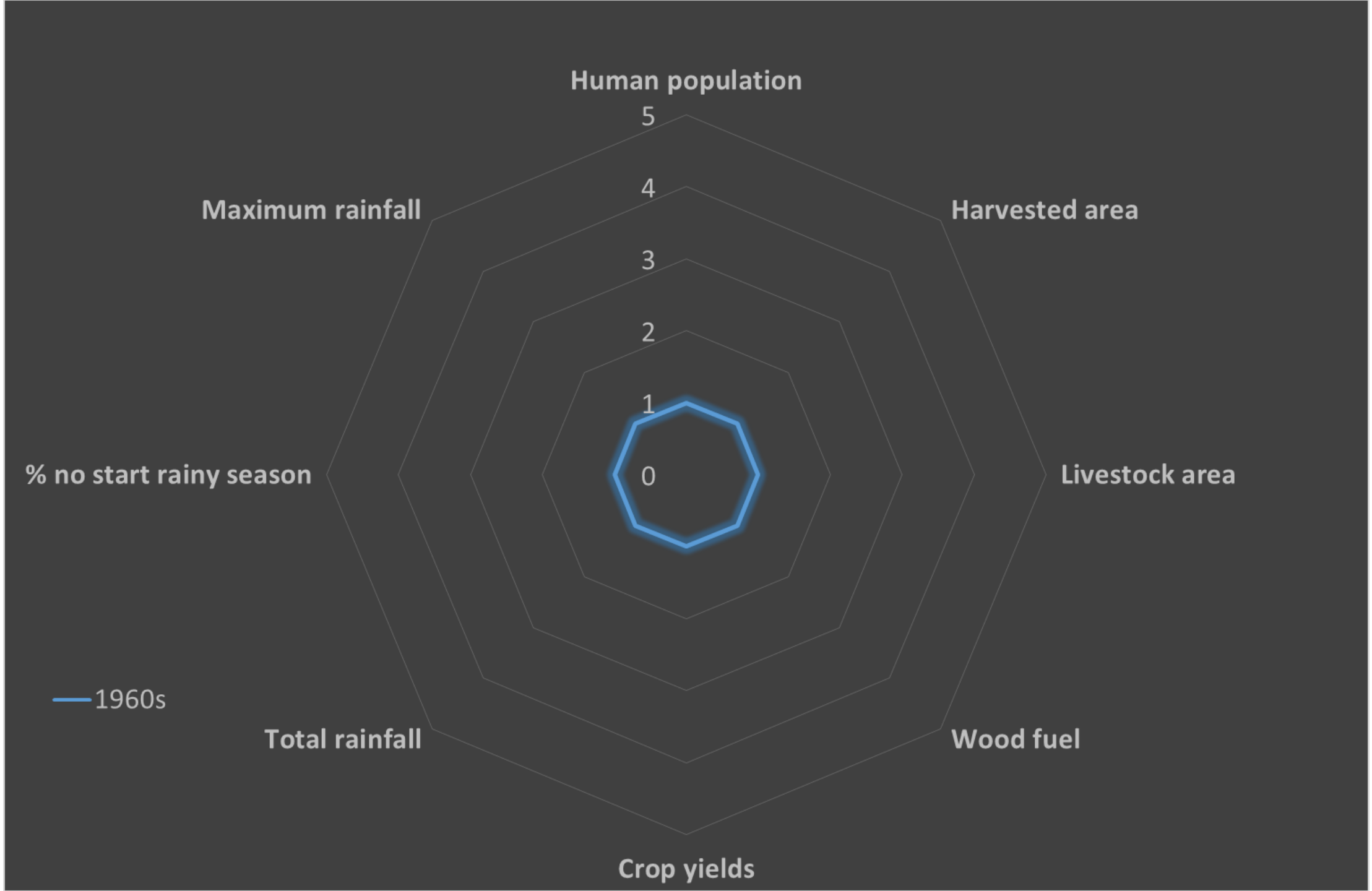
Climate	Arid Sahel		
Mean annual rainfall	300-500 mm		
Perception of change	-	NC	+
Source / Indicator	Yearly total rainfall		
Akponikpè et al. (2010)	91	2	2
Nielsen & Reenberg (2010)	62	6	32
Mertz et al. (2012)	83	4	13
Diessner (2012)	90	6	3
This study (Niger)	**81**	**3**	**14**

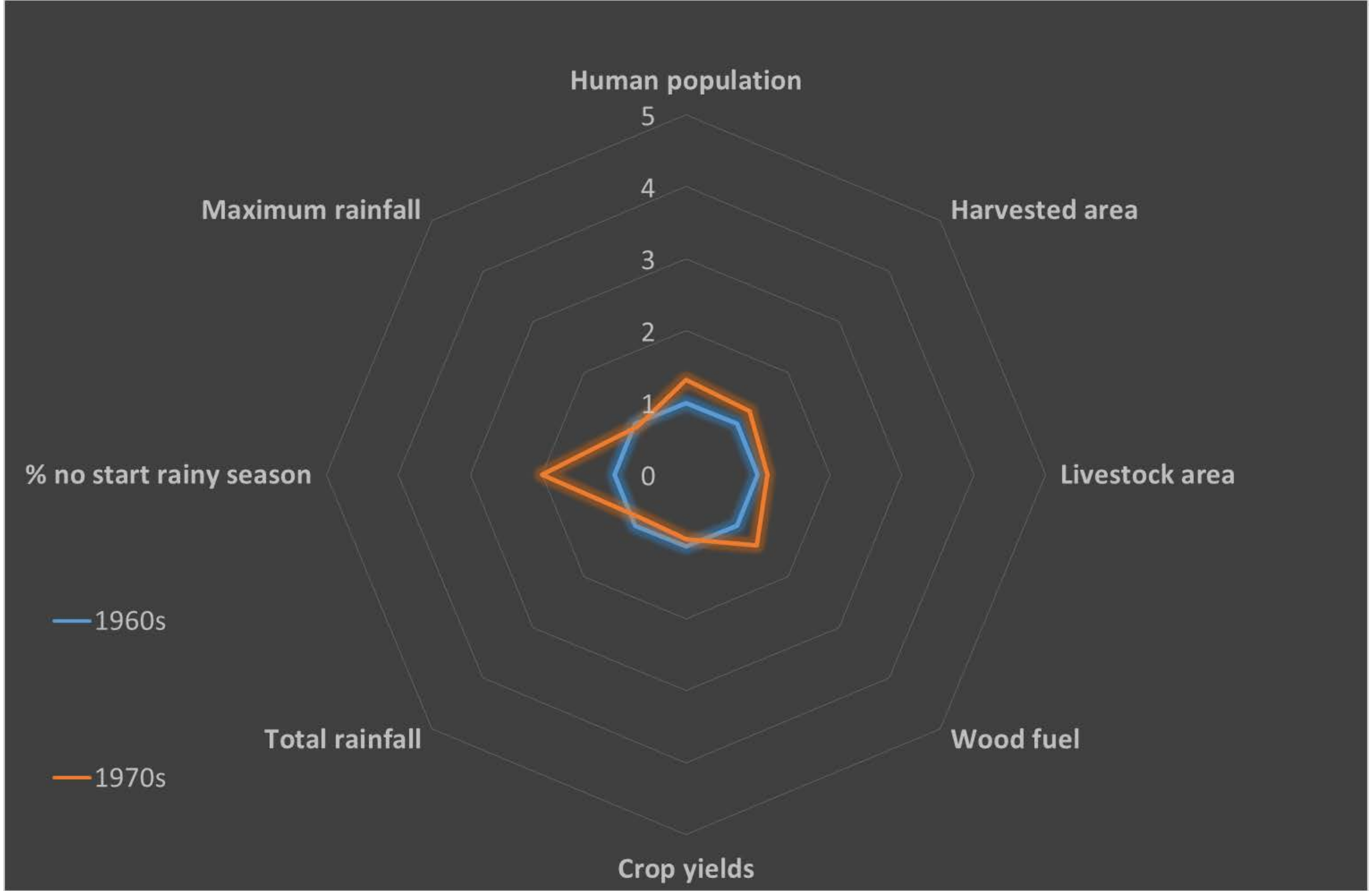
Adaptation to climate change (rainfall)

Temporal migration in response to a drier climate: 4.4%
Permanent migration in response to a drier climate: 29.8%
Temporal migration in response to a drought: 35.9%
Migration in the ‘top 3’ adaptation strategies to climate change: 54%

Measured rainfall




Human population
5
4
3
2
1
0
Harvested area
Livestock area
Wood fuel
Crop yields
Total rainfall
% no start rainy season
Maximum rainfall
1960s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Livestock area
Wood fuel
Crop yields
Total rainfall
% no start rainy season
Maximum rainfall
1960s
1970s


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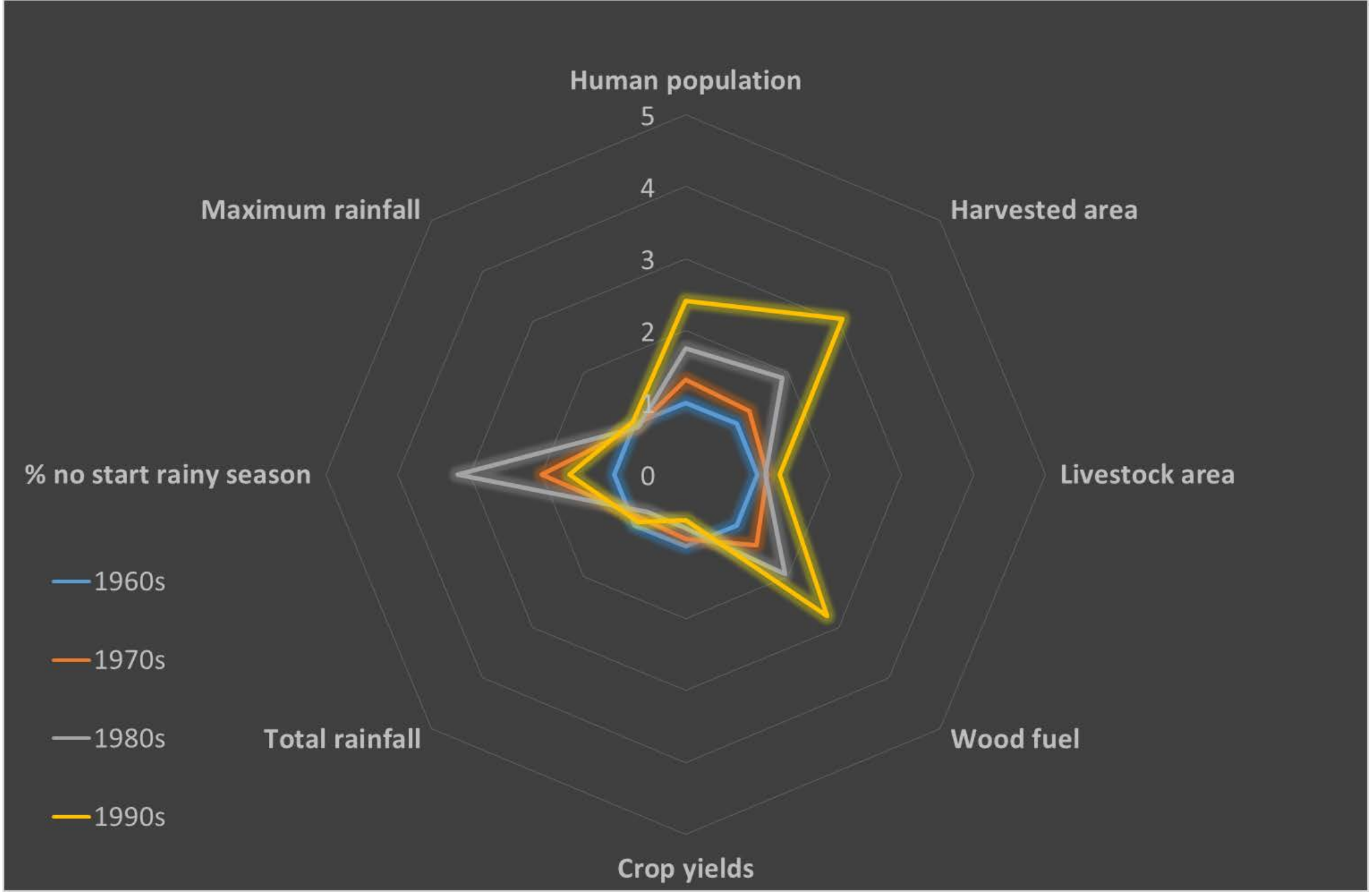
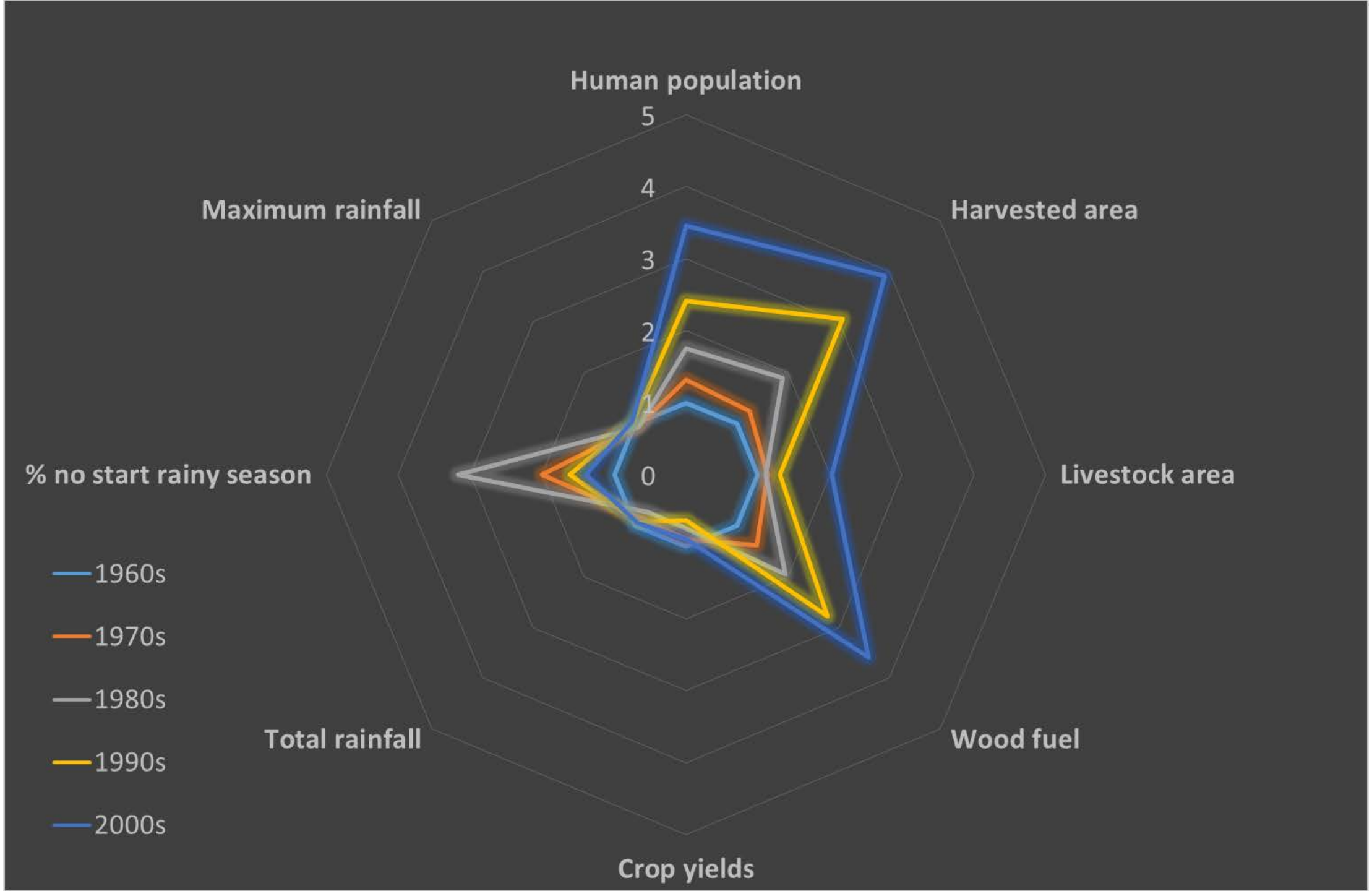
5
4
3
2
1
0
Harvested area
Livestock area
Wood fuel
Crop yields
Total rainfall
% no start rainy season
Maximum rainfall
1960s
1970s
1980s


Human population
5
4
3
2
1
0
Harvested area
Livestock area
Wood fuel
Crop yields
Total rainfall
% no start rainy season
Maximum rainfall
1960s
1970s
1980s
1990s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3
2
1
0
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Livestock area
Wood fuel
Crop yields
Total rainfall
% no start rainy season
Maximum rainfall
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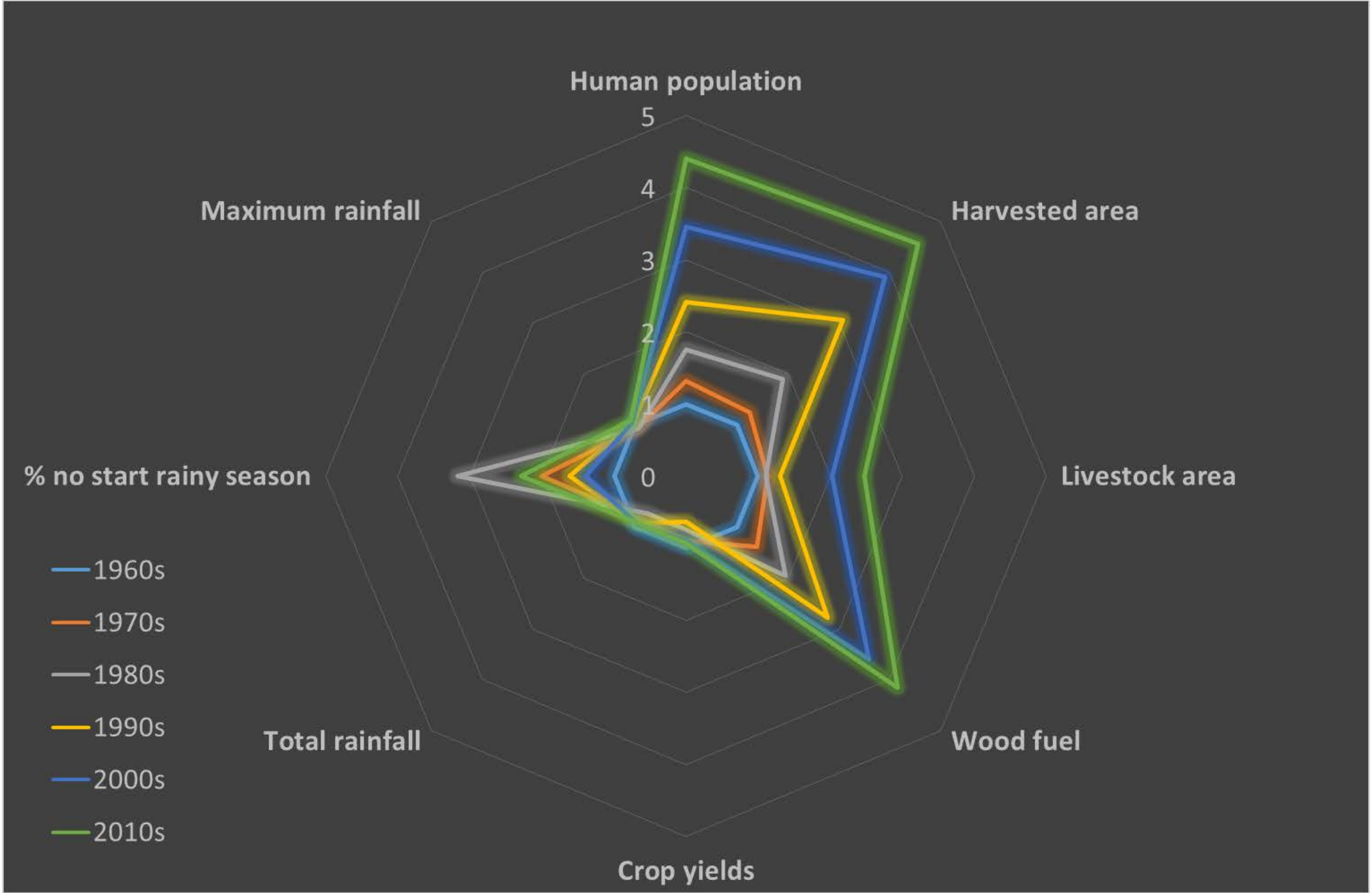
1970s
1980s
1990s
2000s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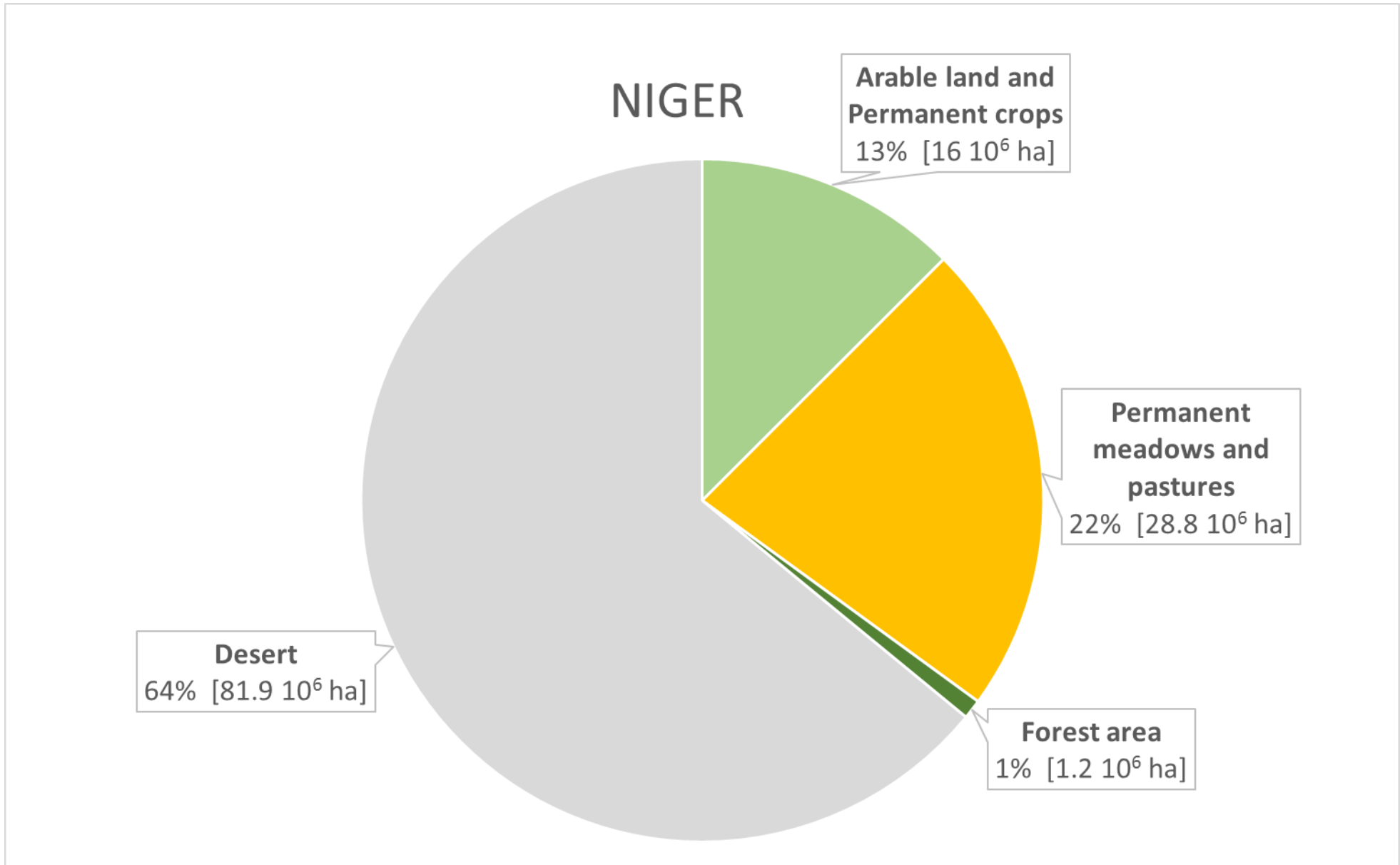
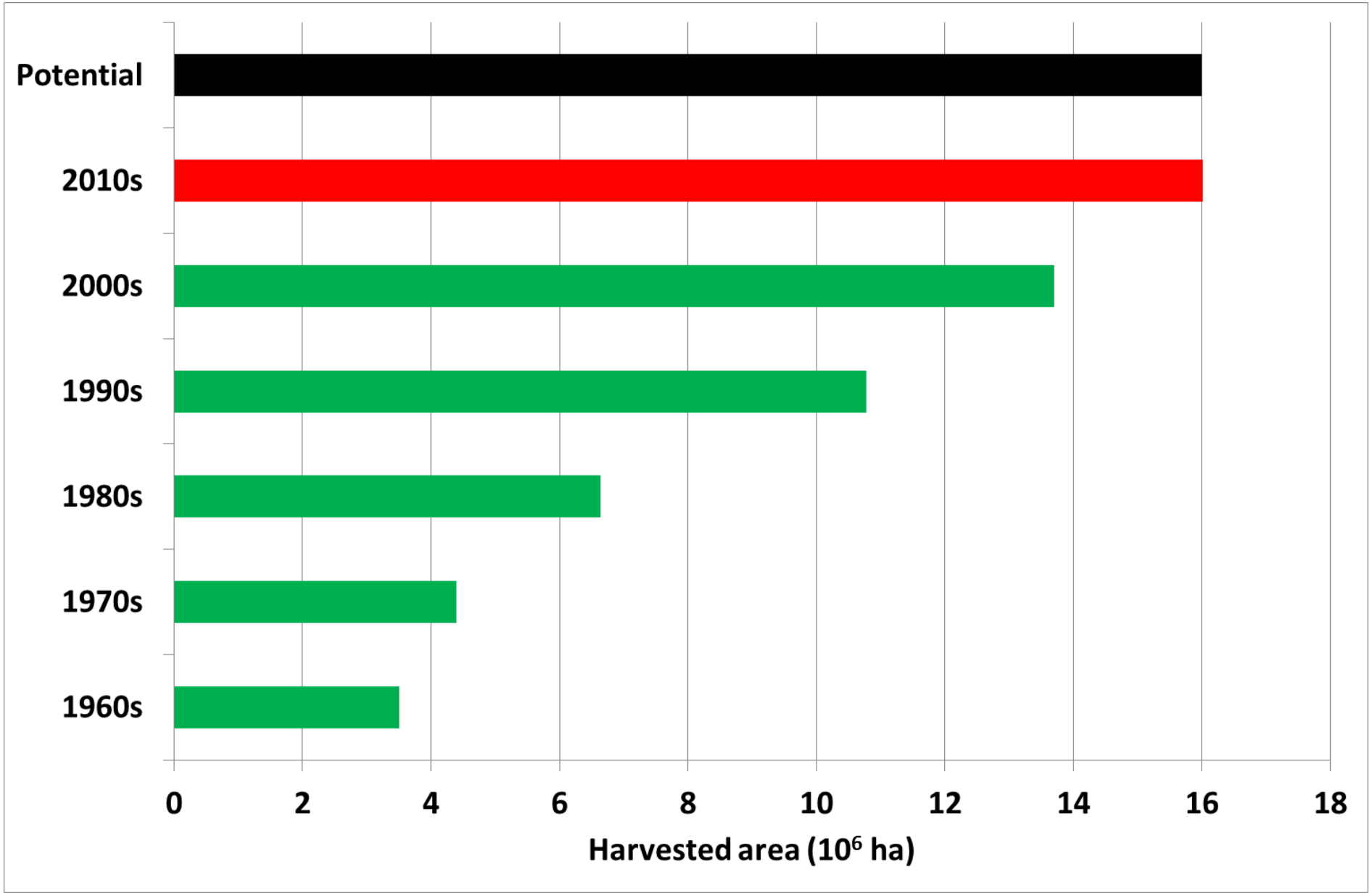
0
Harvested area
Livestock area
Wood fuel
Crop yields
Total rainfall
% no start rainy season
Maximum rainfall
1960s
1970s
1980s
1990s
2000s
2010s

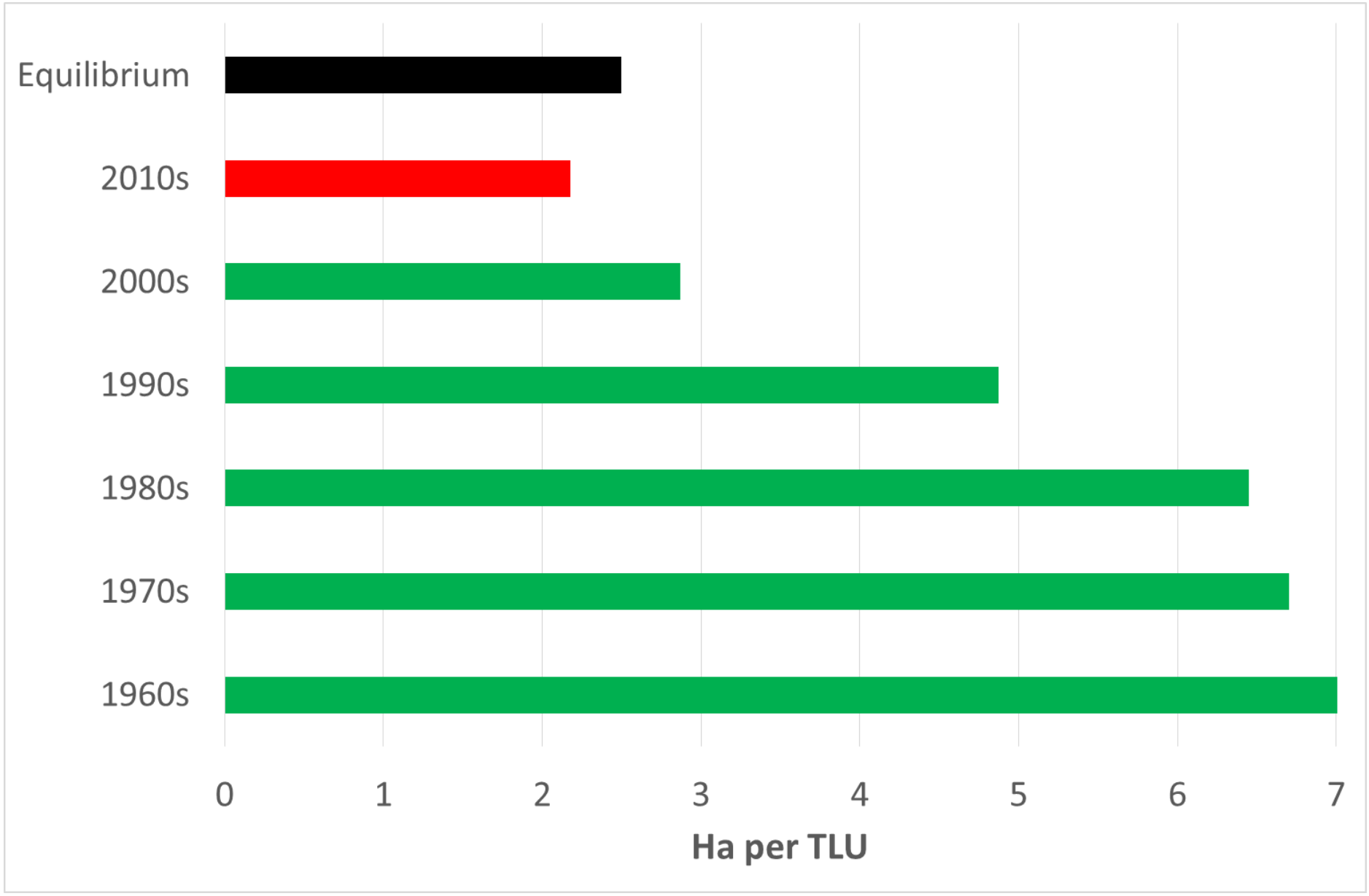
Potential land resources in Niger (FAO, 2015)



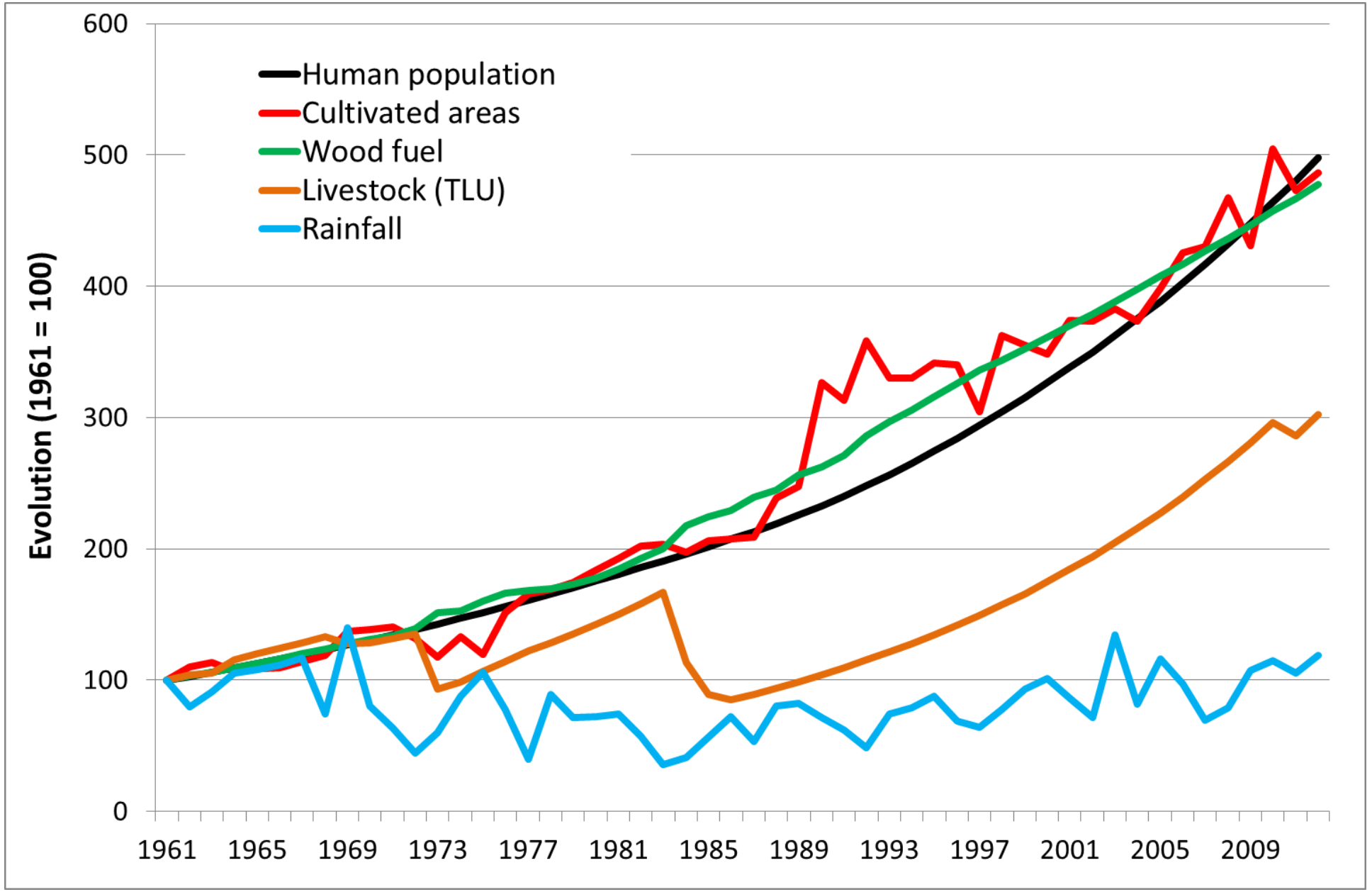
Harvested area Vs Arable land and permanent crops potential



Livestock area Vs Permanent meadows and pastures potential

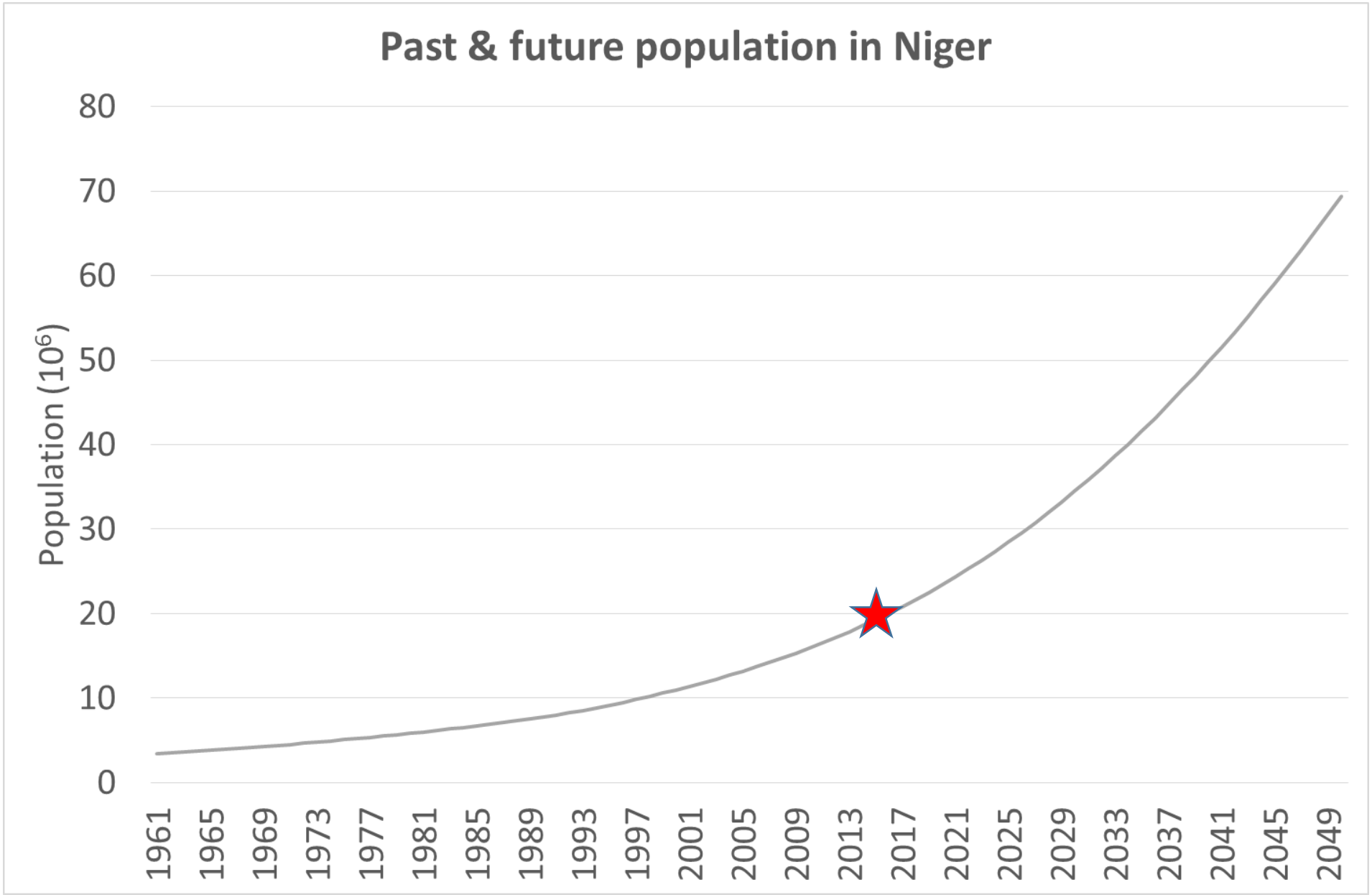


Evolution of some indices in Niger (1961-2013)



Data: FAO, 2014; Ozer *et al.*, 2015

What's next ?

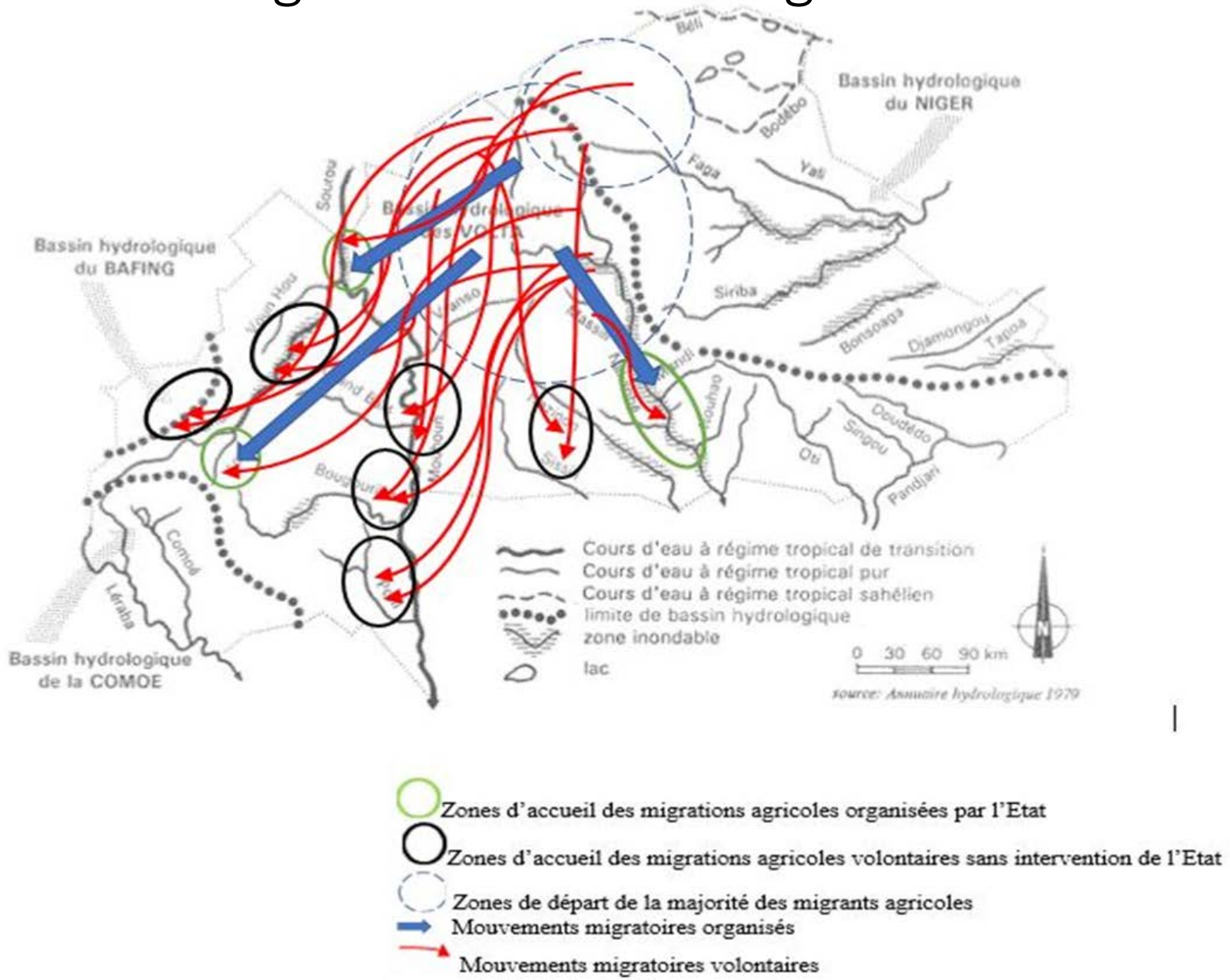

Past & future population in Niger
Population (10^6)
80
70
60
50
40
30
20
10
0
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049

Social ‘tipping points’ under climate/environmental change

I will talk about Burkina Faso, where the application of Law 034/2009 on rural land tenure security may turn into a national conflict

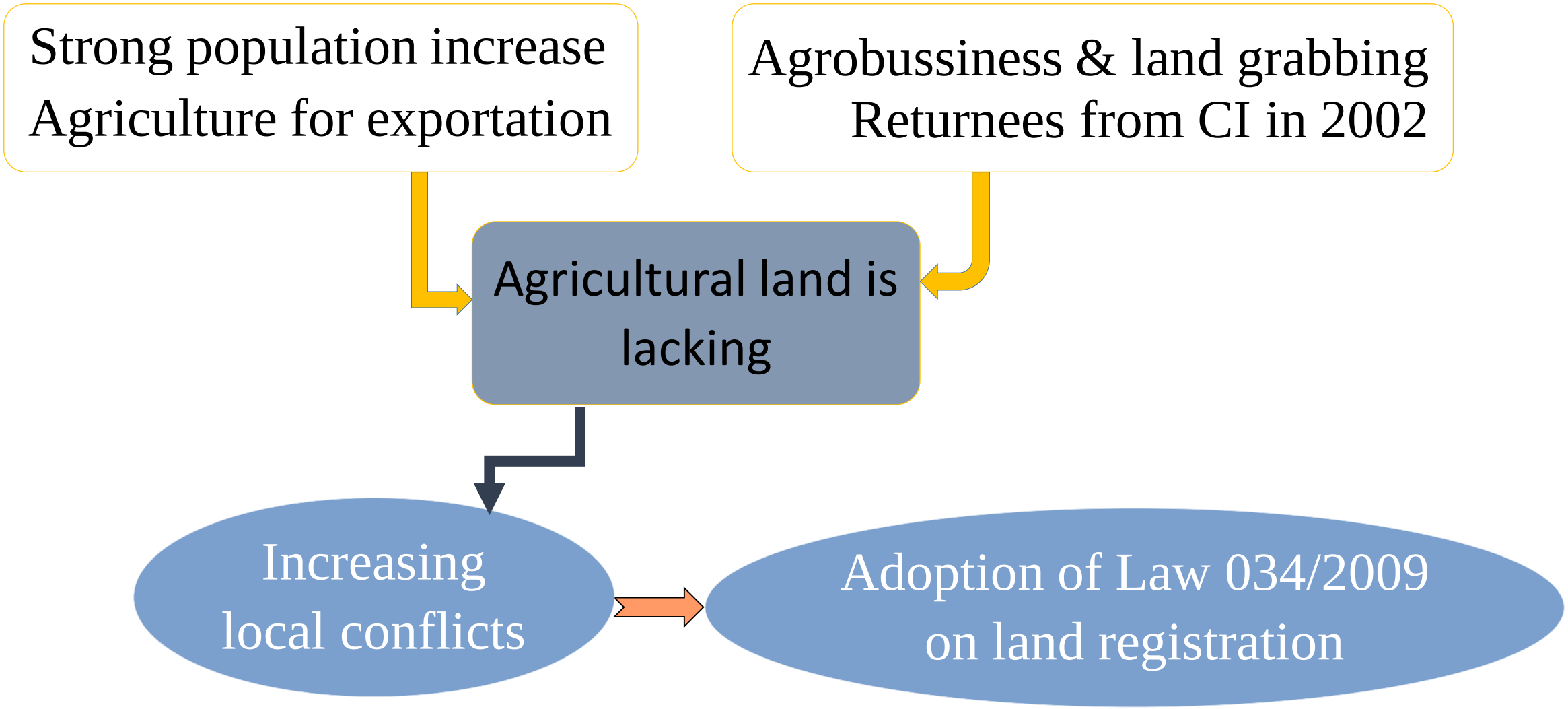
Context

Large migration resulting from severe droughts of the 1970s and 1980s

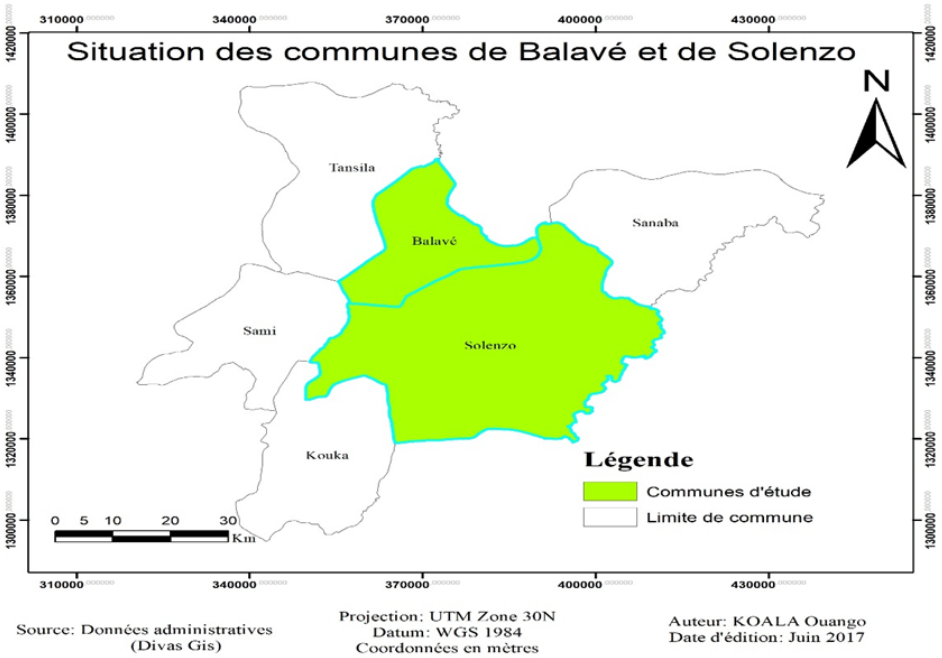


Koala *et al.*, 2017

Context


Strong population increase
Agriculture for exportation
Agrobussiness & land grabbing
Returnees from CI in 2002
Agricultural land is lacking
Increasing local conflicts
Adoption of Law 034/2009 on land registration

Data & methods



Source: Données administratives (Divas Gis)

Projection: UTM Zone 30N
Datum: WGS 1984
Coordonnées en mètres

Auteur: KOALA Ouango
Date d'édition: Juin 2017

Rainfall analysis
1950- 2013

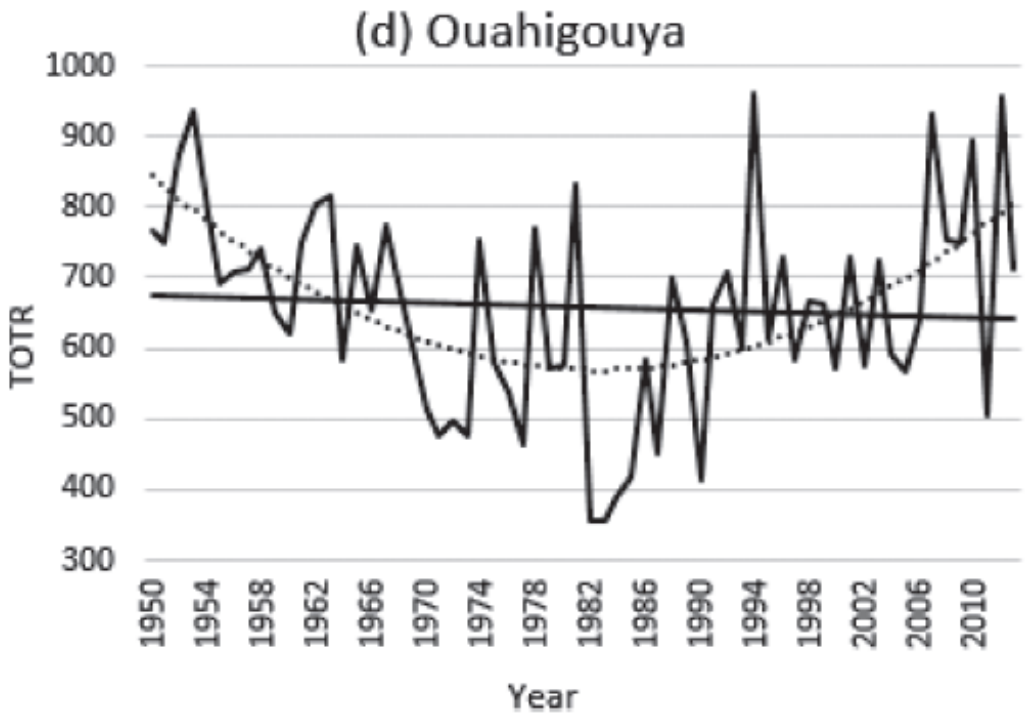
Data & methods

Interviews with local & national authorities

Interviews with 200 ‘migrant farmers’ & 100 future land owners

Results

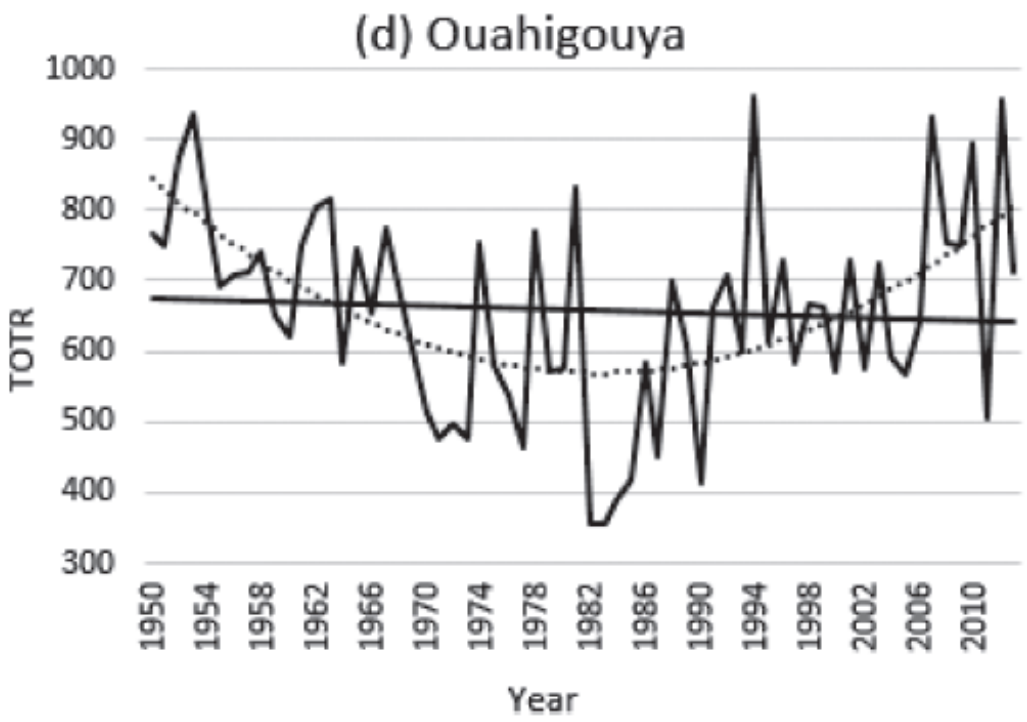
Rainfall



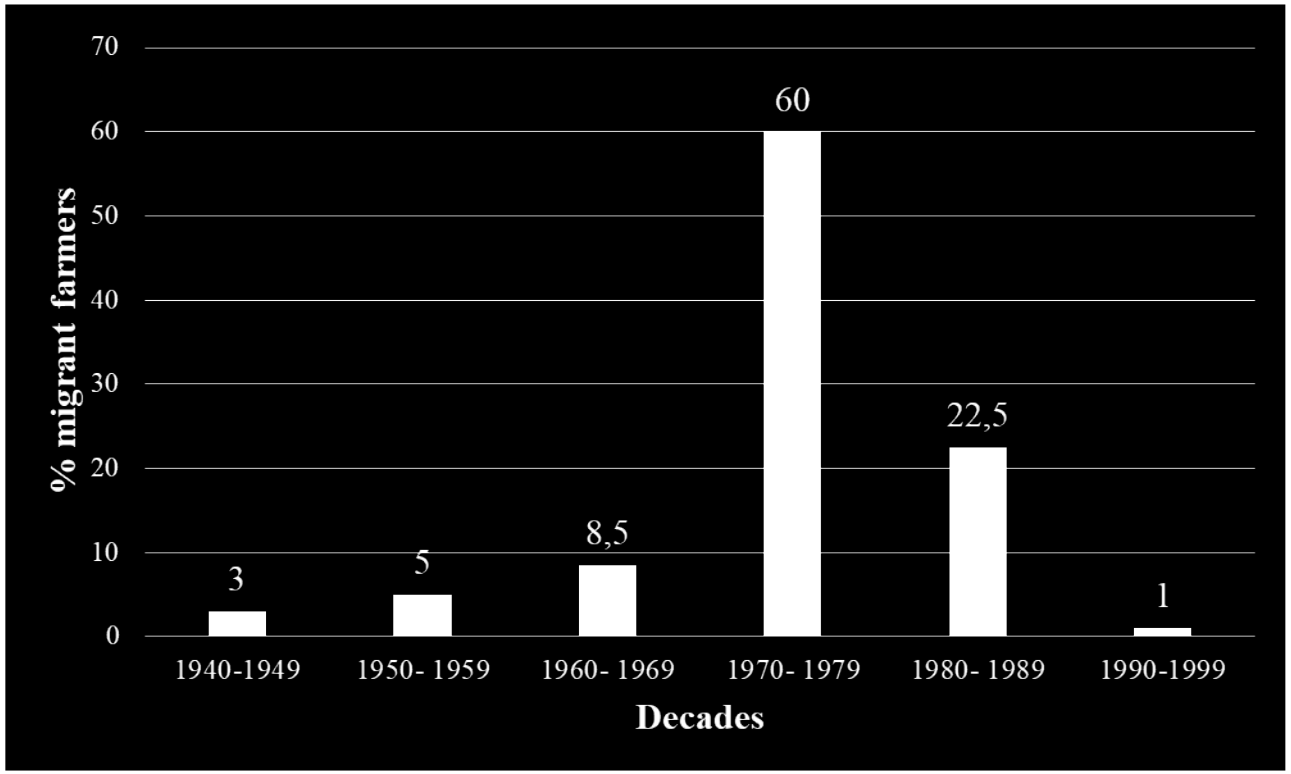
De Longueville *et al.*, 2016

Results

Rainfall



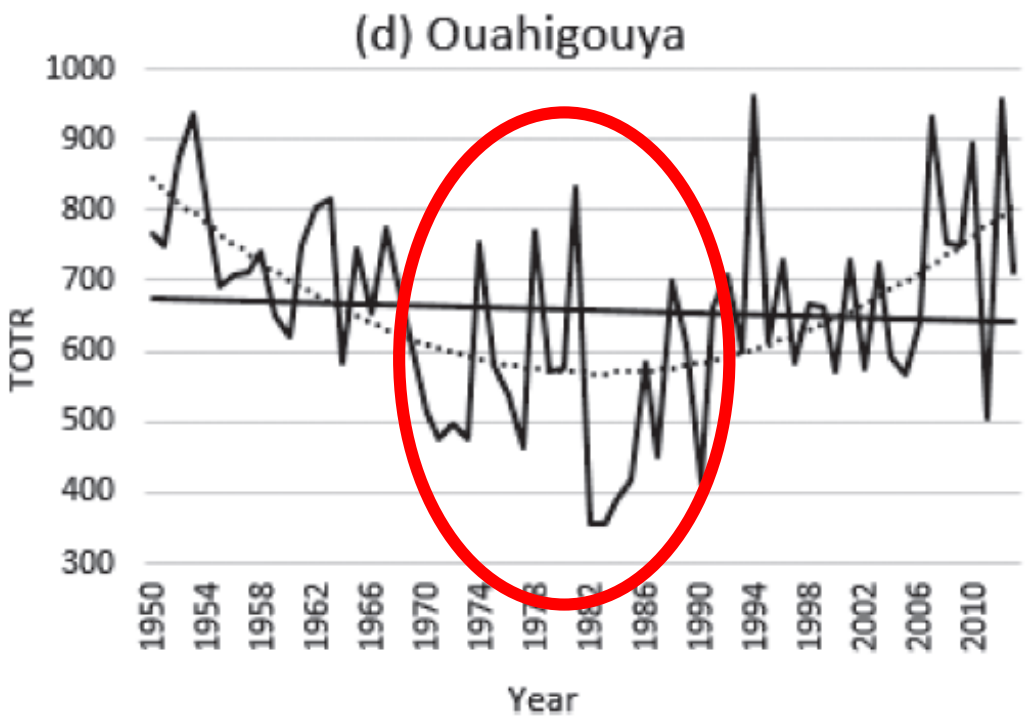
Period of migration



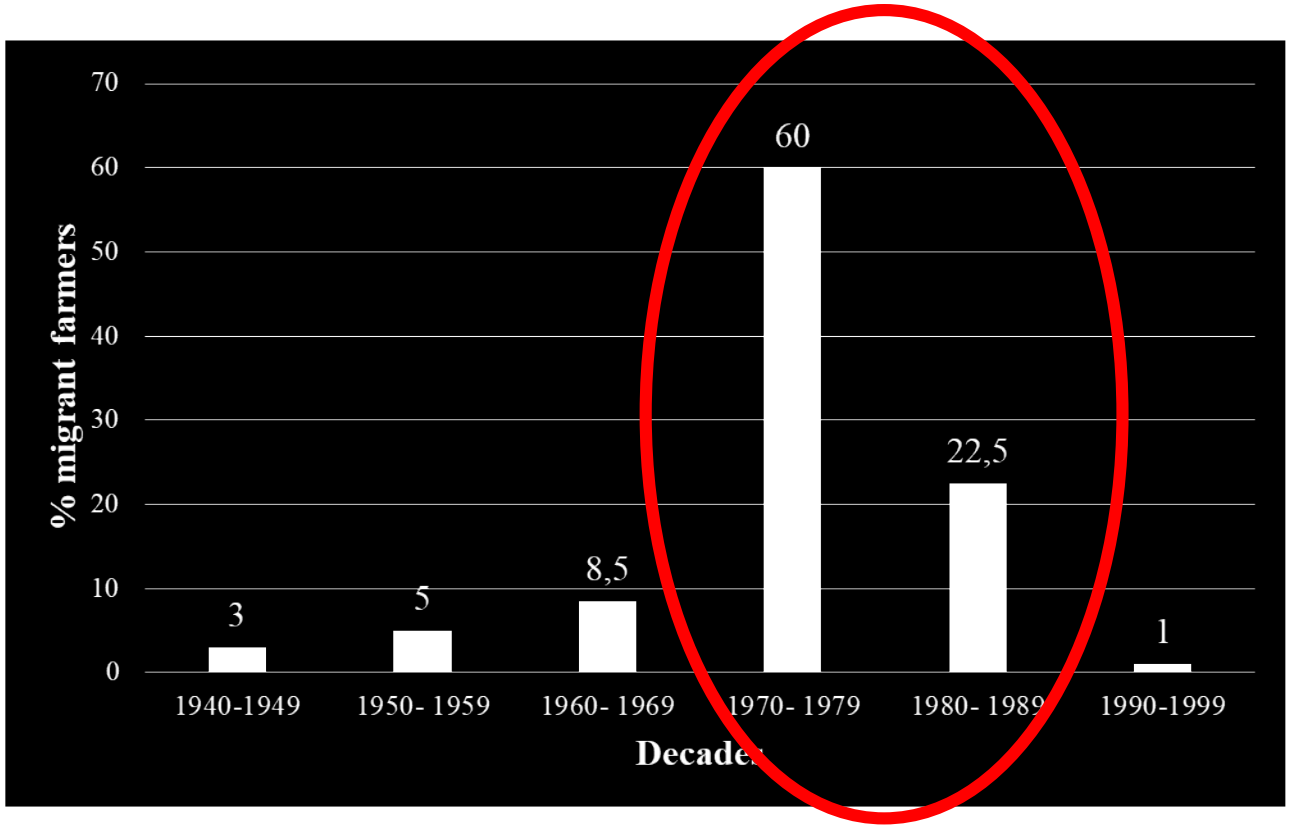
De Longueville *et al.*, 2016

Results

Rainfall



Period of migration



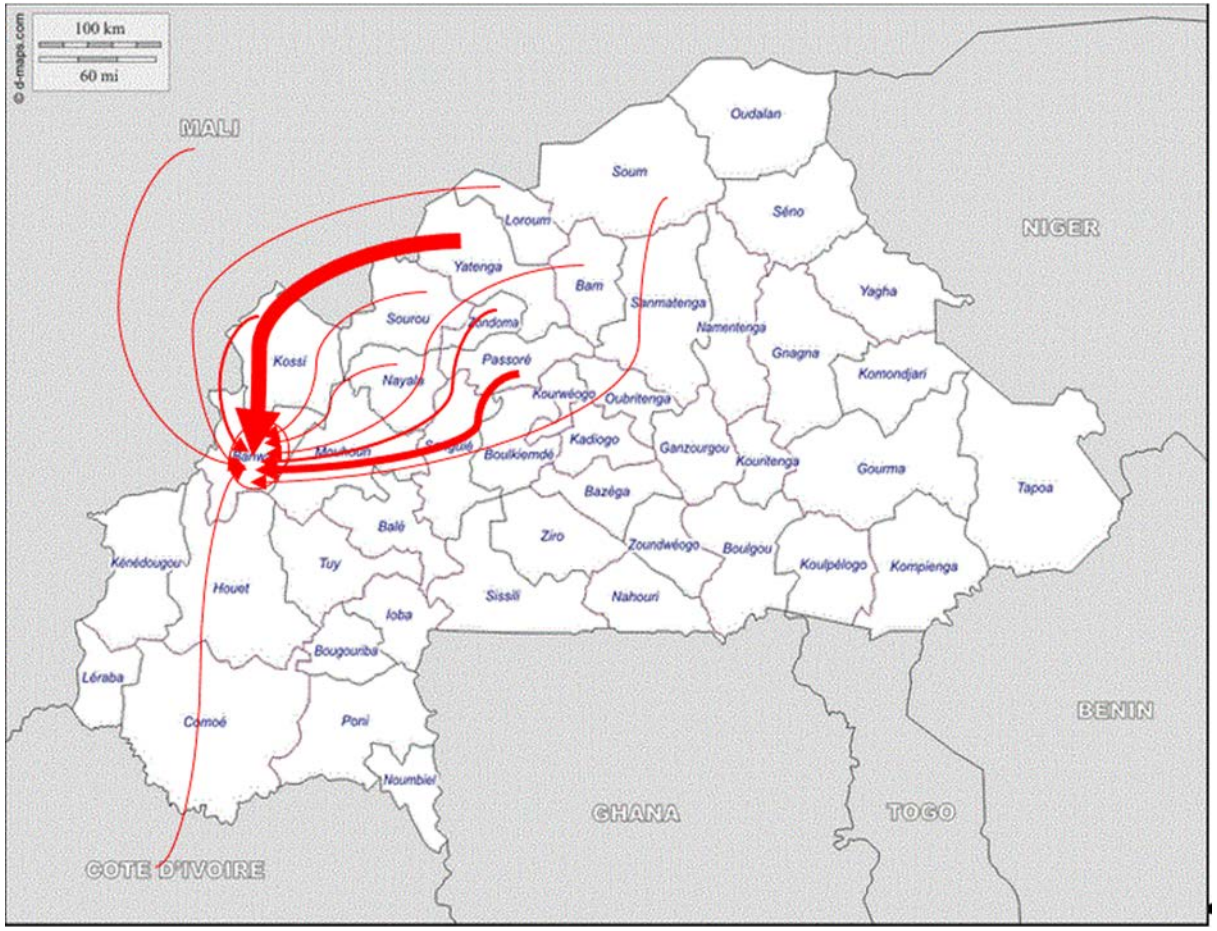
Main reasons of migration

Land degradation (46.5%), drought (28%), lack of land (12%)

De Longueville *et al.*, 2016

Results

Region of departure



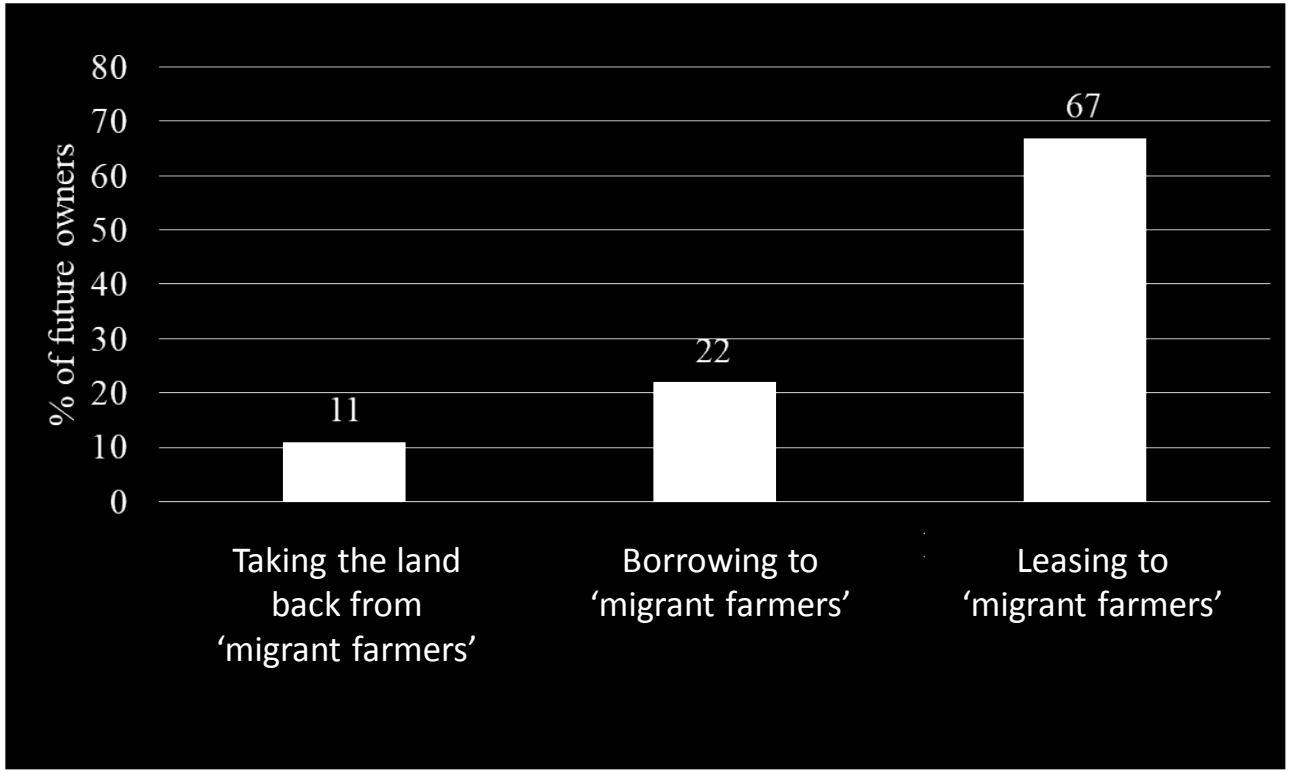
Current access to the land for the 'migrant farmers'

Borrowing	92%
Leasing	3%
Owner	5%

95% of the 'migrant farmers' will not have a 'free access' to the land after the application of Law 034/2009 on land registration

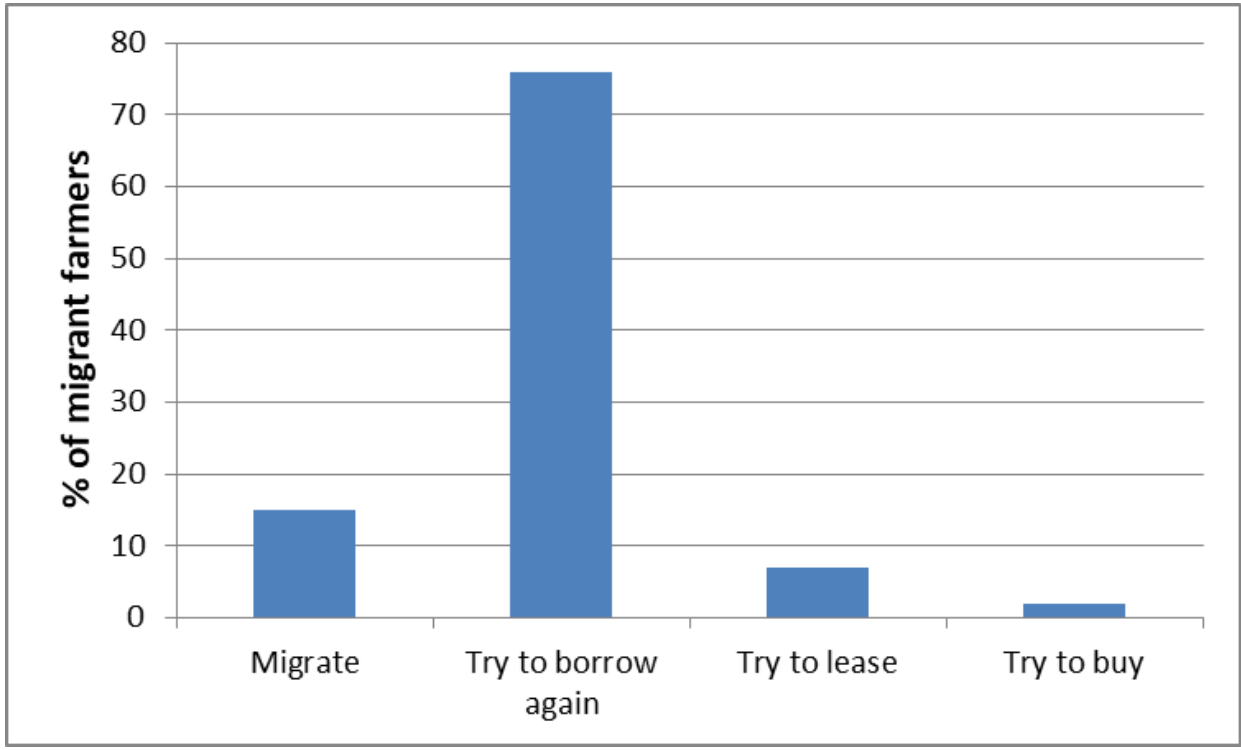
Results

What will the future owners do with their land ?



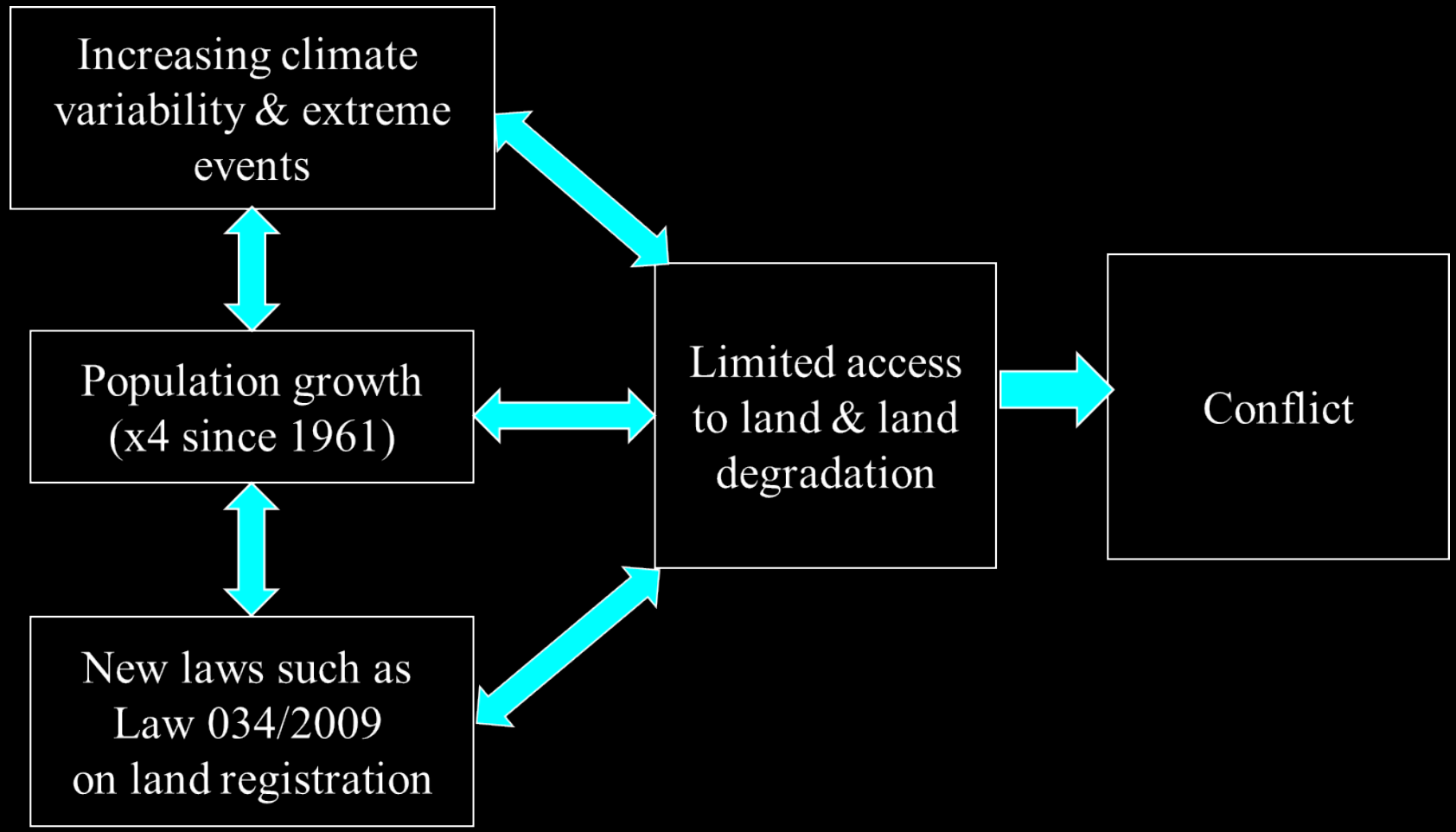
High risk of limited access to the land since 60% of the 'migrant farmers' live below the poverty line (INSD, 2016)

How will 'migrant farmers' adapt after the application of Law 034/2009

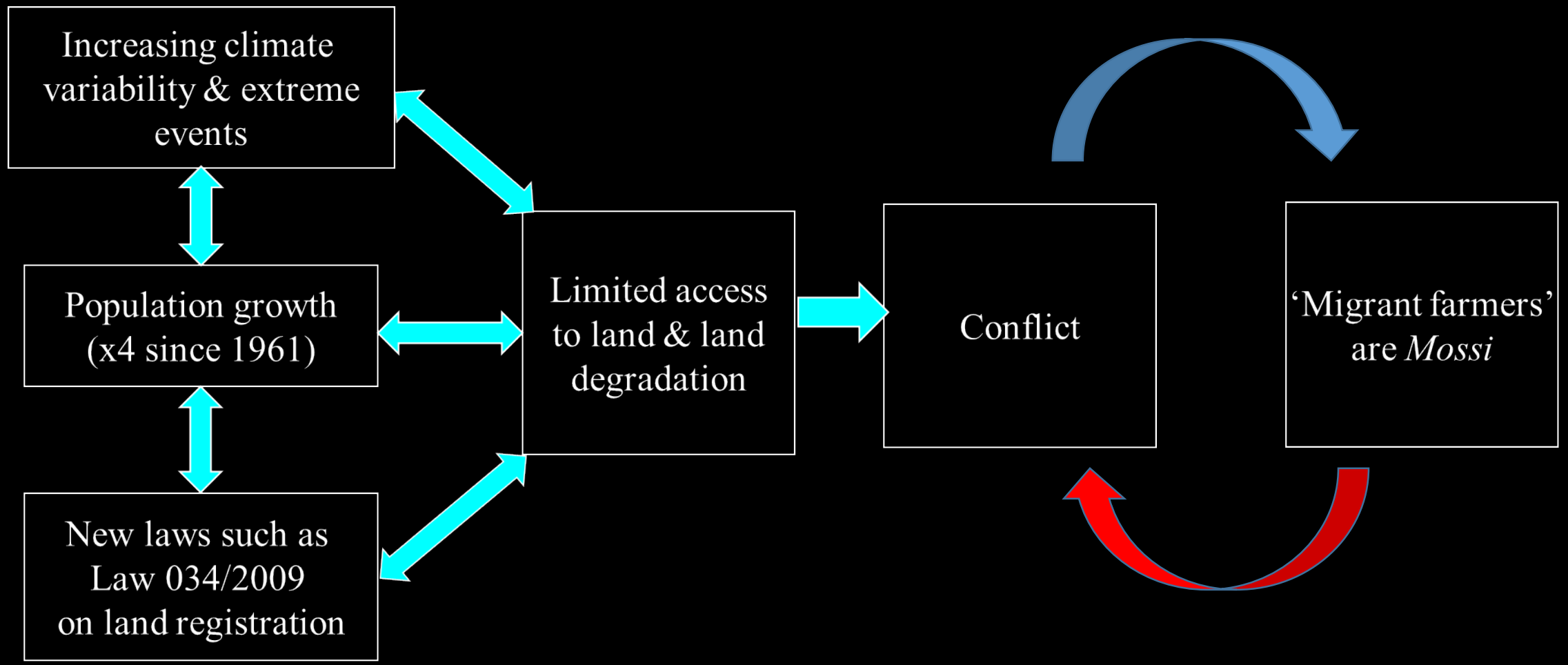


Many 'migrant farmers' will likely be 'trapped', especially the poorest. 86% of the 'migrant farmers' will not back to their region of origin.

Conclusion


Increasing climate variability & extreme events
Population growth (x4 since 1961)
New laws such as Law 034/2009 on land registration
Limited access to land & land degradation
Conflict

Conclusion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'Migrant farmers' are *Mossi*

Conclusion

Increasing climate variability & extreme events

Population growth (x4 since 1961)

New laws such as Law 034/2009 on land registration

Limited access to land & land degradation

Conflict

'Migrant farmers' are *Mossi*