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Building an agent-based model for South Africa's land reform

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Presentation Outline

- Motivation
  - Historical background of land reposition
  - South African land reform and its components
  - Progress with land redistribution
- Model scenarios and research questions
- Model description
- First pilot results of a baseline scenario and discussion
- Preliminary conclusions and way forward

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Historical background of land reposition

- Like many other African, Asian and American countries, South Africa was colonised and land was forcefully taken from the natives.

- Similar to other former colonial states, when the first democratic government took power in 1994, a three-pronged land reform policy was adopted based on World Bank "willing seller – willing buyer" (WS-WB).
  - Three prongs:
    1. Land tenure
    2. Land Restitution
    3. Land Redistribution

- Our study focuses on Land Redistribution prong.

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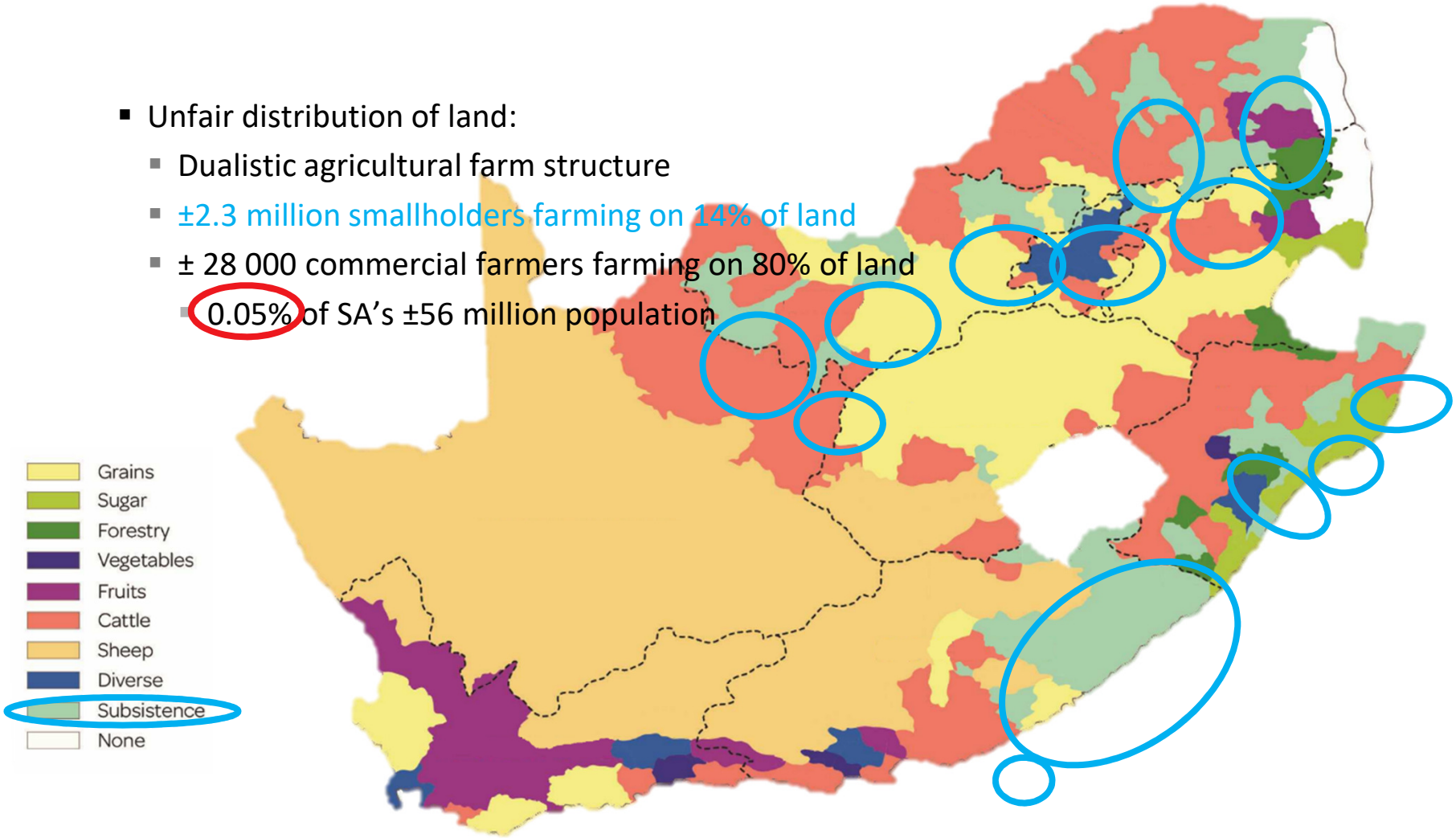
Skewed racial land distribution in South Africa

- Unfair distribution of land:
  - Dualistic agricultural farm structure
  - ±2.3 million smallholders farming on 14% of land
  - ± 28 000 commercial farmers farming on 80% of land
    - 0.05% of SA's ±56 million population



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Progress with land redistribution so far

- ~ 10% of agricultural commercial farm land (78 413 227) have been redistributed since 1994.
- A plethora of challenges have been cited for the perceived slow progress in land redistribution.
- Among the cited reasons is failure of the WS-WB, such that there is not enough land on the open market.
- Further, reason is that there is no sufficient budget to pursue land redistribution at a faster pace as desired.
- However, there is no scientific empirical evidence of such claims.

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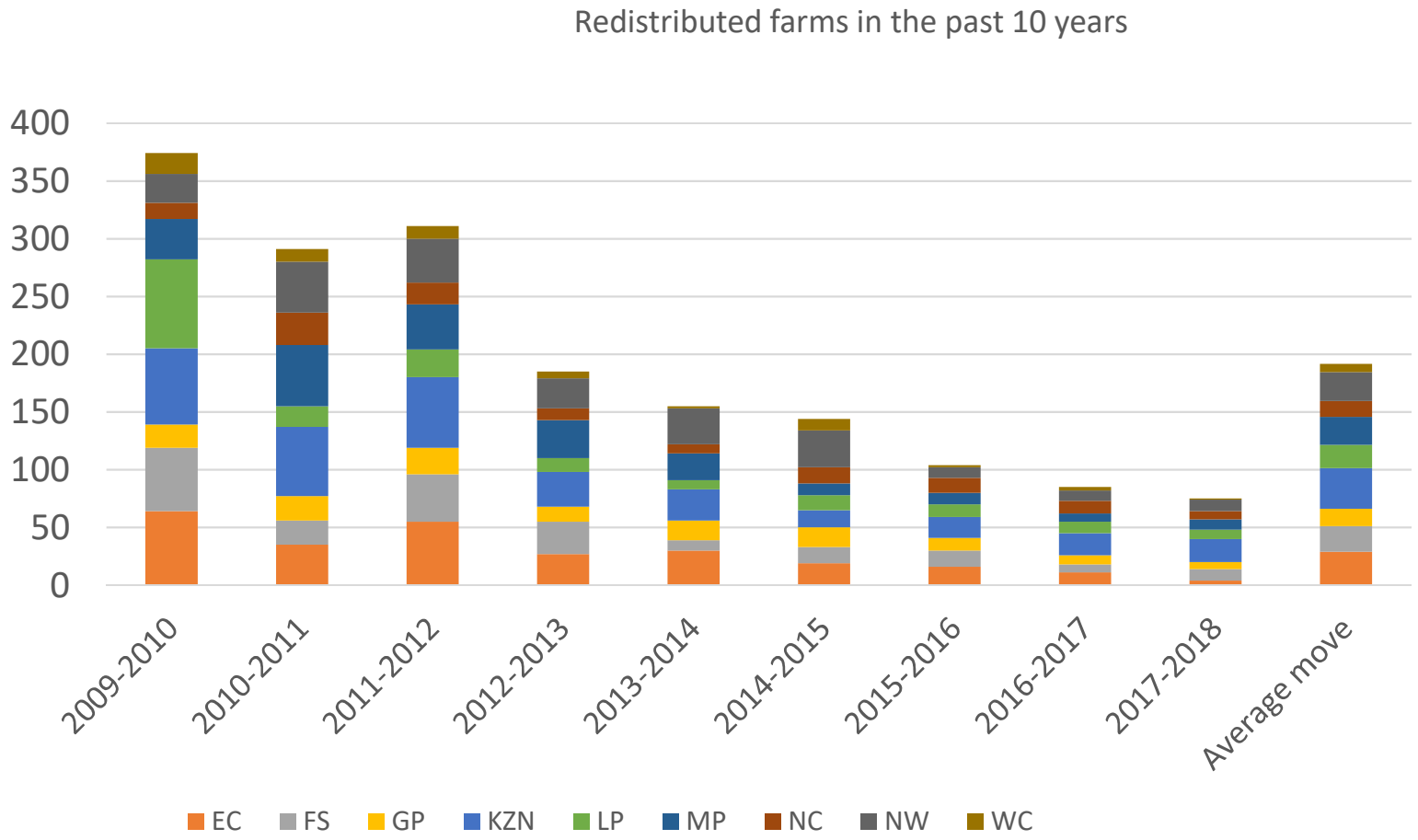
Pace of farm redistribution across the country



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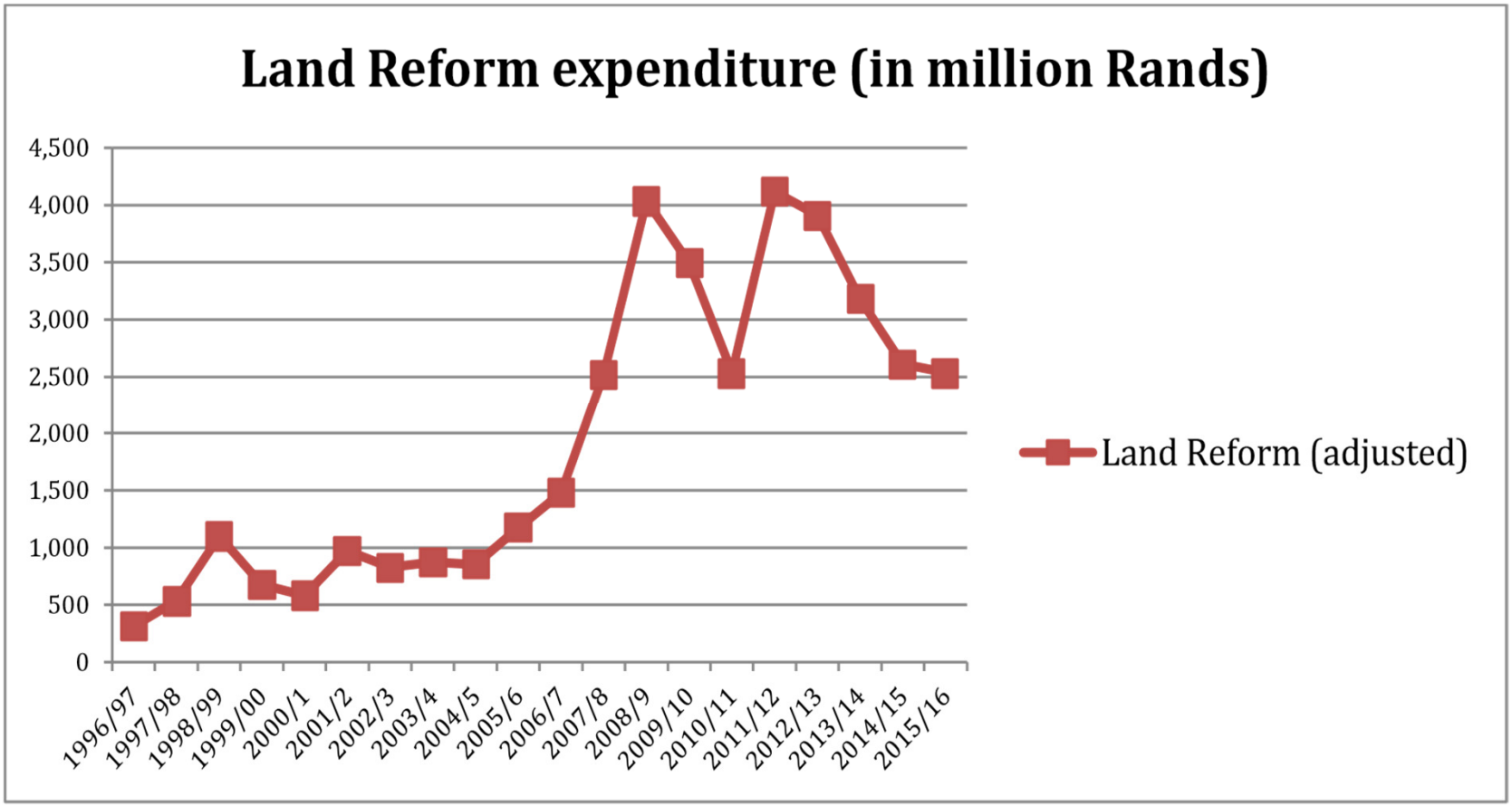
Public expenditure on land reform



Why do we need ABM for modelling land reform policy?

- Unlike the pure agricultural sciences, in agricultural economics it is not possible to do experiments with farm households.
- Kremmydas (2012) has argued that Agent Based Models are used for agricultural policy as ‘virtual laboratory experiments’.
- Thus, modeling and simulation have emerged to provide a solution for testing the impact of policy scenarios analysis in the economic and social sciences.
- ABM has been widely applied in modelling land use impacts (see Berger, 2001; Berger et al. 2006, Mohring et al., 2016; Berger et al., 2017), among others.
- However, in South African land reform, ABM has been hardly applied.

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Objectives and scenarios

- How much land could potentially be available on the market from farmers willing to exit? Is this land more or less than the current redistribution rate?
- What type of farm land will be available (grazing, field crops, forestry, grapes)?
- If this land is subdivided, how much farm income can we get? Is the income reasonable to attract smallholders willing to move to the commercial farms?
- How much budget will the state need to rent the available farms and provide operating capital for the new emerging farmers?

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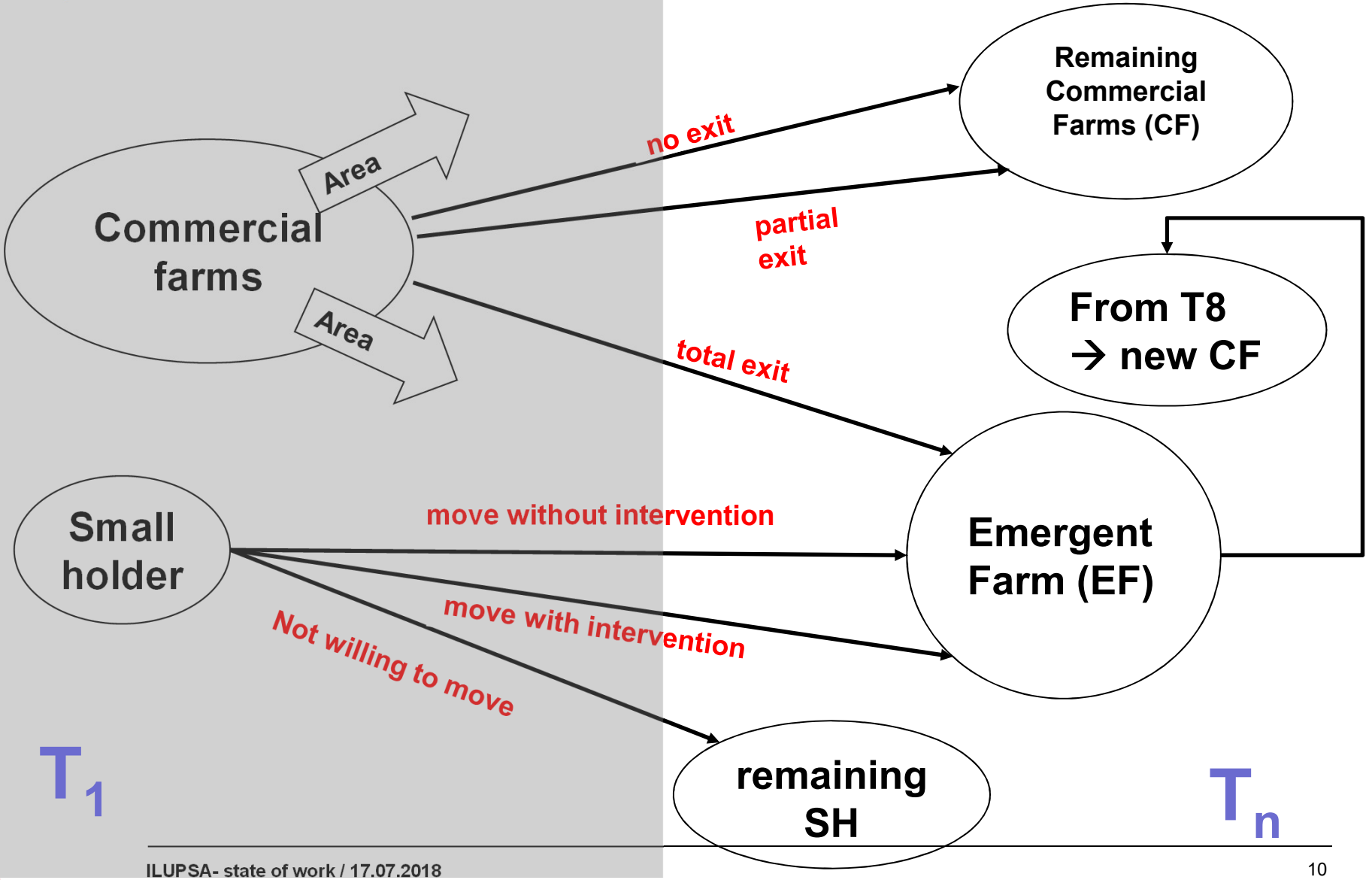
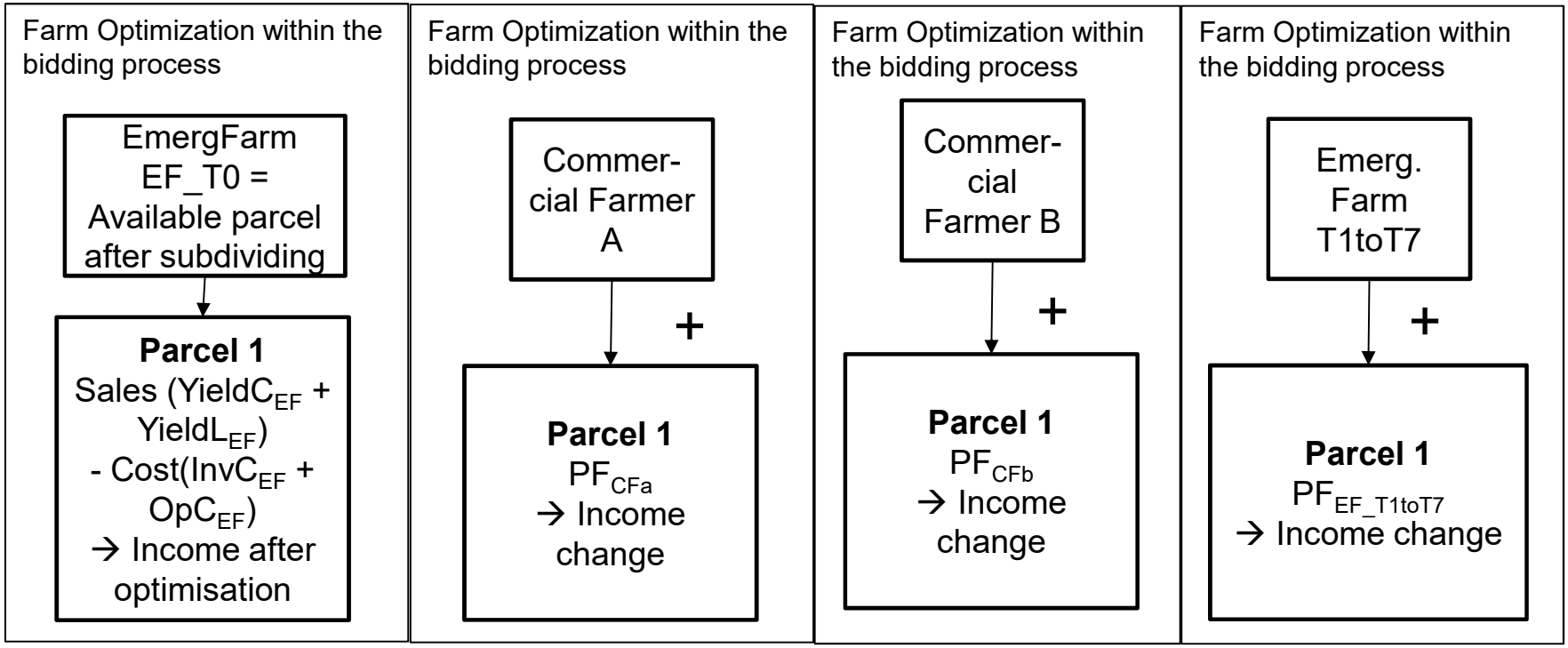
Model description: Definition of agent population



Bidding process in year one



Data-base for modelling smallholders

- A multi-stage sampling approach was employed to sample 833 farmers.
- Sample was done in three provinces that house >60% of smallholders in the country.
- Face to face interviews

- Data comprised
  - Farmer demographics
  - Production- cost and output
  - Aspirations
  - Willingness to relocate to commercial farms

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Modelling the typical homeland setting of smallholder farms

Data-base for modelling commercial farms

- Data collection based on an online survey via survey monkey with 90% response rate
- Survey in all provinces

- Data comprised
  - Farmer demographics
  - Production- cost and output
  - Farm income
  - Willingness to exit or to partially exit

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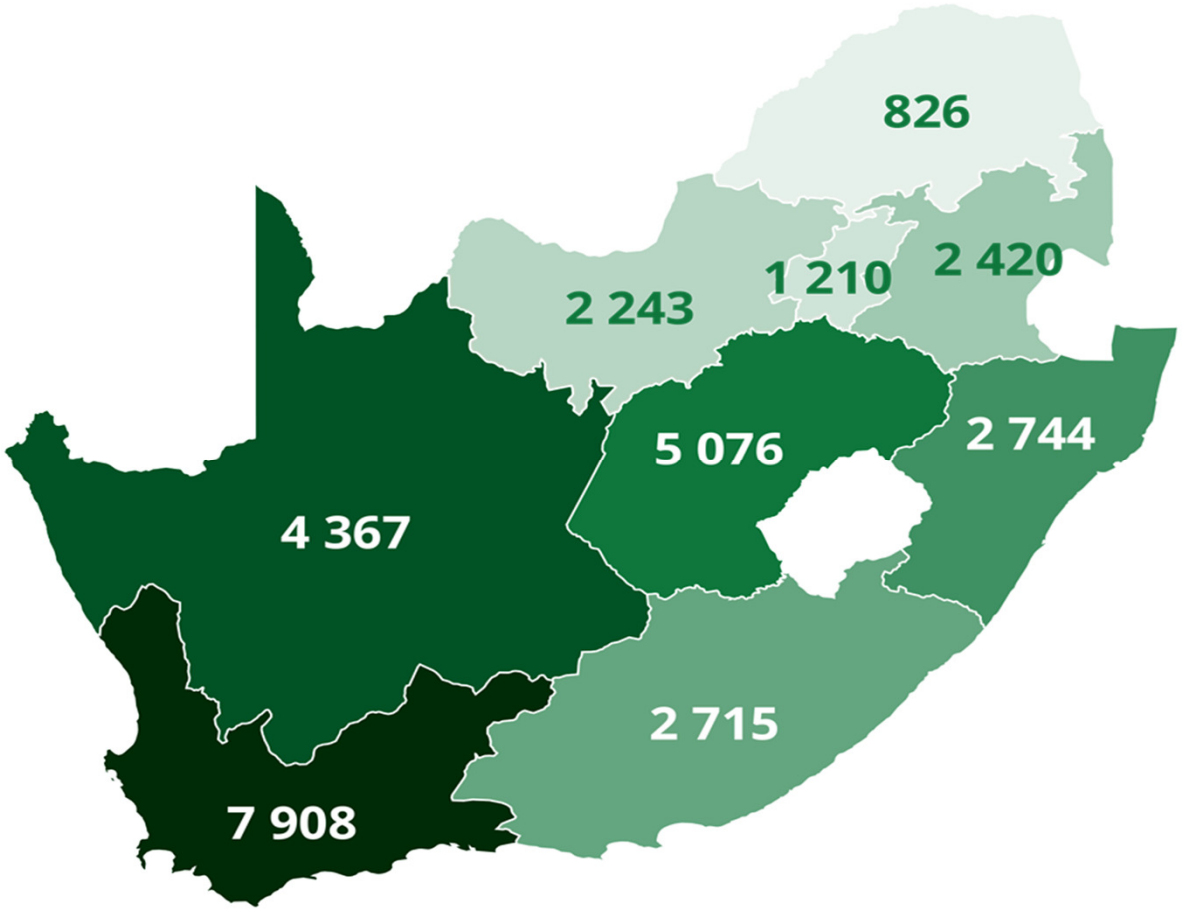
Distribution of commercial farms in S.A



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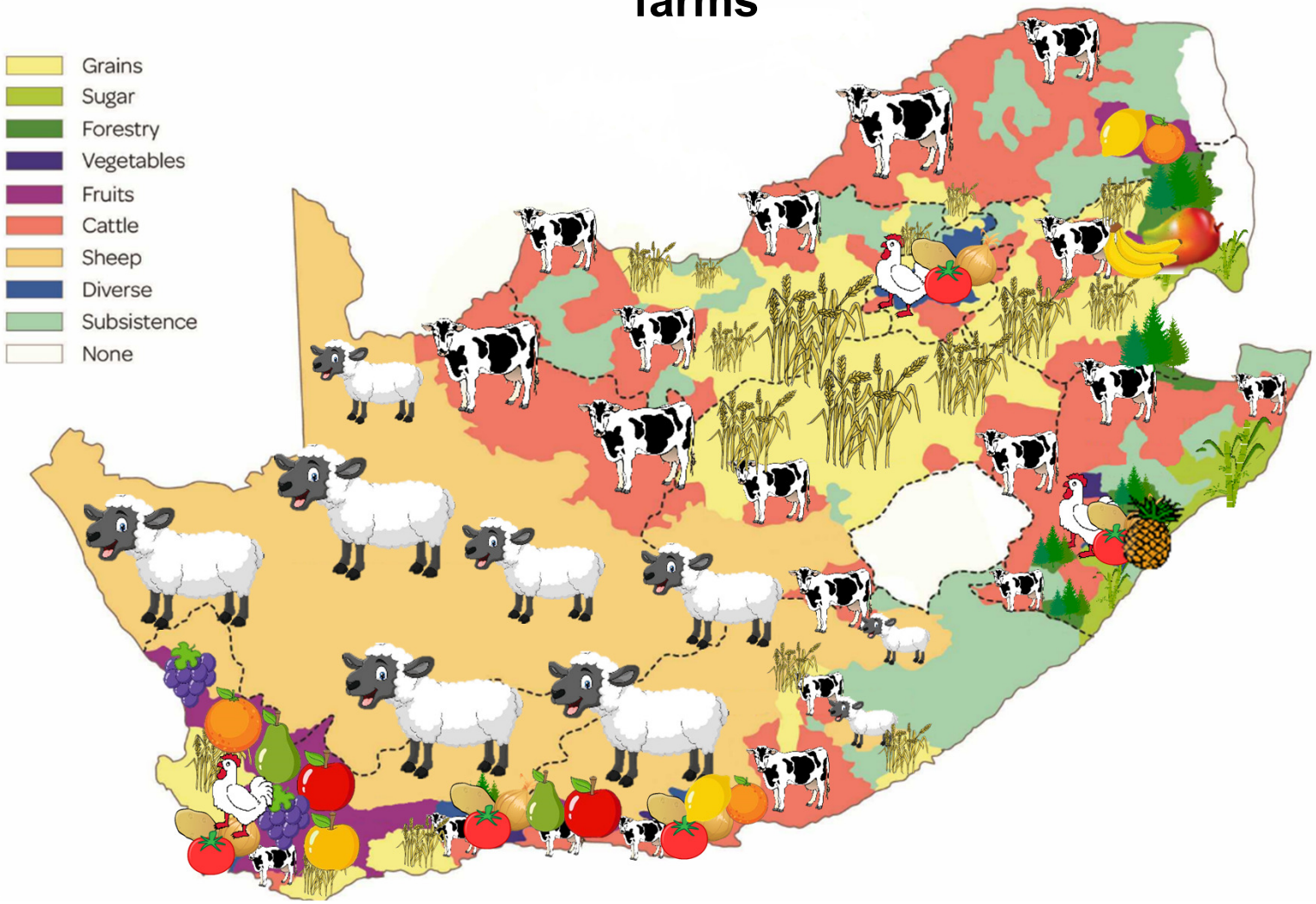
Database for modelling the commercial farms

Province	Count	Actual share	ideal share	Add	New total	New share
Limpopo	68	7	7	120	188	7
KwaZulu Natal	139	15	9	90	229	9
Mpumalanga	61	6	9	170	231	9
Western Cape	464	49	17	0	464	18
Eastern Cape	104	11	10	150	254	10
Gauteng	10	1	4	100	110	4
North West	24	3	12	290	314	12
Northern Cape	38	4	13	300	338	13
Free State	31	3	19	470	501	19
South Africa	**939**	**100**	**100**	**1690**	**2629**	**100**

Modelling the heterogenous production types of commercial farms



ILUPSA scenarios and focus of this presentation

1. Maintaining the status quo — voluntary exits of commercial farmers
2. Preferential smallholder produce procurement
    - a Low EF price increase 5%
    - b Medium EF price increase 10%
    - c High EF price increase 15%
3. Expropriation scenarios
    - a Expropriation with compensation - 50%
    - b Expropriation with compensation - 25%
    - c Expropriation without compensation - 0%
4. Land tax
    - a Low land tax increase 10%
    - b Medium land tax increase 20%
    - c High land tax increase 30%
5. Operational Subsidies
    - a High subsidy
6. Transferred land switch to production of EF's original crop

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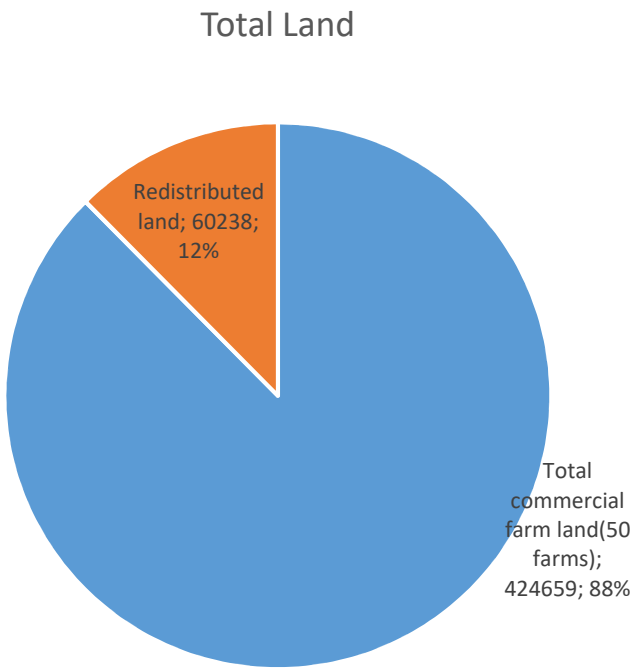
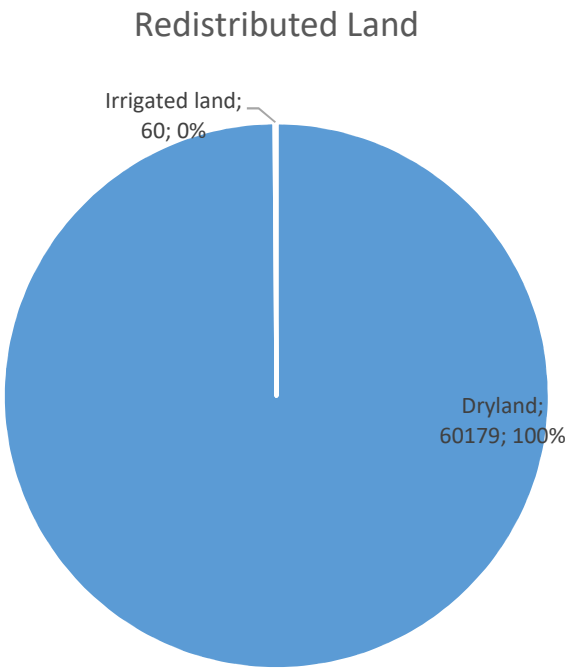
First results for a pilot model: Land redistribution





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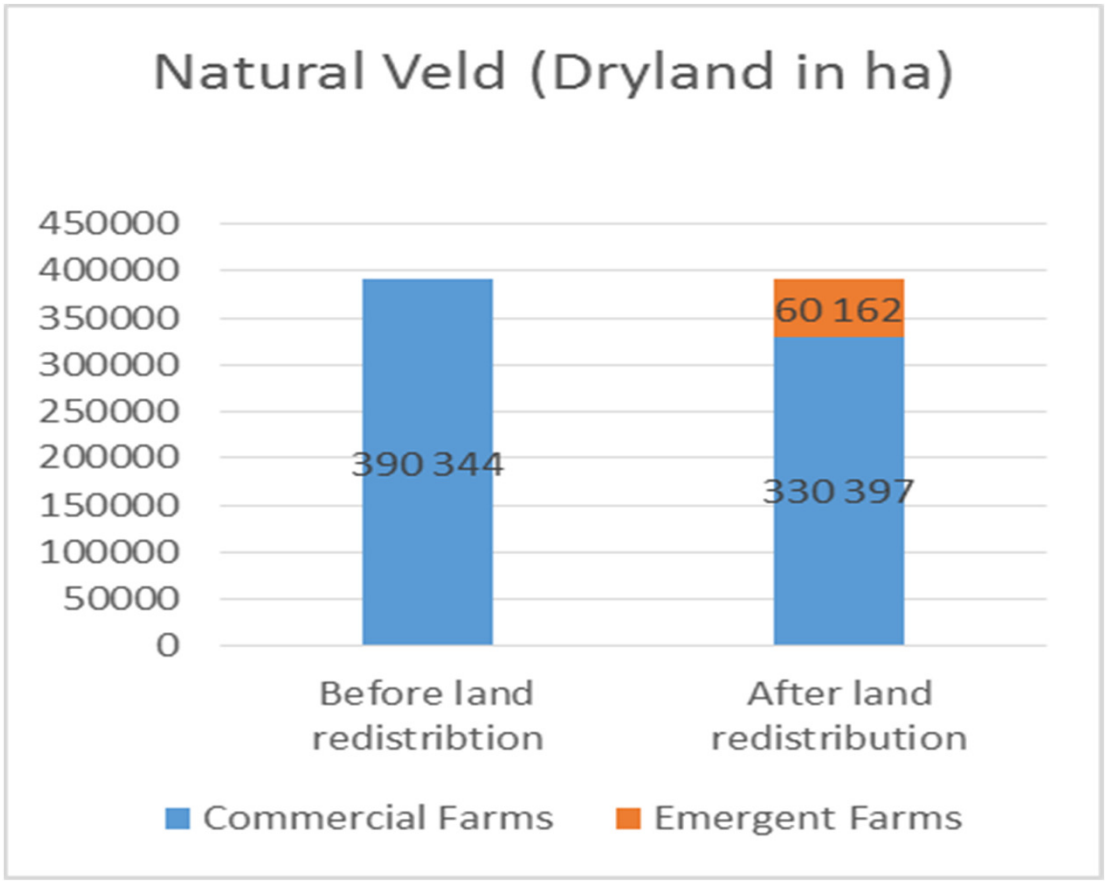

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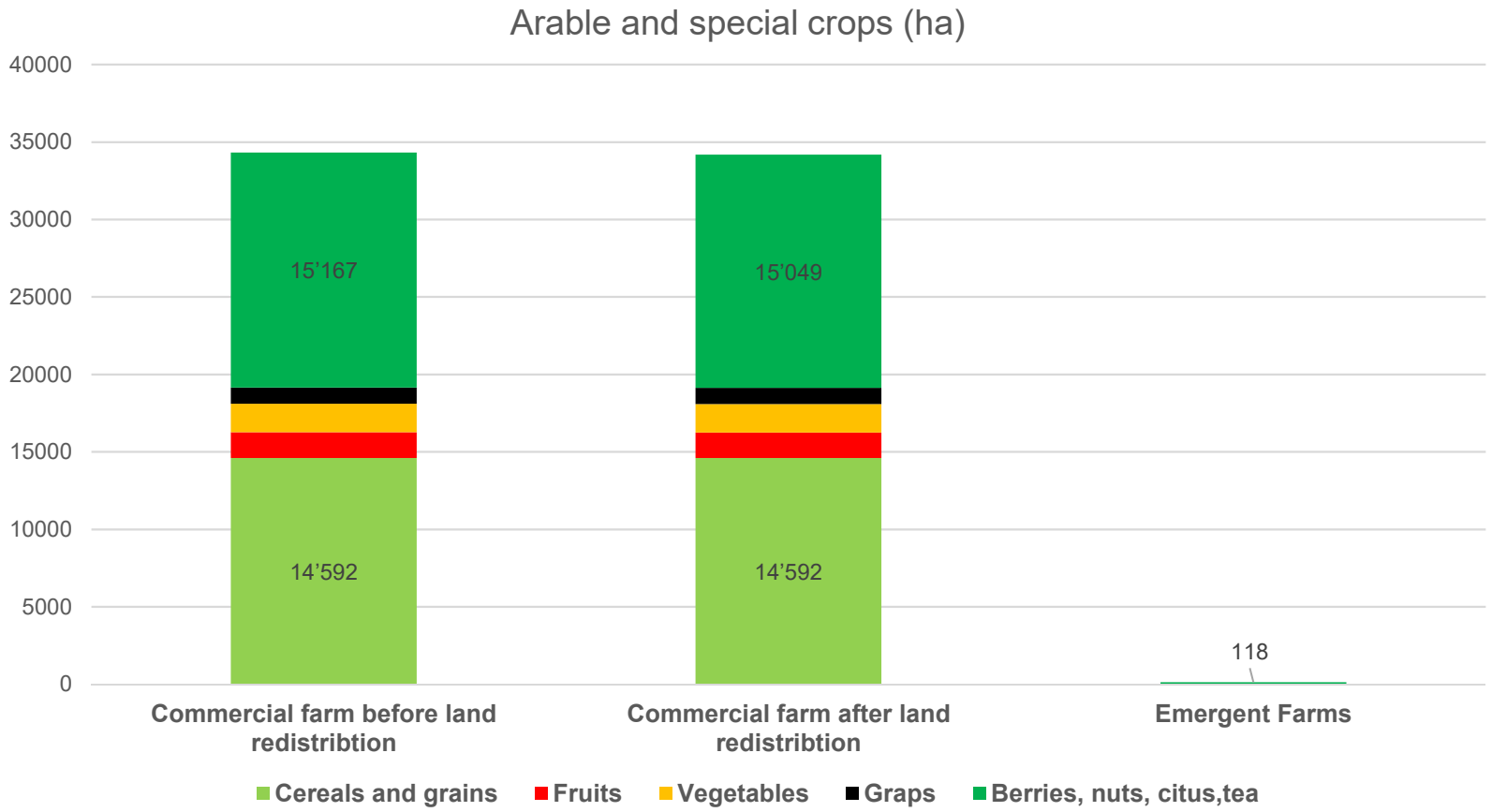
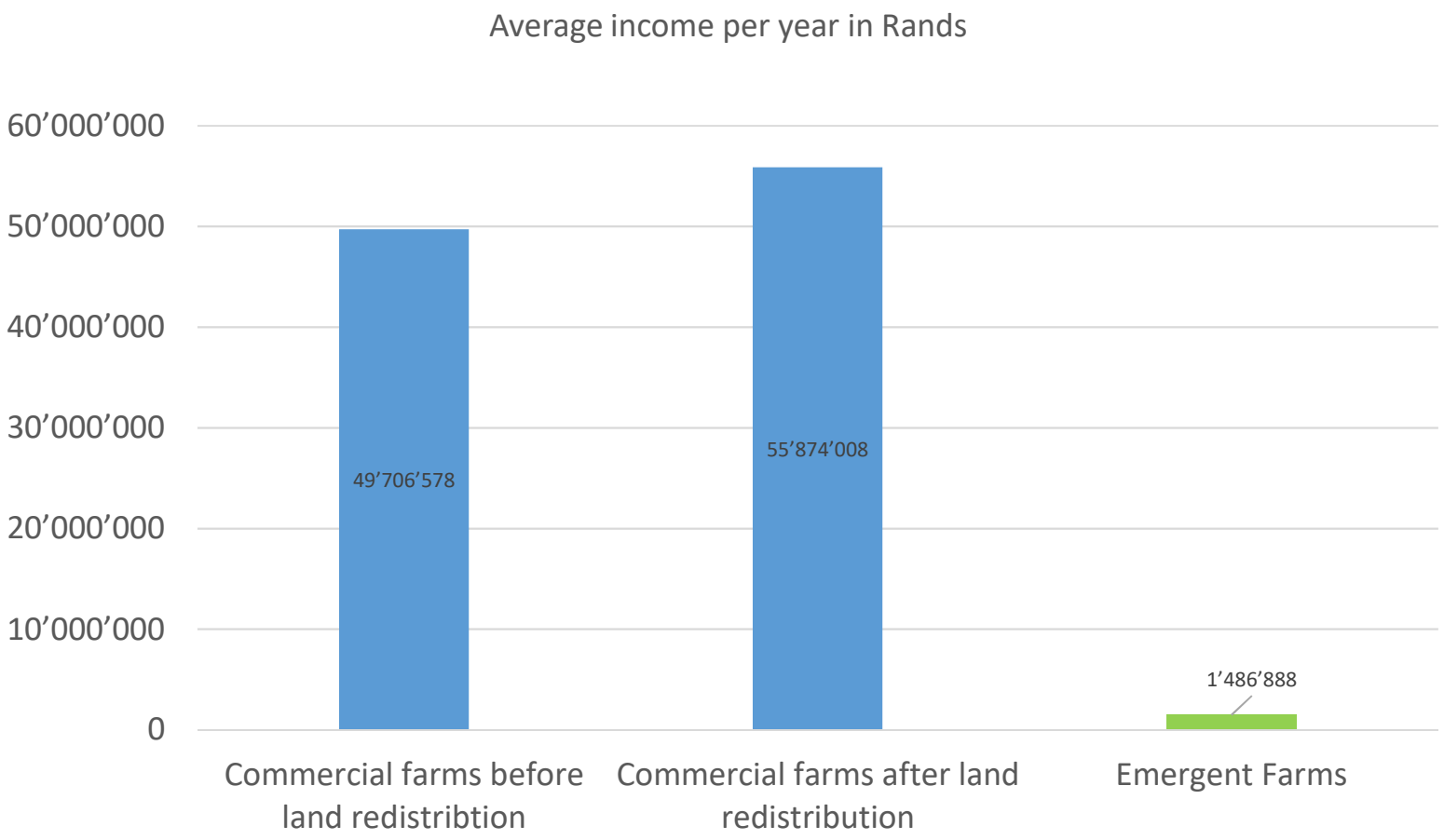


First results for a pilot model: Income distribution



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First results for a pilot model: Income distribution

- Can the farm income on subdivided farms attract potential emerging farmers currently farming on former homelands?
  - YES.
  - Average aspirational income for smallholders: R39 339 – R66 877/ production season or cycle (Zantsi & Mack, 2019).
  - Both smallholder and emergent farm incomes > poverty line (R1 200/person/month based on StatsSA, 2018).

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First results for a pilot model: required budget for land redistribution in ZAR

According to the NDP (2030 strategic plan), the state wants to redistribute at least 30% (~ 8400 farms) of commercial farm land

	Investment costs (land acqui.) for EF	Operational costs (prod.) for EF	Total costs for EF	Estimated State costs for EF
Mean (ZAR)	582 600	1 993 003	2 575 603	43 270 130 400

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Preliminary conclusions

- Land availability: South Africa cannot solely rely on WS-WB approach to achieve land redistribution.
- Mostly land of poor quality becomes available for redistribution.
- Farm size and farm income on the subdivided redistribution farms can attract potential emerging farmers, despite the poor quality farms.
- In order to achieve land redistribution faster, state needs to allocate much more funds than the 2016 expenditure.
- A well organised and coordinated support for emergent farmers will be required to achieve land redistribution.

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Lessons drawn and implications for next scenarios

- Alternative methods of making land available for redistribution are needed.
  - Most of the alternatives are among our list of next scenarios
- Competition for markets will disadvantage emerging farmers because of small farm size and therefore, procurement strategies will be necessary.
  - E.g. Smallholder produce procurement
- A definitive period of support for emerging farmers is needed to have a sufficient budget.

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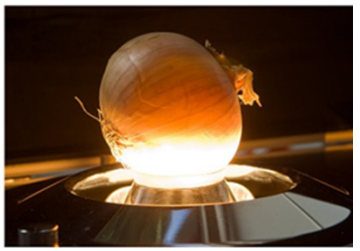







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Historical background of land reposition

Land item	Hectares
South Africa total	122 518 143
State-owned land	10 566 215
Nature conservation, national parks, etc.	7 448 764
State forests	1 812 478
Department of Water Affairs	575 723
Department of Defence	688 127
Correctional Services	41 123
Urban areas, towns and villages	11 357 935
Farm land under traditional tenure	18 036 773
Land use change due to urban sprawl, mining, expansion of parks and forests since 1994	4 143 993
Total area of farm land under freehold	78 413 227