

Is a firewood crisis looming in Bushbuckridge? Revisiting and re-evaluating the predictions of Banks et al (1996)

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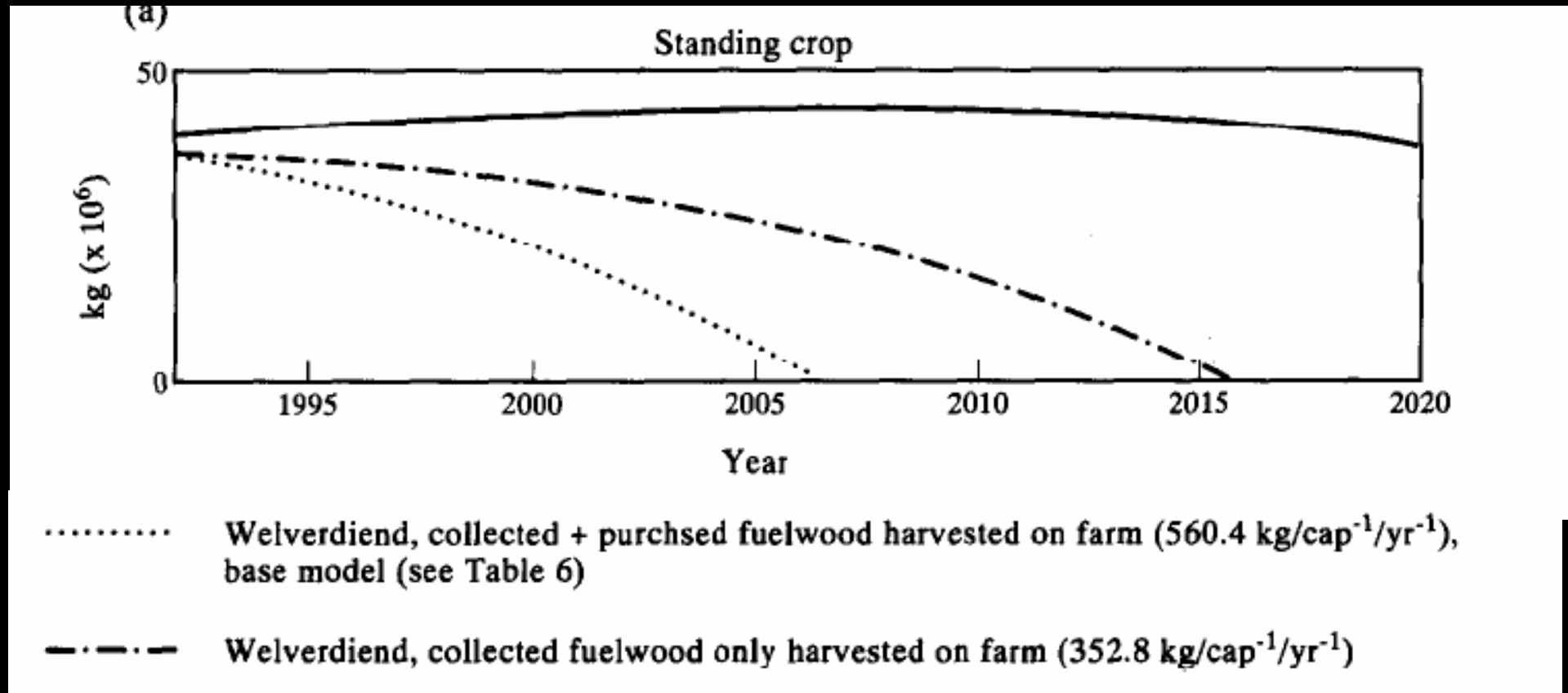
Firewood: the other energy crisis in South Africa

- > 40 % rural electrification
- 95% rural households use firewood as primary domestic energy source
- High dependance on firewood is projected to continue with population growth in the immediate future
- Firewood is a “Renewable” energy source only if harvested *sustainably*



**HOW SUSTAINABLE IS THE CONTINUED
HARVESTING OF FIREWOOD FROM
COMMUNAL SAVANNA WOODLANDS IN
SOUTH AFRICA?**

The predictions: Banks *et al* (1996) baseline model

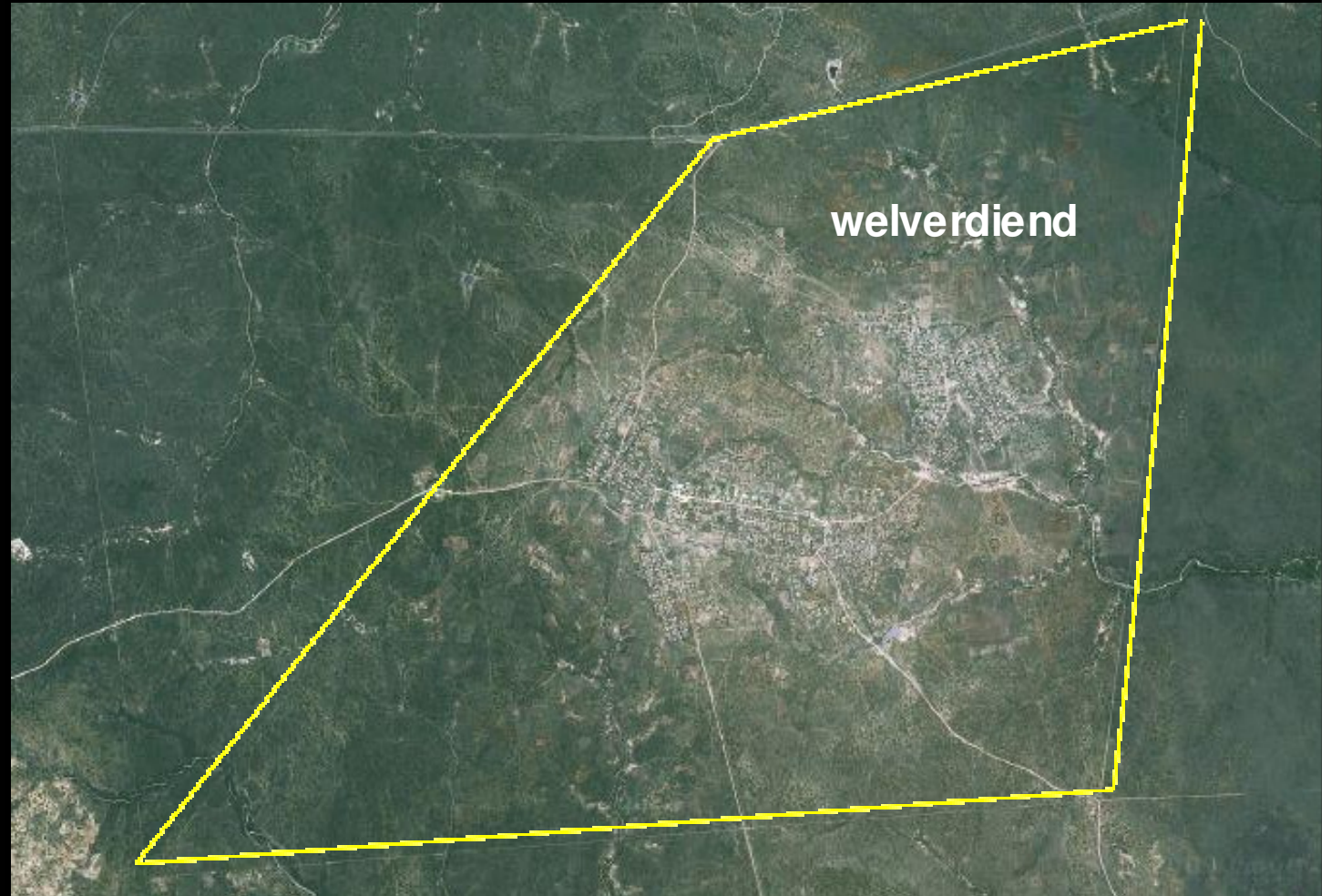


“Woodland collapse” by 2007 if per capita consumption continues at $560 \text{ kg cap}^{-1}\text{annum}^{-1}$

“Woodland collapse” by 2016 if per capita consumption decreased to $353 \text{ kg cap}^{-1}\text{annum}^{-1}$

Development and sourcing of alternative firewood/energy sources

Case study site: Welverdiend village, Bushbuckridge

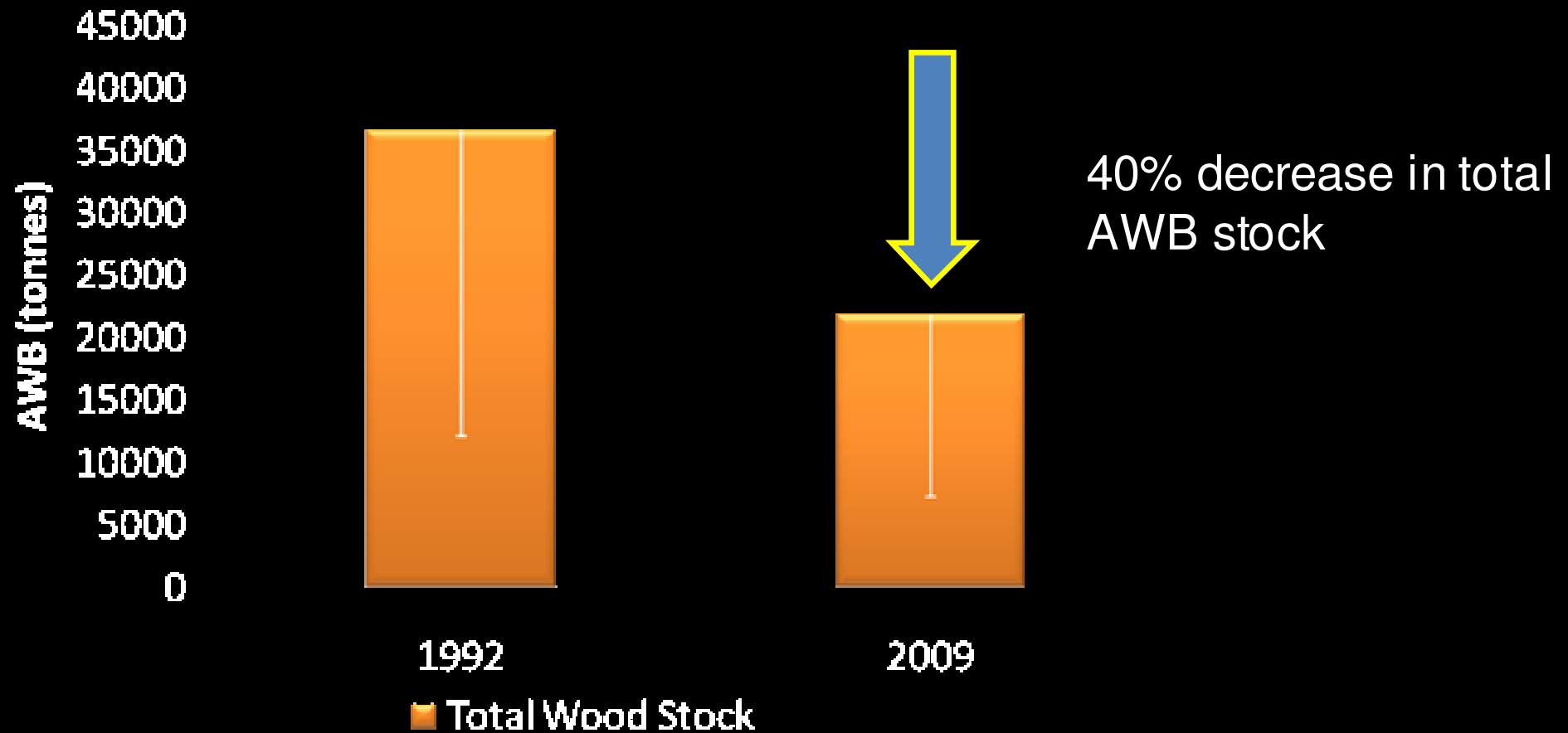


Methods:

- Plot-transect sampling in Welverdiend communal rangelands in 2009 after Shackleton *et al* (1994)
- All measurements and analyses undertaken at stem level
- Biomass figures derived from plot measurements
- Comparative analysis with 1992 dataset for Welverdiend village
- Household interviews focusing on firewood use and collection



Results: “Woodland collapse” by 2007?



Total AWB stock	36,672 ±23,056	21,876±15,754	Loss of 15,000
(* 10³ kg)			tonnes

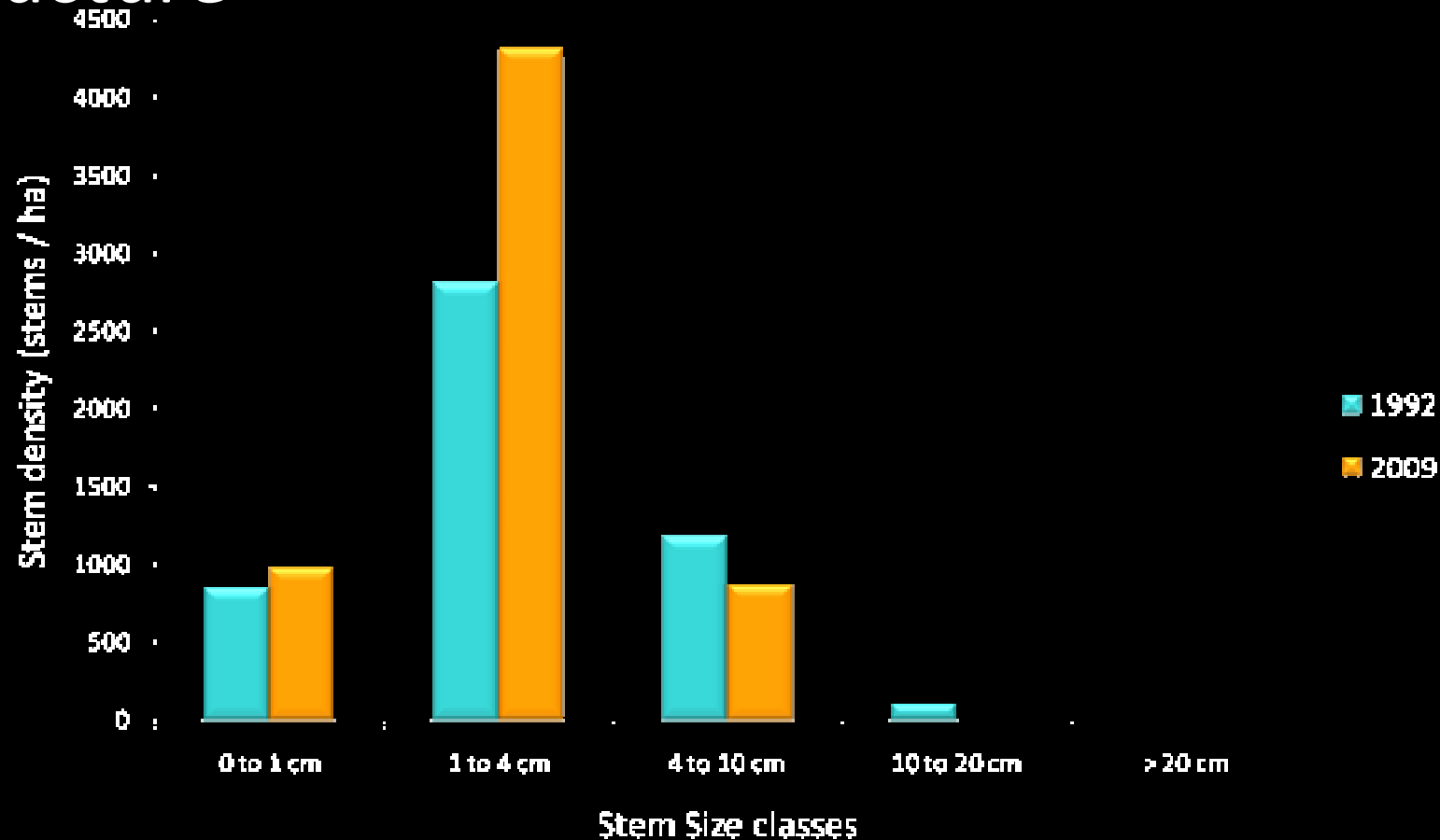
Results: Change in total Aboveground Woody Biomass stock

Woodland parameter	1992	2009	
Total AWB stock (* 10 ³ kg)	36,672 ±23,056	21,876±15,754	Loss of 15,000 tonnes
Mean AWB density (kg ha⁻¹)	5,927±3,333	4,168±973	not significant
Woodland Area (ha)	3,380	2, 283	1,000 ha landuse conversion 30% woodland area lost

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Results: Change in woodland stem density and structure



**Woody stem
density (stems ha⁻¹)**

4,997± 610

6,460± 706

not significant

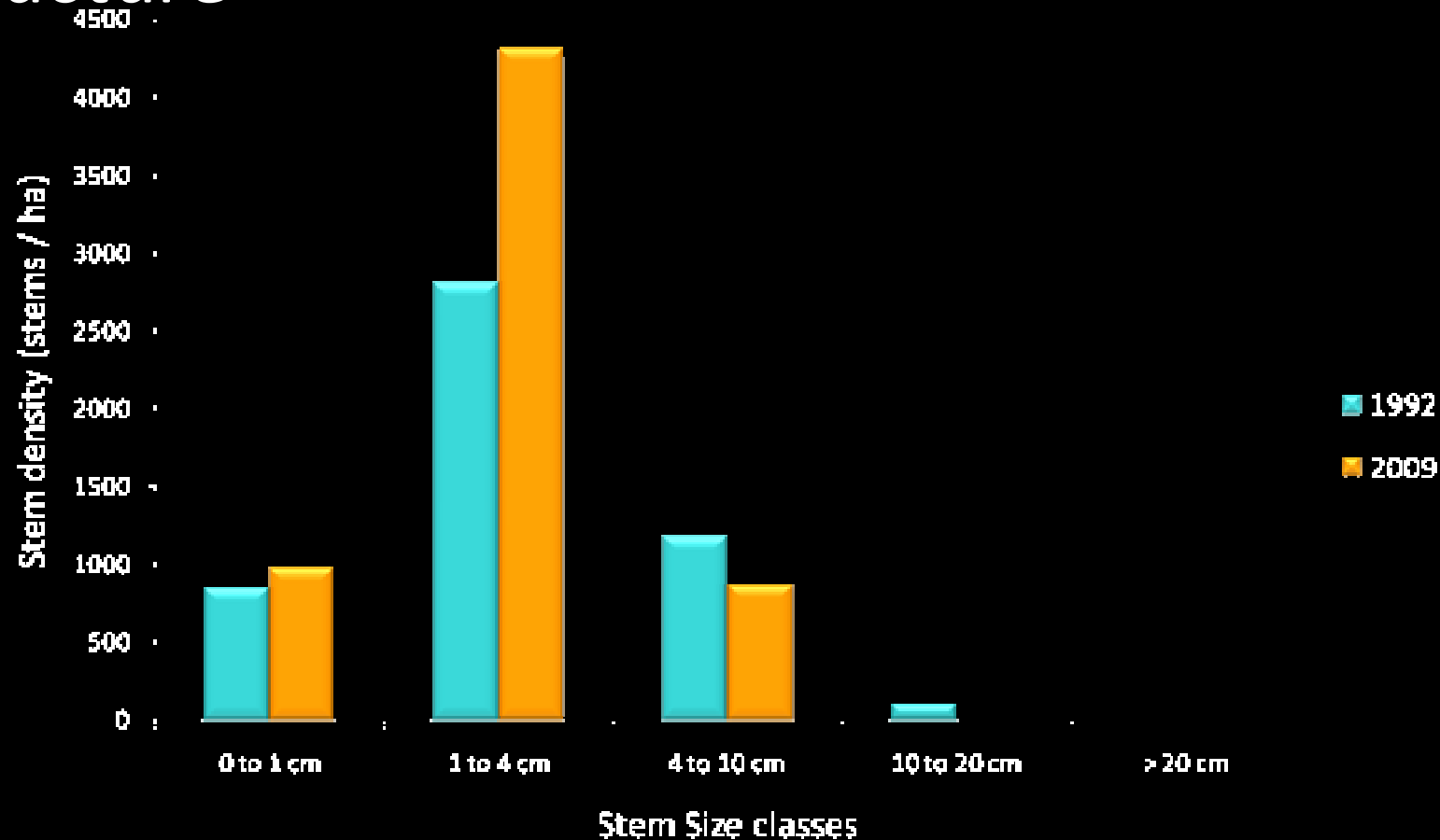
**Coppice Stem
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291±101

873±216

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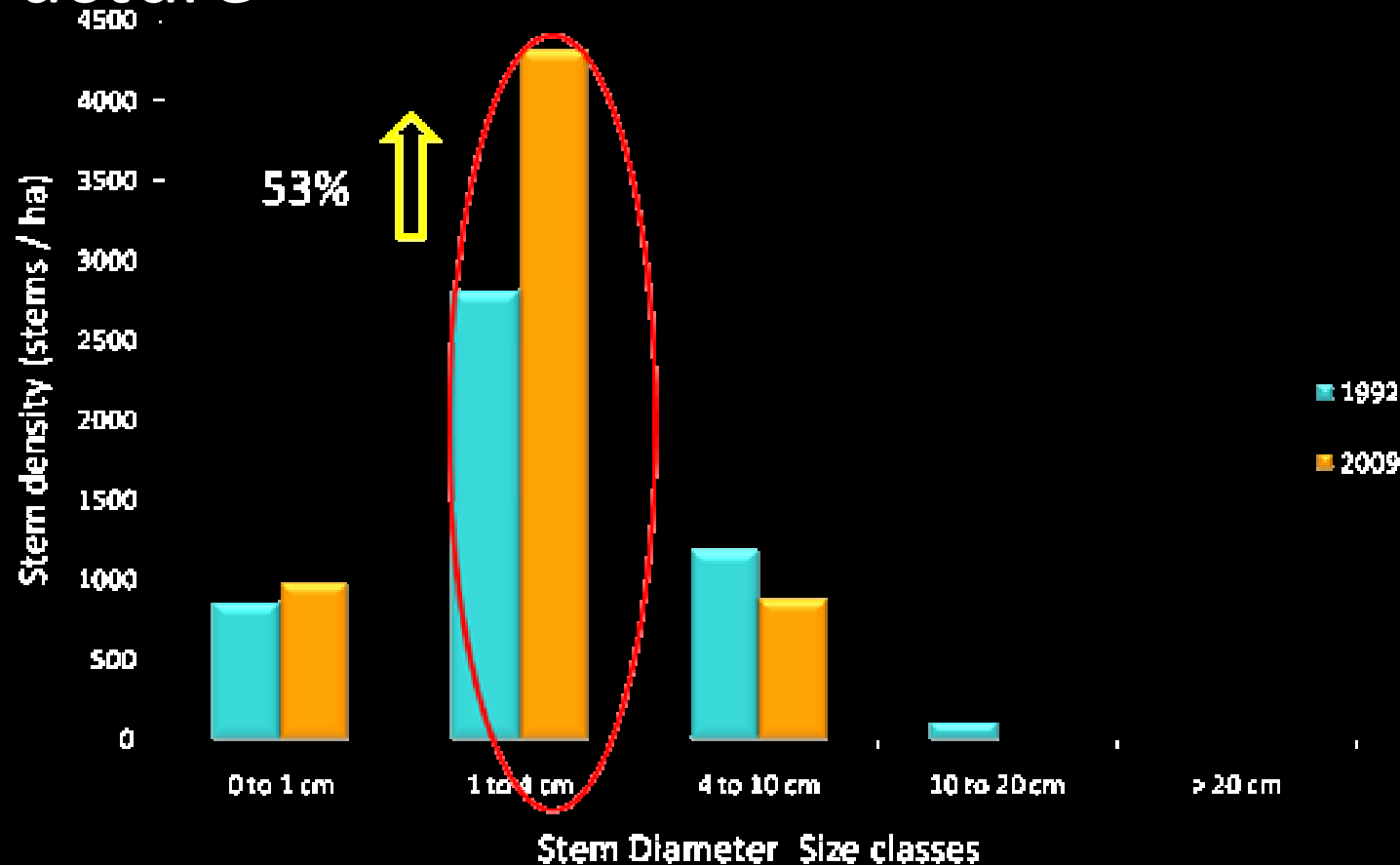
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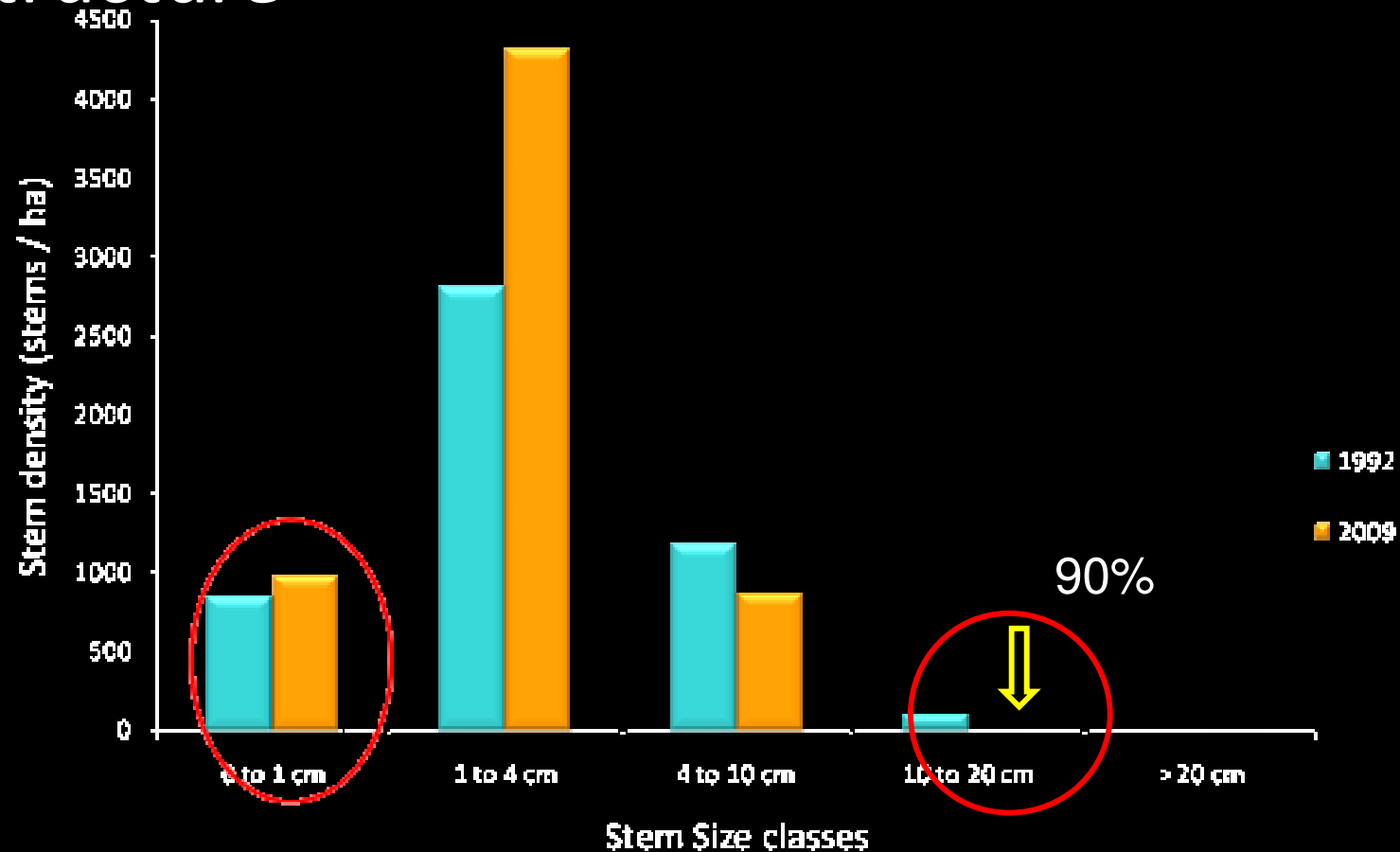
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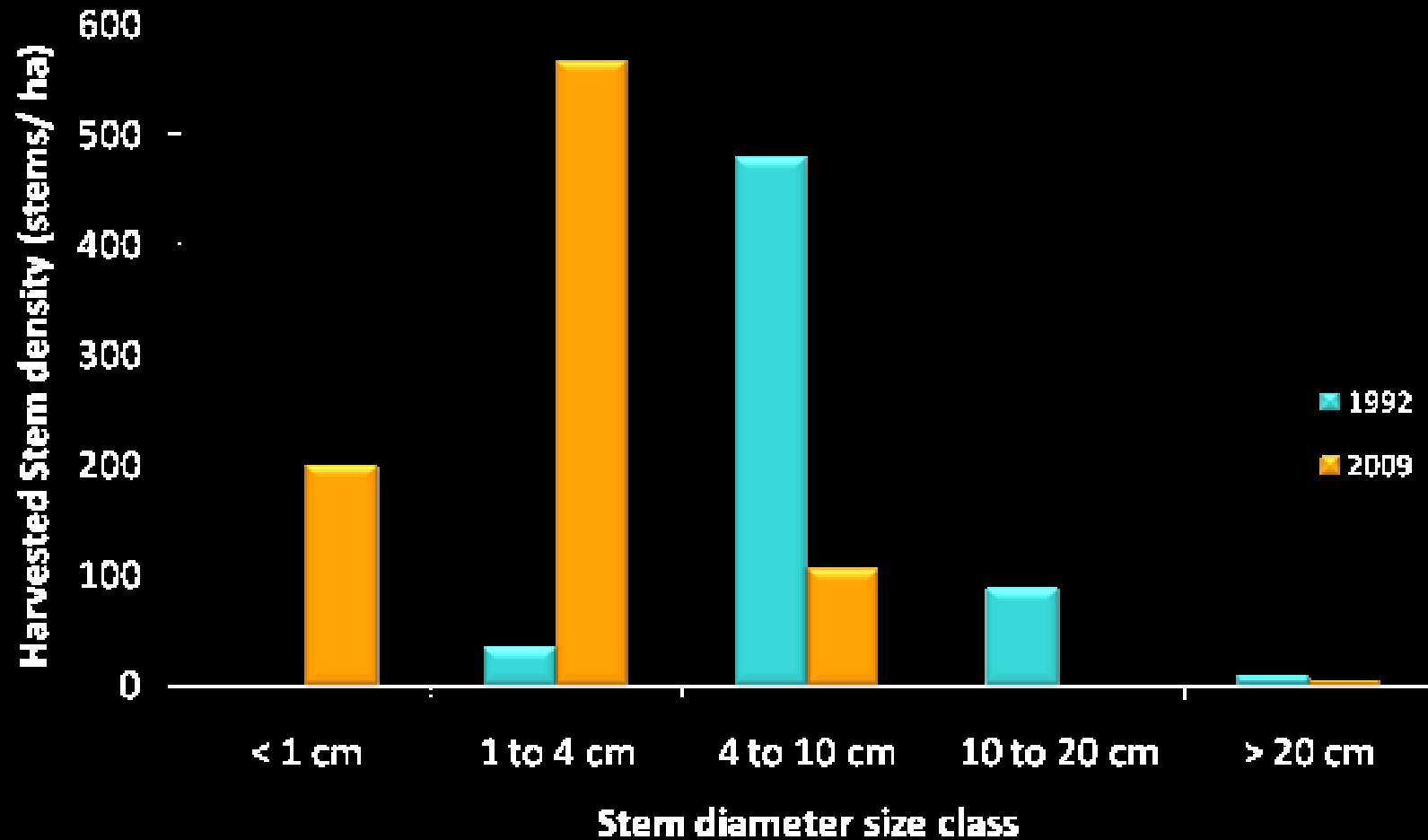
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Results: Change in available firewood resource quality



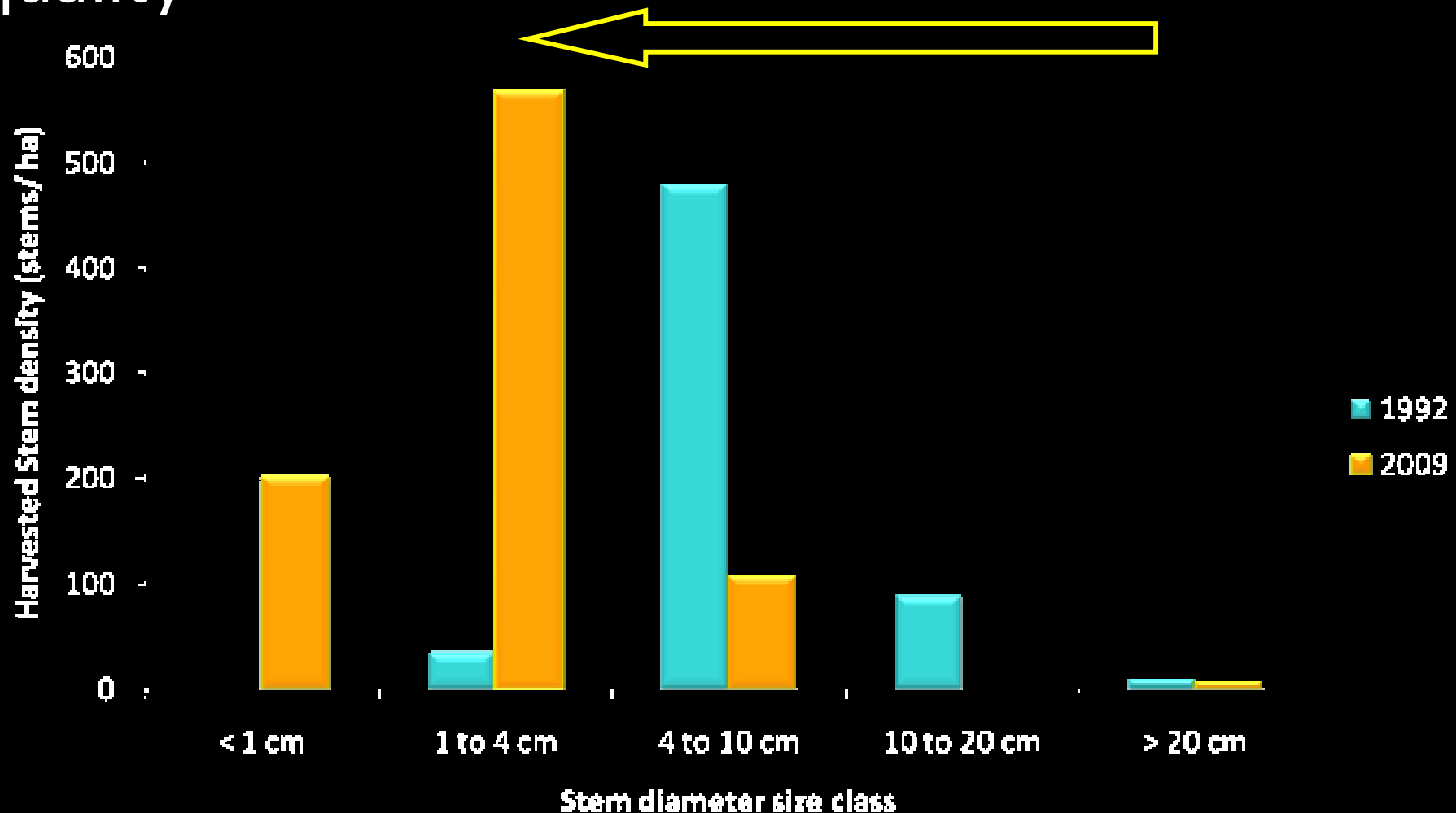
Median diameter
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2.15±0.09

Significant

Results: Change in available firewood resource quality



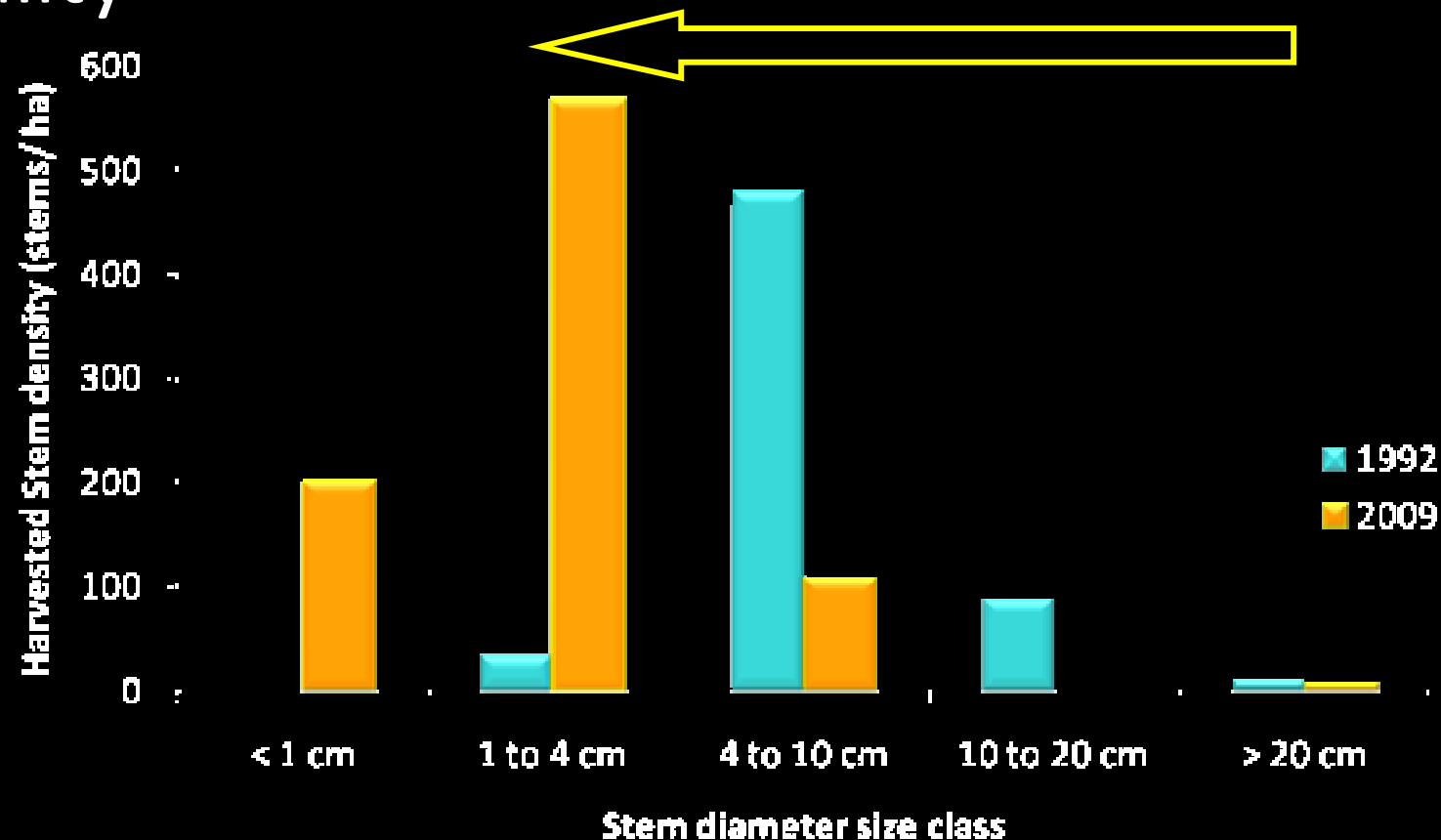
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Harvested stems density (stems ha⁻¹)	612±113	473±133	Significant at 0.1
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The Social Context: Welverdiend village

Household parameters	1992	2009
Households (estimate)	564*	1,509
Average household size	8.3	6.3
Total population (estimate)	4,700*	± 9,500
Firewood consumption (kg cap ⁻¹ annum ⁻¹)	560.4*	584.4
% hholds purchasing wood	19%*	35 %
Perception of scarcity (can't get enough firewood)	-	33%

* Banks et al 1996

Banks et al (1996) predicted:

1. “If extraction pressure continued at 1992 levels there would be complete woodland collapse by 2007/8”

But 2009 data shows:

- ⇒ Woodland denudation has not occurred but on-going woodland degradation
- ⇒ Loss of reproductively mature plants
- ⇒ Increasing Coppice regrowth as a form of persistence
- ⇒ Species dominance of “bush encroachers” - *D cineria* and *A harveyi*
- ⇒ Degraded quality of firewood potential resource

Banks et al (1996) predicted:

2. “If extraction pressure decreases then in 2008/9 standing AWB stock will be \pm 50% 1992 level”

But 2009 data shows:

- ⇒ Aboveground Woody Biomass stock has almost halved BUT AWB density has not changed:
- ⇒ Residential and agricultural expansion may be a more immediate threat

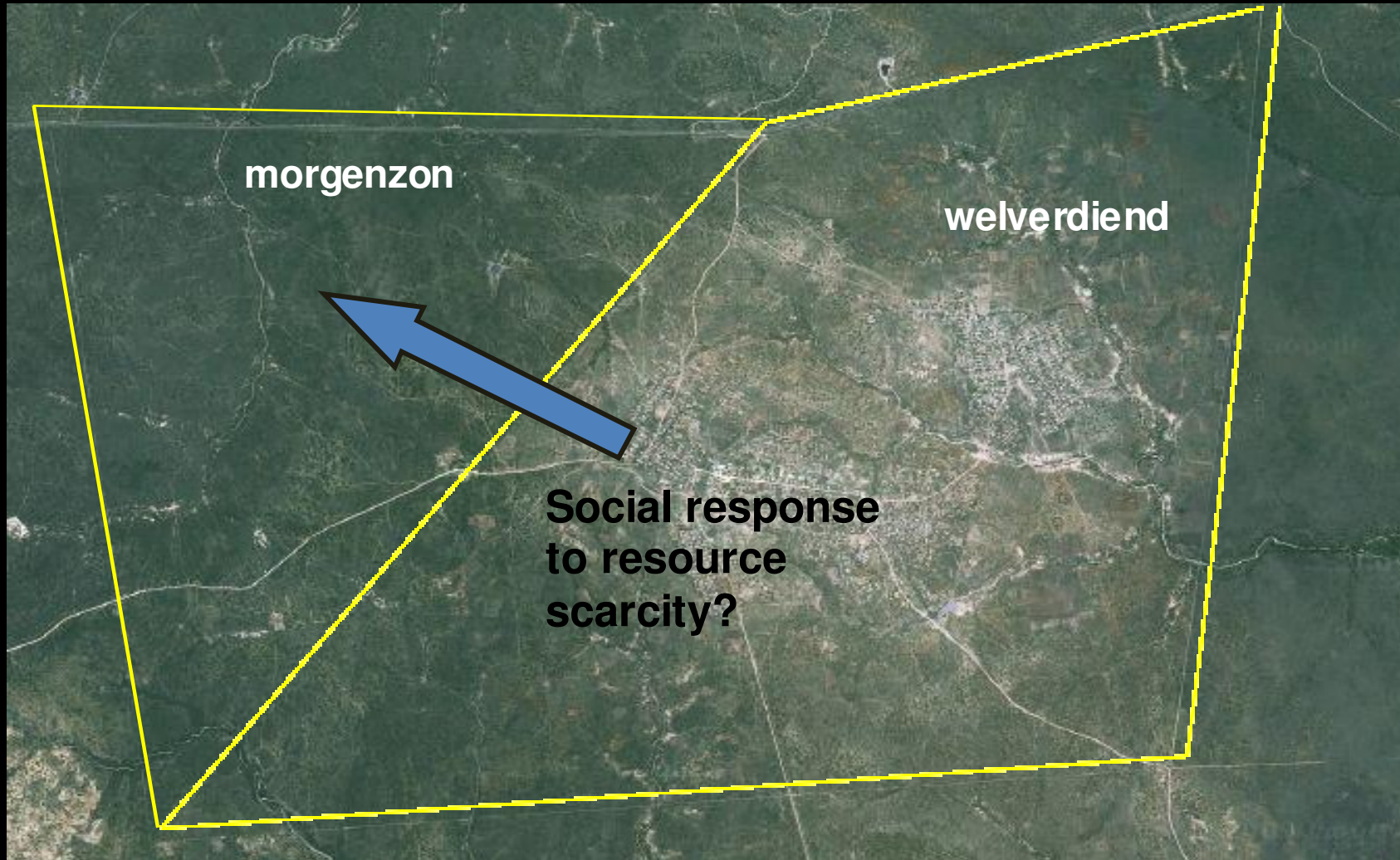
Banks et al (1996) predicted:

3. “Increasing scarcity will lead to exploitation of alternatives: firewood markets and perhaps different sources”

2009 data shows

- ⇒ 1 in 3 people perceive that there is a firewood shortage
- ⇒ Twice as many households purchase firewood in 2009: 35% vs 19% in 1992
- ⇒ Social movement to incorporate neighbouring “unused” land, Morgenzon into Welperdiend resource base

A twist in the tale... Morgenzon



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- ✓ Coppice regeneration of harvested stems is a key factor shaping communal woodland persistence

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- ✓ YES, if Welperdiend is representative of all villages
- ✓ Land-use/cover change more immediate threat to firewood resource base than selective livewood harvesting
- ✓ Coppice regeneration of harvested stems a key factor shaping communal woodland persistence
- ❖ Evaluation of Athol village to evaluate the accuracy of the predictions

Conclusions:

- Change in resource use behaviour happens before the collapse of the resource (when firewood quality is too low)
- Communal savanna woodlands persist but they may no longer deliver the firewood provisioning ecosystem service
- Rural expansion must be taken into account in ecosystem services management scenarios.

ACKNOWLEDGEMENTS:

The BioModels Project:

Modelling of the domestic energy system based on biomass energy in rural areas in Southern Africa



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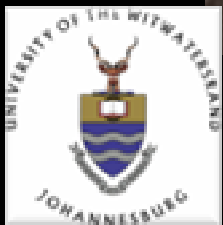
EDUARDO MONDLANE
UNIVERSITY



UNIVERSITY OF ZAMBIA



Barend Erasmus & Wayne Twine
Prof C Shackleton
The Lab of Awesomeness!!



Energy security is central to the achievement of poverty alleviation

Thank you...