Exploring on-farm adaptation options under climate change in southern Africa

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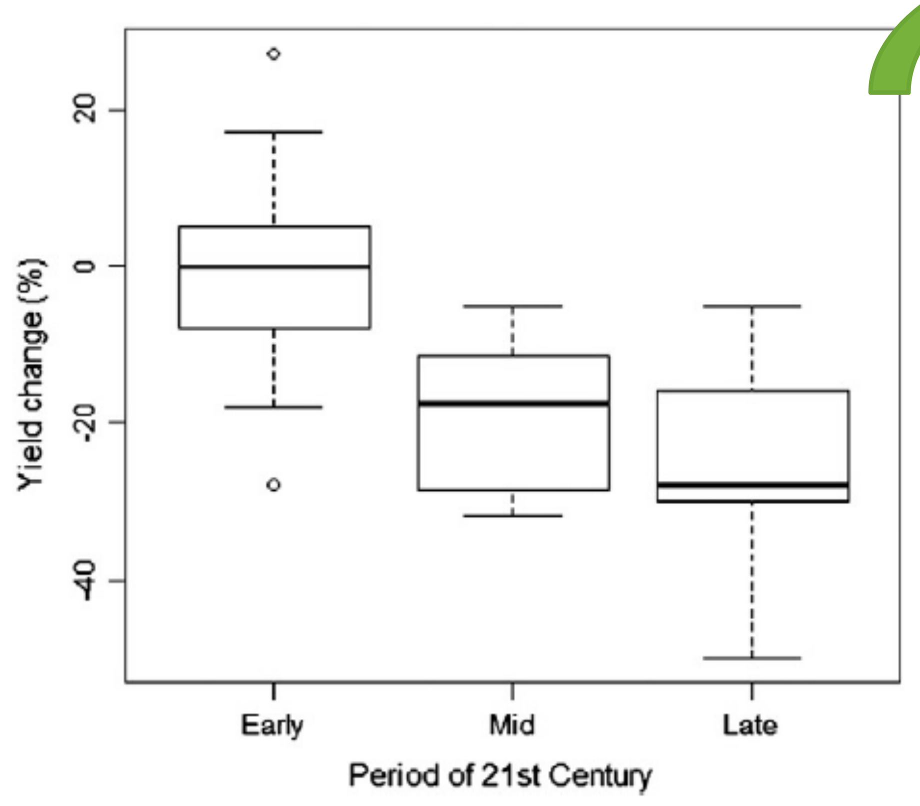
INTRODUCTION

Climate change will impact crops in southern Africa strongly. While impacts are uncertain in the early 21st century, they are negative in the mid 21st century (-18%) and more severe in late 21st century (-30%) (Fig 1). There is need to adapt crop production to climate change so a to preserve or promote food security in the region, especially for the more vulnerable smallholder dryland farmers.



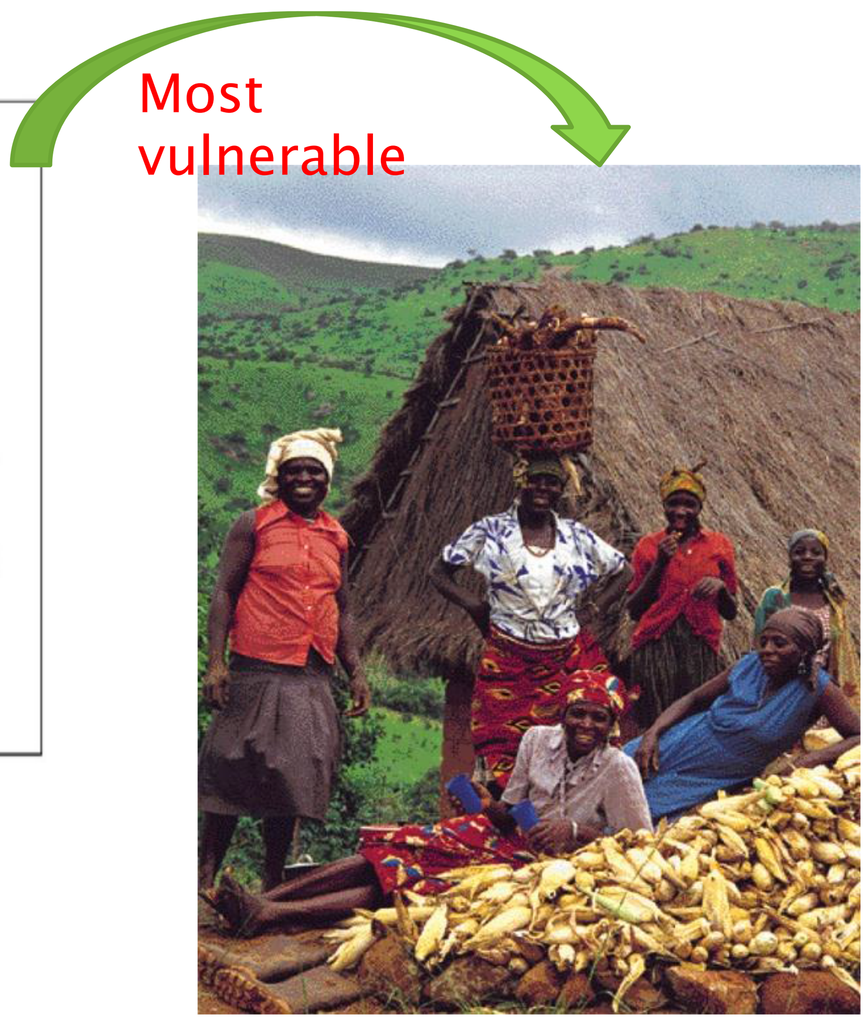


Fig 1. Mean yield change in 21st century relative to present in southern Africa (Zinyengere et al., 2013)

OBJECTIVE & METHODOLOGY

QSTN: Can on-farm tactical adjustments help resource poor smallholder farmers in southern Africa to adapt to climate change?

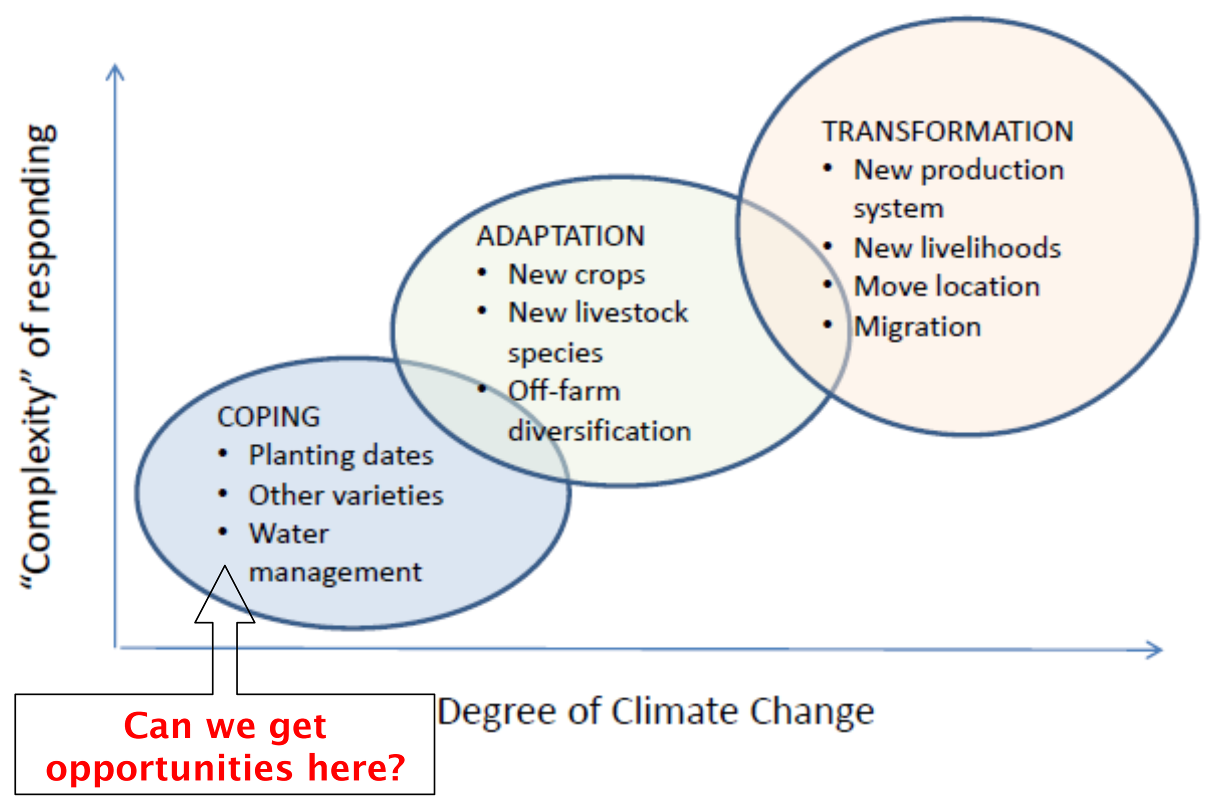


Fig 2. Complexity of agricultural adaptation responses based the degree of climate change (Adapted from Howden et al. ,2010)

HOW?: By testing the usefulness of on-farm adjustments for adapting maize to climate change via modelling (Fig 3):

- Fertiliser amounts (F)
- Planting dates (S), and
- Planting density (D), *a total of 294 combinations*

WHERE?: *Big Bend-Swaziland; Mohale's Hoek-Lesotho; Lilongwe-Malawi*

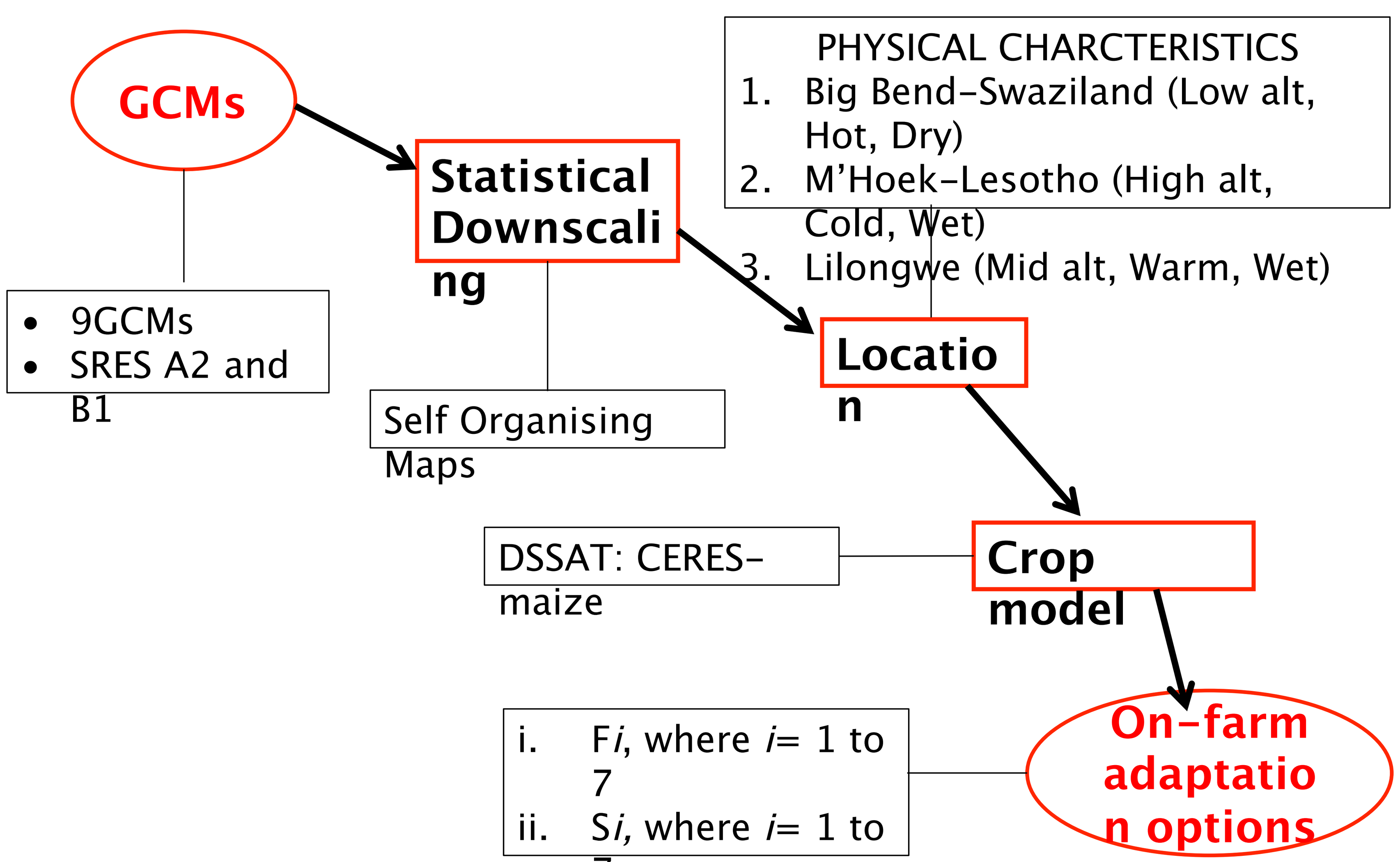


Fig 3. Tools and approaches used in simulations for a baseline (2000s) and future period (2050s).

RESULTS

Preliminary simulations including only 4 combinations of practices showed potential adaptation benefits in Mohale's Hoek especially under late planting-LP (Fig 4).

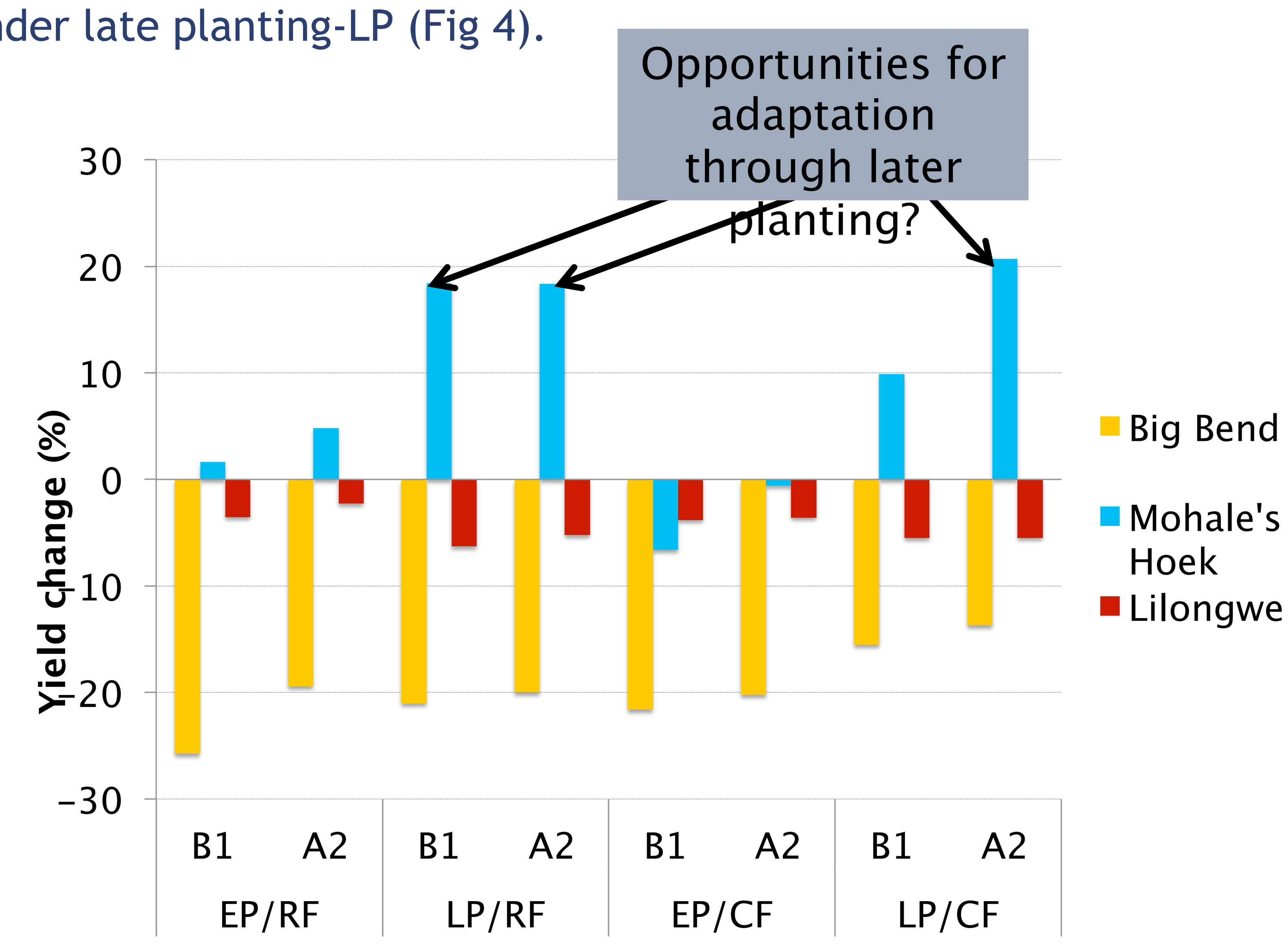


Fig 4. Mean maize yield change between 2000s and 2050s for A2 and B1 scenarios 4 agronomic strategies. CF–Common Fertilizer ; RF–Recommended Fertilizer; EP–Early Planting; LP–Late Planting. (Zinyengere et al., 2014)

- **Big Bend** - No reduction in negative impacts of climate change. Future yields declined up to -35% compared to baseline (Fig 5a).
- **Mohale's Hoek** - Future yield gains of up to 30% with late planting. Moderate yield gains (up to 10%) with moderate fertilizer and yield losses (up to -10%) at high fertilizer (F5-F7) increase (Fig 5b).
- **Lilongwe** - Opportunities to adapt exist with high fertilizer application. Late planting (S7) is mal adaptive, future yields decline by up to -10% (Fig 5c).

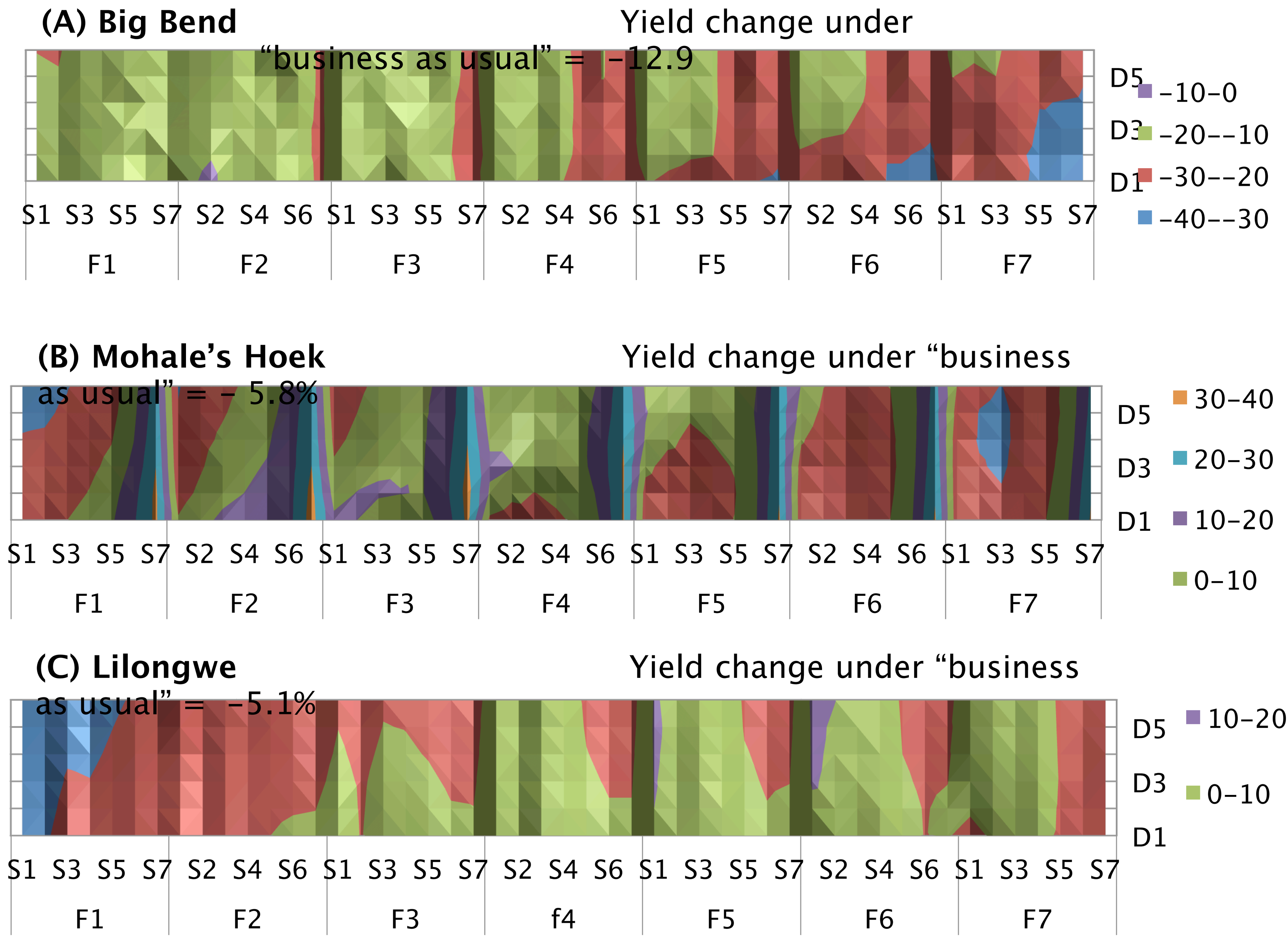


Fig 5. Mean maize yield change between 2000s and 2050s for A2 scenarios and 294 combinations of agronomic strategies i.e. 7 fertiliser (F*i*), 7 planting dates (S*i*) and 6 planting densities (D*i*).

CONCLUSION

- Opportunities for adaptation through on-farm adjustments exist and vary by location.
- Communities located in cool and wet areas (e.g. Mohale's Hoek) and moderate and wet areas (e.g. Lilongwe) have a wider range of opportunities to adapt to climate change through on-farm adjustments than those in hotter and drier areas (e.g. Big Bend).

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