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The U.S. Government's Global Hunger & Food Security Initiative

A Spatial Examination of Agricultural Land Use Potential in Malawi

An agricultural zonation scheme for Malawi for agricultural planning purposes

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Agricultural planning and Malawi's geographic diversity and complexity

- Significant agro-ecological diversity
 - Farmers in Malawi have developed a variety of farming systems to exploit the diverse combinations of local agricultural resources
 - Each farming system has a comparative advantage for the profitable production of specific sets of commodities
- As a result, any agricultural policy or program using a single technical approach to improving productivity or farm profitability will fail in many places
 - In designing agricultural development policies, geographic diversity of Malawian agriculture needs to be considered

Zonation scheme for agricultural planning in Malawi

- Aim to guide strategic thinking on where specific investments could best be placed across Malawi to promote increased commercialization of agricultural production
- Scheme should reflect spatial variability both in agricultural productivity and in the profitable commercial opportunities available
 - Productivity primarily determined by agro-ecological factors
 - Profitability primarily determined by access to specific markets
- In developing the agricultural zonation scheme, interested in:
 - whether an agricultural commodity can be produced in an area, and
 - whether farmers there will consistently be able to produce the commodity in a **profitable** manner

How an agricultural zonation scheme might be used in planning

- Spatial targeting of development programs in agriculture, rural transport, and market infrastructure
- Guiding location of private investment in agriculture
 - Primarily through public sector planners identifying where incentives can best be placed to most profitably attract such investment
- Identifying potential areas of expansion for commercial crop production, particularly high-value crops
- Examining the current binding constraints to increasing the scale of commercial agriculture in an area
 - Particularly constraints that may be solved through public action and investments

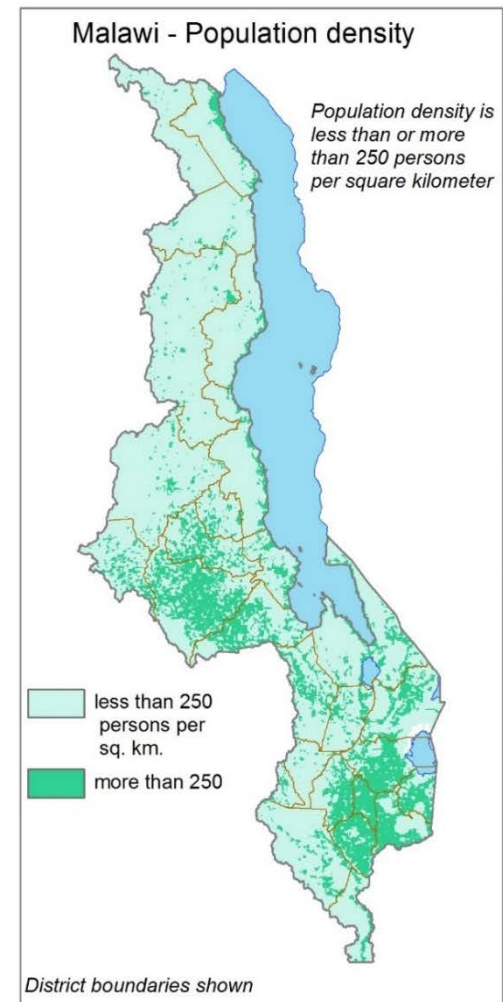
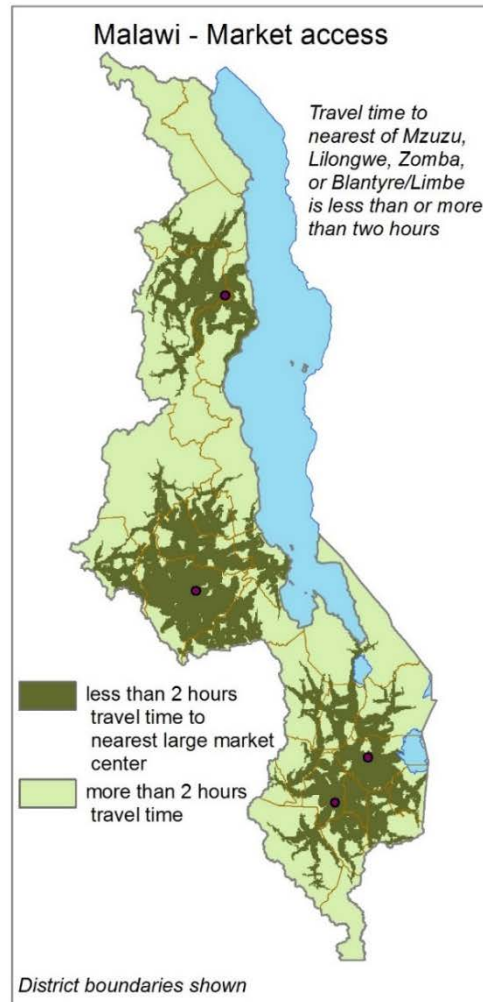
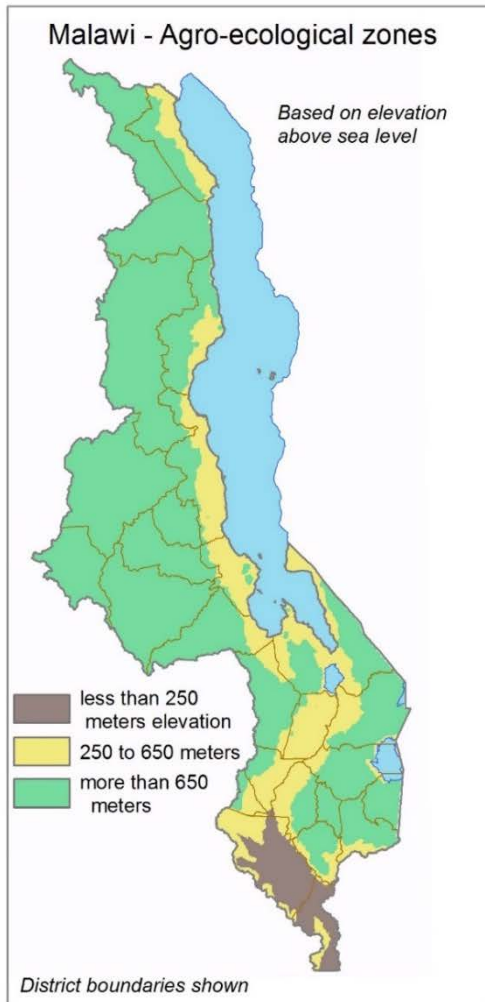
Approach

- Two levels to zonation scheme described here
 1. At higher, more general level, establish ***agricultural development domains*** for Malawi
 - Districts categorized by three factors:
 - a. General agro-ecological potential
 - b. Physical access to markets
 - c. Population density
 - Assess the general economic comparative advantage for particular agricultural development initiatives
 2. Thereafter, use ***crop suitability maps*** for Malawi
 - Extend analysis to more local scale by considering specific agro-ecological suitability of an area for production of a commodity

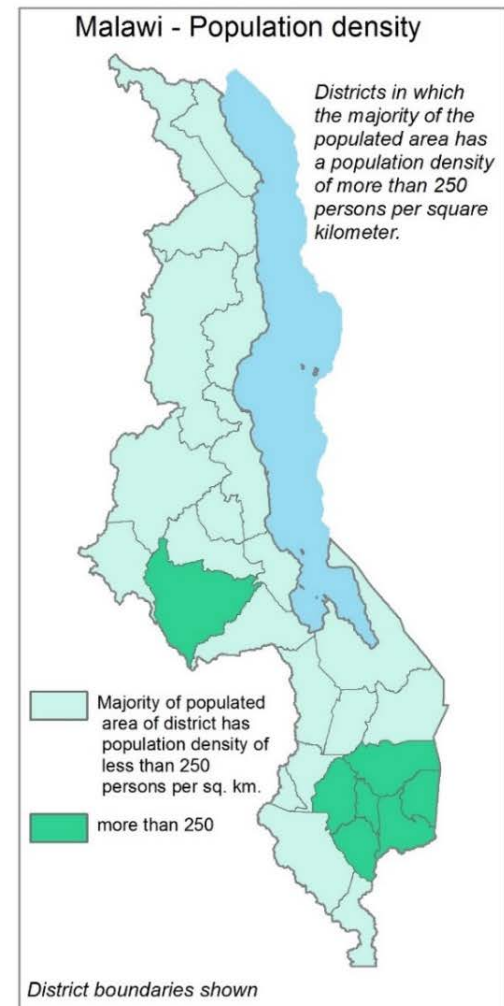
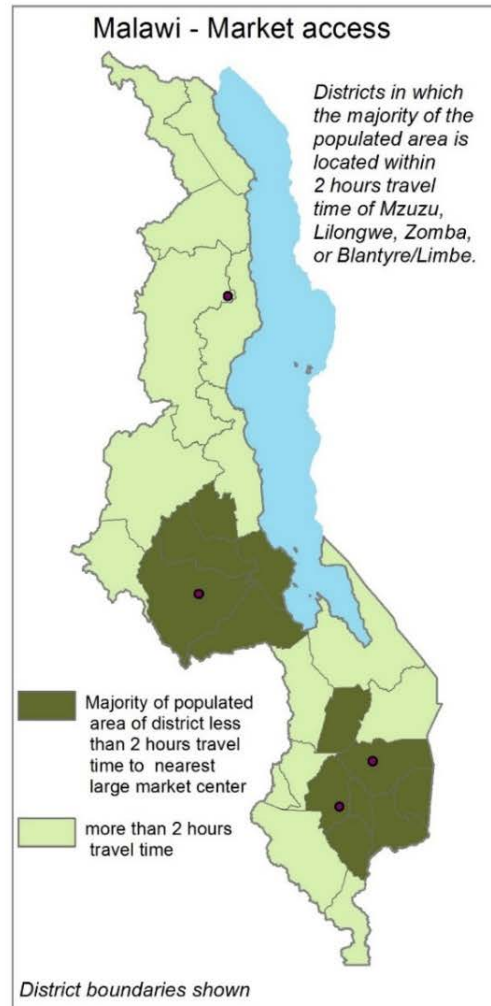
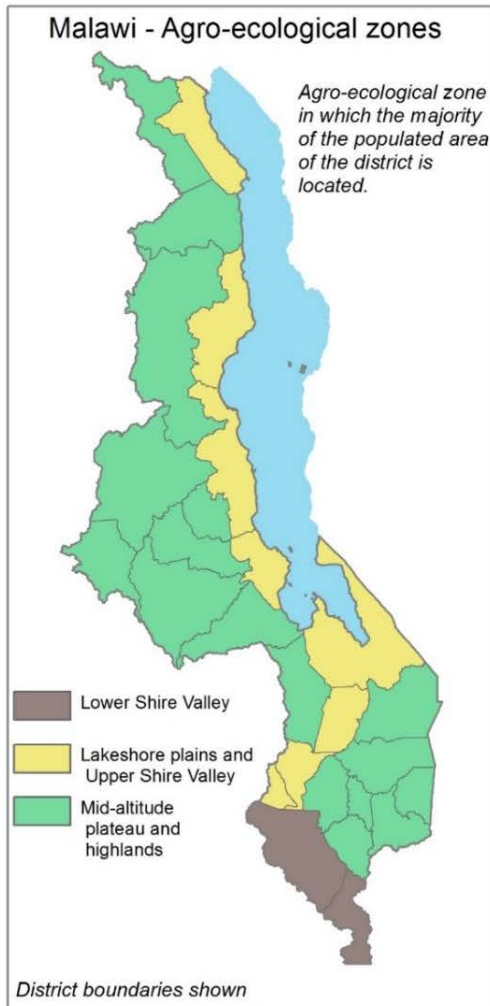
First level: Agricultural development domains

- Incorporate information on determinants of agricultural development potential
 - Particularly for increased agricultural commercialization
- Keep it simple
 - If bring in too many factors into consideration, will be difficult to use in establishing strategic objectives for agricultural development

Three spatial data layers for agricultural development domains

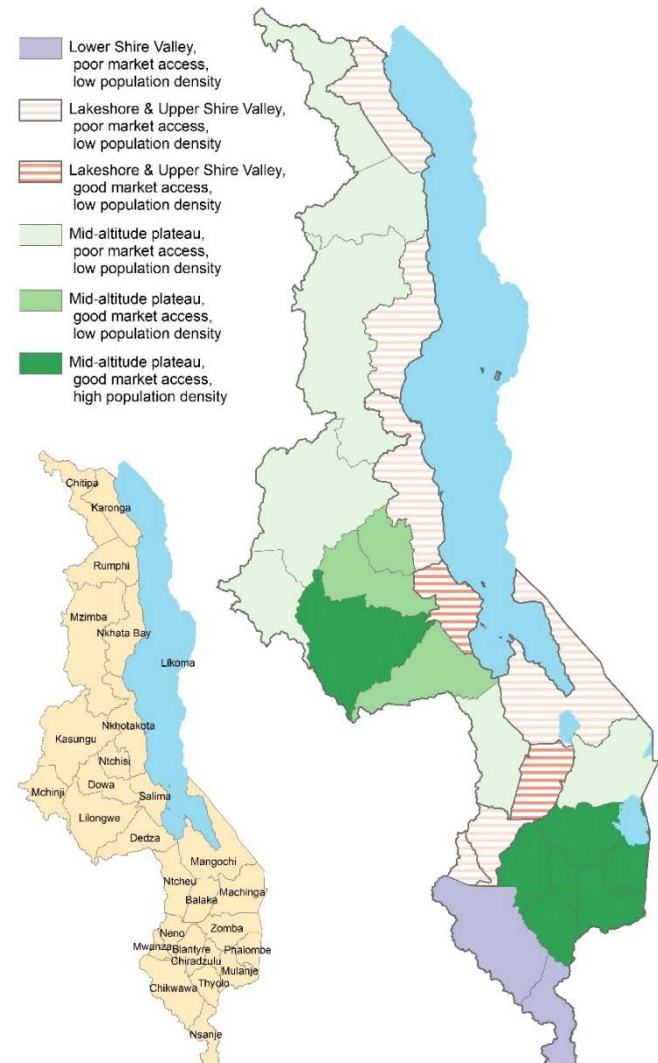


Aggregate data to district level



Intersect data layers to define agricultural development domains

- Six agricultural development domains resulted
- Different agricultural development potentials for the different domains
 - Different agricultural development strategies should be considered for areas found in different domains
 - Common general strategies possible for areas in same development domain



Second level: Bringing in detailed, sub-sector specific spatial information

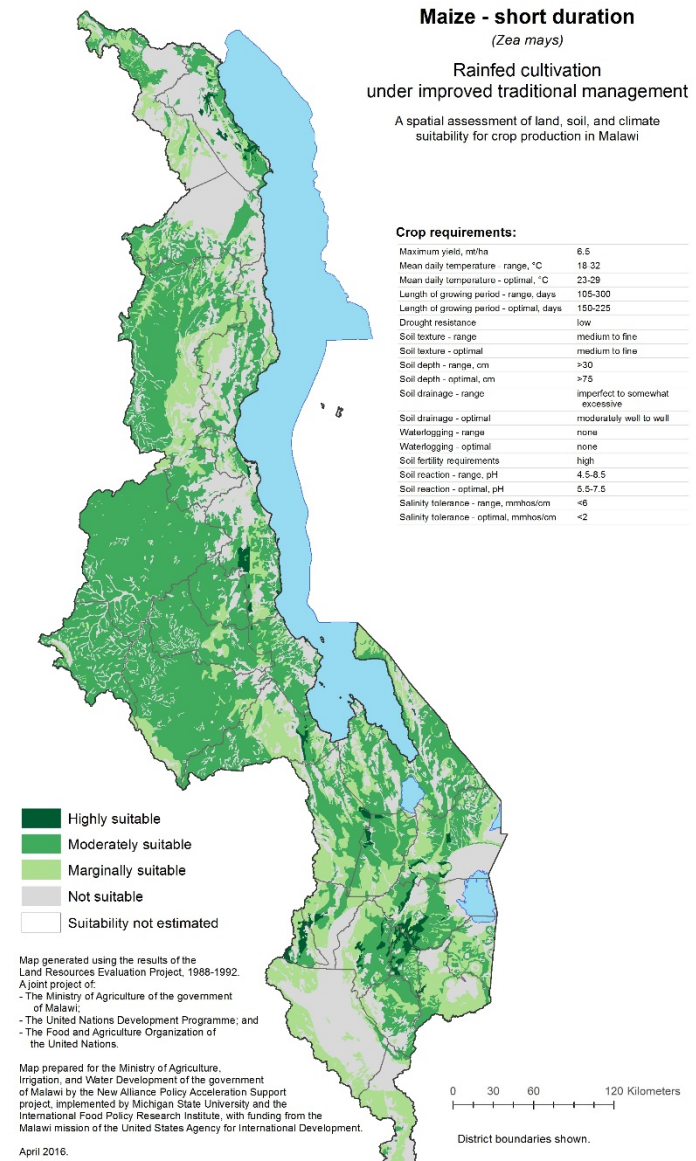
- The development domain zonation aids in strategizing on agricultural development options
 - Particularly with regard to commercial agriculture investments
- However, once a broad outline of a spatially-informed agricultural development strategy is in place, sub-sector specific analyses are required
 - To determine the design of actions to be taken
 - Draw upon a considerably broader range of both spatial and non-spatial data to do so

Crop suitability maps from Malawi Land Resources Evaluation Project (LREP)

- For planning crop-related investments, LREP crop suitability maps are important information source
 - LREP carried out by Ministry of Agriculture and FAO between 1988 and 1992
 - Involved relatively detailed mapping of the soils and agro-climate zones of Malawi
 - ‘Land units’ then identified from unique combination of soils and climate characteristics
 - Suitability analysis done for production of specific crops and tree species for each land unit across Malawi
 - 43 crop x management regimes; 16 tree species

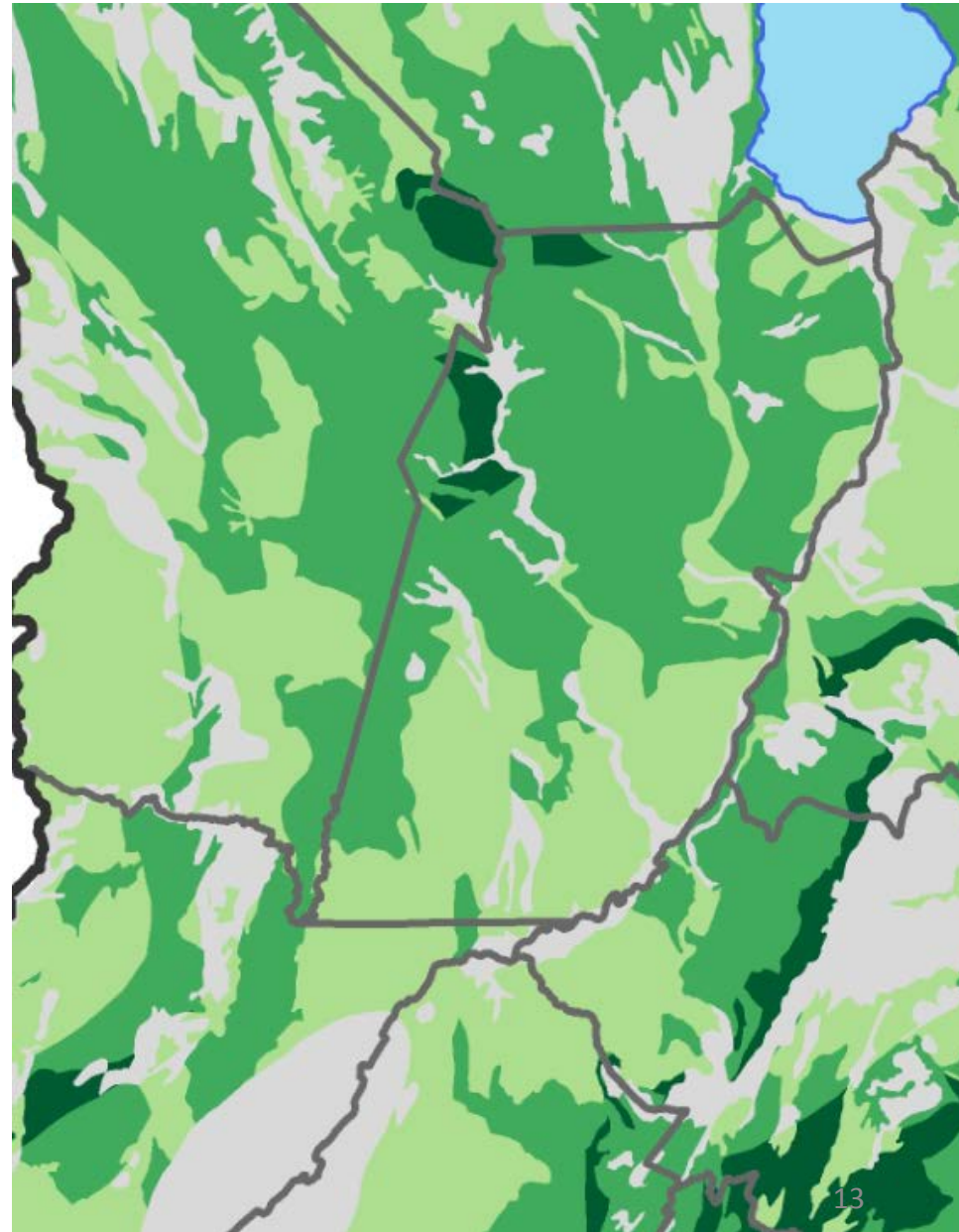
Suitability map for maize (short duration)

- Results in national crop suitability map
- Based on optimal agro-ecological conditions for crop
 - From agronomy literature
- Four suitability levels
 - Linked to likely crop productivity level in a given land unit relative to maximum potential productivity under optimal agro-ecological conditions under a particular crop management regime



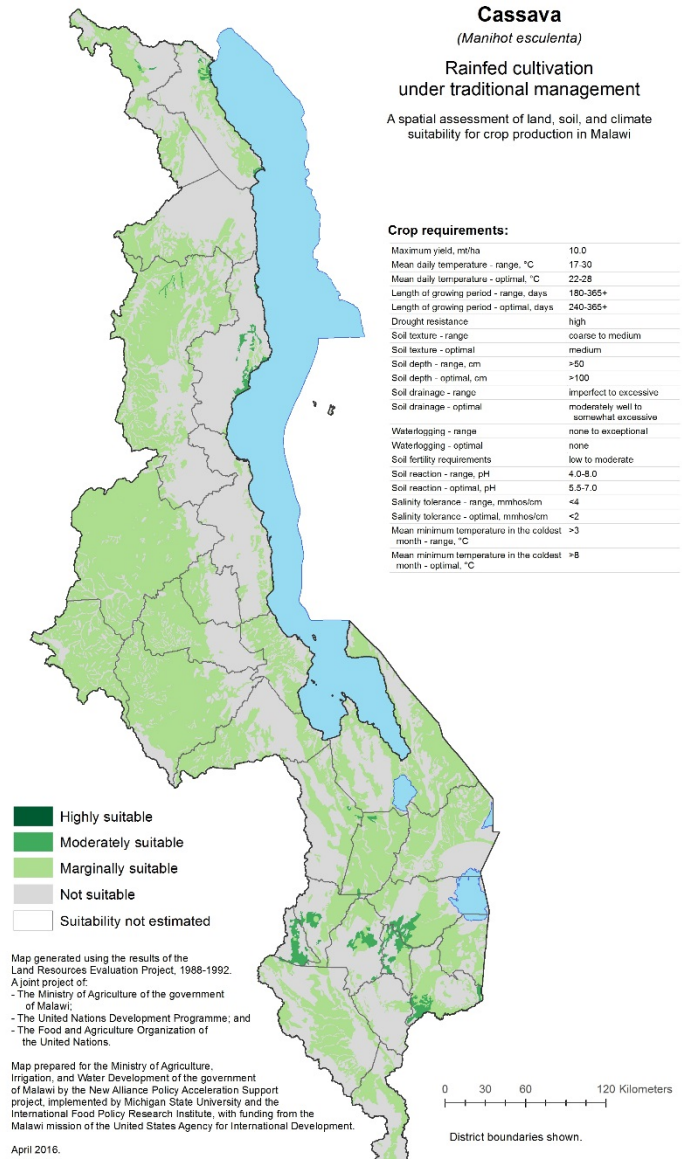
Suitability maps are relatively high resolution

- Originally mapped at 1:250,000 scale (1 cm = 2.5 km)
 - Here we zoom in on Balaka district on map for maize (short duration) shown on previous slide
- Maps permit spatial analysis of cropping potential at sub-district level (EPA, TA)
 - But not village-level



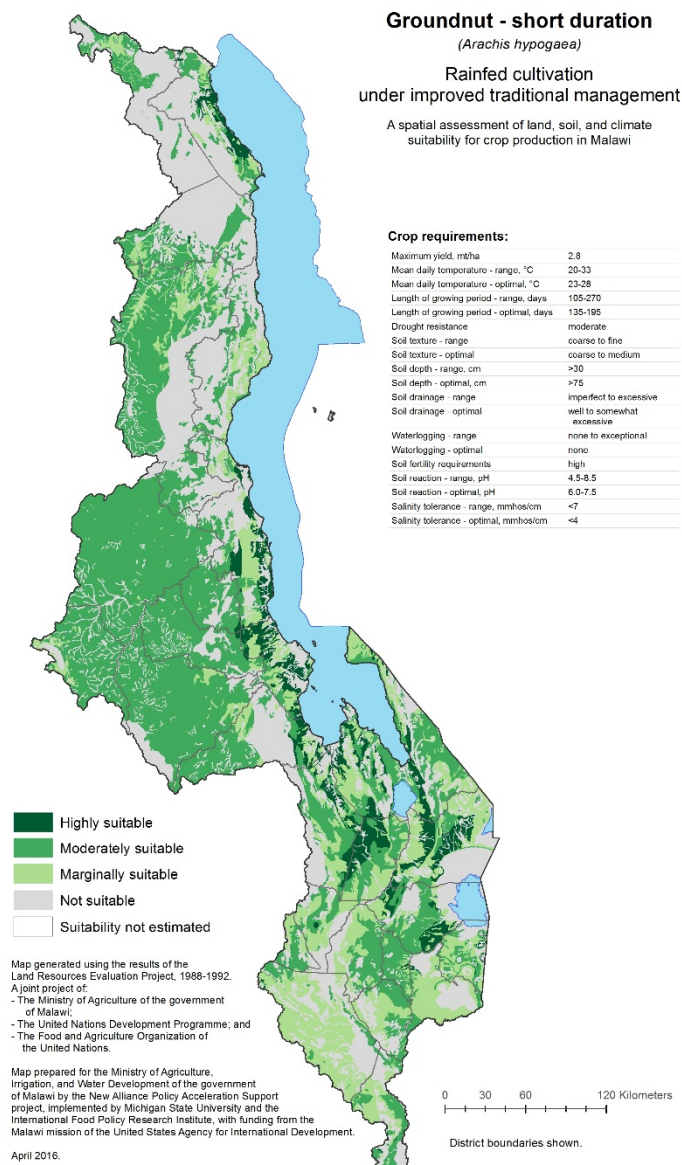
Suitability map for cassava

- Here under *traditional management*
 - Rather than *improved traditional management*
- While cassava grows in most areas, it is not highly suitable for anywhere in Malawi
 - Primarily due to moisture and temperature constraints



Suitability map for groundnut

- Broad areas that are moderately suitable for groundnut production
 - Particularly mid-altitude plateau
- Short duration groundnut more highly suited for production along lakeshore plain and in Upper Shire valley



Suitability maps for tree species

- Suitability maps also prepared for 16 tree species
- Here *Faidherbia albida* (Msangu)
 - An important agroforestry species in traditional farming systems across Africa
 - Particularly common on lakeshore plain, but map shows scope for expansion

