Managing Soil resources and Food Security in South Asia and Sub-Saharan Africa

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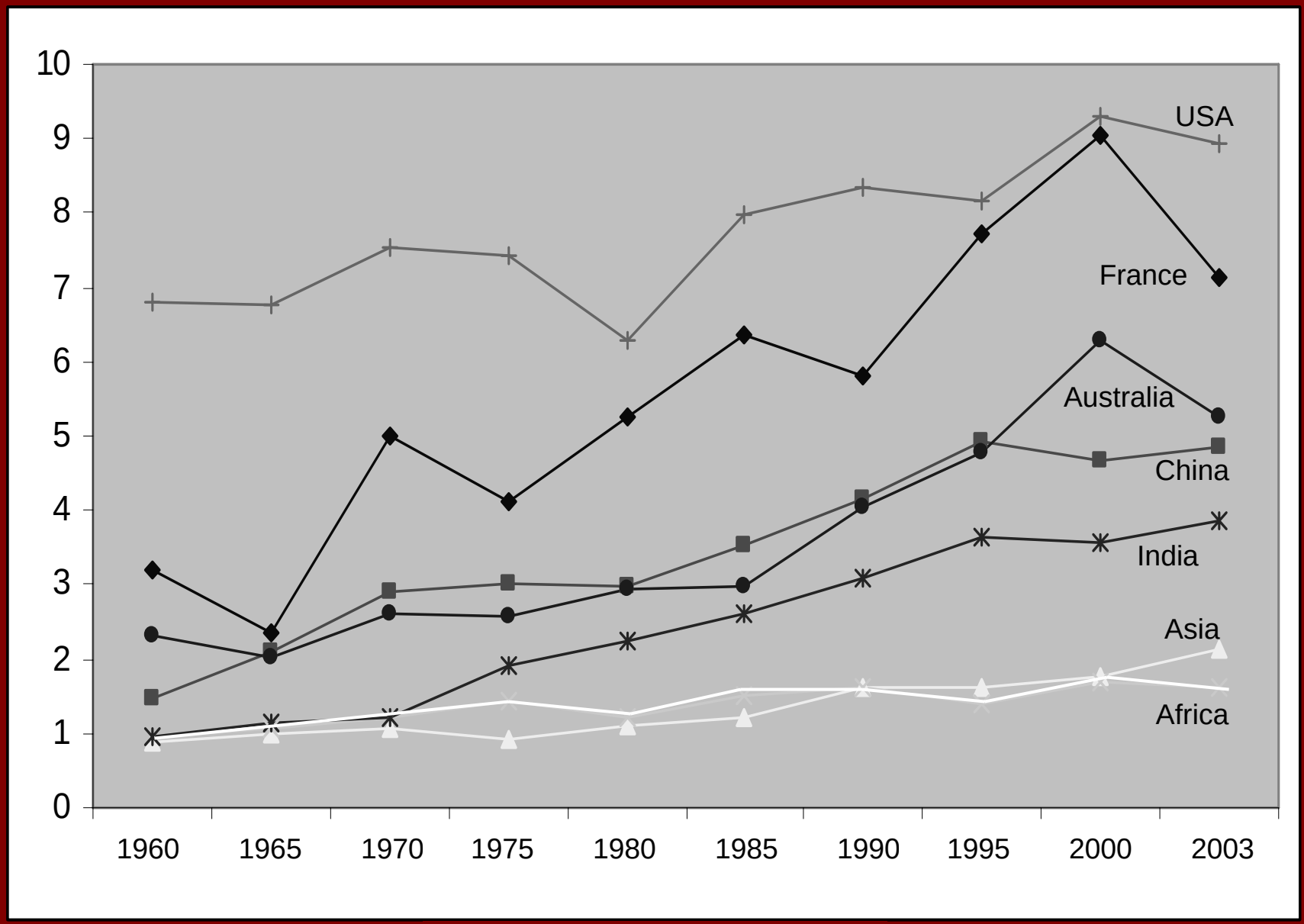
Temporal changes in corn grain yield (Redrawn from FAO Production Yearbooks)



Causes of Low Crop Yields in SA and SSA

a. Small Size Farms
b. Resource-Poor Farmers
c. Lack of input

1. **Poor soil quality: nutrients and organic matter depletion, soil erosion and degradation**
2. **Recurring drought**
12. **Climate change and related problems**
15. **Population growth**

Soil Degradation in South Asia (FAO, 1994)

Process	Area Affected (10^6 Ha)
Water Erosion	82
Wind Erosion	59
Nutrient/OM Depletion	11
Waterlogging	5
Salinization	42
Lowering of ground water	20
Annual Deforestation	0.6

- Irrigated cropland is ~60%
- Fertilizer rate is 100 kg/ha in irrigated and 10 kg/ha in rainfed crops

- Only 5% of cropland is irrigated in SSA
- The fertilizer use is <10 kg/ha

Established Management Practices to Maintain Soil Productivity

Issue	Management
1. Soil and water conservation	Mulching, no-till farming, cover cropping, agroforestry and contour hedges, terracing, controlled grazing
2. Drought management	Water harvesting, recycling, supplemental irrigation
3. Soil fertility management	INM, precision farming, BNF
4. Land reform	Land tenure, land use planning

Native Shrubs

Piliostigma reticulatum *Guiera senegalensis*

Play multiple roles in improving soil quality.

However, alternative sources of fuel are needed to protect these shrubs

Aerobic Rice

Specific varieties that can be grown as wheat or corn can save water and improve WUE.

However, weed control is needed.

New, Innovative & Emerging Technologies

1. Remote sensing of plant physiology for nutrient management and soil quality (e.g., Normalized Difference Vegetative Index to predict plant cover).

2. Zeolites and synthesized nanomaterials for water conservation, slow release fertilizers, soil conditioners, and purifier of irrigation water.

3. Biotechnology to develop varieties tolerant to specific stresses, better root system, improved BNE.

New Technologies….cont.

4. Manipulating micro-organisms in the rhizosphere to reduce the need for off-farm input, to stimulate plant growth, and enhance drought stress.

5. Phytosimulators produced by some bacteria and fungi that increase plant growth and yield.

6. Disease-suppressive soils that suppress plant pathogens and reduce soilborne diseases.

7. Microbial enhancement of P uptake through mycorrhizal association.

Potential Yield Increase With Soil Quality Improvement

- Quadrupling the current yield levels is attainable.
- Potential of improved varieties cannot be realized unless grown under optimal soil conditions.