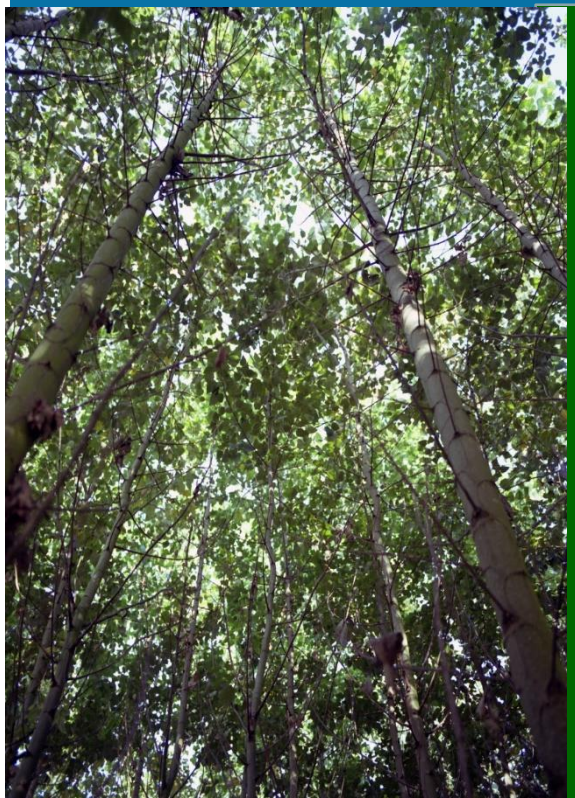
# *Bioenergy for Sustainable Development*

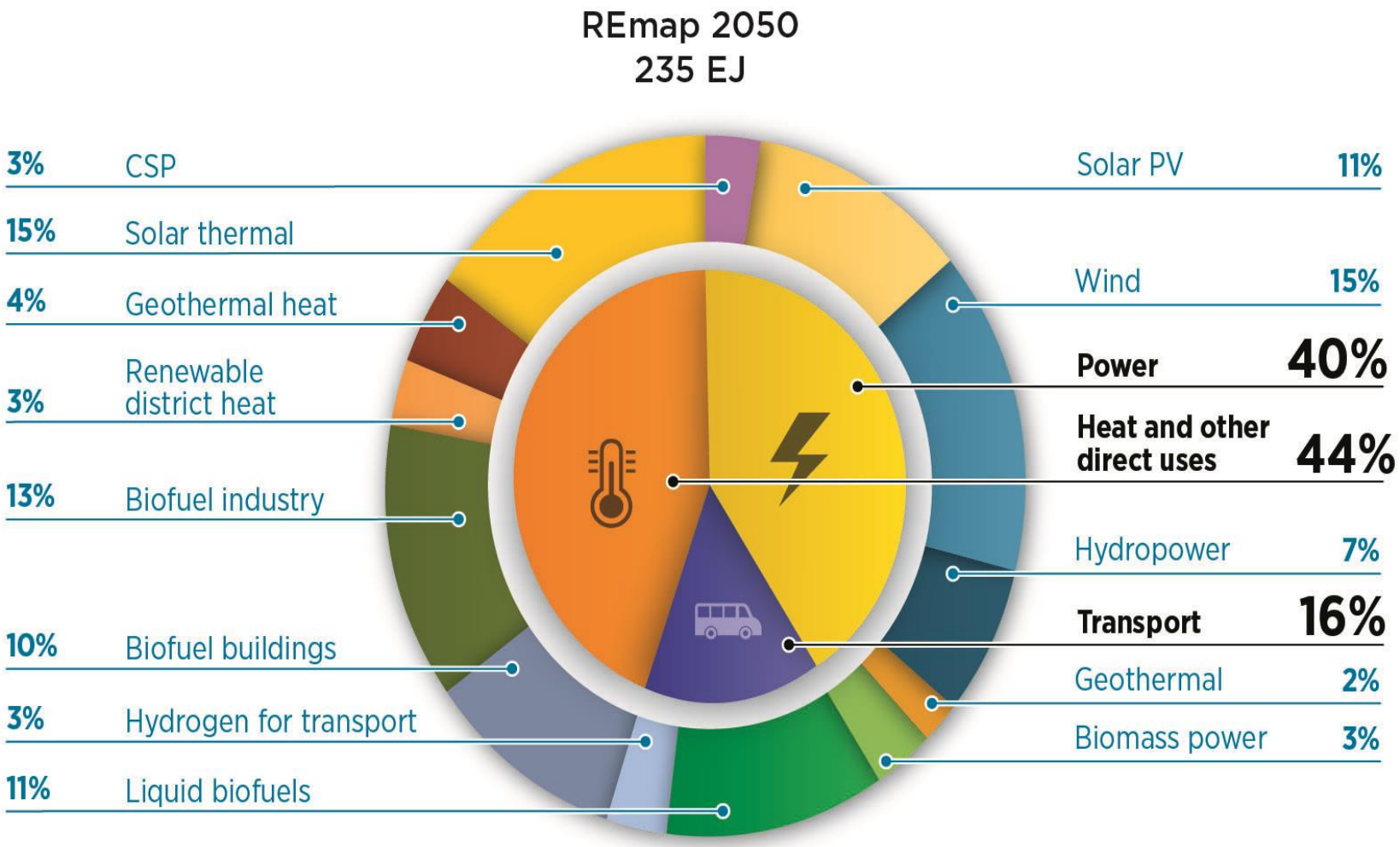


**Thematic Meeting on Bioenergy at IRENA Eighth Assembly**

**Abu Dhabi**
**12 January 2018**

**Jeff Skeer**
**IRENA**

# Major Modern Biomass Needs in 2050



# Meeting the Challenge Sustainably

- Social Challenge: Food vs Fuel
  - Sustainable intensification: higher yields
  - Allows to produce more food AND fuel.
- Environmental Challenge: Land Use Change
  - Sustainable intensification: energy crops
  - Avoid forest loss, encourage forest expansion
  - Convert degraded land to productive use
- Economic Challenge: Low Price of Oil
  - Efficient use of biomass for cooking, heat, power
  - Competition not mainly with oil in these sectors
  - Count value of reducing atmospheric pollutants

*Bioenergy for Sustainable Development*

*IRENA – International Renewable Energy Agency*
*http://www.irena.org/*

*IEA Bioenergy – International Energy Agency*
*Technology Collaboration Programme on Bioenergy*
*http://www.ieabioenergy.com/*

*FAO – Food and Agriculture Organization of the UN*
*http://www.fao.org/*

# Yield Gap: Illustrated by Maize

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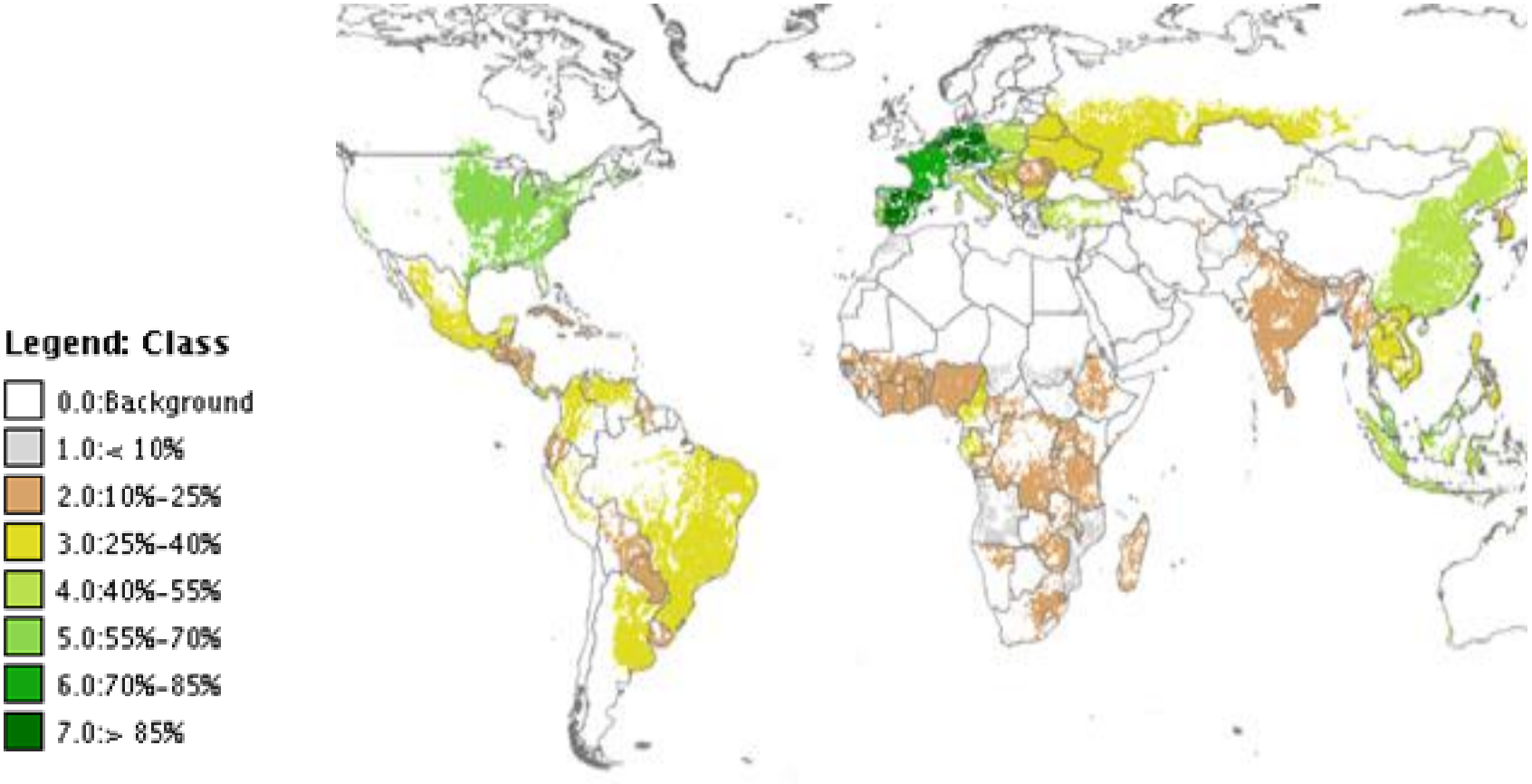
***Ratio of Actual to Potential Yield for Maize (Year 2000)***




**Source: Global Agro-Ecological Zones**

# Yield Gap: Illustrated by Wetland Rice

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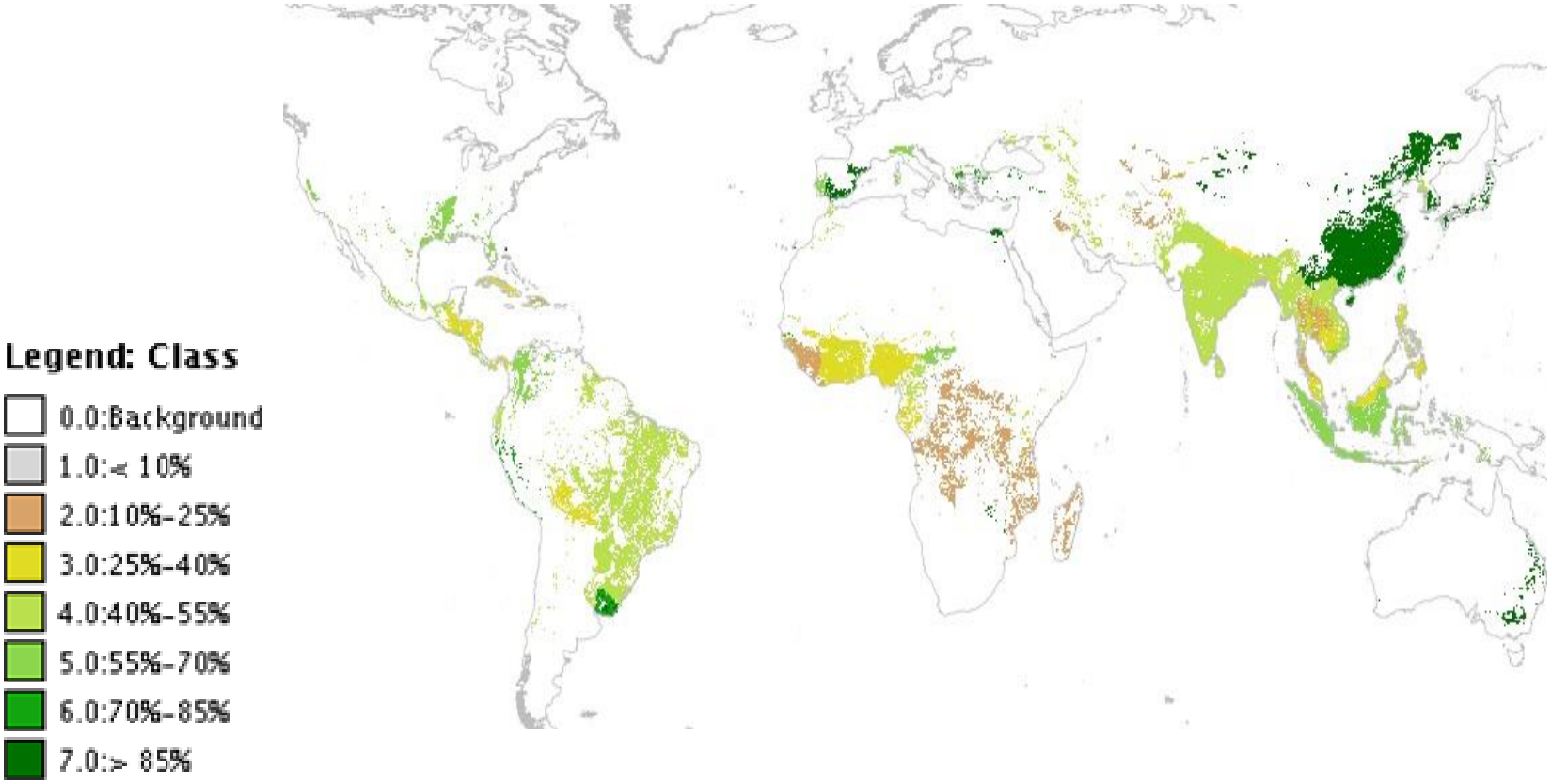
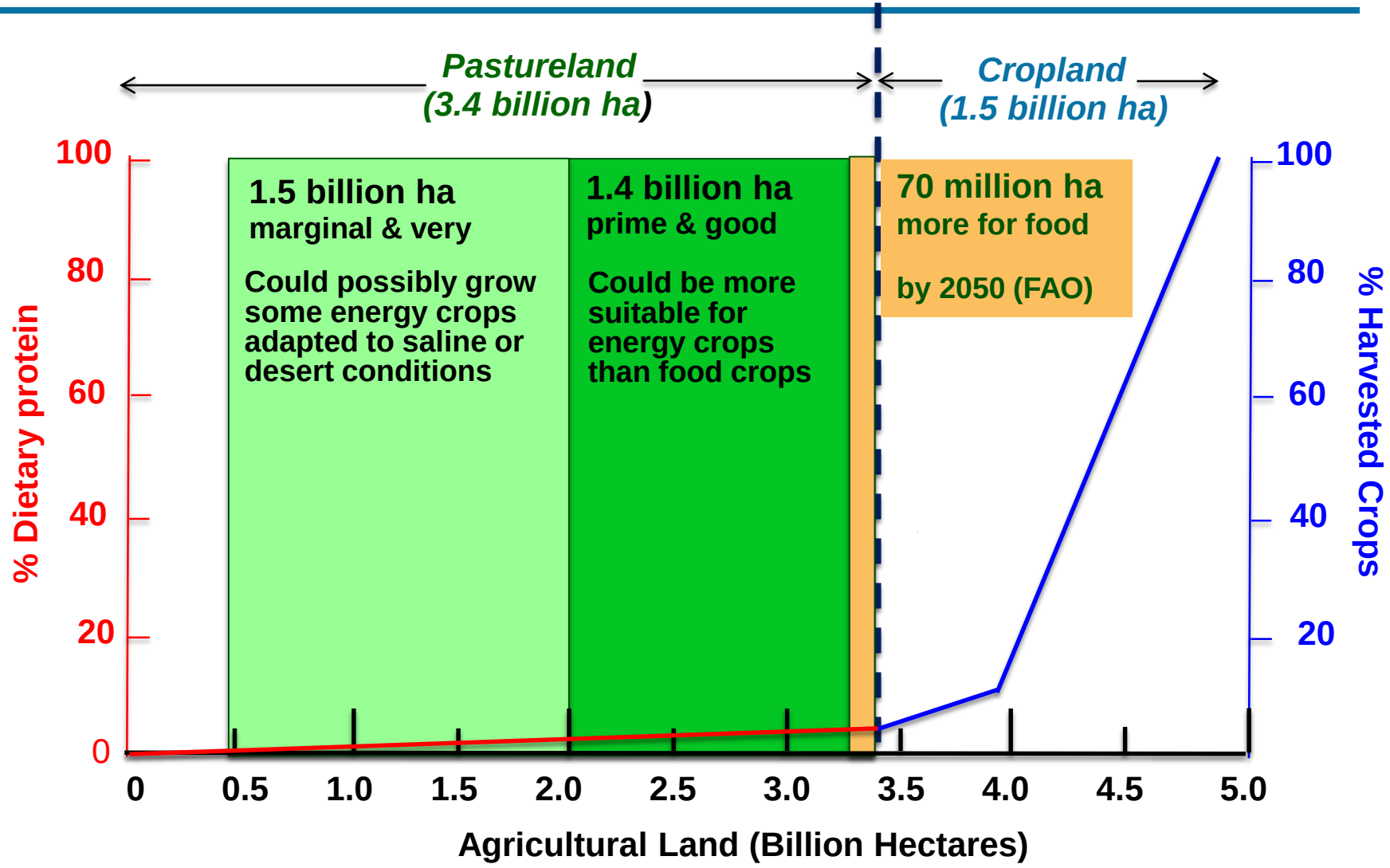
***Ratio of Actual to Potential Yield for Rice (Year 2000)***




**Source: Global Agro-Ecological Zones**

# Pastureland Available Globally for Biofuel Crops



# Expansion Measures: Higher Yields

Several measures can help **boost yields** . . . **Agricultural extension services can promote adoption of modern farming techniques** and development of good management practices at a local level, including agroforestry strategies for growing a mix of high-yielding food and fuel crops in different soils and climates. **Secure land tenure can give farmers financial incentives to manage their land for high yields while sustaining soil productivity**.

# Best Practice Losses by Food Chain Stage

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| Food Type | Agricultural Production | Postharvest Handling & Storage | Processing and Packaging | Distribution: Supermarket Retail | Consumption |
|---|---|---|---|---|---|
| **Cereals** | 2% | 2% | 3.5% | 2% | 1% |
| **Roots & Tubers** | 6% | 7% | 10% | 3% | 2% |
| **Oilseeds & Pulses** | 6% | 0% | 5% | 1% | 1% |
| **Fruits & Vegetables** | 10% | 4% | 2% | 8% | 5% |
| **Meat** | 2.9% | 0.2% | 5% | 4% | 2% |
| **Milk** | 3.5% | 0.5% | 0.1% | 0.5% | 0.1% |

# Reduced Food Chain Waste and Losses

**Food chain losses could be reduced by promoting good harvesting techniques, investing in storage and refrigeration facilities, developing transportation infrastructure** to safely deliver food to markets, **discounting imperfect food items** to encourage their sale, **modifying labels** so food is not discarded prematurely, and **educating consumers** to better match food purchases to their needs.

# Degraded Landscape Restoration

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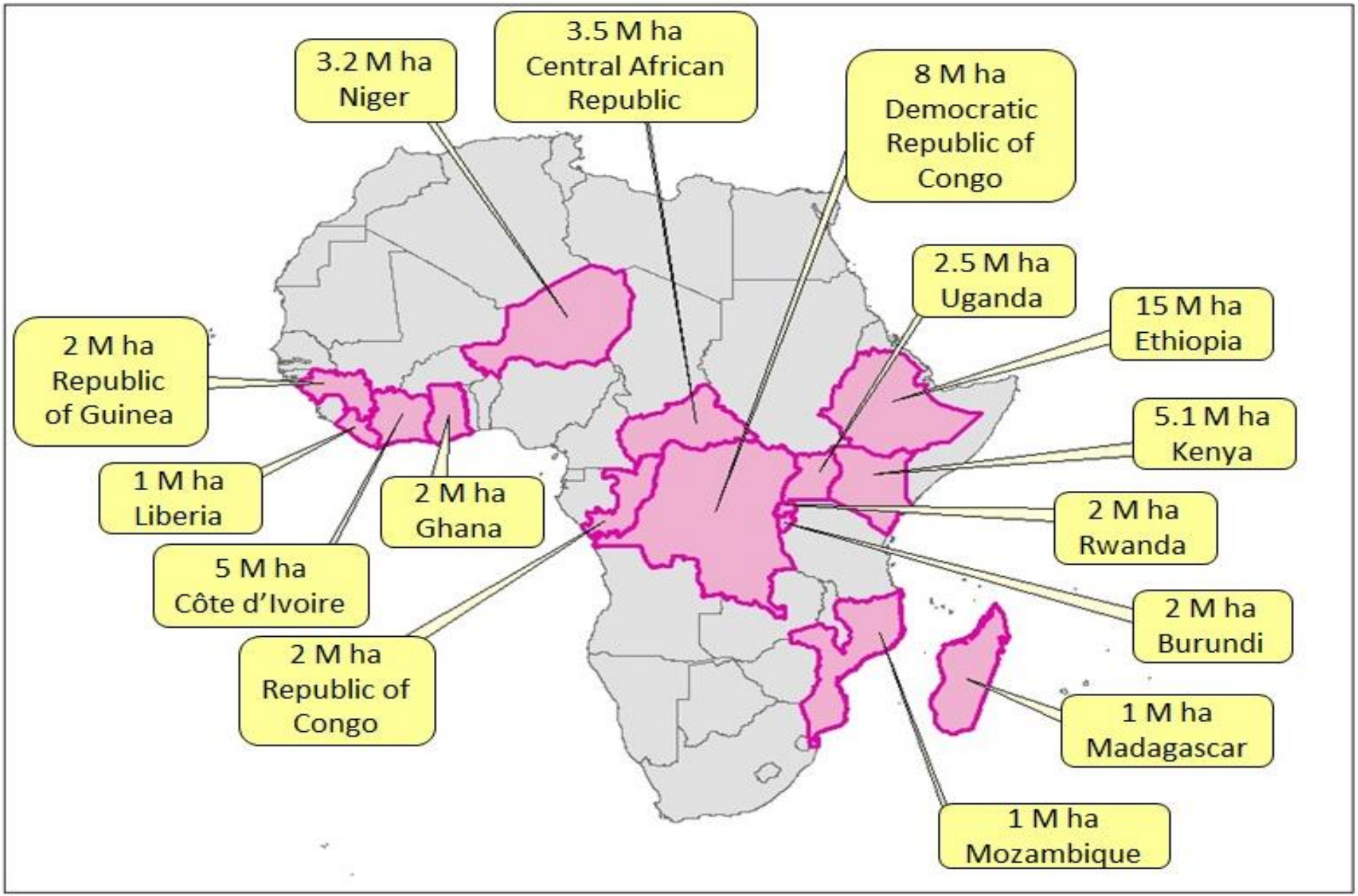

# Restoring Degraded Land

**Use of degraded or marginal land** is an option for biomass production that **helps restore soil productivity and avoids or mitigates competition for higher quality land. Economic incentives** to promote such land uses should be combined with dissemination of **information on suitable production systems** and experience from previous initiatives, while protecting vulnerable communities.

# Potential Land for Solid Biomass

- **Closing the Yield Gap: 550 M ha**
- **Better Use of Pasture Land: 950 M ha**
- **Reduced Food Chain Losses: 270 M ha**
- **Landscape Restoration: 350 M ha**
- **TOTAL: OVER 2 BILLION HECTARES, 300 EJ**

# Farm and Forest Residues

- **Farm Residues** (46-95 EJ of bioenergy)
- **Forest Management** (27 EJ of bioenergy)
- **Forest Residues and Waste** (15-30 EJ of bioenergy)
- **Modern Cookstoves** (8-17 EJ of bioenergy conserved)

## Farm and Forest Residues

Other steps can support **better use of residues and waste from agriculture and forestry value chains**. Examples include incentives for sustainable use of residues, supported by **guidelines to ensure appropriate residue extraction rates** in different conditions. **Soft loans for machinery** can further support the ramping up of bioenergy systems that use residues and waste as feedstock… **Logistical approaches** for cost-effective harvesting and transport of … residues can be disseminated.

# IRENA Bioenergy Work – 3 Pillars

- **Sustainable resources**
- **Technology pathways**
- **Scale-up tools and strategies**

# Sustainable Resource Pillar

- **SR-1 Sustainability Outreach to Build Support**
- **SR-2 Logistics of Collecting Sustainable Feedstocks**
- **SR-3 Scaling Up Sustainable Sugarcane**
- **SR-4 Mass Balances: Sustainable  Use of Forest Wood**
- **SR-5 Mass Balances: Sustainable Use of Farm Residues**
- **SR-x ADDITIONAL IDEAS from IRENA Members**

# Technology Pathways Pillar

- **TP-1 Biorefineries w/ High Value Chemicals, Materials**
- **TP-2 Baseload Power from Biogas with Wind & Solar**
- **TP-3 Bioenergy Costs – Energy Cane vs Sugarcane**
- **TP-4 Case Studies: Advanced Liquid Biofuel Plants**
- **TP-5 Case Studies: Bioenergy for Agroprocessing**
- **TP-x ADDITIONAL IDEAS from IRENA Members**

# Scaleup Tools & Strategies Pillar

- **ST-1 Improved Bioenergy Simulator for a Mix of Food and Fuel Crops**
- **ST-2 Strategies to Reduce Food Chain Waste & Losses**
- **ST-3 REstore – Developing Wood on Degraded Land**
- **ST-4 Municipal Waste and Methane to Markets**
- **ST-5 Effective Bioenergy Promotion Policies**
- **ST-6 Bioenergy Scale-up Strategies for Russia**
- **ST-7 Bioenergy Scale-up Strategies for Southeast Asia**
- **ST-x ADDITIONAL IDEAS from IRENA Members**

# Thanks for listening!

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