Bioenergy Development Practices and Promotion Strategies in IRAN

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جمهوری اسلامی ایران

وزارت نیرو

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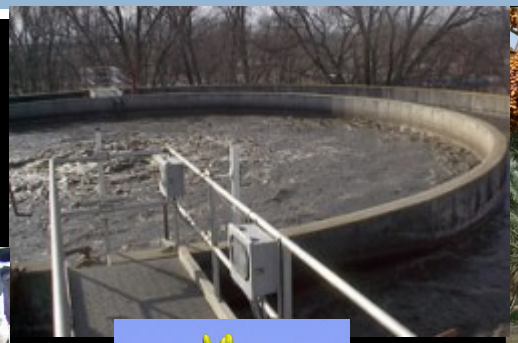
Introduction to Bioenergy

- ***Bioenergy*** is the energy contained in living or recently living biological organisms!

- Organic material containing bioenergy is known as ***biomass***.

Biomass Resources

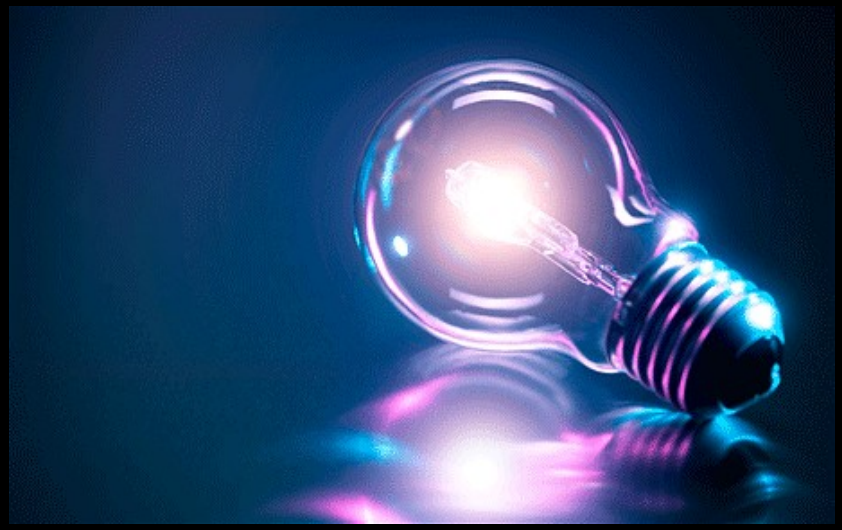

Figure 1. Manure pit opening.




MEHR

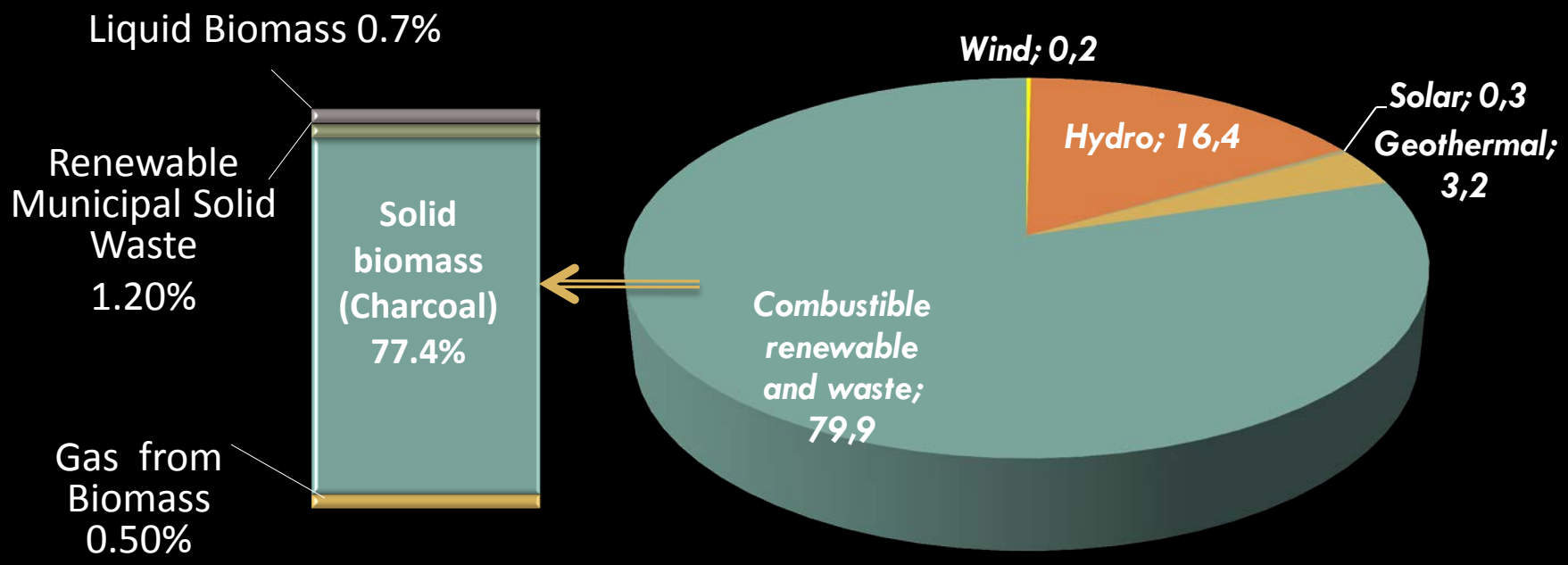

MEHR

Types of Energy from Biomass



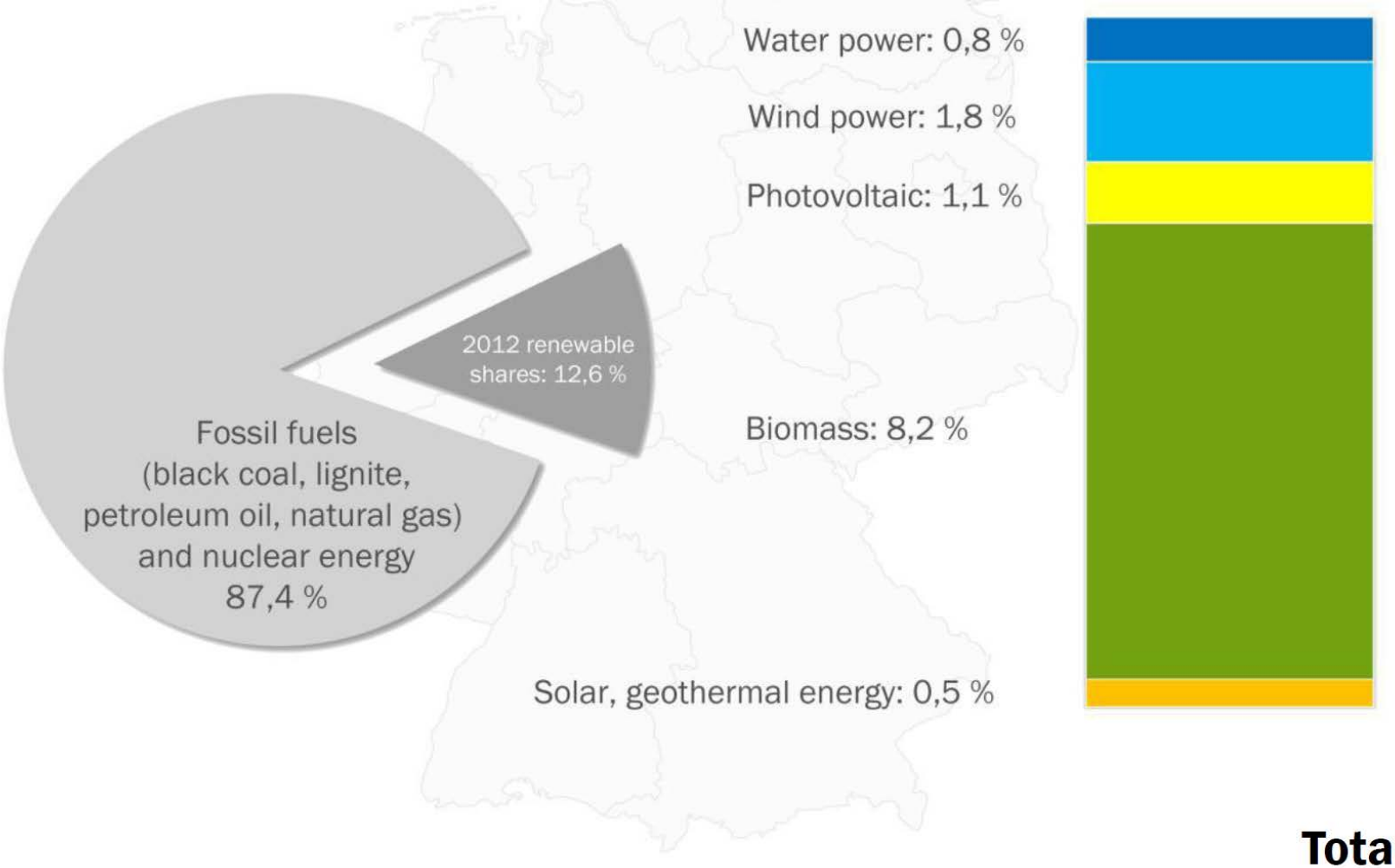
Structure of RES Share in Total Energy Supply of the World

- 10.6% world total energy supply
  - 80 % total renewable energy supply
- Solid biomass has grown at 1.8% per year since 1990
- Liquid biomass has grown at 84% annually



Source: EIA

Percentage of final energy consumption generated from renewables in 2012 - Germany

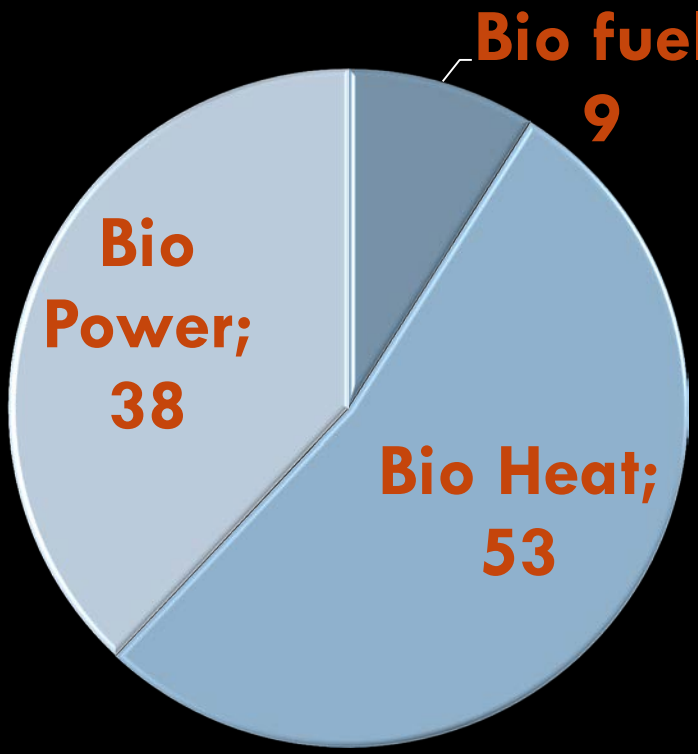


Source: Renewable energy in figures, BMU 2012 / Volke Lenz, DBFZ presentation

Share of Biomass in Renewable Energy Resources in Germany:

	Biomass Share (%)
Primary Energy Supply	61
Final Energy consumption	65.5
Electricity Generation	30
Heat Generation	91

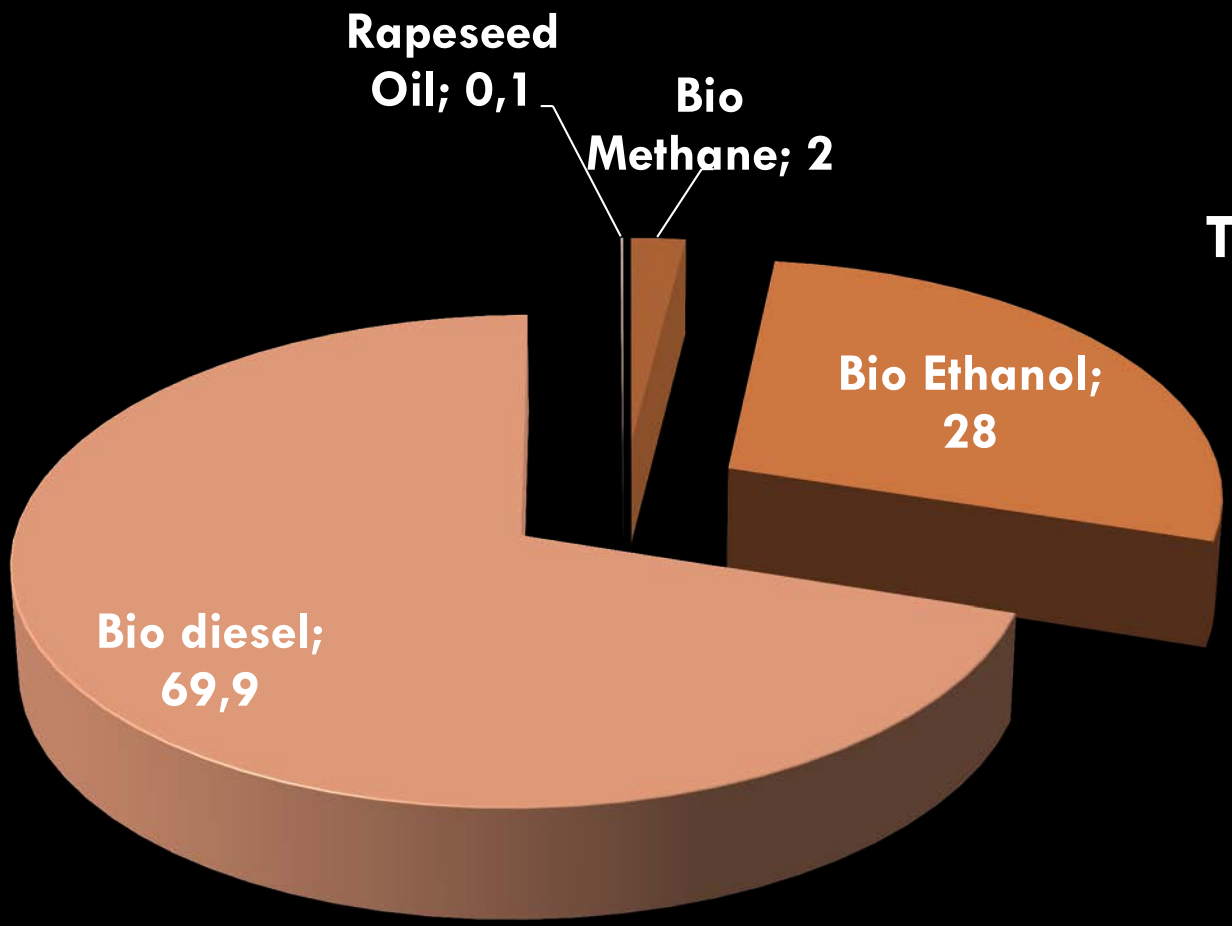
Structure of Bio Energy in 2013 Germany (%)



Total : 1286 PJ

Lenz et al., BWK, 05/2014

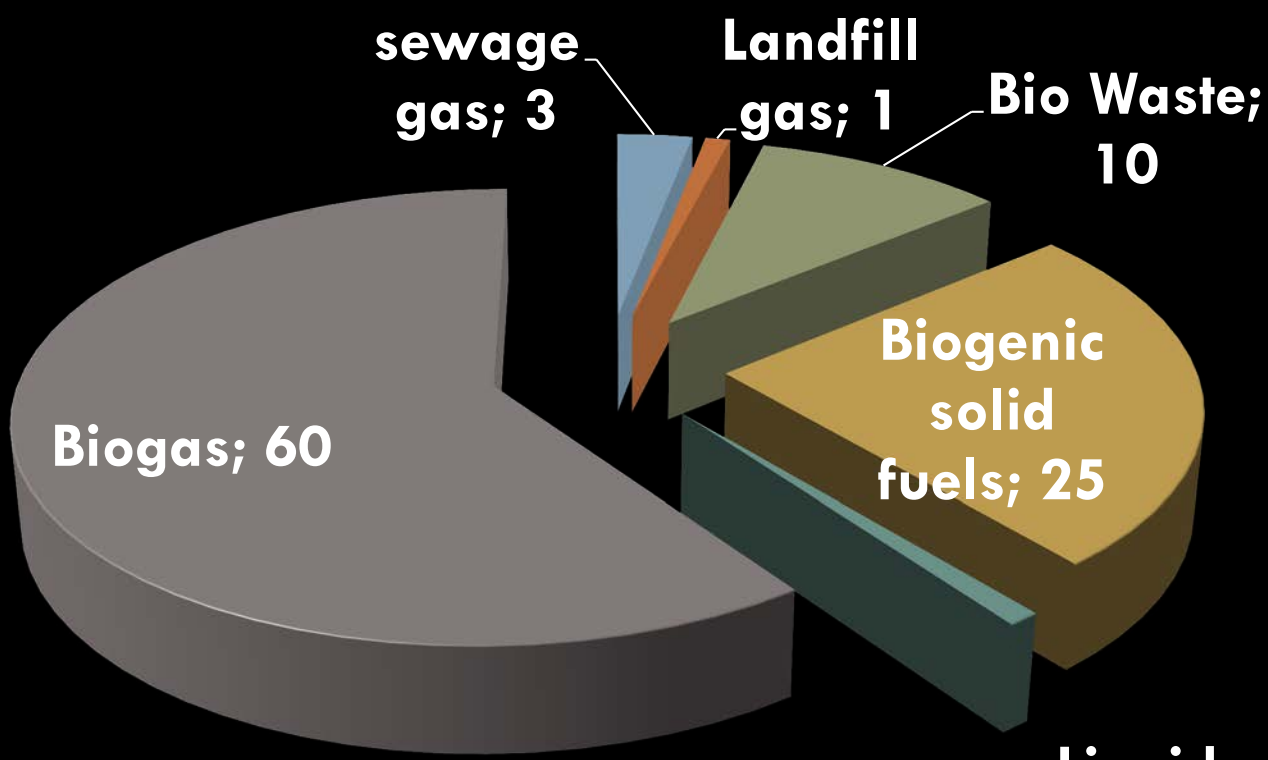
Structure of Bio fuels- Germany 2013 (%)



Total: 116 PJ

Lenz et al., BWK, 05/2014

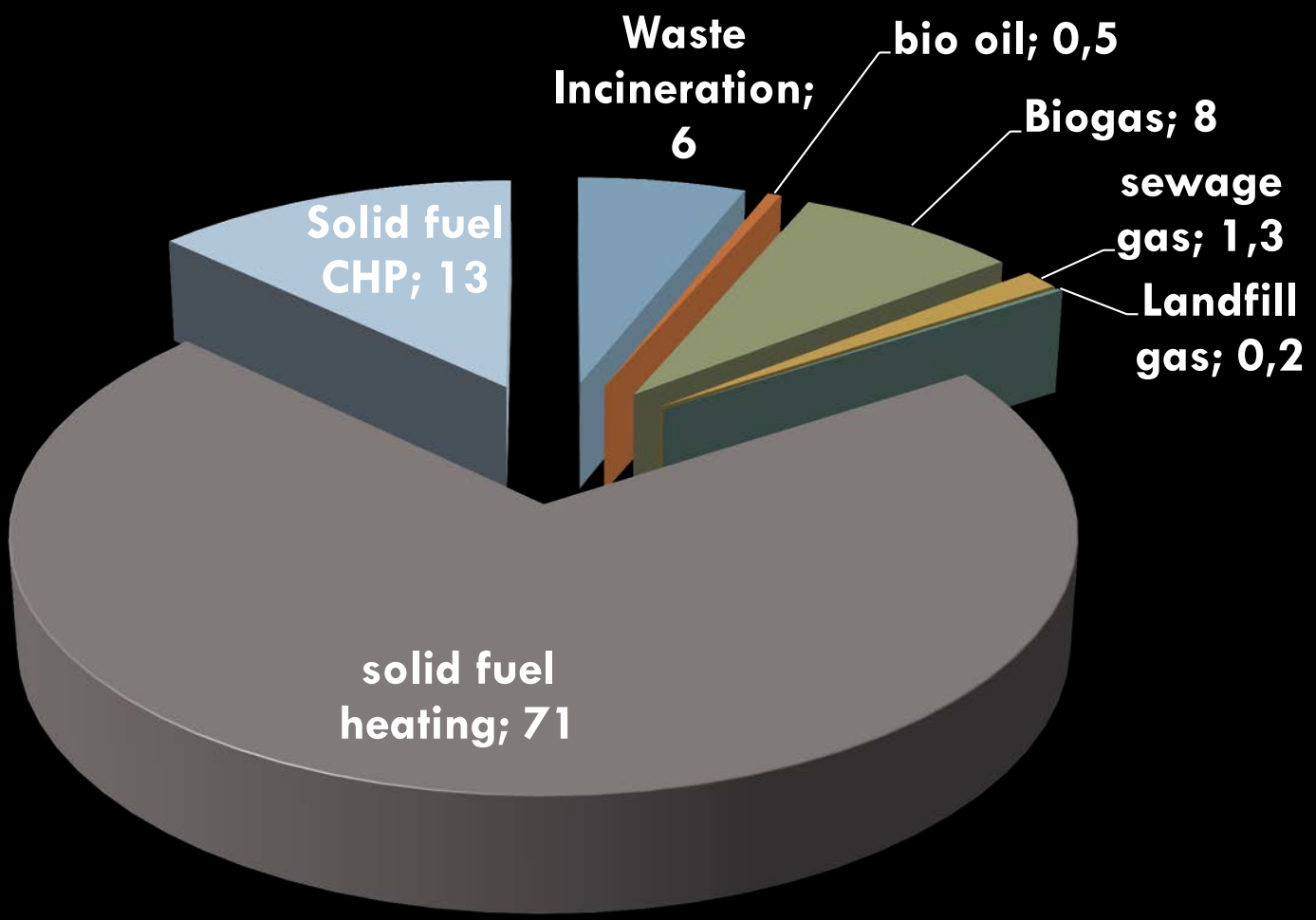
Structure of Biopower in Germany 2013 (%)



Total: 45 TWh

Lenz et al., BWK, 05/2014

Structure of Bio Heat in Germany 2013 (%)

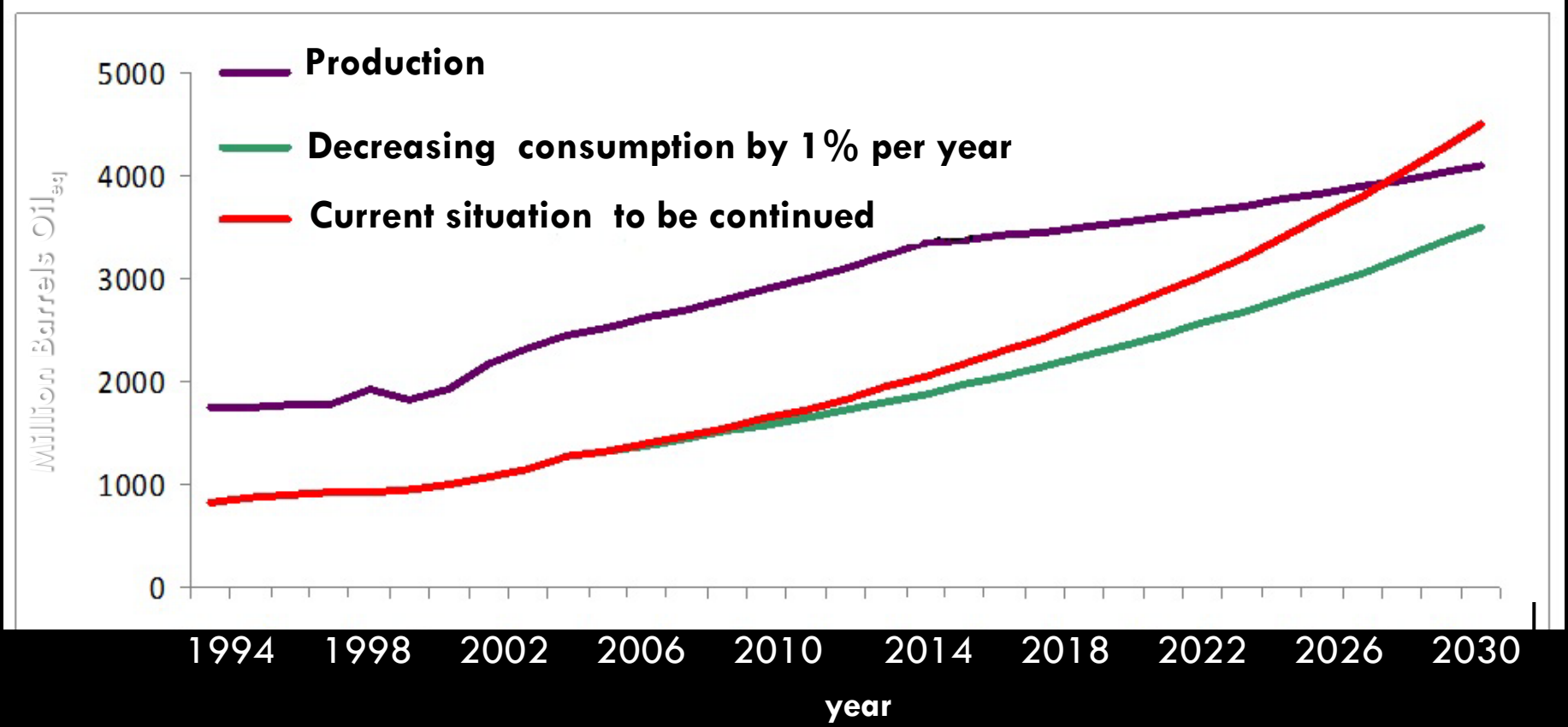


Total: 507 PJ

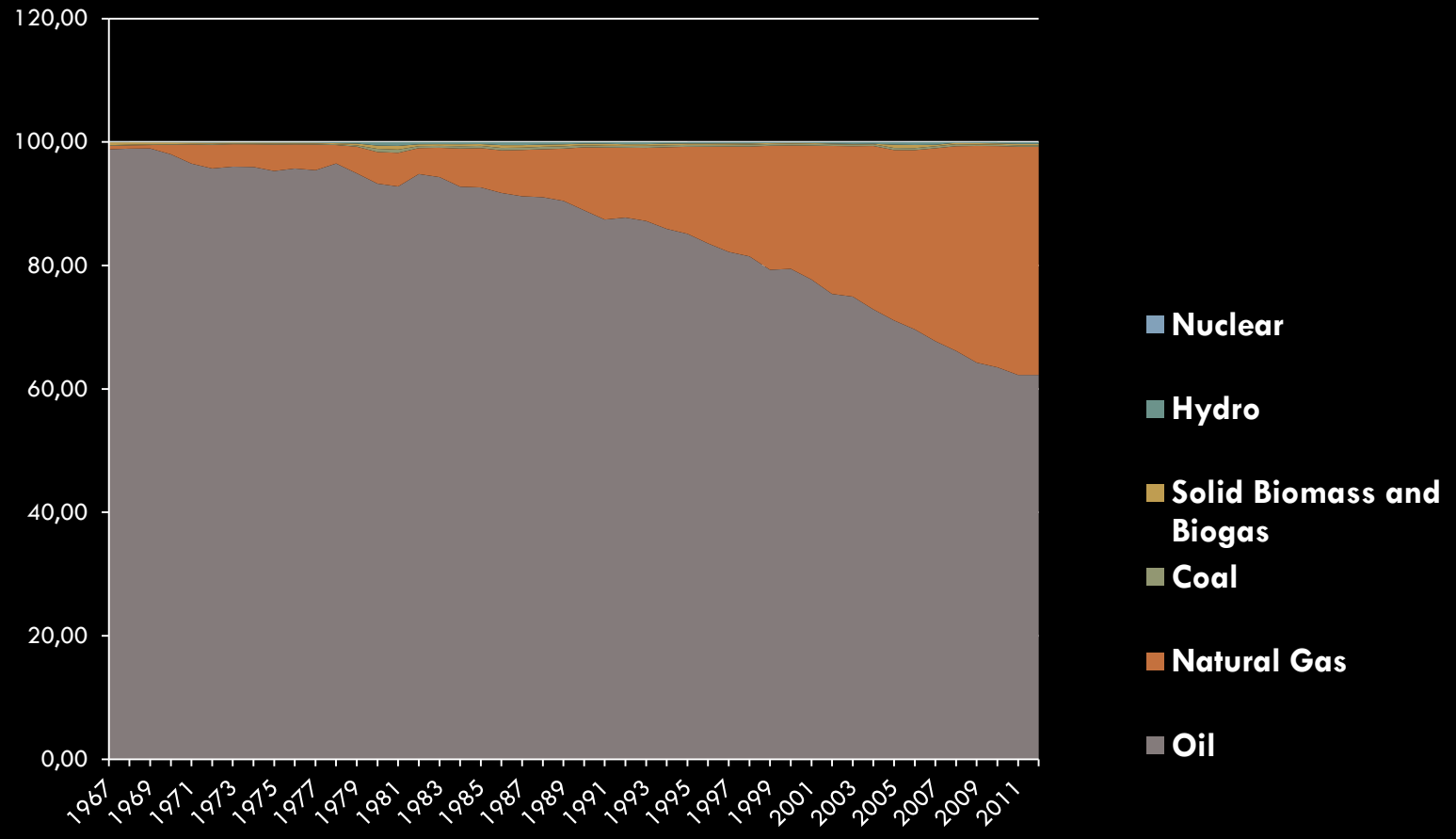
Lenz et al., BWK, 05/2014

Bioenergy Promotion in Iran ???

Domestic Energy Consumption = 44% of total Energy production

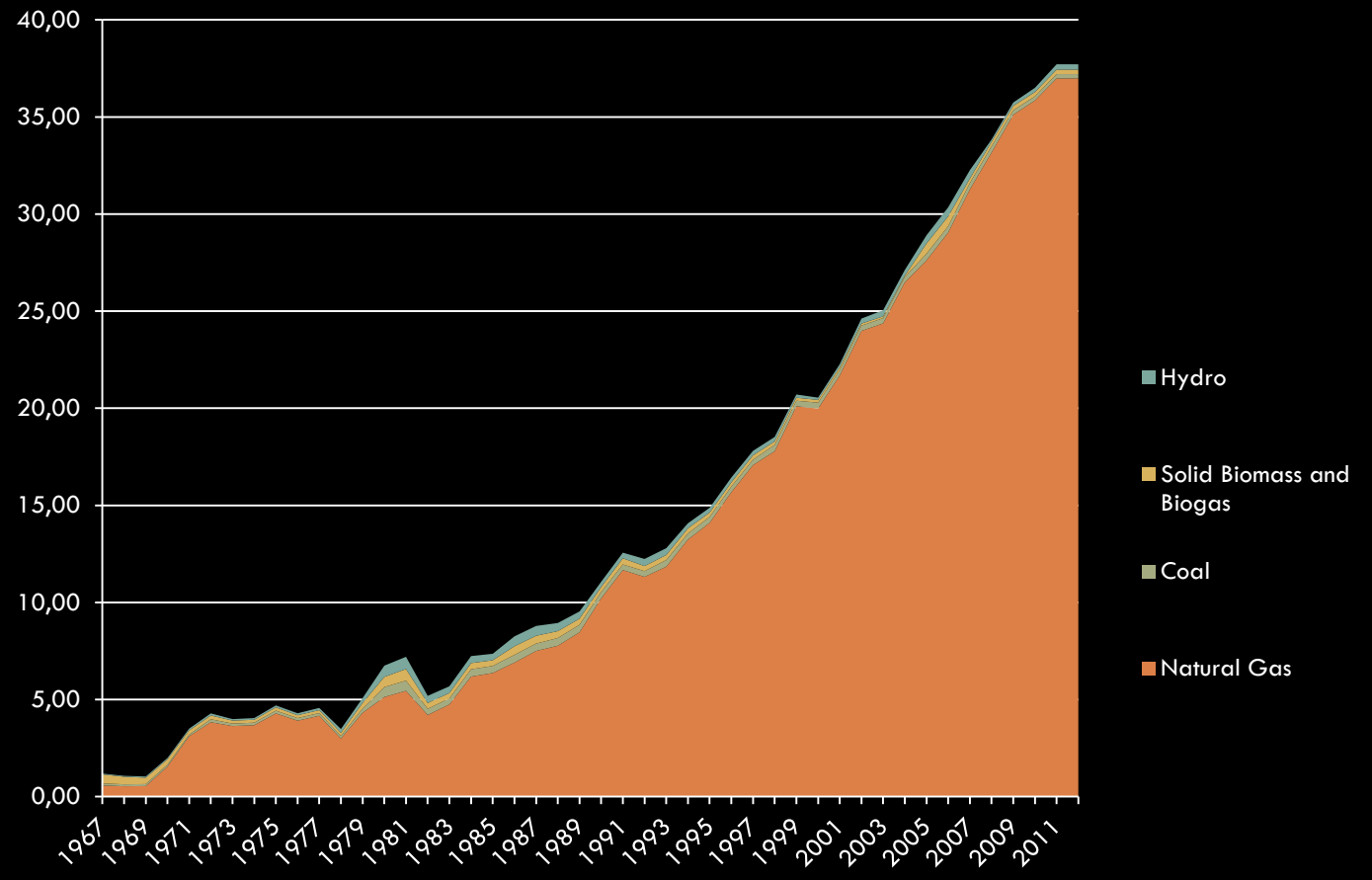


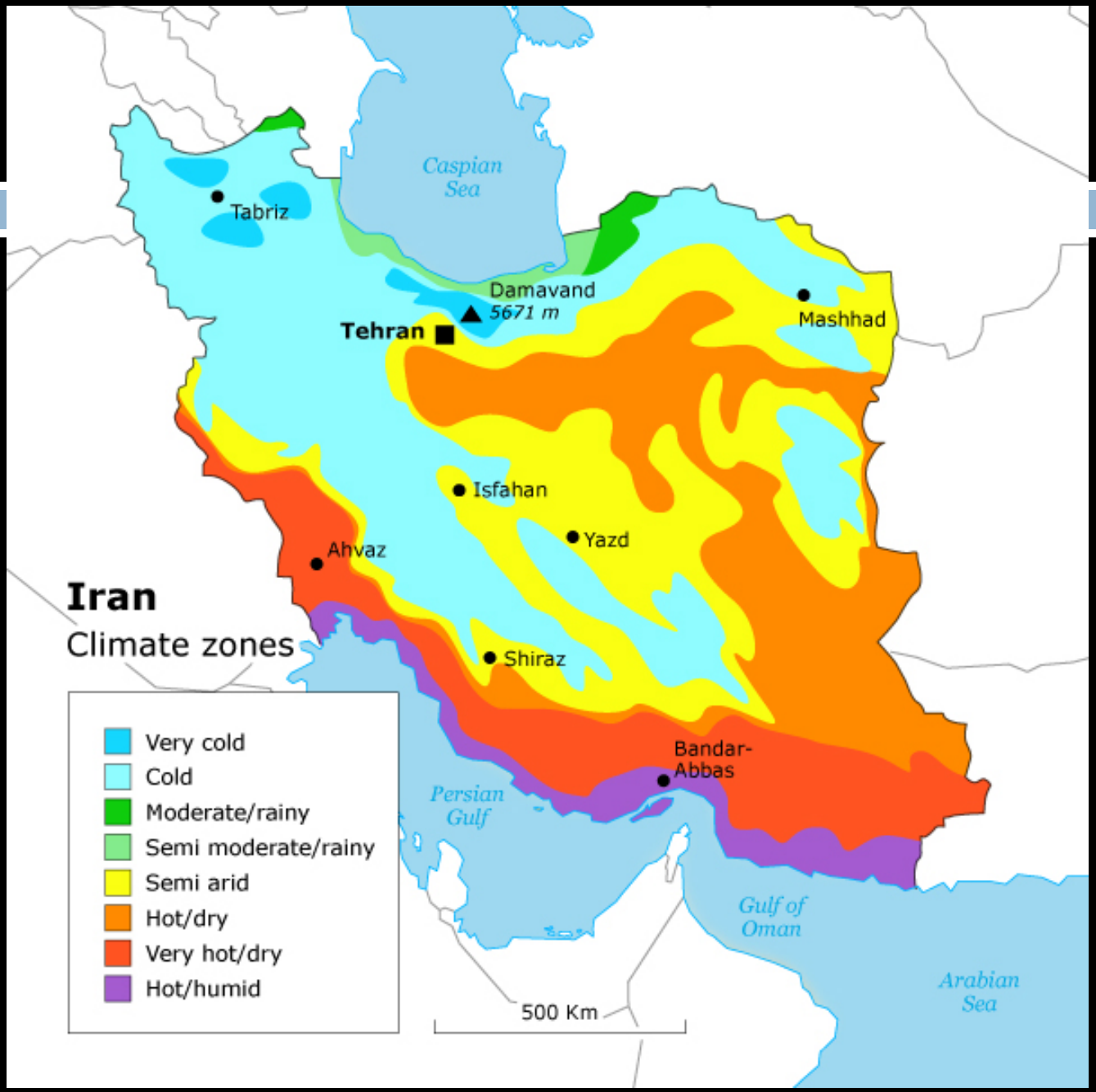
Primary Energy Supply Share of Sources (%) (1967-2012)



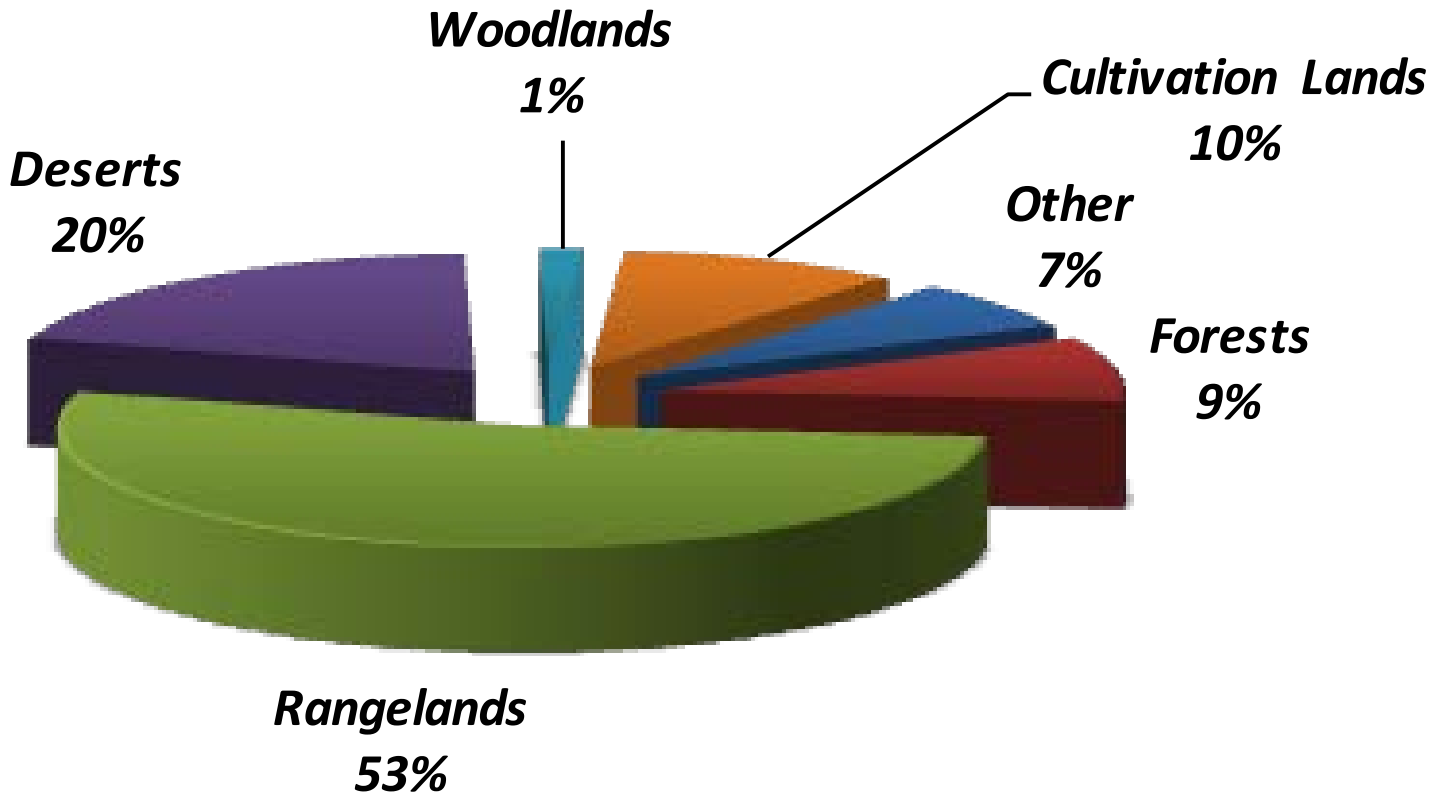
Primary Energy Supply Sources % (1967-2012)

~~Oil~~

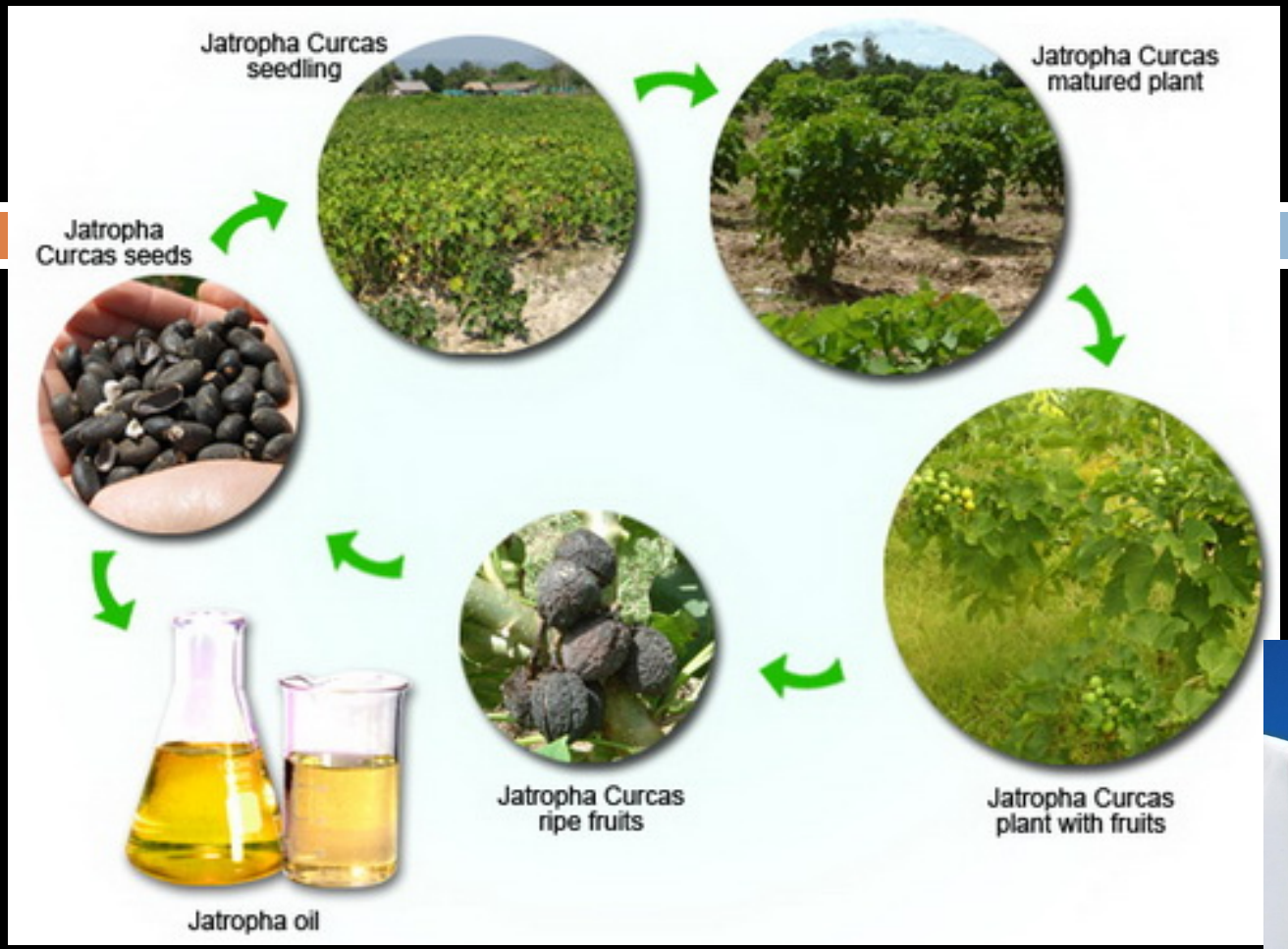



Caspian Sea
Tabriz
Damavand
5671 m
Tehran
Mashhad
Isfahan
Yazd
Ahvaz
Iran
Climate zones
Shiraz
Bandar-Abbas
Persian Gulf
Gulf of Oman
Arabian Sea
Very cold
Cold
Moderate/rainy
Semi moderate/rainy
Semi arid
Hot/dry
Very hot/dry
Hot/humid
500 Km

Iran Landuse Pattern



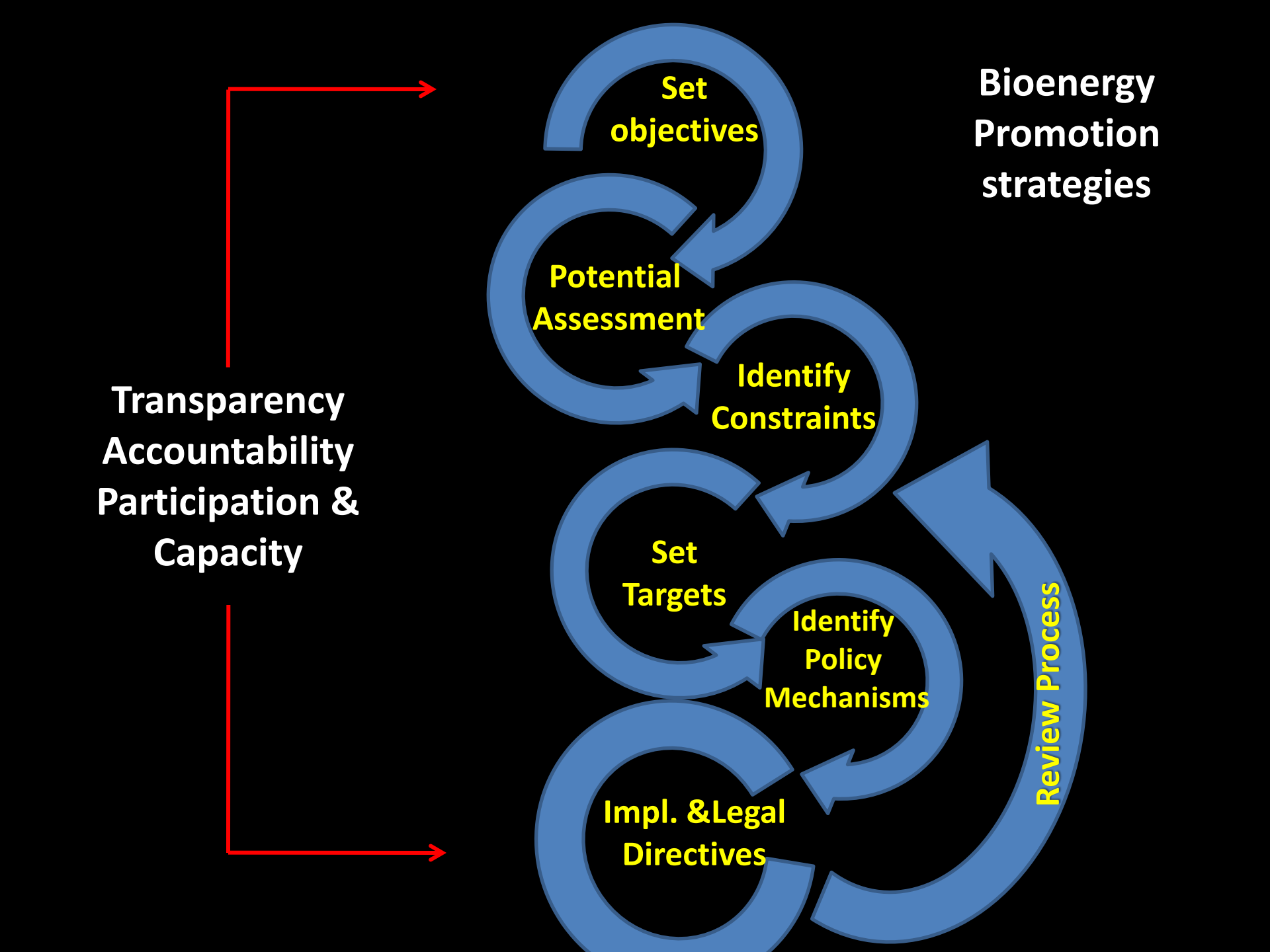

SAUDI ARABIA
QATAR
www.roobeno.com


Jatropha Curcas seedling
Jatropha Curcas matured plant
Jatropha Curcas seeds
Jatropha Curcas ripe fruits
Jatropha Curcas plant with fruits
Jatropha oil


Ultra Low Sulphur
Premium Unleaded
95
(ULSP)
BS EN 228

Bioenergy Advantages

- Diversification of Energy Sources
- Environmental and Health Benefits (waste management option)
- Economical Benefits : job creation, rural development
- Energy Security Benefits (Distributed Generation)
- Less distance between supply and demand (Electricity and Heat)
- CO2 Reduction/ CO2 Neutral
- Local Value Chains


Bioenergy Promotion strategies
Set objectives
Potential Assessment
Identify Constraints
Set Targets
Identify Policy Mechanisms
Impl. &Legal Directives
Review Process
Transparency
Accountability
Participation &
Capacity

Classification

Biomass cannot be regarded as a single product but consists of an almost countless group of products that can be classified according to:

- Physical and chemical properties (moisture content, calorific value, etc.);
- Type (energy crop, by-product/residue, waste product);
- Sector of origin (agriculture, industry, waste processing sector);
- Potential energy applications (electricity, heat, CHP or transport fuel);
- Legal status (waste or product)

Category	Class	Subclass/examples
1. Primary Agricultural Biomass (Post harvest/in farm)	Agriculture Residues	Straw
		Silage
	Horticulture Residues	Garden thinning
		Fruit waste
2. Secondary Agricultural Biomass (Processing Waste)	Solid	Rice husk and sugarcane Bagasse
		Sugar and Candy Industries' waste
		Nuts Shell
		Plant Oil industries' waste and residues
		Fruit and Vegetables Processing Industries' waste and residues
		Fodder and feed producing industries' waste and residues
		Other Industrial organic waste
	Liquid	Alcohol and Nectar Production Wastewater
		Slaughterhouse and Dairy Production Wastewater
		Meat Processing Wastewater
		Other Industrial Organic Wastewater
3. Primary Forestry Residues (Natural/Plantations)	Logging Residues	Stump
		Residual Foliage
		Sawdust
	Forest Fuel	Wood Fuels
		Charcoal
4. Secondary Forest Biomass	Sawmill Residues	Residues from round wood processing
	Residues from Wood (panel) Material Production	Veneer and Plywood Production Residues
		Fiberboard Production Residues
		Particleboard Production Residues
		Laminate and Parquets Production Residues
	Carpentries	

Biomass Resources Classification

1. **Primary Agricultural Biomass (on-farm post harvest residues)**
2. **Secondary Agricultural Biomass**
3. **Primary Forestry Residues**
4. **Secondary Forest Biomass**
5. **Urban Waste**
6. **Manure**
7. **Energy Crops**

1. Primary Agricultural Biomass

Primary residues – Wheat, barely straw, sugarcane top, maize stalks;…
Horticulture: thinning,…

2. Secondary Agricultural Biomass

- **Solid:**
  - » Rice husk and sugarcane Bagasse
  - » Sugar and Candy Industries' waste
  - » Nuts Shell
  - » Plant Oil industries' waste and residues
  - » Fruit and Vegetables Processing Industries' waste and residues
  - » Fodder and feed producing industries' waste and residues
  - » Other Industrial organic waste
- **Liquid**:
  - » Alcohol and Nectar Production Wastewater
  - » Slaughterhouse and Dairy Production Wastewater
  - » Meat Processing Wastewater
  - » Other Industrial Organic Wastewater

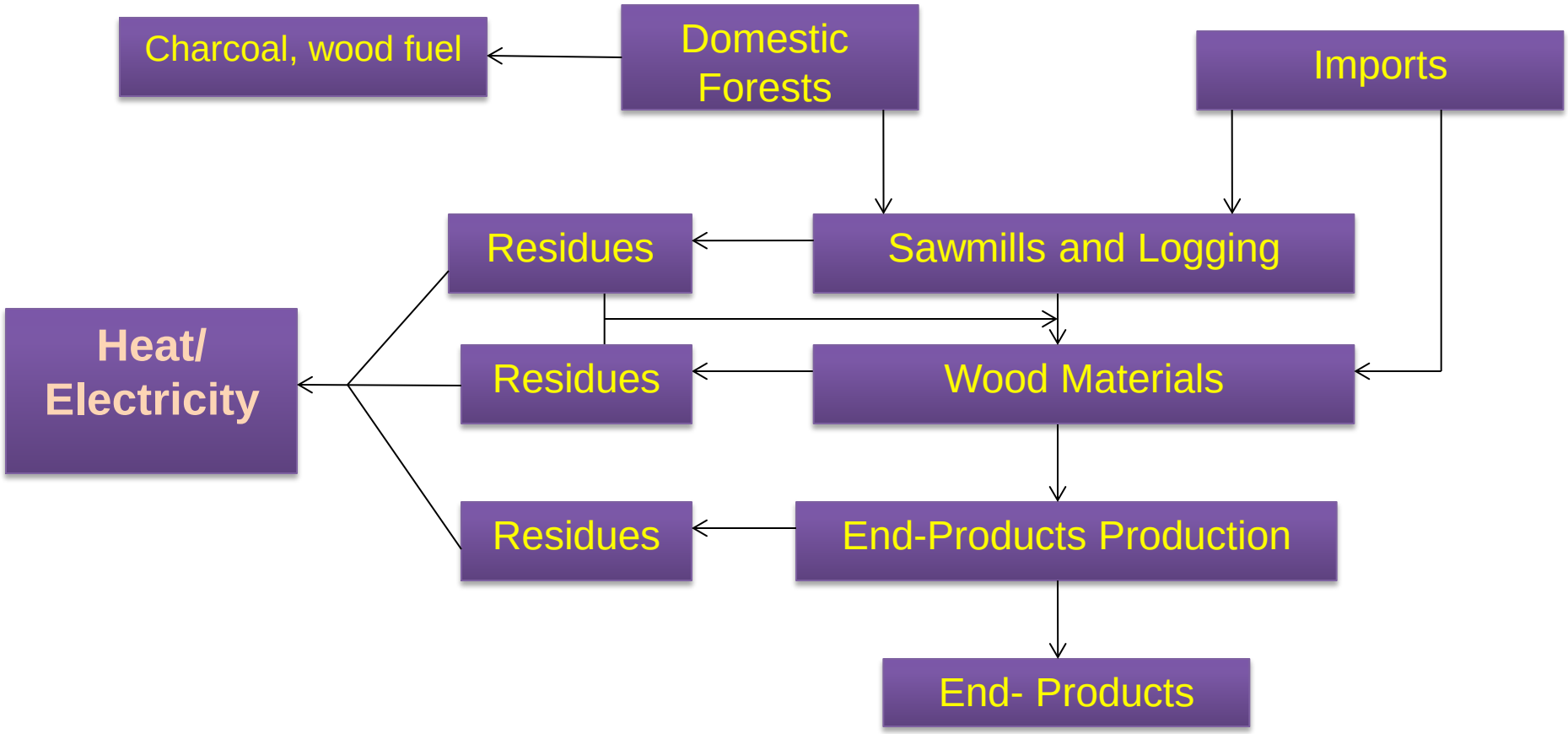
3.Primary Forest Biomass

- Logging Residues
  - Residual Foliage
  - Sawdust
- Forest Fuel
  - Wood Fuels
  - Charcoal

4. Secondary Forest Biomass

- Sawmill Residues
  - Residues from round wood processing
- Residues from Wood (panel) Material Production
  - Veneer and Plywood Production Residues
  - Fiberboard Production Residues
  - Particleboard Production Residues
  - Laminate and Parquets Production Residues
- Wastes and Residues from Final Products Production
  - Carpentries
  - Door and Window Production
  - Furniture Production waste and residuesPulp and Paper
- Pulp and Paper Industry
  - Black Liquor

WOOD CYCLE


Charcoal, wood fuel
Domestic Forests
Imports
Residues
Sawmills and Logging
Heat/ Electricity
Residues
Wood Materials
Residues
End-Products Production
End- Products

5. Urban Waste

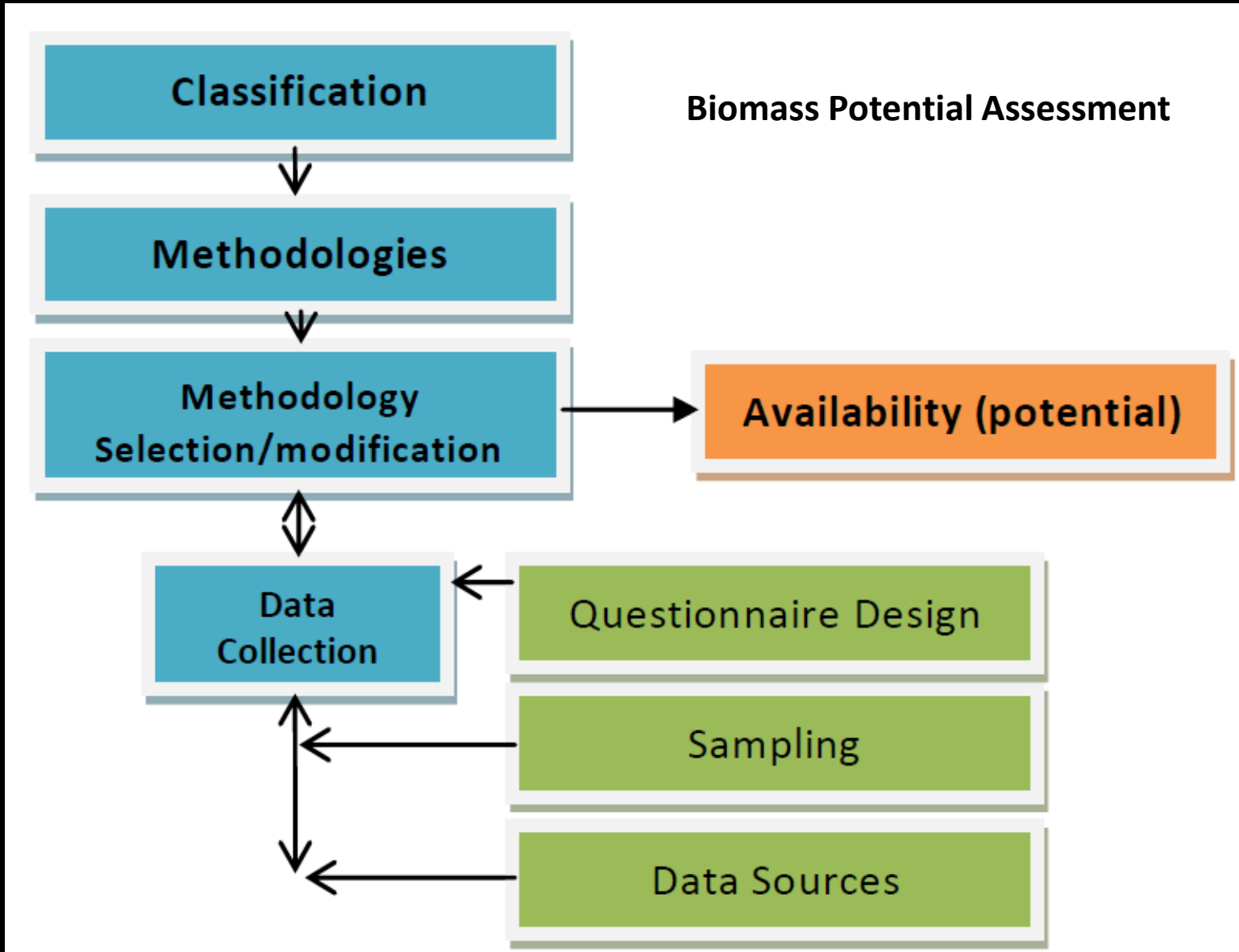
- Municipal Wastewater
- Municipal Solid Waste

6. Manure

- Poultry
  - Chicken
  - Turkey
  - Ostrich
- Livestock
  - Cattle and Bull

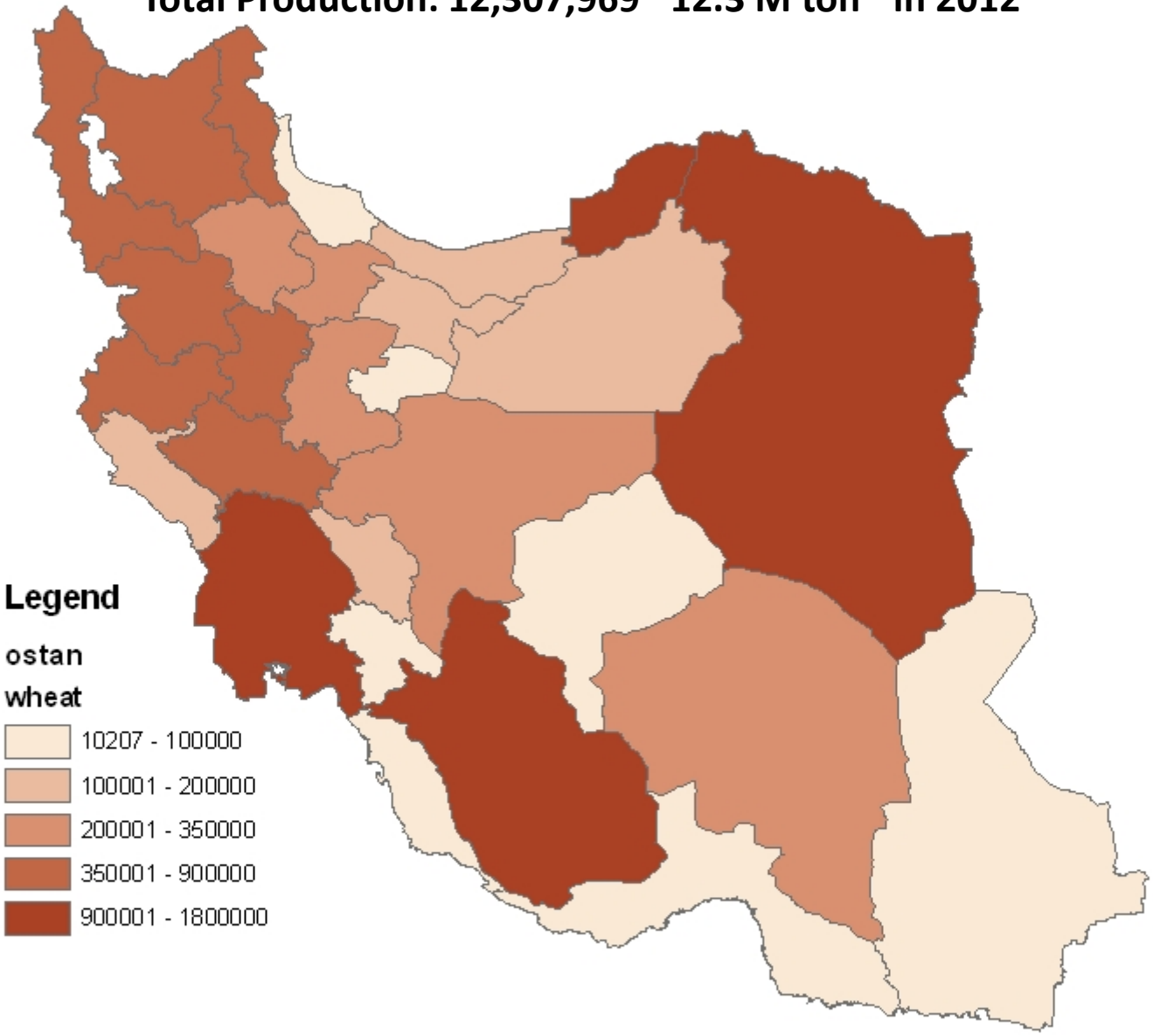
7. Energy Crops

- Energy Plants Cultivated on Arable Land
  - Short Rotation Forest Plantations
  - Agroforestry
- Energy Plants Cultivated on Degraded Lands
  - Jatropha
  - Switchgrass
  - Miscanthus
- Algae

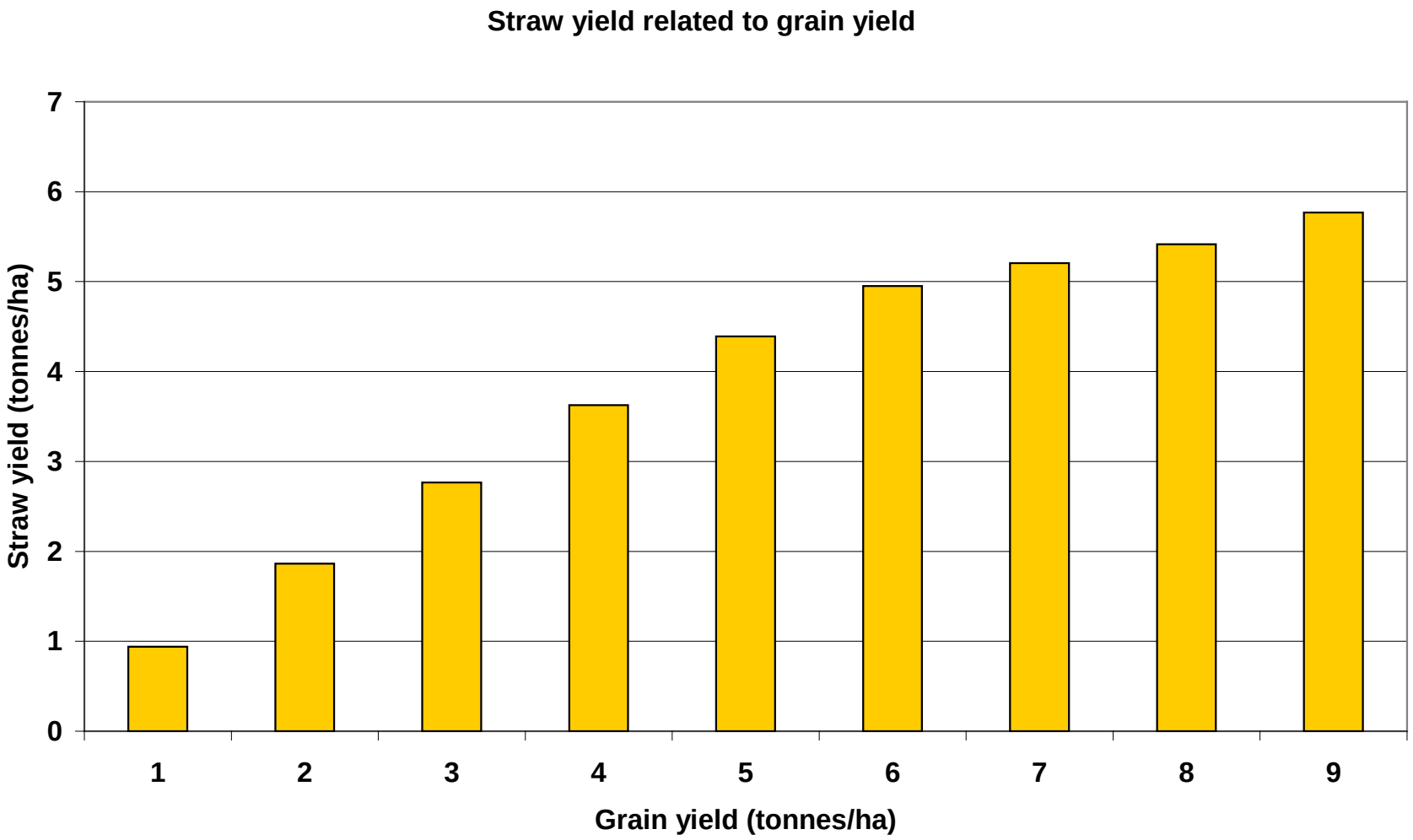

Biomass Potential Assessment
Classification
Methodologies
Methodology Selection/modification
Availability (potential)
Data Collection
Questionnaire Design
Sampling
Data Sources

Wheat Production In IRAN Provinces

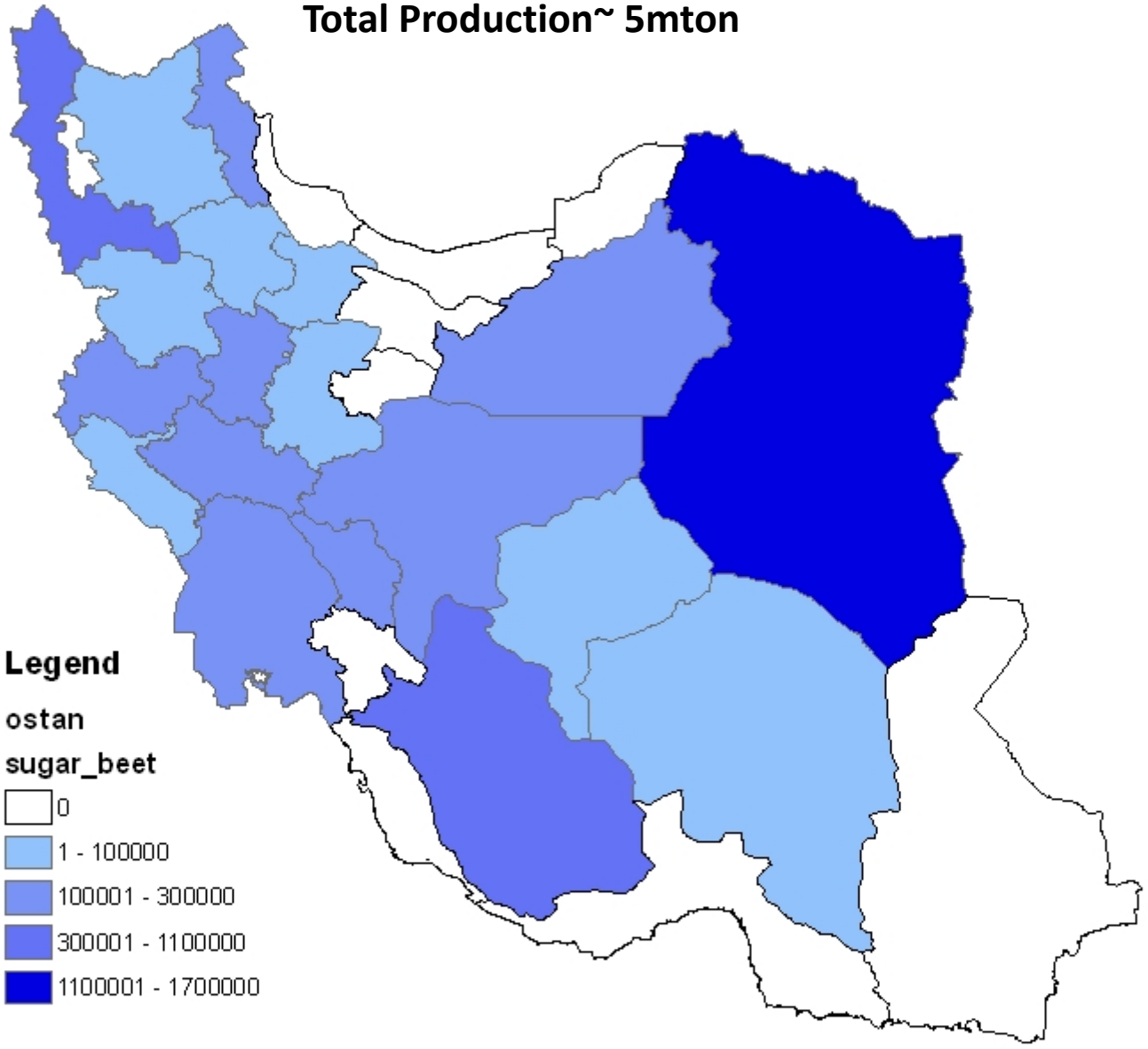
Total Production: 12,307,969 ~12.3 M ton in 2012



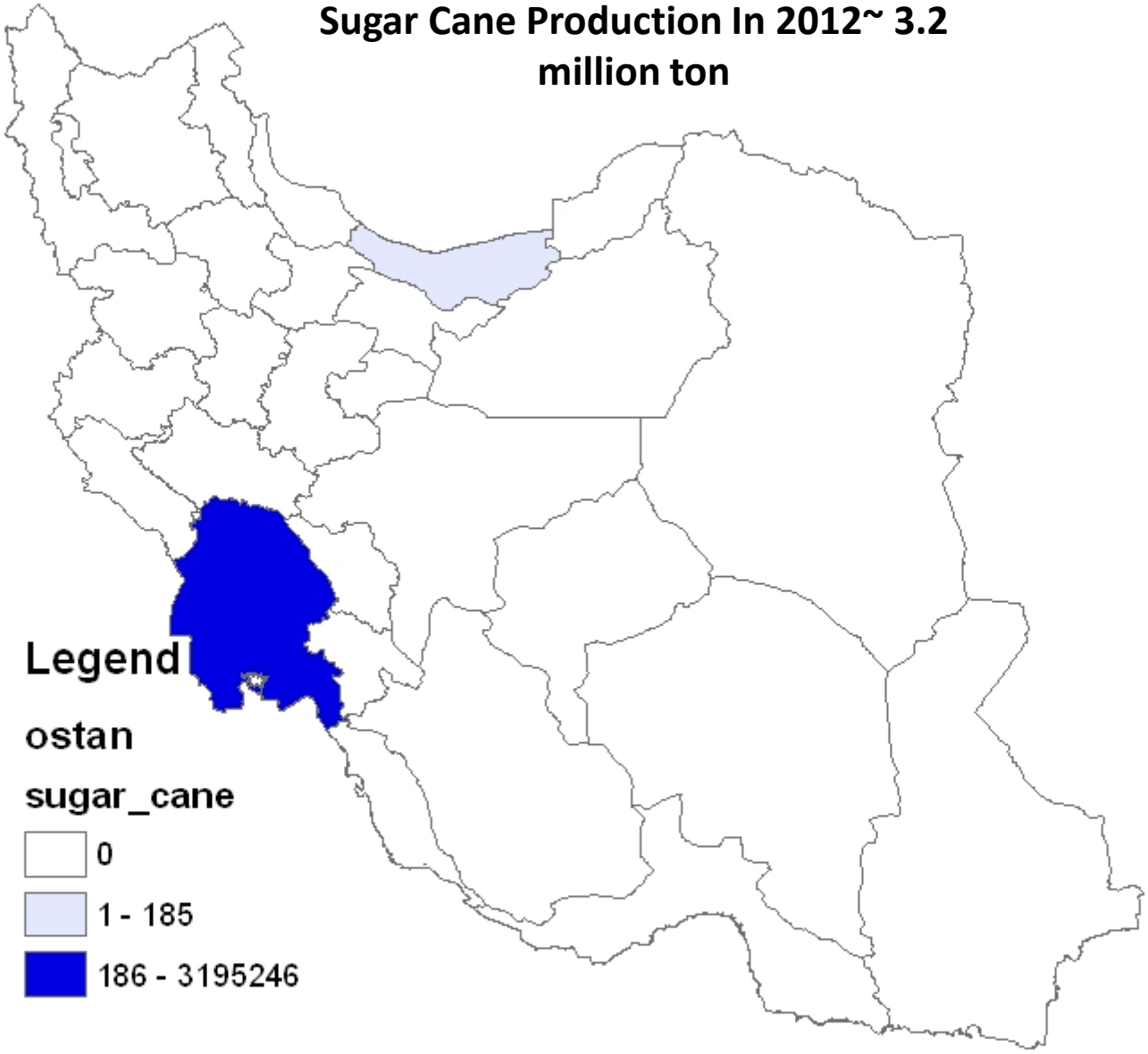
Basis of Methods (Example Straw/Grain)



Sugar Beet Production in Iran Provinces
Total Production~ 5mton

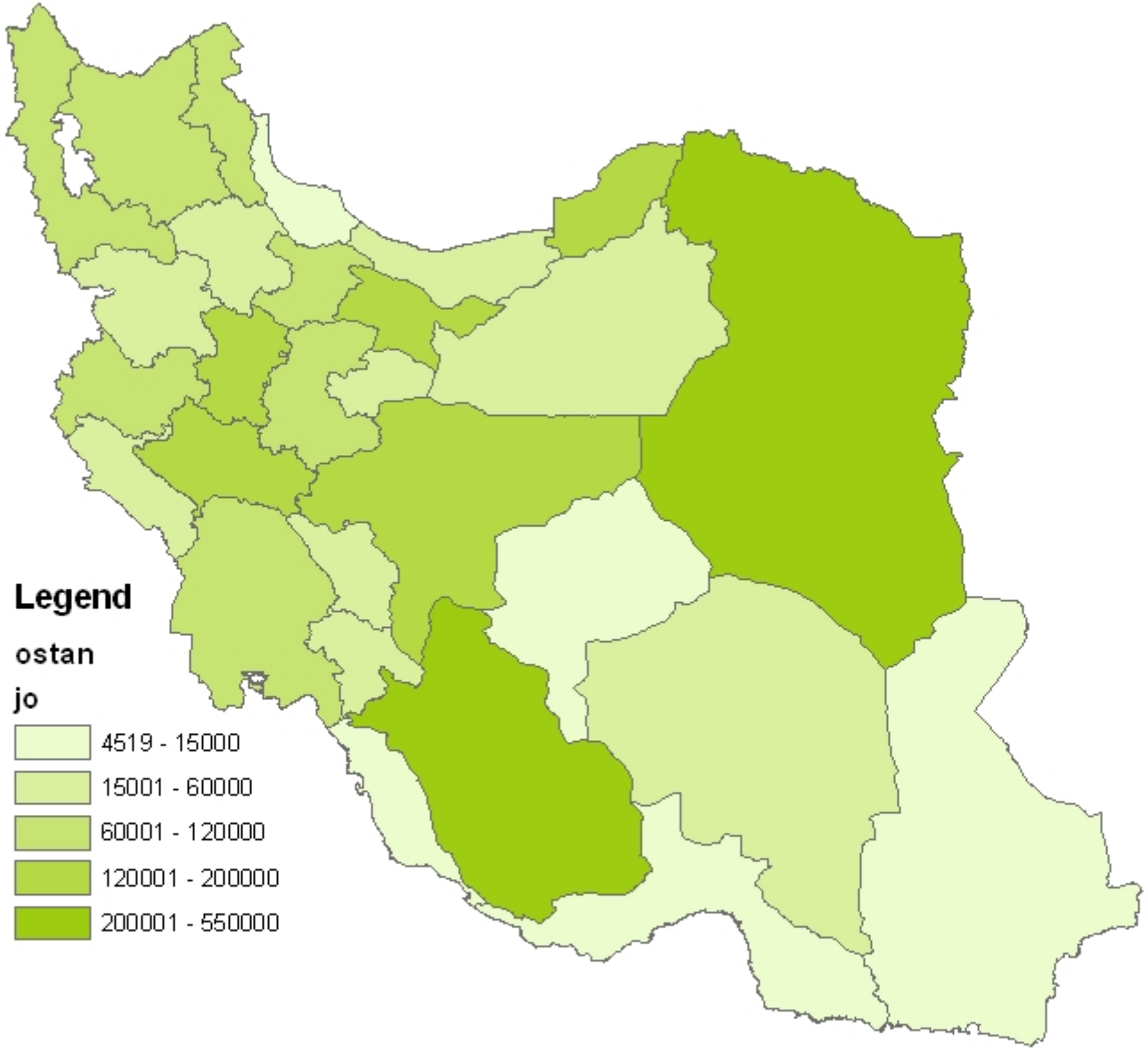


Sugar Cane Production In 2012~ 3.2 million ton



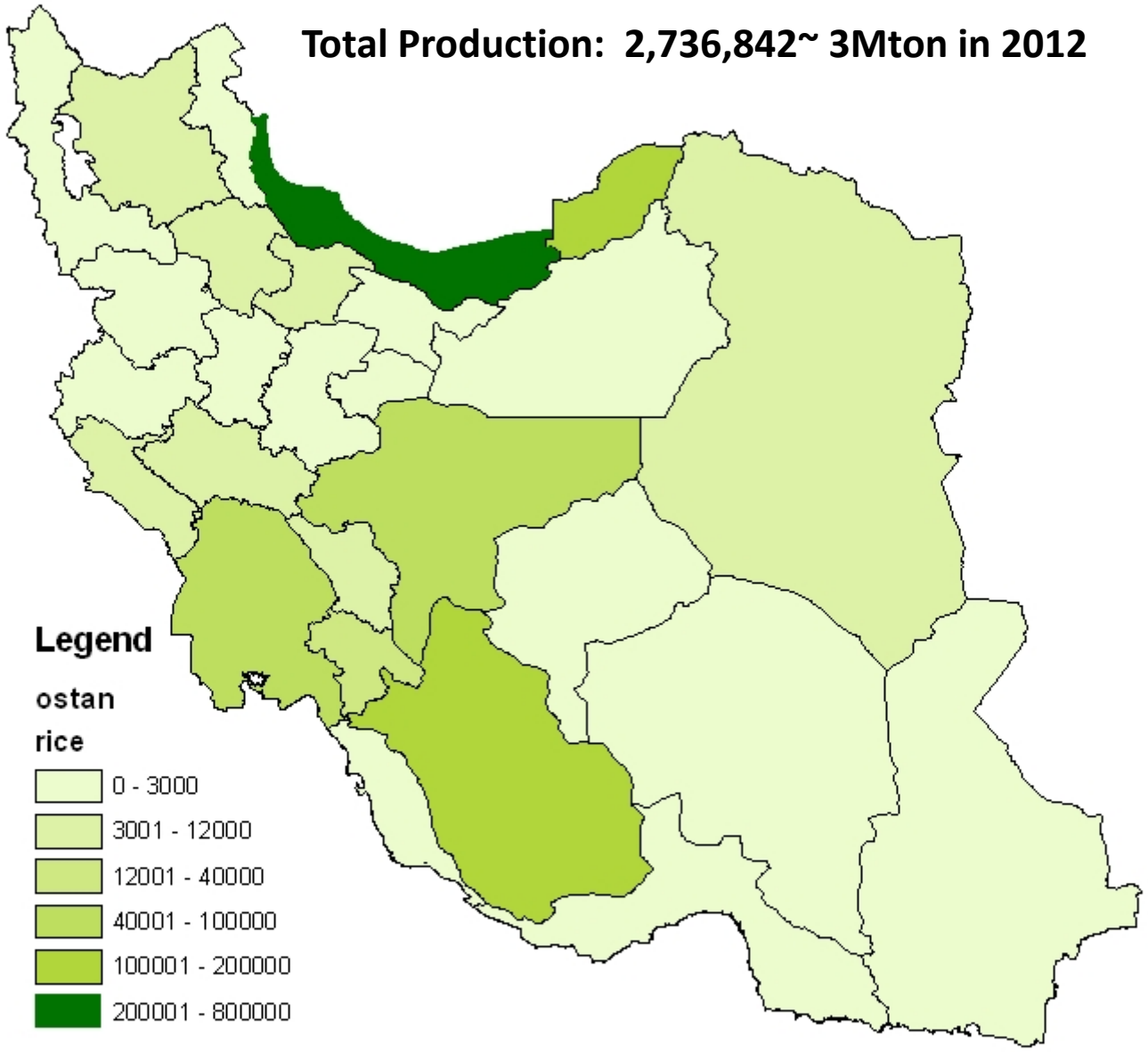
Barely Production in Iran Provinces

Total Production ~ 2Mton in 2012

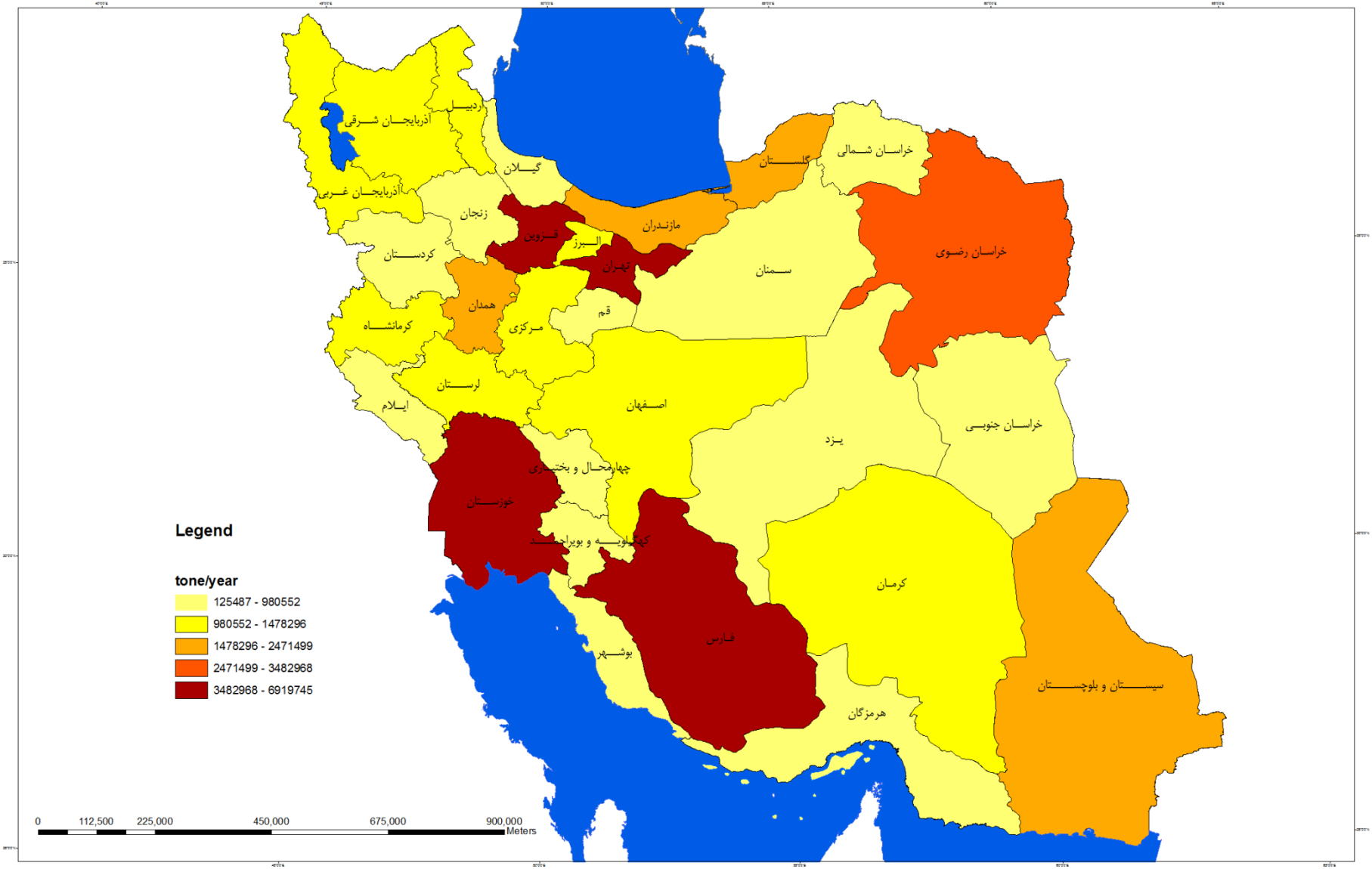


Rice Production in Iran Provinces

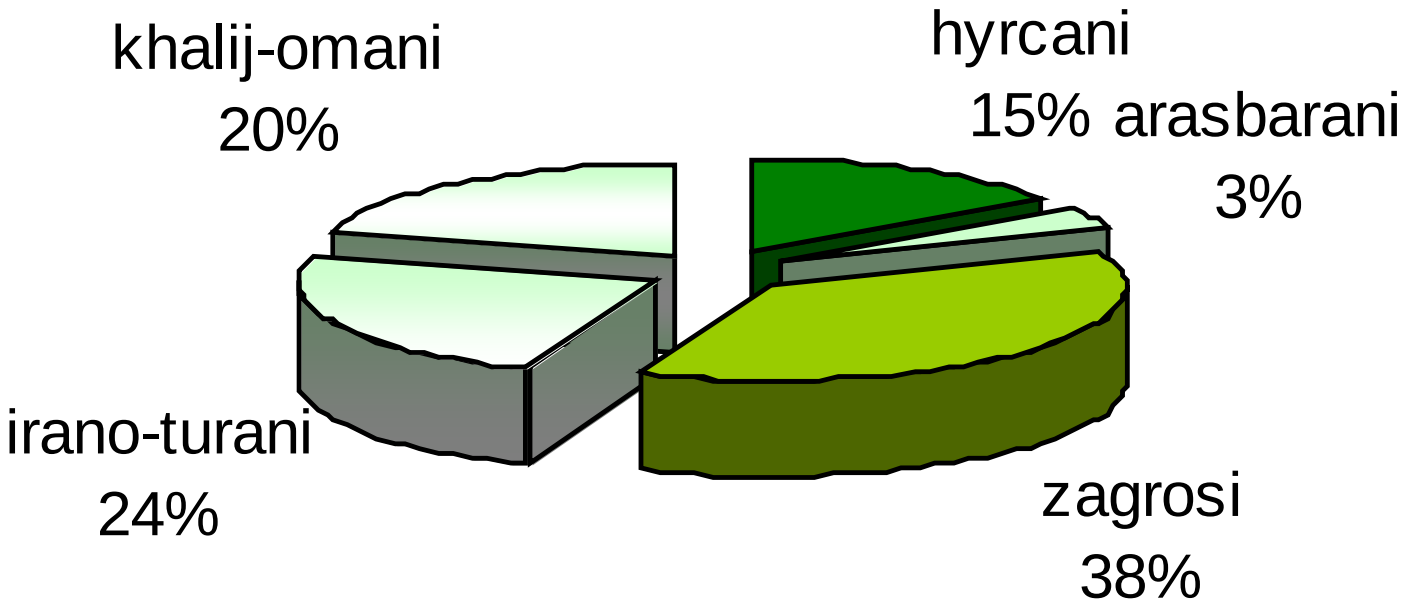
Total Production: 2,736,842~ 3Mton in 2012



Agricultural Primary Residues



Forests

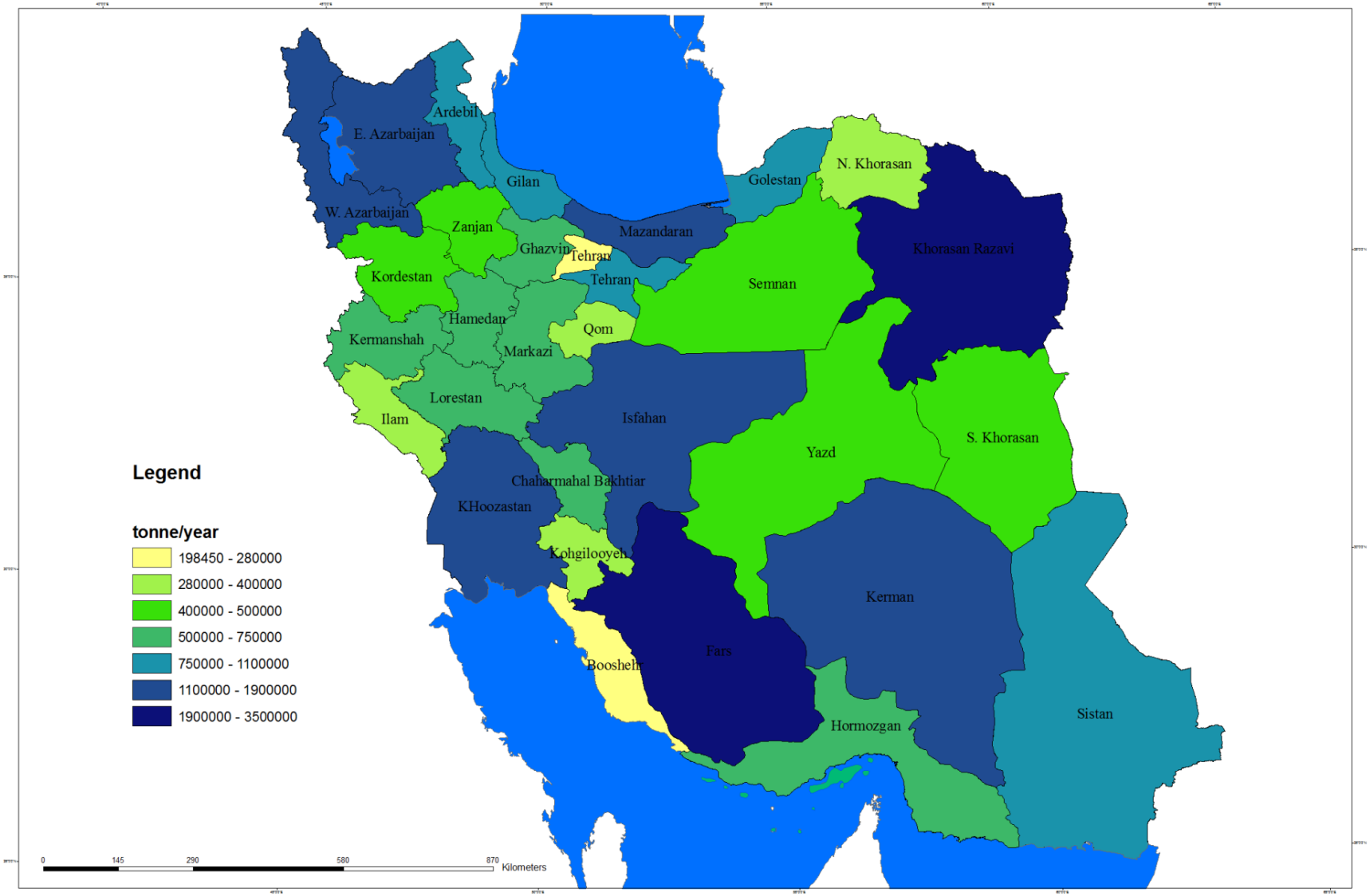


Total Area: 14,000,000 ha

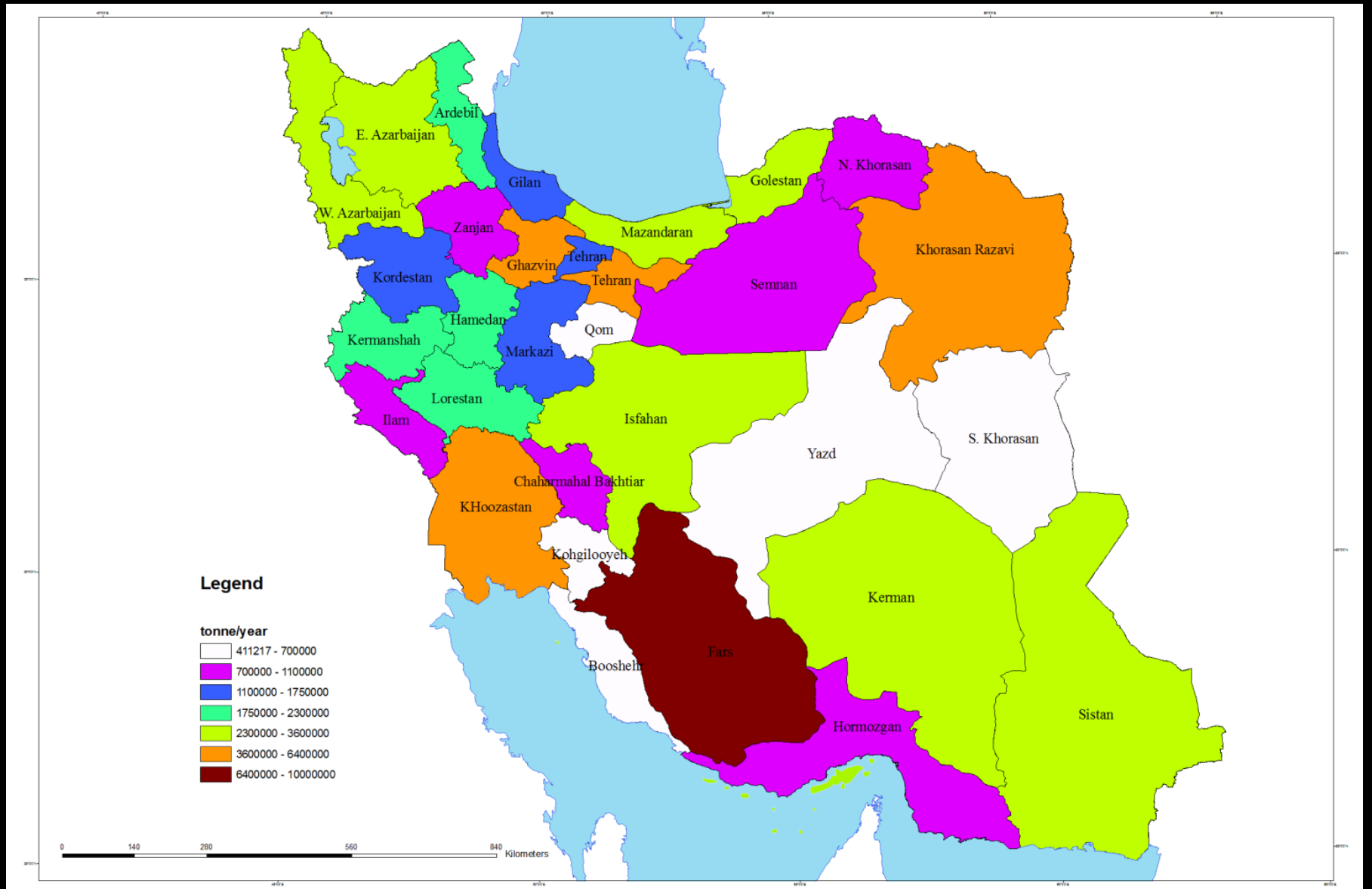
Plantations: 20,000 ha

Forest Biomass Potential

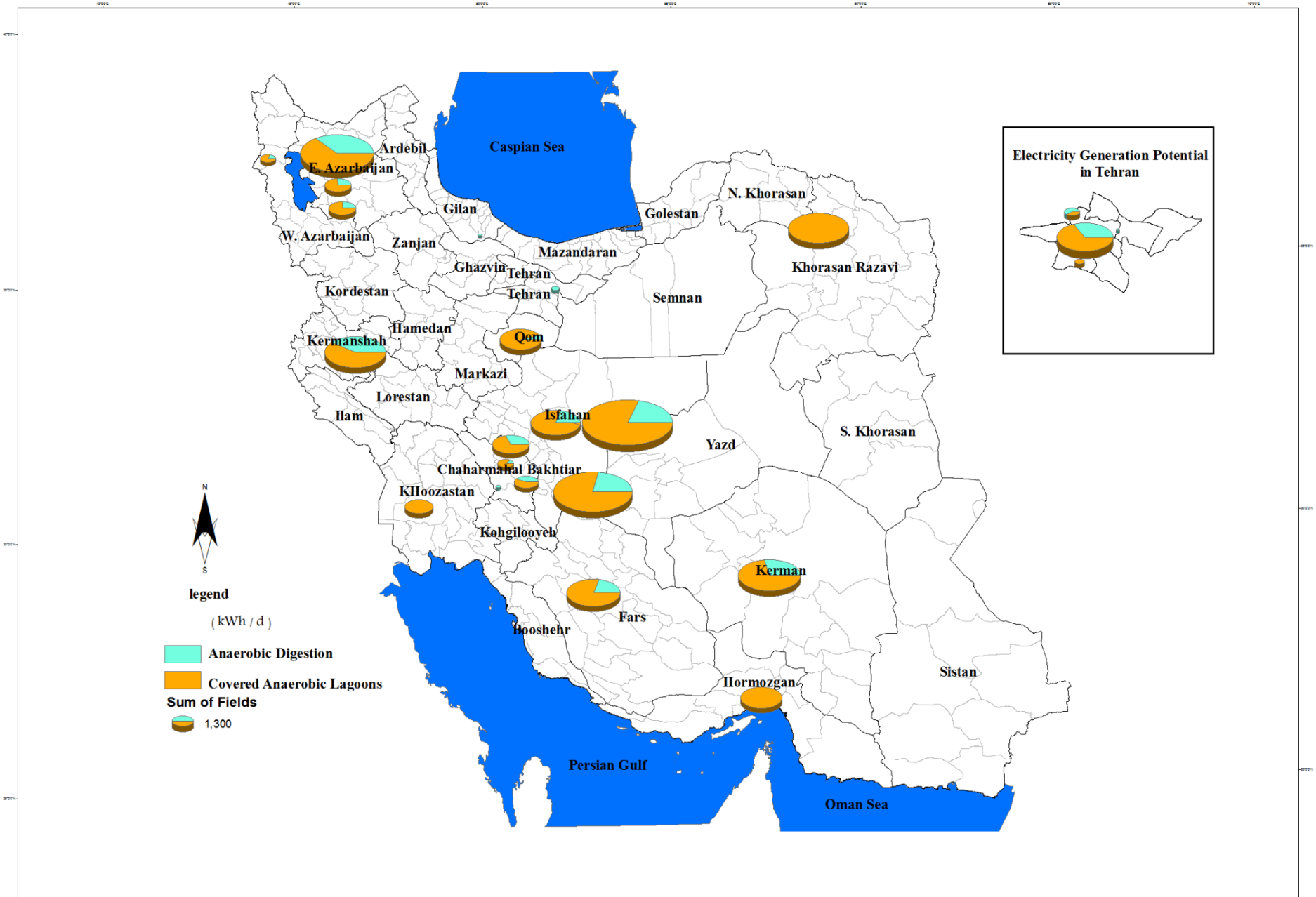
Manure


Ardebil
E. Azarbaijan
W. Azarbaijan
Gilan
Zanjan
Ghazvin
Tehran
Tehran
Mazandaran
Golestan
N. Khorasan
Khorasan Razavi
Semnan
Kordestan
Hamedan
Kermanshah
Markazi
Qom
Lorestan
Ilam
Isfahan
Yazd
S. Khorasan
Chaharmahal Bakhtiar
KHoozastan
Kohgilooyeh
Kerman
Fars
Boosheh
Hormozgan
Sistan
Legend
tonne/year
198450 - 280000
280000 - 400000
400000 - 500000
500000 - 750000
750000 - 1100000
1100000 - 1900000
1900000 - 3500000
0
145
290
580
870
Kilometers

Agricultural+Horticultural+ Manure+Forestry Biomass



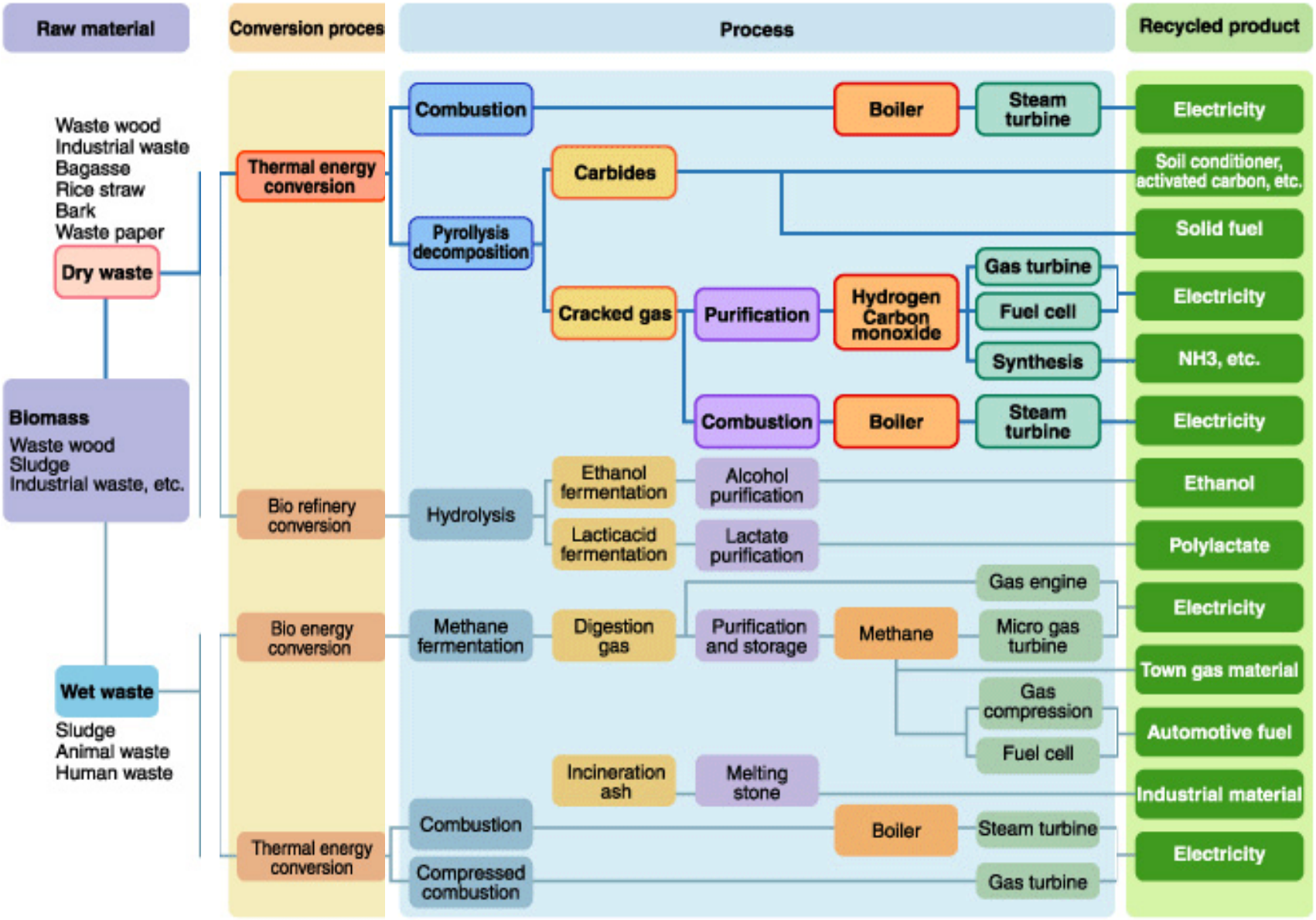
Wastewater Energy Recovery



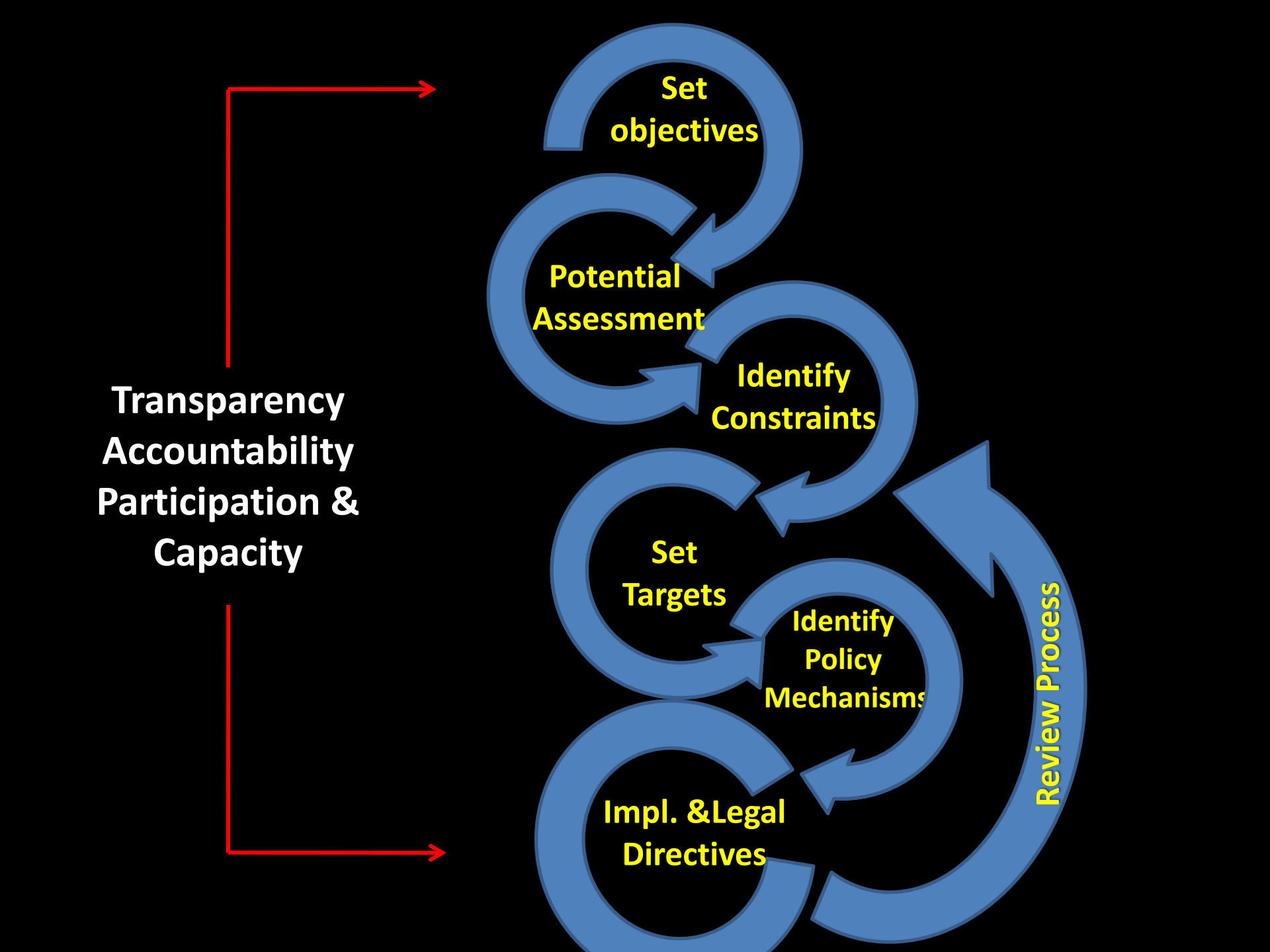
Technological Capacity

The development of domestic industries and manufacturers is often desirable to support local growth and job creation, which can also lead to political acceptability of renewable energy programs

Biomass Conversion Technologies



Equipments		Domestic Capabilities				
		Low capability				High capability
		No Ability	Able to Operate	Able to Assemble	R&D and Pilot	Able to Design, Manufacture and Install and Operate
Biomass Pretreatment	Shredder		■	■	■	■
	Sieve		■	■	■	■
	Dryer		■			
Biomass Transportation	Conveyer		■	■	■	■
	feeder		■	■	■	■
Combustion	Furnace		■	■	■	■
	Boiler		■	■	■	■
Instruments	Instruments		■	■	■	■
Air Feeders	Gas Tubes		■	■	■	■
	fan		■	■	■	■
	Compresser		■			
Heat Recovery	Economisers		■	■	■	■
Exhaust Gas Cleaning	Cyclone		■	■	■	■
	Filter		■	■	■	■
	Scrubber		■			
	Dust Chamber	■	■	■	■	■
	Bag Filter		■			
	Electrostatic Scrubber	■				
Anaerobic Digestor	Anaerobic Digestor		■	■	■	■
Power Generation	turbine		■	■	■	■
	generator		■	■	■	■


Transparency
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Providing Policy Mechanisms

- Preferred Policy Mechanism depends on the country objectives:

1. Objective: to increase manufacturing,
   - supply-push policies (policies that support development and production conversion technologies
2. Objective: to increase installed capacities
   - demand-pull policies(policies that increase support for the production of electricity)

Demand-Pull	Supply-Push
Feed-in tariffs set a fixed, guaranteed rate that power producers will be paid through a standard PPA for every kWh fed into the grid and usually guarantees grid access to RE generators.	**Research and Development (R&D) low cost loans** aim to increase the amount of innovation by providing direct funding to specific projects. Effectiveness depends on successful selection of projects where funding does not replace private-sector money.
Renewable Portfolio Standards (or Renewable Purchase Obligation-RPO or quota): measure requiring a percentage of electricity or heat capacity be provided using renewable energy sources. Obligated utilities are required to ensure that the target is by own generation, signing PPAs or, in many cases, purchasing Renewable Energy Certificates (REC)t; if it is not, a fine is usually levied.	**Matched equity funding** provides financing and business advice to early stage companies/developers, or more established entities looking to grow.
Public procurement/bidding is an approach under which public authorities organize tenders for a given quota of renewable energy supply or capacity, and remunerate winning bids at prices that are typically above standard market levels.	**Training** provides supplemental support to build capacity among personnel and research facilities, and information sharing.
Tax incentives/credits, consumer grants or rebates are pay¬ments by a utility, government agency, or government-owned bank to cover a share of the capital cost of an investment in a renewable energy asset such as a solar water heater or a solar photovoltaic system.	

Conclusion:

- Energy efficiency
- Investment Loans (Waste Management Options)- long payback time
- Feed in Tariff modification
- Plan Regionally
- Symbiosis Approach

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