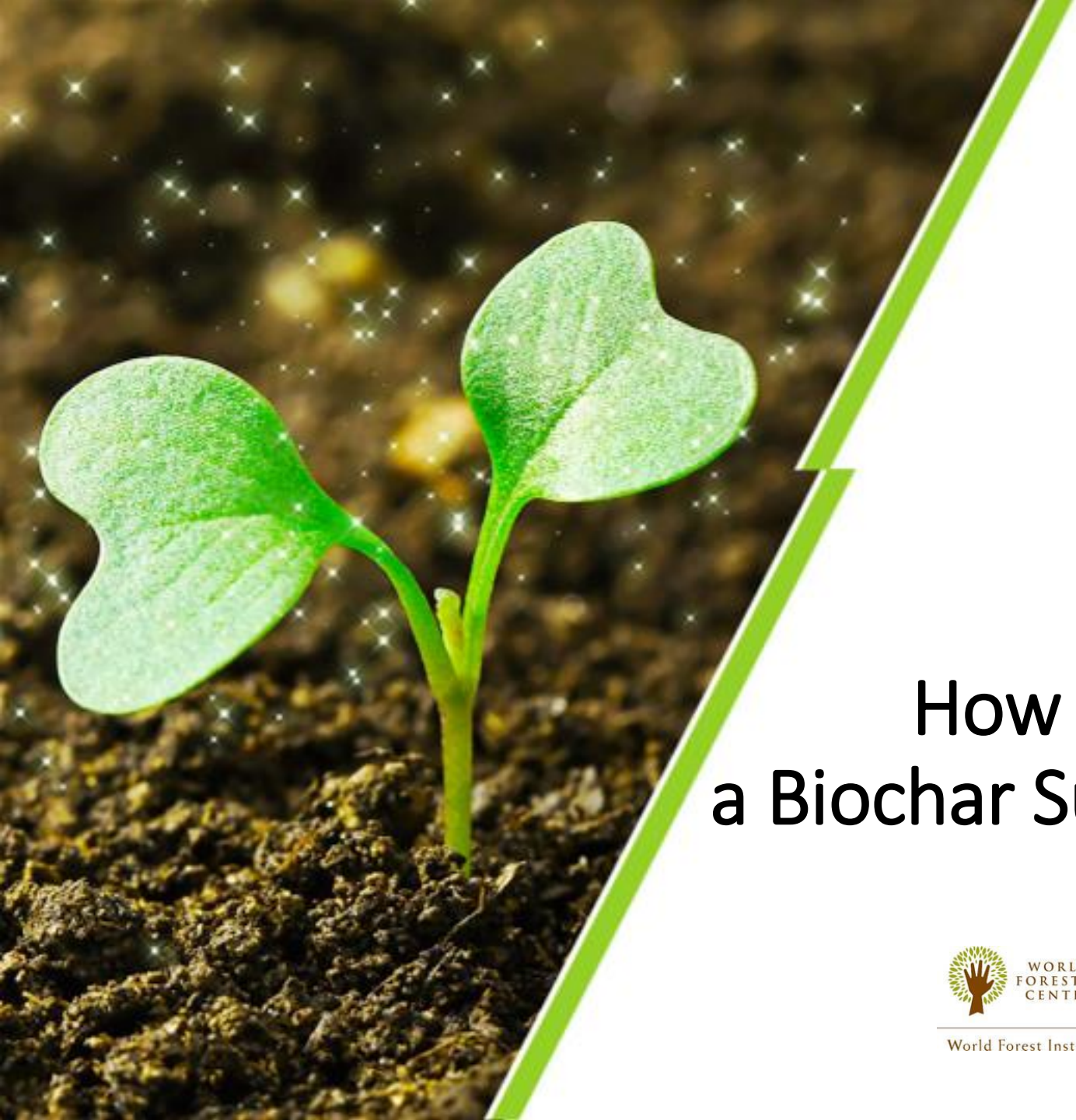


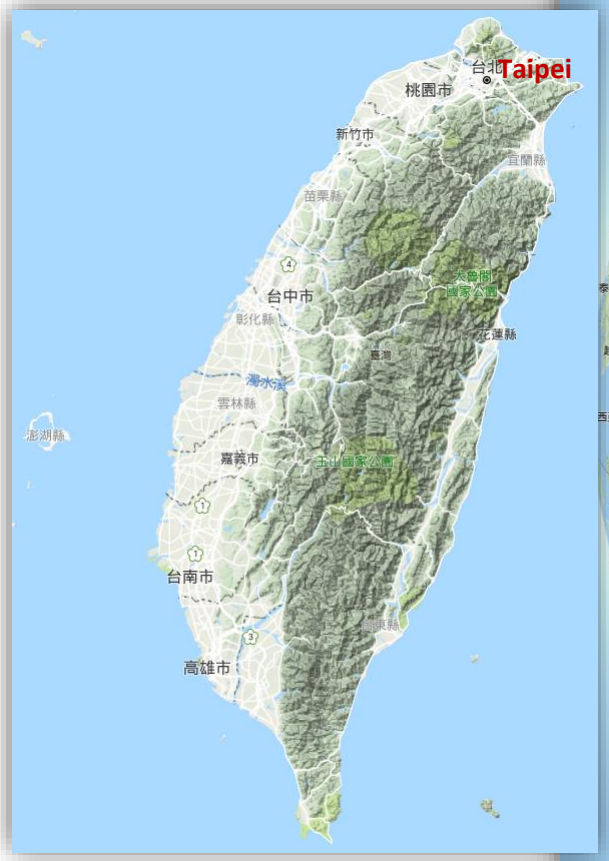
How to Establish a Biochar Supply Chain

Meei-ru Jeng
Fellow from Taiwan

WORLD FORESTRY CENTER
World Forest Institute

行政院農業委員會 林業試驗所
TAIWAN FORESTRY RESEARCH INSTITUTE

Geographic



Location: East Asia
Area: **1/7 of Oregon**
Population: 23 million
(6 times > Oregon)
Capital: Taipei City

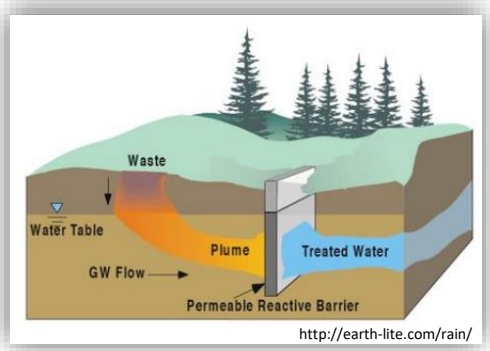
What is Biochar?

Biochar is a solid material obtained from the carbonization or thermochemical conversion of biomass in an oxygen-limited environment

“High quality charcoal”

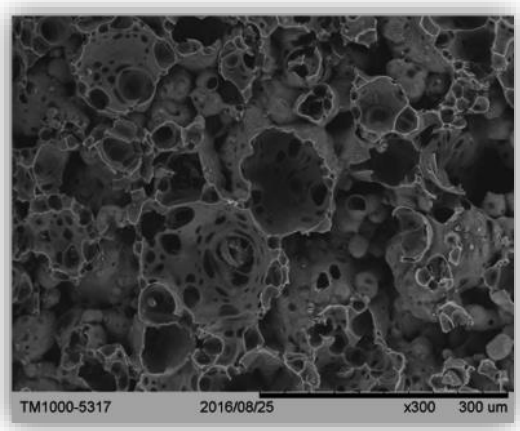
Some Examples of Biochar Applications

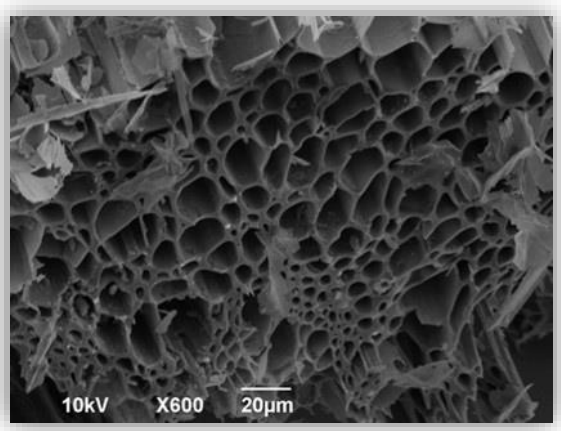
1. Soil Amendment
   - Agriculture
   - Forestry
   - Horticulture
2. Stormwater/ Wastewater Filtration
3. Composting



Why Biochar?

Biochar is fine-grained, highly porous martial that increases soil retention of nutrients and water.





https://www.dudegrows.com/biochar/

Surface of Biochar

Lessons Learned

Status of the Biochar Industry in the US

- 150 producers
- 30 producers (20%) make 80% of the biochar
- 120 producers make very small amounts of biochar
- 87% of biochar feedstock comes from woody biomass
- Domestic biochar production is 35K to 70K tons/yr.

  For example:
  290 million acres of US Crop Land,
  21.6 million tons/yr. fertilizer usage
  (biochar @ 2% > 400K tons/yr.)

biochar feedstocks

Biomass Briquetting Machines Process to Produce Briquettes-Karishma Nimavat

Status of the Biochar Industry in the US

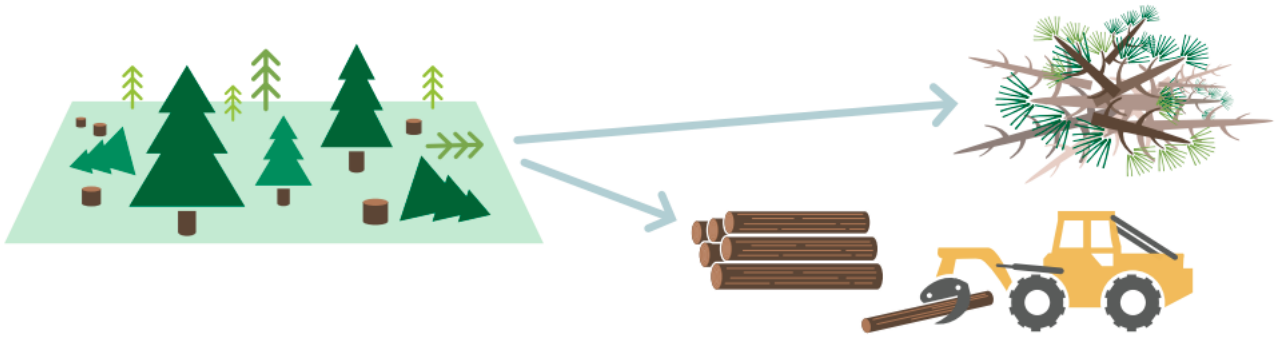
- Price depends on quality and final use
  $400 to $2K /ton
  - wholesale price: $1/lb
  - retail price: $1.5/lb
- Biochar products come in different formulations, mostly to amend soil

Status of the Biochar Industry in the US

- Biochar products composition and crop specific applications are still in development
- Price is high
- Market is small
- Technology development to scale up production

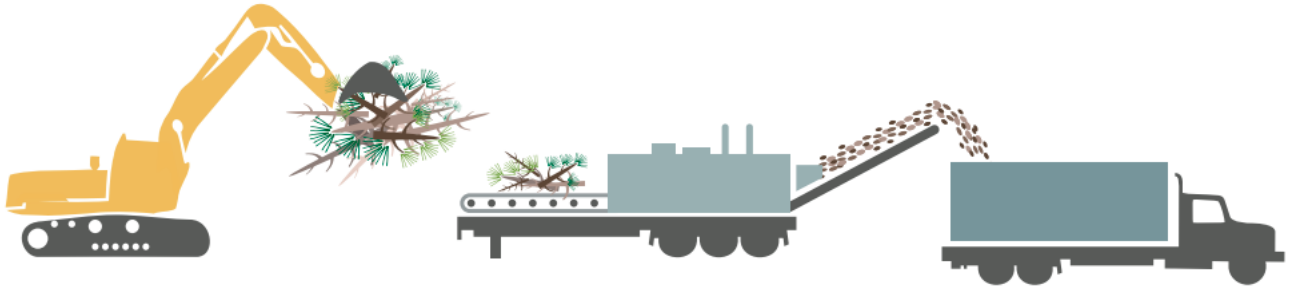
Biochar Supply Chain

1.Biomass production



- Logging type
- Moisture content

2.Feedstock logistics



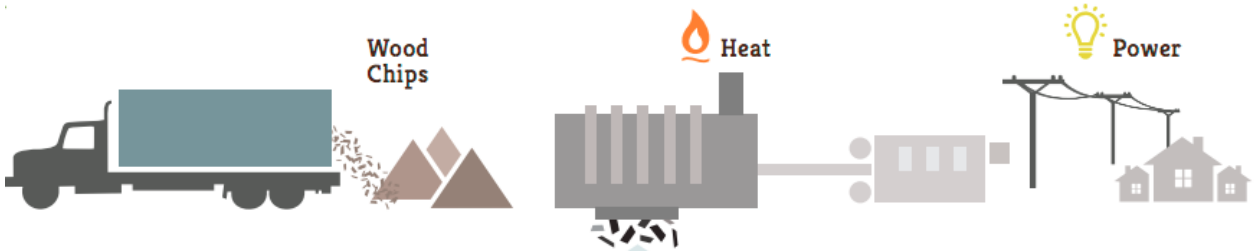
- Collection
- Transportation
- Storage

Source: Science You Can Use Bulletin • September/October 2014 • ISSUE 13

Biochar Supply Chain

3.Conversion

- Treatment
- Co- products

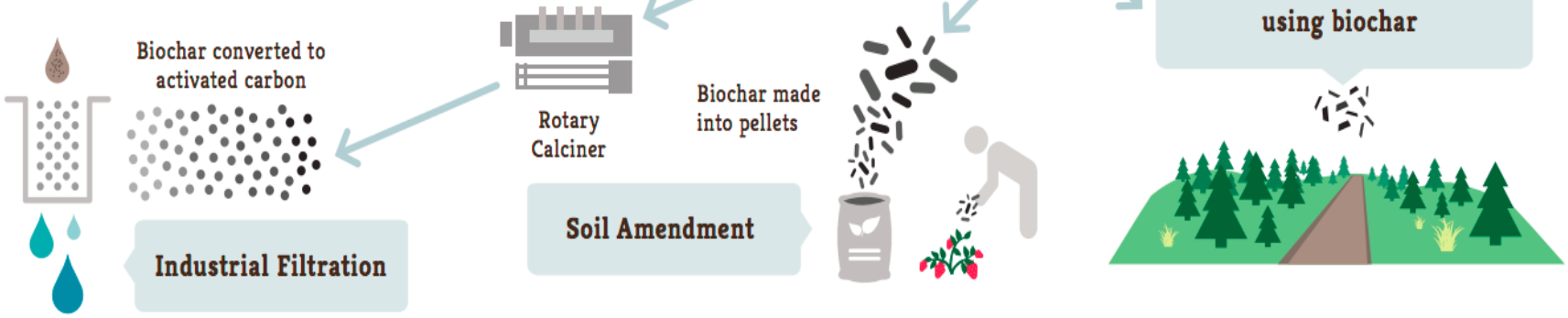


4.Distribution logistics

- Packaging
- Transportation
- Storage

5.End use

- Blending
- Processing
- Application



Source: Science You Can Use Bulletin • January/February 2016 | Issue 17

Biochar Supply Chain

Costs/Profits

Biochar Next Steps…

Encourage research collaboration between **Industry** and **Universities**

- Technology: Increase efficiency of biochar conversion systems (<$)
- Material: Standardize biochar “grades”
- Use: Conduct longer-term field trials amending soils with biochar in high-value crops
- Tested use: Promote biochar uses among farmers through University Extension

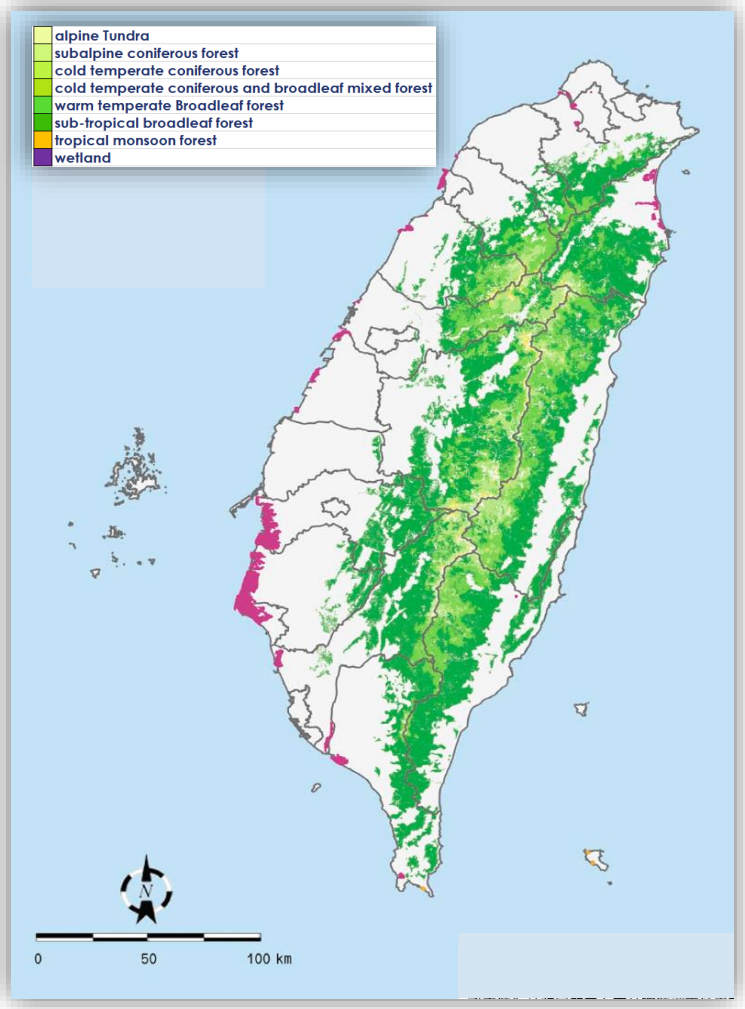
Take Home Messages

Biochar Materials in Taiwan

- Forest Coverage Rate:
  60% (5.4 million acres)

- (1992) Natural Forests
  Logging ban = no logging

- No logging waste



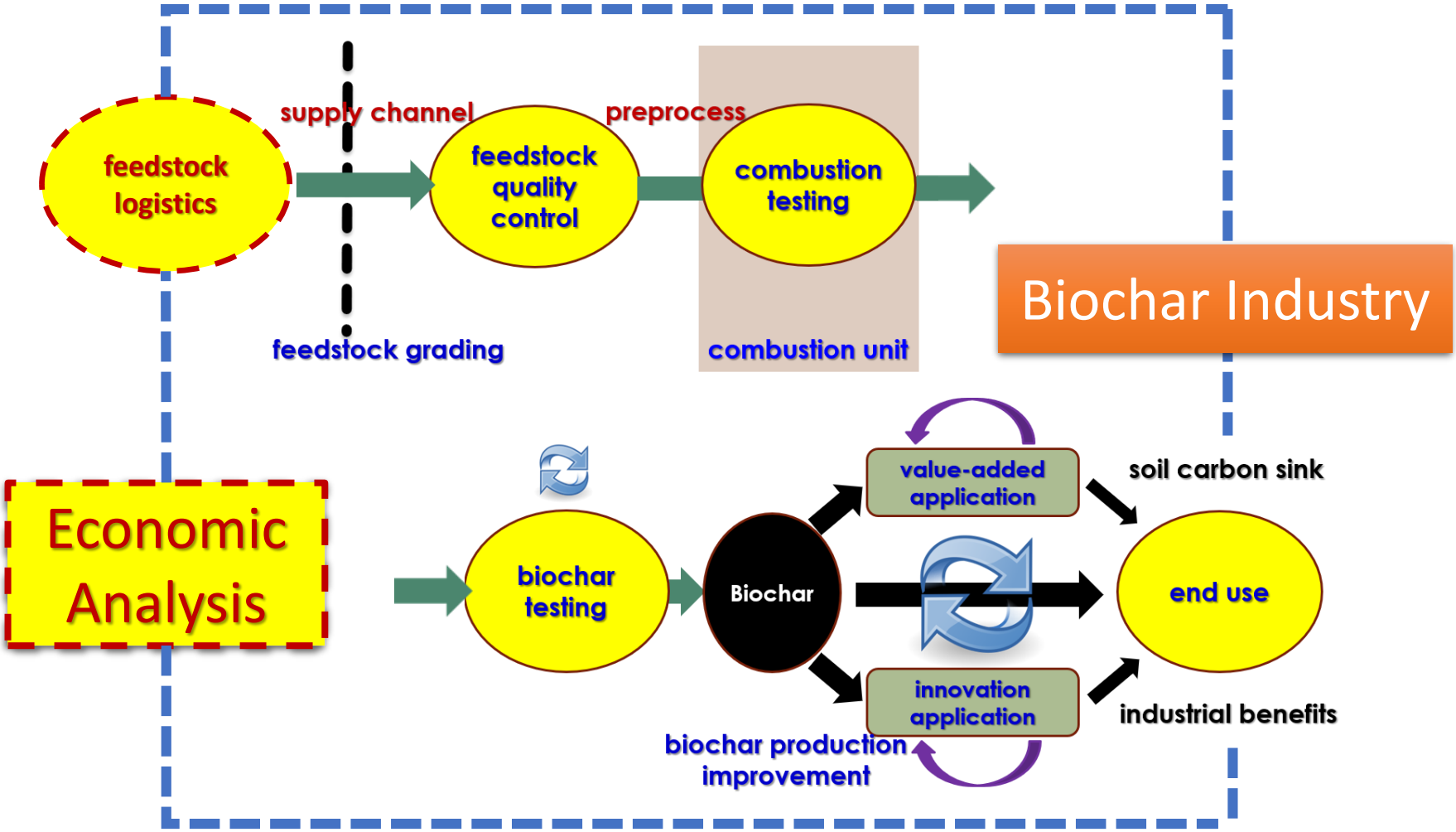
Biochar Materials in Taiwan

- Taiwan is a Fruit Kingdom
- Fruit tree orchard trimming waste can become biochar feedstock

Biochar Conversion Technology in Taiwan

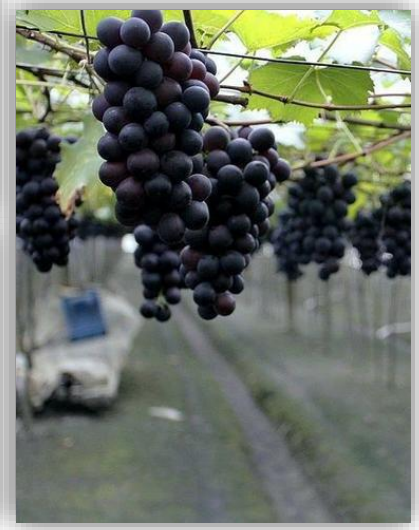
Biochar Use Research in Taiwan

Biochar Application Promoting Project in Taiwan



Take Home Messages

- Include economists in our project team
- Establish a feasible biochar supply chain
- Consider using biochar on high-value crops and estimate its yield improvements



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