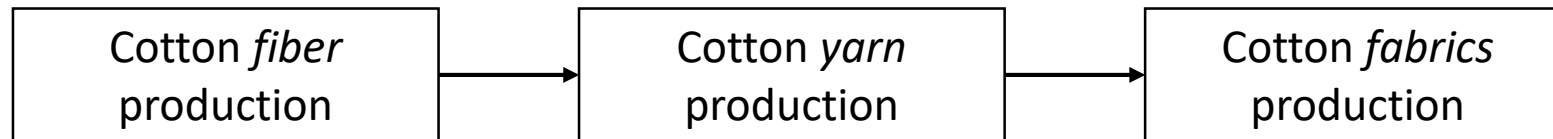


# Life Cycle Assessment Using OpenLCA

**Software Exercise Session: Create a life cycle model (Part I)**

Prepared by Qingshi Tu, PhD

# Case study: cotton fabrics production



Please use the handout to complete the life cycle model

- For each process:
  - Create intermediate/final product flows as *quantitative reference*
  - Search for proper flows for input/output
  - Select a proper *provider* for a flow, if applicable
- Create a product system

## ▼ Inputs

+ X 1.23

Flow	Category	Amount	Unit	Costs/Rev	Uncertain	Avoided w	Provider	Data quali	Descripti
F cottonseed; at harve...	Agriculture, forest...	0.02000	kg		none				
F CUTOFF irrigate; gra...	Water supply; sew...	22.20000	m3		none				
F CUTOFF nitrogenous...	Manufacturing/ISI...	0.45700	kg		none				
F CUTOFF pesticide, 1...	Manufacturing/ISI...	0.01600	kg		none				
F diesel	Energy carriers an...	47.70000	MJ		none				
F electricity mix	Energy carriers an...	12.10000	MJ		none		P Elec...		
F Hard coal, at consum...	Energy carriers an...	0.52000	kg		none				
F LPG - liquefied petrol...	Energy carriers an...	1.38300	MJ		none				
F Natural gas, at consu...	Energy carriers an...	0.35000	kg		none				

## ▼ Outputs

+ X 1.23

Flow	Category	Amount	Unit	Costs/Rev	Uncertain	Avoided pr	Provider	Data quali	Descripti
F Carbon dioxide, from...	Emission to air/lo...	4.26500	kg		none				
F Carbon monoxide, fr...	Emission to air/lo...	0.01610	kg		none				
F cotton fiber	[case study] cot...	1.00000	kg		none				
F Hydrocarbons, unspe...	Emission to air/lo...	0.00500	kg		none				
F Methane, from soil or...	Emission to air/lo...	0.00760	kg		none				
F Nitrogen oxides	Emission to air/lo...	0.02270	kg		none				
F Sulfur dioxide	Emission to air/lo...	0.00400	kg		none				

Cotton

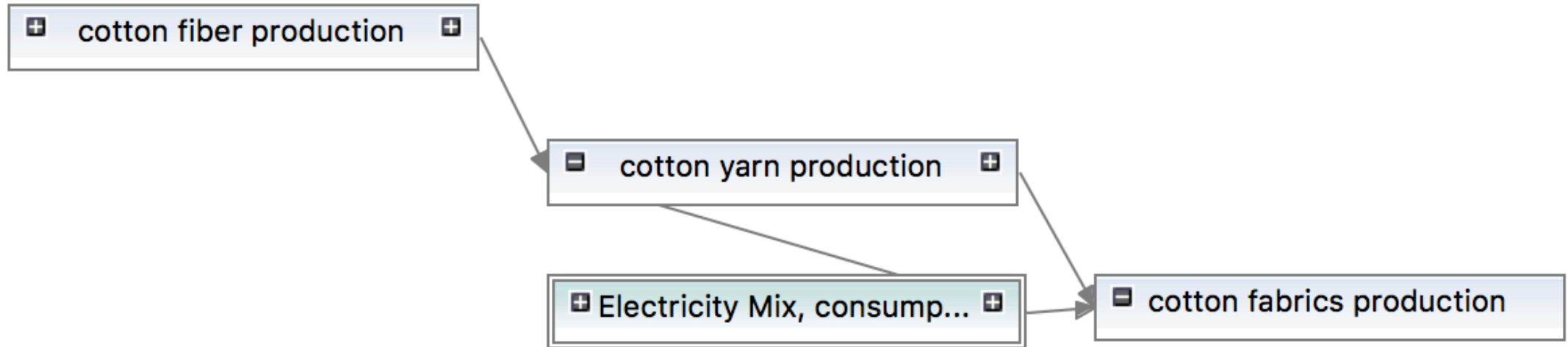
Fiber

Production

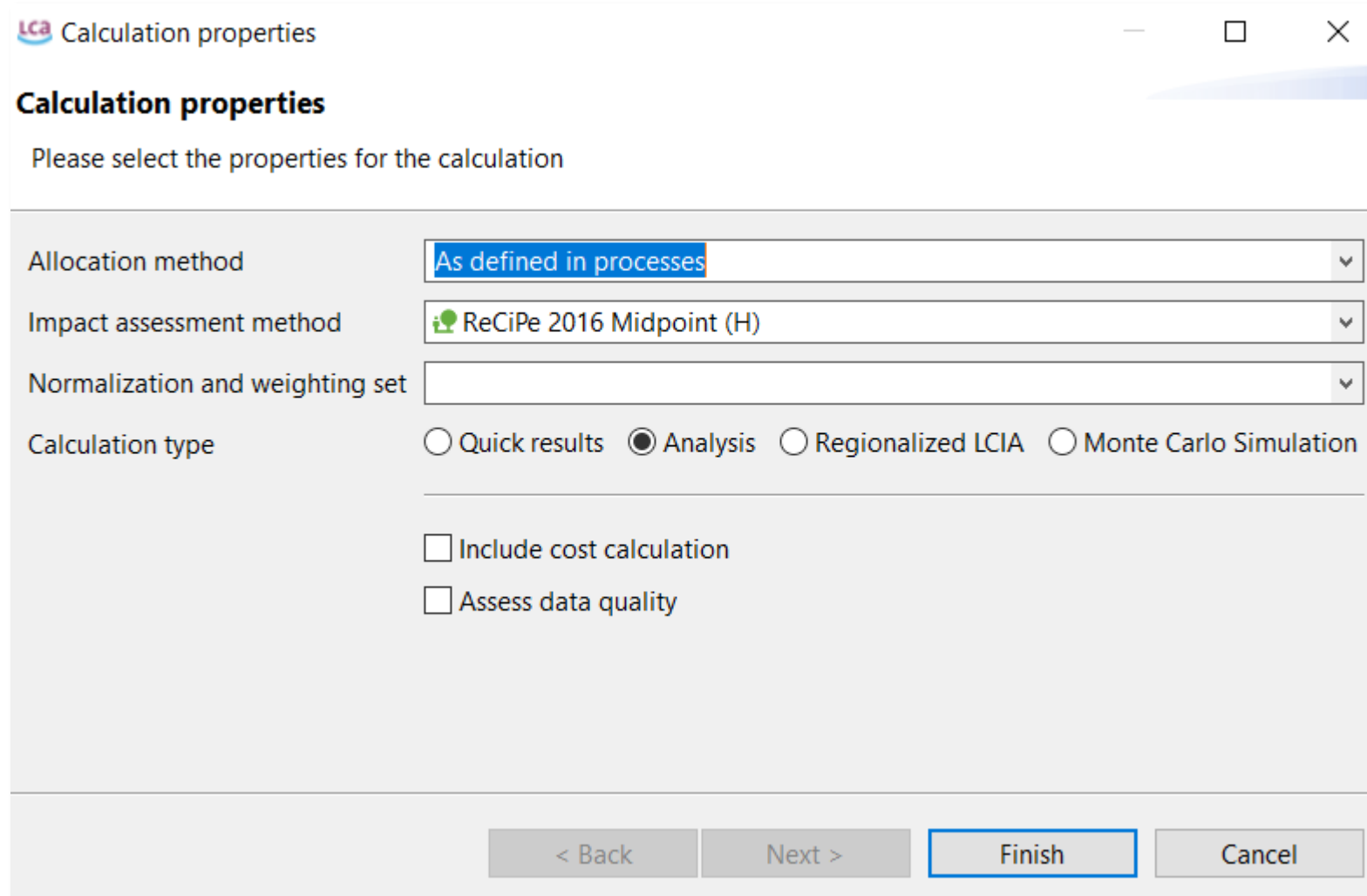




# Cotton fabrics production system



# Perform the impact assessment



The screenshot shows a software window titled "LCA Calculation properties". Inside, the heading "Calculation properties" is followed by the instruction "Please select the properties for the calculation". There are four main settings: "Allocation method" set to "As defined in processes", "Impact assessment method" set to "ReCiPe 2016 Midpoint (H)", and "Normalization and weighting set" which is empty. Under "Calculation type", four radio buttons are present: "Quick results", "Analysis" (which is selected), "Regionalized LCIA", and "Monte Carlo Simulation". Below these are two unchecked checkboxes: "Include cost calculation" and "Assess data quality". At the bottom, there are four buttons: "< Back", "Next >", "Finish" (highlighted with a blue border), and "Cancel".

**Calculation properties**

Please select the properties for the calculation

Allocation method: As defined in processes

Impact assessment method: ReCiPe 2016 Midpoint (H)

Normalization and weighting set:

Calculation type: ☐ Quick results ☒ Analysis ☐ Regionalized LCIA ☐ Monte Carlo Simulation

☐ Include cost calculation

☐ Assess data quality



























< Back Next > Finish Cancel



# Perform the impact assessment

☐ Flow

☒ Impact category

Contribution	Process	Amount	Unit
▼ 100.00%	 cotton fabrics production	 24.57643	kg C...
▼ 84.06%	 cotton yarn production	 20.65801	kg C...
▼ 50.03%	 cotton fiber production	 12.29498	kg C...
> 37.90%	 Electricity Mix, consumption mix, at consumer, AC, 230V - ...	 9.31325	kg C...
> 06.30%	 Diesel, consumption mix, at refinery, from crude oil, 200 p...	 1.54823	kg C...
> 03.28%	 Natural Gas Mix, consumption mix, at consumer, technolo...	 0.80633	kg C...
> 01.30%	 Hard coal mix, consumption mix, at consumer, technology...	 0.32020	kg C...
00.00%	 CUTOFF irrigate; gravity, groundwater source, in 1996 - US...	 0.00000	kg C...
00.00%	 CUTOFF pesticide, 1-Naphthaleneacetamide; at point-of-s...	 0.00000	kg C...
00.00%	 CUTOFF nitrogenous fertilizer, ammonium nitrate; at point...	 0.00000	kg C...
00.00%	 Dummy_LPG - liquefied petroleum gas	 0.00000	kg C...
> 34.03%	 Electricity Mix, consumption mix, at consumer, AC, 230V - ...	 8.36303	kg C...
> 15.94%	 Electricity Mix, consumption mix, at consumer, AC, 230V - ...	 3.91842	kg C...

# Discussion

- What are the major contributors, e.g., to the impact of climate change?

# Discussion

- How does the choice of electricity grid affect climate change results?

# Discussion

- Contribution from fertilizer and pesticides?

# Discussion

- Take another look at input/output data table for “Cotton fiber production”, comment on:
  - The choice of flow for “CO<sub>2</sub> emission to air”
  - Any inventory missing?