

The Comparative Study of Wood Fuels Using Life Cycle Assessment

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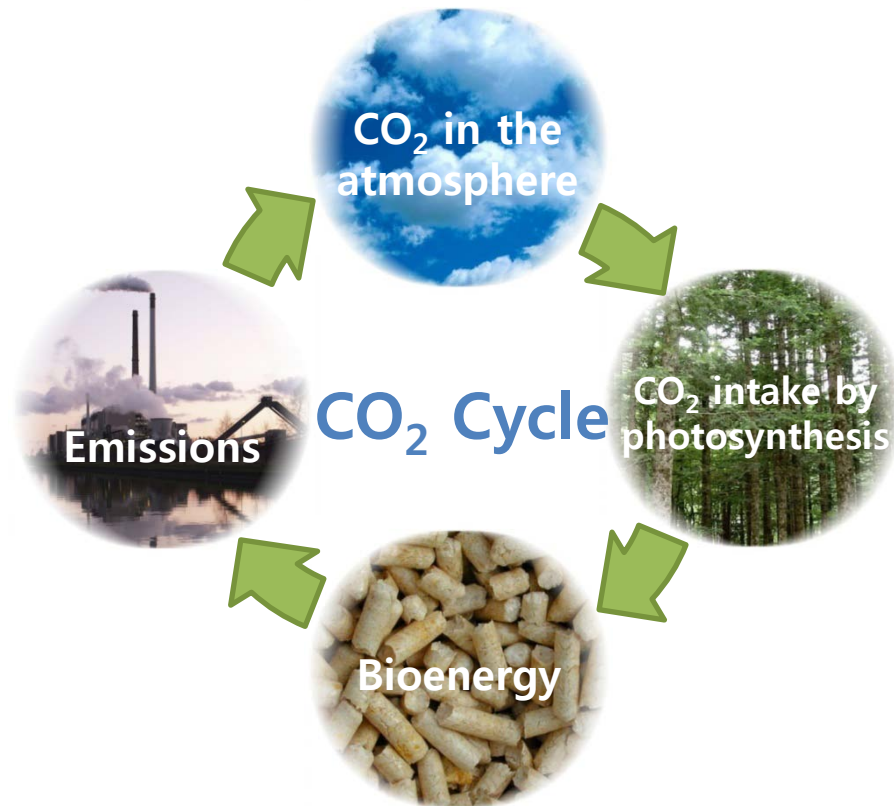
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I . Introduction

■ Background

■ What are the advantages of using the woody biomass?

■ The characteristics of carbon neutral, Substitution for fossil fuels



I . Introduction

■ Necessity

- The wood biomass research in Korea is still at the primitive stage.
- The importance of analyzing the wood biomass production and the specific process of the use

■ Purpose

Calculates cost of wood chips and wood pellets according to the process in LCA approach

Compares with utility of wood chips and wood pellets

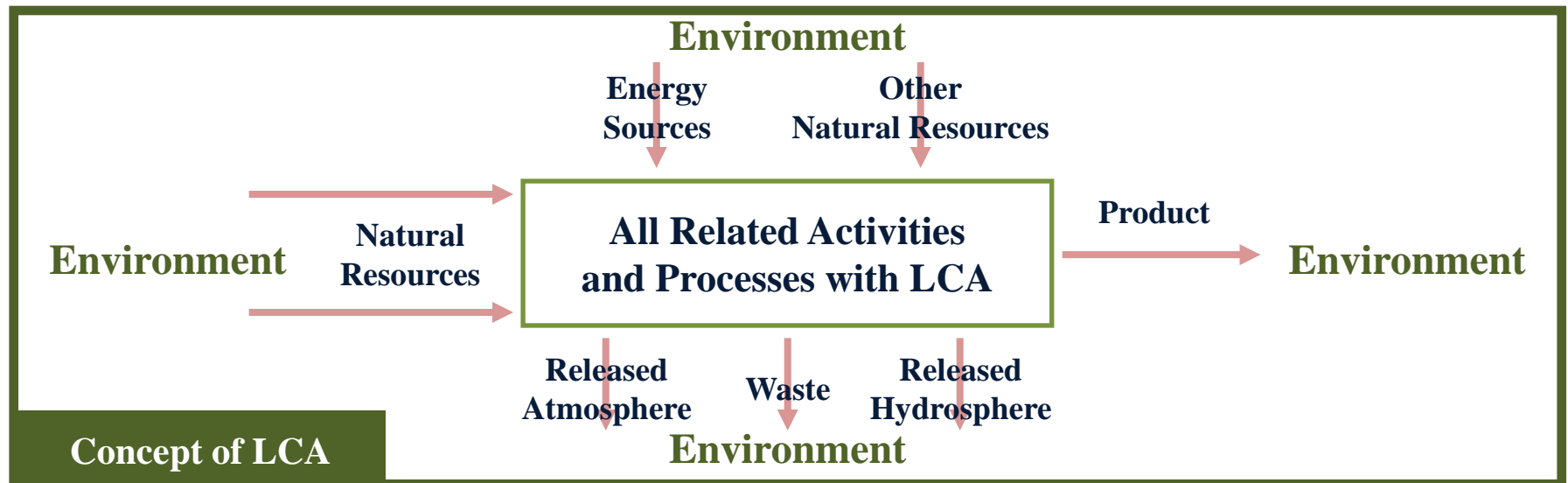
Looking into its application potential in the market

II. Methods

■ What is the "LCA"?

■ Life Cycle Assessment (**From the Cradle to the Grave**)

- Analysis method considering and approaching all activities where products are produced and used
- Connections between products and by-products
- Approaches with the feature of delivering from one process to another process



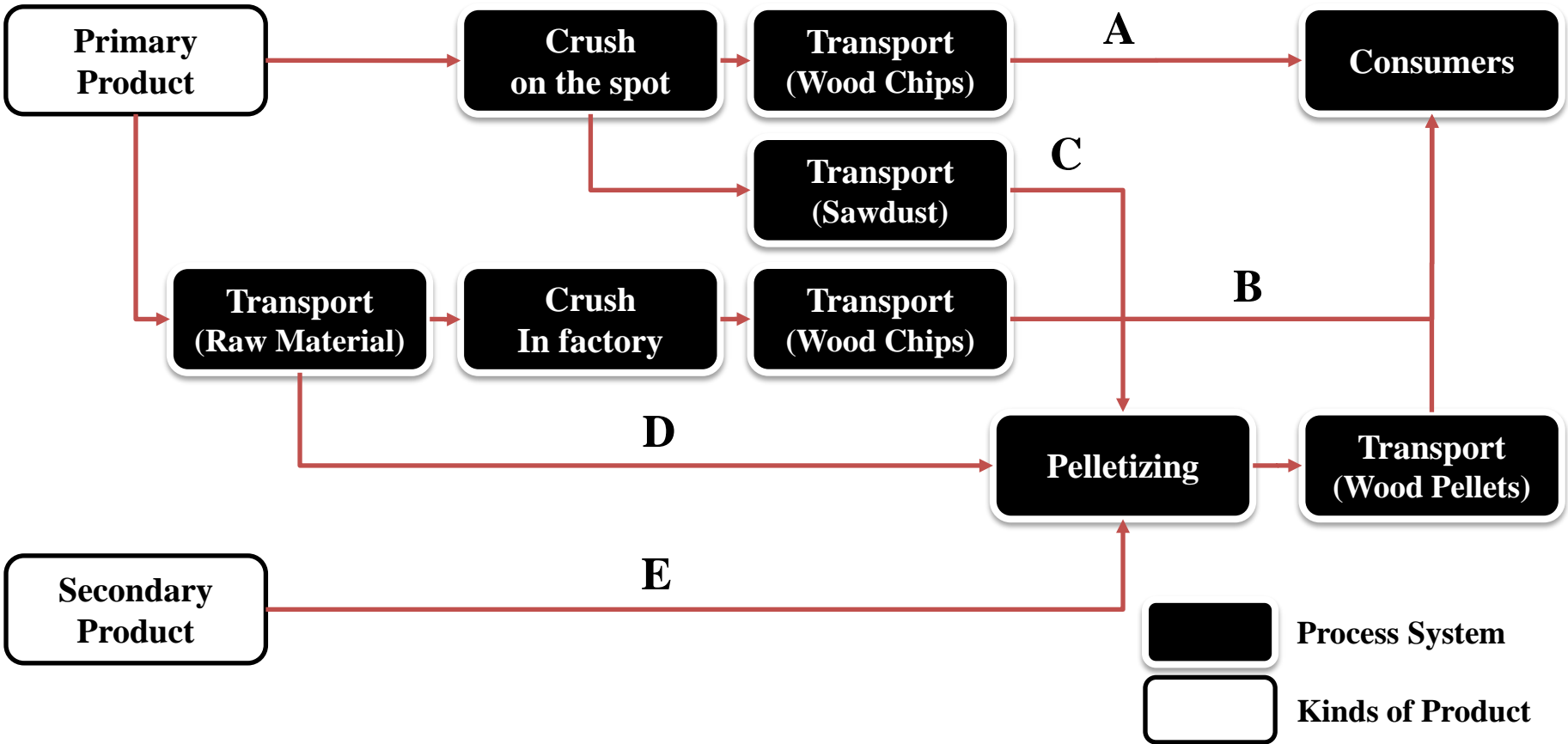
II. Methods

■ What are we going to do in this study?

- **Abstract the most effective process** by examining the process that produces wood chips and wood pellets
 - Production process : Limited after considering the process after afforestation
 - Divide into the actual field and the factory according to the places of crushing raw materials and consider the transportation step toward clients
 - Consider the initial value of raw materials from the opportunity cost perspective
- **Calculate costs by process** and compare benefits according to production costs per unit
 - Calculate heat value per unit according to profits from producers' point and heat value per unit from consumers' point
- **Mention overall matters** according to the use of wood chips and wood pellets in a real situation

III. Results & Discussion

■ Derive the production processes



III. Results & Discussion

Derive the production processes

Production cost according to the process

Unit : \$ per ton

Process	Final Product	Cost of Raw Material	Crush on the spot	Transport (To Wood Chip Factory)*	Crush In Factory	Transport (To Wood Pellet Factory)*	Pelletizing	Transport (To Consumers)	Total
A	Wood Chips	40	11					29	80
B		40		34	37			29	140
C	Wood Pellets	40	11			28**	148	15	242
D		40				34	148	15	237
E		117				33	129	15	294

* Applied 100km of transportation distance for all of chip factory transportation, pellet factory transportation, and consumer transportation

** Calculated the transportation cost according to the difference of specific gravity in wood chip and wood pellet as 2 process is for delivering wood chip crushed in the actual field to the pellet factory

III. Results & Discussion

■ Efficiency of Wood Chips and Wood Pellets

■ From producer point of view

■ Net benefit of wood chip and wood pellet

Unit : \$ per tonne

	Wood Chips			Wood Pellets			
	A	B	Avg.	C	D	E	Avg.
Production Cost(P.C) ; 100km	80	140	110	242	237	294	258
Market Price(M.P)	171	171	171	334	334	334	334
Net Benefit(M.P - P.C)	91	31	61	92	97	40	76

■ Choice : Wood pellets

III. Results & Discussion

■ Efficiency of Wood Chips and Wood Pellets

■ From consumer point of view

■ Caloric value for price

	Unit	Wood Chips	Wood Pellets
Market Price	\$ per tonne	171	334
Caloric Value	kcal per tonne	3,400,000	4,300,000
Caloric Value for Market Price	kcal per \$	19,883	12,874
Price Ratio of Wood Pellets to Wood Chips for getting the same caloric value	:	1	1.54

* The moisture content : Wood chips is 30%, Wood pellets is 10%

■ Choice : Wood chips

III. Results & Discussion

■ Efficiency of Wood Chips and Wood Pellets

■ Using efficiency of wood chips for the producer

■ From producer point of view

- The farther the crush field becomes, the larger transportation cost of a movable crusher becomes
- Need to prepare for the additional storage place if the distance of the crush field is far

■ From consumer point of view

- The fuel storage facilities may be larger than the wood pellet facilities as the volume is bigger
- Additional labor due to frequent refueling.
- High reoccurrence (wood chip is less than 3%, wood pellet is less than 1.6%)
- Decomposition possibility due to humidity in case of storage

■ Using efficiency : Wood pellets > Wood chips

IV. Conclusion

■ Summary of the Results

- Derive the process that minimizes cost of each procedure through a life cycle assessment approach
 - Wood chips : Crush collected residues into pieces on the spot for merchandizing
 - Wood pellets : Transport to manufactory for pelletizing
- Compare efficiency between wood chips and wood pellets
 - From producer point of view : Wood pellets with high benefits.
 - From consumer point of view: Wood chips with in high caloric value compared to the price
 - Use efficiency : Wood pellets > Wood chips
- **Choose adequate wood fuels : condition of the working spot, distance to the consumer, income level of the consumers**

IV. Conclusion

Limitations

Applied view of opportunity cost

-  Raw Materials : Applied purchase cost in market as opposed to collecting cost of woody product

Collected various sources

-  Coefficients may not be accurate

Meaning of this study

Analyzed the production cost according to LCA

-  Compared the efficiency of wood chips and wood pellets considering real market

Concluded various matters

**THANK YOU
FOR YOUR ATTENTION!**