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# **Composite Construction Material from Fibrous Biomasses: A Feasibility Study**

**Wirachai Soontornrangson, Ph.D.**

**Environment Ecology and Energy Department**

**Thailand Institute of Scientific and Technological Research**

**Panel Discussion 5: Biomass Utilization**

**The Second Biomass-Asia Workshop**

**Century Park Hotel, Bangkok, Thailand**

**December 14, 2005**

# Presentation outline

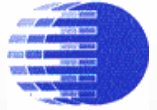
- Objective of Study
- Study Procedure/processes
- Results Obtained
- Conclusions
- Recommendations/comment

# Objective of Study

To find out:

- Alternative utilization of biomass for indirect energy purpose by producing composite construction material
- Commercialize potential of composite construction material from biomass

# Study Procedure



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## Composite Construction Material from Fibrous Biomass: A Feasibility study

Production of Composite construction material

Selections of Biomasses

Pre-treatment/treatments

Castings/pressings

Physical testing

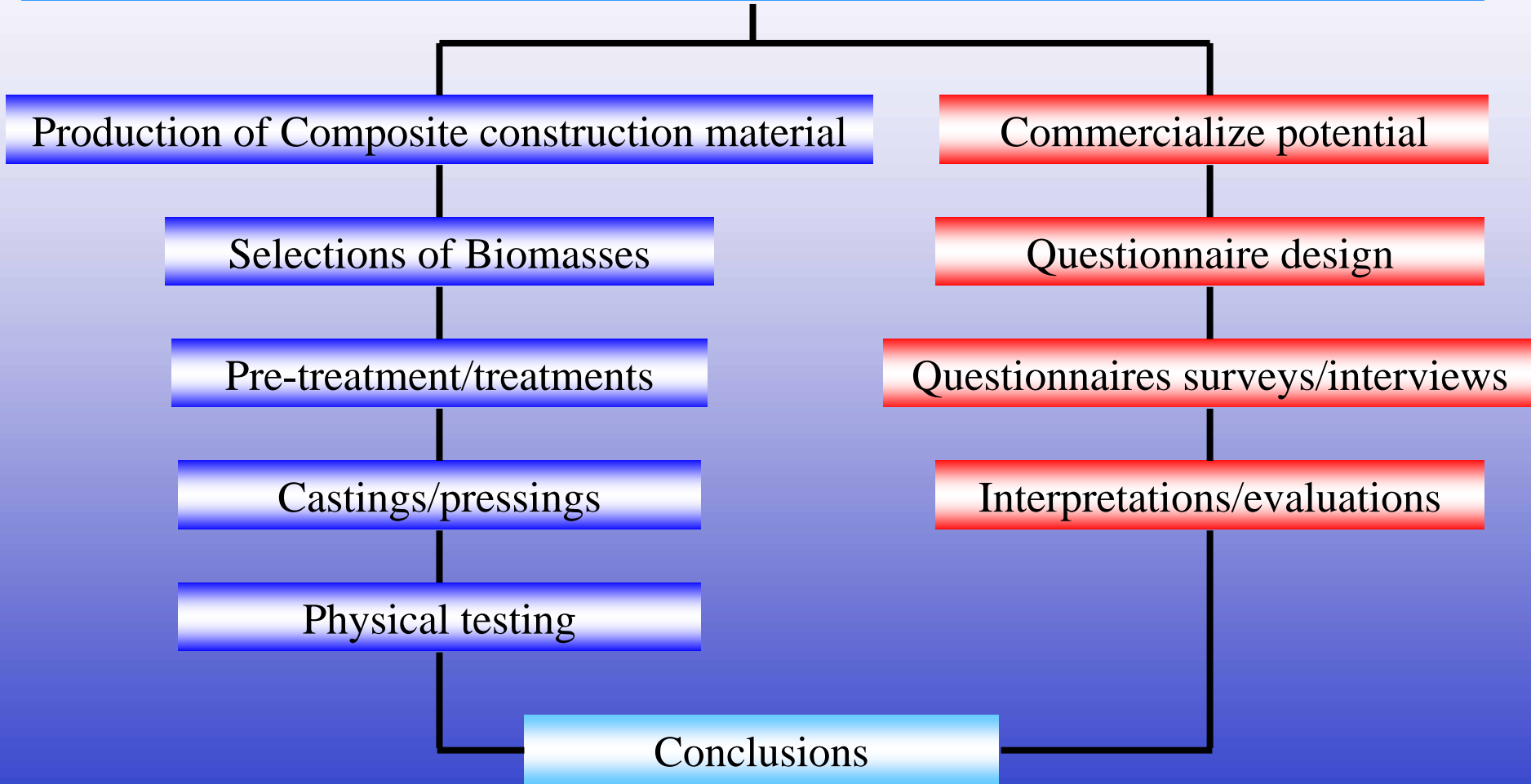
Commercialize potential

Questionnaire design

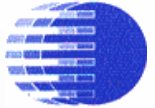
Questionnaires surveys/interviews

Interpretations/evaluations

Conclusions



# Selections of Biomasses

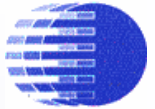


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## Criteria :

- An excess of industrial/agro-industrial processes
- Abundant quantity with no competitive demand for utilization
- Capable of being transformed into composite material

# Selected Biomasses



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**Vetiver**



**Wood pulp**



**Rice straw**

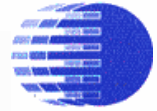


**Kenaf**



**Sisal**

# Producing Composite Material



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## Pre-treatments



**De-fibered  
(Manual/machine)**



**Combing**



**Shredding**

## Treatments



**Boiling**



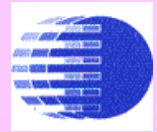
**Washing**



**Refining**

# Producing Composite Material

## Casting

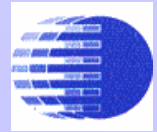


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# Producing Composite Material

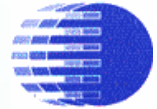
## Cold Pressing



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# Physical Properties Testing



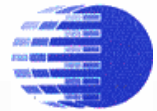
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## Compressive Strength Test



# Physical Properties Testing

## Thermal Conductivity Test

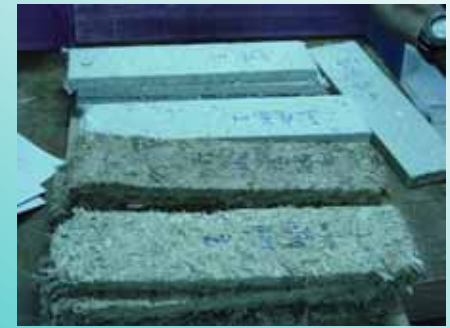


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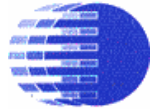


# Physical Properties Testing

## Three-points Bending Test

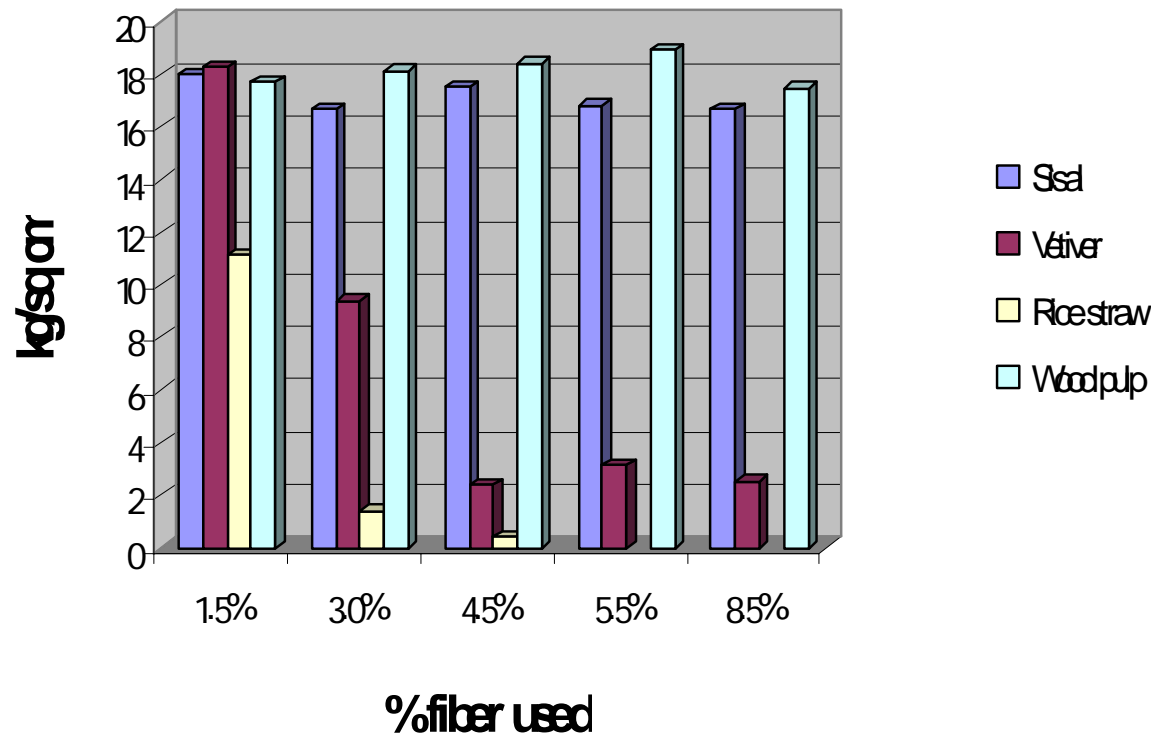


# Results obtained

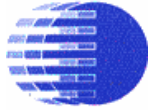


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## Compressive Strength Test

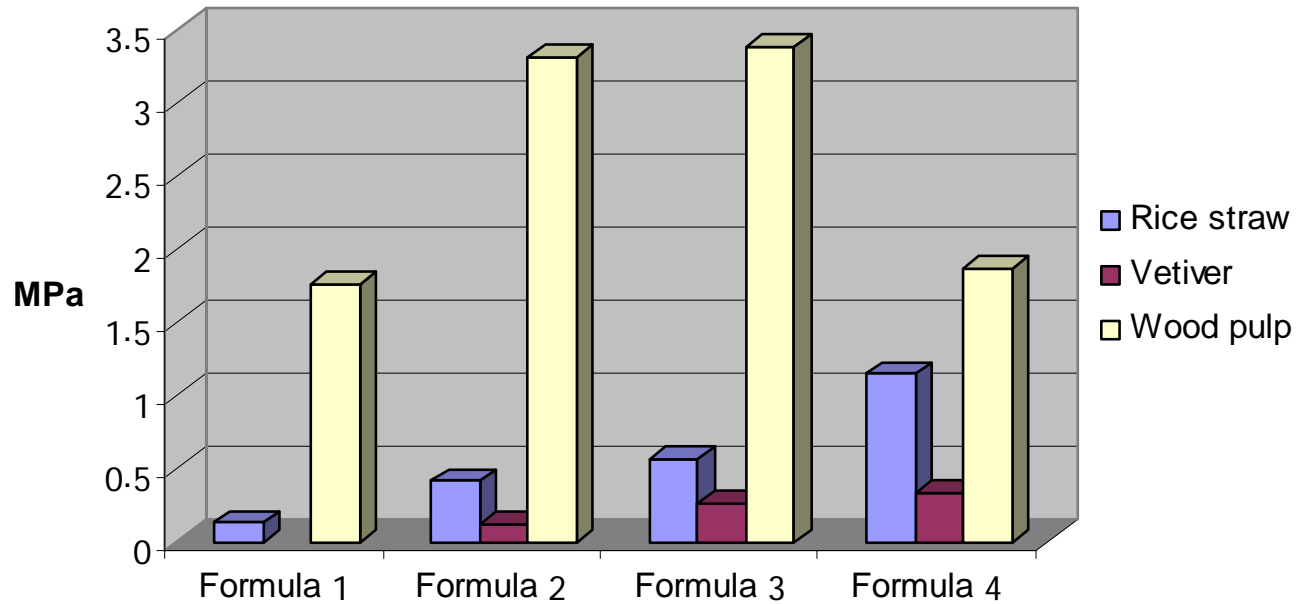


# Results obtained

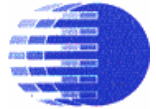


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## Three-points Bending Test

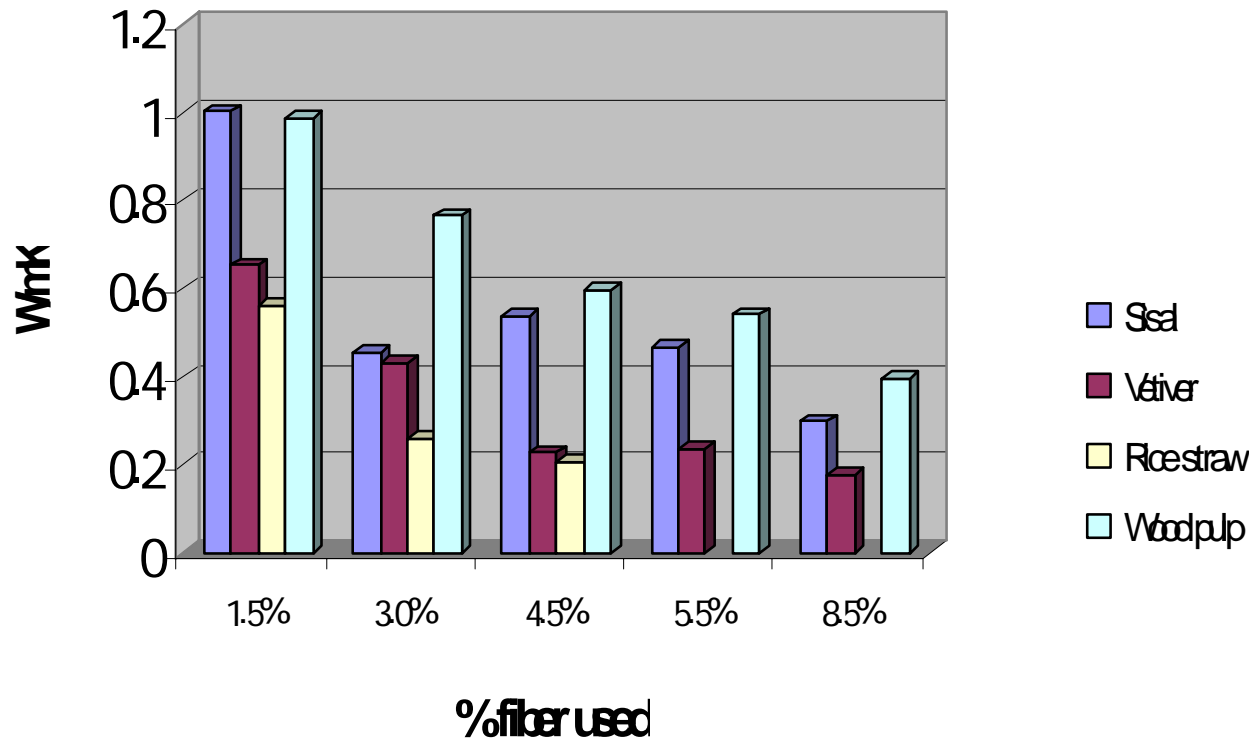


# Results obtained

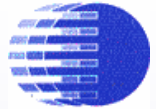


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## Thermal Conductivity Test



# Summary of Results obtained



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Biomasses	Quantity	Thermal Conductivity		Compressive strength		Bending Test		Environment Impact	Type of material	
		Samples	Commercial products	Samples	TIS	Samples	Commercial products		Load bearing	Non-load bearing
Vetiver	Sufficient	0.3456	1.09	7.15	25.5 - 71.4	0.239	9.0-12.0	Low	X	X
Sisal	Uncertain	0.5526		17.13		-		High	X	X
Rice straw	Abundant	0.3436		4.31		0.562		Medium	X	X
Wood pulp	Sufficient	0.6568		18.13		2.578		Low	X	X

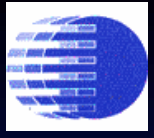
Notice: Units used in table

Thermal Conductivity; W/m-K

Compressive Strength; kg/sq cm

Bending; Newton/sq mm

# Commercialized Potential



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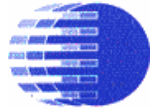
## Contents of questionnaire:

- **Personnel information**
- **Attitude on the selection of resident/ construction materials**
- **Attitude on price and quality of construction materials**
- **Attitude/concern on conservations of energy and environment**

## Target group:

- **200 males and females**
- **Age between 25-45 years old**
- **Resident in Bangkok Metropolitan and vicinity**

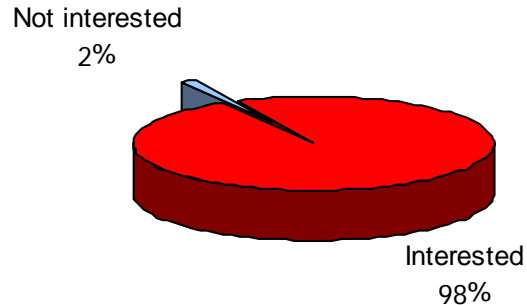
# Results obtained



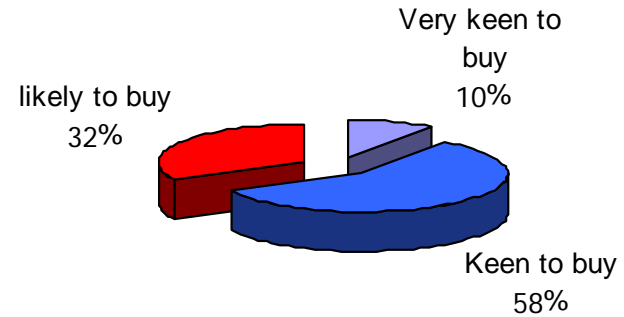
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## Questionnaires Surveys

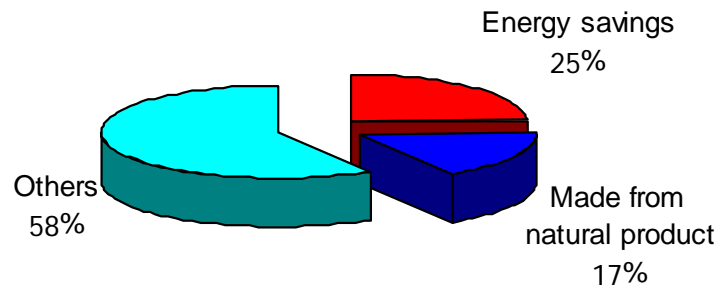
### Product interest



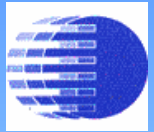
### Buying attitude



### Reasons to buy



# Conclusions



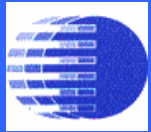
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**Feasibility for producing composite construction material from fibrous biomasses**

**Feasible but further R&D required for improving strength of composite material**

**Commercialized potential for composite construction material from fibrous biomasses**

**High !**

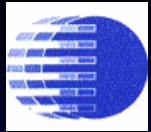


# Recommendations for further studies

- **New techniques/formulas for improving strength**
- **Decomposition rate and toxic fume emitted when conflagration**
- **Mold and insect resistances**
- **Toxic chemical contamination**

## Comment

**Unless new techniques/formulas for improving strength are found, it is recommended to use fibrous biomasses for producing insulation materials instead of construction material**



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# Thank you

