

●Basic Stage

(Fiscal Year 2006-2008)

# Yoneshiro River Basin Area

Construction of "Environmentally-friendly" Wood Industry with Technological Development to Utilize and Apply Akita sugi and to Integrate the Use of Wood -Based Biomass

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### Framework for Project Promotion

- Project Director.....Hiroaki Yoshida
- Chief Scientist.....Koji Harada
- Chief Scientist.....Masaaki Kuwahara
- Science and Technology Coordinator.....Koji Harada
- Chief Scientist.....Hiroaki Yoshida (Project Director)  
Koji Harada (Chief Scientist)  
Masaaki Kuwahara (Chief Scientist)

### Core Research Organizations

- Akita Prefectural University (Institute of Wood Technology, Faculty of Bioresource Sciences, Faculty of System Science and Technology)

### Major Participating Research Organizations

- Industry... Japan Housing and Wood Technology Center, Aizawa Meimoku K. K., Akita Glulam Co., Ltd., TOJU CORPORATION, LTD., Akita Plywood Co., Ltd., Aica Kogyo Company, Limited, KOSHII & CO., LTD., Electric Power Development Co., Ltd., KAN ARCHITECTS & ENGINEERS, Nakashima Komuten, YAMASAMokuzai Co., Ltd., AKITA MINAMI KYOUDUBIRU ZIGYOUBU, Meiji Consultant Co., Ltd., NIHON KIKAI KOGYO Co., Ltd., Woody Sannai Co., Ltd., Japan Conservative Engineers Co., Ltd., NOUSAN, KUDO HAJIME ZAIMOKUTEN, K. K., Yasuikoumuten Co., Ltd., YASUTOKU, Daiichikankou, KITANIHON ZEORAITO HANBAI, SHONAI MACHINERY CO., LTD., AKITAKEN RINGYO CONSULTANT, and others
- Academia... Akita Prefectural University (Institute of Wood Technology, Faculty of Bioresource Sciences, Faculty of System Science and Technology), Akita University (Faculty of Engineering and Resource Science), The University of Tokyo (Graduate School, Institute of Industrial Science), Nagasaki Institute of Applied Science (Institute for Innovative Science and Technology), Musashi Institute of Technology (Faculty of Engineering, Department of Architecture), Hokkaido University (Research Faculty of Agriculture), Waseda University (Faculty of Science and Engineering (Architecture))
- Government... Hokkaido Northern Regional Building Research Institute, Akita Research Center for Public Health and Environment

### Aims of Project

Akita sugi boasts both the largest plantation area and reserve of postwar afforested Japan. On the other hand, a long-term decrease in the Akita sugi demand is continuing owing to reasons such as a decrease in the number of new houses being built, the westernization of houses, and changes in the structural methods. Consequently, appropriate forest management, such as thinning, is becoming insufficient, and the abundant forest resources is strengthening the overheat tendency.

As a result, the decreasing demand in regional wood material such as Akita sugi may cause decreases in the absorption of carbon dioxide by forests and in the fixed function. In this project, to achieve a society without negative environmental impact through the promotion of the sustainable utilization of the regional wood material as biomass, we aim at: the following.

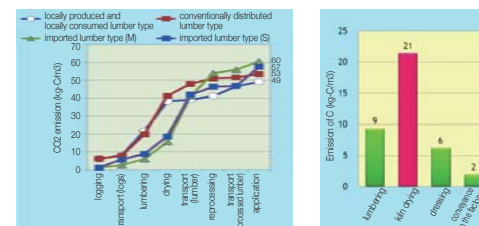
- 1) The formation of an allied environmental zero-emission wood industry, whereby forest resources are utilized in the manner of ideal circulation with consideration of the effective use and reduction of fossil fuel use.
- 2) Corporatization and the market expansion of Akita sugi to metropolitan areas by developing and providing new practical products and features such as highly fire-resistant wood construction.

### Contents of Project

1. Formation of a reasonable distribution system of regional wood materials "Akita sugi"  
This is aimed at the construction of an optimal production system from the forest to disposal, from the perspective of the circulatory use of wood resources, negative impact on the environment, and landscape evaluation.
2. Development and provision of wood materials and construction methods using regional wood resources
  - 1) New wooden building construction methods corresponding to next-generation needs  
Proposal and preparation of a manual for the design and construction of spacious and earthquake-resistant residences by developing a rigid-frame wooden house construction with glued-in hardwood dowels.
  - 2) Developing wood-based materials for structures requiring high fire resistance  
This is aimed at promoting the utilization of Akita sugi by developing fire-resistant materials and construction methods in order to expand the range of applications to those in which wood previously could not be used owing to the restrictions imposed by building standards.
  - 3) Practical application of hybrid wooden civil engineering structures  
The aim is the practical application of wooden bridges by standardizing the design and reducing the cost by combining glulam and steel material. Moreover, the utilization of wooden civil engineering structures will be promoted through the management of information such as that on the construction and maintenance of wooden dams and fences.
  - 4) Proposal of housing materials and construction methods for providing a comfortable residential space  
Housing materials, construction methods and their optimal utilization for providing a comfortable residential space are proposed by elucidating the physical and chemical variables concerning the amenity of wooden houses.
3. Integrated utilization of wood biomass
  - 1) Energy conversion of wood resources  
This is aimed at developing an efficient way of utilizing wood waste and the unused wood resource, as energy alternatives to fossil fuels, in order to generate high-calorie gas.
  - 2) Practical use of water purification pellet  
In this research, the improvement of the purification system as a result of using techniques developed in the starting stage of the project will be tested and demonstrated. The aim is the promotion of environmental awareness and the nurturing of related corporate groups.

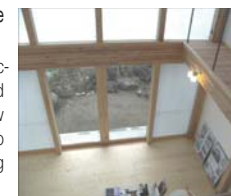
### Main Results

1. Comprehensive clarification of flow of wooden housing material and LCA estimation  
The emission of CO<sub>2</sub> is 49-60kg-C/m<sup>3</sup> from wood-based materials that are produced and consumed locally, conventionally distributed, or imported for wooden houses. Houses constructed of locally-produced material shows the lowest emission, but surprisingly, the difference among housing types is small.



2. Construction of rigid-frame wooden house with glued-in hardwood dowels

The first house in which the rigid-frame construction with glued-in hardwood dowels was used was built as a result of the development of new wooden construction methods responding to next-generation needs. It exhibits high bearing performance and high earthquake resistance.



Rigid-frame wooden house with glued-in hardwood dowels

3. Construction of fire-resistant wooden structure in accordance with fire-resistance validation method

The revision of the Building Standards Law in 2000 permitted the construction of fire-resistant wooden structures. However, few buildings were constructed in spite of a high demand, because the design is complicated and requires a long working period. In this project, a trial design was made to resolve this aspect. As a result, the trial design was adopted for a gymnasium of a primary school in Noshiro City.

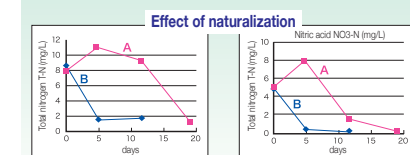
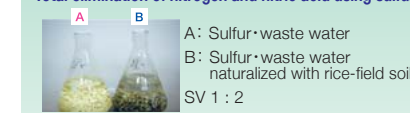


CG Image of the gymnasium of a primary school

4. Development of purification pellet to eliminate both phosphorus and nitrogen

A new function of eliminating ammonia nitrogen using sulfur was found in the purification pellet, in addition to the selective adsorption effect of phosphate-P.

### Total elimination of nitrogen and nitric acid using sulfur



Total elimination of nitrogen and nitric acid using sulfur

