



10th  
WORLD  
BAMBOO  
CONGRESS  
PROCEEDINGS  
17-22 September 2015



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ISSN 2150-1165



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## **10<sup>th</sup> WBC Welcoming Message**

**From Damyang Governor Choi Hyungsik**

Damyang in Korea is a region of bamboo with a history and tradition over 1000 years and an ecological city with well-preserved environment. Damyang also has many natural tourism attractions such as Juknokwon (Bamboo Park), Metasequoia Road, Geumseongsan Mountain Fortress, Gwanbangjerim Forest and etc.

I am very happy to hold the 10<sup>th</sup> World Bamboo Congress under the slogan “Bamboo for a Greener Future” in Damyang and welcoming every visitor in Damyang.

I think Bamboo looks like a human life. Every bamboo joint is a course of growth and stop in a life. It is like an adversity in human life that a soft bamboo shoot grows stronger as time goes and bamboo is bent and broken in the wind and snowstorm sometimes. It is also same as a human community that bamboos gather together to show their fellowship and cooperation and intertwist together to support each other and prevent landslides. Like this, bamboo teaches us virtues of humanities as a teacher of life. I think everyone in WBC who studies and loves bamboo so much is an environmental guard to prepare climate change.

WBC is a place of bamboo network to unify lovers and professionals of bamboo together. I want to encourage you to share everything about bamboo throughout the topic presentations, poster session, videos and tours during the 10<sup>th</sup> World Bamboo Congress in Damyang. And I wish WBC tremendous success and vigorous interchanges about the future of bamboo.

In addition, World Bamboo Fair will be held from September 17<sup>th</sup> to October 31<sup>st</sup> in Damyang. You can meet the past, present and future of bamboo with countless values in bamboo craft, advanced biotechnology industry, food, fiber, architecture, landscaping and etc.

Please enjoy the Fair in Damyang, the region of bamboo and experience to purify your spirit and body in the green bamboo forests and many other magical attractions.

I wish good health and fortune to every visitor in Damyang and lovers of bamboo in the world.

Thank you.

**County Governor of Damyang**

**Choi Hyung-sik**

## 제 10 차 WBC 환영 메세지

대한민국 담양은 1000 년의 역사와 전통을 자랑하는 대나무 고장으로서, 자연 환경이 잘 보존된 생태도시이며, 죽녹원, 메타세쿼이아 가로수길, 금성산성, 관방제림 등 천혜의 관광자원이 풍부한 지역입니다.

이곳 담양에서 “대숲에서 찾은 녹색미래”라는 주제로 세계대나무협회 제 10 차 총회가 열리게 된 것을 매우 기쁘게 생각하며, 담양을 방문하시는 모든 분들을 진심으로 환영합니다.

대나무는 사람이 살아가는 모습과 흡사하다 생각합니다. 대나무 마디 하나 하나가 인생의 성장과 멈춤의 과정이며, 부드러운 죽순으로 자라나서 시간이 흐르면서 더욱 단단해지고, 때로는 바람에 흔들리기도 하며 눈보라에 꺾어지기도 하는 모습은 사람이 살아가면서 겪는 역경과도 같으며, 또한 모여서 숲을 이루어 유대감과 협동으로 존재감을 드러내고 뿌리가 서로 얹혀서 서로를 지탱하면서 산사태도 예방해주는 모습 등은 인류가 살아가면서 공동체생활을 하는 모습과도 일치합니다. 이렇듯 대나무는 인생의 스승처럼 우리에게 인문학적 덕목을 가르치고 있습니다. 이러한 대나무를 깊이 연구하고 사랑하시는 WBC 참여자 여러분이야말로 기후변화에 적절히 대응해 나가는 환경 파수꾼이라고 생각합니다.

WBC 는 대나무 애호가들과 전문가들을 실질적으로 단합시키는 대나무 네트워크의 장인만큼, 담양에서 열리는 제 10 차 세계대나무협회 총회에서 많은 주제발표와 포스터 세션 등 대나무의 모든 것을 선보여주시길 바라며, 아울러 대나무의 미래에 대한 보다 활발한 교류와 WBC 의 무궁한 발전을 기원합니다.

또한, WBC 가 개최되는 담양에서는 9. 17 부터 10. 31 까지 45 일동안 세계대나무박람회가 개최됩니다. 죽세공예를 비롯하여 첨단바이오산업과 식품, 섬유, 건축, 조경분야 등 무궁무진한 가치를 가진 대나무의 과거, 현재, 미래를 만나보실 수 있습니다.

대나무의 고장 담양에 머무시는 동안 박람회 관람 잘하시고 푸른 대숲과 관광명소에서 몸과 마음이 정화되는 신비로운 경험을 체험하시길 바랍니다.

담양을 방문하신 모든 분들과 대나무를 사랑하는 전 세계의 모든 분들의 건강과 행운을 기원합니다.

감사합니다.

## 담 양 군 수 최 형 식

From the World Bamboo Organization Executive Director, Susanne Lucas



My road to Korea started before the 9<sup>th</sup> World Bamboo Congress even ended, as the connection to the Damyang delegates in Belgium was one of camaraderie and of earnest need. We often don't realize the importance of meeting face-to-face, especially in these virtual times of the world-wide-web, Skype and mobile phones. However, when I saw the looks on the faces of the Damyang delegation in the lobby of a hotel in Antwerp (April 2012), I realized these people were eager to meet the world bamboo community and share bamboo. They had come a long way (like many of the global participants), and for them, they had never met "bamboo people". The World Bamboo Congress is an incredible amalgamation of individuals. You have to go to one to find out.

So, I hope you are here in Damyang, attending, sharing, networking, and enjoying. The World Bamboo Organization is the only free, independent, decentralized, non-governmental network of bamboo people. Individuals, entrepreneurs, artists, architects, farmers, botanists, industrialists, dreamers, foresters, designers, scientists, musicians, ecologists, nurserymen, professors, students, product developers, horticulturists, land managers, wildlife managers, biologists, and more. I am so proud of what the World Bamboo Organization has achieved.

Evolving, the WBO is in the midst of changing its administration structure a bit, to reflect a more horizontal structure to encourage more creative collaborations. We are launching a new platform called the World Bamboo Ambassadors, comprised of enthusiastic, progressive, dedicated persons who see the global potential of bamboo and who want to push it forward. Welcome me by welcoming the new team of World Bamboo Ambassadors. You'll meet some of them here in Damyang, and trust that the ones that are not here are somewhere on the planet talking about bamboo!

From the President of the World Bamboo Organization



### Bamboo, a new road for a greener future

For this 10th World Bamboo Congress, the World Bamboo Organization decided to take a new road and plant its flagship in Damyang-gun, South Korea. Choosing Damyang to hold this meeting might seem a bit peculiar. However, here, the governor, Choi Hyung-sik and his devoted team, are winning a bet: to re-launch a three-hundred-year-old tradition, establishing a bamboo-ware market in the middle of the city. This effort is leading to the creation of a new bamboo economy in the region of Damyang-gun, based on the innovations of young companies from various fields of manufacturing - furniture design, soap, charcoal, bicycles, tea, and others. The result is a flourishing of activities around bamboo that is spreading around the city. During the World Bamboo Fair, Damyang will show « the work on the road », while throughout the World Bamboo Congress, the world bamboo community will share, exchange and inspire.

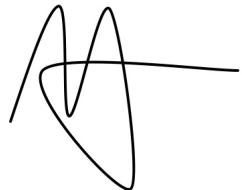
Globally, in the last three decades, bamboo has made a giant step forward through multiple transformations and applications. From traditional uses in rural areas of Asia, South Asia, Central and South America, and across Africa, bamboo has become a material of choice for innovative products, including flooring, housewares, furniture, housing, industrial buildings, bridges, fuel, pulp for paper & textile to advanced technology fibers. Bamboo is becoming a « green invader » of the modern world.

Other proof of the growing influence of this fast growing plant on the world market is the use in fine cuisine by great gourmet chefs. In the best restaurants, cooking the virtue of the bamboo shoots to the taste of the gourmets has become a reference for excellence! But in Damyang, with a lot of simplicity and in the full spirit of sustainable development, you will have the unique chance to taste the best meal prepared on a six-meter bamboo plate cooked intact within a huge oven. An unforgettable experience!

On the bright road of a greener future, bamboo has to cope with a big challenge: climate change. On that field, the versatility and adaptability of this extraordinary plant will give us some examples to follow. The 10<sup>th</sup> WBC sessions will provide us all lessons via scientific research and practical applications, thanks to the WBC Technical Committee led by Chairs Ms. Nirmala Chongham, Mr. Jean Luc Kouyoumji and Dr. CN Park, and Committee members Rebecca Reubens, Lynn Clark, Yavin Lin, MS Bisht, Ximena Londono, Darrel DeBoer, Hector Archila, Neelam Manjunath, Chris Stapleton, Victor Brias, Johan Gielis, Geert Potters, Andras Darabant, Nick Hogarth, TM Yen, DX Wang, Ho, JD Lanvin.

After reading the excellent contributions of the authors of this 10<sup>th</sup> World Bamboo Congress Proceedings, you can be sure that on the road to a greener future, the use of bamboo will draw new ways to improve the global environment and help reduce the threat of climate change... bamboo will give us a new fresh perspective.

With my best wishes for great success,



Michel Abadie  
President, WBO  
Paris, France  
Email: [bambadie@gmail.com](mailto:bambadie@gmail.com)

From the Desk of the Chair, 10<sup>th</sup> WBC Technical Committee

A very warm welcome to one and all to the 10<sup>th</sup> World Bamboo Congress in Damyang. For the Technical Committee, it has been a long journey to the 10<sup>th</sup> WBC, commencing on January 2013 and still continuing till the end of this congress. The Technical Committee started its work in May 2013 with the visit by three of its members Jean Luc Kouyoumji, Lin Yayan and myself to Damyang, the bamboo perfume city and host of the World Bamboo Congress in South Korea on the invitation of Choi Hyung-sik, Governor of Damyang county. We were welcomed by Lee Han Chul, Han Yeon Deok and Lee Chang Hun and their colleagues. It was the time of the Damyang Bamboo Festival, an annual event and it was fascinating for us to see the myriad of activities going on. It was heartening to see that there was so much enthusiasm and passion in all the local people and it is because of their love for bamboo that this plant is scaling new heights in this small county. At that moment itself, we felt that there could not have been a better place than Damyang to hold the 10<sup>th</sup> World Bamboo Congress.

On May 4, 2013, we had a meeting with Damyang National Organizing Committee represented by Park Choong-Nyeon, Lee Han Chul, Han Yeon Deok, Lee Chang Hun and Bin Dorim and many important issues relating to the congress were discussed and finalized. We visited probable venues and other sites and worked out the modalities for the congress.

The first announcement of WBC was made on 1<sup>st</sup> July 2013, with all the information regarding the congress including scientific sessions/themes. There are nine themes - Morphology and Taxonomy, Propagation, Plantation and Management, Post Harvesting and Processing, Architecture, Engineering and Social Housing, Product design and Technology, Food and Pharmaceuticals, Resources, Standards, Commerce and Policy Aspects, Community and Economic Development and Ecology and Environmental Concern. Papers for the congress started pouring in since July 2014 and by the end of paper submission, we received 101 papers for oral presentations and 20 abstracts/ papers for poster presentation. It was indeed an overwhelming response. The committee members did a commendable job of reviewing and re-evaluating all these papers. A new introduction in this WBC is the inclusion of video presentations to which we are eagerly looking forward.

I am deeply indebted to all the members of the Technical Committee for their unstinting support to me. Without their help, it would not have been possible for me to successfully complete the huge responsibility that was given to me. My special thanks to Jean Luc Kouyoumji, Co-Chair of Technical Committee with whom I have been working closely since the last one and half year.

My heartfelt thanks to Jean-Denis Lanvin from France, Tian-Ming Yen and Chen-Lung Ho from Taiwan, Eduardo Ruiz Sanchez from Columbia and O.K. Rema and Daizy R Batish from India for reviewing some of the papers.

Keeping the best for the last but not the least, my thanks to Michel Abadie, President of WBO and Susanne Lucas, Executive Director of WBO and Chair of International Organizing Committee, WBC who are the main pillars behind this Congress. Michel, from time to time has given very valuable inputs and guided us throughout this journey. A special mention and thanks to Susanne who with her exuberance, kindness, cordial nature, and patience is holding such a big bamboo family together. We owe her a lot for running the show so successfully for so many years.

Here's wishing you an unforgettable experience from 17-22 September 2015 in Damyang!

Nirmala Chongtham

Chair, 10<sup>th</sup> World Bamboo Congress Technical Committee



**CHAIR Nirmala C - India**

World Bamboo Ambassador  
Panjab University, Nutrition and Food  
*Email:* cnirmala10@yahoo.com



**CO CHAIR Jean-Luc Kouyoumji - France**

Bambou Sciences et Innovation, Civil Engineering.  
*Email:* jeanluc\_kouyoumji@yahoo.fr



**CO CHAIR Choong Nyeon Park - South Korea**

Department of Materials Science, Chonnan National University (Gwangju).  
*Email:* cnpark@jnu.ac.kr



**Ximena Londono - Colombia**

WBO Honorary Council/World Bamboo Ambassador  
Taxonomy, specialist in Guadua.  
*Email:* ximelondo@gmail.com



**Lynn Clark - USA**

WBO Honorary Council/ World Bamboo Ambassador  
Taxonomy and phylogeny.  
*Email:* lgclark@iastate.edu



**Chris Stapleton - UK**

Bamboo Identification. Taxonomy, Biodiversity, Conservation.  
*Email:* chris@bamboo-identification.co.uk



**I. V. Ramanuja Rao - India**

INBAR. Livelihoods and Economic Development (LED).  
*Email:* rrao@inbar.int



**Victor Brias**- Belgium

WBO Honorary Council. Oprins Plant NV, Plantation expert.  
*Email:* vbrias@oprins.com



**Johan Gielis**- Belgium

9th WBC Co-Chair. Oprins Plant NV, Biotechnology expert.  
*Languages:* English, Flemish, German  
*Email:* johan.gielis@easynet.be



**Geert Potters**- Belgium

9th WBC Co-Chair. Univ of Antwerp, Biochemistry, Molecular biology, Bioenergy.  
*Email:* geert.potters@telenet.be



**M.S. Bisht** - India

Centre for Science Education, Food and Socio-economic Development.  
*Email:* msbisht59@gmail.com



**Neelam Manjunath - India**  
Manasaram Architects  
*Email:* mansarch@gmail.com



**Rebecca Reubens - India**  
World Bamboo Ambassador, Designer, Sustainability.  
*Rhizome Design Co.*  
*Email:* rreubens@gmail.com



**Nick Hogarth - Australia**  
Community and Economic Development, Center for International Forestry Research  
*Email:* nicholas\_hogarth@yahoo.com



**Lin, Ya-Yin - Taiwan**  
Natural Building, Architecture  
*Email:* lin.yayin0@gmail.com



**Héctor F. Archila - UK & Colombia**  
World Bamboo Ambassador  
Architecture, Materials Science, Engineering, Dept. Architecture and Civil Engineering, Univ. of Bath  
*Email:* H.F.Archila.Santos@bath.ac.uk



**Andras Darabant - Austria**

Forestry and Ecology, Department of Forest and Soil Sciences  
University of Natural Resources and Life Sciences, Vienna.  
*Email:* darabant@gmail.com



**Dejene Adem - Ethiopia**

Wagagen Bamboo Association, Plantations  
*Email:* ethio.bamboo7@gmail.com

The Damyang Call :

“Bamboo for Planet”



We, people of bamboo, invite all government leaders from all countries of our planet to recognize the essential contribution of bamboo in the fight against climate change.

We testify that bamboo is one of the best CO<sub>2</sub> sequestering agro-forestry plants, which is able to restore and protect lands from erosion and degradation, that bamboo can produce high quality woody fiber material from a quickly renewable resource, and that bamboo can be sustainably managed to provide economic revenue for human populations in need.

We urge governments to free bamboo, a giant grass, from the restrictions of outdated national forestry codes to stimulate social and economic developments.

We urge governments to launch innovative policies to stimulate the multi-use of bamboo potentiality on energy, building, medicine, transportation, agro-forestry, nutrition, and other modern innovative capacities.

We plead for governments to support research, exchange knowledge and improve communication on bamboo development for the sake of all humanity.

FROM THE WORLD BAMBOO ORGANIZATION



## OUR HISTORY

2015 World Bamboo Congress – 10<sup>th</sup> WBC

Damyang, South Korea

Host: World Bamboo Organization and Damyang-gun

2012 World Bamboo Congress - 9th WBC

Antwerp, Belgium

Host: WBO, IKEBANA and the University of Antwerp

2010 World Bamboo Day Celebration

Kohima, Nagaland, India

Host: Government of Nagaland

2009 World Bamboo Congress - 8th WBC

Bangkok, Thailand

Host: World Bamboo Organization and Royal Forest Department, Thailand

[ 2007 World Bamboo Congress - sadly cancelled! ] - 7th WBC

Brazil

2004 World Bamboo Congress - 6th WBC

New Delhi, India

Host: World Bamboo Organization and the National Government of India

1998 International Bamboo Congress & Workshop - 5th WBC  
San Jose, Costa Rica  
Host: Fundacion Bambu and INBAR

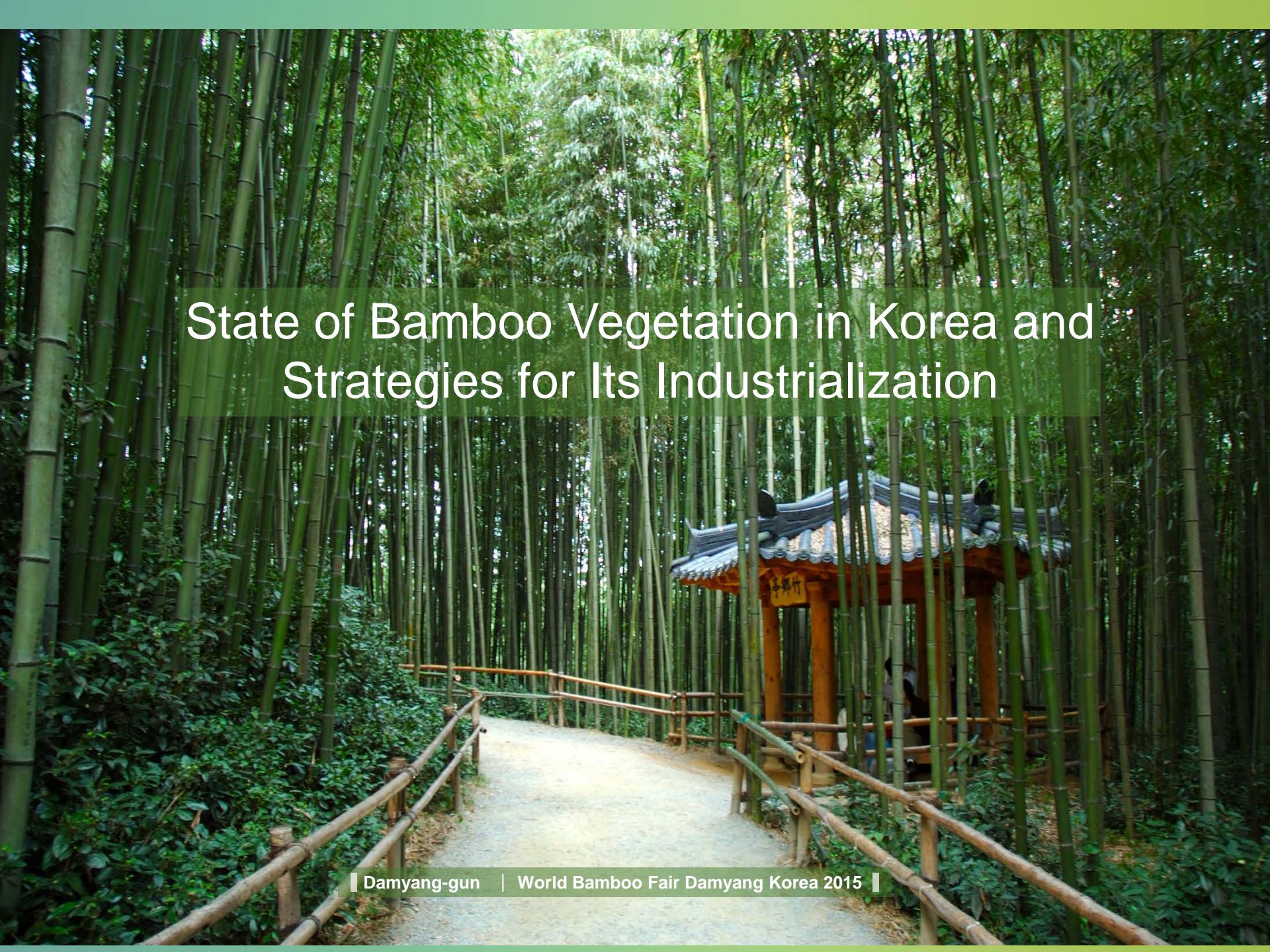
1995 International Bamboo Congress & Workshop - 4th WBC  
Ubud, Bali, Indonesia  
Host: Environmental Bamboo Foundation and INBAR

1992 International Bamboo Congress - 3rd WBC  
Minamata, Japan  
Host: National Government of Japan

1991 International Bamboo Workshop  
Chiang Mai, Thailand  
Host: International Network of Bamboo and Rattan

1988 International Bamboo Congress - 2nd WBC  
France  
Host: European Bamboo Society

1984 International Bamboo Congress - 1st WBC  
Puerto Rico  
Host: American Bamboo Society

The background image shows a lush bamboo forest. A paved path leads through the bamboo towards a traditional Korean pavilion with a curved roof and wooden support posts. The pavilion has some inscriptions on its facade. The overall atmosphere is serene and natural.

# State of Bamboo Vegetation in Korea and Strategies for Its Industrialization



# Contents

1. Current Distribution  
of Bamboo



4. Additional Effects  
of Bamboo



2. History  
of Bamboo in Korea



3. Cases  
of Bamboo  
Utilization



6. 'Juknokwon'  
Bamboo Garden



5. Strategies for  
Bamboo Industry  
in Damyang



## **State of Bamboo Vegetation in Korea and Strategies for Its Industrialization**

### **Part.1 Current Distribution Status of Bamboo**

1

## 1.1 Current Distribution of Bamboo around the World



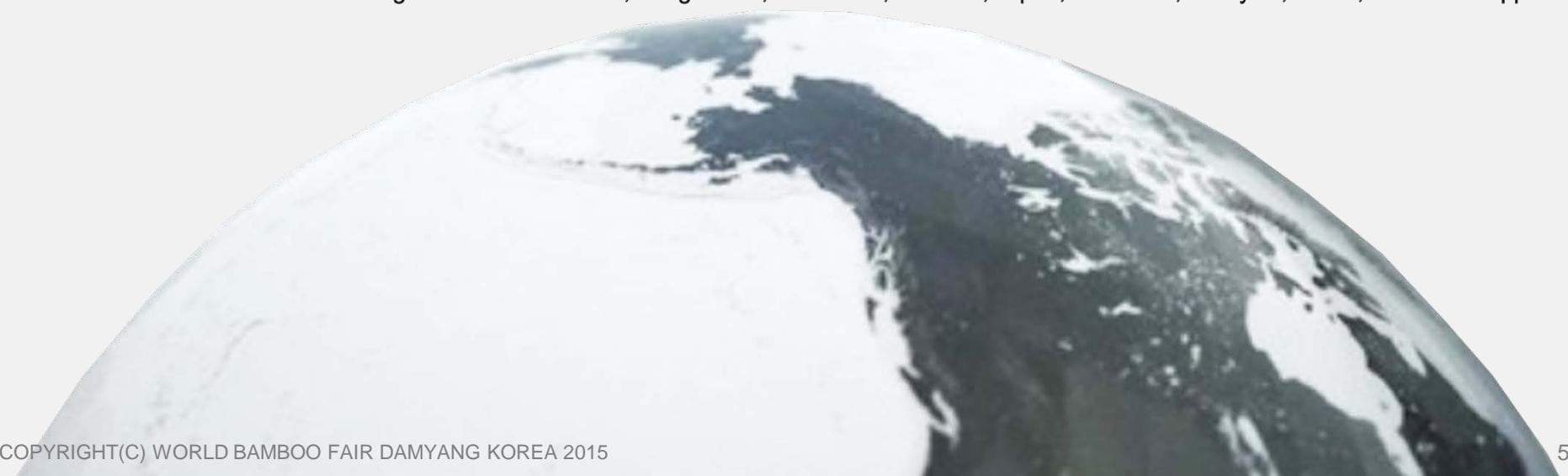
of the world bamboo forests are in Asia

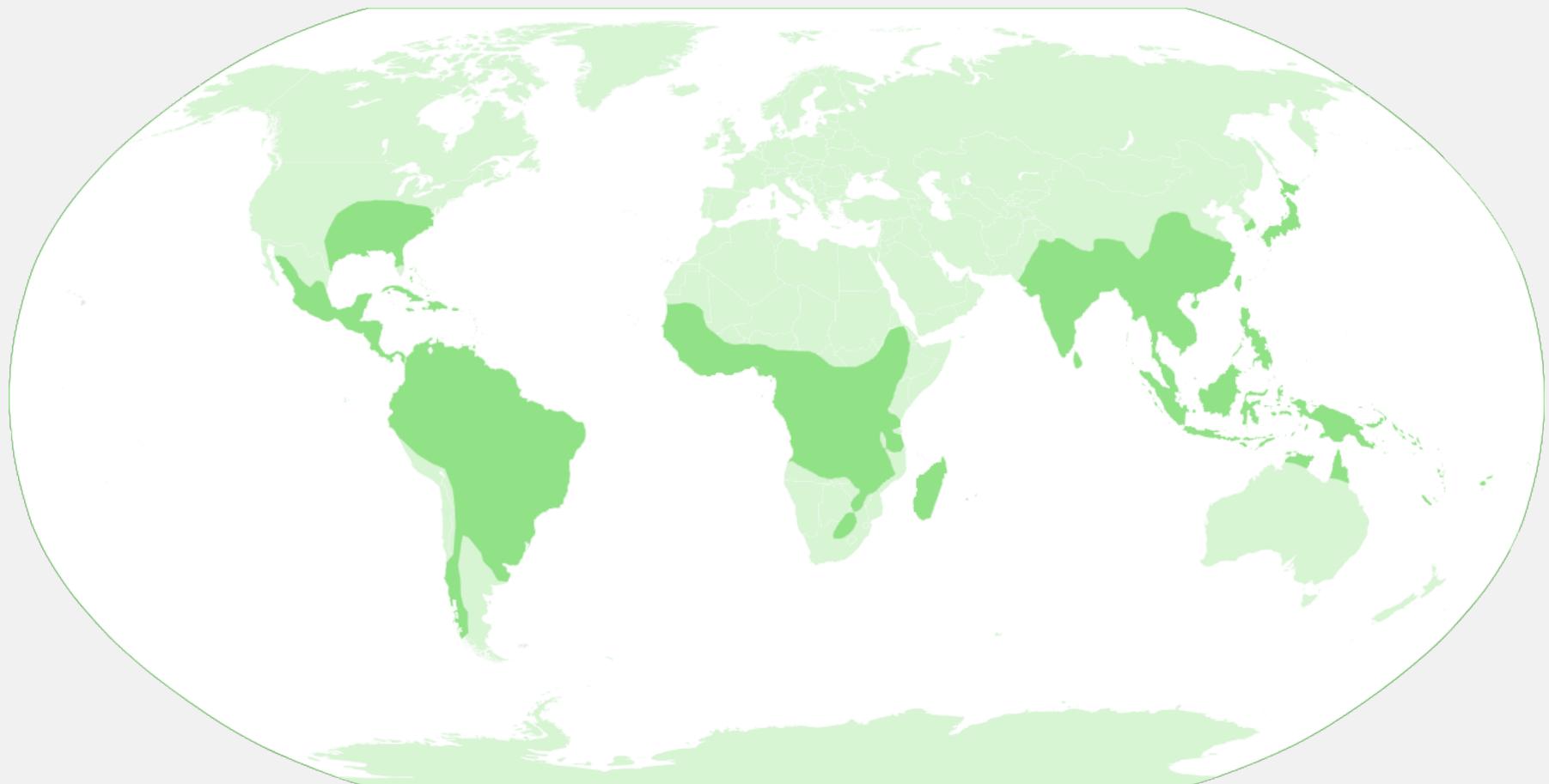
# 14,000,000 ha

Total Area of Bamboo Forests in the World (90 genera 1,500 species)

80% of bamboo forests are in Asia (China, India, Myanmar, etc.), as well as Oceania, Pacific Rim, United States, and Africa

Other nations where bamboo trees grow include Thailand, Bangladesh, Cambodia, Vietnam, Japan, Indonesia, Malaysia, Korea, and the Philippines





## 1.2 Distribution of Bamboo Trees in South Korea

Distribution of Bamboo in South Korea

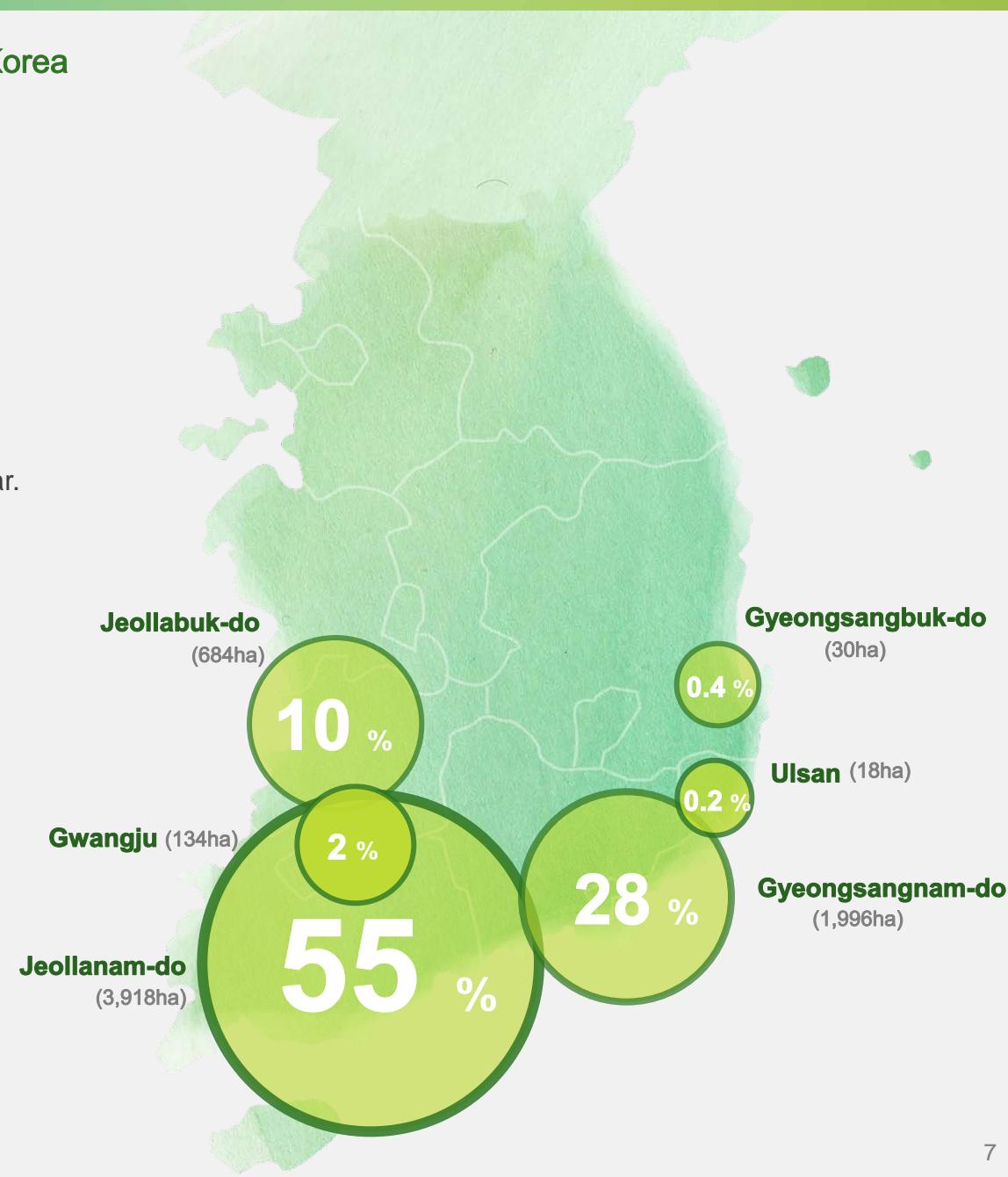
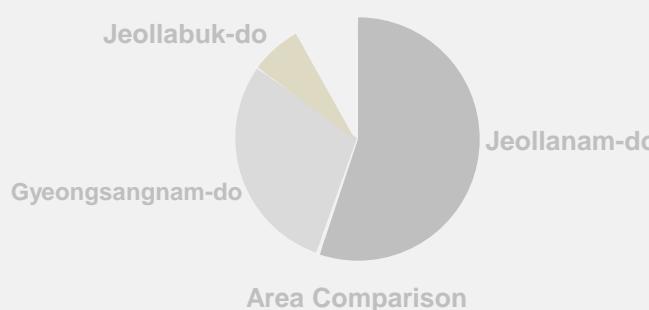
# 7,045ha

Area of bamboo trees in South Korea

(5 genera, 19 species)

*Phyllostachys bambusoides*, *Phyllostachys nigra* var.  
*henonis*, *Phyllostachys heterocycla* f. *pubescens*  
take up the majority area; while most grow in  
Jeolla-do and Gyeongsang-do, much of them is in  
the coastal areas in Gangwon-do and  
Chungcheongnam-do and parts of Jeju island.

Others



### 1.3 Types of Major Bamboo in South Korea



1.3 a)



## Giant Timber Bamboo

*Phyllostachys bambusoides* Siebold & Zucc.

The tallest Bamboo that grows up to 20 meters. They are mostly distributed along the warm areas south of Chungcheong-do, under 600m in altitude. This bamboo has great elasticity and is easy to be crafted for many purposes. Shoots a bit bitter.

1.3 b)



## Henon Bamboo

*Phyllostachys nigra* var. *henonis* (Bean)  
Stapf ex Rendle

This bamboo grows up to 10 meters tall and has white stripes that look like cotton.

The Korean name for it means “cotton bamboo.”



1.3 c)



## Tortoise-Shell Bamboo

*Phyllostachys heterocycla f. pubescens*  
(Mazel ex Lehaie) D.C.McClint.

Many of these bamboo trees grow in the Southern areas. Its origin is China, and it first landed in Korea from Japan in 1898. It grows up to 10-12 meters, and it is called “edible bamboo, Japanese bamboo, river-south bamboo, or angled bamboo.”

1.3 d)



## Black Bamboo

*Phyllostachys nigra* (Lodd. ex Lindl.) Munro

This is a type of Henon Bamboo. The name came from its black stem. It is also called “purple bamboo” and mostly found in Ojukheon in Gangneung, Gangwon-do.

1.3 e)



## Sasa Borealis

*Sasa borealis* (Hack.) Makino

This small bamboo of about 1 meter height usually grows in the mountains. It is often called “mountain bamboo” or “earth bamboo,” and can be found in the south of Hamgyeongnam-do and Pyeongan-nam-do.

1.3 f)



## Arrow Bamboo

*Sasa japonica* (Siebold & Zucc. ex Steud.)  
Makino

Arrow bamboo grows in the coastal areas, south of central regions. It grows up to 2-5 meters tall. The stem is straight but thin with consistent thickness from bottom to top, which are good for making tobacco



1.3 g )



## Arundinaria Simonii

*Arundinaria simonii* (Carrière)  
Siebold & C. Riviere

This grows in coastal areas and is often used to form a windbreak or fence. It is also called "yeojuk," "shikdae" or "shinudae." It can grow to 6 meters tall.

1.3 h)

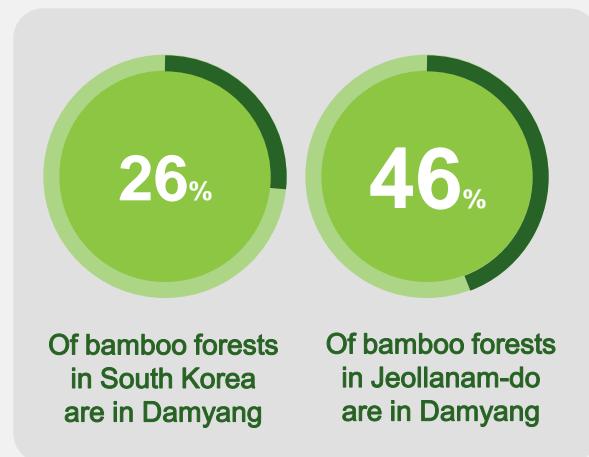


## Sasa Borealis var. Chiisanensis

*Sasa chiisanensis* (Nakai) Y.N.Lee

This variant grows only in Korea. Its height is around 1-2 meters. It is similar to *Sasa Borealis* and can be found only in the area between Jeollanam-do and Jirisan. It can be used to make Korean traditional strainers.

## 1.4 The Area Of Bamboo Forests In Damyang and City Policies





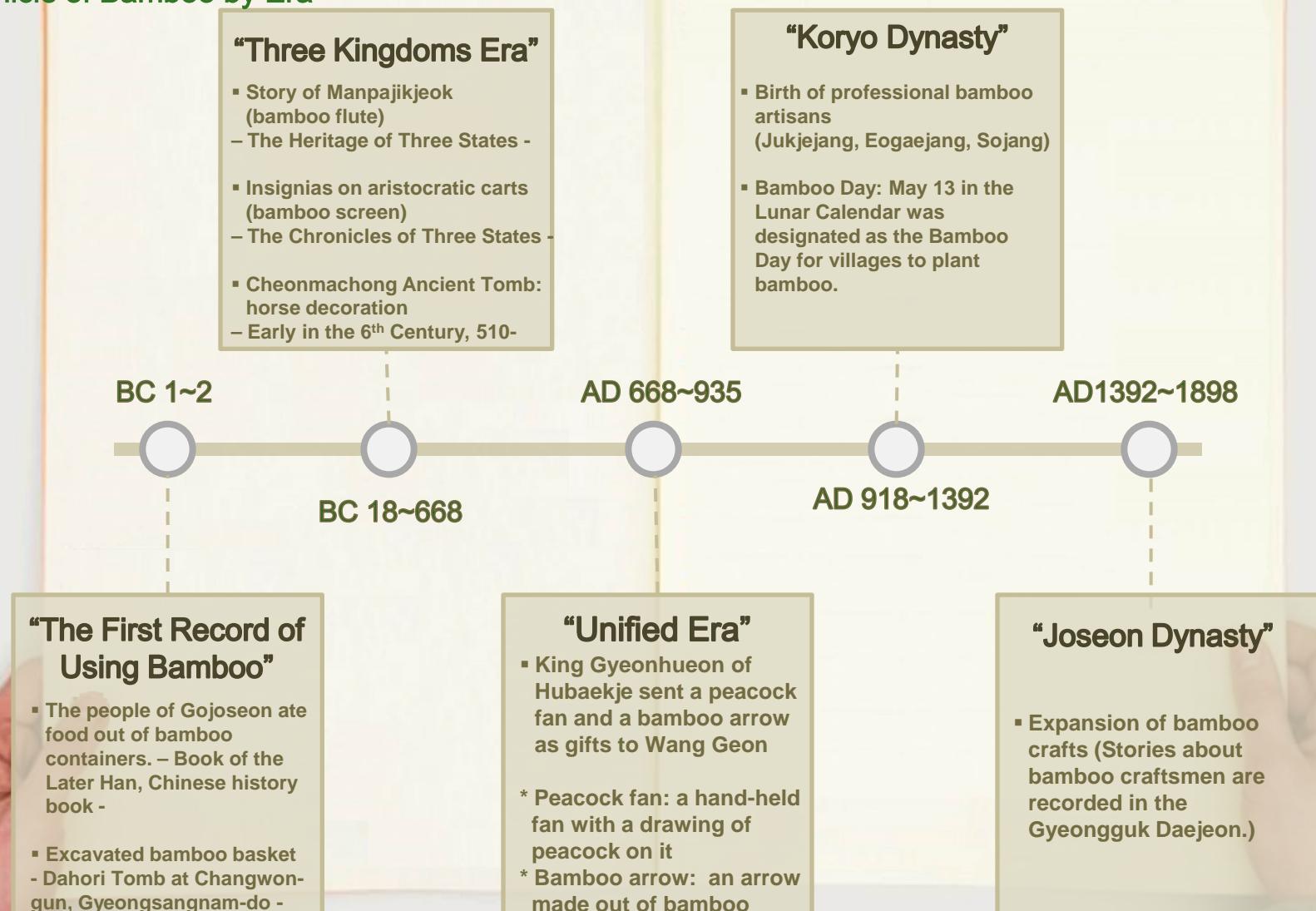
**State of Bamboo Vegetation in Korea and Strategies for Its Industrialization**

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## Part.2 History of Bamboo in Korea



## 2.1 Chronicle of Bamboo by Era



## 2.1 Chronicle of Bamboo by Era

### ▪ Excavated bamboo baskets

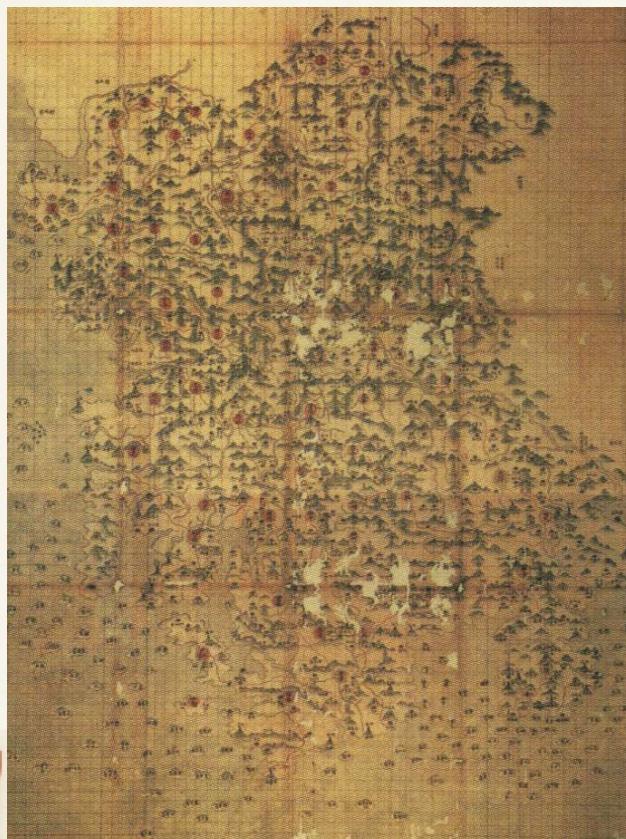


- Early Three Kingdoms Era,  
2038 years ago -

### ▪ Cheonmachong Ancient Tomb: horse decoration – Early in the 6<sup>th</sup> Century, 510-



## 2.2 Damyang and Bamboo



Map of Honam



Old Map of Damyang Area

## 2.2 Damyang and Bamboo

### Fine-Tooth Bamboo Comb,

#### The Origin of Damyang Bamboo Crafts

The origin of bamboo crafts in Damyang is said to come from the Kim family who moved from Jeonju to Damyang several hundred years ago and began making fine-tooth bamboo combs during agricultural off-seasons.

-Chu Seong-ji-



### Flourishing Bamboo Industry

Damyang has a flourishing bamboo industry with a master artisan from the central government, who was sent to the city to manufacture bamboo fans.

- From the Diaries of the Royal Secretariat, Joseon Dynasty -



### Ecological City, Bamboo Forests Damyang

#### Bamboo, Damyang's Best Offering to the King

Short arrows, giant timber bamboo, black bamboo, and arrow shafts (were tributed to the king)

- From Book of Geography vol. 151, The Annals of King Sejong -



## 2.2 Damyang and Bamboo

YEAR 1970



## 2.2 Damyang and Bamboo

YEAR 1980



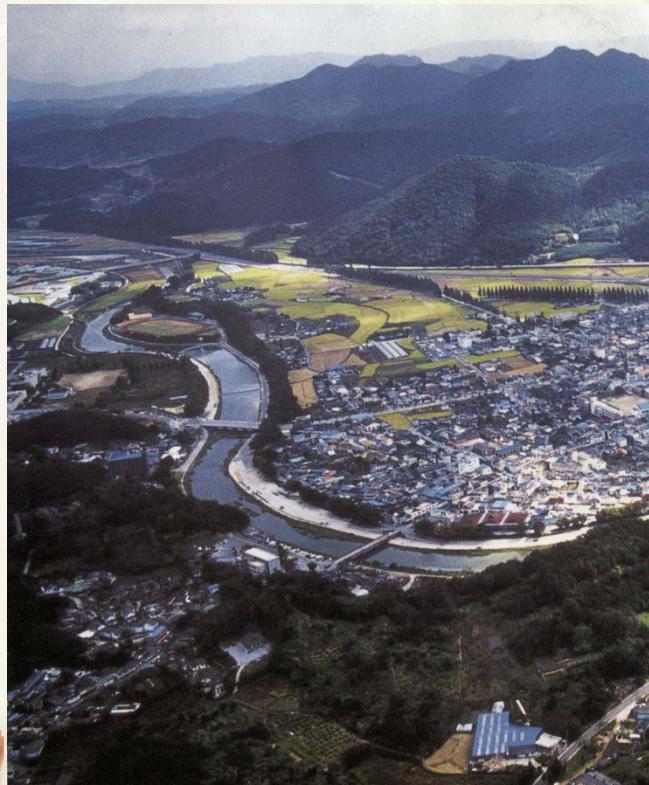
Jukmul Market  
(Bamboo Produce Market)



Wonjuk Market  
(Bamboo Market)

## 2.2 Damyang and Bamboo

Bird's-Eye-View of Damyang



YEAR 2000

## 2.3 Symbolic Meanings in Bamboo

### Virtue, Fidelity, Integrity

As one of the four noble plants including plum flower, orchid and chrysanthemum, bamboo is said to possess pure virtue.

It is regarded as one of the “Three Friends of the Cold Winter,” including pine tree and plum flower. Bamboo symbolizes fidelity and integrity.

### Sacredness

Bamboo is used to indicate sacred areas in shamanism and folk beliefs such as Byeolshindae.

### Eternal and Long Life

Bamboo is green throughout the year and lives long with its vigor.



## **State of Bamboo Vegetation in Korea and Strategies for Its Industrialization**

### **Part.3 Cases of Bamboo Utilization**

3

### 3.1 Traditional Use of Bamboo

#### Literary Embodiment

Song of the Five Friends, Four Noble Plants,  
Manpashikjeok, and bamboo legends



#### Musical Instrument

Flute, pipe, daegeum flute, sogeum flute



#### Bow and Arrow

Used for war weapons



#### Household Items

Bamboo screen, mat, Dutch wife, fan, hat, strainer, gate, furniture, fishing tools, chopsticks, tobacco pipe, sitting cushion, bamboo slips), bamboo horse, etc.



## 3.2 Use by Part

### Bamboo Leaf Rich in fiber, low-calorie and alkaline

Relieves fever and raise body temperature, removes phlegm, cures hangover, prevents stroke and treats cancer and inflammation.

Tea, alcoholic beverage, Udon, cold noodles, Kimchi, traditional snacks, etc.

### Bamboo Stem

Contains the most silica and digestive sugar than any other plants

Reduces skin aging and diabetic symptoms; antibacterial effects.

Bamboo crafts, bamboo plywood, bamboo vinegar, bamboo oil, bamboo sap, bamboo charcoal, bamboo rice, etc.

### Bamboo Charcoal

Emits more negative ions and far-infrared than red clay or stone plates

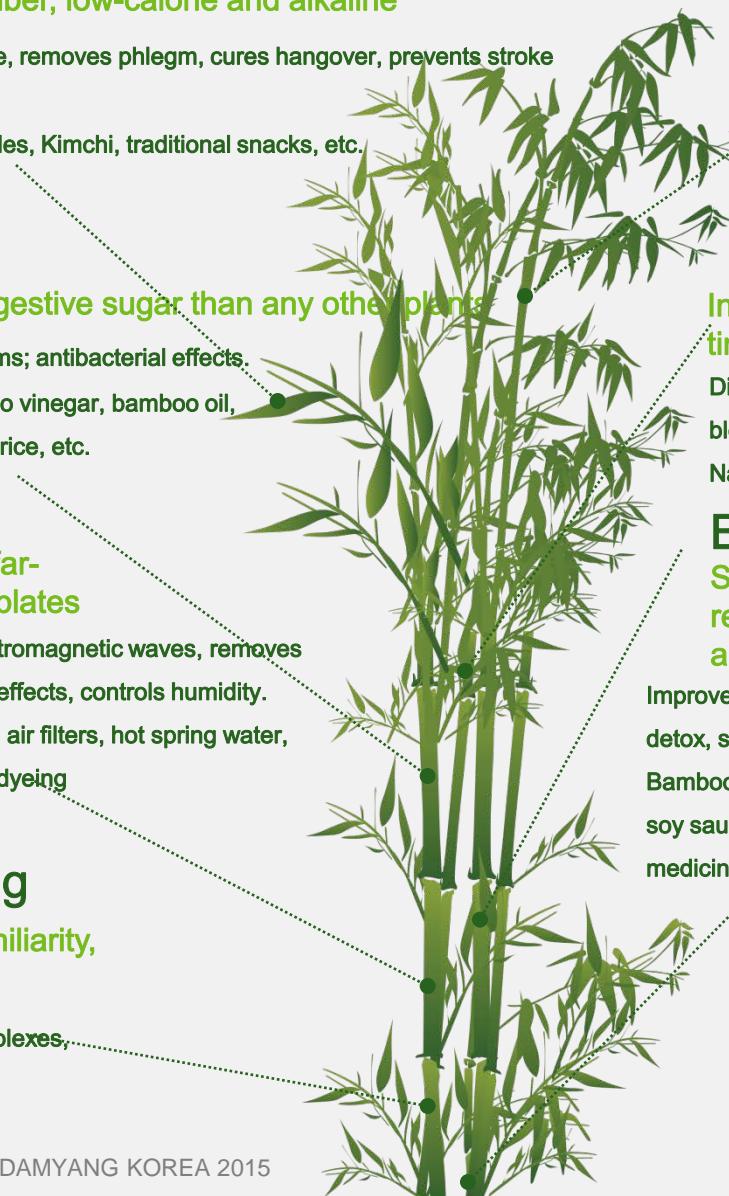
Contains deodorizing effects, blocks electromagnetic waves, removes heavy metal, purifies water, antibacterial effects, controls humidity.

Soil fertilizer, pesticide, added cosmetics, air filters, hot spring water, agricultural vinyl, charcoal crafts, natural dyeing

### Bamboo Landscaping

Symbolism, natural beauty, familiarity, convenience, practicality

Parks, tourist attractions, apartment complexes, building fences, interiors, etc.



### Bamboo Vinegar

Kills pests and germs, improves soil fertility, induces plant growth, and deodorizes.

Bamboo vinegar strawberries, bamboo vinegar ports, bamboo vinegar soap, bathing supplies, anti-adult diseases, health food, food additives, soil improvements

### Bamboo Sap

Includes many minerals (2.4 times calcium and 50 times magnesium than acer mono sap)

Diuretic effects, calms the mind, good for stomachache, nerves, high blood pressure, stroke, coughing.

Natural health drink products, anti-freckles and anti-trouble cosmetics

### Bamboo Salt

Salt is baked 9 times in bamboo container to remove toxins and impurities. Nutrition in bamboo and red clay are well harmonized in this salt.

Improves inflammation in intestines and stomach, improves body type, detox, stimulates appetite and treats asthma.

Bamboo salt soybean paste, bamboo salt red pepper paste, bamboo salt soy sauce, bamboo salt cheonggukjang, skin cleanser, toothpaste, medicine, health supplements

### Bamboo Shoots

Rich in fiber and unsaturated fatty acids

Prevents fatty liver and constipation, reduces cholesterol levels, clears blood, lowers fever, cures hangover and insomnia and has a good diuretic effect.

Pollution-free health nutrition food (raw bamboo shoot and 100 other types of foods)

### 3.3 Modern Use of Bamboo

Various industrial use: for food, medicine, dietary supplement, eco-friendly products, architecture & interior decoration, indoor & outdoor landscaping, tourism, etc.

Architecture and Interior

Food, Medicine,  
Health Supplement,  
Eco-friendly  
Products

Indoors and Outdoors  
Landscaping and Tourism

Chaesangjang, Important Cultural Heritage No. 53: Tea Tray and Interior Accessories

### 3.4 Various Tools

a )



Chaesangjang, Important Cultural Heritage No. 53: Tea Tray and Interior Accessories +Designer Ha Ji-hun furniture series

b )



### 3. Cases of Bamboo Utilization

'Empty Bamboo Stationery' by yu jian

c )



Bogobrush: a bamboo toothbrush with nylon bristles 100% biodegradable



### 3. Cases of Bamboo Utilization

Bamboo tricycle by a21studio  
d )



Bamboo by Cascando



'Empty Bamboo Stationery' by yu jian  
e )



Bamboo Straws



## **State of Bamboo Vegetation in Korea and Strategies for Its Industrialization**

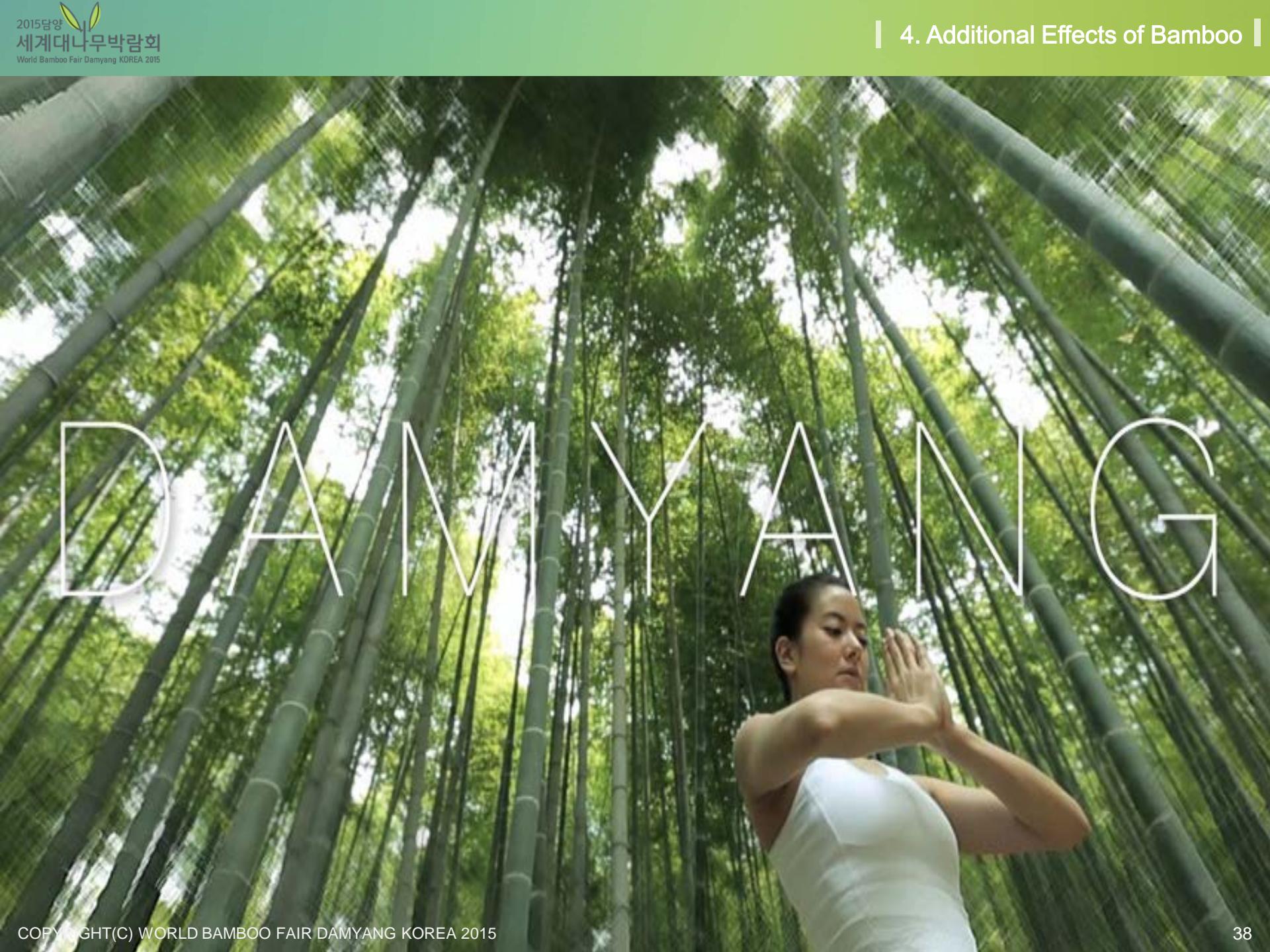
### **Part.4 Additional Effects of Bamboo**

1



여백을에서  
힐링을 만나다

| *Healing in the Bamboo Forest* |



DAMYANG

A large, semi-transparent text overlay reading "DAMYANG" in a bold, sans-serif font. The letters are white with black outlines, and they are slightly slanted upwards from left to right. The text is positioned in front of a woman who is performing a traditional Korean hand gesture (Mudang) with her hands joined together near her chest. She is wearing a white tank top and is surrounded by a dense forest of tall, green bamboo stalks.

“Good for relieving stress, calming mind  
and stimulating brain activities”



7.68TC



29.34TC

\* Bamboo forests can absorb CO<sub>2</sub> 4 times more than pine tree forests (per 1 hectare)

 667 pptv

\* ‘Juknokwon’ Bamboo Garden produces 2 times more Phytoncide than cypress forests in the summer.

## 4.1 7 Effects of Bamboo Charcoal (reported by Korea Forest Service)

### Relieves Stress



Air purification and negative ion from bamboo charcoal work to calm the mind and the body to relieve stress

### Removes Odor



Superior absorption power of the bamboo charcoal removes bad odors in refrigerator, rice and rooms

### Protects the Skin



Bamboo charcoal changes the bath water to alkaline to soften it, and the thermal effect from infrared emission prevents coldness from setting in after bath, enhancing the blood circulation

### Blocks Electromagnetic Waves



Bamboo charcoal has high electricity conduction to prevent static electricity and to free the human body from harmful electromagnetic pollution

### Absorbs Water and Stabilizes Water Quality



Bamboo charcoal absorbs sweat and other liquids to disintegrate impurities via minerals

### Antibacterial Effects



Bamboo charcoal is manufactured in 1,000° C, rendering it germ-free. The addition of bamboo vinegar curbs germs from breeding

### Far Infrared Effects

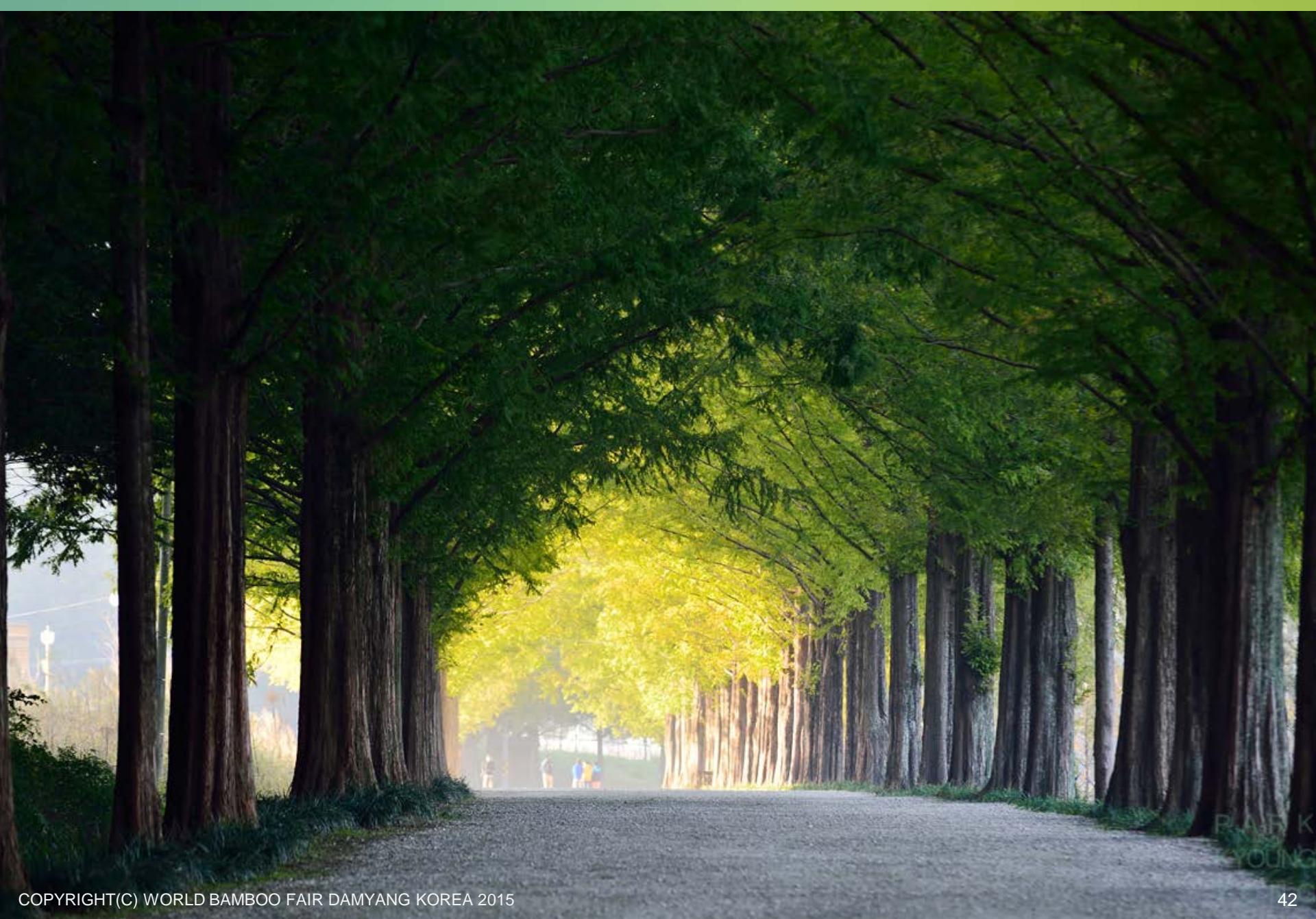


Bamboo charcoal has a high emission capability of far infrared, which stimulates blood circulation and other bodily functions during sleep

## **State of Bamboo Vegetation in Korea and Strategies for Its Industrialization**

### **Part.5 Strategies for Bamboo Industry in Damyang**





PARK  
YOUNG  
G



## 5.1 Setting up the Image of Bamboo

### Bamboo

86% of South Koreans associate bamboo with Damyang

All residents are proud of Damyang as a center of bamboo industry



### Cultural Assets

6 intangible cultural assets, 9 masters, 6 sub-masters

Cultural assets: Chaesangjang, Chambitjang,  
Jukryeomjang, Nakjukjang, Seonjajang

Masters: Bangnipjang, Juklamjang, Akgijang,  
Jukgeomjang, Byeonbijang

### Local Branding

Improve local brand value by registering the origin of bamboo shoots

### Jukmul Market

(Bamboo Product Market)

With 300 years of history, it is the only bamboo market in Korea

### Bamboo Museum

The only Korean bamboo museum chronicling a thousand years of history in Damyang

## 5.2 Vision of Damyang Bamboo Industry

### Vision of Damyang Bamboo Industry

Expand bamboo forests (10,000 ha)  
and commercialize forest resources

Register Damyang bamboo  
fields as Globally Important  
Agricultural Heritage Systems

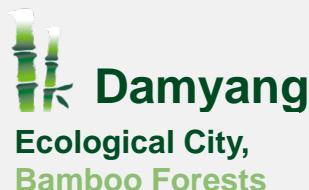
Nurture bamboo industry as a new  
growth engine for Damyang

Develop 'Juknokwon' as the center  
of history, culture, and humanities

Improve its global brand value by  
expanding exchange programs  
regarding bamboo industry and culture

Grow Damyang into a city of ecology,  
culture, tourism, and healing

### 5.3 Setting up Agenda for Industrialization



## Declining Bamboo Industry

Bamboo craft industry in Damyang saw its heyday in the 1970s but declined with plastic and cheap Chinese products replacing them in 1980s

## From Decline to Revival

Scientific researches on the effects of bamboo confirmed the potential for its commercialization

Bamboo Selected as the Most Attractive Strategic Industry

After 2002



Turn bamboo forests as tourist attractions for healing  
‘Juknokwon’  
Bamboo Theme Park



Develop new bamboo products and nurture bio industry

Bamboo charcoal, bamboo vinegar, bamboo oil, bamboo tea, bamboo soap, and other modern bamboo products developed

## New Products of Bamboo

Bamboo leaf beverage, Chuseongju, bamboo vinegar soap, paste sauce, bamboo snacks, Changpyeong candy, bamboo charcoal, bamboo sap, bamboo tea, bamboo salt, architecture and interior materials, landscaping, fabric

## 5.4 Industrialization Strategies

### Effort to industrialize bamboo and scale up its industry for sustainable growth



#### Promote New Bamboo Industry

Expand bamboo forests by 10,000 ha by 2044

Register Damyang bamboo forests as Globally Important Agricultural Systems



#### Build Eco-Friendly Culture/Tourism/Eco City

Expand industrial/cultural exchange for bamboo

Effort to increase brand value as a eco-friendly city





## State of Bamboo Vegetation in Korea and Strategies for Its Industrialization

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### Part.6 ‘Juknokwon’ Bamboo Garden





## 6.1 Background

Renowned high-quality  
Damyang bamboo products  
prospered as household  
necessities

Mass production and  
mechanization led the  
bamboo industry to decline  
in the 1980s

**“Rediscovery of a resource value”  
in the Bamboo Forests everywhere  
around us!**

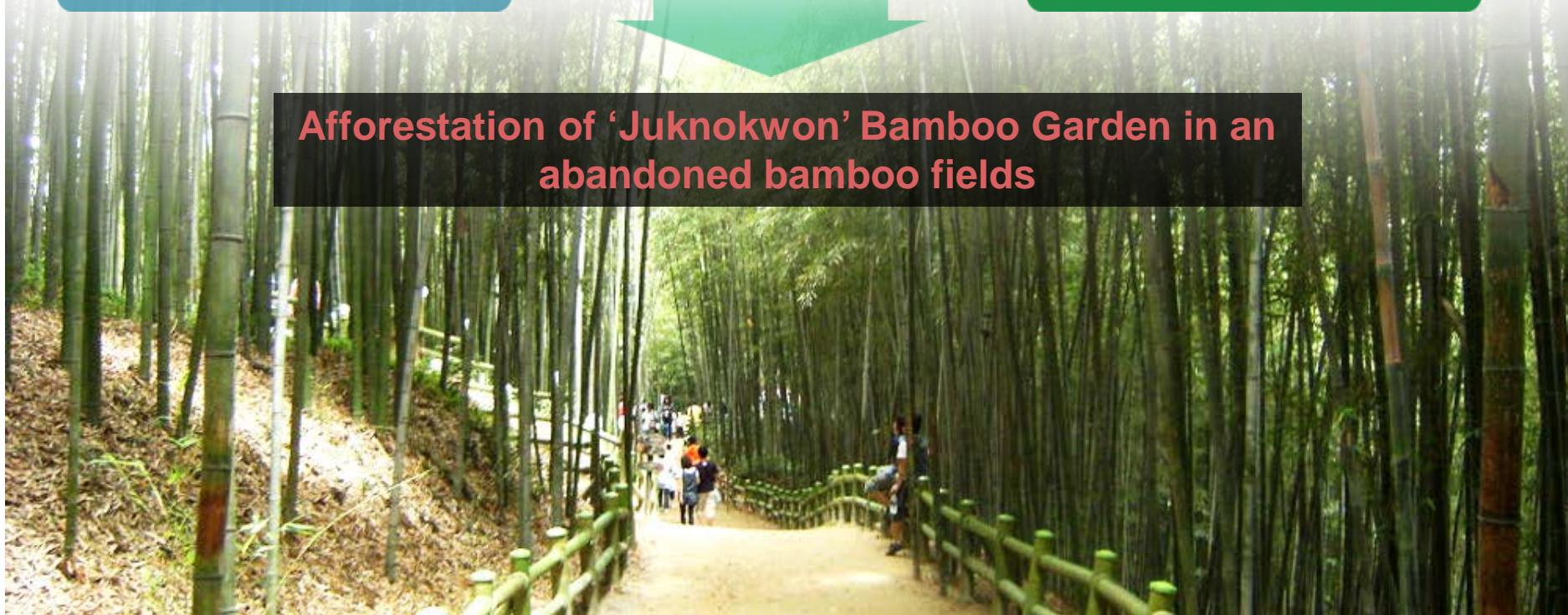


## 6.1 Background

**Need for theme parks associated with Gwanbangjerim Forest to promote the place as a festival venue**



**Afforestation of 'Juknokwon' Bamboo Garden in an abandoned bamboo fields**



## 6.2 Facilities

### 'Juknokwon' Bamboo Garden, embracing the Nature

Feel touched  
**Bamboo Forest**

- ▶ Giant timber bamboo, henon bamboo, moso bamboo (183,352m<sup>2</sup>)



Take a healing walk  
**8 Trails in Juknokwon**

- ▶ Good Luck Trail, Nostalgia Trail, etc.

Observatory

Korean traditional gazebo



Meet the genuine nature  
**Ecology Museum,**

- ▶ Dome structure (515m<sup>2</sup>)



## 6.2 Facilities

### 'Juknokwon' Bamboo Garden, enriched with Culture

#### Reproduced Major Gazebo **Poetry Culture Village**

▶ 6 Restored Gazebos Including  
Myeongokheon

Poem Education Hall

Poem Monument Park

Bamboo Tea Room



#### Place to relax **Hanok Stay**

▶ 9 Wooden Buildings  
(13 Rooms) with Tile Roof

Deunghwanggak

Chuijukheon

Gwanunjae

Yehyangdang

Uihyangdang

Jukhyangdang



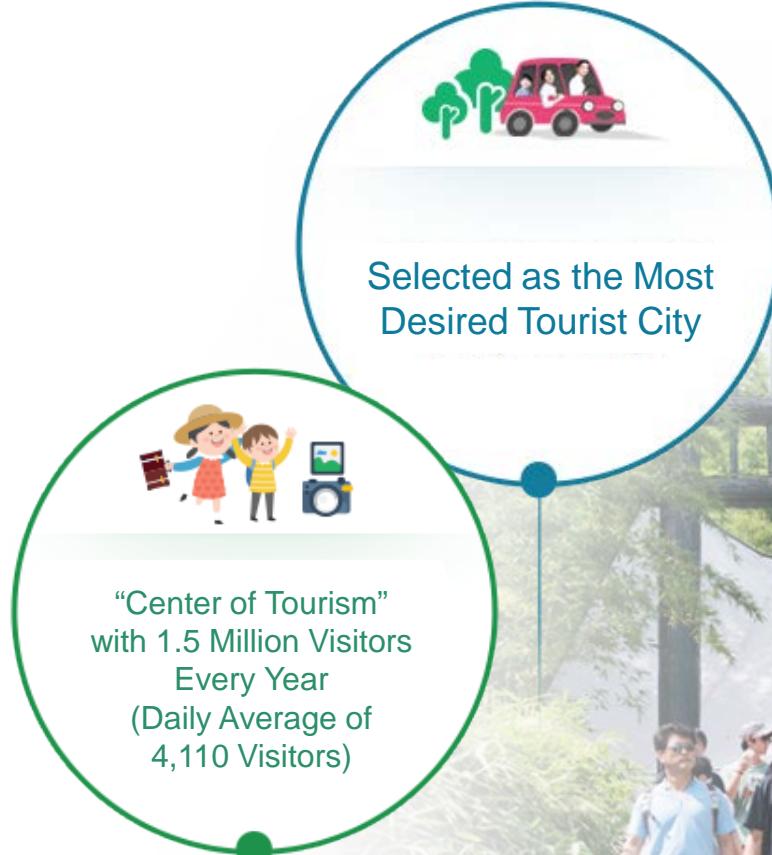
#### The First National Joint Volunteers Against the Japanese Invasion of Korea in 1592 **Chuseong Changui Memorial Hall**

▶ 9 Restored Buildings  
Including Chuseonggwan

Lodging available



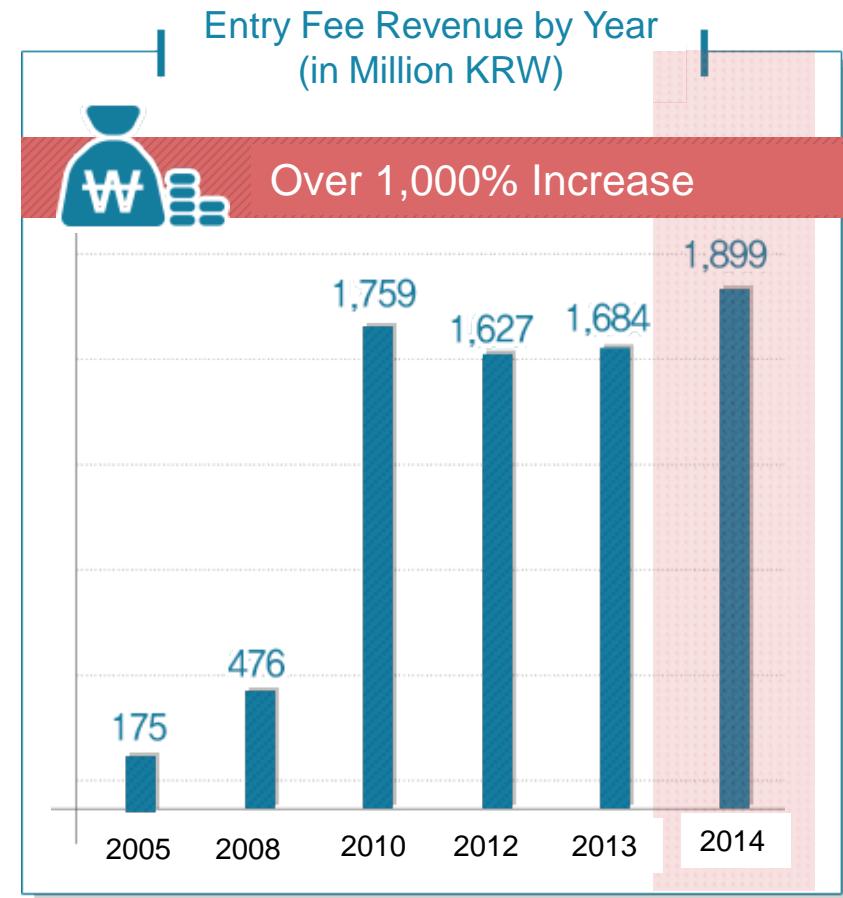
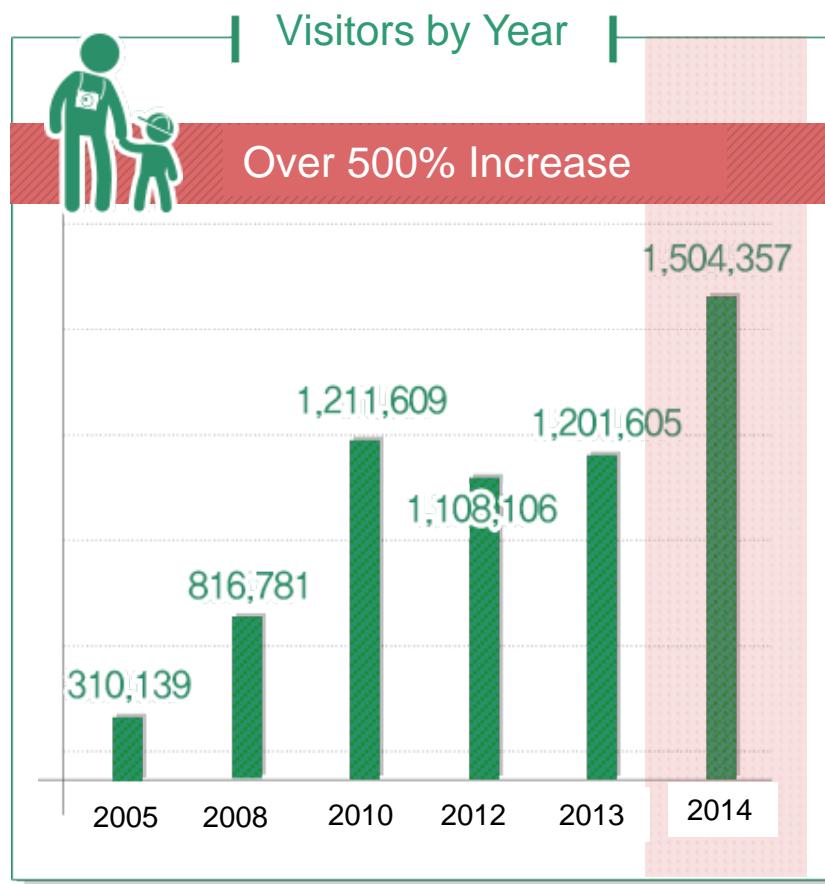
## 6.3 'Juknokwon' Bamboo Garden, inspiring Damyang again



'Juknokwon' Bamboo Garden is where you might have at least once seen on TV or in a film.

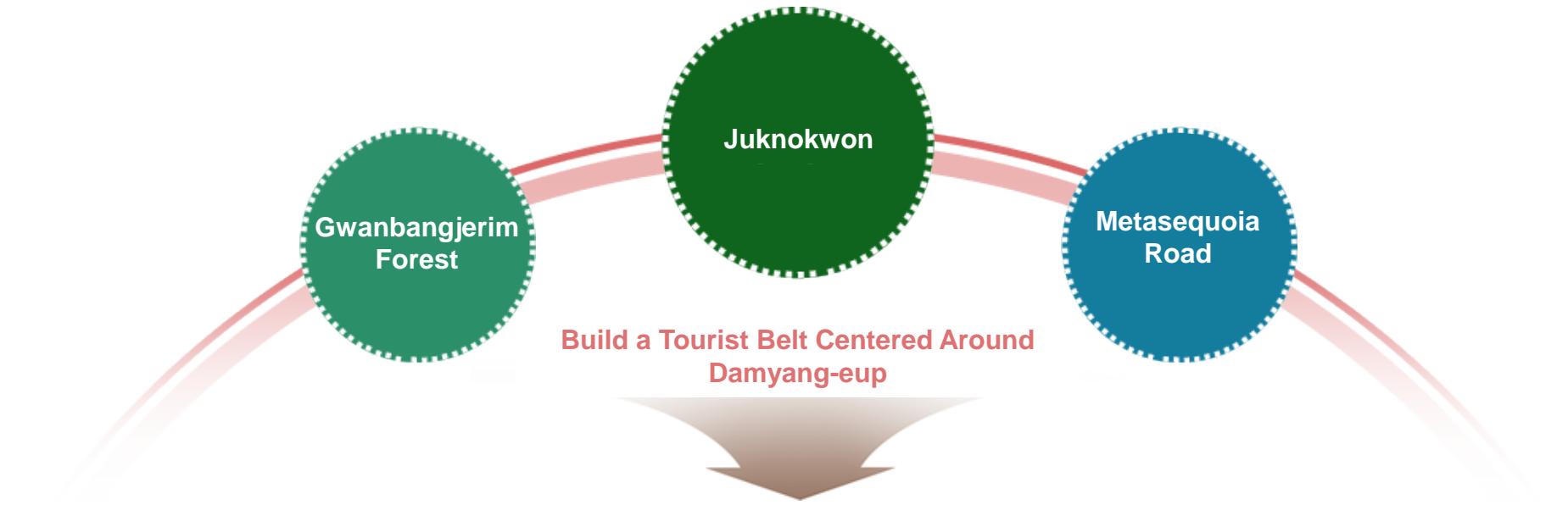
## 6.4 Visible Achievements

### Securing Confidence About the Future and Vitalization of Local Economy



## 6.5 Ripple Effects

**Playing a leading role in this era of annual 7 million tourists and vitalization of local economy**



Form Noodle Street

Create Meta-Provence

Establish a Cutting-Edge Culture Complex



A photograph of a bamboo forest. A paved path leads from the bottom center towards a traditional wooden pavilion with a curved roof and intricate carvings. The pavilion is surrounded by tall, slender bamboo stalks. A simple wooden railing runs along the path. The background is filled with more bamboo trees.

| Thank You |



# **Value of the Humanities on Bamboo**



## Moon, Soontae

### Novelist

Former professor at Gwangju University

Vice Chairman of National Asian Cultural Hall Committee

Chairman of Damyang Bamboo Festival Committee

High Councilor for Korean Novelist Association

Chairman of Saengoji Creative Village

“Ninety percent of me was brought up by the wind from bamboo forests”



# CONTENTS

**1** Definition of Humanities

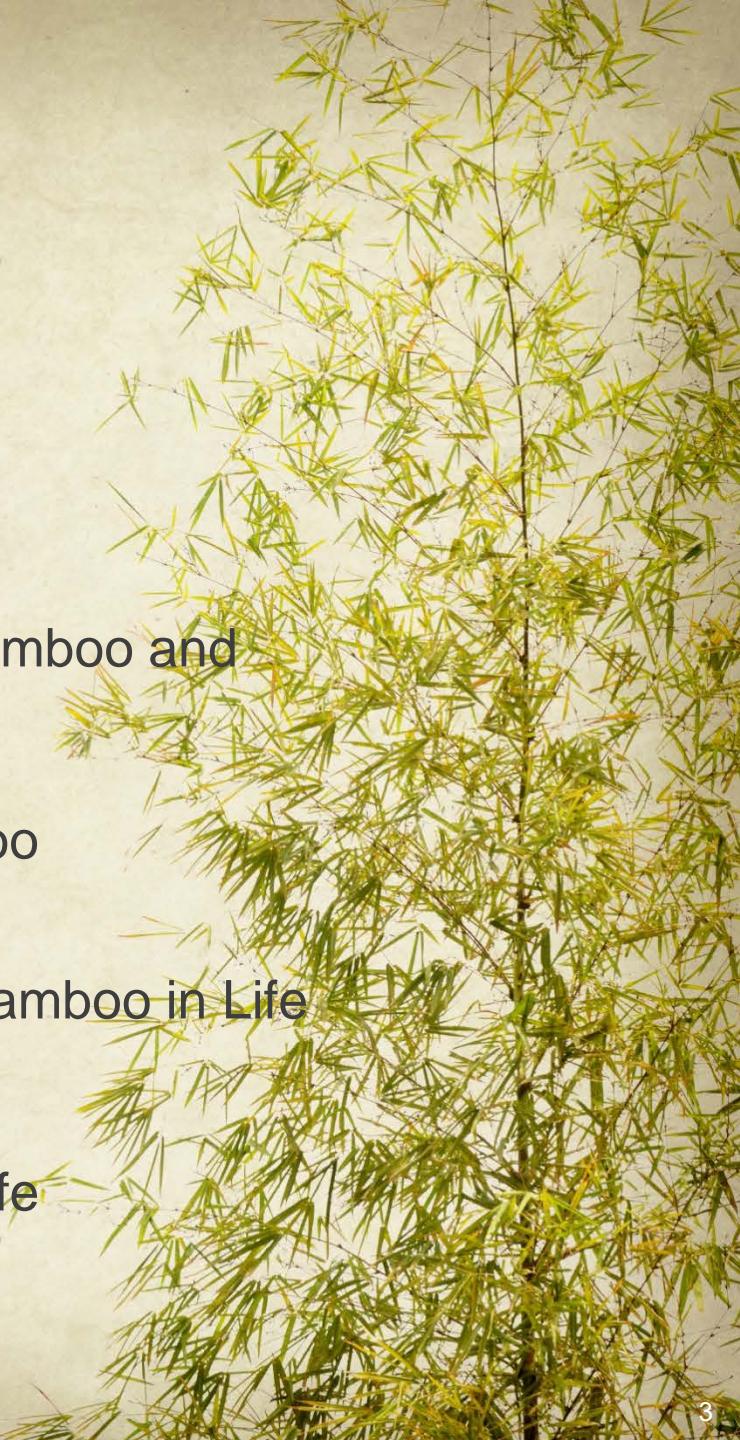
**2** Bamboo and Human Life

**3** Ecological Characteristics of Bamboo and  
Relationship to Humanities

**4** Literature and Arts of Bamboo

**5** Value and Culture of Bamboo in Life

**6** Way to Happier Life





1

Definition of Humanities

# What is ‘Humanities’?

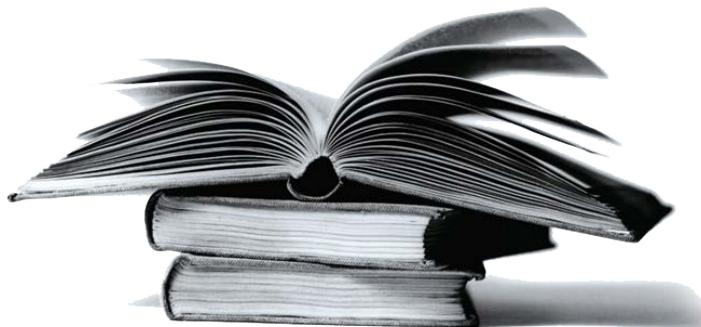
Humanities is an opposite concept of natural sciences.

A study on issues, ideas and cultures related to the humanity.

If natural sciences deal with objective natural phenomena,  
humanities deals with the values in human life.

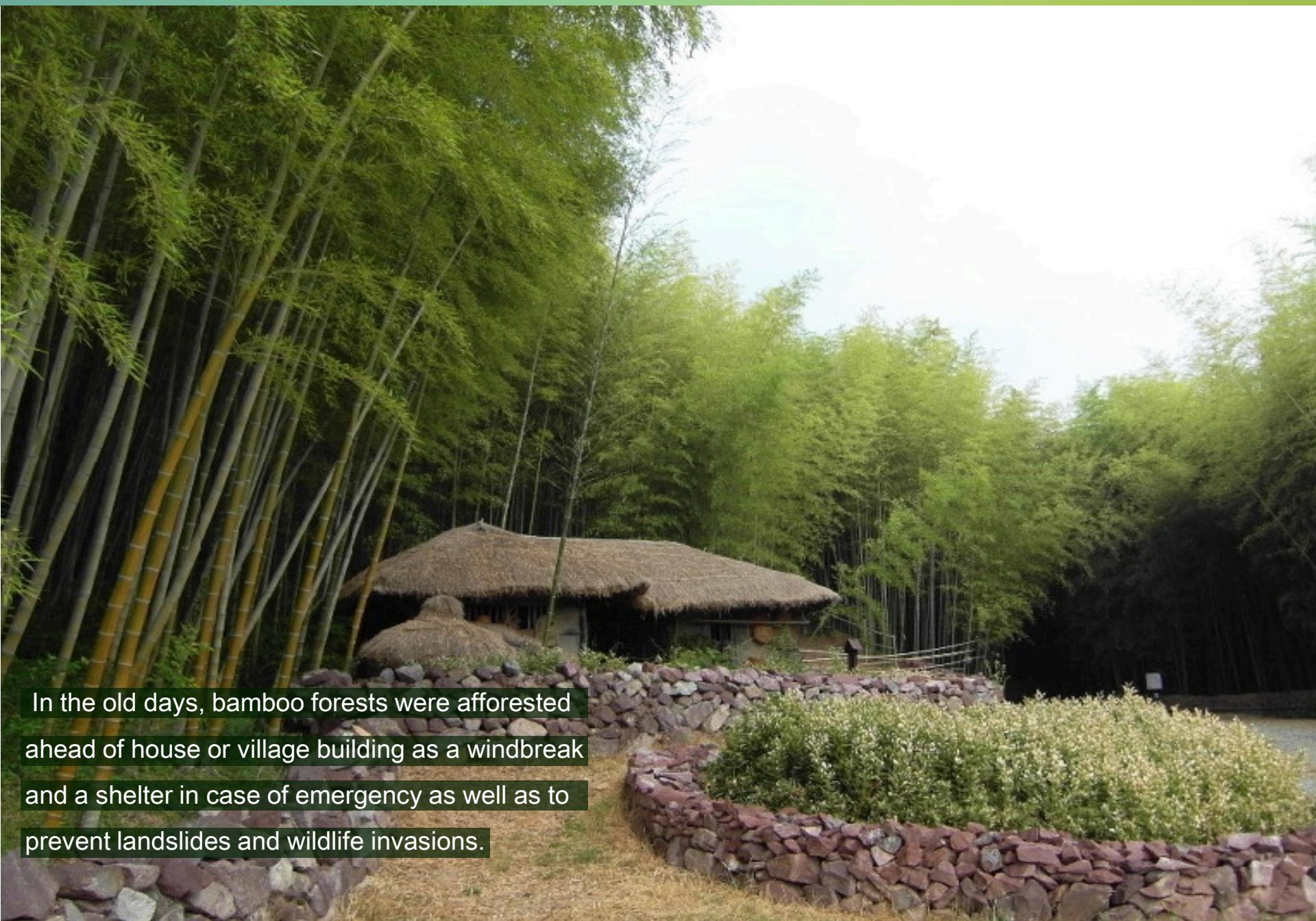
A study of humans **How to live**

Culture, history and philosophy is the container for humanities  
**Humanities** of Bamboo. Humanities, Human-ness





Bamboo and Human Life



In the old days, bamboo forests were afforested ahead of house or village building as a windbreak and a shelter in case of emergency as well as to prevent landslides and wildlife invasions.



| Bamboo Slips |



| Dutch Wife |



| Bow |



| Basket |



| Lighting, Interior |



| Furniture |

Bamboo is used to make amenities required for human life such as bamboo slips, bow, fishing rod, fence, threshold and bamboo horse.



| Bamboo Shoots |



| Spicy Bamboo Shoots |



| Beef and Bamboo Shoots |



| Bamboo Shoot Namul |



| Bamboo Shoot Soybean Paste Soup |



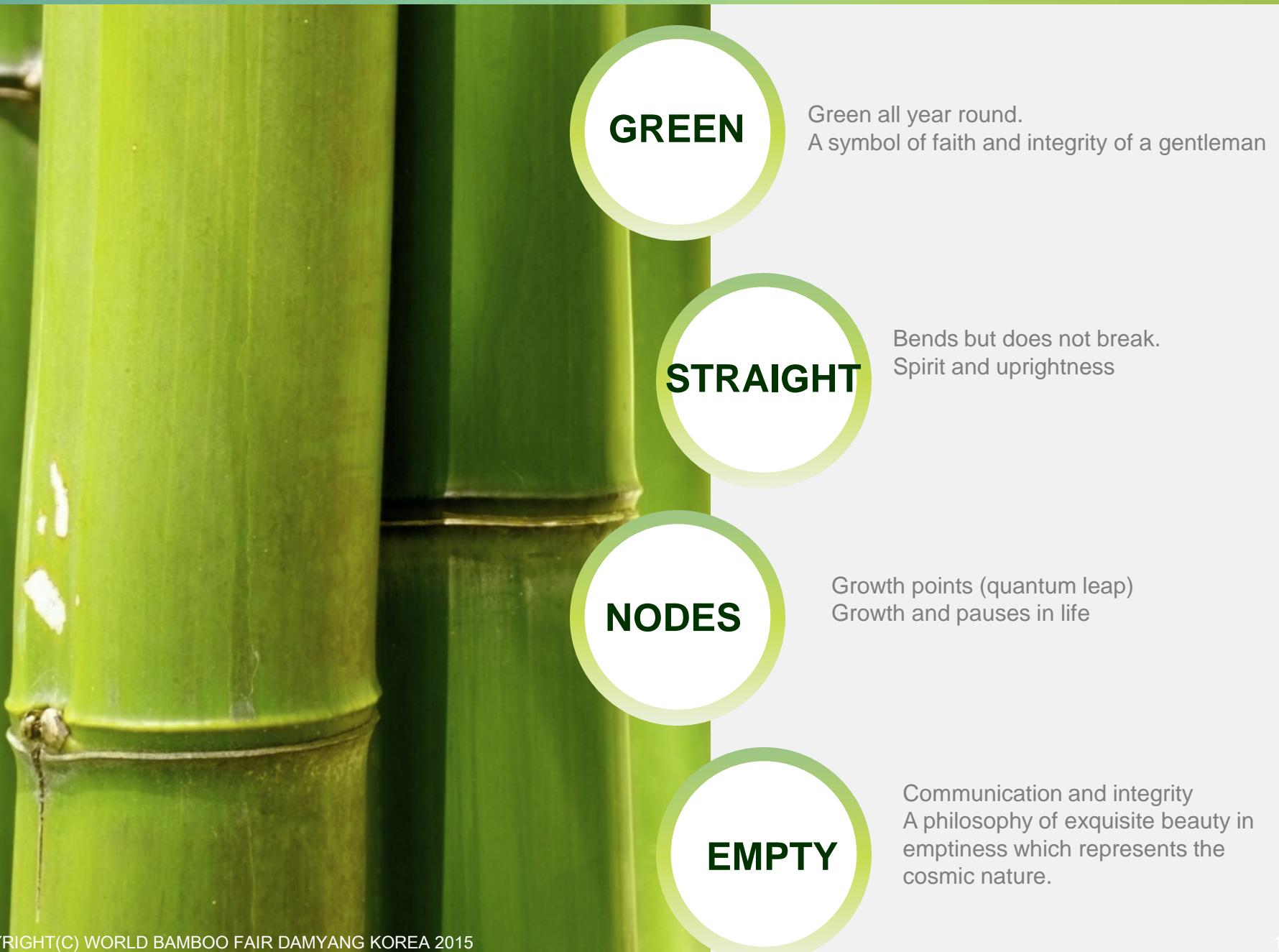
| Grilled Bamboo Shoots |



# 3

Ecological Characteristics of  
Bamboo and Relationship to  
Humanities

# Ecological Characteristics of Bamboo and Relationship to Humanities



# Ecological Characteristics of Bamboo and Relationship to Humanities



**ROOTS**

The source of long life and power of bamboo

After 4 years of rooting, bamboo grows out in the fifth year.  
Importance of life preparation

**FOREST**

Bamboo tent to grow together.  
Cooperation, bonds and community

# Ecological Characteristics of Bamboo and Relationship to Humanities



BAMBOO  
FLOWERS

When nutrients run out in 60 to 70 years, the entire bamboo forest withers once after blooming flowers without scent.

The meaning of the flowers is integrity and faithfulness, the virtues that people should keep.

China's best book on geography and astronomy,  
<Classic of Mountains and Seas 225-420>



Literature and Arts  
in Bamboo



# “Sincere Friend (淸友)” “This Friend(此君)”

Yi Inro, Koryo dynasty poet (1152-1220)

Want Xizhi, Chinese calligrapher

“How will I live one day without this friend (此君)”

Wang Xizhi

“I am fine without meat on my table,  
but I must have bamboo in the house to stay pure.”

Su Shi, Chinese poet (1036-1101)

## | Literary works|

Chinese poets Li Bai (701-762), Du Fu (712-770) and Su Shi  
Kim Shiseup and Kim Satgat, of Joseon dynasty





Three Ink Paintings of Bamboo during Joseon Dynasty

Yi Jeong

Shin Wi

Yu Deok-jang

Musical instruments made of bamboo since BC 57



| Daegeum |

| Junggeum |

| Sogeum |

| Tungso |



| Hyangpiri |

| Dangpiri |

| Sepiri |



▼ Bamboo instrument band consisting of 100 middle school students in Damyang

◀ Won Jangyeon of Damyang, one of the best Daegeum performers in Korea

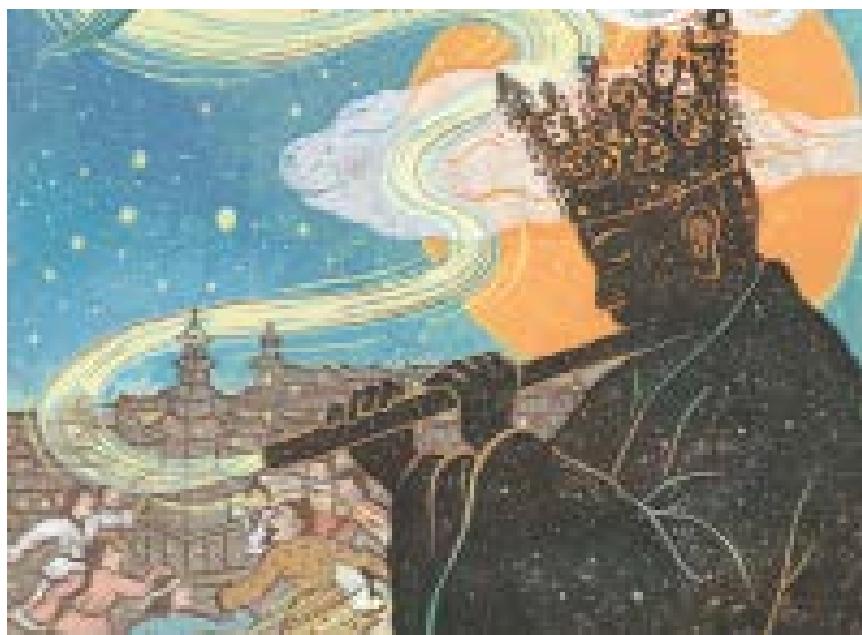


# Manpashikjeok

A legend flute of Silla that is known to take away all the cares and anxieties in the nation

King Munmu of Silla Dynasty (681-692) fended off the enemies with his large flute, and cured infectious diseases, called for rain and stopped typhoons.

The sound of large flute symbolizes  
**Peace, Wellness and Happiness**



| King Munmu |



5

Value and Culture of  
Bamboo in Life

Soswaewon,Jigok-ri, Nam-myeon, Damyang-gun, Jeollanam-do

## Bamboo Forest, a Space of Ideals for the Scholars





## Seven Wise Men of the Bamboo Forest

Seven scholars went into the bamboo forest, away from the tumultuous world, in 266, when a transition of dynasties was taking place in China. There, they engaged in philosophical discussions.

## Ascetic Values of Taoism

Taoists look to abandon worldly desires to practice virtue and find meaning in life. This ascetic value stems from the core of Taoist ideas, *Wu Wei*, which means “doing nothing.”

## *Wu Wei* (Doing Nothing)

Living as the nature dictates



### Bamboo Grove Monastery

India's first Buddhist  
monastery and the largest  
Buddhist holy site

### 담양 죽림정사

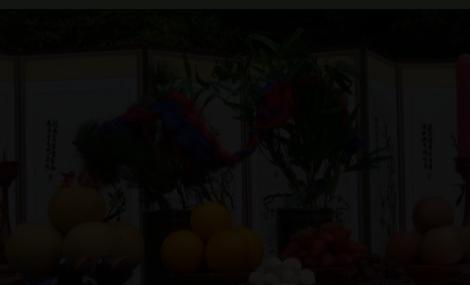
(담양 응면 쌍태리)

인도 대숲 속에 자리잡  
은 사찰 죽림정사 중  
하나



### 무당집 대나무

대나무는 신령이 하강하는 통로  
이며 인간과 신이 만나는 매개체

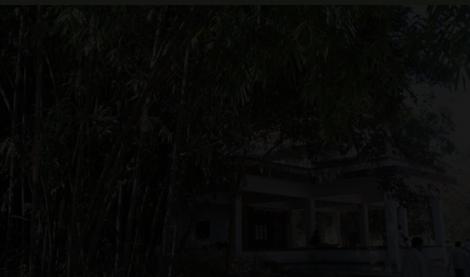


### 초례상 땃잎파리

초례상 화병에 땃잎파리를 꽂는  
전통흔례







### | 인도 죽림정사 |

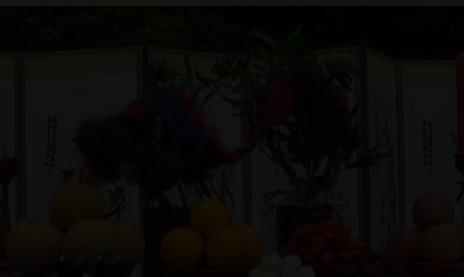
인도 최초의 불교사원  
이자 최대 불교성지



### [ Damyang Jukrimjeongsa Temple ]

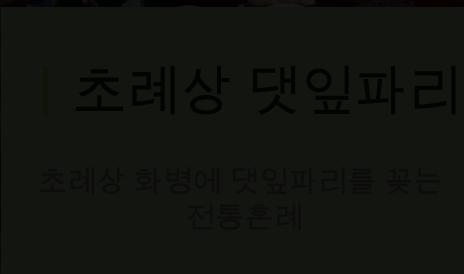
(Ssangtae-ri, Yong-myeon, Damyang)

One of the bamboo temples surrounded by an Indian bamboo forest in Damyang



### | 무당집 대나무 |

대나무는 신령이 하강하는 통로  
이며 인간과 신이 만나는 매개체



### | 초례상 땃잎파리 |

초례상 화병에 땃잎파리를 꽂는 전통흔례





### | 인도 죽림정사 |

인도 최초의 불교사원  
이자 최대 불교성지



### 담양 죽림정사

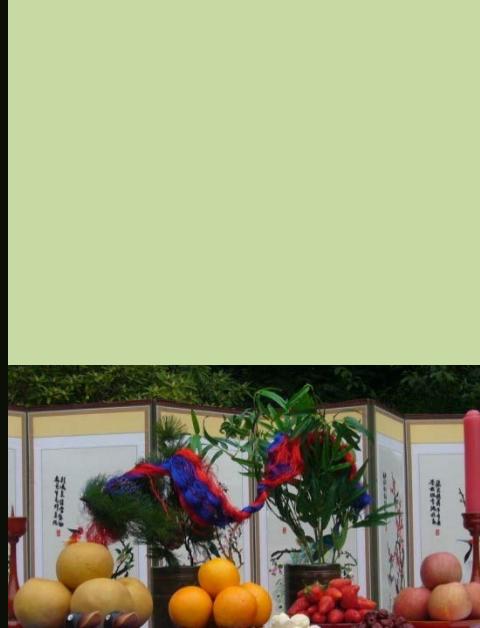
(담양 응면 쌍태리)

인도 대숲 속에 자리잡은 사찰 죽림정사 중 하나



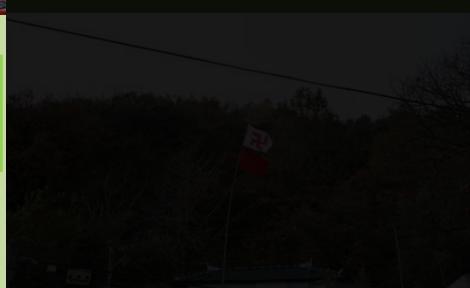
### Bamboo Leaf on Wedding Table

Traditional weddings with bamboo leaf fly on the table

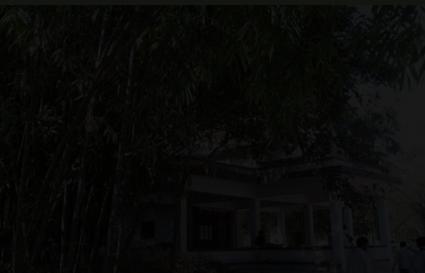


### | 무당집 대나무 |

대나무는 신령이 하강하는 통로이며 인간과 신이 만나는 매개체







### | 인도 죽림정사 |

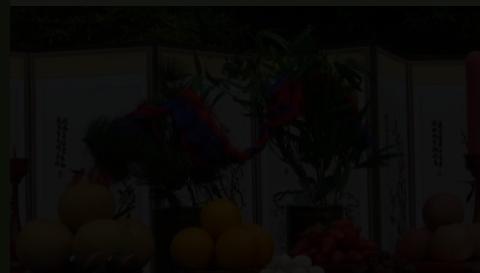
인도 최초의 불교사원  
이자 최대 불교성지



### 담양 죽림정사

(담양 응면 쌍태리)

인도 대숲 속에 자리잡은 사찰 죽림정사 중 하나



### | 초례상 땃잎파리 |

초례상 화병에 땃잎파리를 꽂는 전통흔례



### Bamboo in Shaman House

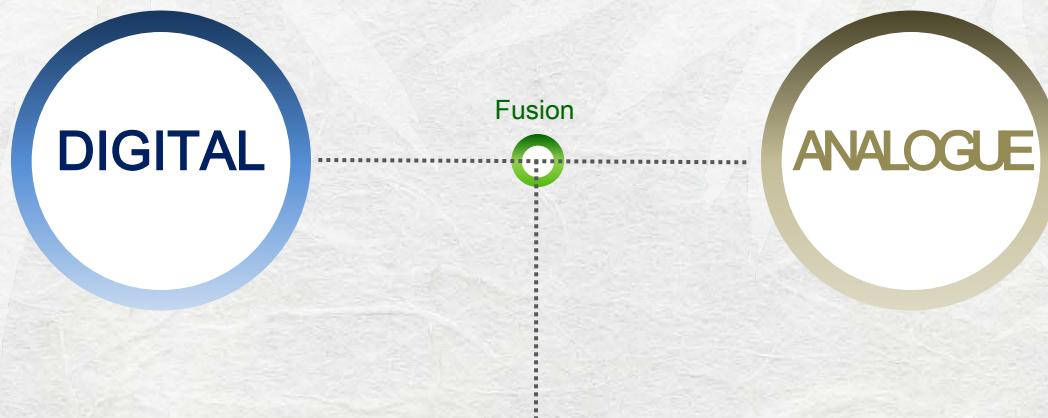
Bamboo is a passage for the spirits and a medium for humans and gods to be met





Way to Happier Life

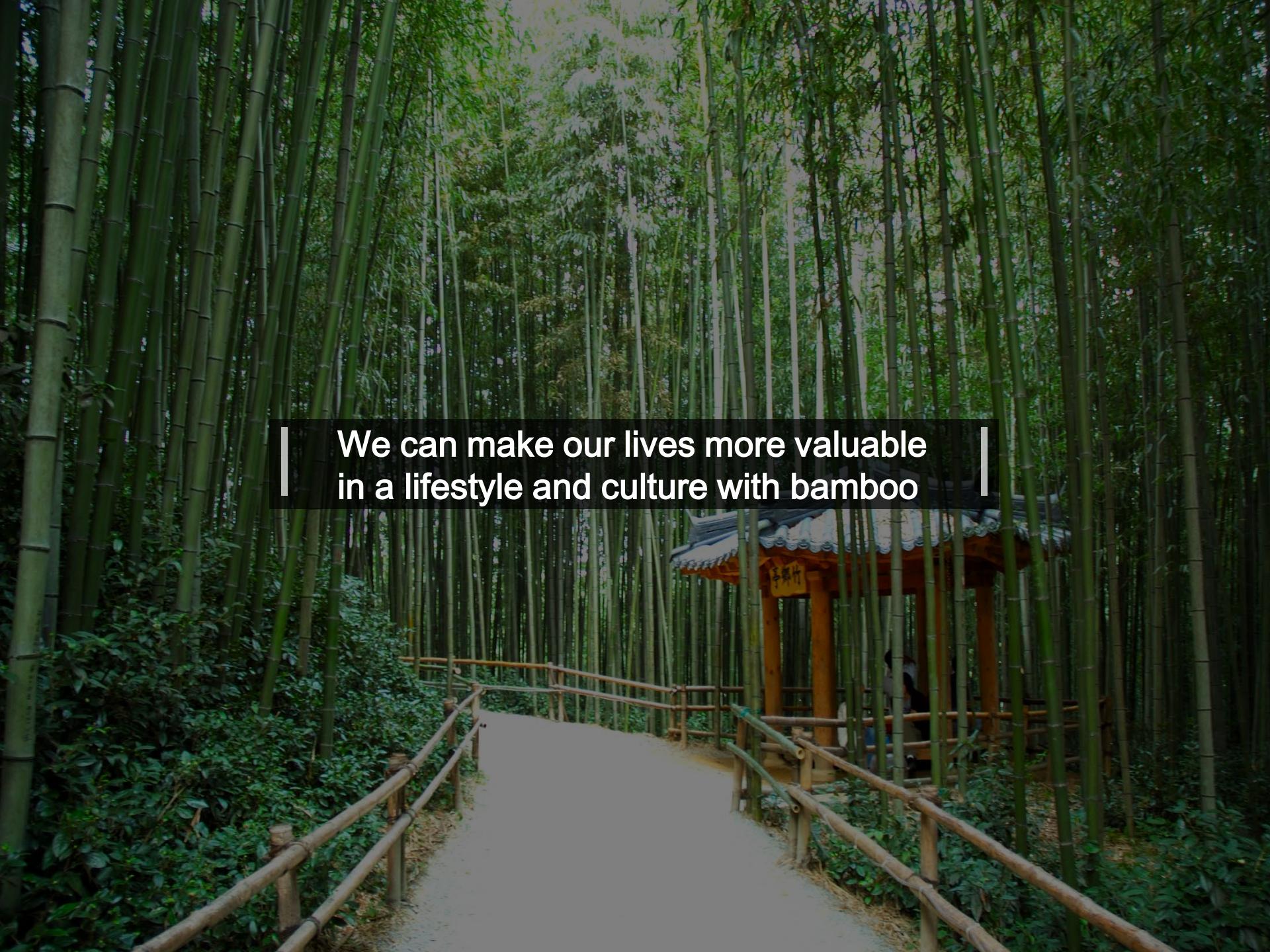
Bamboo lies deep in the human minds and lives



Reviving the humanistic value of bamboo does not mean returning back to the analogue world.

It means to combine the analogue and digital values of bamboo together in order to

**Find the Way to ‘Happier Life’**

A photograph of a lush bamboo forest. A paved path leads through the green stalks towards a traditional wooden pavilion with a tiled roof and a sign that reads "竹林亭".

We can make our lives more valuable  
in a lifestyle and culture with bamboo



**10<sup>th</sup> World Bamboo Congress Bamboo Pioneer Awards, Korea 2015**  
*presented by Susanne Lucas, Executive Director, WBO*

The World Bamboo Congress (WBC) has been held every three years by the World Bamboo Organization (WBO), and represents a congregation of scientists, engineers, public and private sector participants who join together to share knowledge, experience and expertise on the ever developing field of bamboo.

From its reputation as a “poor man’s timber” to its current potential as a high-end product that provides better structural, architectural and visual qualities over traditional alternatives, bamboo’s use globally has progressed at an unprecedented rate. Additionally, bamboo has been rediscovered as an alternative fiber, an alternative to fossil fuels, a substitute for plastic, nutritional food supplement, and a green resource to mitigate climate change, as well a viable tool for rural economic development.

Dedication, determination and collaboration are required to advance any scientific endeavor, and those individuals whose lifelong commitment to bamboo science deserve our attention and honored recognition. The World Bamboo Organization initiated the Bamboo Pioneer Awards at the 8th WBC held in Bangkok in September 2009 to honor the immense contribution of these people.

**At the 10<sup>th</sup> World Bamboo Congress Korea, we honor 6 of these great Bamboo Pioneers:**

**Choi Hyungsik, South Korea**

**Jorge Moran Ubidia, Ecuador**

**Thomas Soderstrom, posthumous, USA**

**Dina Nath Tewari, India**

**Charley Owen Younge, posthumous, The Netherlands**

**Zhu Zhaohua, China, and the UEDA lecture**

We wish to acknowledge EcoPlanet Bamboo for their leadership and commitment - financially, socially and environmentally - to the bamboo revolution, and we thank EcoPlanet Bamboo's CEO, Mr. Troy Wiseman, for his sponsorship of the 10<sup>th</sup> WBC World Bamboo Pioneer Awards.

The World Bamboo Pioneer Award will take place during the closing ceremonies of the 10th WBC on Monday, September 21. We look forward to having the recipients present - in person - thanks to the generous support of EcoPlanet Bamboo.

Previous World Bamboo Pioneer Recipients are:

*At the 8th WBC Bangkok, 2009:*

Ueda Koichiro of Japan  
Krit Samapuddhi of Thailand  
Floyd Alonso McClure of the United States  
Walter Liese of Germany, and the UEDA lecture

*At the World Bamboo Day, 2010, Nagaland:*

Richard Belho of Nagaland  
Rajeev Goswami of Assam  
Vinoo Kaley of Maharashtra  
Cherla Sastry of Canada  
Sampurana Singh of Meghalaya

*At the 9<sup>th</sup> WBC, Belgium, 2012:*

Shuen Chao Wu of Taiwan  
Oscar Hidalgo Lopez of Colombia  
Jules Janssen of the Netherlands  
Masatoshi Watanabe of Japan, and the UEDA lecture  
Wenyu Hsiung of China



## **Choi Hyungsik**

Choi Hyungsik was born in 1955, and graduated from Jeonnam National University in political science. He became the secretary to a member of parliament in 1988, and became a member of the provincial parliament in the Province of Jeolla Namdo in 1991. During this time, he also served as chairman of the steering committee of the Jeolla Namdo parliament from 1998-2000, as well as being a political advisor for the environmental committee of the National Assembly in 1999.

He left the provincial parliament of Jeolla Namdo and became the Governor of Damyang County in 2002 and focused his life on the development of Damyang-gun. He served this term as Governor until 2006. With a keen interest in the environment, Choi, while still Governor, became a member of the Advisory Committee to the President on sustainable development in 2004.

His dedication to the region was realized again in 2010, when he began another term as Governor of Damyang County, and he continues to serve in this capacity now, re-elected to serve yet another term, which began in 2014. He also serves as the Chairman of the Organizing Committee of the World Bamboo Fair. His commitment to improving the region with bamboo is rooted in his appreciation of the region's history. Damyang bamboo has a history of 1,000 years, which he enjoys sharing, "It is a valued local asset handed down from our ancestors." The intention of the World Bamboo Fair, which is an evolution from Damyang's traditional annual bamboo festival, is to enhance the brand value of Damyang as an ecological city. Although bamboo is widely used and appreciated in Korea, Damyang is more closely associated with bamboo. The area planted with bamboo in Damyang represents a share of 34.3% (2,420ha) of the national total. Damyang has traditionally produced bamboo baskets, mats, hats, pillows, covered boxes, and folding fans. Currently, the County attracts over 5 million tourists annually, thanks to bamboo forests, delicious fresh foods featuring the use of bamboo shoots and a clean environment. In 2014, Damyang was honored with the top prize as Korea's No. 1 ecotourism region by the Korea Tour Club.

Governor Choi has made a tremendous impact on the county of Damyang, revitalizing its bamboo sector by expanding its bamboo industry for modern and sustainable utilization. Twenty years ago, the bamboo markets closed in Damyang because of declining demand for bamboo products. Today, thanks to Governor Choi, the local bamboo resources are carefully maintained and managed to sustainably supply bamboo culms and shoots for emerging new markets.

**Bamboo related projects in Damyang County under the rule/initiative of Governor Choi :**

- |              |   |
|--------------|---|
| 2003         | Establishment of the Bamboo Resource Research Institute                                       |
| 2003-2005    | Creation of a bamboo park (Juknokwon) in Damyang City (165,000 sq m)                          |
| 2003-2006    | Registration of 82 bamboo-related intellectual property rights<br>(16 registered, 66 pending) |
| 2003-2007    | Creation of bamboo eco-park (924,684 sq m)  |
| 2003-2007    | Establishment of 8 bamboo-related new product venture companies                               |
| 2003 present | Extension of bamboo forests: target 10,000 ha until 2044                                      |
| 2004-2006    | Creation of bamboo bio-forest (50 ha)   |
| 2004 present | 21 bamboo-related research projects (7 completed, 14 in progress)                             |
| 2015         | Application for registration of bamboo forests as World Agricultural Asset                    |
| 2015         | World Bamboo Fair and 10 <sup>th</sup> World Bamboo Congress                                  |

Choi has said the World Bamboo Fair will “display everything about bamboo” around Juknokwon Garden. “You will experience the past, present and future of bamboo, which has a wide variety of uses from bamboo art, cutting-edge biotechnology, food, textiles and architecture to landscape gardening. You will have an amazing experience with bamboo which purifies your body as well as your mind,” he added.

Choi Hyungsik is certainly a World Bamboo Pioneer !



### **Jorge Morán Ubidia**

Jorge Morán was born in Guayaquil, Ecuador, in 1940. He received a degree in Architecture at the University of Guayaquil where he later taught in the Faculty of Architecture and Urbanism for decades and also guided students' theses in the Architecture Faculty at the Catholic University of Guayaquil.

Professor Morán was one of the first to compare the physical properties of bamboo with wood and recognize the great structural strength of some bamboo species. Feeling an affinity for the spectacular native timber bamboo, *Guadua angustifolia* - known locally as "caña guadua" and at the time used for mostly humble purposes - he devoted his life to researching and using this resource. Jorge was instrumental in developing the Hogar de Cristo social housing project by designing ecological housing built with Ecuadorian bamboo for low-income families. The families moved into dignified, environmentally-friendly houses, and being elevated, were safe as they were no longer subjected to flooding.

In Ecuador, the use of bamboo is pre-Columbian; the oldest evidence of use dates back 5,550 years from the Valdivian culture. Professor Morán explored all the historic information available relating to bamboo and his interests extended beyond bamboo's use as a building material, examining the multitude of ways bamboo has helped mankind in the past and how it can help us now and in the future.

Jorge attended the 1<sup>st</sup> Latin American Bamboo Symposium held in Manizales, Colombia, where he met Oscar Hidalgo and other bamboo researchers, growers, architects and artisans. In 1982, he organized the 2<sup>nd</sup> Latin American Bamboo Symposium in Guayaquil, Ecuador, and never strayed from that investigatory path. Since those events more than twenty years ago, Jorge has continued to be a key player and contributor at bamboo conferences, training programs and symposiums worldwide. He is a mentor to many and his dedication has sparked a true evolution in South America to investigate the modern potential of naturally-occurring bamboos throughout continent. Furthermore, Jorge continues to serve as an advisor to the Latin American office of INBAR on their regional initiatives, technological advances and information exchange.

Colleague Ximena Londoño of Colombia beautifully described Morán's life's work as follows:

"Like bamboo, Jorge has always worked to form a strong network of rhizomes, where the ultimate goal is the collective welfare and not individual welfare. His work is as creative, practical and timely as bamboo. His generosity as a teacher and friend equate to the versatility of bamboo which is infinite, yet it is also a malleable. Jorge has maintained his passion for bamboo through these long years, equating the concept of sustainability with bamboos throughout time. Jorge is innovative: through his long career he has taken the bamboo culm and gradually transformed it into Esterbam, Plasbam, Ecubam, Tripbam, RecCel and PlasCel, among others." (The product names refer to his modern bamboo-lumber innovations.)

Passionate and generous, Jorge recently created the Bamboo Documentation Center, a repository of Jorge's many books, located at the Catholic University of Guayaquil where he was a professor for 40 years. Naturally, the small building is made of local bamboo and is aesthetically pleasing. "It's one of the best buildings of bamboo. This center will function as a library open to all university students and is very special because the books I have are scarce, they cannot be found in any bookstore," Jorge emphasized proudly.

Jorge Morán has been a guiding force and spokesman for bamboo in Ecuador and all of Latin America and is certainly a **World Bamboo Pioneer!**



## Thomas Robert Soderstrom

(1936 - 1987)

Tom Soderstrom was an American agrostologist, which means he studied the botany of grasses (family Gramineae or Poaceae). He was Curator of Grasses at the National Museum of Natural History of the Smithsonian Institution in Washington, DC for over twenty years.

In 1957, Soderstrom graduated from the University of Illinois with a BSc in Biology, and enrolled at the graduate school at Yale University, earning a Master of Science in Biology the following year and a PhD in Botany 1961. He joined the National Museum in 1960 as assistant curator. He became an authority on the taxonomy and biology of bamboos, publishing about 40 titles and undertaking lecture tours in numerous countries, most notably at the 1985 International Bamboo Conference held in Puerto Rico (what is now considered the first World Bamboo Congress). His field-work covered parts of Latin America, Africa, and Asia. Not only was he a founder member of the Association of Tropical Biology, but was also a fellow of the Linnean Society, the American Association for the Advancement of Science, and an honorary associate of the Botanical Society of Brazil. Despite poor health he undertook the organizing of the First International Grass Symposium held at the Smithsonian in July 1986. An important collaborator of his was Cleofé E. Calderón (1929–2007), the Argentinian-born agrostologist.

Sadly he died at the prime of his career and has been acknowledged by many of his peers as a true pioneer in the research of grasses, particularly bamboo.

He is commemorated in *Soderstromia*, *Ilex soderstromii*, *Anthurium soderstromii*, *Lessingianthus soderstromii*, *Vriesea soderstromii*, *Ouratea soderstromii*, *Cryptochloa soderstromii*, *Ocellochloa soderstromii*, *Poa soderstromii*, *Raddia soderstromii*.

The standard author abbreviation Soderstr. is used to indicate this individual as the author when citing a botanical name.

Some publications of his include:

- Soderstrom, TR; FO Zuloaga. 1989. *A revision of the genus Olyra and the new segregate genus Parodiolyra (Poaceae, Bambusoideae, Olyreae)*. Ed. Smithsonian. pp. iv, 79
- Judziewicz, EJ; TR Soderstrom. 1989. *Morphological, anatomical, and taxonomic studies in Anomochloa and Streptochaeta (Poaceae, Bambusoideae)*. Ed. Smithsonian. pp. iii, 52
- Soderstrom, TR; RP Ellis; EJ Judziewicz. 1989. *The Phareae & Streptogyneae (Poaceae) of Sri Lanka : a morphological-anatomical study*. 27 pp. 8 fig.
- Soderstrom, TR. 1987. *Grass Systematics & Evolution*. Ed. Smithsonian. 4to, pp. xiv, 473. ISBN 0-87474-300-1
- Zuloaga, FO; TR Soderstrom. 1985. *Classification of the outlying species of New World Panicum (Poaceae: Paniceae)*. Ed. Smithsonian. Contrib.Botany N° 59: pp. 1–63, 25 fig. 2 tablas
- Sendulsky, T; TR Soderstrom. 1984. *Revision of the South American genus Otachyrium (Poaceae, Panicoideae)*. Ed. Smithsonian.
- Calderon, CE; TR Soderstrom. 1973. *Morphological & anatomical considerations of the grass subfamily Bambusoideae based on the new genus Maclurolyra*. Ed. Smithsonian. pp. iii, 55
- Soderstrom, TR. 1967. *Taxonomic study of subgenus Podosemum & section Epicampes of Muhlenbergia (Gramineae)*. Ed. Smithsonian. Vol. 34, N° 4: pp. 75–189, 14 plates
- TR Soderstrom, RP Ellis. 1987. *The position of bamboo genera and allies in a system of grass classification*
- TR Soderstrom, CE Calderón. 1971. *Insect pollination in tropical rain forest grasses*. Biotropica, 1-16 1971
- *Some evolutionary trends in the Bambusoideae (Poaceae)* TR Soderstrom Annals of the Missouri Botanical Garden, 15-47 1981
- *Morphological and anatomical considerations of the grass subfamily Bambusoideae based on the new genus Maclurolyra* CE Calderón, TR Soderstrom Smithsonian Contributions to Botany 11, 1-55 1973
- *A commentary on the bamboos (Poaceae: Bambusoideae)* TR Soderstrom, CE Calderon Biotropica, 161-172 1979
- *The genera of Bambusoideae (Poaceae) of the American continent: keys and comments* CE Calderón, TR Soderstrom Smithsonian Institution Press 1980
- *Primitive forest grasses and evolution of the Bambusoideae* TR Soderstrom, CE Calderón Biotropica, 141-153 1974
- *Distribution patterns of neotropical bamboos* TR Soderstrom, EJ Judziewicz, LG Clark Proceedings of a workshop on neotropical distribution patterns. Held, 12-16 1987
- *Chromosome numbers of some Ceylon grasses* FW Gould, TR Soderstrom Canadian Journal of Botany 52 (5), 1075-1090 1974
- *Chromosome numbers of tropical American grasses* FW Gould, TR Soderstrom American Journal of Botany, 676-683 1967
- *Grass systematics and evolution: an international symposium held at the Smithsonian Institution, Washington, DC, July 27–31, 1986* TR Soderstrom International Symposium on Grass Systematics and Evolution, Smithsonian 1987

- *A revision of the genus Olyra and the new segregate genus Parodiolyra (Poaceae: Bambusoideae: Olyreae)* TR Soderstrom, FO Zuloaga Smithsonian contributions to botany 69, 1-79 1989
- *Taxonomic study of subgenus Podosenum and section Epicampes of Muhlenbergia (Gramineae)* TR Soderstrom Contrib. US Nat. Herb 34, 75-189 1967
- *The woody bamboos (Poaceae: Bambuseae) of Sri Lanka: A morphological-anatomical study* TR Soderstrom, RP Ellis Smithsonian contributions to Botany 72, 1-75 1988
- *Classification of the outlying species of new world Panicum (Poaceae: Paniceae)* FO Zuloaga, TR Soderstrom Smithsonian Contributions to Botany 59, 1-63 1985
- *A guide to collecting bamboos* TR Soderstrom, SM Young Annals of the Missouri Botanical Garden, 128-136 1983
- *Morphological, Anatomical, and Taxonomic Studies in Anomochloa and Streptochaeta (Poaceae, Bambusoideae)* EJ Judziewicz, TR Soderstrom Smithsonian institution press 1989
- *Chromosome numbers of some Mexican and Colombian grasses* FW Gould, TR Soderstrom Canadian Journal of Botany 48 (9), 1633-1639 1970
- *Observations on a fire-adapted bamboo of the Brazilian cerrado, Actinocladum verticillatum (Poaceae: Bambusoideae)* TR Soderstrom American Journal of Botany, 1200-1211 1981
- *Two new genera of Brazilian bamboos related to Guadua (Poaceae: Bambusoideae: Bambuseae)* TR Soderstrom, X Londoño American journal of botany, 27-39 1987

Thomas Soderstrom is respectfully remembered today as a World Bamboo Pioneer.



### Dina Nath Tewari

Dina Nath Tewari was born in 1937, growing up the son of freedom fighters, and became a very well educated man. He achieved Master of Science in Chemistry from University of Allahabad, followed by Post Graduation Diploma in Forestry (AIFC) from the Forest Research Institute in Dehradun. From there, he went on to receive his Post Graduation Diploma in Planning & Rural Development, and then Ph.D. in Social Anthropology. He has received honorary Doctorate of Science diplomas from several universities.

Dr. Tewari has spent more than five decades in promoting sustainable management of natural resources and nation building for eradication of poverty and hunger while protecting the environment, and has received international acclaim for achieving sustainability. During 2007 he received the Rio-Tinto-Alcan prize for sustainability, with the award of one million US dollars. His organization, Utthan, applied the award to extend its agroforestry program, especially on degraded land in areas with high levels of poverty.

He has also received numerous national and international awards for his innovations in the field of herbal medicines, biofuel development, water and sanitation. As an inventor, he owns more than 10 patents. He has served United Nation organizations, CGIAR institutions, as Deputy Chairman of the State Planning Commission, Member Planning Commission Govt. of India, Vice-Chancellor and Chancellor of Universities. He is no doubt an expert in forestry, energy, planning and development. Working as Vice-Chairman of the Chhattisgarh Planning Commission, he was responsible for developing large-scale *Jatropha curcas* plantations, bio-diesel production and consumption.

While most known around the world for his remarkable work to develop sustainable communities and help the poor, his innovations in bamboo development include several significant accomplishments. For example, Dina Nath Tewari worked as a silviculturist, a forest utilization officer, conservator and chief conservator of forest to promote bamboo development. He identified 105 bamboo species and raised them in bamboo arboreta at several locations. He

drafted “Intensive Forest Management Plans” and promoted sustainable bamboo management & establishment/expansion of forest industries. He also collected germ-plasm of elite bamboo species and developed micro- and macro- propagation techniques.

His enthusiasm led him to promote cultivation, management and sustainable harvesting techniques, and as well as improved processing and marketing of bamboo handicraft items. Thinking of more modern applications, Dr. Tewari promoted the use of bamboo as bioplastics, biofuels and advocated more than 1500 recorded uses including food, fodder, fiber, shelter & herbal medicine etc.

While he was working as Director of Environment and for the Tribal Development government of India, he advocated for protecting the environment by raising bamboo plantations in a number of ways such as:-

- The Taj Mahal (a wonder of the world) was facing the problems of air pollution mainly due to sulfur dioxide. The landscape of Taj was improved by raising plantation of bamboo & other species.
- Important watersheds were greened by raising bamboo plantations for soil stabilization and erosion control and for purification of soil, water and air. Siltation of Bhakha Nangal, Bansagar & Hirakund reservoirs has been substantially reduced.
- Air pollution in New Delhi and Raipur were reduced by raising bamboo plantations in the President Estate, Lodhi Garden and around Bhilai Steel Plant & Sponge Iron Plants.
- Countered climate change by recycling of carbon dioxide (12 tonnes per ha per year), release of oxygen and sequestration of carbon into the soil by raising bamboo in agroforestry systems.

While working as Director General of the Indian Council of Forestry Research and Education, Dr. Tewari worked on the following endeavors:

- Improvements in bamboo-based handicrafts, household goods, building materials, flooring and bio-based composites;
- Improvements in pulping techniques, paper making and developing textiles and rayon fibers;
- Production of bamboo charcoal, vinegar and extracts from bamboo leaves;
- Promotions for the production and consumption of bamboo shoots and other derivatives as medicine;
- Compilation of findings in research papers, magazines and books;

And he wrote a comprehensive monograph on bamboo, published by International Book Distributors, Dehradun, in 1994. This monograph was a benchmark for future botanists and investigators.

As Member of the Planning Commission of India, he continued to promoted bamboo development, with the founding of the Bamboo Technology Mission to provide technical, financial and engineering support for the establishment of bamboo-based industries. This led to India’s National Mission on Bamboo, which is charged with creating and improving bamboo plantations, improving harvests and stimulating markets to help eradicate poverty.

Dr. Tewari has been very engaged in promoting projects to “green” the Earth to help counter climate change, and he authored the book, *Agroforestry and Wastelands* in 1996, with M.P. Singh. As President of the Utthan: Centre for Sustainable Development and Poverty Alleviation, he initiated the following activities:

- Rehabilitated 10 million hectares of degraded forest by planting bamboo under the Joint Forest Management scheme;
- Promoted integrated development of 10,000 forest villages by adopting agroforestry and planting bamboo as a pioneer species on community lands;
- INBAR/IDRC project by planting bamboo and jatropha on surface soil-mined (clay bricks) areas converting red dirt to green landscapes. Later on by adopting bioremediation techniques, 90,000 hectares of mined areas around cities were greened, increasing the productivity and the profitability of 100,000 poor families, enabling them to cross the poverty line;
- Generation of electricity in remote areas using bamboo chips as raw material in biogas fire;
- Establishment of a number of modern nurseries producing 2 million quality bamboo saplings yearly and distributing to farmers for greening degraded areas;
- Development of bamboo application technology courses (certificate, diploma and degree courses) and started organized education programs and skills development for employment in bamboo-based industries and enterprises;
- Support of the Bamboo Society of India, Centre For Green Building Materials and Technology, Kishan clubs, Bamboo-Based Industries and Enterprises for using bamboo as an environmentally friendly, rapidly renewable resource, having more than 1500 listed uses, effective in disaster management and rehabilitation and generating employment for the masses;
- Seminars, workshops, exhibition orientation programs, awareness camps and demonstrations etc. to popularize bamboo for using it in a great number of ways and greening the Earth for survival of living beings.

Dr. Dina Nath Tewari is indeed a World Bamboo Pioneer!



## Charley Owen Younge

( 1941 - 2015 )

Charley Younge was an enthusiastic promoter and advocate for bamboo, and a successful innovator for branding bamboo as a modern material.

He was born September 23<sup>rd</sup> 1941 in Sekatoe, Java, Indonesia, where he lived until his family moved to The Netherlands in 1958. He attended Pedagogical College in Hilversum, The Netherlands, from 1965-1969 he studied the Dutch language.

For over 20 years, he was a teacher in Amsterdam, caring for children with learning and behavioral difficulties.

The success story of bamboo in Europe is closely linked to Charley's formation of the Bamboe Informatiecentrum Nederland (BIC) [[www.bamboe-ic.nl](http://www.bamboe-ic.nl)] in the late 1980's in the small village of Schellinkhout, where his family moved after Amsterdam. He set up a bamboo nursery and bamboo show garden specializing in hardy bamboos suitable for the northern European climate. In 1992 the existing bamboo collection in Schellinkhout was supplemented with the bamboos of the Station for the Nursery in Boskoop, and later, The National Reference Collection was created in Schellinkhout.

Charley attended the international bamboo workshop in Chiangmai, Thailand sponsored by INBAR in November, 1991 Charley learnt about the various possibilities of 'flat' bamboo material, like bamboo flooring. He promptly traveled to China to find the source of these products together with his good friends Michel Abadie and Bob Caso.

In 1993 Charley Younge started to sell bamboo flooring under the European trademark of PLYBOO® which he enthusiastically developed and marketed. It was one year earlier that the first bamboo flooring in Europe had been laid in the home of the Younge family in Schellinkhout, The Netherlands. That original floor still exists today with the family's complete satisfaction. Nowadays the Bamboo Information Centre develops and sells decoration products in direct collaboration with the leading production companies in Asia for the tastes and demands of the western society, as well as maintains a magical bamboo garden and the selling of live bamboo plants for people longing to bring bamboo and its mystic into their European gardens.

Through the years Charley held many lectures and organized exhibitions to make people aware about the almost infinite possibilities to use bamboo in numerous situations. He was very instrumental in the formation of the European Bamboo Society – The Netherlands.

Charley was passionately engaged with bamboo, and his zest earned him a reputation worldwide for his knowledge about the bamboo plant and its development as an alternative to wood.

Charley was - in his heart and in his soul - a World Bamboo Pioneer.



## Zhu Zhaohua

Zhu Zhaohua, born in 1938 in Zhejiang Province, China, graduated from the Department of Biology, Lanzhou University in 1962, and was a senior researcher of the Research Institute of Forestry, the Chinese Academy of Forestry (CAF). As a scientist, Professor Zhu has made outstanding contributions to world forestry research. He is knowledgeable, friendly and well-known to the world

For his early career, Zhu carried out the integrated research project on the forest resource *Paulownia*, funded by the Chinese Government and the International Development Research Centre (IDRC)(1978-1991). The research included the taxonomy and distribution of genus *Paulownia*, selection and breeding of *Paulownia*, effects and structure of *Paulownia* intercropping, the technique of cultivation and the agroforestry model of *Paulownia*, technologies of propagation and cultivation, etc. Since 1989 the majority of Zhu's work was focused on the integrated research on Agroforestry and *Paulownia*. Zhu led the project "Integrated Research on Agroforestry System in China"(1991-1995) and the project "Alternative Socioeconomic Approaches to Reclaiming Degraded Lands" jointly supported by IDRC-CIFOR (1995-1997). He earned the title of "The Special Contribution Scientist of State" by State Council of China (1991).

Beside national and provincial awards, Zhu also received many international awards, including in 1985, the award of the first "Man of Tree" by International Richard St. Barbe Baker Foundation for his contribution in developing rural forestry in China; in 1995, he received an award by the Prime Minister of Canada – Jean Chrétien on the occasion of the 25th Anniversary of IDRC for his contribution in leading international cooperation projects; in the same year, Zhu was entitled "All Life Research Professor of Indian Academy of Forestry"; and in 2002, he was elected the Honorable Member of the American Society of Foresters.

A number of Zhu's publications in English have been used extensively by other researchers. These include:

1. Paulownia in China – Cultivation and Utilization, 1985.
2. Agroforestry Systems in China, 1987.
3. Participatory Forestry in China, 1997.
4. Non-Timber Forest Products and Forest Biodiversity in China, 2001.
5. Sustainable Development of the Bamboo and Rattan Sectors in Tropical China, 2001.
6. Impact Assessment of Bamboo Shoot on Poverty Reduction in Linan, China with Elsie Yang, 2003.

Zhu has been invited to 45 countries for the purposes of academic and technical exchange. He was in charge of the organization of 36 international training workshops since 1987, 910 international participants from more than 50 countries attended these workshops. He was invited by many international organizations and national governments as project consultant, and has provided consultant services in 14 countries: USA, Australia, Pakistan, India, Turkey, Syria, Ecuador, Ghana, Nepal, Colombia, Bolivia, the Philippines and Vietnam. It is easy to see why Zhu is considered an international expert of worldwide influence in many countries. His publication, *Sustainable Development of the Bamboo and Rattan Sectors in Tropical China*, 2001, is a benchmark for the modern management schemes and develop projects worldwide.

Professor Zhu is one of the founders and the first Deputy Director General of the International Network for Bamboo and Rattan (INBAR), which is the first international organization headquartered in China. From 1995, Zhu has spent great energy to carry out the research and study on the bamboo and rattan development strategies of China. From 1999 to now, Zhu has been undertaking the annual international training workshops on bamboo and rattan for INBAR. From 2000, Zhu was entitled the Distinguished Fellow of INBAR for Life. He is considered a founding father for his significant contributions to the establishment of INBAR.

Zhu Zhaozhu is absolutely a World Bamboo Pioneer ! And today he is with us to share his experiences during an additional honor, the UEDA Lecture.

In addition to THANKING the incredible team of the 10<sup>th</sup> World Bamboo Congress Organizing Committee, especially the Technical Committee led by Nirmala Chongtham, Jean Luc Kouyoumji, and Park Choong we are extremely grateful to...

Our Keynote Speakers, including the world-renown architect Simon Velez, Ghana Bamboo Bicycles Initiative founder Bernice Dapaah, Kathleen Buckingham, Mauricio Mora Tello, Yiping Lou, Manuela Mendes & Hugo Gutierrez from Brazil's Joao Santos Group, Dirk Hebel from Switzerland, and Moso International's Pablo van der Lugt.

The Bamboo Pioneers Award recipients, those renowned experts who have dedicated their life work to bamboo: Thomas Soderstrom (posthumously, USA), Jorge Moran Ubidia (Ecuador), Dina Nath Tewari (India), Zhu Zhaohua (China), Charley Younge (posthumously, The Netherlands), and Choi Hyung-sik (South Korea).

Travel for this year's award recipients was sponsored by EcoPlanet Bamboo. Thank you, Troy!

The World Bamboo Fair team, including Lee Yu-ok, Kim Ki-jung, Han Woo-sung, Kang Kyung-won, Jun Hee-joo, Lee Kyung-mo (International Cooperation Team Leader), and all of their team members, as well as the entire municipality of Damyang, Jeollanum-do, South Korea for their exceptional planning and gracious hospitality.

Personally, as WBO Executive Director and Chair of the 10<sup>th</sup> WBC International Organizing Committee, I wish to gratefully say <kamsa hammida> to my very first Korean friends: Han Yeon-duk and Lee Chang-hun, who traveled to the United States as friendly diplomats for Damyang. Thanks go to a very special person, Ohsowho, who charmingly guided me on my visits to Damyang, to Dr. Choong N. Park of Chonnan University, and to Mr. Bin Dorim (aka Dirk Fuendling) for his wonderful role as translator and colleague. The liaison of Ms. Lee Hyunmin (Amy) was exceptional - she was absolutely invaluable during these past two years of planning.

We have been fortunate to have the leadership of WBO President Michel Abadie, who has flown the ship of WBO for the past 6 years with vision and with commitment. I am eternally grateful to have such a strong shoulder to lean on, and we will be friends for life. Merci, Michel!

And, last but not least, we are especially grateful to Governor Choi Hyung-sik, for without him, this event would have never taken place.

Listen, share, learn, and enjoy this 10<sup>th</sup> World Bamboo Congress.

Where will we meet next?

Thank you.



CEO and Executive Director, WBO

## **Keynote Speakers**

Ghana Bamboo Bicycles Initiative

Bernice Dapaah

Stories that change the paradigm: bamboo structures for sustainable and resilient communities

Corinna Salzer, Sonia Fadriga, Andrea Fitrianto and Kim Boram

Environmental Assessment of Industrial Bamboo Products, Life Cycle Assessment and Carbon Sequestration

Pablo van der Lugt

Bamboo: The Opportunities for Forest and Landscape Restoration

Kathleen Buckingham

Green Steel - constructing alternatives out of bamboo

Dirk Hebel

Bambusa®: Pioneering Latin America's First Bamboo Craft Beer

Mauricio Mora Tello

Introduction to the Methodology for Carbon Accounting of Bamboo Plantation Projects

Yiping Lou

Large-Scale Plantations of Bamboo for Cellulose and Biomass held in Northeast Brazil

Hugo Gutierrez-Céspedes Germán and Manuella Mendes Araujo

## **Keynote Speakers**

**Sessions / Themes :**

*Architecture, Engineering and Social Housing*

*Community and Economic Development*

*Ecology and Environmental Concerns*

*Food and Pharmaceuticals*

*Morphology and Taxonomy (Biology)*

*Product Design and Technology*

*Propagation, Plantations and Management*

*Post-Harvesting and Processing*

**Sessions / Themes**

Session: International Network of Bamboo and Rattan

**Expert dialogue:** Global Assessment of Bamboo and Rattan (GABAR):

*What knowledge do countries need to better develop their bamboo resources to create green economy growth and jobs?*

*A dialogue between experts on bamboo use for land restoration, markets and enterprise value chains, forest management and supply.*

GABAR is an initiative of INBAR with its 41 Member States and a growing group of development partners.

GABAR partners are enthusiastic that bamboo and rattan can increase livelihoods and green economy activities to benefit millions of people, especially in low-income countries. But for this to become a reality at a large scale, more precise knowledge is needed in specific areas, including:

- Assessment of current bamboo and rattan resources, by country and region
- Value chains and enterprise approaches for economic growth and job creation
- Strategies and practices for using bamboo for rapid and large-scale restoration of degraded lands
- Planning and forest management approaches to ensure stable supply for businesses

The GABAR session at the WBC will examine these issues in a dialogue between an expert panel composed of:

- **Hans Friederich**, INBAR Director General - discussion leader.
- **Kathleen Buckingham**, World Resources Institute - Landscape restoration options and opportunities with bamboo.
- **Pablo van der Lugt**, Moso, Netherlands –Needs of the private sector to link bamboo resources to markets.
- **INBAR country partners – Cameroon, Philippines, others TBC.**

**Expert dialogue** –Views and wisdom of four world-leading experts on bamboo development.

*Advice and perspectives from senior experts who advise countries worldwide on their bamboo development.*

*A dialogue between senior experts on approaches and principles for effective development of countries' national bamboo sectors.*

Unlike other sectors such as forestry and natural resource management, bamboo counts a very small group of experts and leading thinkers who have dedicated their careers to improving the learning on bamboo development. Several of them are together at the World Bamboo Congress, and INBAR will bring them, together in a special senior-expert dialogue.

This dialogue will tap the knowledge and wisdom of four experts on topics including, developing bamboo economies – lessons from success and failure in bamboo resource countries; new

- **Dr Hans Friederich**, INBAR Director General - discussion leader.
- **Dr Tewari** bamboo senior bamboo expert and Founder and Director of Utthan, Centre for Sustainable Development & Poverty Alleviation – India.
- **Prof Zhu**, senior bamboo Expert, INBAR, China and advisor to countries worldwide on bamboo development – China.
- **Ximena Londono** – senior bamboo expert, President, Colombian Bamboo Society – Colombia
- **Dr. Masatoshi Watanabe**, Senior bamboo expert and advisor to the Japanese government and countries worldwide, Secretary General of the Japan Bamboo Association – Japan.



## Poster Presentations

Rashmi

Bamboo Shoots: Potential and Prospects for Utilization as Nutraceutical

Houlete Komlan

The Bamboo in Construction in Togo, What Future?

Briceno & Vargas

Application of silvicultural management and biometric model development for carbon sequestration, growth and yield forecasting of Guadua (*Guadua angustifolia*) plantations in the south region of Costa Rica

Nemenyi et al

Leaf and Culm Sheath Phenology in Species of the Bamboo Genus *Phyllostachys*

Chang & Lin

Flowering gene expression analysis of *Bambusa edulis* in different growth stage

Thakur et al

Efficient micro-propagation technique of *Dendrocalamus asper* for mass production and evaluation in field for biomass production

Lima et al

The potential of Brazilian native bamboos in biodiversity conservation, landscape restoration and sustainable innovative economic systems

Park & Lee

Manufacture of bamboo charcoal cup prepared from different temperatures and its physicochemical properties

N Patil

Upgrade method of bio-char unit

Novaes et al

Reforestation with Bamboo in the area of state University of Southwest of Bahia, Brazil

Ali et al

Comparative antimicrobial efficiency of different antibiotics for in vitro culture of *Bambusa balcooa*

Ray et al

In search of low cost bedding material for macro-propagation of *Bambusa balcooa*

Yeasmin et al

Distribution of Bamboo Species: A study at coastal saline belt of Sundarban Delta of Indian sub-continent

Noichan & Rittironk

Study of physical properties and structural capability of bamboo trussed frame connections

Oinam & Sharma

High fiber cookies from bamboo shoot paste

Naosek pam et al

Fermentation of Bamboo Shoots in North-East India: Technique, Microbial Diversity and Enhancement of Bioactive Compounds

NamGyu Ju et al

Comparison of Regional Biomass estimations for *Phyllostachys bambusoides* and *Phyllostachys nigra var henonis* stands in Southern Korea

Yoo et al

Characteristic of spatial distribution and dynamic change of bamboo forests in Gyeongsangnam-do region, Korea

Choi et al

Characteristic of bamboo cultivar Cheongsan (*Phyllostachys bambusoides* S et Z) for Landscape tree

Mukherjee & Saha

Use of bamboo mat boards as bus body building material in public transport, India

Manoj et al

Current and Potential role of bamboo in rural occupation in south western region of India

Gupta

Estimation of strength properties from anatomy of bamboo species

Al-Amin & Taluqdar

*Bambusa vulgaris*: Retention wall for landslide applying vegetative propagation and carbon repository in Bangladesh

Rane et al

Can *Dendrocalamus stocksii* be the multipurpose bamboo species for domestication in peninsular India?

Iwamatsu

Branding bamboo shoots and practical use of charcoal by a rural community of Kitakyusu, Japan

Narayan

Ten bamboo transition shelter kits for disaster relief

Saevfors

Bamboo for urban density housing

Sheth

Bamboo Provides Green Packaging Solution Coir Atlas – A Value Added Substitute of Wood

Sarangi

Bamboo in the perspective of present environment management scenario and sustainable growth

Hossain et al

Propagation of *Dendrocalamus asper* by branch cutting in greenhouse with a simple inexpensive method

Archila et al

Limeboo: lime as replacement of cement in wall-framing systems with bamboo-guadua (bahareque encimentado)

Sundriyal RC

Community conservation and adaptive management of bamboo in global hotspot: a socio-ecological approach

Geetika et al

Effect of pre-sowing irrigation treatments on performance of ageing *Dendrocalamus hamiltonii* seeds

Chen et al

Production and marketing channels on green bamboo shoots (*Bambusa oldhami*) in Taiwan

NamGyu Ju et al

Biomass equations and productivity of three bamboo plantations in a local level