FORMATH FUKUSHIMA 2013
Program: March 13 (Wed) - 14 (Thu)

Date	March 13, 2013		
10:00 ～11:00	**Registration**		
11:00 ～11:10	**Opening Remarks**		
11:10 ～12:00	**Workshop on Harvest Scheduling System**	Coordinator: Yoshimoto	ISM
12:00 ～13:00	**Lunch Break**		
1.	**Harvest Scheduling**	Coordinator: Konoshima	University of Ryukyus
13:00 ～13:40	A methodology for addressing the problem of harvest scheduling considering maximum area restrictions	Dr. Mauricio Ruiz-Tagle	Universidad Austral, Chile
13:45 ～14:25	Multiband Robust Harvest Scheduling	Dr. Annie Raymond	ZIB in Berlin, Germany
14:30 ～15:10	Effects of stand conditions on annual supply potentials and available amounts of timber and logging residues using forest management records in Tochigi prefecture, Japan	Dr. Kazuhiro Aruga	Utsunomiya University
15:10 ～15:30	**Coffee Break**		
2.	**Risks and Disturbances**	Coordinator: Surovy	ISM
15:30 ～16:10	Simulation Analysis of Spatial Management for Controlling seed dispersal and disturbances	Dr. Masashi Konoshima	University of Ryukyus
16:15 ～16:55	Snow damage analysis by multinomial regression models	Dr. Ken-ichi Kamo	Sapporo Medical University
16:55 ～17:15	**Coffee Break**		
17:15 ～18:00	**3 D Image Analysis Demo**	Coordinator: Konoshima	University of Ryukyus
18:00 ～20:00	**Poster Session & Open Discussion on the Issues Presented with Dinner provided with no charge**	Coordinator: Konoshima	University of Ryukyus

Date		March 14, 2013		
3.		**3D modeling**	Coordinator: Asante	BC Energy College and U of A
10:00	～10:40	Analysis of Standing tree Using A Motion Capture System: Three-Dimensional Stem Model for The Basal Bending of Japanese Cedar (Cryptomeria japonica)	Mr. Kei Kobayashi	Akita Prefectural University
10:45	～11:25	Nondestructive 3dimensional data acquisition of stem surface: case studies from Okinawa	Dr. Peter Surovy	ISM
11:25	～12:50	**Lunch Break**		
4.		**Economics**	Coordinator: Takahashi	FFPRI
12:50	～13:30	Forest bioenergy in Japan: An integrated engineering and socio-economic approach	Dr. Nicklas Forsell	IIASA
13:35	～14:15	Quantifying Timber Values at Risk using Shadow Prices	Dr. Patrick Asante	BC Energy College and U of A
14:15	～14:35	**Coffee Break**		
5.		**Growth and Modeling**	Coordinator: Konoshima	University of Ryukyus
14:35	～15:15	Developing a site index model using digital crown height model derived from digital aerial images	Dr. Yasushi Mitsuda	Miyazaki University
15:20	16:00	How spacing affects tree growth? Preliminary study of shape fixed, area increase design plots experiment	Dr. Masayoshi Takahashi	FFPRI
16:00	～16:10	**Closing Remarks**	Dr. Yoshimoto	ISM

Poster Sessions

P01	Effects of the simultaneous reduction of Japanese, U.S., and Chinese intermediate demands for electricity on the GDP gains or output ratios of each sector.	Yozaburo Ejiri	Iwaki Meisei University
P02	Identification of forestry sectors in each economy from the viewpoint of skyline graphs.	Masato Suzuki, Naoki Takeda, Nobuhisa Watanabe, Yozaburo Ejiri	Iwaki Meisei University
P03	Seasonal change of light competition among species with various functional groups in moorland plant communities	Chiho Kamiyama et al.	ISM
P04	Applied Vegetational Research into Forest Road Slope in Subtropical Okinawa	Hiroyuki Hattori	University of Ryukyus

March 13 (Wed), 2013
Session 1: Harvest Scheduling

13:00～13:40
A methodology for addressing the problem of harvest scheduling considering maximum area restrictions

Mauricio Ruiz-Tagle (Universidad Austral, Chile)

A major problem in harvest scheduling is effective consideration of spatial constraints, which in many cases are to limit, with an upper bound, spatially continuous harvest areas that do not allow forest green-up. Harvesting regimes obtained as solution of a planning model based on linear programming, often provide a set of situations where this restriction is not satisfied, ie harvest macro-units composed of adjacent harvest units which together account an area that exceeds the upper bound. In order to reduce the subset of macro-units that exceed the limit area, we propose a methodology based on a systematic search of sub-clusters whose harvesting period should be modified, in order to minimize the impact on the original solution, under volume criteria or economic criteria. In this search, proposed methodology considers variable criteria in allocating new seasons, by using a MIP model. We describe a real problem in a forestry company in Chile, with the solution implemented by a matrix-generator software for forest planning models.

13:45～14:25
Multiband Robust Harvest Scheduling

Annie Raymond (ZIB in Berlin, Germany)

The goal of the Harvest Scheduling Problem (HSP) is to select the areas of a forest to be harvested in each period of a time horizon. Though the HSP has been well-studied in a deterministic fashion, little research has focused on its uncertain counterpart. Indeed, many components of HSP are uncertain: for example, the timber price and the production volume in future time periods can only be estimated. Here, we consider the cluster packing formulation (Murray 1999) with volume constraints. We propose a new robust optimization model that handles those two sources of uncertainty. We show how the uncertainty can be modeled through the new multiband setup (D'Andreagiovanni 2012) and we present some preliminary computational results.

14:30～15:10
Effects of stand conditions on annual supply potentials and available amounts of timber and logging residues using forest management records in Tochigi prefecture, Japan

Aruga Kazuhiro (Utsunomiya University)

In this study, the annual supply potentials and available amounts of timber and logging residues from profitable sub-compartments for all cities and towns in the Tochigi prefecture were estimated using forest management records. Five log markets and three factories in the Tochigi prefecture were assumed as destinations for timber and logging residues, and forest operation systems were set based on forestry cooperatives. The results showed that when the unit price of logging residues was 10,000 yen/ton, the annual available amounts of logging residues from the profitable sub-compartments could almost cover the annual demands of the three facilities that we used for this study. The introduction of the FIT had a large impact. Furthermore, the annual available amounts of logging residues with subsidy could meet 70% of the annual woody biomass demands of the large-scale factory in Sano city, which is 100,000 tons. Effects of stand conditions on profitable sub-compartments were examined. Profitable sub-compartments were mainly consisted of Hinoki (Japanese cypress) and along roads because of its high price and low extracting costs.

March 13 (Wed), 2013
Session 2: Risks and Disturbances

15:30～16:10
Simulation Analysis of Spatial Management for Controlling seed dispersal and disturbances

Masashi Konoshima(University of Ryukyus), Atsushi Yoshimoto(ISM)

Seed dispersal causes various undesirable environmental changes such as the spread of invasive species and the gene flow from genetically modified trees. Numerous studies on seed dispersal mechanism have been conducted in the fields of ecology and biological sciences. However, few studies have evaluated the effectiveness and efficiency of management for controlling seed dispersal. We developed a simple spatial simulation model to explore the effect of management on seed dispersal and disturbances. We compared different intensity levels of managements. Our simulation results showed that higher management intensity is more costly initially, but leads to less disturbed area at the end of planning horizon.

16:15～16:55
Snow damage analysis by multinomial regression models

Ken-ichi Kamo(Sapporo Medical University), Atsushi Yoshimoto(ISM)

Forest stands are individual trees are often devastated by natural disasters such as heavy snowfall, resulting in significant economic losses to the forestry sector. Identifying characteristics that affect the degree of damage could inform management strategies designed to reduce the overall risk of damage. In this study, we evaluate risks of snow damage to Toyama prefecture's forest by multinomial regression models, and specify the factors that essentially affect risk probability throughout the model selection procedure. Results indicate that areas with little wind or those with thin forest stands may have a high-risk probability of snow damage. Conclusions from this evaluation regarding risk probability should have broad implications on management techniques such as species control or thinning that are presently used to minimize snow damage.

March 14 (Thu), 2013
Session 3: 3D modeling

10:00～10:40
Analysis of Standing tree Using A Motion Capture System: Three-Dimensional Stem Model for The Basal Bending of Japanese Cedar (Cryptomeria japonica)

Kei Kobayashi, Katsuhiko Takata (Institute of Wood Technology, Akita Prefectural University)

Three-dimensional visualization has been used in various fields such as construction, design, medical appliances and so on, because it allows to visually evaluate the characteristics of the structure as realistic as possible. Three-dimensional models of trees have the potential to reveal the relationship between the tree shape and variation of internal wood characteristics (e.g. growth, volume, density, anatomical characteristics, and mechanical properties). Using 3D data of stem surface we can calculate the accurate timber volume with very high precision especially in cases of irregular shapes (like for example bended trees). Precise estimation of stem volume is of particular interest of forestry managers.

10:45～11:25
Nondestructive 3dimensional data acquisition of stem surface: case studies from Okinawa

Peter Surový(ISM), Masashi Konoshima(University of Ryukyus), Atsushi Yoshimoto(ISM),

In this presentation we show several case studies using 3d magnetic motion tracker Polhemus FASTRAK and its possible application to biometrical analysis of trees. The magnetic motion tracker in contrast to laser scanning can acquire data not only from the visible surfaces but also from the surfaces and objects which are “invisible” (behind other objects) for the source of magnetic field. This is of particular advantage when for example assessing the horizontal cross sectional area of stem, which is only visible from one side. We will show mathematical background for the 3d data acquisition, automatic processing of point fields obtained from the digitizer and several case studies of forest species from northern Okinawa.

March 14 (Thu), 2013
Session 4: Economics

12:50～13:30
Forest bioenergy in Japan:　An integrated engineering and socio-economic approach

Nicklas Forsell(IIASA)

The over-all objective of this study is to analyze the potential bioenergy supply from forest in Japan. A technical assessment is used to support a policy discussion on the suitability of this mitigation tool for Japan. We first examine the technical potential of bioenergy. A global forestry model is applied in order to estimate the biomass availability. In a second step, the biomass results from the forestry model are used as input data for an engineering model for optimized scaling and locating of coupled heat and power plants (CHP). The obtained geographically explicit locations and capacities for forest-based bioenergy plants are consequently overlaid with a geological suitability map.

13:35～14:15
Quantifying Timber Values at Risk using Shadow Prices

Patrick Asante (Institution: BC Energy College and U of A)

March 14 (Thu), 2013
Session 5: Growth and Modeling

14:30～15:10
Developing a site index model using digital crown height model derived from digital aerial images

Yasushi Mitsuda(Miyazaki University)

This study aims to develop a site index model of sugi (*Cryptomeria japonica*) planted forest in Shimanto District, Kochi Prefecture, which is defined as a prediction model for spatial distribution of site index using geographic factors. Digital image processing provides digital surface models (DSMs) which represent the height information of land surface and all objects on it from stereo pair aerial images. In Japan, digital elevation model (DEM) has been published for whole area of Japan in 10m resolution. Thus, we can easily get digital crown height model (DCHM), represents the height information of tree crown surface, as difference of DSM and DEM in forest area. I prepared spatial distribution of crown height, stand age, and topographic factors using aerial images and GIS database within sugi planted forest in this study area. The unit area of analysis is a 50-meter grid and upper 80 percentile of DSM within each grid is regarded as stand height. Because site index is defined as average upper tree height at reference age (e.g. 40 years), I need to estimate site index with stand height data of various stand age. Therefore I combined the site index model and the height curve model as a function of stand age, and then parameterized using these data source by Markov chain Monte Carlo methods. The site index model parameterized in this study can predict the spatial distribution of site index of sugi for this study area.

15:15～15:55
How spacing affects tree growth? Preliminary study of shape fixed, area increase design plots experiment

Masayoshi Takahashi (FFPRI), Naoyuki Furuya (FFPRI Hokkaido)

The effect of spacing is one of the major problems of tree growth modeling. Nelder(1962) proposed unique idea to conduct the experiments to discuss spacing problem. We set a series of Nelder(1962) fan design experimental plots at Hitsujigaoka experimental forest of Hokkaido Research station, Forestry, and Forest Products Research Institute in 1972. Since then, we have been conducted periodical measure of trees. As a preliminary research, we employ tree data of shape fixed, area increase design plot (Design Ib) to solve spacing problem. We selected one of *Picea glehnii* planed Design Ib plot that designed density is 1000/ ha. To avoid the effects of mortality, we removed not only dead tree data but also neighboring tree data. Searching the factors, we used multivariate regression model and information criterion. As a results, area size is affected both the growth of DBH and Height. In the same time, DBH growth is also affected by neighboring tree size.