Society of American Foresters

International Forestry Working Group Newsletter

Working Group B3

March 2014

Thanks to everybody who sent in an article for this newsletter. Our next issue will be in June. I hope as you work on your international projects you consider writing a short article for the International Forestry Working Group newsletter.

- Blair Orr, IFWG Chair
(bdorr@mtu.edu)

Contributed Articles

The Economics of Willow in Poland: Lessons Learned from an Entrepreneur

Michael Jacobson, Professor of Forest Resources at Penn State, recounts his October 2013 visit and conversation with bioenergy entrepreneur and willow grower Stanislaw Dolata, whose willow business is located in northwestern Poland. Jacobson toured Eastern Europe with fellow NEWBio researcher Larry Smart, Associate Professor of Horticulture at Cornell University.

The old adage 'learn by doing' fits nicely with any new innovation, especially in the relatively new arena of growing high-yielding energy crops. Knowledge and experience are rare commodities when it comes to producing shrub willow or any dedicated energy crop for biomass.[1] Learning from early adopters is crucial. This paper discusses lessons learned after visiting the largest willow producer in Poland during September 2013.

Shrub willow is native to many temperate regions including the northeastern United States and northern Europe. Breeding for high-yield hybrid shrub willow occurs in Sweden, Denmark, the United Kingdom, Northern Ireland and the United States. In Europe, most of the commercial willow plantations are in Sweden and the UK but growth is most rapid in eastern European countries, especially Poland and Ukraine where vast amounts of land are 'available'.

Poland's interest in energy crops stems from EU mandates which call for the increased use of renewable energy to meet carbon emissions levels and reduce dependency on fossil fuels. Poland is heavily dependent on coal, which accounts for over 80% of the country's electricity. Poland also has the largest carbon emitter in Europe – the Belchatow coal plant.[2] According to the EU Directive, Poland's target is to have at least 15 % of its gross final energy consumption and 10% of its transportation fuels come from renewable energy by the year 2020. Currently, renewable energy accounts for 9% of Poland's total primary energy production, 86 % of which comes from biomass (2011 figures).[3]

Source (accessed 03 February 2014): http://en.wikipedia.org/wiki/Template:Location_map_Poland .

Bioenergy is one of Poland's most promising opportunities to meet the EU goals, with the country rapidly becoming among the largest willow producers in Europe. A report suggested that energy crops could provide about 290-370 petajoule (PJ) annually by the year 2020. This equates to about 2 to 2.3 million hectares, assuming an average harvest of 9 tons/ha/year of willow at a heating value of 18 gigajoule/ton.[4]

Most of the current biomass consumed in Poland comes from forest residues after harvest, and agricultural by-products such as wheat straw and rye. Some crops such as rape seed are grown specifically for biofuels. There is also a substantial import of biomass, over 1.5 million tons in the year 2010, mainly from Ukraine, but this has slowed. Power stations are the main users of solid biomass.[5] Although bioenergy use is growing, there is still a lack of subsidies for energy crops and certainty from the government for feed-in-tariffs and green certificates related to the renewable electricity targets. Most of the hybrid willow in Poland, about 8,000 hectares to date,

is planted on relatively arable land, which is where one finds cereal crops such as wheat and barley. Poland still depends heavily on agriculture with about one-fifth of its workforce working in that sector. The average farm size is about six hectares, a legacy of not collectivizing farms during the Soviet era. Moreover, this is mainly subsistence or small family-type farming, constraining efficiency.[6]

Studies have shown than production costs in Poland are substantially lower than in Western European countries, mainly due to lower labor, diesel and fertilizer costs. However, that cost disparity is shrinking as Poland becomes more integrated within the EU.[7] In terms of comparing willow to wheat and barley, willow does better at growing on poorer soils, and is more profitable. Therefore, most below-average soils are used to grow shrub willow.

Although willow production is increasing in Poland, the lack of knowledge about – and experience with – this crop has prevented maximum expansion. This situation with willow may be analogous to the one with rape seed, which was introduced to Europe in the 1960s but not fully utilized until 20 years later.[8] Numerous papers document the key barriers to growth of perennial crops, which include long growing periods between harvests, high establishment costs, and uncertainty over subsidies and government policies.

The Entrepreneur/Willow Grower

Stanislaw Dolata, a businessman and gentrified landowner, waited for me and fellow researcher Larry Smart (from Cornell University) at one of his many willow fields. We drove about 200 km north from Poznan to Borowice, a settlement within Gmina Goleniów (county) in northwestern Poland, close to Germany and near the Baltic Sea. Borowice is a rural landscape with small towns, large acreages of Scotch pine plantations and scattered crop fields. It is not the bread basket of Poland, and seemed neglected in terms of development. One could imagine that little has changed in this region since the end of the Cold War.

Dolata was attracted to energy crops in the early-to-mid 2000s, a time when Poland's economy was emerging after entering the EU and there was some confidence in the biofuel market. Moreover, Dolata wanted to have his own power station, to use in one of his businesses, a sawmill where he cut and dried firewood for sale in the rural communities around Borowice. The mill was a lucrative business since wood was still a major home heating source in that region. His idea was a combined heat and power (CHP) facility where he would sell excess power to the grid; He started planting willow in 2005, ahead of the planned installation of the bioenergy facility. However, while getting ready to build the plant in 2008 (about the time his first crop of willow would be harvested)[9] he was told by the government they would not allow a bioenergy facility in this region because of combustion emissions concerns within a newly-established nature preserve. In hindsight he would have built a pellet plant.

From l to r: Larry Smart, Jan Bocian, unidentified, and Stanislaw Dolata. Photo credit: L Smart.

By 2008 Dolata had about 500 hectares of willow planted. He received subsidies for establishment costs, which is not unusual as most farmers get payments from the EU for farming. However, his plans fell short as the closest buyers for chipped wood were CHP plants over 160 km away. His net returns after transportation costs were quite unattractive, but what alternative did he have? He had also found a local buyer for stem wood used in matting for sand bank reclamation along the Baltic. When asked about making money from willow, he laughed. Although his yields were a fairly respectable 25 tons/hectare and the subsidies had helped cover about 20% of initial costs, he was not making money from willow per se. As a businessman with other revenue sources, he was fortunate to be able to view his venture into energy crops with few regrets. But he was clear about what he would differently next time.

When we visited in Borowice, Dolata's willow planation was already down to about 320 hectares. He attributed the 180 hectares taken out of production to poor varieties and roots which damaged drainage tiles. He plans to turn those fields into cultivation of berries (blueberries, gooseberries and black currants).

Lessons Learned: Harvesting Logistics are Critical

Swedish varieties of shrub willow were planted in fairly good soils with relatively low pH, and no fertilizers or lime were applied. The land, said Dolata, was not good enough for higher valued grain crops given the un-level fields. No damage from insects or pests was observed in the fields, in part due to already good nutrient levels. Nitrogen fertilizer was recently added to some coppiced stands as a test. The jury is out as to whether or not this helped. One issue is leaf discoloration in the fertilized stands. This may be from the overuse of Nitrogen, since it was only seen after the fertilizer application.

Regardless, Dolata added that adding Nitrogen and or lime on low pH soils would not be economical. Market limitations were Dolata's main regret. but he also had much to say about willow production. Although all steps of the production process, from site preparation to planting and tending to harvesting, are critical, Dolata emphasized site and harvesting logistics. He

stressed the importance of optimizing planting density, planting row length, space for harvest equipment, entry and exit of chip transport trucks, and storage of the chips.

Certainly, many of these issues were discussed before any activity was carried out, but he noted many were unforeseen.. The field size (row length, row spacing and headlands) was critical to ensuring both the harvest and the dump truck could ride the field and turn efficiently. In addition, there were bottlenecks as either the chip trucks were having trouble on the icy roads or were waiting too long to load and leave. Dolata debated whether using a two-phase system of chip storage prior to final delivery or having the chips be delivered to the bioenergy facility directly would be more efficient. Storage is important if reducing wood moisture content is an issue.

Another issue is headland size and size between rows and fields. Any opening is a haven for unwanted weeds. One lesson learned: match the species variety to spacing. Generally, the Swedish varieties grow straighter, i.e., they are less bushy so more light is available to let more weeds grow.

Harvesting is usually carried out in April, as the snow recedes but the ground is semi-frozen, so equipment can grip. It was also clear that forestry tires are needed, which are not cheap, and that the harvester needed to go in the same direction across the field to avoid more damage. Dolata noted found that narrow tractors fared better on icy roads and suffered less tire damage. Finally, uncertainty remained as to whether two- or three-year rotations were better.

One of my final questions to Dolata was if he was able to encourage any neighbors to follow his lead and plant willow. Again a chuckle: he said "no", and referred to the main issue of initial costs. I asked Dolata if he would plant willow again. He stated firmly "not a chance", primarily because of the current regulatory environment and limitations imposed by the nature preserve. Government uncertainty over willow as an energy crop has ramifications both for initial planting subsidies and downstream credits in heat and electric use. Willow in Poland, and in Europe, generally is caught in a no-man's land between forest use and agricultural use. A typical forest subsidy is for 8 years; willow is a 3-year crop and so is not eligible, albeit the stand will be harvested over 20-25 years. Energy crops are on a different playing field from traditional agricultural uses.

Circling back to markets, Dolata also stressed the need for having clear long-term contracts in place before embarking. He thinks potential markets, such as schools and other institutional type buildings within 20 kilometers of his fields could use his willow for wood heat. But with huge government subsidies for coal and other fossil fuels, it would be a long uphill battle to change the market. Ironically, Poland recently hosted an Intergovernmental Panel on Climate Change conference. Will it make a difference?

Footnotes

[1]Energy crops include perennial grasses such as switchgrass, miscanthus, and other short rotation woody crops (SRWC) such as poplar, black locust and eucalyptus.

[2]http://www.nytimes.com/2013/11/01/business/energy-environment/poland-wedded-to-coal-spurns-europe-on-clean-energy.html?partner=rss&emc=rss&_r=0

[3]Renewable Energy and Bio-fuel Situation in Poland. Gain Report prepared by by USDA Foreign Agricultural Service, December 2012

[4]Ibid

[5]Ibid

[6]Erricson,K. et al. 2006. An agro-economic analysis of willow cultivation in Poland. Biomass and Bioenergy. 30: 16-27
http://www.lth.se/fileadmin/miljo/personal/KarinE/willow_economics_poland_paper_bb06.pdf

[7]Ibid

[8]Moran, A, et al. 2103. Modelling the perennial energy crop market: the role of spatial diffusion. J R Soc Interface. 2013; 10(88):20130656.

[9]Willow is a short rotation woody crops that matures in 2-3 year cycles at which time it is coppiced (after harvest the stump re-sprouts). The cycle continues at least seven times before a new willow cutting is planted.

Edited by Rachel Passmore, Penn State Class of 2014 and NEWBio Intern

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Research and Development of Decision Support Systems for Sustainable Forest Management and Policy Advice

José G. Borges (Coordinator of IUFRO Unit 4.04.04 and Chair of the Conference Organizing Committee), Luis Mira (Member of the Conference Organizing Committee), Ljusk-Ola Eriksson (Member of the Conference Scientific Committee) and Harald Vacik (Deputy Chair of IUFRO Unit 4.03.03 and Chair of the Decision Support System Community of Practice)

Summary statement: The 2013 Decision Support System Workshop and ForestDSS Community of Practice (http://www.2013forestdss.chil.org/) reported the state-of-the art on the development and use of decision support systems (DSS) to enhance forest management planning and forest policy analysis. It targeted further the transfer of knowledge and technology to DSS end-users. Through seminars the participants were exposed to the interdisciplinary nature of developing DSS. Computer labs were instrumental for the demonstration of the use of DSS.

An approach to DSS knowledge and technology transfer

The ForestDSS 2013 Workshop on Decision Support Systems and the first physical meeting of the ForestDSS Community of Practice took place in December 4-6, 2013 in Lisbon, Portugal. It was sponsored by IUFRO Unit 4.04.04, by the Forest Research Centre and the Association for Innovation and Enterprise Incubation (INOVISA) of the School of Agriculture of the University of Lisbon (ISA/UL), by the Erasmus Mundus Master Course MEDfOR (Mediterranean Forestry and Natural Resources Management Planning) and by the Community of Practice on Forest Decision Support Systems. It involved participants from Europe, Africa, America and Asia. Its program encompassed one seminar with presentations focusing on hot topics such as the **a)** architecture and implementation, **b)** models and methods, **c)** knowledge management techniques in DSS, **d)** the participatory processes to be supported by DSS as well as **e)** the innovative dissemination of DSS descriptions, case-studies and lessons learned by a Wiki semantic structure. A major part of the workshop was devoted to computer labs to demonstrate the potential of DSS to increase the efficiency and the effectiveness of forest management planning and to facilitate the transfer of knowledge and technology. Participants had the opportunity to interact with 9 state-of-the-art DSS and its application to address a wide range of forest management planning and policy analysis problems. The opportunity for hands-on experience was very appreciated by the participating forest stakeholders and was deemed as influential to the success of outreach efforts and to the wider dissemination and use of DSS to improve management and to enhance forest policy analysis. Recommendations were provided to the developer teams of the DSS in order to improve the usability of the tools, the documentation of processes and the general applicability to support problem solving.

Participants at the 2013 Forest Decision Support System Workshop and ForestDSS Community of Practice in Lisbon, Portugal, December 4-6 (photo by Henrique São Martinho)

The Community of Practice on Forest Decision Support Systems

The ongoing research and development in evaluating tools for supporting forest management and policy analysis processes will be supported by the Community of Practice on Forest Decision Support Systems – ForestDSS CoP (www.forestdss.org). At the meeting in Lisbon it was possible to agree on the Memorandum of Understanding (MoU) for the modalities and organisation of the work within the ForestDSS CoP. The CoP organizes knowledge about the construction and use of forest Decision Support Systems (DSS) for promoting sustainable forest management. Currently more than 50 members have adopted the MoU and are willing to support the ForestDSS Cop with their expertise and knowledge. In this context a session to further disseminate this work at the IUFRO 2014 World Congress (Decision Support for providing Ecosystem Services - Community of Practice of Forest Decision Support Systems) was launched by IUFRO Units 4.02.07, 4.03.03 and 4.04.04.

Smallholder *Eucalyptus Grandis* Woodlots in Eastern Paraguay

By Brook Alloway

The mismanagement of native forests in eastern Paraguay has long been of concern. With a historic lack of forest regulations and the inability to enforce those in place, harvesting practices resemble high grading. Today, trees with large diameters, of species with high economic value or of timber quality, are rare in the native forests.

Rural communities rely on timber to build homes, fence yards and fields, and make tool handles or furniture. Industries rely on timber as a source for bio-fuels and lumber, from which a myriad of products are made. To meet the high demand for timber, farmers and corporations have begun planting forests of fast growing species. The most common species is *Eucalyptus grandis*.

While serving as a Peace Corps volunteer in the settlement of Pindoyu, located in the Department of Caazapá, I had the opportunity to work with small landholders on their *Eucalyptus grandis* woodlots.

Small E. grandis *woodlot planted as a windbreak in Pindoyu, Caazapá*

These woodlots are between one half to ten hectares in size, planted on relatively fertile sites at 3 x 3 meter spacings. Silvicultural practices, including pruning and thinning, encourage large diameter trees with straight boles and few knots, attractive qualities for the timber market.

Peace Corps Volunteer and Pindoyu farmer smile happily on his E. grandis woodlot

The market encourages farmers to engage in good management practices by offering far more money for large trees of good form. Forestry extension programs offer education on *E. grandis* and incentives, such as free seedlings. The possibility of economic reward and the

promotion of woodlots have resulted in an increase in their numbers. The Department of Caazapá is now a mosaic landscape of native forests, farm fields, pasture, and woodlots.

The landscape of Caazapá as seen from Mount Tres kandu in Yvytyruzu Reserve

Although farmers are engaging in sound silvicultural practices it is not certain whether they will see significant economic gains. The market is growing and wood processors pay well. However, connecting the farmer to the wood processor is challenging. Farmers do not have the necessary equipment to harvest their own stands and transport timber, and the wood processors have no incentive to locate woodlots of harvest age as middlemen are already delivering wood to the mills. Middlemen cruise through the countryside offering low rates for mature trees. The limited options available for farmers to sell trees, a need for in hand cash, and the uncertainty of when the opportunity to sell will come again, all encourage farmers to sell their stands to middlemen at less than 25% of their market value. This is an issue that needs to be addressed if farmers are to view woodlots as good financial investments.

Call for Pacific Island and/or Invasive Species Associates

In the last issue of this newsletter there was a request for topics of interest to B3 working group members that might be developed into a short general education program. Based on the feedback we plan to develop short video segments on plant invasive species on Pacific Islands. The effort will be led by Blair Orr (B3 working group chair, bdorr@mtu.edu) and Jolie Goldenetz Dollar (Research Forester, American Samoa Community College; goldenetzdollar@gmail.com). After some discussion with Carlin Starrs, Manager of Education and Outreach at the SAF headquarters, it looks like we can develop a program that can be used for SAF Continuing Forestry Education credits and be available to the general public. The work could be placed on ForestEd, the new SAF site which Carlin manages.

If you have a background or interest in working with us on this project, please send one of us an email.

The Snout Beetle Game[1]

In Lesotho in the 1970s *Eucalyptus viminalis* had been planted as a relatively cold-hardy species suited for the lowlands (1600 to 2100 masl). Unfortunately, *Gonipterus scutellatus* (snout beetle) entered the country and caused significant damage on *Eucalyptus viminalis* growing in the village woodlots. Woodlot Project staff members were frequently asked what was wrong with the trees and one of the extension responses was to develop a game for children.

A poster board was set up with pictures illustrating three key ideas about the snout beetle and the eucalyptus trees. An extension agent gave a brief talk to a group of school children using the poster and then asking the group a few questions about the beetle and trees. After the talk each student was given the opportunity to take a verbal one-question quiz. The question was one of the same ones that had just been asked to the group, so almost every participant gave the correct answer.

Students who had answered correctly then had the opportunity to throw an old sock filled with sand at a nursery box. The box was placed on edge with a hand-sketched picture of an evil snout beetle on the bottom (which was now a target standing on the side). If a student knocked the nursery box/snout beetle over he or she would win a small piece of candy.

Those who failed the quiz or the throw could repeat. There is no telling how many children repeated even if they had been successful the first or second time.

This game can be adapted to many different scenarios with the simple steps:

1. Have a short visual presentation, not more than a few minutes, highlighting three key ideas. Reinforce those ideas.

2. Have a short verbal quiz asking one simple question on one of the three key ideas. Questions should be simple enough that most people will be able to answer correctly.

3. If a participant answers correctly they get to throw something at a target. A hit wins a small prize.

Participants will not develop in-depth knowledge of a subject with the snout beetle game, but they should know three key ideas and have a good time learning the ideas.

[1] This field note is inspired by Bill Ciesla's article on Forestry and Forest Health in South Africa that appeared in the December 2013 newsletter. Bill's article mentioned *Gonipterus* as a problem in South Africa and reminded your editor of his younger days working in Lesotho. Also, nobody else sent in a Field Note so, as editor, I had to fill space. - Blair Orr

Join an SAF Working Group

As a member of the Society of American Foresters you can join SAF working groups by going to the website:

http://www.safnet.org/workinggroups/join.cfm

If you want to join this working group, we are B3, the International Forestry Working Group. Please pass this information along to SAF members who might be interested in joining a working group – especially B3, the International Forestry Working Group.

SAF World Forestry Committee News

The World Forestry Committee is happy to welcome Jason Gordon, Linda Heath, and William Wagner as our newest members, and would like to thank our outgoing members, Jim Johnson and Jeff Wright for all their work. The Committee will have a booth at the 2014 SAF Convention to showcase the work of SAF members in international forestry. Please contact Danielle Watson at watsond@safnet.org if you would like to participate in highlighting the efforts of North American foresters abroad. Remember, applications for the 2014 Gregory Award are due April 1st. The scholarship funds a young forester from outside of North America to attend Convention. Applications can be found online at: www.xcdsystem.com/saf/site14/scholarships.

Pipa Elias, WFC chair
Danielle Watson, SAF Policy Associate

Announcements, Meetings and Events

General Information: http://www.xcdsystem.com/saf/site14/

The registration link is in the right hand column.

Register Now for World Forestry Center International Educators Institute July 13-19, 2014

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TROPICAL NOTES
Frank H. Wadsworth
International Institute of Tropical Forestry
USDA Forest Service
San Juan, Puerto Rico

Elephants and multiple use

In Gabon a study of 500 elephants in fully protected areas and multiple use areas found that movements involved the wetlands and bordering lagoons. It was concluded that survival of the elephants within both wet and dry seasons depends mostly on diverse multiple-use areas with corridors to less diverse fully protected areas.

L. S. Eggert and others, Using genetic profiles of African forest elephants to infer population structure, movements, and habitat use in a conservation and development landscape in Gabon. [Conservation Biology 28(3):107-118, 2013]

Monarch protection

Mexican and international efforts to protect the Monarch Butterfly Biosphere Reserve in Michoacan, Mexico are summarized from 2000 to ,2012. Large-scale illegal logging in the Reserve that affected 731 ha from 2005 to 2007 has been stopped but small-scale logging is still a source of concern. Significant as well, however are changes in land use in the surrounding core area. There 2,057 ha were illegally logged, leaving 1,254 ha with less than 10 percent forest covered and 925 ha degraded. Nothing is reported in the abstract regarding any population trend of the butterflies.

Omar Vidal and others, Trends in deforestation and forest degradation after a decade of monitoring in the Monarch Butterfly Biosphere Reserve in Mexico. [Conservation Biuology 28(1):177-186 2013]

Fuelwood for dry Africa

In Sahelian and Sudanian West Africa rainfall is becoming more variable and the demand for fuelwood is increasing. We expect that fuelwood production will be limited to drier sites in the future. To identify the best tree species for fuelwood under dry conditions five were studied. Growth rates, gross caloric values, and fuel value index were related to tree age and rainfall. Larger trees had wood with higher caloric value per cubic meter but

lower fuel value indexes. Geographical coordinates explained relations with rainfall that differed with species. Two of the five species studied are recommended.

Carmen Sotelo Montes and others, Growth and fuelwood properties of five tree and shrub species in the Sahelian and Sudanian ecozones of Mali: relationships with mean annual rainfall and geographical coordinates. [New Forests 45:179-197 2014]

Community improvement – Africa

Community-based Forest Groups (CBFGs) have been formed in Kenya, Uganda, Tanzania, and Zambia. Their development has been positive, with high membership, commitment, operational skills, the growth of local, regional, and international markets, and infrastructure improvements. Impediments include insecure access rights, weak leadership and organizational capability, weak market access, and limited entrepreneurial and value-added capacity. The article suggests measures to improve the Groups.

K. E. Johansson and others, Community-based forest groups in Eastern and Southern Africa – a study of prospects for capacity improvement. [International Forestry Review 15(4):471-488

Winds and tree form

Comparisons of wind speed effects on the trunk form of trees of *Pinus caribaea hondurenses* in Brazil gave a significant inversely proportional relationship between wind speed and tree form (percent of cylinder). The higher the wind speed the lower the form factor of the trees (and yield from logs).

Otacilio Santana and Jose Encinas, Wind effects on log volume and on form factor of *Pinus caribaea* var. *hondurensis.* [Cerne, Lavras 19(2):347-356 2013]

After 50 years at Pasoh

A comparison of forest structure 40-50 years after selectively logged Malaysian lowland forest. The cutover forest had a brighter understory than the undisturbed forest. Tree diameter growth was significantly faster in the cutover forest. Recruitment rates were significantly lower in the cutover forest. In the logged forest early successional tree species were declining, a phenomenon not in the undisturbed forest, indicating that succession is still in progress after 50 years.

Toshihiro Yamada and others. Effects of 50 years of ,selective logging on demography of trees in a Malaysian lowland forest. [Forest Ecology and Management 310:531-538 2013].

Teakwood properties

The use of teak in plantations has changed the supply from large-diameter logs to small-diameter logs featuring a higher proportion of juvenile wood and more knots. From fast-growing plantations teak is harvested generally after 15 to 30 years with logs ranging from 12 to 30 cm in diameter. A review of the factors that influence heartwood formation includes extractive content, color, and durability. No further details in the abstract.

Roger Moya and others, A review of heartwood properties of *Tectona grandis* trees from fast-growing plantations. ,[Wood Science Technology 48:411-433 2014]

Logging compaction results

Soil compaction is a major determinant of plant growth and/or mortality. Comparison 20 years after logging was made in an enrichment planting of dipterocarp seedlings in a tropical forest in Sarawak in a skid trail and undisturbed areas. Surface soil in the compacted area had two to three times more resistance to penetration than undisturbed soil. Soil penetration resistance contributed significantly to seedling mortality during the first year. The lateral root growth rate of the seedlings was significantly inhibited during 24 months. After 81 months lateral root elongation did not differ between the two areas.

Daisuke Hattori and others. Effects of soil compaction on the growth and mortality of planted dipterocarp seedlings in a logged-over tropical rainforest in Sarawak. [Forest Ecology and Management 310:770-776 2013]

CL vs. RIL biomass results

The results after conventional logging and reduced impact logging of 25.4 ha plots at Paragominas, Para, Brazil were compared. Conventional logging removed 29.7 m^3ha^{-1}, 26 % of its above-ground biomass. Reduced Impact logging removed 38.6 m^3ha^{-1}, 17% of its above-ground biomass. Over 16 subsequent years conventional logging, apparently with no silvicultural follow-up, biomass increment was 0.05$m^3ha^{-1}/year^{-1}$. For reduced impact logging the corresponding average was 2.8$m^3ha^{-1}year^{-1}$. The authors conclude that RIL is an important step toward sustainability.

Thales A. P. West and others, Forest biomass recovery after conventional and reduced impact logging in Amazonian Brazil. [Forest Ecology and Management 314:59-63 2014]

Logging vs. regeneration

In a moist forest of Ghana recruitment was compared between logged and unlogged forests during a 7-year period. Seedling recruitment was enhanced by logging at first with pioneer species but after one year non-pioneer species recruits outnumbered those pioneer. By three years the composition of recruits had converged with that of unlogged forest. The initial effects of disturbance were still detectable after 7 years. By that time seedling recruitment was similar to that of unlogged forest. Pioneers still dominated but non-pioneers continued to be the most numerous.

A.Duah-Gyamfi and others, Can harvesting for timber in tropical forest enhance timber tree regeneration? [Forest Ecology and Management 314:26-37 2014]

Logging vs. Sapotaceae.

The effects of 1997 logging on tree species of Sapotaceae in Para, Brazil was determined in 22 plots of 0.5 ha counted before and after selective logging. *Pouteria laurifolia* lacked 67% trees and 51% basal area. Corresponding figures for *P. macrocarpa* were 25 and 29; for *Micropholis acutangula* were 20 1nd 11; for *Manilkara huberti* were 16 and 18; and for *M. paraensis* were 12 and 31. These are indicators of time required for restoration of these key timber species without management.

Olegario Pereira de Carvalho and others, Effect of reduced impact logging in some sapotaceae species in the eastern Amazon. [FLORESTA 43(3):395-406 2013]

Volume recovery index

The index, the fraction of the inventoried tree volume that can be recovered and commercialized, improves on the traditional marketing coefficient used in the Congo Basin. VRI as a sustainability indicator, considering the growth conditions, management, and legislated policy concerning processing. Recommended are the use of VRI in discriminating environmental limitations, fully adopting RIL, saving low-quality timber, and promoting recovery, forest benefits, and poverty alleviation.

T. B. Mayaka and others, On volume recovery index and implications for sustainable logging in the Congo Basin. [Forest Ecology and Management 313:292-299 2014]

Soil porosity with Eucalyptus

In Rio Grande do Sul, Brazil *Eucalyptus* plantations are replacing grasslands. Soil porosity is reduced by the tillage necessary to establish the plantations. This loss is no

longer perceptible after three years, showing the resilience of the plantation in restoring and maintaining the functionality of the soil pore system. The study might have, but the abstract did not report any possible superiority of the pore system under the plantation versus that under the prior grassland.

Julianna Prevedello and others, The functionality of soil porous system in *eucalyptus* forestry on a Hapludalf. [Scientia Forestalis Piracicaba 41(100):557-566 2013]

Dealing with bamboo

In Acre, in southwestern Amazonia, two species of bamboo have a negative effect on forest regeneration and recruitment. In logged plots almost two thirds of the commercial timber volume was reduced. This compromises sustainable timber management goals because there are so few crop trees. The authors suggest the integration of non-timber forest product extraction with low harvest intensity, reduced impact logging, and tending of natural regeneration and diversification of commercial species.

Cara A. Rockwell and others, Logging in bamboo-dominated forests in southwestern Amazonia: caveats and opportunities for small-holder forest management.[Forest Ecology and Management 315:202-210 2014]

Eucalyptus *for plywood*

Nine species of *Eucalyptus* wood were tested for production of veneer and and multilaminated plywood. Veneers were cut to a nominal thickness of 2mm. Plywood panels were manufactured consisting of 5 bonded sheets. Glue-line shear testing and static bending parallel and perpendicular demonstrated that *E. grandis, E. saligna, E. dunnii, E globulus, E. viminalis, E. robusta,* and *E. pellita* have great potentials for the production of plywood panels for outdoor use.

Setsuo Iwakin and others, Evaluation of the use potential of nine species of genus *Eucalyptus* for production of veneers and plywood panels. [Cerne Lavras 19(2):263-269 2013]

Eucalyptus *spacing and veneer quality*

Processing small-diameter *eucalyptus* logs into veneer is a burgeoning industry in southern China. Little information is available on plantation alternatives with respect to veneer yields and quality. Field trials were assessed with six spacings, ranging from 666 to 2,222 trees ha^{-1} at 12 years. The highest veneer value per unit area was that with the highest stocking. Second logs (up from butt logs) had significantly lower average volume than butt logs they had significantly higher average veneer recovery (68% vs.59%). Had the trees been pruned their values would have been raised for appearance-grade veneer.

Yan Peng and others, Grade and value variations in *Eucalyptus urophylla x E. grandis* veneer due to variations in initial plantation spacings. [Australian Forestry 77(1):39-50 2014]

Leucaena *litter for* Eucalyptus

In southwest China *Eucalyptus* is being planted either pure or mixed with nitrogen-fixing tree species. On soils that are highly rocky *Eucalyptus camaldulensis* has been tested with *Leucaena leucocephala*. After 10 years the contribution of *Leucaena* litter, rather than root extension was the cause of faster growth in the mixed plots. The soil did not permit much root development.

Guoyong Tang and others, Accelerated nutrient cycling *via* leaf litter, and not root interaction increases growth in mixed-species plantations. [Forest Ecology and Management 310:45-53 2013]

Eucalyptus *heartwood durability vs. tree age*

After 9 years exposure above ground natural durability of the heartwood of 5 eucalypts taken from trees aged 30-50 or 80 years was similar. However, for 4 of the 5 species tested the heartwood of trees of less than 25 years was less durable than the older heartwood. In the young trees heartwood density was a good predictor of natural durability.

Laurie I. Cookson and Kevin I. McCarthy. Influence of tree age and density on the above-ground natural durability of eucalypt species at Innisfail. [Australian Forestry 76(3-4):113-120 2013]

Pruning schedules for clear wood

Branch pruning is necessary to produce high-value products from eucalypt plantations. Requirements of an effective and efficient regime include (a) restrict the pruned stem-diameter to a specified maximum, (b) ensure only green branches are pruned, (c) remove a proportion of the green crown that allows for continued competitiveness of the pruned trees, and (d) minimize the number of pruning interventions. The authors, setting pruning height at 6m and an upper diameter of 12cm, take 50% of the green branches in 2 lifts.

A.N. Callister and D. Wisemen, A form diagram to optimize pruning schedules for eucalypt clear-wood production. [Australian Forestry 76(3-4):156-163 2013]

Thin plantations early

Thinning in *Eucalyptus* plantations in Australia is increasing with the development of solid wood products. A test of the sawlog crop tree response to thinning compared plantations of 3.2 and 13.2 years thinned to 300 trees per hectare. Five years later the average basal area increase was 4.1 m^2ha^{-1} and the volume increased 30.1 $m^3h^{\cdot 1}$. In percent the thinning of the young plantation increased basal area 42% and volume, 32%. For the older plantation the corresponding figures were 21% and 17%.

David I Forrester and others. Relative, but not absolute, thinning responses decline with increased thinning age in a *Eucalyptus nitens* plantation. [Australian Forestry 76(3-4):121-127 2013]

Plantation responses to culture

Thinning, pruning, and fertilization influence plantation growth via different mechnisms. The most important and valuable trees in thinned and pruned *Eucalyptus* plantations are the largest diameter potential sawlog trees. In three studies reductions in crop tree growth due to pruning were greater in thinned stands than in unthinned stands because in unthinned stands the lower branches are shed rapidly, but in the better illuminated thinned stands they remain green. Absolute and relative thinning responses increased with site quality.

David I. Forrester, Growth responses to thinning, pruning, and fertilizer application in *Eucalyptus* plantations: A review of their production ecology and interactions. [Forest Ecology and Management 310:336-347 2013]

From Oregon Live by way of Frank Wadsworth and Steve Wilent One Oregon mill has retooled to make lumber for Japan:

http://www.oregonlive.com/business/index.ssf/2012/05/vanport_international_cuts_for.html

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