

Federal Ministry of
Food, Agriculture
and Consumer Protection

**Poplars and Willows in Germany:
Report of the National Poplar Commission**
Time period: 2008-2011

Editor:

Johann-Heinrich von Thünen-Institut (vTI)

Bundesforschungsinstitut für Ländliche Räume, Wald und Fischerei

(Dr. Georg v. Wühlisch)

Institut für Forstgenetik

Sieker Landstr. 2

22927 Großhansdorf

**Poplar Commission
of the
Federal Republic of Germany**

**Poplars and Willows in Germany:
Report of the National Poplar Commission**

Time period: 2008-2011

Poplar Commission of the Federal Republic of Germany

Poplars and Willows in Germany: Report of the National Poplar Commission

Time period: 2008 bis 2011

Contents

I	POLICIES AND LEGISLATION.....	6
	Policies	6
a)	Cultivation of poplars and willows in short-rotation coppices on arable lands	6
b)	Genetic conservation of the black poplar (<i>Populus nigra</i> L.)	6
c)	Agroforestry systems	7
	Legal measures	7
II	STATISTICAL AND ECONOMIC DATA.....	8
	Statistical data	8
	Production	8
	Imports and exports	9
	Trends	9
III	TECHNICAL DATA.....	9
	Identification, registration and plant variety protection	9
a)	Identification	9
b)	Approvals	10
c)	Registration	11
d)	Arboriculture Register	11
e)	Plant variety protection	11
	Cultivation	11
a)	Conventional rotation	11
b)	Short rotation	11

Breeding and selection	12
c) Conventional rotation	13
d) Short rotation	13
Protection measures	13
Exploitation and utilisation	14
a) Exploitation	14
b) Utilisation	14
Scientific studies and other activities	14
GENERAL INFORMATION	15
National Poplar Commission	15
Relations with other countries	15
Annexes	

I Policies and Legislation

Policies

a) Cultivation of poplars and willows in short-rotation coppices on arable land

During the period under review, the cultivation of poplars and willows in short-rotation coppices (SRC) increasingly developed into a practicable form of energy wood production. This applies to the supply with appropriate planting material, to the availability of specialised contractors for planting and harvesting measures and to practical knowledge with regard to establishing and maintaining such plantations. But knowledge on the development of such plantations in the course of their calculated stand time and on the predictability of the expected biomass yields related to a certain site type is still lacking. In addition, there is a demand for productive poplar and willow clones. Several projects were supported with experimental plantations by the *Fachagentur Nachwachsende Rohstoffe* (Agency for Renewable Resources) and other institutions with a view to answering questions about the practical cultivation, profitability and the selection of suitable species and varieties.

For the production of renewable energy, this form of land use is generally recognised as the form that combines high CO₂ fixation with low CO₂ avoidance costs and that can at the same time use agricultural marginal land and is therefore not necessarily in direct competition with food production. The ability of poplars and willows to fix atmospheric nitrogen allows for the production of large amounts of biomass without further increasing nitrogen deposition in soils and groundwater. It is this ability in particular that makes biomass production in short-rotation coppices so sustainable. The total area of short-rotation coppices in Germany has increased to 4,000-5,000 ha and continues to increase significantly.

Although the promotional policy under the Renewable Energies Act (EEG) has increased the prices of woody solid fuels (firewood, wood chips, pellets), they are still only 60% of the price of natural gas and 50% of the price of heating oil and are less volatile.

b) Genetic conservation of black poplar (*Populus nigra* L.)

Most pure black poplar occurrences only consist of relict stands with over-mature trees. Efforts have been continued to preserve the remaining population through *in situ* and *ex situ* measures. The gene banks of several *Länder* (NW, RP, HE, SN, BB, ST) contain black poplars of certified purity and origin for renaturation measures in the respective region. Black poplar stands have been approved for harvesting generative reproductive material for genetic conservation purposes in accordance with the Act on Forest Reproductive Material (*Forstvermehrungsgutgesetz* -

FoVG). Seed samples from gene conservation units have been made available to American poplar breeders.

c) Agroforestry systems

According to the European AgroForestry Federation (EURAFF), the term agroforestry system (AFS) means that field crops (trees) and agricultural crops are cultivated on the very same plot. Positive interactions between woodland and arable crops require that the entire growing area be regarded as a so-called agroforestry system. In addition to ecological (ecotonal structures, biotope network) and climatic (increased roughness of the landscape) benefits, timber production and agricultural crop rotation patterns have also been integrated into this system. The cultivation of poplars, willows and black locust in rows in short-rotation plantations alternating with agricultural crops is studied as a new form of cultivation in the scope of various projects. The positive effects are very promising.

Legal measures

With the elimination of the compulsory set-aside under Regulation (EC) No 73/2009, areas with short-rotation plantations and agroforestry systems have been classified as eligible permanent crops. The rotation periods must be shorter than 20 years each.

In order to maintain this eligibility for aid, the tree species poplar, willow, black locust, birch, alder and ash (CN code 0602 90 41) may be cultivated in short-rotation plantations and agroforestry systems.

By amendment to the Federal Forest Act (BWaldG) of 31 July 2010, short rotation plantations and agroforestry systems are no longer considered forest (Article 2 (2) no 1 BWaldG). This implies that no afforestation authorisation is required for the establishment of short rotation plantations outside forest land. The area can also be converted back for food production at any time without having to apply for a clearing and conversion authorisation. This approach is meant to facilitate the creation of short-rotation plantations outside forests. On the other hand, the establishment of short rotation plantations in forests is not regarded as regular forest management. A forest conversion authorisation would be necessary for this purpose.

An environmental risk assessment (ERA) is only required for areas greater 50 ha, but every short rotation plantation or agroforestry system must be regarded as an individual case. It is therefore advisable to notify such plantations to the lower nature conservation authority or the competent agricultural agency.

Permanent grassland areas are subject to the obligation to conserve grasslands. Eligible permanent grassland areas must only be converted into short rotation plantations to a minor extent, as they are considered permanent cultures (see cross-compliance/obligation to maintain grasslands under Regulation (EC) No 73/2009 and Regulation (EC) No 1122/2009).

The provisions of the Act on Forest Reproductive Material (FoVG) also apply to short-rotation plantations outside forests.

II Statistical and Economic Data

Statistical data

Planting of poplars and willows in Germany's forests is presently rare. This is primarily due to the as yet low sales potential for poplar wood and the clearcut-free continuous cover forest management. Aspens and balsam poplars are introduced as pioneer crops in mixed stands only on calamity areas or other afforestation areas. It is therefore difficult to record area percentage figures. The most recent National Forest Inventory cites hardwoods with short life spans (birch, alder, poplar, willow, rowan and other deciduous trees) in summary at 10%. Poplars and aspens take up an area of up to 100,000 hectares. Willows, by contrast, are restricted to only a few wet and extensive sites.

The area of biomass plantations with poplar and willows on formerly agriculturally used non-forest areas has distinctly increased and is now between 4,000 and 5,000 hectares. A great increase in these areas is anticipated since the regulatory framework guarantees that they are considered agricultural areas and are therefore eligible for aid.

Production

The cultivation of poplar and willows as a basis for raw materials is of minor importance in the Federal Republic of Germany. We have no precise data on the current levels of poplar raw wood felling since poplar fellings and sales are recorded and entered in the databases together with the timber species group 'beech'. Annual poplar felling is estimated at 150,000 to 300,000 m³, as old stands have been increasingly used and have not been replaced by new plantings. There are no separate records on the use of poplar raw wood.

The timber volume of approx. 50,000 t that is annually produced in short-rotation plantations concerns the energy market and is comparatively insignificant in this context as compared to the quantities of imported wood pellets which already amount to several million tonnes.

Imports and exports

The Federal Republic of Germany's foreign trade in poplar timber is of minor significance, as Germany has no poplar timber-based industries. A separate market for poplar timber has not developed to any major significance in Germany. But occasionally, export prices of approx. € 50/m³ were realised near harbours for standard poplar log varieties.

Trends

Interesting markets are increasingly developing for energy use of poplar and willow timber in the form of wood chips to be used for the combined generation of power and heat in power stations in municipalities with district heating networks or other heat users.

III Technical Data

Identification, registration and plant variety protection

a) Identification

Under the FastWOOD project funded by the BMELV, the methods for the identification of poplar clones have been extended by molecular methods. There are now reliable identification methods for all marketable clones and varieties. Reference databases are in the making. These methods allow for the reliable and increasingly cost-effective control of the breeders' marketing rights for these varieties.

A common method uses microsatellite DNA polymorphisms. These are short, non-coding DNA sequences that are often repeated in the genome of an organism in non-coding regions of the chloroplasts – such as the nuclear DNA (syn. SSR – Simple Sequence Repeats or SSLP – Simple sequence length polymorphism). These DNA fragments are electrophoretically separated in a gel matrix and show characteristic banding patterns for the examined genotypes. Another method uses variations of individual base pairs in a DNA strand, referred to as single nucleotide polymorphisms (SNP marker). The variation is identified by way of sequencing the nucleotide base pairs and shows genotype-specific sequences that allow for exact distinctions. Moreover, knowledge about species-characteristic microsatellite markers or SNPs allows the determination

of the parent species of species hybrids, thus helping to reconstruct the genealogy of suitable poplar hybrids. These instruments support efficient breeding activities.

Biochemical analysis methods are also used for the conservation of the European black poplar with a view to ensuring that only pure species material is conserved. Since the European black poplar crosses spontaneously with the widespread hybrid clones, genetic mixing with native black poplars cannot be excluded.

b) Approvals

The following basic material for the production of forest reproductive material was approved in the period under review on the basis of experimental plantations under the provisions of the Act on Forest Reproductive Material (*Forstvermehrungsgutgesetz - FoVG*) and the accompanying ordinances in the category "Tested Reproductive Material".

Clone name	Cross	Gender	Number	Time limit
Matrix 11	P. maximowiczii × P. trichocarpa		95304	30.06.2021
Matrix 24	P. maximowiczii × P. trichocarpa		95305	30.06.2021
Matrix 49	P. maximowiczii × P. trichocarpa		95306	30.06.2021
Ahle 1	P. tremula × P. tremula	m	98404	30.06.2018
Ahle 2	P. tremula × P. tremula	m	98405	30.06.2018
Ahle 13	P. tremula × P. tremula	m	98408	30.06.2018
Ahle 4	P. tremula × P. tremula	m	98406	30.06.2018
Ahle 5	P. tremula × P. tremula	f	98407	30.06.2018
Ahle 16	P. tremula × P. tremula	m	98409	30.06.2018
Ahle 17	P. tremula × P. tremula	m	98410	30.06.2018
Müнден 2	P. tremula × P. tremuloides	m	98506	30.06.2018
Müнден 6	P. tremula × P. tremuloides	m	98507	30.06.2018
Müнден 7	P. tremula × P. tremuloides	f	98508	30.06.2018
Müнден 11	P. tremula × P. tremuloides	f	98509	30.06.2018
Müнден 13	P. tremula × P. tremuloides	m	98510	30.06.2018
Müнден 16	P. tremula × P. tremuloides	m	98511	30.06.2018
Müнден 20	P. tremula × P. tremuloides	f	98512	30.06.2018

c) Registration

Since 2011, the Federal Agency for Agriculture and Food (BLE) in Bonn is maintaining the register of clones, clonal mixtures and parents of family approved in Germany by the authorities competent under *Land* law (www.ble.de).

Under Article 4 of the Act on Forest Reproductive Material (FoVG), approvals of these species of basic material may only be granted in the category "Tested". The vegetative production of forest reproductive material to be placed on the market also must be based on basic material of this category (Article 7 FoVG).

A list of poplar clones, clonal mixtures and family parents can be downloaded from http://www.ble.de/SharedDocs/Downloads/02_Kontrolle/07_SaatUndPflanzgut/Pappelklone_mischungen.pdf?__blob=publicationFile.

An overview of poplar stool beds and the competent *Land* agencies can be downloaded from http://www.ble.de/SharedDocs/Downloads/02_Kontrolle/07_SaatUndPflanzgut/Pappelmutterquartiere.pdf?__blob=publicationFile.

d) Arboriculture Register

Approved poplar clones and clonal mixtures are entered in an Arboriculture Register. The Arboriculture Register for poplars is maintained by Regierungspräsidium Kassel, Steinweg 6, D-34117 Kassel.

e) Plant variety protection

Due to the low trade volume for poplar reproductive material and the comparatively high costs, variety protection is not often claimed.

Cultivation

a) Conventional rotation

Poplars, aspens and willows are not cultivated to any notable extent in conventional rotation. Due to the better economic situation of forestry holdings as a result of higher timber prices, there is a greater interest in planting pioneer crops. These allow earlier exploitations and profits. Balsam poplar hybrids as well as aspens and aspen hybrids (*P. tremula* × *P. tremuloides*) are particularly suitable as pioneer tree species. Thus, aspen hybrid species such as 'Holsatia', for instance, are selling better than in past decades.

b) Short rotation coppices

The various government-supported cultivation, breeding and testing programmes include, for example, ProLoc and FastWood. Other projects can be found at <http://www.nachwaxsenderohstoffe.de/projekte-foerderung/projekte/>. Short rotation coppices were continued and expanded in Hesse, Lower Saxony, Saxony, Bavaria and, above all,

Brandenburg so that about half of the 4,000 ha of short-rotation plantation area in Germany are established there.

The results of the ProLoc project reveal that biomass growth is significantly dependent on water supply. An average water supply of 300 l/m² during the vegetation period and water-holding soils can produce yields of 10 t of dry matter per hectare annually. With high precipitation or groundwater impact also guaranteeing a continuous growth in dry periods, the yields can even be 20 t and higher; whereas with a poorer water supply, the annual dry mass increment per hectare can be 6 t or less.

The investment costs for establishing a plantation are high and vary depending on the tree species and the number of plants, which, in turn, depends on the utilisation purpose of the woody biomass produced. Total costs of € 1,800 – 5,500 (establishment, operating and harvesting costs) per hectare are calculated for biomass production with a large number of plants and short rotation periods, establishment costs for industrial utilisation with lower numbers of plants and longer rotation periods are € 1,600 per hectare, in both cases not including fencing, which can be calculated at an additional € 1,000 per hectare.

In addition to investment costs, harvesting and transport are also major cost factors that heavily depend on the production target. Harvesting costs of € 45-82/t of dry mass have been estimated if specially constructed harvesting machinery to harvest wood chips for energy exploitation at a maximum 4-year growth is used. These costs could be reduced by improved capacity utilisation of the harvesting machinery. Longer rotation periods result in thicker harvest material, which results in higher harvesting costs.

To evaluate the economic situation of plantations for energy use of woody biomass and an average plantation volume yield (10 t/ha) and lifetime (seven 3-4 year rotations), production costs between 30 and 45 €/t absolute dry weight woody biomass are calculated. If the operating risks are not taken into account and revenues of € 50/t absolute dry weight are calculated for the produced biomass, annuities (at 3.5% interest) of between 125 and 250 €/ha can be anticipated. The current prices of € 90/t absolute dry weight for wood chips will result in higher revenues. Under the present circumstances, short rotation plantations are no competition to agricultural food production. It seems reasonable to operate short-rotation plantations on agricultural marginal soils with water supplies that are too low or too high and on poor soils.

Biotic damages are a risk factor. Increased spread of plantation areas could cause significant economic damages due to better development opportunities of previously insignificant harmful organisms. The primary risk is, however, the price at which the produced material can be utilised. If oil prices remain at their present high for a long time or above it temporarily, woody biomass could be competitive as an energy source, particularly if rationalisation potentials could be developed for seedling production, harvesting and transport at increasing utilisation.

Breeding and selection

c) Conventional rotation

No breeding or selection took place for exploitation in conventional cultivation during the period under report. Genetic resources of the black poplar (*P. nigra*) in the form of pollen and seed were provided for breeding work in the USA.

d) Short rotation

In the course of production of renewable energies, the cultivation of poplars, aspens and willows is gaining increasing interest. There has been such great demand for seedlings in Germany that it could not be satisfied by domestic nurseries for a time that poplar seedlings had to be imported from Austria, Hungary, Italy and France and willow cuttings from Sweden. The demand for aspens could also not be satisfied.

According to the guidebook *Energieholzproduktion in der Landwirtschaft* (Energy Timber Production in Agriculture; 3rd edition, 2009; author: M. Hofmann) published by *Fachagentur Nachhaltende Rohstoffe* (Agency for Renewable Resources), eight poplar varieties are suitable: Hybrids 275 (Syn. NE 42), Max (multiclonal variety), *P. koreana**, 10/85, 20/85*, Androscoggin, Trichobel and Muhle Larsen and six willow varieties: Björn, Tora, Zieverich, Tordis, Inger and Sven for cultivation in short-rotation plantations. In 2011, about 80% Max clones and 15% Hybrids 275 were used. As for willows, the shift in preferences was even more significant. The clones Tordis and Inger with 35% each and Tora with 20% are used most, whereas clone Sven and new breed Klara only amount to 5% each (oral information by C. Neumeister). Many varieties have not yet demonstrated their suitability on agricultural sites, however. This clearly demonstrates that there is not only a great demand for varieties but that these must also be tested for suitability. This underlines the importance of projects like ProLoc in the scope of which the suitability of clones is tested on a wide variety of sites in various German regions.

Protection measures

Considerable damage events are not known for poplars and willows. Protective measures must, however, be taken, primarily in the first year of planting against browsing by game with fencing, against damage done by rodents and against competing vegetation. *Chrysomela* (= *Melasoma*) *populi* L. has done some damage, particularly feeding damage on the newly flushing coppice shoots after harvesting. Feeding damage by *Chrysomela vigintipunctata* can also reduce growth increment in individual cases. After several years, however, there seems to be a balance between the beetles and their enemies so that damages become tolerable without protection measures (written communication by K. Döhrrer). In years with extreme spring aridity, mortality was high

(in parts even total). Supplementary irrigation, particularly during the young growth phase, is recommended to safeguard successful regeneration and to increase the increment.

Most occurrences of pure black poplars are damaged by fungi and insects. This particularly applies to foliar rust caused by *Melampsora larici-populina*. The over-maturity of the trees in the occurrences, mostly in relict stands, can be considered the cause of the alarming health condition. The genetic resources must therefore be protected and regeneration measures introduced.

Exploitation and utilisation

a) Exploitation

Poplars and willows grown in conventional rotation periods are exploited according to normal forestry practices. Poplar raw wood is graded according to the statutory provisions on raw wood grades.

The woody biomass produced in short-rotation plantations is used in the form of wood chips, e.g. for wood-based materials, but mainly for energy production.

b) Utilisation

The biomass produced in short-rotation plantations is mostly used as solid fuel, which is mainly burnt as wood chips in adapted boiler systems. With greater volumes of woody biomass, increased pelletisation would be conceivable. Methods for the gasification of woody biomass (pyrolysis) or the liquefaction of fuels (Fischer-Tropsch process) have not yet been developed to the point of practical application.

Scientific studies and other activities

Old poplar tests, clone collections and neglected mother plantations have been examined and secured within the scope of new breeding activities and the FastWOOD project. Many of the existing clones have been identified with the help of molecular markers. The clones are also tested for their suitability for biomass production in short-rotation plantations.

General Information

National Poplar Commission

The National Poplar Commission is chaired by the head of Directorate-General 5 (Bio-Based Economy, Sustainable Agriculture and Forestry) of the Federal Ministry of Food, Agriculture and Consumer Protection.

The Secretariat of the National Poplar Commission is maintained by the Federal Ministry of Food, Agriculture and Consumer Protection.

Relations with other countries

A collection of 58 clones, bred at the University of Minnesota (USA), of the cross-breeds *P. deltoides* × *P. deltoides* (5), *P. deltoides* × *P. nigra*, (39) *P. deltoides* × *P. maximowiczii* (9), (*P. trichocarpa* × *P. deltoides*) × *P. deltoides* (3) and *P. deltoides* × (*P. trichocarpa* × *P. deltoides*; 2) was made available in 2010 to the Institute of Forest Genetics of the von Thünen Institute in Germany and Poland and other scientific studies. For phytosanitary reasons, the clones were transferred into tissue cultures in order to avoid the unintended introduction of harmful organisms.

A total of six progenies of the crossbreeds *P. tremula* × *P. tremuloides* (4), *P. tremuloides* × *P. tremula* (1), *P. tremula* × (*P. tremula* × *P. tremuloides*); (1) were made available for field tests in Riga (Latvia) and Tartu (Estonia) in 2009.

Annex 1

This report is primarily based on the specialised contributions of the following individuals and institutes:

Bayerisches Amt für forstliche Saat- und Pflanzenzucht
Forstamtsplatz 1
83317 Teisendorf
<http://www.forst-design3.bayern.de/asp/>

Bund-Länder-Arbeitsgruppe
Forstliche Genressourcen und Forstsaatgutrecht
<http://www.genres.de/en/forest-plants/>

Karl Döhner
Warburger Weg 26
34474 Diemelstadt

Fachagentur Nachwachsende Rohstoffe e.V. (FNR)
Dorfplatz 1
18276 Gülzow
<http://www.fnr.de>

Hochschule für Nachhaltige Entwicklung Eberswalde
Fachbereich Wald und Umwelt
Waldwachstum
Alfred-Möller-Str. 1
16225 Eberswalde
<http://www.hnee.de>

IB Biomasseconsulting/ Salixenergi Europa AB
Vertriebsleiter Deutschland, Österreich
Carsten Neumeister
Höfgen Nr. 1
01623 Ketzerbachtal OT Höfgen

Johann-Heinrich von Thünen Institut (vTI)
Bundesforschungsinstitut für Ländliche Räume, Wälder und Fischerei
Institut für Forstgenetik

Sieker Landstr. 2
22927 Großhansdorf
<http://www.vti.bund.de>

Kompetenzzentrum HessenRohstoffe (HeRo) e.V.
Am Sande 20
37213 Witzenhausen
<http://www.hero-hessen.de>

Leibniz-Institut für Agrartechnik
Potsdam-Bornim e.V. (ATB)
Max-Eyth-Allee 100
14469 Potsdam
<http://www.atb-potsdam.de>

Ltd. Forstdirektor a.D.
Dr. Dr. habil. H. Weisgerber
Im Grübchen 16
34346 Hann. Münden

Nordwestdeutsche Forstliche Versuchsanstalt
Abteilung Waldgenressourcen
Prof.-Oelkers-Strasse 6
34346 Hann.-Müenden
<http://www.nw-fva.de>

Philipps-Universität Marburg
Fachbereich Biologie Naturschutzbiologie
Karl-von-Frisch-Strasse
35032 Marburg
<http://www.uni-marburg.de/naturschutzbiologie>

Regierungspräsidium Kassel
Baumzuchtregister
Steinweg 6
34117 Kassel

Sächsische Landesanstalt für Forsten
Graupa

Bonnewitzer Str. 34

01827 Graupa

<http://www.forsten.sachsen.de/laf>

Annex 2

Bibliography

- Amthauer Gallardo D., Hofmann M., Siebert C., Wachendorf M. (2009): Verbundvorhaben ProLoc - Erste Ergebnisse zu Überlebensraten im Anwuchsjahr. In: Mitteilungen der Gesellschaft für Pflanzenbauwissenschaften, Bd.21, 21-22
- Atta-Alla, Hamdy; Zaghloul, Mostafa; Waly, Abd El Kawee; Fladung, Matthias; El Sherif, Fadia (2009) Activation tagging in aspen using a glucocorticoid-inducible two component Ac/Ds-enhancer element system. *Catrina*, Vol. 4, No. 2, p. 45-51
- Atta-Alla, Hamdy; Zaghloul, Mostafa; Waly, Abd El Kawee; Fladung, Matthias; El Sherif, Fadia (2009) Activation tagging in aspen using a heat-shock inducible two component Ac/Ds-enhancer element system. *Catrina*, Vol. 4, No. 3, p. 1-7
- Bangarwa, Kulvir S.; Wühlisch, Georg von (2009) Using exotic poplar in Northern India for higher returns in agroforestry. *APANews*, Vol. 35, p 3-5
- BAUM, Ch., P. LEINWEBER, M. WEIH, N. LAMERSDORF, I. DIMITRIOU, 2009: Effects of short rotation coppice with willow and poplar on soil ecology. *Landbauforschung – vTI Agriculture and Forestry Research* 59 (3), 183-196
- BEMMANN, A.; KNUST, C. (2010): *AGROWOOD: Kurzumtriebsplantagen in Deutschland und europäische Perspektiven*. Weißensee-Verlag: 342 p
- Berge, Christina (2009) *Gentechnisch veränderte Pappeln zur Erhöhung der Biomasseproduktion*. Hannover: Fachhochsch, 91 p., Hannover, Fachhochschule, Fakultät Maschinenbau und Bioverfahrenstechnik, Diplomarbeit, 2009,
- BLE, BUNDESANSTALT FÜR LANDWIRTSCHAFT UND ERNÄHRUNG (2008): *Zugelassene Klone und Klonmischungen der Pappel (Populus spp.)*. Download under: www.ble.de
- Boelcke, B, Kahle, P. (2008): *Energieholzproduktion mit Weiden und Pappeln – Ertragsbildung und Grundnährstoffbedarf [Energy Forestry with Willows and Poplars – Yields and Nutrient Supply]* *Pflanzenbauwissenschaften*, 12 (2). p 78–85
- Brüggmann, Tobias (2011) *Entwicklung molekularer Marker zur genetischen Charakterisierung von Genotypen verschiedener Arten der Gattung Populus L.* Hamburg: Universität Hamburg, 134 p., Hamburg, Univ, Fachber Biologie, Masterarbeit, 2011
- Brunner, J. und D. Landgraf (2011): *Wildverbiss auf Kurzumtriebsplantagen*. *AFZ - Der Wald* 10, 16-17
- Budde, K.B., Gallo, L., Marchelli, P., Mosner, E., Liepelt, S., Ziegenhagen, B., Leyer, I. (2011). *Wide spread invasion without sexual reproduction? A case study on European willows in Patagonia, Argentina*. *Biological Invasions*, 13:45-54. DOI 10.1007/s10530-010-9785-9
- CREMER, E., KONNERT, M. (2010): *Genetische Untersuchungen an Schwarzpappeln aus Bayern*. *LWF Wissen* 64, 46 – 51.
- Donnarumma, Francesca; Paffetti, Donatella; Fladung, Matthias; Biricolti, Stefano; Ernst, Dieter; Altosaar, Illimar; Vettori, Cristina (2011) *Transgene copy number estimation and analysis of gene expression levels in Populus spp. transgenic lines* [online]. *BMC proceedings*, Vol. 5, No. Suppl. 7, Seite P152, ISSN: 1753-6561, zu finden in <<http://www.biomedcentral.com/content/pdf/1753-6561-5-S7-P152.pdf>> [zitiert am 20.10.2011]

- El Sherif, Fadia; Kamal, Hamdy; Fladung, Matthias (2010) Activation tagging in transgenic poplar : activation tagging in aspen using an inducible two component Ac/Ds-enhancer element system. Saarbrücken: Müller, 116 pp
- Eusemann, Pascal; Fehrenz, Steffen; Schröder, Hilke; Ziegenhagen, Birgit; Bialozyt, Ronald (2011) Charakterisierung von Sorten und Klonen der Pappel : Verbesserung der Vergleichbarkeit verschiedener Labore. AFZ, der Wald, Vol. 66, No. 22, p. 32-33, ISSN: 0936-1294; 1430-2713
- Ewald D, Ulrich K, Naujoks G, Schroeder MB (2009) Induction of tetraploid poplar and black locust plants using colchicine: chloroplast number as an early marker for selecting polyploids in vitro. Plant Cell Tiss Organ Cult 99:353–357
- Fladung, Matthias (2009) Funktionelle Genomik in Pappeln. GenomXPress, No. 4, p. 14-16,
- Fladung, Matthias (2011) Analysis of re-integrated Ac element positions in the genome of *Populus* provides a basis for Ac/Ds-transposon activation tagging in trees. Trees, Vol. 25, No. 3, p. 551-557,
- Fladung, Matthias (2011) Gentechnik und Produktion nachwachsender Rohstoffe im Hinblick auf den Klimawandel. Mitteilungen aus der Forschungsanstalt für Waldökologie und Forstwirtschaft Rheinland-Pfalz, Vol. 69/11, p. 43-54,
- Fladung, Matthias; Becker, Dirk (2010) Targeted integration and removal of transgenes in hybrid aspen (*Populus tremula* L. x *P. tremuloides* Michx.) using site-specific recombination systems. Plant biology, Vol. 12, No. 2, p 334-340
- Fladung, Matthias; Becker, Dirk (2010) Targeted integration and removal of transgenes in hybrid aspen (*Populus tremula* L. x *P. tremuloides* Michx.) using site-specific recombination systems. Plant biology, Vol. 12, No. 2, p. 334-340, ISSN: 1438-8677
- Fladung, Matthias; Buschbom, Jutta (2009) Identification of single nucleotide polymorphisms in different *Populus* species. Trees, Vol. 23, No. 6, p. 1199-1212, ISSN: 1432-2285
- Fladung, Matthias; Kaufmann, Helgard; Markussen, Torsten; Hönicka, Hans (2008) Construction of a *Populus tremuloides* Michx. BAC library. Silvae genetica, Vol. 57, No. 2, p. 65-69, ISSN: 0037-5349 [PDF Dokument](#) (nicht barrierefrei) 147 KB
- Fladung, Matthias; Schenk, Tobias M. H.; Polak, Olaf; Becker, Dirk (2010) Elimination of marker genes and targeted integration via FLP/FRT recombination system from yeast in hybrid aspen (*Populus tremula* L. x *P. tremuloides* Michx.). Tree genetics & genomes, Vol. 6, No. 2, p. 205-217, ISSN: 1614-2942
- Gebhardt, K. 2008: Herausforderungen und Chancen der Pappelzüchtung. In: Arbeitskreis Deutsche In Vitro Kulturen - aktuell 11.Jg., 2, 8-18
- Gebhardt, K. 2010: Neuzüchtung und Erprobung bisher nicht registrierter Weidenklone und –sorten. Tagungsband des Symposiums „Agrarholz 2010“, 18.-19.5.
- Gerold, D., Landgraf, D., Böcker, L. (2008): Vorschläge für Bewirtschaftungsstrategien von Kurzumtriebsplantagen basierend auf Erfahrungen der letzten Jahre. In: Cottbuser Schriften zur Ökosystemgenese und Landschaftsentwicklung Bd. 6: Holzerzeugung in der Landwirtschaft, ISBN: 3-937728-05-8, S. 75-82
- Gerold, D., Landgraf, D., Wolf, H. und M. Schildbach (2009): Bewirtschaftungsstrategien von Kurzumtriebsplantagen. In: Reeg, T., Bemann, A., Konold, W., Murach, D. und H. Spiecker: Anbau und Nutzung von Bäumen auf landwirtschaftlichen Flächen., Wiley-VCH, ISBN: 978-3-527-32417-0, S. 73-82

Anlage - VI -

- Große, W., Böcker, L., Landgraf, D., und V. Scholz (2010): Rückwandlung von Plantagenflächen in Ackerland. In: Knust, C. und A. Bemmann (Hrsg.): AGROWOOD – Kurzumtriebsplantagen in Deutschland und europäische Perspektiven. Weißensee Verlag Berlin, ISBN: 978-3-89998-159-9, 130-138
- Große, W., Landgraf, D., Scholz, V. und J. Brummack (2008): Ernte und Aufbereitung von Plantagenholz. Schweizerische Zeitschrift für Forstwesen 6, 140-145
- Helbig, C. und D. Landgraf (2009): Verstärkter Käferbefall bei Pappel im Kurzumtrieb. AFZ - Der Wald 22, S. 1206-1207
- Helbig, C., Müller, M. and D. Landgraf (2011): Insect pests in short rotation coppice in Germany - an overview of their effects, risk potential and control measures. BENWOOD-Proceedings: Short rotation forestry and Agroforestry: an exchange of experience between CDM countries and Europe., 46 - 56
- HOFMANN, M. (2009): Energieholzproduktion in der Landwirtschaft. Fachagentur Nachwachsende Rohstoffe: 42 S.
- Hönicka, Hans; Nowitzki, Olaf; Hanelt, Dieter; Fladung, Matthias (2008) Heterologous overexpression of the birch *FRUITFULL*-like MADS-box gene *BpMADS4* prevents normal senescence and winter dormancy in *Populus tremula* L.. *Planta*, Vol. 227, No. 5, p. 1001-1011, ISSN: 1432-2048
- HUBER, G. (2010): Allgemeine Verbreitung und Ökologie der Schwarzpappel. LWF Wissen 64, 9 – 14.
- HUBER, G. (2010): Ergebnisse der Schwarzpappel-Kartierung in Bayern. LWF Wissen, 64, 15 – 28.
- Janssen, A.; Fey-Wagner, C. 2011: Züchtung schnellwachsender Baumarten für die Produktion von Biomasse auf Kurzumtriebsplantagen. In: Maurer, W. D.; Haase, B. (Hrsg.): Holzproduktion auf forstgenetischer Grundlage im Hinblick auf Klimawandel und Rohstoffverknappung. FAWF-Mitteilungen, Nr. 69/11, 107-115
- Janssen, A.; Fey-Wagner, C.; Hofmann, M.: Verbundvorhaben FASTWOOD: Züchtung schnellwachsender Baumarten - Teil Pappeln. Tagungsband des Symposiums "Agrarholz 2010", 18.-19.5.2010
- Kahle, P.; Baum, C.; Boelcke, B.; Kohl, J.; Ulrich, R. (2010): Vertical distribution of soil properties under short-rotation forestry in Northern Germany. *Journal of Plant Nutrition and Soil Science* vol. 173 issue 5 October, p. 737 - 746
- KOLBE K., MEYER M., HORTIG F., KRABEL D. 2010. Zitterpappeln – Energie- und Rohstoffquelle der Zukunft? *Forst und Holz* 65 (1), 41-43
- LAMERSDORF ET AL. (2010): Kurzumtriebsplantagen. Handlungsempfehlungen zur naturverträglichen Produktion von Energieholz in der Landwirtschaft. Ergebnisse aus dem Projekt NOVALIS.
- Landgraf, D. (2010): Energieholzplantagen: Lohnendes Standbein für karge Böden. DBK 3/10, 28-29
- Landgraf, D. (2010): Erfahrungen aus der kommerziellen Vermehrung von Pappeln und Weiden. Tagungsband zum Symposium der FNR und DLG „Agrarholz 2010“ am 18./19.Mai 2010 in Berlin, <http://www.nachwachsenderohstoffe.de/agrarholz2010/>
- Landgraf, D. (2010): Mit bewährten Waldbausystemen zur nachhaltigen Produktion von Energieholz im Wald. BDF aktuell 6/2010, 14-15
- Landgraf, D. (2011): Einsatz innovativer Technik zur erfolgreichen Etablierung von Wiederaufforstungen und Kurzumtriebsplantagen (KUP). Tagungsband zum 11. Internationalen BBE-Fachkongress für Holzenergie vom 22. – 23.09.2011, Messe Augsburg

Anlage - VII -

- Landgraf, D. (2011): Erfahrungen bei der Akquise von Flächen für Kurzumtriebsplantagen, Klon- und Steckholzauswahl. Tagungsband zur Fachtagung Chancen und Hemmnisse für die Energieholzproduktion aus Kurzumtriebsplantagen am 20. und 21.10.2011 in Tharandt, S. 43-52
- Landgraf, D. Johne, A. und H. Röhle (2009): Ertragspotenzial von Pappel im Kurzumtrieb. AFZ - Der Wald 22, S. 1203-1205
- Landgraf, D. und A. Winkelmann (2010): 10.000 ha Kurzumtriebsplantagen der RWE für Deutschland – Illusion oder Vision? In: Knust, C. und A. Bemann (Hrsg.): AGROWOOD – Kurzumtriebsplantagen in Deutschland und europäische Perspektiven. Weißensee Verlag Berlin, ISBN: 978-3-89998-159-9, 332-333
- Landgraf, D. und C. Helbig (2010): Pappelblattrost in Kurzumtriebsplantagen. AFZ – Der Wald 8, S. 46-47
- Landgraf, D. und C. Helbig (2011): Keulhornblattwespen an Pappeln in Kurzumtriebsplantagen. AFZ - Der Wald 10, 14-15
- Landgraf, D. und L. Böcker (2009): Regionale Wertschöpfungsketten im Rahmen der Nutzung von schnellwachsenden Baumarten im ländlichen Raum am Beispiel Südbrandenburgs. In: Reeg, T., Bemann, A., Konold, W., Murach, D. und H. Spiecker: Anbau und Nutzung von Bäumen auf landwirtschaftlichen Flächen., Wiley-VCH, ISBN: 978-3-527-32417-0, S. 125-133
- Landgraf, D. und L. Böcker (2010): Kurzumtriebsplantagen auf Sonderstandorten. In: Knust, C. und A. Bemann (Hrsg.): AGROWOOD – Kurzumtriebsplantagen in Deutschland und europäische Perspektiven. Weißensee Verlag Berlin, ISBN: 978-3-89998-159-9, 54-64
- Landgraf, D., Böcker, L. und D. Wüstenhagen (2009): Rodungsfräsen zur Rückumwandlung von Schnellwuchsplantagen? AFZ – Der Wald 6, S. 284- 285
- Landgraf, D., Böcker, L., Schildbach, M. und H. Wolf (2010): Baumarten- und Sortenwahl In: Skodawessely, Pretsch, Bemann (Hrsg.): Beratungshandbuch zu Kurzumtriebsplantagen. Entscheidungsgrundlagen zur Etablierung von KUP in Deutschland. ISBN: 978-3-86780-146-1, 6/6 - 6/11
- Landgraf, D., Brunner, J. and C. Helbig (2011): The impact of wild animals on SRC in Germany - a widely underestimated factor. BENWOOD-Proceedings: Short rotation forestry and Agroforestry: an exchange of experience between CDM countries and Europe., 133 - 140
- Landgraf, D., Helbig, C. und L. Böcker (2010): Großflächiger Anbau erfordert phytosanitäre Begleitung. Holz-Zentralblatt 136/13, 327
- Liesebach H, Schneck V, Ewald E (2010) Clonal fingerprinting in the genus *Populus* L. by nuclear microsatellite loci regarding differences between sections, species and hybrids. *Tree Genet Genomes* 6:259–269
- Liesebach, Heike; Naujoks, Gisela; Ewald, Dietrich (2011) Successful hybridisation of normally incompatible hybrid aspen (*Populus tremula* x *P. tremuloides*) and eastern cottonwood (*P. deltoides*). Sexual plant reproduction, Vol. 24, No. 3, p. 189-198,
- Liesebach, Heike; Schneck, Volker; Ewald, Elke (2010) Clonal fingerprinting in the genus *Populus* L. by nuclear microsatellite loci regarding differences between sections, species and hybrids. *Tree genetics & genomes*, Vol. 6, No. 2, p. 259-269,
- Liesebach, Heike; Schneck, Volker; Ewald, Elke (2011) Klontidentifizierung in der Gattung *Populus* L. mit nuklearen Mikrosatellitenmarkern. *Mitteilungen aus der Forschungsanstalt für Waldökologie und Forstwirtschaft Rheinland-Pfalz*, Vol. 69/11, p. 115-122,

Anlage - VIII -

- LUCKAS, M. (2010): Erhaltungsmaßnahmen und Sicherung der Schwarzpappel-Vorkommen. LWF Wissen 64, 52 – 53.
- Meier-Dinkel, A. 2010: Cryopreservation of in vitro shoot tips of wild cherry (*Prunus avium*), aspen (*Populus tremula*) and aspen-hybrids (*P. tremula* x *P. tremuloides*). *CryoLetters* 31, (1), 79–80
- MEYER, M.; GÜNTHER, B.; HELLE, G.; KRABEL, D. 2008. Investigation of drought reaction in juvenile aspen wood (*Populus tremula* L.). TRACE Tree Rings in Archaeology, Climatology and Ecology. Volume 7: Proceedings of the Dendrosymposium 2008, Zakopane, Poland, S. 102-107
- Mosner, E., Schneider, S., Lehmann, B., Leyer, I. (2011). Hydrological prerequisites for optimum habitats of riparian *Salix* communities – identifying suitable reforestation sites. *Applied Vegetation Science* 14, 367-377
- MURACH ET AL. (2008): DENDROM – Zukunftsrohstoff Dendromasse. Systemische Analyse, Leitbilder und Szenarien für die nachhaltige energetische und stoffliche Verwertung von Dendromasse aus Wald- und Agrarholz. Endbericht. Download under:
<http://www.dendrom.de/daten/downloads/DendromFinSmall1.pdf>
- Naujoks, G. (2011) Aspen-Saatgut: Auf die Hülle kommt es an. *Wissenschaft erleben*, No. 2, Seite 2
- Naujoks, Gisela (2007) Micropropagation of *Salix Caprea* L.. In: Jain S Mohan, Häggman H (Herausgeber). *Protocols for micropropagation of woody trees and fruits*. Dordrecht; Heidelberg; London: Springer, p. 213-220,
- Naujoks, Gisela; Liesebach, Mirko (2006) Vegetative propagation of difficult-to-root *Salix caprea* L. clones for pathogenicity tests. In: Jezowski Stanislaw, Wojciechowicz M K, Zenkteler E (Herausgeber). *Alternative plants for sustainable agriculture*. Poznan: Institute of Plant Genetics, Polish Academy of Sciences, p. 33-37,
- Pakull, Birte; Groppe, Katrin; Mecucci, Federica; Gaudet, Muriel; Sabatti, Maurizio; Fladung, Matthias (2011) Genetic mapping of linkage group XIX and identification of sex-linked SSR markers in a *Populus tremula* x *Populus tremuloides* cross. *Canadian journal of forest research*, Vol. 41, No. 2, p 245-253
- Pakull, Birte; Groppe, Katrin; Meyer, Matthias; Markussen, Torsten; Fladung, Matthias (2009) Genetic linkage mapping in aspen (*Populus tremula* L. and *Populus tremuloides* Michx.). *Tree genetics & genomes*, Vol 5, No. 3, p 505-515
- Pfennig, Karin; Hoffmann, Marion; Brauer, Michael; Liepelt, Sascha; Fladung, Matthias; Gebhardt, Karl (2011) SNP-Diagnose züchtungsrelevanter Eigenschaften von Salicaceae. In: Nordwestdeutsche Forstliche Versuchsanstalt, Abteilung Waldgenressourcen (Herausgeber). *Symposium: Züchtung und Ertragsleistung schnellwachsender Baumarten im Kurzumtrieb – Erkenntnisse aus drei Jahren FastWOOD, ProLoc und Weidenzüchtung : Symposium 21. und 22. September 2011, Hann. Münden*. oO: oV, p. 1-2
- Pfennig, Karin; Wühlisch, Georg von (2011) Wachstums-Entwicklung von Pappeln und Weiden in Agroforstsystemen. In: Nordwestdeutsche Forstliche Versuchsanstalt, Abteilung Waldgenressourcen (Herausgeber). *Symposium: Züchtung und Ertragsleistung schnellwachsender Baumarten im Kurzumtrieb – Erkenntnisse aus drei Jahren FastWOOD, ProLoc und Weidenzüchtung : Symposium 21. und 22. September 2011, Hann. Münden*. oO: oV, p. 1-2,
- Quinkenstein, Ansgar; Jochheim, Hubert; Grünewald, Holger; Schneider, Bernd Uwe; Hüttl, R. F. (2008) Modellierung des Kohlenstoffhaushalts einer Dendromasseplantage von Robinie und Pappel im

- Kurzumtrieb. Cottbuser Schriften zur Ökosystemgenese und Landschaftsentwicklung, Vol. 6, p. 175-177
- Rathmacher, G., Niggemann, M., Kohnen, M., Ziegenhagen, B., Bialozyt, R. (2010). Short-distance gene flow in *Populus nigra* L. accounts for small-scale spatial genetic structures: implications for in situ conservation measures. *Conservation Genetics*, **11**, 1327-1338.
- REEG, T., A. BEMMANN, W. KONOLD, D. MURACH, H. SPIECKER (Hrsg.), 2009: Anbau und Nutzung von Bäumen auf landwirtschaftlichen Flächen. Weinheim, Wiley-VCH Verlag, 355 p
- Röhle, H.; Böcker, L.; Feger, K.-H.; Petzold, R.; Wolf, H.; Wael, A. (2008): Anlage und Ertragsaussichten von Kurzumtriebsplantagen in Ostdeutschland. *Schweiz Z Forstwes* 159: 133-139
- Scherling, Christian; Ulrich, Kristina; Ewald, Dietrich; Weckwerth, Wolfram (2009) A metabolic signature of the beneficial interaction of the endophyte *Paenibacillus* sp. isolate and in vitro-grown poplar plants revealed by metabolomics. *Molecular plant microbe interactions*, Vol. 22, No. 8, p 1032-1037
- Schildbach, M., Landgraf, D. und L. Böcker (2008): Steckhölzer zur Begründung von Kurzumtriebsplantagen. *AFZ - Der Wald* 18, S. 992-993
- SCHIRMER, R. (2010): Geprüfte Pappelsorten steigern Ertrag deutlich. *AZF/Der Wald* 22, 29 – 31
- SCHIRMER, R. (2010): Mehr Ertrag und mehr Sicherheit. Bei Kurzumtriebsplantagen geprüfte Pappelsorten verwenden. Bayer. Landeswirtschaftliches Wochenblatt 44, 41 – 43.
- Schmitt, A.-K., Tischer, S., Elste, B., Hofmann, B., Christen, O. (2010): Auswirkung der Energieholzproduktion auf physikalische, chemische und biologische Bodeneigenschaften auf einer Schwarzerde im Mitteldeutschen Trockengebiet. [Effect of energy forestry on physical, chemical and biological soil properties on a Chernozem in continental dry climate conditions in central Germany] *JOURNAL FÜR KULTURPFLANZEN*, 62 (6). p 189–199
- Schneck, Volker; Zaspel, Irmtraut (2008) Phytopathologische Probleme bei der Anzucht und Kultur von Pappeln (*Populus* spp.) für die Biomasseproduktion. Cottbuser Schriften zur Ökosystemgenese und Landschaftsentwicklung, Vol. 6, p. 203-207
- Schneck, Volker; Zaspel, Irmtraut (2008) Phytopathologische Probleme bei der Anzucht und Kultur von Pappeln (*Populus* spp.) für die Biomasseproduktion. Cottbuser Schriften zur Ökosystemgenese und Landschaftsentwicklung, Vol. 6, p. 203-207,
- SCHOLZ ET AL. (2008): Produktion von Pappeln und Weiden auf landwirtschaftlichen Flächen. *KTBL-No.* 79: 44 S
- Schröder, H.; Fladung, M. (2010) SSR and SNP markers for the identification of clones, hybrids and species within the genus *Populus*. *Silvae Genetica*, Vol 59, No. 6, p.257-263
- Schröder, Hilke; Fladung, Matthias (2010) Unterscheidung von Pappelarten und -klonen - molekulare Marker machen's möglich. *Forst und Holz*, Vol. 65, No. 11, p. 18-21,
- Schröder, Hilke; Fladung, Matthias (2011) Art- und Hybrid-Identifizierung innerhalb der Gattung *Populus* mit Hilfe von SNP-Markern-Markern. *Mitteilungen aus der Forschungsanstalt für Waldökologie und Forstwirtschaft Rheinland-Pfalz*, Vol. 69/11, p. 180-186
- Schröder, Hilke; Höltken, Aki M.; Fladung, Matthias (2011) Chloroplast SNP-marker as powerful tool for differentiation of *Populus* species in reliable poplar breeding and barcoding approaches [online]. *BMC proceedings*, Vol. 5, Suppl. 7, p. 56,
ISSN: 1753-6561, zu finden in <<http://www.biomedcentral.com/content/pdf/1753-6561-5-S7-P56.pdf>>
[zitiert am 19.10.2011]

Anlage - X -

- STARK, H., UNSELD, R., SCHÜLER, G., BAUHUS, J. (2010): Energievorwälder - Langzeiteffekte auf den Nährstoff- und Kohlenstoffhaushalt des Waldbodens. Forstarchiv-Sonderheft, 2010 / Sektionstagung Waldbau
- STARK, H.; UNSELD, R.; SCHÜLER, G.; BAUHUS, J. (2010): Energy Nurse Crops: Long-Term Effects on Forest Soil Nutrient and Carbon Cycles. IUFRO-Tagungsband. XXIII IUFRO World Congress 23.-28.8.2010 Seoul, Korea
- Stimm, B., Weisgerber, H.: *Populus x canescens* (AIT.) SM., 1804. In: Roloff, A., Weisgerber, H., Lang, U. M., Stimm, B. (Hrsg.): Enzyklopädie der Holzgewächse. Handbuch und Atlas der Dendrologie. 48. Erg. Lfg. 1/08, III-2, 1-14.
- TUBES, M., SCHIRMER, R. (2010): Sind alte Pappelsorten für den Kurzumtrieb geeignet? AFZ/Der Wald 22, 32 – 34
- Ulrich, Kristina; Stauber, Thomas; Ewald, Dietrich (2008) *Paenibacillus* - a predominant endophytic bacterium colonising tissue cultures of woody plants. Plant cell, tissue and organ culture, Vol. 93, No. 3, P. 347-351
- Ulrich, Kristina; Ulrich, Andreas; Ewald, Dietrich (2008) Diversity of endophytic bacterial communities in poplar grown under field conditions. FEMS microbiology ecology, Vol. 63, No. 2, p. 169-180
- Unselde Rüdiger, Möndel Alexander, Textor Bernd, Seidl Frieder, Steinfatt Kathrin, Karopka Manuel, Nahm Michael (2010): Anlage und Bewirtschaftung von Kurzumtriebsflächen in Baden-Württemberg. MLR Stuttgart, 2. revised edition, 56 p
- Unselde, R., Bauhus, J. (2011): Wuchspotenziale von Pappeln für Vorwald auf Waldstandorten Südwestdeutschlands. AFZ-Der Wald, 66/10, 6 - 9.
- Unselde, R., Wessels, W., Bauhus, J. (2010): Gepflanzte Vorwälder zur Biomasseproduktion. AFZ-Der Wald, 14, 30-31.
- Unselde, R.; Wenzel, M.; Weich, T.; Stark, H.; Weinreich, A.; Bauhus, J. (2010): Energie-Vorwälder in Südwestdeutschland - Alternative Bewirtschaftungsformen zur Steigerung der energetisch nutzbaren Biomasse im Wald. Forst & Holz 65 No. 10; S. 14-17.
- Weich, T.; Unselde, R. (2011): Erntetechniken im Energie-Vorwald und Konsequenzen für den Waldbau. AFZ-Der Wald 05/2011; S.20-23
- Weisgerber, H., Luan, S. Q.: *Populus szechuanica* C. K. SCHNEID., 1916. In: Roloff, A., Weisgerber, H., Lang, U. M., Stimm, B. (Hrsg.): Enzyklopädie der Holzgewächse. Handbuch und Atlas der Dendrologie. 59. Erg. Lfg. 11/11, 1-12.
- Weisgerber, H., Luan, S. Q.: *Populus x tomentosa* CARRIÈRE, 1867. In: Roloff, A., Weisgerber, H., Lang, U. M., Stimm, B. (Hrsg.): Enzyklopädie der Holzgewächse. Handbuch und Atlas der Dendrologie. 56. Erg. Lfg. 12/10, 1-15.
- Weisgerber, H., Zhang, Z. X.: *Populus adenopoda* MAXIM., 1879. In: Roloff, A., Weisgerber, H., Lang, U. M., Stimm, B. (Hrsg.): Enzyklopädie der Holzgewächse. Handbuch und Atlas der Dendrologie. 57. Erg. Lfg. 03/11, 1-11.
- Weisgerber, H., Zhang, Z. X.: *Populus lasiocarpa* OLIV., 1890. In: Roloff, A., Weisgerber, H., Lang, U. M., Stimm, B. (Hrsg.): Enzyklopädie der Holzgewächse. Handbuch und Atlas der Dendrologie. 50. Erg. Lfg. 10/08, III-2, 1-11.
- Weisgerber, H.: *Populus* L., 1753. In: Roloff, A., Weisgerber, H., Lang, U. M., Stimm, B. (Hrsg.): Enzyklopädie der Holzgewächse. Handbuch und Atlas der Dendrologie. 54. Erg. Lfg. 1/10, 1-30.

Anlage - XI -

- Wuehlisch, G. von 2009: EUFORGEN Technical Guidelines for genetic conservation and use for Eurasian aspen (*Populus tremula*). Bioversity International, Rome, Italy, 6 pages
- Wuehlisch, Georg von (2011) Evidence for nitrogen-fixation in the Salicaceae family. Tree planters' notes, Vol. 54, No. 2, p 38-41
- Wuehlisch, Georg von (2011) Evidence of nitrogen fixation in the Salicaceae family. Indian journal of ecology / the Indian Ecological Society, Vol. 38, Spec. Iss., p 80-83
- Wuehlisch, Georg von (2011) Fertilizer requirements of poplar and willow. In: Short rotation forestry and agroforestry: an exchange of experience between CDM countries and Europe : June 20-22,2011, Marchesi di Barolo, Barolo, Italy : Conference Proceedings. Vienna: IUFRO, p. 39-45
- Wühlisch, Georg von (2011) Hybridaspensorte 'Holsatia' jetzt europaweit zugelassen. AFZ, der Wald Vol. 66, No. 14, p 8-9
- Wühlisch, Georg von (2011) Vater aus Amerika - Mutter aus Europa: die Hybridaspensorte Holsatia ist jetzt europaweit zugelassen. Bayerisches Landwirtschaftliches Wochenblatt, Vol. 201, No. 26, p 40
- Wypukol, H., Liepelt, S., Ziegenhagen, B., Gebhardt, K. 2008: Genetische Methoden zur Abstammungsanalyse und Prüfung von Sortenechtheit und –reinheit. In: K. Gebhardt (Hrsg.) Hderkunftskontrolle an forstlichem Vermehrungsgut mit Stabilisotopen und genetischen Methoden. Nordwestdeutsche Forstliche Versuchsanstalt, Hann. Münden, 2008. S. 67-84.
- Zaspel, Irmtraut (2009) Occurrence of *Pseudomonas syringae* on poplar damaged by necrosis and canker. In: Tugba H (editor). Proceedings of the conference of IUFRO working party 7.02.02 in Egirdir, Turkey, 11-16 May 2009. Isparta: SDÜ Orman Fakültesi, p 162-167
- Ziegenhagen, B., Gneuss, S., Rathmacher, G., Leyer, I., Bialozyt, R., Heinze, B., Liepelt, S. 2008: A fast and simple genetic monitoring reveals the spread of poplar hybrids at a natural Elbe river site. Conservation Genetics, 9, 373-379