

ABSTRACTS

Session 1: Environmental Planning and Management

1.1 Planning and Management Techniques for Optimization of Timber Harvesting – a Case Study in Czech Republic

Keywords: forest management, linear programming, renewable resource, modeling technique

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In the future we can expect the strengthening interest in wood as renewable energy resource and building material. Apart from both these reasons, the wood is very important material for common life, for example paper, furniture, stationery and so on. The forests also carry out a lot of environmental functions. Especially soil-protection, water-management and protection, social and recreational function. The forests are big bio-reservoirs and are important for conservation of biodiversity. Because of all these reasons, it is necessary to conserve forests as natural ecosystems and at the same time to provide the production of wood.

All the different ecosystem relationships in forest are possible to be represented by means of models. The modeling as a field of study is very important in the branch of forest management because majority of the processes in the forest ecosystems take tens of years, therefore the consequences of our encroachments to those ecosystems will appear in long time span. Because of that we need to recognize seriousness of all our actions in advance.

For its undisputed advantages the simplest and even the most complicated methods of modeling are very popular. Presented paper demonstrates the possibility to use linear programming (as modeling technique) for planning in forestry in Czech forest management. The principle of the linear programming is finding the extreme of a particular function while fulfilling given boundary conditions, assuming that all the conditions are expressed by equations or inequations.

1.2. Climate Impact of Pork Production in a Life Cycle Assessment Perspective

Keywords: Life Cycle Assessment, pork production, Climate impacts

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Concern for the climate changes is increasing and as food is an essential part of living, food production's impact on global climate is highly relevant. Livestock contributes 18% to the global anthropogenic greenhouse gas (GHG) emissions. In Denmark a large part of the livestock is swine with a production up to 27 mill units per year. The object of this study was to find the climate impact of pork production in a life cycle assessment (LCA) perspective. Several studies were found with different angles and approaches to LCA that led to a difference in the results; 1.56-4.63 kg CO₂-eq. and 2.83-4.23 kg CO₂-eq. per kg live weight at the farm gate for conventional and organic farm systems, respectively. Despite the dissimilarities all LCAs find nitrous oxide to be the most important GHG, attributed to the farm and fodder production. Furthermore there are consensus about the fodder production and the manure to be the hot spots. Major differences in the final results

come from different practises at the farm with manure handling and storage, different assumptions about soya amount in feed concentrate, fertilizer use in feed crop production and changes in IPCC's assumptions about enteric- and manure methane emissions has made this greenhouse gas more dominant in later studies. Studies, which include processes after the farm gate, show that total greenhouse gas emission will increase by only a few percentages if the LCA was finished to the final disposal. Due to differences in the inventory phase and transparency of data not all aspects could be compared.

1.3. Reduced Emissions from Deforestation and Forest Degradation (REDD) as a Tool for Climate Change Mitigation in Brazil

Keywords: Climate change; deforestation; land-use; REDD.

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Within the context of environmental crisis faced today, it is essential to understand the interdependence between ecological, economical and social dimensions of land-use if sustainable development is to be achieved. For instance, strategies and policies related to land-use management dictate impacts on greenhouse gases emissions, agriculture and social welfare – especially in Brazil, where the expansion of soya and cattle ranching is the main deforestation driver and also a major source of income.

Recognizing the multidimensional importance of forests and the fact that their protection is the most cost-effective way to mitigate climate change, the federal government starts adopting a more flexible position towards Reduced Emissions from Deforestation and Forest Degradation (REDD). By providing a financial compensation to those who contribute to forest preservation, this mechanism seems a prominent instrument for environmental protection.

However, issues concerning its technical aspects (e.g. monitoring, report and verification methodologies) or co-related institutional factors (e.g. governance, land tenure, political coordination) remain controversial and might pose challenges to its implementation.

Climate-related policies must have their potential consequences carefully assessed before they come into effect. Likewise, their effectiveness over time is also dependent on the coordination of different actions, particularly with regards to the institutional aspects previously mentioned. Given the complexity REDD implies and the diversity of scopes that REDD projects may assume, the implementation of this mechanism constitutes a land-use strategy that should be evaluated accordingly.

With this in mind, the present study offers an overview of REDD in Brazil and indicates some measures that should be taken by the country in order to lay down the conditions for really benefiting from a future REDD scheme. Conclusions show that local specificities need to be considered in the design of a REDD scheme and financial incentives must be combined with other measures in support of law enforcement.

Session 2: Environmental Biotechnology

2.1. Nitrogen Deposition Effects on the Reactivity of Soil Organic Matter in the Forest Edges

Keywords: Nitrogen Deposition, Carbon Sequestration, C/N ratio, Soil Organic Matter, Litter Decomposition

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The research aims for the thesis are to estimate the effects of N deposition on the reactivity of soil organic matter (SOM) in terms of the CO₂ effluxes as well as the rate of mineralization and nitrification of SOM. N deposition gradients in forest edges were used as a proxy to evaluate the effects of N deposition. Three conifer forest sites were compared and the soil samples were collected at Vloethemveld forest in Belgium (Austrian pine, *Pinus nigra* ssp. *nigra*), Klosterhede and Thyregod forest (Norway spruce, *Picea abies*. L. Karst). Soil water content, loss of ignition, soil CO₂ effluxes and the concentration of NH₄⁺-N and NO₃⁻-N before and after soil incubations were measured at the laboratory. The results indicated that CO₂ effluxes were suppressed in either a very dry or very wet soil moisture conditions. Soil respiration rate related to the degradation rate of SOM. Decomposition rate was faster at litter and fermentation (LF) layer than at humus (H) layer and the slowest decomposition rate was taken place at mineral soils. There was a positive relationship between C/N ratio and CO₂ efflux rate at LF and H layer of Klosterhede forest site, but no correlation was found at LFH layer of Vloethemveld site. The general changing patterns were displayed that soil CO₂ efflux rates were enhanced by increasing mineralization rate except at H layer of Klosterhede. The positive correlation between the two variables was only significant at LF layer of Klosterhede sampling sites. Changes of nitrification rate were more obvious at LF layer than at H layer. In all, N deposition leads to a decline of the mineralization rates; it also reduces the SOM decomposition rate, hence slow down the CO₂ accumulation rate and therefore more C storages at LFH layer.

2.2 Biomonitoring of Airborne Fluoride Pollution by Means of Different Indicator Plant Species

Keywords: Fluoride bioindication; spatial and temporal distribution; pollution gradient; birch.

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The intention of present study was to investigate the fluoride pollution gradient in the vicinity of a large ceiling systems manufacturer in Grafenau, Bayern, and an HF producing factory in Bad Wimpfen, Baden Württemberg. For that purpose, a passive biomonitoring was performed

employing foliage from conifer and broad-leaved tree species at the first location, and birch trees at the second location. The leaves and needles were collected and the fluoride content was analyzed in washed and unwashed samples so as to determine the amount of both external and total fluoride. The fluoride content in the samples from Grafenau showed background concentrations that varied from less than 1 $\mu\text{g g}^{-1}$ F to 3.2 $\mu\text{g g}^{-1}$ F, with a fluoride removal by washing above 50 %, on average. At the Bad Wimpfen site, fluoride levels ranged from background levels up to 87.6 $\mu\text{g g}^{-1}$ F, showing a clear pollution gradient with distance and a fluoride removal by washing of 28 %, on average. The analysis of temporal variations in the vegetation from Bad Wimpfen indicated lower F-contents in birch leaves than in the years before.

The present results showed that the fluoride emissions were of no importance in Grafenau, while in Bad Wimpfen further biomonitoring should be performed in order to study emission reductions in the following years.

2.3 Quantitative Microbial Risk Assessment of Agricultural Use of Fecal Matter Treated with Urea

Keywords: Ammonia treatment, Ascaris, inactivation, sustainable sanitation, urea

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Today about 2.6 billion people lack access to improved sanitation and over 2 billion people use pit latrines. This results in spreading of pathogens from excreta to the environment, causing severe illnesses. In developing countries the health impact of this is, however, overshadowed by malnutrition, and over one billion people in the world is chronically hungry. Sustainable sanitation aims to recycle the nutrients in excreta in order to increase agricultural food production, and to avoid humans getting exposed to the pathogens in the excreta.

A planned sanitation system in Kampala, Uganda is aiming to sell fecal matter as a fertilizer product, after 2 months of treatment with urea at ambient temperature (20-25°C). Urea is the most common mineral fertilizer in the world, and using urea to treat fecal matter will inactivate most of the pathogens, and increase the fertilizer value of the treated fecal matter. The objective of this research was to assess the health risk for the farmer applying the fertilizer product, and for the food consumer eating crops grown in these fields. The evaluation of the urea treatment was done by using microbial risk assessment tools for identifying the health risk, applying relevant data for the conditions in Kampala.

Ascaris was identified as the main threat to human health. Assuming that the farmers are not using protective clothing, 4 % w/w urea is needed to achieve an annual risk of Ascaris infection less than 10⁻³, which is suggested to be tolerable. Health risk associated with consumption of raw carrots and spinach grown in soil amended with treated fecal matter were acceptable if 3 % w/w urea or more was used in the treatment. However, if a professional team is responsible for the application of the treated fecal matter, and/or if crops that are not processed before eating are restricted to grow, less urea need to be added.

Session 3: Water Resources

3.1 Modelling of Micropollutants in a River Network

Keywords: micropollutants, pharmaceuticals, carbamazepine, diclofenac, photolytic degradation

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Micropollutants from urban or agricultural sources i.e. pharmaceuticals or pesticides are facing increasing public awareness. In the last years, many studies reported on the occurrence of micropollutants in different water samples, including drinking waters. Moreover, harmful effects could be detected on fish where micropollutants acting as endocrine disruptors.

Micropollution measurements of a national water-quality inventory in Switzerland (NADUF) indicate a relative constant load pattern for Carbamazepine (650 g/week \pm 190 g/week) throughout the year. This backs up the hypothesis that Carbamazepine is persistent. For Diclofenac the load pattern of the same river was fluctuating to a larger extend (640 g/week \pm 400 g/week), especially during dryer time periods in summer the loads were significant lower than the average. One explanation for the fluctuation in Diclofenac loads is a variation in the input loads to the river, an other is degradation via direct photolysis in the river network.

To prove this we set up a one-dimensional model of the fate of these pharmaceuticals in a pre-alpine river catchment. In the model the pharmaceutical input is calculated on the base of yearly sales per capita, a constant yearly consumption and waste water treatment plants as point pollution sources. The model indicated that up to 28 % of the seasonal variation in Diclofenac loads could be explained by direct photolysis. In truth both hypothesis have to be combined to explain the drop to the full extend. Additionally, when consulting hourly simulations we found that the environment is harmed from human pharmaceuticals to a large extent were critical environmental values are exceeded up to 93 % of the time. In future the model should be extended to non-point source pollution from agriculture for instance.

3.2 Changing Water Use Institutions and Farming Strategies as a Response to Groundwater Depletion - A Case Study in Minqin County, Gansu Province, China

Keywords: farming strategies, groundwater management, institutions, North China

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The regulation of groundwater extraction to avoid exhaustion of the resource is a vexed question worldwide. It also arises in North China where groundwater use has developed rapidly over the last few decades, in some regions resulting in aquifer depletion. Minqin County is a remote oasis in the North West of China, confronted with aggravating water scarcity as a consequence of the rapid withdrawal from groundwater resources. The county is located in the delta region of the Shiyang

River basin, interlocked between Inner Mongolia's deserts. Because of extremely low rainfall agriculture depends on irrigation.

Since the 1960s the region's irrigation water inflow diminished due to damming of the river upstream. To compensate for the reduced inflow the abstraction of groundwater intensified. Since the 1980s the increased use of groundwater resources led to falling water tables and caused related problems, such as soil-salinization and desertification.

Through empirical surveys, the societal response to aquifer depletion has been analysed. Results from multi-level stakeholder interviews show that since early groundwater exploitation, farmers have cooperated to access the resource. In response to environmental degradation and growing water scarcity water users changed their farming strategies, mainly by switching from traditional food crops to cash-crops. Besides that, the encroaching desert caused a strong out-flow of migrants since the 1990s. In 2007 the government introduced a policy to restrict the use of groundwater by closing down part of the wells and setting a water quota per person. Social control within the village communities played an important role in the enforcement of this policy.

On the whole, farmers adapted their farming strategies over time, but did not give up collaboration to access the increasingly depleted resource. Only after 2007, farmers' collaboration was turned into a social control mechanism which ensured the restriction of groundwater use.

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3.3 Current Status of Climate Change Adaptation Plans across the United States

Key words: Climate change, Adaptation, United States

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As the understanding of climate change science deepens and far-reaching impacts and implications are seen and felt across the United States, individual states have created and begun implementing local adaptation plans to climate change. Despite the lack of a clear federal policy directive that requires proactive national adaptation to climate change; state wide approaches are being taken as they are seen as a necessary next step to current mitigation efforts. While risks, vulnerabilities and options for adaptation to climate change are diverse, specific to local circumstances, sectors, scales and portions of society, adaptation decisions are being made and implemented by a wide variety of businesses and at different levels of government as an initial step towards a future federally regulated national adaptation program.

This project reviews the current status of state created climate change adaptation plans across the fifty United States. A comprehensive overview of climate change impacts, adaptation measures including focus areas, and responsible agencies has been conducted. This project serves as a living resource document, as it lists corresponding responsible agencies and working groups, making easy linkages to current available information. It has been created to illustrate the broader current status of state wide adaptation approaches to climate change. This presentation describes various impacts of climate change across the United States, highlights the variety of sectors addressed within the different adaptation plans, and points out specific states that are leading the way for the future with their up to date comprehensive climate change adaptation plan.

Session 4: Food Quality and Food Safety

4.1 Consumer Defined Quality Specifications of Frozen Green Peas and Quality Prediction Using Physico-Chemical Parameters

Keywords: Sensory Analysis of Critical Control Points (SACCP), Food Quality Assurance, Frozen Peas

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To define consumer quality specification and predict the quality of frozen green peas consumer acceptance tests, descriptive sensory evaluations and physico-chemical analyses were performed. Such data may be used to improve perceived quality and maintain frozen pea quality in the manufacturing process from a Sensory Analysis of Critical Control Points (SACCP) view. The investigated physico-chemical parameters included texture, colour, peroxidase activity, dry matter, sugar, starch, alcohol insoluble solids, available and unavailable carbohydrates content. Twenty-four samples of six different brands of frozen green peas were analyzed. The consumer acceptance tests were performed with 208 consumers, who regularly eat and buy frozen green peas. The consumers evaluated appearance, odour, taste, texture and overall liking. The Quantitative Descriptive Analysis (QDA) was performed by 12 trained sensory panelists, who evaluated 27 different descriptors. Linear regression and multivariate methods of analyzing data, including Principal Component Analysis, Generalized Procrustes Analysis and Preference Mapping were used for the calculations. Several correlations between physico-chemical properties, descriptive sensory characteristics and the results of the spontaneous hedonic acceptance test were investigated and discussed. Positive drivers for overall consumer liking were found to be tenderness, sweet aroma, green colour intensity, fresh taste, moistness and sweet taste. Descriptors negatively correlated to consumer overall liking are mostly the texture attributes mealiness and chewiness. Bitter taste, presence of starchy flavours and large seed size also contribute to what appears to be undesirable traits. It is proposed that size sorting, blanching and post harvest handling temperatures of the peas are critical points to control in frozen green pea manufacturing. The correlation coefficients show several relationships between consumers' hedonic liking and various physico-chemical parameters. Some of the corresponding physico-chemical testing methods especially colour and texture measurement seem suitable to monitor parameters of critical control points in the manufacturing process.

4.2 Fruit Quality of the Non-Transgenic Apple Cultivar 'Jonagold' Affected by Transgenic Rootstocks

Keywords: apple, fruit quality, transgenic rootstock, rolB-gene

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Gene technology has become more and more attractive in plant breeding during the last twenty years. This is probably because it can readily improve the existing commercial cultivars that have only some drawbacks by modifying one or a few genes without changing the main genetic constitution. In this regard, gene technology is more effective than conventional breeding. The aim of this project was to analyze the fruit quality of the non-transgenic apple scion 'Jonagold' grafted on non-transgenic and rolB-transgenic apple rootstocks. The rootstocks used were M9-rolB1, M9-rolB2, M26-rolB and non-transgenic controls M9 and M26. The analysed fruit quality parameters were size, weight, colour, firmness, total soluble sugar (TSS), acid (TA) content, the ratio of TSS to TA, vitamin C and total phenols.

The results showed that M26-rolB had larger fruits than the control M26, while M9-rolB1 and M9-rolB2 had higher sugar content, and M9-rolB1 showed higher firmness. These differences are positive for the fruit quality. The other analysed parameters did not differ significantly between the transgenic rootstocks and the control. It is uncertain if the observed differences are due to rolB or other factors such as crop load and micro climate and further studies are required to confirm this. The conclusion from this study is that rolB does not obviously influence the fruit quality of apple cultivar 'Jonagold' grafted on the transgenic rootstocks of M9 and M26. Therefore the gene could be used for improving the rooting capacity of rootstocks for commercial production, consequently increasing the production efficiency.

4.3 Factors affecting the growth of bifidobacteria in human milk

Keywords: bifidobacteria, human milk, oligosaccharides, lysozyme

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Microbial colonization of human intestine begins at birth, when from a sterile state the newborn is exposed to an external environment rich in various bacterial species. Important group of intestinal bacteria are bifidobacteria. Prebiotic oligosaccharides of human milk serve as food for bifidobacteria in the digestive tract of infants. Breast milk also contains other substances such as lysozyme, which may affect the bifidobacteria in the intestinal tract of infants.

The growth of 7 strains of bifidobacteria in 15 different samples of human milk was tested. Three strains (2 *B. bifidum* and 1 *B. longum*) were isolated from infant faeces. Two strains of *B. animalis* were isolated from fermented milk products. Remaining two strains (*B. bifidum* and *B. longum*) were isolated from commercial probiotic products. Luxuriant growth of *B. bifidum* in human milk was accompanied with decreasing of pH (up to 4.0) and production of acetic and lactic acid (up to 6

g/l). On the other hand, numbers of viable cells of *B. animalis* decreased from 6 log CFU/ml to 3 log CFU/ml after incubation in human milk. There were significant differences ($P < 0.05$) between bacterial counts of *B. bifidum* and *B. animalis* in most human milk samples tested. The growth of *B. longum* in human milk was variable.

Resistance to lysozyme and the ability to utilize human milk oligosaccharides (HMO) were identified as the most important factors affecting the growth of bifidobacteria in human milk. In general, strains of human origin (*B. bifidum* and *B. longum*) were resistant to lysozyme, while *Bifidobacterium animalis* was susceptible species.

HMO were isolated and purified from four different human milk samples. Again, only *B. bifidum* and *B. longum* utilized HMO. We recommend the resistance to lysozyme and the ability to utilize HMO as new criteria for the selection of new probiotic bifidobacterial strains.

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Session 5: Agriculture and Biodiversity

5.1 Local Perception of Agrobiodiversity from Organic Farmers on their Farms in the Region Mostviertel (Part of Lower Austria) with special Attention to the Gender Debate

Key words: agrobiodiversity, organic agriculture, gender

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Agrobiodiversity, the biological diversity in agriculture, contains all varieties and breads of animals plants an micro organism additionally the surrounded nature which is effected by agricultural production. This diversity is highly endangered, the nutrition of the worlds human population depends to more than 90 % on 30 different plants, although there are 7.000 different kinds of useful plants.

In this work the correlation of attitude and adjustment of organic farmers (men and women) and the endowment of agrobiodiversity on their farms was studied. Structured interviews (questionnaires), freelists and pilesorts were the methods which fit best in the research design, men and women were interviewed separately.

12 organic farms in the Mostviertel (a region of Lower Austria) were visited. The results show, that organic farmers think of nature and biodiversity more in an aesthetic and phenological way rather than in a scientific one. The concept of agrobiodiversity is for most of the farmers unknown. Nevertheless organic farmers conserve many important elements of agrobiodiversity for example orchards, hedgeros and ponds, the reasons for keeping these structures are often cultural or traditional ones. To conserve nature on organic farms in Austria cause much more work than a modern farm with high technical standard, so the work of men and women farmers is very important.

Another conclusion, which is also drawn by other studies, is that more communication between conservationists, scientists and farmers would lead to more acceptances of agri-environmental-programms by the farmers. Such concepts should be made WITH not FOR the farmers.

5.2 Carbon storage potential of the Kikonda Forest Reserve in Uganda

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The purpose of this project was to assess the carbon storage potential of soils under different land use classes at the Kikonda Forest Reserve, Uganda. The primary source of data was generated at the Kikonda Forest Reserve, a commercial forestry project in the Kiboga district, Western Uganda. The land use classes investigated were: 8 year pine rotation; 5 year pine rotation; 3 year pine rotation; recently cleared areas within the reserve; secondary forest; and primary forest acting as a baseline for comparison. The closest primary forest used was the Budongo Forest Reserve in the Masindi district, approximately 150km away from Kikonda. It is assumed that the primary forest will have the highest soil organic carbon content and the cleared area the lowest. Likewise, the 8 year rotations should have higher soil organic carbon content than the 3 year rotation. This research will investigate the presumed soil carbon differences and to what extent those differences may be. At time of writing, the research is on-going.

5.3 Traditional Soil Management Practises in the Himalayan Region of Nepal: Implications for Agricultural Productivity

Key words: Litter, farm yard manure, Carbon, Nitrogen, Productivity

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Traditionally, the agricultural systems in the Himalayan region of Nepal rely on livestock, forestry and crop production. Farmers know the importance of soil fertility and adopt different strategies to maintain it. People collect litter from the forest and use it as animal bedding. The mixture of bedding material with livestock urine and faeces is composted and used in the agricultural land. Additionally, they also use human waste as a source of fertilizer. The extraction of litter, tree fodder and grasses from the forest ensures a net movement of C and N from the forest to the agricultural land and household. The aim of the study is to assess the sustainability of farming systems by computing the input and output C and N balance of the agricultural land. The study was conducted in the forest and agricultural land of the buffer zone area of the Sagarmatha National Park. Three methods: questionnaire survey, field measurements and laboratory analysis of samples were used to determine the C and N inputs and fluxes from the systems. It was found that litter is one of the major source of C (645 Kg-1 ha-1 a-1) and N (20 Kg-1 ha-1 a-1) to the agricultural land. Another, pathway for the flow of C and N within the agricultural land is through the fodder fed to the livestock. The C and N supply via compost and manure to the agricultural land is 0.9 Mg ha-1 a-1 C and 38.5 Kg ha-1 a-1 N respectively. Out of the total C and N added to the farm, 400 Kg of C and 14 Kg of N are shared by livestock manure, while 25 Kg of C and 4.5 Kg of N come from human waste. In general, C and N balance in the study site highlight the sustainability of the system.

Session 6: Agriculture in a bio-based Economy

6.1 Alternative Sources of Energy and Their Impact upon the Prices of Food

Keywords: Alternative sources of energy (ASE), price of food, trend, threat, business opportunity

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Keywords: Alternative sources of energy (ASE), price of food, trend, threat, business opportunity

Presentation emphasizes the drawbacks of the alternative sources of energy (ASE), from the point of view of common taxpayers, stakeholders or just customers in the groceries – consequently all the people influenced by ASE by spending more finances on the ordinary goods, concretely food.

Creation of electric energy by ASE is occupying large amount of land. That obviously obtains conventional power plants as well, but ASE are explicitly more exacting. This land, in the past used implicitly for agricultural production, is now used for entirely different purposes and the importance of the lack of productive soil is directly proportional to the density of particular area and food dependency of concrete country.

Even larger problem than power plant turns up production of oilseed rape for the production of biofuels. European Union (EU) set the limit of minimal organic integrant in the fuels – oil (diesel) or petrol (gasoline). In order to motivate the agronomists to plant the oilseed rape, countries have set up the alleviation from the consumption tax.

That caused large changes on the agricultural cultivated plant market - consequences have appeared early and situation displayed in the increased price of commodities, above all in food prices. That has become a reason of noticeable protests and objections on the side of specialists and humanitarian organizations. Future progression is currently very important to forecast in order to minimize all the potential threats.

6.2 Ecosystem Services in Energy Producing Agroecosystems – Qualification, Quantification and Economic Valuation

Key words: Ecosystem Services; Agroecosystems; Agriculture; Energy Crops; Natural Capital

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All ecosystems provides numerous of ecosystem services that are necessary to maintain, not only human life, but all the earth's life-support system. Also agroecosystems provides several ecosystem services but compared to non-agricultural ecosystems non-market services are often provided at a low level. By focusing on multiple ecosystem service goals in agroecosystems these can be appreciated by farmers and policy makers and thereby enhance the global provision. The quality and quantity of ecosystem services differ between crops and management systems thus current

study estimates the values of nine ecosystem services provided by six Danish energy producing agroecosystems.

The nine ecosystem services are food and fodder (ES1), biomass (ES2), hydrological flow (ES3), carbon accumulation (ES4), pollination (ES5), biological control (ES6), aesthetic (ES7), soil formation (ES8) and nutrient cycling (ES9). The six agroecosystems are the crops miscanthus, perennial grass-clover at high (hi) and low (lo) management intensity, oilseed rape, sugar beet and a combined food and energy system (CFE).

The study show that the highest total values are provided by the most intensively managed agroecosystems but the proportion of non-market values (ES3-ES9) varied from 28 % to 85 % and is highest in perennials. However, miscanthus yields only 49 % non-market values. If ecosystem service valuation has to provide an economical appreciation of the non-market values in agriculture the methodology has to give higher values to these. In designing agroecosystems, for bioenergy or any other purpose, ecosystem service values can be used as a goal but the valuation is highly controversial. To improve ecosystem service valuation as a basis for policy making, further understanding of ecological processes and environmental consequences is needed and a organized and approved framework for valuation.

6.3 Technology and profitability of production RME for own needs of selected farm

Key words: RME, esterification, pressing

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Nowadays in agriculture there is a necessity to look for savings in order to improve the profitability of agricultural production. Producers do not have a impact on prices of agricultural projects. Means of production are becoming more expensive. The need for savings penetrates even to activities in agriculture, which have not yet been taken into consideration. An example of the phenomenon of rising prices is to change the prices of liquid fuels that are used not only by farmers - a problem with the economy as a whole, therefore, and society.

One solution is to use fuel produced from agricultural raw materials, in particular, either directly produced on the farms. Agriculture, as a special branch of the Polish economy which is responsible for food production, is backed by a partial refund of excise duty on fuel used for agricultural production. However, it may be that for this purpose the amount is too great a burden on the budget soon. New opportunities for biofuel production could bring in a farm of rape from their own crops. Combined with subsidies for energy crops and excise tax credits, it becomes an alternative worth examining.

In this thesis author presents technology and calculation of the profitability of production biofuel for needs of selected farm in Poland. Production stage is divided into 3 stages - the production of rape, oil pressing and esterification. At each stage author analyzed available technologies of production and selected the most appropriate to the scale of production. It was found that production of biofuels for their own use is not profitable. Additional solutions to improve profitability have been answered. Author further claimed that the significant changes in external factors (legislation, structure of the farm area) it would be advisable to revise calculations.

Session 7: Environmental Hygiene

7.1 Polyphasic Screening of the Microbial Quality of Commercial Shrimp Products from Different Farming Regions

Key words: Aquaculture, shrimp, microbial quality, antibiotic, susceptibility test

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The consumption of shrimps and related products has increased in the last 20 years. This development has led to a worldwide production of shrimp in aquacultures to a quantity of about 3.2 million t in 2006 (FAO, 2009). However, the high consumption level of crustaceans is associated with environmental problems and therefore food safety issues regarding microbial quality should not be neglected. Trade in aquaculture commodities carries an inherent risk of moving and spreading aquatic animal pathogens and this is reflected by several notifications of import alerts. A high range of broad-spectrum antibiotics are in use in shrimp farms and therefore contribute to some potential risk of increased resistance properties of food pathogens.

In this study the relevant microbial quality parameters of different shrimp products sold in Austria were examined. A polyphasic screening through autochthonous bacteria families (e.g. Enterobacteriaceae, Pseudomonadaceae, Bacillaceae, Clostridia) and the detection and characterisation of food-related pathogens (e.g. *Listeria*) were performed.

Identified strains of tested pathogens and spoilage-causing bacteria were subjected to antimicrobial disk susceptibility tests (NCCLS documents M2 – A7, Performance Standards for Antimicrobial disk Susceptibility Tests), in order to analyze potential resistance caused through antibiotic usage.

The study on one hand revealed important results on the overall microbial quality and diversity in commercially available shrimps. On the other hand, the outcomes from antimicrobial susceptibility testings were discussed in relation to those from other seafood studies.

7.2 The role of *Hagenia abyssinica* on soil fertility management in the highlands of Ethiopia

Key words: *Hagenia abyssinica*, soil fertility, soil physical and chemical properties, environmental management

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Deforestation and land degradation are serious problems in Ethiopia. Soil degradation can be seen as a direct result of past agricultural practices in the country especially in the highlands. Loss of soil and the deterioration in fertility reduce agricultural productivity which ultimately results in food insecurity. To improve the fertility status of soils in the Ethiopian highlands integrating multi-purpose tree species could be an option. *Hagenia abyssinica* is one of the indigenous tree species growing in the highlands of Ethiopia. It is a multi-purpose species and has tremendous values. The study was conducted in order to assess soil quality indicators (physical and chemical properties) under *H. abyssinica* tree. Soil physical and chemical properties were assessed in the laboratory following standard procedures. The results showed that *Hagenia abyssinica* trees are capable of enriching the soil with N (7.6 mg g⁻¹) and organic C (89.2 mg g⁻¹). The soils had high content of soil organic matter (15.4 %) and CEC (38.6 cmolc kg⁻¹). This could implicate that soils under *Hagenia* can act as reservoir for basic elements due to high organic matter content which resulted from high litter inputs and biomass production under the tree. Therefore, it can be recommended to integrate this tree species of great potential in agricultural lands for soil fertility management. Given the low soil fertility status of the farms in the Ethiopian highlands, associating such important tree species is vital which ultimately help to achieve sustainable food production and environmental management in the Ethiopian highlands.

7.3 Personality and Feed Intake Regulation in Fast and Slow Growing Broiler Chickens

Keywords: broilers, personality, feed intake, body weight, hormones

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In wild birds, such as great tits and gulls, a relationship exists between personality and feed intake (FI). Whether this is also the case in broilers is largely unknown. 120 1-d-old broiler males of Hubbard Flex (fast growing) and Hubbard JA 657 (slow growing) were reared in floor pens covered with wood shavings. During the first week, a composite behavior test was conducted to characterize individual personalities. Based on the results of this test, chickens were housed in groups of 3 individuals of the most comparable personality. Chickens were fed ad libitum with a commercial available feed. Results showed that the slow growing strain had a larger range of variation in personality than the fast growing strain. The fast growing strain had higher body weight (BW) and FI and lower feed conversion ratio (FCR) than the slow growing strain (all $P < 0.001$). T3 and corticosterone were significantly higher in the fast growing strain than in the slow growing strain ($P = 0.02$ and $P < 0.001$, respectively), but glucose was not different. Shy personalities had a higher BW and lower FCR compared to bold personalities within the slow growing strain ($P = 0.02$ and $P = 0.03$, respectively). In the fast growing strain, shy personalities also had a higher BW than bold personalities ($P = 0.01$). A higher performance of shy personalities within strain was not reflected in the hormone levels. It was concluded that in fast and slow growing broilers there is a lot of variation among individuals. Moreover, a relationship exists between personality and performance, but not with FI.

Session 8: Ecological background of insect biocontrol

8.1 Functional Traits of IPS Typographus Originated From Three Populations in the Czech Republic

Key words: spruce bark beetle, Ips typographus, sexual dimorphisms, sex ratio, migration

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The purpose of this work is to monitor and compare population functional traits (body length and sex ratio) of individuals of spruce bark beetle population in three locations in northwest part of the Czech Republic (1. location – Libčeves, 2. location – Košťálov, 3. location – Červený Vrch). Studied locations are characterized by different population abundance of bark beetle. Experiment was performed in vegetation season of the year 2009. Beetles were trapped using pheromone Theyson collectors with pheromone dispenser Pheagrt IT. Set of collectors up to 25 pieces were placed in regular net in each location. Beetles were collected regularly with 7 day interval. Research hypothesis assumed the population abundance be as follows: Libčeves – high, Košťálov – moderate, Červený Vrch – low. We assumed high male migration activity in Červený Vrch due to low population abundance and high amount of available food source. Results confirmed are hypotheses. Number of male beetles was the lowest in Libčeves (26% of males) representing high population abundance. In Košťálov (moderate population abundance) number of males reached 33% and in Červený Vrch (low population abundance) number of male beetles reached 35%. The difference in sex ration was most significant between Červený Vrch and Libčeves ($p < 0.000116$; ANOVA Tukey HSD test). The difference in sex ratio between Košťálov and Libčeves was also statistically significant ($p < 0.000131$; ANOVA Tukey HSD test). Furthermore we tested the difference between male and female body length. Average size of male beetle was 4,77 mm and 4,73 mm female beetle. Body length difference was also found between the three locations: Libčeves (4.75 mm), Košťálov (4.83 mm), Červený Vrch (4.57 mm). This research is carried on with the main task to study migration and Allee's principle.

8.2 Assessment of Soil Suppressiveness – The System of Fusarium Foot Rot on Wheat

Keywords: Bioassay; Fusarium graminearum; Fusarium culmorum; Fungistasis; Tillage; Preceding crop

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The soil suppressiveness to fusarium foot rot caused by Fusarium graminearum and Fusarium culmorum was assessed by two complementary analyses: the bioassay and the fungistasis test. The

bioassay addresses suppressiveness to fusarium foot rot and the fungistasis test evaluates the pathogen suppression capacity of different soil samples. A field experimental set up to study effects of conventional and reduced tillage and different preceding crops (wheat, oat and oilseed rape) was used for the study. In addition to establish the methodology for assessing the suppressiveness to fusarium foot rot caused by *F. graminearum* and *F. culmorum*, the different cultural practices were evaluated in their impact on the suppressiveness. Reduced tillage increased the suppressiveness to fusarium foot rot caused by *F. graminearum*, since reduced tillage decreased disease severity of the wheat plant growing on soil with wheat as preceding crop in the bioassay. In addition, reduced tillage decreased the germination rate of conidia spores of *F. graminearum* in the fungistasis test. For *F. culmorum*, no impact of the tillage treatment on the suppressiveness could be detected. Soil with oilseed rape as preceding crop showed the lowest disease incidence in the bioassay, what suggests that crop rotation with oilseed rape increases the suppressiveness to fusarium foot rot. Cultural practices which showed a significant effect on disease suppression, did not necessarily show an effect on pathogen suppression which was also influenced by the two *Fusarium* species differently due to their different ecology.

8.3 Effects of Intensive Winter Wheat Production on Carbon Dioxide Fluxes

Keywords: CO₂-fluxes, intensive wheat production, eddy-covariance, climate change

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For an improved prediction of the effects of climate change on structure and functions of agricultural regions the need for understanding local exchange processes between soil-plant and atmosphere is evident. The aim of our work, as part of the integrated DFG-project on "Regional Climate Change" (PAK 346), was to quantify the CO₂-fluxes within the vegetation period of a winter wheat stand, to relate them to the observed phenological states, and to get a better picture of the effects of the intensive crop production on the emission of the greenhouse gas CO₂. We conducted eddy-covariance measurements on a winter wheat stand in Kraichgau, an intensively used agricultural area in southwest Germany. Fluctuations of vertical wind speed and CO₂-concentration of the air was measured with a frequency of 10 Hz and aggregated to 30 min-fluxes. In addition, soil variables were measured and the development of the wheat (phenological data, canopy height, and leaf-area index) recorded. A footprint analysis was performed, showing that more than 95% of the CO₂-flux detected at the turbulence tower originated from the winter wheat field. The measurements showed the typical behavior, with increasing CO₂ uptake rates until flowering and a pronounced ripening and maturing period corresponding to a net release of CO₂ until harvest in August. The net CO₂ uptake of 540 gCm⁻³ C showed good agreement with the estimated carbon content of grains, residues, and straws. These results will be compared to the measurements of the season 2010 and also to the results of measurements from the Swabian Alb, an extensively used agricultural area in southwest Germany.

Poster Presenters' Abstracts

9.1 Antioxidant and Antiproliferative Effects of Phenolic Extracts from Bacaba (*Oenocarpus bacaba*) and Jenipapo (*Genipa americana*) on HepG2 Cancer Cell Line

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Key words: Antioxidant effect, Antiproliferative effect, HepG2 cancer cell line, Bacaba (*Oenocarpus bacaba*), Jenipapo (*Genipa americana*)

Increased consumption of fruits and vegetables has been associated with reduced risk of chronic diseases such as diabetes, cardiovascular disease and cancer. It has been shown that the phytochemicals in fruits are the major bioactive compounds in regard to health benefits. Bacaba (*Oenocarpus bacaba*) and Jenipapo (*Genipa americana*) are native fruits from Brazilian savannah and Amazon rainforest which perform an important role in the diet of rural communities and are also a source of income for poor people. The aim of this study was to assess the antioxidant and antiproliferative effects of the phenolic extracts from Bacaba and Jenipapo on human HepG2 cancer cell line. Therefore the fruit extracts were investigated in a concentration range from 0-25 mg/mL for the antioxidant assay and 0-1400 µg/mL for the antiproliferative assays. The antioxidant effect of the fruits was investigated with the CAA assay which measures the antioxidant activity of antioxidants directly in cell model and therefore guarantees biologically relevant results. The antiproliferative effect was evaluated after incubation with the extracts for 96 hours by measuring the mitochondrial and esterases activity of viable cells with the MTT and MUH assays, respectively. The results from these assays were proven by assessing the effects also with the Trypan blue exclusion test and Methylene blue staining. Bacaba and Jenipapo showed relatively potent antioxidant and antiproliferative activities on HepG2 cells as oxidant generation and cell proliferation were significantly inhibited in a dose-dependent manner after exposure to the phenolic extracts. The EC50 values gained indicate a higher antioxidant effect on HepG2 cancer cells for Bacaba than for Jenipapo fruit as a lower EC50 indicates higher antioxidant activity. For the antiproliferative assays lower IC50 values for Bacaba again indicate a higher antiproliferative activity for that fruit. A possible apoptotic effect on HepG2 cells was positively investigated by PARP-cleavage.

Acknowledgments: International Foundation for the Promotion of Nutrition Research and Nutrition Education, Switzerland, for the financial support.

9.2 Happy Meal? by The Rural Wageningen Foundation (RUW - A critical journey through our food system

Author: RUW (The Rural Wageningen Foundation)

From September until December 2010 the Rural Wageningen Foundation (RUW) is making a critical journey through our food system by the project Happy Meal? During different activities

there will be looked critically to our present food production system but foremost to innovative initiatives to make it more sustainable.

The Rural Wageningen Foundation (RUW) is a critical student organisation that wants to connect Wageningen students to actors from the field related to green issues. RUW organises excursions, debates and more about 'hot topics' related to green issues.

More and more people don't know any more where their daily food is coming from and how it is produced. At the same time food production is being viewed in a critical way by many people because of recent developments like for instance breakouts of animal diseases like Q-fever and use of antibiotics in animal production.

With the project Happy Meal? RUW wants to address these issues and also bring Wageningen students into contact with the actors that are producing their food. RUW is doing this by organising different activities: broadcasting movies like Food inc. and Our Daily Bread, discussion and presentations, visit to a slaughterhouse, conference about Green Economy, excursion to ELLS conference in Copenhagen, workshop about labels, Eat-Ins and more.

9.3 Biotransformations in Food Production. Effect of Immobilization upon Catalytic Activity of Yeast

Keywords: immobilization, yeast, biotransformations, lipase

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Biotransformations can be used e.g. for synthesis of aroma compounds and optional extras for food. Using enzymes from the microorganisms we can reduce requirement for synthetic chemical reactions in the industry which are less safe for the environment.

The industrial application of biotransformations that is to say reactions with enzymes, has become possible mainly due to the methods of immobilization. Not only isolated enzymes can be immobilized but also whole cells of microorganisms. Using immobilized enzymes/cells is more economic and more convenient. Furthermore, biological factors are more stable. All of this makes using immobilized forms more eco-friendly than traditional forms. As a matrix for immobilization organic or non-organic compounds can be used for example natural or synthetic polymers. It is the aim of my thesis to report the influence of immobilization on catalytic activity of three kinds of yeast: *Pichia jadinii*, *Rhodotorula glutinis* and *Yarrowia lipolytica*. The standard reaction was hydrolysis of p-nitrophenyl laurate. The yeast have been cultivated in typical conditions (medium YPD) and in medium which was additionally enriched with carbon source that is olive oil then supernatant was immobilized on calcium alginate. In my project I have also tried to obtain the method of immobilization both, cells and supernatant on calcium alginate, on gelatin cross-linked with glutaraldehyde and on polyvinyl alcohol.

The results obtained in this study permitted to conclude that immobilization of supernatant from *Yarrowia lipolytica* and *Rhodotorula glutinis* reduced catalytic activity of lipase within the first five hours of reaction. However during the progress of the reaction the activity increased. On the contrary immobilized supernatant from *Pichia jadinii* was more active than free supernatant and its activity was the highest among the examined yeast.

9.4 *The effect of contaminated urban particulate matter on risk element contents in leafy vegetables*

Key Words: Leafy vegetable, urban dust, particulate matter, risk elements

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In the last few decades the accumulation of contaminated traffic dust in soils and plants has been increasing. This traffic dust contains also a big amount of pollutants, among them risk elements. This study focus on investigation of the accumulation of risk elements by leafy vegetable in dependence on the type of dust application, type of leafy vegetable and soil. In the model pot experiment we used two types of soil and two vegetable species, lettuce (*Lactuca seriola* var. capitata), and chard (*Beta vulgaris* var. cicla). Contaminated urban particulate matter was collected in filters from air conditioning system in Prague Congress Centre, which is situated close to arterial Prague road. The dust were applied in two ways i) single rate to the soil before start of the experiment and ii) spraying of the particulate matter suspension on vegetable leaves during vegetation where final amount of 30 g of the particulate matter was reached in the end of the experiment. The concentrations of Cd and Pb and also Fe, Zn were determined by ICP-OES in aboveground biomass.

Expectably, higher element contents were determined in vegetables cultivated in the sandy soil compared to Chernozem characterized by higher sorption capacity and content of organic matter. The soil amendment by urban particulate matter did not result in significant increase of elements in vegetables. No significant differences were observed among individual vegetable species and individual particulate matter fractions.

The situation of plant biomass after foliar treatment with the particulate matter suspension is quite different. Although gently washed leaves with deionized water the element contents in plant biomass remain higher compared to control. Apparently, the potential risk of the contamination of leafy vegetables by urban particulate matter consist predominantly in foliar uptake and planting of these crops close to frequent highways can result in problems.

9.5 *Food Scarcity in Africa*

Keywords: scarcity, Africa, malnutrition, affects, humanitarian aid

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The objective of my paper is to study economic determinants of developing countries, precisely in Africa and relate them to situation in African food markets. I would like to compare situation in Africa and focus on relationship between malnutrition and disease outbreaks in specific locations in Africa. In the beginning of the 21.st century, about 1/7 of population was suffering from the hunger.

Malnutrition and hunger decreases peoples' ability to use their resources efficiently. While malnutrition is one of the pressing problems in Africa, same can be argued about obesity. Both obesity and malnutrition contribute to significant losses in terms of economic as well as social performance in the analyzed regions. It is one of my goals to study the relationship among economy, malnutrition and obesity on the one hand and on the other hand try to analyze some of the policies of the developed world that aim at mitigation of these issues. Past and current data on the extent of the humanitarian aid will be analyzed in light food scarcity and malnutrition in general and its effect on mortality and natality of the population in particular.

9.6 Water Scarcity in Africa

Keywords: water, scarcity, poverty, Africa, development

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Environmental and developmental problems of third world countries create a challenge in today's world. One of these alarming issues is water scarcity and poverty. The assumption whether or not water scarcity is correlated with poverty, the higher the level of poverty the lower water coverage and sanitation. The hypothesis tested in this work is : "The main problem in Africa is not physical water scarcity but poverty, poor and corrupted governance with lack of care to serve rural poor, shortage of finance and insufficient infrastructure."

The main goal of the research is to examine relationship between poverty and physical water scarcity. In addition, a market for water in Africa and examine externalities and market failures. Furthermore, the problem of property right is discussed, e.g., analyze water as a private and public good and try to answer the question whether water should be treated as public or private good. For the purposes of my bachelor thesis research quantitative methods of econometrics are used such as regression and time series analysis. It is expected that water scarcity is caused by poverty due to lack of capital, low level of development and absent technologies. On the other hand, in some cases, water scarcity may contribute to poverty as the price of essential input for agricultural production is high. By using some of the time series analysis techniques, the causation will be analyzed. The research may, hence, contribute to improvement of welfare in some of the countries.

9.7 Water Resources in Nigeria

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Nigeria a country in the West of Africa with a population of 138 million, the climate is tropical, characterized by extreme weather conditions (wet and dry seasons) though there are variations between North and South. There has been a continual threat to agriculture and water resources

which is aggravated by the global climate change, the improper use of water and lack of effective water policy. Because of these threats, problem of feeding the ever increasing population and preserving the entire ecosystem is envisaged.

Bearing in mind the importance of water to life and ecosystem, this paper analyses the economics of water resources in Nigeria, uses, problems of availability of quality water, the intricate relationship between availability of water for household consumption and other productive uses on the one hand and the issues of health and diseases, poverty, food security and the environmental sustainability on the other. The role of environmental externalities caused by the farmers' irrigation of their farms, pollution of water by cement companies, oil spillage caused by multinational oil companies in the Niger delta of Nigeria and improper disposal of waste into water. The issue of water as a public good versus private good is also discussed in this paper.

The assumptions used in this paper are based on the pricing of water and pollution. Proper management of water resources with the abatement of the externalities (reduction in pollution) to the barest minimum is the key to sustainable water resources and essential for meeting a major demand created by accelerated urbanization, industrialization and agricultural development not only in developing countries like Nigeria but globally.

Keyword: Nigeria, Niger-Delta, Water resources, Water pricing, principle of sustainability, Water Externalities, Polluter paid principle.

9.8 The Bioavailable Portions of Risk Elements in Leafy Vegetables

Keywords: Leafy vegetables, particulate matter, PBET, risk elements

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Urban particulate matter contains risk elements. In our pot experiment the effect of soil type, method of particulate matter amendment and plant species on element bioavailability in leafy vegetables (lettuce, chard) were investigated. Dust was removed from the filters of air conditioning units close to Prague's highway. We used two physical fractions of dust: 0.063 - 0.119 mm, over 0.063 mm. To the estimation of bioavailable portions of risk elements in plant biomass was used sequential extraction „PBET“ (Ruby et al. Environ.Sci.Technol. 30, 422, 1996). This in vitro method simulates human digestion process. ICP-OES were used for determination of As, Cd, Cu, Fe and Zn in aboveground biomass of vegetables and in PBET extracts.

Element contents extractable from dust contaminated biomass was significantly higher compared to control, even after washing with deionized water and using ultrasonic bath. The element portions in dust samples extractable with simulated gastric solution decreased in order $Cd > Zn > Cu > As > Fe$. The element portions extractable from uncontaminated plant biomass decreased in order $As \sim Zn > Cd > Cu \gg Fe$ for lettuce, and $As \sim Zn \sim Cu > Cd \gg Fe$ for chard. Possible effect of plant species should be taken in account. The element portions leached with pancreatic solution were affected by pH of the extractant. Although dust contamination reduces the bioavailable portions of elements in absolute terms their uptake by human are significantly higher compared with control.

9.9 Storage of Agricultural Products in The Ciasna District - Current State and Development Prospects

Keywords: crop storage, hay-silage, storage base, storage methods, development, grains, corns, rape seeds, potatoes

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Agricultural products perform many functions: they are not only human food and animal feed, but also the raw material for food processing, pharmaceutical, chemical, textile, construction and automotive industries. The seasonal nature of agricultural production and year-round consumers' needs cause the necessity of storing crops for short or long periods of time. Therefore preservation is one stage in the food chain production system, which could bring major benefits to the producer, if it is carried out under appropriate conditions. However, on a global scale there are still a variety of changes occurring in all living plants' organisms as a result of faulty storage that contribute to a significant loss of quantity and quality of crops. During only one year the storage losses are estimated at an average of 5% of the total amount of crops, which is calculated as the amount of grains sufficient to feed 225 million people. Therefore crop storage methods strongly influence the technological value, mechanical resistance and quantity of damages of agricultural products. For that reason the objective of this study was to characterize the current state and development prospects of storage methods of seeds and potatoes used on the farms in southern part of Poland, precisely in Ciasna district (the Silesia province). The study was carried out in 2010 on 45 farms in the form of a opinion poll using a questionnaire with 36 various questions. The survey showed that in the research area, consisting of 45 selected farms, the following ways of crop storage were found: basic cereal grains are stored in half of the produced mass in the traditional way - "in the attic"; modern grain silos are mainly in a group of large farms in an amount of 23 corns are produced in only three very large farms, among which only one was equipped with grain and corn drier hay-silage is stored in accordance with the latest trends: in form of the pressed hay-silage in smaller farms and silos in larger farms oilseeds are sold immediately after threshing to state oilseeds purchasers in oil industry potatoes are stored in the traditional way – in clamps or in cellars; there is no modern potato storage facility in the neighbouring areas of the Ciasna district there are more modern methods of crop storage, including the formation of producer groups.

9.10 An Analysis of International Water Consumption and Sanitation Coverage - A contribution to the International Water Association

Water Demand – Economic Plants – Irrigation Requirement – FAO CROPWAT

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The International Water Association (IWA) is global network of 10,000 individuals and 400 corporate water professionals in 130 countries, who, through international conferences and publications aims to create innovative, pragmatic and sustainable water solutions to challenging global water needs. The IWA partners with several leading world organizations to fulfil the challenges of the UN Millennium Development Goals, as well as other international water challenges. The IWA is decomposed into several self managing specialist groups who meet biennially at the World Water Congress to collaborate and discuss their individual research and publications. This paper contributes to the publication on World Water Consumption and Sanitation Coverage, published by the IWA Specialist Group in Statistics and Economics in Montreal, Canada 2010. The focus of this paper is a database update from the previous publication, with an emphasis on trends, figures and future projections; including data on water consumption, sanitation coverage, and pricing of water utilities. ArcGIS digitalization of statistical data has been incorporated into this paper, to contribute a spatial representation of international figures. Statistical analyses have been performed in Minitab to address the distribution, normalization, correlation and significance of the reported data for the publication. A final conclusion on findings, data issues, statistical congruence, as well as a future outlook on climate change impacts on water resources is addressed; giving a final analysis on water development for the IWA, and a contribution towards the UN Millennium Development Goals.

9.11 Determinants of Non-compliance of Organic Operators with Organic Standards in Germany

Keywords: non-compliance, organic operator, control body

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Organic agriculture is not only a certain level of products' quality but also an approach to their production. This implies stricter rules along the whole organic food supply chain. Such rules enhance higher production costs, ergo resulting in higher market prices. Consumers are very likely to prefer conventional products when suspecting that the organic analogue misses certain organic qualities, hence not following the prescribed organic standards. Thus, inefficient organic control system might collapse organic markets. 'Gatekeepers' of this system are the control bodies.

Control bodies must carry out, among others, additional inspections that are based on the risk of occurrence of non-compliance. If these controls are not oriented towards operators with higher probabilities of non-conformity, fewer cases of the latter are detected. Consequently, reliability of the organic control system is reduced.

The vast majority of studies focus on consumers' attitudes towards organic food and only a few - on the supply side of the respective market. Thus, highlighting the factors that influence the probability of organic operators not to comply with organic standards is the aim of this study.

Quantitative binary analysis is applied to cross-sectional data on operational characteristics of German organic operators provided by a German control body. The results will show, which of these attributes influence, either positively or negatively, the probability of non-compliance. At present the research is ongoing. Thus, the corresponding poster presents only the modeling approach and the hypotheses on the determinants of non-compliance which are based on the literature search.

The findings of this study might be exploited by the German organic control bodies in particular, since they provide useful information for the risk classification of the operators.

9.12 Plug-In Performance Ground

Keywords: Urban Agriculture, Networking, Local Empowerment

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The studio project Plug In Performance Ground takes a look at Urban Agriculture as a generator of social networks, developed in the city of Syracuse in Upstate New York, USA. As in several other American cities, Syracuse continues to suffer from loss of industry, declining population and associated increased vacancy on land parcels. Looking at the landscape as a whole; it becomes clear that the epicenter of change must start with the weakest link to steadily increase the (you might insert here specifically what kinds of capacity, e.g. social, economic, etc) capacity of the whole system.

Consequently, Urban Agriculture is implemented in the city's most desolate area as a catalyst for existing organizations and initiatives to perform together on adjacent vacant lots. The role of the designer is to work as a catalyst for social change, connecting residents, community organizations and government incentives in powerful, local networks. The focus is in increasing the well-being of the individual and the performance capacity of the vacant lots.

The expectation is that our future urban landscapes will have to perform at a higher level of intensity. This system promotes an incentive to re-connect and close the open production loops that exist in most urban settings today, and at the same time promotes interaction and information flow, increases social well-being, creates green jobs, increases food security and creates a sense of community. The players always set the framework of the Performance Ground. Consequently, a system of flexible, adaptable places starts to take form that is responsive to the evolving needs and resources of given contexts. The playgrounds are conceived not only for the needs of the present players, but also to allow for flexibility of player configurations both initially and over time.

9.13 Long-term Copper Application in an Organic Vineyard Modifies Spatial Distribution of Soil Microorganisms

Keywords: Copper, organic, vineyard, soil microorganisms, downy mildew

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Organic viticulturists utilize copper, a heavy metal, to prevent and reduce downy mildew, a fungal disease, within the vineyard. As a heavy metal, copper either builds up in the soil is leached into the groundwater or taken up by living organisms. Therefore, its use impacts the environment and organisms around the grape vines, as well as the fungi. As there are currently no substitutes available, it is necessary to understand the depth of damage that copper is inflicting on soil microbial communities, as it kills plant fungi. This study focuses on deepening this knowledge by analyzing a small grid area, 4 m by 5 m, within a 15 year practicing organic vineyard in Southwestern Germany. Copper fractions and soil biology analyses have been measured and spatial distribution maps were interpolated. These maps are color codes of high and low areas of copper, microorganisms, enzyme activities and other variables so that trends can be pictorially observed. It is hypothesized that (i) copper fractions and other soil properties are unevenly distributed within and between the rows of vineyards, (ii) copper reduces the abundance of soil microorganisms, (iii) copper decreases soil microbial activity and (iv) copper changes the composition of microbial communities. As hypothesized, interpolation maps illustrate that copper, available and exchangeable fractions, are higher within the vine rows and lower between them. With total copper ranging from 43 mg kg⁻¹ to 142 mg kg⁻¹, ranging from critical to warning values of the European Community. In areas of high copper, a negative influence on total microbial and fungal PLFA quantities, ergosterol, as well as, phosphatase and xylanase enzyme activity can be seen. Soil properties have been amended, reflecting year-old tillage patterns within the vineyard. It is concluded that copper fungicide is negatively affecting soil microorganisms and that further research should be conducted.

9.14 Eddy-Covariance-Measurements of Surface Energy, Water and Carbon Dioxide Fluxes between a Winter Wheat Stand and the Atmosphere

Keywords: Eddy-Covariance method, biosphere-atmosphere interaction, energy balance closure, land surface models

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Understanding and quantifying the exchange of energy, water and CO₂ between Earth surface and atmosphere is of major importance in times of global climate change. The validation and improvement of existing land-surface models (LSMs) is one main goal of the integrated "Regional Climate Change"-project (PAK 346), to which this study was linked. My task was to quantify the surface energy, water and CO₂-fluxes between a winter wheat stand in the intensively used agricultural Kraichgau region and the atmosphere, for the vegetation period of 2009, and relate it to the development of wheat. Additionally, I evaluated the experimental set-up.

According to the performed footprint analysis, it is reliable to assume that all fluxes we measured originated from the wheat field of interest. The resulting energy fluxes were all in the range of published data recorded at similar sites, which justifies the use of these data for validating and improving the LSM NOAH. An energy balance closure of 68% was observed, which is also typical for heterogeneous, agricultural sites. The fact that both water and carbon balances were almost closed strengthens the reliability of the measured water and CO₂-data. The closed water balance furthermore underpins the idea that the larger scale atmospheric circulations mainly transport sensible heat instead of water vapor.

Analyzing the seasonal dynamics showed that especially the period when plants become senescent has a great impact on the climate system, first due to reduced amounts of water vapor in the atmosphere and secondly because the wheat stand acts as a source for CO₂ during that period. Therefore, it is necessary to further investigate the crop-atmosphere interactions and find approaches to aggregate the fluxes of different crops for the implementation into models.

9.15 The Reliability of Organic Standards - Their Development and Impact on Consumer Prices

Keywords: Organic agriculture, Certification, Standards

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The organic agriculture movement has become a major topic of concern since its introduction and insertion into general consciousness. It represents a way to live, produce and consume in accordance to nature and natural processes. It is a solution for people to thrive on healthy products, knowing that their production has not had a serious harmful impact on the nature and on the environment. Being of a superior quality and having to conform to certain quality standards, organic products are generally more nutritionally valuable, therefore more costly, than convenient-farmed products.

But we can only assume that this price premium reflects a quality standard, assigned to a product and adhered to. In reality, a standard itself invokes further questions. These would concern the evidence of healthiness, ensured by the latter, coherence and synchronising.

Standards do change as new information becomes available, on account of new technologies, cultural and social changes and law regulations. In addition, new chemical substances are being constantly discovered thanks to new research and tracing methods available, as well as new characteristics of already discovered substances. Their nuisance or benefits influence production methods, imposed on organic agriculture.

On my Poster, information asymmetry in case of organic production is analyzed. As sometimes producers may possess an information advantage over the consumers, it is advisable to employ clear and understandable widely accepted standards. Development of particular standards is examined, as well as its impact on organic agriculture in the matter of production and pricing.

A comparison of prices of particular chosen organic products is suitable for a further analyse in light of information asymmetry to give a consistent answer to the question: Is the price of a product a pertinent indicator of standards applied to its production?

9.16 *Microbiological and Chemical Characterisation of Bovine Colostrum*

Keywords: colostrum, protein, whey protein, immunoglobulin

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Colostrum is the secretion of the mammary glands immediately after parturition and up to about one week. The natural importance of colostrum is to provide antibodies as well as other bioactive peptides to the newborn and thus protect it against infections. Compared with mature milk, it possesses higher levels of proteins, especially represented by the whey fraction such as immunoglobulins and lactoferrin. As a consequence of the high content of proteins and growth factors, recent research has been focused on advanced techniques to purify the relevant substances.

The aim of this study was to characterize the microbiological and chemical properties of bovine colostrum. Samples from different suppliers were analysed for total viable counts (TVC), dry matter content (DM), pH, total protein (TP) and selected whey protein concentrations, such as lactoferrin (Lf), β -lactoglobulin (β -Lg), α -lactalbumin (α -La), bovine serum albumin (BSA) and immunoglobulins (IgA, IgM, IgG).

Large differences were detected in terms of TVC and protein fractions. TVC values range from 3.100 colony forming units per ml (cfu/ml) up to 118.500.000 cfu/ml. DM content and TP-content varied from 10,10 up to 31,41, and 6,37 to 19,31 g per 100 g respectively. Lf, β -Lg, α -La, IgG, IgA and IgM-contents were in the range of 0,095-0,746 mg/ml, 7,74-32,08 mg/ml, 1,12-3,74 mg/ml, 1,93-85,19 mg/ml, 0,94-21,67 mg/ml, and 0,76-9,08 mg/ml respectively. In spite of these differences, pH levels were comparatively constant with a mean of 6,37.

9.17 *The Long and Smelly Way to Hosts- Long distance orientation of the Parasitic Wasps *Cephalonomia tarsalis* (Ashmead) (Hymenoptera: Bethyridae), *Anisopteromalus calandrae* (Hymenoptera: Pteromalidae) and *Lariophagus distinguendus* (Förster) (Hymenoptera: Pteromalidae)*

Keywords: host finding, range, stored product protection

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Grain pests cause much damage in food stores worldwide. Often chemical or physical methods are used to control these pests. Disadvantages of these methods are for example the buildup of resistances or the high energy demand. An alternative method is biological pest control which uses natural enemies like predators or parasitoids to control pests. Common examples for cosmopolitan stored-product pests are the saw-toothed grain beetle, *Oryzaephilus surinamensis* L. (Coleoptera: Cuculidae) and the granary weevil *Sitophilus granarius* L. (Coleoptera: Curculionidae). Most

damage is caused by the larvae of these beetles. They are either free living (*O. surinamensis*) or develop inside grain kernels (*S. granarius*).

Natural enemies of these pests are *Cephalonomia tarsalis* parasitizing *O. surinamensis* larvae and *Lariophagus distinguendus* as well as *Anisopteromalus calandrae* parasitizing larvae of *S. granarius*. A key problem of these parasitoids is to find their hosts. *L. distinguendus* is attracted by the odor emitted from larval faeces of *S. granarius* (Steidle & Schöller, 2002). *C. tarsalis* is attracted by healthy and damaged grain as well as by host faeces and trail-traces of *O. surinamensis* larvae (Collatz, unpublished). These odors are normally mediated by wind. In closed environments such as a grain store odors are mostly spread by diffusion processes.

To determine the distances over which odors can be detected by parasitoids under these conditions, experiments were conducted with *C. tarsalis*, *A. calandrae* and *L. distinguendus*. The active space of different odor sources such as damaged grain or larval faeces was detected in Plexiglas boxes for all three parasitoid species to show up to which distance these parasitoids are able to find their hosts. Preliminary results show that the effect of odors spread only by diffusion seems to be relatively short, shorter than expected. Consequences for the application of the three parasitoid species for biocontrol in storage buildings will be discussed.

Collatz, Jana; Shcherbakov, Denis; Steidle, Johannes L.M.: (unpublished): Travelling in space and between spaces- locomotion behavior of *Cephalonomia tarsalis* (Ashmead) in response to host-associated odors

Steidle, Johannes L.M.; Schöller, Matthias (2002): Fecundity and ability of the parasitoid *Lariophagus distinguendus* (Hymenoptera: Pteromalidae) to find larvae of the granary weevil *Sitophilus granarius* (Coleoptera: Curculionidae) in bulk grain. *Journal of Stored Products Research* 38 (2002) 43-53

9.18 Feeding Habits and Behaviour of *Lymantria dispar* (Lep.: Lymantriidae) when Infected with the Microsporidian Pathogen *Vairimorpha disparis*

Keywords: *Lymantria dispar*, *Vairimorpha disparis*, microsporidia, behaviour, feeding

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Understanding the behaviour of an insect when it is infected with a pathogen is a vital part of the whole picture of how the pathogen could function as a biological control agent. Behavioural modifications can serve to be beneficial in increasing the likelihood of transmission of said pathogen as well as having ramifications for interactions with other natural enemies. The natural rhythm of *Lymantria dispar* larvae may change when they become infected with the microsporidian pathogen, *Vairimorpha disparis*. To test whether this is the case, two experiments were set up. The first looked at the hourly production of feces in order to pinpoint when and how much the infected and control larvae were feeding. The other involved direct observation of wandering, feeding and resting patterns of control versus infected larvae. The results show there is a change in behaviour and feeding habits of *L. dispar* larvae when they are infected with *V. disparis*. At 7 days post infection there was significantly more feces produced during the dark period by both the infected and uninfected larvae. Infected larvae feed less than control larvae which was evident through

significantly lower feces production. During the late stages of infection, they rest much more and feed much less than the control larvae of the same age. Deceased infected larvae were usually found on the ground. Aside from these behavioural modifications it seems that the infected larvae retain many of their tendencies despite severe infection. They continue to feed more during the dark hours than during the light and also alternate between feeding and resting during the dark hours which is typical for healthy larvae.

9.19 Microemulsions as Antimicrobial Delivery System to Enhance Safety and Quality of Sliced Sausages

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Mirenat®-D is a novel surface-active antimicrobial that has shown high activity against foodborne pathogens and spoilage organism, however its ability to improve quality of meats is limited.

Mirenat can however be combined with lipophilic antimicrobials to form antimicrobial microemulsions. The objective of this study was to examine their antimicrobial activity of on the surface of sliced meat products post contamination.

Microemulsions were formulated with 50 mM Brij® 35, Mirenat, mixtures of Brij-Mirenat (25:75, 50:50 and 75:25) and two essential oil components (thymol or eugenol) at pH 3. Size and charge of microemulsions were determined by dynamic light scattering. Antimicrobial activities were tested against *Lactobacillus curvatus* using spot inoculation assays. On Lyoner slices, antimicrobial activity was determined by incubation at 4 and 14 °C with 10⁴ CFU/cm² inoculums and subsequent enumeration.

At pH 3, increasing Mirenat concentrations in the microemulsion led to an increasingly positive surface charge (e.g. +56.35 mV for Mirenat and +0.47 mV for Brij), but only a little change in size (17.70 nm for Mirenat and 20.20 nm for Brij). Higher Brij concentrations enabled a higher loading with thymol or eugenol. At pH 6, only Brij and Brij-Mirenat (75:25) microemulsions could be formed. The maximum inhibitory concentration of these two microemulsions loaded with eugenol or thymol was < 25 ppm in spot inoculation. Surprisingly, little to no antimicrobial activity was detected on sliced Lyoner at the highest concentration of the emulsions tested and the sensory quality was negatively impacted. To decrease the molecular interactions between the antimicrobial substances with ingredients of meat that could reduce effectiveness, pectin was added to form a microemulsion-polymer

complex (50 mM microemulsion, 0.012 % w/v pectin). This improved the sensory properties but did not induce a better antimicrobial activity. Probably the penetration of the microemulsion into the product resulted in decrease on effective surface concentrations.

Results suggest that further studies on the transport mechanism of antimicrobial emulsions must be conducted to determine the cause of activity loss in complex products.

9.20 Food Insecurity and Threats to the Environment in Nigeria

Key words: Environment, Degradation, Food Security.

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This paper is aimed at bringing to light the problem of food insecurity in Nigeria by highlighting the influencing factors and correlating the consequences by and for the environment at large. Food security implies that individuals are able to obtain adequate food needed at all times.

Food insecurity is usually influenced by household income distribution, educational level, household size, urban or rural dwelling, population density and environmental degradation, which is increasingly being compounded by the impacts of climate change

Three pillars, namely; food availability, accessibility and nutritional factors have been identified as affecting food security in Nigeria (World Bank 2001). The poverty level of Nigeria is currently 85%; this means that most Nigerians live below \$1 per day. The threats to the Nigerian environment through climate change as well as other factors like; static of food availability (%), household consumption (%) and how the population characteristic of Nigeria also affects food security will be looked at.

The failure of industrialized agriculture means that subsistence agricultural production still remains the main source of food; while the lack of natural resources management techniques as well as little or no post harvest technology leads to additional loss of agricultural produce. Also, rural to urban migration (urbanization and overpopulation) further compounds the problems.

Major environmental problems, which have been worsened by the impacts of climate change includes: desertification, oceans and river overflow resulting in enormous flooding, erosion (soil, gully, coastal), deforestation and pollution(water, air, land).

In summary, Nigeria has the potential for development; but, food scarcity, overpopulation, environmental degradation, corruption, mismanagement of the economy; unaccountable elites, corruption and insecurity of lives and property have been the critical issues in the nation's life and public debate. Tackling the problems of food insecurity and environmental degradation will go a long way in reducing the suffering of ordinary Nigerians.

9.21 Flavonoid Metabolism in Different Strawberry Species

Keywords: Anthocyanin, Biochemical, Cyanidin, Enzyme, Flavonoids, Fruit, Strawberry (F.x ananassa, F. vesca)

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The anthocyanidin composition and creation of the B-ring hydroxylation pattern of flavonoids was studied in different *Fragaria* species. The anthocyanin contents and the anthocyanidin composition

of 14 *F. x ananassa* cultivars - including Elsanta as the leading variety in Central Europe - were compared with a *F. vesca* variety. The anthocyanin content - expressed as pelargonidin equivalent (Pgeq) - varied from 88.5 to 324.1 µg Pgeq/g FW and 0.8 to 2.6 mg Pgeq/g DW, respectively. The cyanidin content varied from 10 - 53.6 % cyanidin.

F. vesca cv. Red Wonder showed the highest cyanidin content (53.6 %), a high anthocyanin content (324.1 µg Pgeq/g FW, 2.1 mg Pgeq/g DW) and above average DW. Among the 14 tested *F. x ananassa* species, cv. Clery showed the lowest cyanidin content (4.5 %) and cv. Gloria the highest (37.3 %). Relative quantification of F3'H gene expression in 6 developing stages of fruits of cv. Elsanta and 4 stages of cv. Red wonder confirmed the two peaks of gene expression; the first at medium green fruit stages and the second at red ripe fruit stages. There was high conversion of NAR to eriodictyol, DHK to dihydroquercetin (DHQ), kaempferol to quercetin and apigenin to luteolin.

9.22 *Effect of Soil Type and Production Temperature on the Mineralization of Biochar*

Keywords: biochar, pyrolysis temperature, decomposition rates, carbonate

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Biochar is a residue from pyrolysis of organic matter with the specific purpose to be incorporated into the soil. Biochar can be used as a soil amendment to improve soil quality and enhance yields. Furthermore biochar can be used to sequester atmospheric carbon. The stability of biochar in the soil is of fundamental importance for its ability to provide sustained improvements in soil quality and permanent carbon sequestration. The stability of biochar is believed to be affected by feedstock, production conditions, environmental conditions and soil type. The purpose of this study was to see how mineralization of biochar is affected by production temperature and soil clay content.

Biochar was produced from ¹⁴C labeled plant material at 400 °C, 500 °C and 600 °C and incubated in three different soils. Evolved ¹⁴C was trapped in NaOH and counted on a scintillation counter. The study showed that the decomposition time of biochar produced at 400 °C was higher than biochar produced at 500 °C, but no further decrease in mineralization rate was seen at biochar produced at 600 °C. However, mineralization rate of biochar produced at 600°C was lower, than biochar produced at 500°C, at the end of the incubation period indicating that long-term stability would be higher. The carbonate content increased with increasing production temperature and was also the reason for the high release of CO₂ in the beginning of the incubation. This could be the reason for biochar produced at 600°C has a higher mineralization rate in the beginning than biochar produced at 500 °C. No significant effect of soil type was observed on the mineralization. However, in the initial stages, mineralization increased with increasing acidity. This could be due to soil acidity affecting the release of carbonates in the biochar products.

9.22 An Analysis of International Water Consumption and Sanitation Coverage – a contribution to the International Water Association

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The International Water Association (IWA) is global network of 10,000 individuals and 400 corporate water professionals in 130 countries, who, through international conferences and publications aims to create innovative, pragmatic and sustainable water solutions to challenging global water needs. The IWA partners with several leading world organizations to fulfil the challenges of the UN Millennium Development Goals, as well as other international water challenges. The IWA is decomposed into several self managing specialist groups who meet biennially at the World Water Congress to collaborate and discuss their individual research and publications. This paper contributes to the publication on World Water Consumption and Sanitation Coverage, published by the IWA Specialist Group in Statistics and Economics in Montreal, Canada 2010. The focus of this paper is a database update from the previous publication, with an emphasis on trends, figures and future projections; including data on water consumption, sanitation coverage, and pricing of water utilities. ArcGIS digitalization of statistical data has been incorporated into this paper, to contribute a spatial representation of international figures. Statistical analyses have been performed in Minitab to address the distribution, normalization, correlation and significance of the reported data for the publication. A final conclusion on findings, data issues, statistical congruence, as well as a future outlook on climate change impacts on water resources is addressed; giving a final analysis on water development for the IWA, and a contribution towards the UN Millennium Development Goals.

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