CONFERENCE HANDBOOK

#euro2018valencia

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3 - Multi-objective optimization for the selection of wells for a water monitoring campaign of the Patiño aquifer, Paraguay

Christian von Lucken, Liz Báez, Cynthia Emilia Villalba Cardozo, Juan Pablo Nogues

In Paraguay, the Patiño aquifer supplies water for 43% of the population covering the largest and most densely populated urban area of the country. A previous work [1] identified 42% of the aquifer with greatest contamination risk considering Total Nitrogen (TN) and Total Coliforms (TC) concentrations. There also exists around 2800 deep wells that extract water from the subsoil with very little sanitary treatment. Due to economic and practical constraints it is not possible to analyze all deep wells. Thus, this work aims to select 70 wells to conduct a groundwater quality sampling campaign considering to maximize: contamination risk indices by concentrations of TN and TC, the coverage area and the wells which are publicly accessible. A Multiobjective Optimization Problem was defined to obtain the possible selections, and the Nondominated Sorting Genetic Algorithm II [2] was implemented to solve it. Executions of the algorithm with 100, 200, 300 and 400 generations were produced. The selected wells cover 67% of the aquifer area with high contamination risk indexes and 48 wells are publicly accessible. References 1. Báez, L., et al., Mapeo del Riesgo de Contaminación del Acuífero Patiño. 2014; https://goo.gl/stWkZM. 2. Deb, K., et al., A fast and elitist multiobjective genetic algorithm: NSGA-II. IEEE transactions on evolutionary computation, 2002.

4 - Aggregated linear programming models to estimate emissions of livestock production from animal diets

Concepcion Maroto, Marina Segura, Concepción Ginestar, Baldomero Segura

The European Union has decreased greenhouse gases emissions in the majority of sectors since 1990. In particular, the reduction amounts to 20% in agriculture, whose main source of emissions of carbon dioxide, methane, and nitrous oxide is livestock production. As feed intake is an important variable in predicting emissions, which depend on animal nutrition, the objective of this research is to design and explore the contributions of linear programming models to improving the quality and accuracy of livestock emissions at country level. Firstly, we have developed a linear programming model to estimate the most important emission factors attributable to diet in animal production. Secondly, we have applied this model to Spanish intensive livestock farms, concentrating on pork and poultry because of their relevance in the European Union, where the consumption of pork meat is the highest followed by poultry with 21 and 13.7 million tons respectively in 2016. Both types of meat are also the most important worldwide. Model data come mainly from EUROSTAT and FAOSTAT. LINGO was used to formulate and solve the models, as well as to carry out the sensitivity analysis. Finally, the developed models generate relevant information for improving the accuracy of emissions inventories. In addition, they are suitable tools to study the effects on greenhouse gases and pollutant emissions due to changes in feed price, expert nutrition recommendations and agricultural policy.

■ TA-50

Tuesday, 8:30-10:00 - 4D UPV 1.1

Optimization of Biomass-Based Supply Chains

Stream: Biomass-Based Supply Chains
Chair: *Magnus Fröhling*

1 - Designing optimal contracts between biomass processors and producers in the US biofuels industry
Sinem Tokcaer, Ozgur Ozpeynirci, Hayri Onal

In 2005, the US government introduced blending mandates to achieve energy security and cleaner transportation fuels. The Renewable Fuel Standard (RFS), a federal law, requires blending large amounts of biofuels obtained from cellulosic biomass with oil-based fuels. However, since the inception of RFS, commercial production of cellulosic biofuels has been stalling due to high conversion costs, low oil prices, limited availability of agricultural resources, absence of a competitive biomass market, and the perennial nature of energy grasses. The cellulosic biofuel industry can become an economically viable reality only if bio-refineries guarantee a steady flow of biomass at a reasonably low price while biomass producers receive adequate returns over a medium time horizon. Contracting between producers and bio-refineries is proposed as a mechanism to accomplish these. In this paper we find an optimal contracting scheme, in particular the price of biomass and the duration of the contract. Because of the hierarchy and independence of the decisions made by biomass producers and bio-refineries, we formulate the problem as a bilevel optimization model. We apply the model to a mid-size cellulosic bio-refinery surrounded by numerous risk-averse farmers that may contract with the biorefinery. We present the empirical results along with the computational performance of the model.

2 - The effect of postponement strategies under sequence dependent setup times in the wine industry
Alejandro Mac Cawley, Sergio Maturana, Benjamin Bastidas, Mauricio Varas

Wineries face a problem during the planning of the bottling process, because they must deal with a large number of products to be processed, high-demand variability and sequence dependent setup times. Under these conditions, managers must generate scheduling plans which are both cost efficient and can fulfill the demand of the client. In some cases, they can resort to the postponement of the labeling of bottled wines; in order to gain productivity but in the process, they must incur in a extra double handling cost. In this research, we look to assess the impact of implementing production planning models that integrate postponement strategies in high demand variability and sequence dependent setup times conditions. We analyze the performance impact of postponing the labeling of bottled wines by developing a multi-stage mixed-integer stochastic programming model with full recourse for demand scenarios. The underlying data and policies are based on an unnamed Chilean export-focused winery. The model supports lot-sizing under several winery production policies. Results show benefits of implementing postponement strategies under given capacity of the system, demand variability and setup times.

3 - Households' decision processes in an agent-based simulation using PROMETHEE
Beatriz Beyer, Lars-Peter Lauven, Jutta Geldermann

In Germany, heating demand is largely covered by fossil fuels, which causes 40 % of all energy-related greenhouse gas emissions. Some 80 % of the central heating systems in Germany use combustion technologies, and 70 % of its 20.7 million residential heating systems are older than 15 years and correspondingly energy inefficient. Households' decisions for a heating system are long-term investments and influence the sustainability of the market over a long time. In order to obtain deeper insights on the market dynamics for a more sustainable heating market, we developed an agent-based simulation model and applied it to Lower-Saxony, a region in northwestern Germany. Different agents in the model represent various households and their dissimilar decision behavior concerning investments into heating systems. The individual decision processes are modeled as multi-criteria decisions using PROMETHEE. With the combination of an agent-based simulation and multi-criteria decision processes of individual households, the possible effects of different legislations can be observed more closely. Different scenarios concerning demand and price fluctuations, behavioral changes, and incentive programs are simulated. Thus, this agent-based simulation of the heating market allows for a better understanding of the interdependencies and can therefore be used a decision support system for industry or legislator.

4 - Combining GIS and location planning to evaluate biomass utilisation chains
Magnus Fröhling, Andreas Rudi, Charlie Liebscher