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FOOD AND WINE SUPPLY CHAIN

7th International Conference

Instituto de Ingeniería Industrial UNCuyo

Contents

Preface

The Universidad Nacional de Cuyo has the honor and pleasure of welcoming you to:

The 7th Food and Wine Supply Chain Conference.

As the global food and wine industries continue to evolve, specially after COVID pandemic, the intricate network of supply chains and transportation systems that underpin them become increasingly critical. This conference serves as a platform for industry leaders, researchers, experts, and stakeholders to convene, share knowledge, and explore innovative solutions to the challenges and opportunities presented by this dynamic sector.

This year's proceedings delve into a wide range of topics, from sustainable sourcing and ethical production to cutting-edge technologies that are revolutionizing the way food and wine are transported and distributed. Our aim is to foster a deeper understanding of the complex interplay between supply chains, transportation, and the overall sustainability of the food and wine industries.

We are honored to have a distinguished lineup of speakers and panelists who will share their insights and experiences on a variety of subjects, including:

Emerging trends and technologies shaping the future of food and wine supply chains

- **Sustainability** initiatives and their impact on the industry
- **Global challenges such as climate change**, food security, and geopolitical factors **Innovative transportation solutions** and their role in optimizing efficiency and reducing costs
- **Case studies of successful food grow and supply chain strategies and practices**

We believe that this conference will provide valuable opportunities for networking, collaboration, and knowledge exchange. By bringing together diverse perspectives and expertise, we can collectively address the challenges and seize the opportunities that lie ahead for the food and wine industries.

Thank you for joining us, and we look forward to a fruitful and inspiring conference.

Ricardo R. Palma Conference Chair Organization

1 Routing of Automated Spraying Vehicles in Agricultural Areas

Routing of Automated Spraying Vehicles in Agricultural Areas*

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Abstract. Precision Farming (PF) is a systematic approach to manage spatial and temporal variability within a field, achieve cost reduction, improve yield quantity and quality, and reduce environmental impact. On the one hand, the introduction of robot fleets brings advantages to PF such as increased operator safety, better use of resources and economies of scale. On the other hand, they also add complexity to robot coordination and field coverage. The Split Delivery Capacitated Arc Routing Problem (SDCARP) is an abstract problem that can be applied to the challenge of dividing a field into paths that can be worked by agricultural machinery, and was motivated by the real-world problem of efficiently routing automated spraying vehicles through an orchard. In this paper, we introduce a novel approach to address the SDCARP by approximating real-world, irregular agricultural plots of land as regular grid graphs, and we use mathematical insights and heuristic techniques to seek high-quality solutions. In particular, we leverage methods on graphs with specific properties of the regular grid graph, where each robots path plan follows adjacent demand edges, making it straightforward and easy to generate better solutions. Additionally, we provide a heuristic method to generate the solution and explore potential avenues for future research. The contributions of the present paper are twofold. First, we provide a set of realistic datasets for future testing and establish a connection between agricultural applications and the SDCARP model. Second, we apply newly developed SDCARP solution methods to a real-world problem, transforming irregular, real-world graphs to graphs that are more amenable to the application of such methods.

Keywords: Split Delivery Capacitated Arc Routing Problem · PrecisionFarming · Orchard Spraying · Ground Vehicles

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2 Optimization Clusters Lot Sizing Problem Elastic System

Optimization Clusters Lot sizing problem Elastic system*

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Abstract. The need of companies to reduce costs and increase their profits has led to an emphasis on logistic activities as an approach to achieve these objectives. Among these activities, the inventory management is an alternative to reduce the costs of organizations through a better management of stored materials and their transportation. In this context, investigating the behaviuor of the order grouped sizes to meet the needs of the system is highly important. By analyzing what the optimal strategy is to comply with the supply of raw material and inputs,an analogy is observed with the potential energy of a one-dimensional system of particles connected by elastic elements. Therefore, it might be probable to find that the problem of material requirement planning is isomorphic to the proposed mechanical system, which has an exact analytical solution. This leads to a better interpretation of the problem.

Keywords: Optimization Cluster · Lot sizing problem · Elastic system

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3 Contributions of Green and Lean approaches to supply chain managemen

Contributions of Green and Lean approaches to supply chain management*

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Abstract. Business development is a challenge and in the case of SMEs it becomes more acute given the current influence of the context. Particularly in Olavarría, its link as suppliers to large industries suggests that supply chain management (SC) is a point to rely on to improve its performance. Work on fluctuating demands, capacity limitations, visibility problems, supplier dependency, inventory and storage management to affect customer satisfaction, reduce delivery times and be efficient in the use of resources. Addressing these problems requires methodologies and tools to improve operational efficiency, information flow and coordination with other organizations. The concepts of sustainability and lean practices could be used as foundations to consolidate the change and begin the path of coordination and integration of SC based on continuous improvement. The lean philosophy consists of eliminating waste in processes while improving the flow of material and information. Sustainable organizations manage to balance the direction of their activities with good economic, social and environmental results. The key words in SC management are integration and time. At this point, the objective is to identify the bases to address the use of a maturity model as an instrument to define the initial state and the necessary actions to advance the degree of integration with SC agents incorporating lean and green approaches. An analysis that can be extrapolated to SC from other areas or sectors.

Keywords: Supply chain management · Lean and Green management · Sustainability

1 Aportes de enfoques Green y Lean a la gestión de la cadena de suministro

1.1 Contributions of Green and Lean approaches to supply chain management

1.2 Resumen

El desarrollo empresarial es un desafío y en el caso de Pymes se agudiza frente a la influencia actual del contexto. Particularmente en Olavarría su vínculo como

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proveedoras de grandes industrias hace pensar que la gestión de la cadena de suministro (SC) sea un punto donde apoyarse para mejorar su desempeño. Trabajar sobre demandas fluctuantes, limitaciones de capacidad, problemas de visibilidad, dependencia de proveedores, gestión de inventario y almacenamiento para repercutir en satisfacción del cliente, disminuir tiempos de entrega y ser eficiente en el uso de recursos. Abordar estas problemáticas requiere buscar metodologías y herramientas para mejorar la eficiencia operativa, el flujo de información y la coordinación con otras organizaciones. Los conceptos de sostenibilidad y prácticas lean podrían ser usados como cimientos para consolidar el cambio e iniciar el camino de coordinación e integración de SC apoyándose en la mejora continua. La filosofía lean consiste en la eliminación de desperdicios en los procesos mientras mejora el flujo material y de información. Las organizaciones sostenibles logran equilibrar la dirección de sus actividades con buenos resultados económicos, sociales y medioambientales. Las palabras clave en la gestión de la SC son integración y tiempo. En este punto se plantea como objetivo identificar las bases para abordar el uso de un modelo de madurez como instrumento para definir el estado inicial y las acciones necesarias en el avance del grado de integración con actores de la SC incorporando los enfoques lean y green. Análisis extrapolable a SC de otros rubros o sectores.

1.3 Palabras clave: Gestión de la cadena de suministro. Enfoques Lean and Green. Sostenibilidad.

Keywords: Supply chain management. Lean and Green management. Sustainability.

4 Growth kinetics of potentially conditions

Growth kinetics of potentially conditions*

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Abstract. In this work the main objective is to study the tolerance of potentially spoilage yeasts to different oenological factors. The microorganisms were isolated from grapes and must from Argentinian vineyards from the winegrowing region D.O. San Rafael (Mendoza). The growth kinetics of this indigenous yeasts, which have been previously identified and characterized "in vitro" as potentially altering the organoleptic characteristics of the wines, were studied under oenological conditions that may affect their survival. The kinetic behaviour of the yeast strains Pichia kudriavzevii 4321-62, Zygosaccharomyces bailii 4421-67, Hanseniaspora uvarum 3221-45, Hanseniaspora vineae 4322-65 and Hanseniaspora guilliermondii 3312-47 in a medium commonly used for yeast growth (YPD) were analysed under different conditions:pH range 2.5 to 4.0; ethanol (0.1 to 25.0% v/v); potassium metabisulphite (0.003 to 6.0 g/L); chitosan (0.0002 to 0.25 g/L); and red and white grape extracts (0.008 to 8.0 g/L). All studied strains showed tolerance to 25% or less ethanol concentrations and in the range of concentrations in which polyphenols can be found in white wines and red wines, all the yeasts studied grew without suffering inhibition. P. kudriavzevii 4321-62 was more resistant than the other strains to the antimicrobial oenological agents studied, potassium metabisulphite and chitosan. Those results in the assays conditions indicate that they could be able to survive in wines conditions, confirming their dangerousness as potential fermenting agents or wine spoilage agents.

Keywords: D.O. San Rafael · Growth Kinetics · Spoilage Wine Yeasts

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5 Infraestructuras Críticas y de Nueva Generación, Análisis del Sistema del Agua

INFRAESTRUCTURAS CRÍTICAS Y DE NUEVA GENERACIÓN ANÁLISIS DEL SISTEMA DEL AGUA *

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Abstract. En el presente documento se aborda la problemática de las infraestructuras críticas (IC) y de nueva generación (INEXTGEN), la cual se agudiza frente a los acelerados desafíos y riesgos que estas enfrentan. En este marco, se analizará específicamente cómo los problemas inherentes al sistema del agua trascienden la mera protección física y enfatiza en la importancia de una visión integral que abarque desde su origen hasta su distribución y uso en diversos ámbitos como la agricultura, agua potable, industria, generación hidroeléctrica y actividades recreativas. Para ello, el trabajo se adentra en un análisis de las definiciones, características y normativas que rigen las IC y INEXTGEN en diversos sectores, con base en los lineamientos de entidades gubernamentales y organizaciones a nivel regional e internacional. De esta forma, se fundamenta que la creciente importancia de los riesgos emergentes asociados a infraestructuras clave como energía, transporte, tecnologías de la información y comunicación, entre otros, proyecta su presencia en futuras agendas políticas, económicas y sociales a escala global. Por lo tanto, el marco teórico se apoya en una perspectiva de "infranómica" (Gheorghe et al., 2013) ya que permite una comprensión amplia de la infraestructura no solo como una entidad física, sino como un proveedor esencial de servicios. En definitiva, trabajo responde a la complejidad de las circunstancias actuales, mayormente influenciadas por el cambio climático, demanda una gestión basada en una gobernanza integral, capaz de manejar conflictos y promover la acción colectiva entre los diferentes actores del sistema (Ostrom, 1990). Por ejemplo, la construcción de escenarios propicios a los conflictos, tanto sociales como internacionales, frente a la escasez de agua y la disminución de su calidad. Mientras tanto, son cada vez más los debates sobre la digitalización de los sistemas de agua y los nuevos desafíos en términos de seguridad informática y resiliencia ante posibles disrupciones Por lo tanto, las conclusiones enfatizan en la necesidad de contribuir la expansión de capacidades en infraestructuras, sino también en su protección, reconociendo su criticidad y vulnerabilidad. Se argumenta que la protección y gestión integral del sistema del agua

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deben ser prioritarias dentro de las políticas ambientales para asegurar su seguridad y eficacia.

Keywords: Cambio climático · Infraestructuras críticas · Agua, Recursos hídricos · Riesgos y Resiliencia · Gobernanza.

6 Use of k-means in continuous biorefinery location problems, A case study

Use of k-means in continuous biorefinery location problems: A case study*

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Abstract. The location of plants is a problem that must be analyzed from a global perspective, where the entire supply chain is included to minimize costs. Within this context are biorefineries, which use raw materials of virgin biological origin or residual origin. Given the complexity of some localization problems, the use of computational algorithms has emerged that reduce calculation time while providing optimal results. In this work, the k-means algorithm is applied as a grouping method to determine the most appropriate number of biorefineries and their location to take advantage of the agricultural waste generated in Ecuador for bioplastics or other bioproducts production. The analysis carried out considered the use of geospatial data so that the results obtained were adapted to the local environment. The methodology used can be applied to other countries with similar characteristics to the one studied.

Keywords: Clustering · GIS, plant location · Agricultural waste

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7 Kinetic studies on the growth and enzymatic production of Aureobasidium pullulans m11-2 as an alternative source of pectinases for winemaking

Kinetic studies on the growth and enzymatic production of Aureobasidium pullulans m11-2 as an alternative source of pectinases for winemaking*

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Abstract. Recently, there has been a growing interest in the use of non-Saccharomyces yeasts during the winemaking process due to their potential to enhance the organoleptic characteristics of wines. Within this microbial group, Aureobasidium pullulans, a yeast-like euascomycete fungus, has shown a positive impact on the winemaking process due to its ability to produce multiple enzymes under oenological conditions. The objective of the present research was to study morphologically and enzymatically the A. pullulans m11-2 strain, previously isolated from the surface of Malbec grapes, and to obtain an optimal method for its preservation as an active dry yeast. For this purpose, the strain was inoculated in a pectin medium, and biomass and pectinolytic activity were evaluated. Biomass determination allowed the study of microbial growth kinetics. Pectinolytic activity was assayed both qualitatively, using the biochemical clarification halo test, and quantitatively, using the DNS technique to measure the amount of reducing sugars released. Based on the morphological studies, both macro and microscopic, it can be observed that the A. pullulans m11-2 strain belongs to the pullulans variety. This strain showed maximum enzymatic production at the end of the exponential growth phase, which was maintained during the stationary phase. Finally, the strain could be adequately preserved by lyophilization with 2.4% sodium glutamate for at least 18 months at 4°C without loss of enzymatic activity.

Keywords: Non-Saccharomyces wine yeast · Pectinolytic enzymes · Active dry yeasts

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8 Effect of Lignin Incorporating on the Final Properties of a Commercial PLA Matrix

Effect of Lignin Incorporating on the Final Properties of a Commercial PLA Matrix*

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Abstract. The incorporation of lignin into commercial poly(lactic acid) (PLA) matrices offers a promising approach to enhance the sustainability and properties of these materials. In this study, films of PLA with varying percentages of lignin filler (2.5%, 5%, and 10% w/w) were prepared and characterized. Thermal analysis (DSC) revealed that the addition of lignin slightly decreased the glass transition temperature (Tg) of the PLA matrix, indicating a plasticizing effect. The presence of lignin also increased the crystallinity of the PLA matrix, likely due to its nucleating effect. Thermal stability, evaluated by TGA, showed that the onset degradation temperature decreased with increasing lignin content but remained above industrial processing temperatures. The addition of lignin significantly improved the opacity and UV-blocking properties of the PLA matrix, with films containing 5% w/w lignin showing 3.5 times values of opacity than neat PLA. The color of the films shifted towards the yellow-reddish range with increasing lignin content, as evidenced by the changes in color parameters (H* and C*). Overall, the results suggest that lignin can be a valuable and environmental friendly additive for enhancing the properties of PLA films, particularly in applications where UV protection and opacity are desired.

Keywords: Poly(Lactic Acid) PLA · Lignin · Thermal Properties · Barrier Properties

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9 Optimal location of food cold chain warehousing facilities: an energy-driven perspetive

Optimal location of food cold chain warehousing facilities: an energy-driven perspetive*

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Abstract. This research aims at finding the best locations for refrigerated warehouses in a national retail supply chain, focusing on eight perishable products. An optimization framework is used to consider logistic, infrastructural, and energy-related factors. The study optimizes the weekly distribution paths from producers to warehouses and retail outlets to account for the dynamic nature of product flows. The optimization model is developed using the Mixed-Integer Linear Programming paradigm, which is tailored for a generic cold supply chain. Primary data from stakeholders, online data repositories, and literature data are used to test model outputs and enhance the proposed solutions' reliability. The optimized network configurations' resilience against fluctuations in cost parameters, such as energy and transportation costs, is assessed through a comprehensive multi-scenario analysis. The results reveal the interplay between cost factors and their implications for the overall efficiency and sustainability of the cold chain logistics ecosystem. This study provides valuable insights into optimal facility location and flow allocation strategies within the context of an energy-conscious supply chain paradigm, significantly enhancing cold supply chains' operational efficiency and environmental sustainability

Keywords: Optimization · Warehouse design · Network design · Food waste · Cold chain.

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10 Model for order lot sizing considering quantity discounts and temporary item deterioration

Model for order lot sizing considering quantity discounts and temporary item deterioration

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Abstract. Effective cost management facilitates the achievement of organizational priorities and contributes to the development of competitive advantages. It also promotes a culture of order and transparency. The growing need for companies to reduce costs in their daily operations and increase profits has led them to focus on logistics activities to help achieve these two goals. In this context, inventory management is where there are more opportunities to reduce costs through better management of stored materials and their transportation.
In this context, this research seeks the development of a simulation model to determine the optimal size of the order lots in the Material Requirements Planning, according to the purchase volume and temporal deterioration of the items. The scientific novelty lies in the exhaustive counting of all the supply strategies that arise when deciding when and how much raw material and/or inputs to purchase. These options grow exponentially as the periods considered in the planning increase, so the aim is to reduce a complex combinatorial problem into a simpler and more controllable one.

Keywords: Optimization · Order lots · Quantity discounts · Deterioration · Exhaustive counting.

11 Mediated Coordination of Fresh Food Growers by Combinatorial Auction

Mediated Coordination of Fresh Food Growers by Combinatorial Auction*

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Abstract. For small fresh food growers, prospects for contractual agreements are limited due to the preference of buyers to work with larger growers so that they must handle fewer transactions. In the United States, where the fresh produce market is plagued with volatile prices, the absence of a contract leaves small growers to take on significant risk when looking to turn a profit for their operation. To alleviate the burden of working with many small growers for a buyer, and to give access to attractive contracts for small growers, the insertion of a new agent into the agricultural supply chain has been proposed: the supply chain articulator. The supply chain articulator is tasked with enabling small growers to form stable coalitions so that they may aggregate their production capabilities to mimic that of a single, large grower. To accomplish this, we propose that the supply chain articulator act as the auctioneer of a reverse combinatorial auction and procure commitments from the growers to satisfy a predetermined contract. This allows the supply chain articulator to determine a stable coalition that is best suited for the opportunity, while maintaining the agency of the participating growers. To showcase the utility of the proposed framework, we walk through some experimental results, discuss their implications, and identify future work.

Keywords: Optimization · Agriculture · Coordination

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12 Machine Learning-based System for Fresh Produce Market Analysis

Machine Learning-based System for Fresh Produce Market Analysis*

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Abstract. The fresh produce market in the United States has often been associated with high variability and volatile prices that may vary according to the product's perishability. Growers, distributors, and other supply chain participants may be able to take advantage of these conditions if the proper information is available to them. Not only would this provide a financial opportunity to the supply chain participants, but it would also address food scarcity events for the benefit of consumers. Unfortunately, publicly available and reliable market data is not easily accessible and may not be curated enough to provide supply chain participants with value-added information to aid their decisions. In this work, a machine learning-based system is developed to bridge this gap.The components of the system each address critical market analyses such as monitoring, signal verification, forecasting, among others. This work presents some of these components and provides case studies to illustrate the framework. Furthermore, we identify future work in this area and provide insights on how this work can be applied to other supply chains, applications, and fields.

Keywords: Machine Learning · Layered System · Fresh Produce

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13 Optimization Model for the Crop Rotation Problem Under Price and Yield Uncertainty

Optimization Model for the Crop Rotation Problem Under Price and Yield Uncertainty*

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Abstract. For fresh food growers, determining what to plant and when to plant it is the fundamental question that must be addressed. Making this an especially difficult task is the variability observed in crop prices and yields. Another dimension to the problem is choosing how to sequentially allocate planting decisions to available land such that profitability is maximized while bearing in mind the sustainability of the operation. To address these issues, we introduce a model formulated as a time-expanded network. To solve instances of the model efficiently, a Lagrangean decomposition approach is utilized to maintain the attractive properties of the problem's network structure. We demonstrate the use of the model through some numerical experiments and then go on to discuss its utility in application for individual growers and for the formation of grower coalitions.

Keywords: Optimization · Agriculture · Planning

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14 Optimal package hierarchy for fruits and vegetables containers in the catering supply chain

Optimal package hierarchy for fruits and vegetables containers in the catering supply chain*

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Abstract. Global food industry stands at a critical crossroads, facing the dual challenge of meeting the ever increasing demand for food products and addressing its environmental and social footprint. Food production and post production operations are recognized as significant contributors to greenhouse gas emissions, accounting for approximately 30 percent of humanmade emissions. Within the Food Supply Chain (FSC) network, numerous stakeholders play pivotal roles in the production of ready to sell food items. The complexity of this system intensifies as more actors become involved. Notably, the food catering supply chain (FCSC), characterized by its multi stage logistic networks, presents a complex scenario suitable for optimizing packaging decisions across primary, secondary, and tertiary package hierarchies. This paper introduces and validates a Mixed Integer Linear Programming (MILP) optimization model, designed to manage the balance between environmental impact, economic feasibility, and operational efficiency when selecting secondary packaging mix at each stage of the FCSC. The generality of the model allows its application to different supply chains or case studies with a broader geography.

Keywords: Reusable Containers · Food Catering Supply Chain · Circular network · MILP · Packaging Sustainability

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15 Navigating Resource Scarcity: Insights into Logistics Challenges and Future Adaptations in Supporting Food Banks Across Europe

Navigating Resource Scarcity: Insights into Logistics Challenges and Future Adaptations in Supporting Food Banks Across Europe*

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Abstract. Food banks (die Tafeln) play an important role in society. In Germany alone, 2 million people visited food banks in 2022 (Schwarz, 2022). Food banks reduce food waste and food loss, and combat hunger by giving surplus food to socially disadvantaged people who need it (Akkerman, Buisman, Cruijssen, de Leeuw, & Haijjema, 2023). Population groups such as senior citizens, families, the poor and refugees are affected. Food waste is bad for reasons such as waste of resources such as land, water, labor, money, and the generation of greenhouse gases like CO2 through its waste (Ma & Liu, 2019). Although relatively affluent countries predominate in Europe, the social situation is worsening, and more and more people are visiting these food banks (Penne & Goedemé, 2021) . There is a top dog here, Die Tafel Deutschland, but there are also smaller, more independent food banks that are run by churches or local authorities, for example. In the DACH region alone, there are almost 1,000 food banks. With inflation, companies seem to be getting better at calculating, developing strategies, and selling (business models), so the supply of food for those in need is decreasing. At the same time, however, refugee crises, inflation and rising social inequalities are increasing the supply of such services in the region. This creates a dilemma of dwindling resources for the food banks and decreasing security of supply for people. In this paper, the authors want to find out what the current situation is regarding the material security of food banks, what problems they are struggling with and what the causes of these problems are. They want to investigate whether all material potentials have already been exhausted or where there are still opportunities for the organisations to continue receiving goods. In this explanatory research, a survey was sent to 1,000 food banks in Europe, over 100 of them already answered. Questions about supply status, food amounts, surpluses and shortages, collection processes and related mechanisms such as the cold chain, market trends, storage facilities and technical and warehouse equipment, problems, delivery status, food quality, and staff availability and acceptance. We also look at legal requirements such as the best-before date, co-operation with authorities and the distribution logistics of the food banks and identify

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possible solutions to the problems faced by the food banks. In this paper, the authors present the food collection processes in the DACH region (Germany, Austria, and Switzerland). To this end, all 1,000 food banks and similar organisations in the region were sent a survey on the topics mentioned. In addition, some representatives of the organisations were questioned in semi-structured interviews to gain in-depth knowledge. The most important factors for the current problems were defined. Based on these findings, the authors have developed practical tips and tricks to improve the current inadequate supply of food banks.

Keywords: Food Banks · Resource Scarcity · Adaptation Governance

1 Design/methodology/approach:

Our study was explorative and both qualitative and quantitative in nature. It considered mostly primary data (surveys and interviews with food bank representatives in the countries Germany, Austria, and Switzerland. In total, about 1000 organizations in the respective area have been asked with over 100 of them responding. We also interviewed 20 of the food banks representatives.

2 Findings:

Our study helps to gain a deeper understanding on the current delivery situation of regional food banks. It helps to identify key problems and sources of current problems. The authors identify practical points of action to improve the food banks' situation and to increase their material resilience.

3 Value:

The study aims to contribute to society by tackling a practical problem and solving it in parts. It helps the food banks' employees to gain insights regarding new, potential solutions to their current material-related problems by transferring ideas from other countries and continents to Europe and by a holistic consideration of the entire food value chain.

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16 Spraying in situ of cornstarch films for use in agricultural soil mulching

Spraying in situ of cornstarch films for use in agricultural soil mulching*

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Abstract. Biodegradable mulches are presented as an alternative to commonly used plastic mulches in horticulture. The objective of this study was to analyze the application of corn starch suspensions using urea as a plasticizer and sodium borate as a crosslinking agent to form films in situ on the soil to be cultivated. The radiometric and mechanical performance of the following gelatinized starch suspensions were evaluated: T1: alkaline gelatinized corn starch suspension, T2: same as T1 with the addition of urea, and T3: same as T2 with the addition of sodium borate. These suspensions were evaluated in a field trial, incorporating a control. Once the mulches were applied, lettuce (Lactuca sativa L.) was transplanted on each treatment. At harvest time, electrical conductivity and pH at 0-5 cm, crop yield, and density and dry matter of the present weeds. In relation to the mechanical and radiometric tests, the presence of additives did not modify the maximum puncture force or UV radiation barrier capacity of films. At the time of crop harvest, the highest number of weeds was found in T0 (105 weeds m-2), with significant differences in the accumulated dry matter in relation to the treatments with mulch (T0>T1=T2=T3). However, the crop yield did not show differences associated with the treatments. The mulches did not modify the EC and pH values, showing values of 1.03±0.2 dS.m-1 and 8.6±0.1, respectively. The application of biodegradable mulches favors weed control without observing deleterious effects on the properties of the soil where they are applied.

Keywords: Corn starch mulching films · Spraying technique · Biodegradable, Agriculture.

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17 Unveiling transport and logistic infrastructure drivers in food security

Unveiling transport and logistic infrastructure drivers in food security*

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Abstract. In recent years, the agrifood sector has faced several challenges like the growth of the global population, increased food demand, climate change threats, and geopolitical instability. Based on scientific and technical innovation, several initiatives are designed to tackle these issues. This paper proposes a framework allowing the identification and analysis of factors related to food security. The aim is to evaluate and visualize the geographic diffusion of reliability dimensions of food supply chains. Based on the main drivers affecting food industry activities, data collection with a focus on the economic, infrastructural, and logistic dimensions is carried out. Geographic, temporal, and product specific data are classified into a relational database. Machine learning models are trained and applied to the database in order to get information about the main dimensions of food security. Based on these outputs, geographic and product specific metrics are developed to assess the reliability of the food supply chain. Graphical elaboration of the results drives the discussion while presenting the main findings on food security geographical features.

Keywords: Agrifood · Transport · Security

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18 Information System for the Digital Transformation of the Control Sub-Process in Changed, Missing, Shrted Dated and/or Damaged Boxes in PEPSICO

INFORMATION SYSTEM FOR THE DIGITAL TRANSFORMATION OF THE CONTROL SUBPROCESS IN CHANGED, MISSING, SHORT DATED AND OR DAMAGED BOXES IN PEPSICO*

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Abstract. The PepsiCo company utilizes SAP ERP as its central information system. However, Chile faces the challenge of modernizing certain processes that are still managed manually. One of these subprocesses is in the reverse logistics arena, which involves the control of boxes arriving with defects. Currently, this process is managed through manual annotations in a notebook, making access to information difficult and slowing down the process. The subsequent transcription of this data into digital format further exacerbates delays. This digital transformation project developed is an information system for managing the defective box control subprocess at the PepsiCo Branch in Talca, Chile. The results obtained include a considerable reduction in the time required to record, analyze, and share information. Consequently, the organization's administrators will be able to dedicate less time to this task and perform it more frequently than once a week. Additionally, the system offers the option of analyzing the frequency of problems based on cash codes and routes, enabling a deeper understanding of the reasons behind these defects, facilitating efforts to minimize them, and ensuring the traceability of the boxes.

Keywords: Information System · · Reverse Logistics · · Digital Transformation.

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