

A mathematical model facilitates inventory management in the food supply chain

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It is a long journey from harvesting in the field to the cooked dish that reaches the dinner table. The food supply chain covers all those processes and the actors involved in satisfying the consumer's needs. To

ensure that the chain is successful requires correct administration of the products in the warehouse, inventory, transport management and coordination between warehouses, transport and destination.

In this sense, the Diverfarming project's research group, framed within work package 6 of the project, in charge of designing and analyzing value chains, and directed by Dr. Francisco Campuzano-Bolarín (Universidad Politécnica de Cartagena) has developed a [mathematical model](#) that facilitates [decision making](#) when planning distribution capacity, and achieves a balance between performance of the inventory and transport in a supply network, taking differing scenarios into account depending on the availability of vehicles.

The model developed is based on the methodology of system dynamics, a recognized way of dealing with problems related to dynamic processes, such as the supply chain. This set of equations, input data and relationships among variables is tested in a frozen products supply chain at national level. This enables managers to determine the best configuration of parameters to obtain the best decision alternative in terms of costs and inventory levels, optimizing the procedure with regard to costs and stock levels.

This model can be applied to supply chains related with diversified crop systems, which is the objective of the Diverfarming project, financed by the European Commission, and seeks to introduce crop diversification into European agriculture to obtain environmental and economic benefits. To do so, they are also working on the design and analysis of value chains, with the aim of facilitating the adoption and dissemination of diversified agroecosystems. This new model represents a further step towards that objective.

A more sustainable industry 4.0

In the context of the fourth industrial revolution or 'Industry 4.0', understood as the actual trend of automation and data exchange which includes the Internet of things and cloud services, a growth in industrialisation that can upset current industrial systems is foreseen.

The increased consumption of resources, global warming, and climate change that can be derived from this situation make it clear that management practices in the production and supply chain taking sustainability into account (economic, social, and environmental) must be adopted as a strategy to face up to the negative effects derived from industry 4.0.

In this line, the research group in the Diverfarming project, framed within work package 6 of the project, in charge of designing and analyzing value chains, and directed by Dr. Francisco Campuzano-Bolarín (Universidad Politécnica de Cartagena) has just had a review of the research carried out thus far on the sustainable supply chain in industry 4.0 published in the journal *Sustainability*. The review concludes that only few studies concern themselves with the social focus of sustainability in industry 4.0., given that the majority tend to focus mainly on habilitating technologies to reduce costs and monitoring. Thus, this work identifies different projects that have adopted sustainability as part of their objectives, as is the case with the H2020 call by the European Commission.

This work, framed within the Diverfarming project, encourages future research lines to center on referring to a sustainable [supply chain](#) from three perspectives: economic, environmental and social, in an integrated manner.

More information: Héctor Cañas et al, A General Outline of a Sustainable Supply Chain 4.0, *Sustainability* (2020). [DOI: 10.3390/su12197978](https://doi.org/10.3390/su12197978)

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