Lluís Miquel Plà Aragonés, Ph.D.

Associate Professor

Department of Mathematics Universitat de Lleida JaumeII, 73 E-25003 Lleida Spain

Tel:+34-973 70 33 18 Fax: +34-973 70 27 16 E-mail: lluismiquel.pla@udl.cat

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Research interests

Operations Research mainly in Agriculture. Herd Management and Markov Decision Models. Decision models applied to livestock production systems. Decision Support Systems. Planning and management, performance analysis and optimization of natural resources, deterministic and stochastic scheduling.

Education

- PhD. University of Lleida (2001)
- MSc in Computational Engineering and Mathematics, URV-UOC (2023)
- BSc in Mathematic Sciences, Universidad Nacional de Educación a Distancia (1999)
- Agronomic Engineer, University of Lleida (1991)

Awards

- Research Grant for project " Methodology of Sow Selection by Litter Size" [METODOLOGIA DE LA SELECCION DEL TAMAÑO DE LA CAMADA EN PORCINO] (Institut d'Estudis Ilerdencs), Local Research Program on Advanced Technologies, 1990.
- Special mention to the work entitled "SIDICON a dynamic simulator for the contingent in the Spanish Army". [SIDICON: SIMULADOR DINÁMICO DEL CONTINGENTE DE TROPA PROFESIONAL] OR Awards "General Fernández-Chicarro" Spanish Ministry of Defence. 2000.
- Best paper award: Discrete Event Simulation of a Pigmeat Packing Plant, presented in the International Food Operations and Processing Simulation Workshop, 2017

Professional Experience

Universitat de Barcelona, Barcelona, Spain
Assistant Professor, Faculty of Laws and Economics, 2/92-2/93
Institut de Recerca i Tecnologies Agroalimentàries (IRTA) , Lleida, SPAIN
Research Fellow, Area of Animal Production, UdL-IRTA R+D Center, 2/92-2004
Universitat de Lleida, Spain
Associate Professor, Faculty of Laws and Economics, Dept. of Mathematics, 2/93-present
Agrotecnio Center , Lleida, SPAIN
Senior Research Fellow, Area of Animal Science, 2014-present
Army of Spain, Lleida, Spain
Second Lieutenant (SEFOCUMA-ET), 4th Engineer Division, 11/93-4/94

Publications

Scientific papers. Indexed SCI

- Mateo, J.; Soto, W.; González, M; Plà-Aragonès L.M. and Solsona F. (2023) Managing quality, supplier selection and cold storage contracts in agri-food supply chain through stochastic optimization. *International Transaction in OR,* 30 (4), 1901-1930 doi :10.1111/itor.13069

- Nadal-Roig, Esteve, Lluís Miquel Plà-Aragonès, and Víctor Manuel Albornoz (2023) Supply Chains: Planning the Transportation of Animals among Facilities *Sustainability* 15, no. 3: 2523. doi : 10.3390/su15032523

- Lamnatou, Chr.; X. Ezcurra-Ciaurriz, D. Chemisana and L.M. Pla-Aragones (2022) Life Cycle Assessment (LCA) of a food-production system in Spain: Iberian ham – an extensive system. *Science of the Total Environment*. 808:151900 doi: 10.1016/j.scitotenv.2021.151900

- Mateo, J., Pagès-Bernaus, A., Pla-Aragones, L.M., Castells-Gasia, J.P., Babot-Gaspa, D. (2021) An Internet of Things Platform Based on Microservices and Cloud Paradigms for Livestock *Sensors* doi: https://doi.org/10.3390/s21175949

- G. Abella, A. Pagès-Bernaus, R.N. Pena, J. Estany, L. Fraile, L. Pla-Aragones (2021) Using PRRSV-Resilient Sows Improve Performance in Endemic Infected Farms with Recurrent Outbreaks *Animals* doi: https://doi.org/10.3390/ani11030740

- Plà-Aragonés, L. M., Pagès-Bernaus, A., Nadal-Roig, E., Mateo-Fornés, J., Tarrafeta, P., Mendioroz, D., Pérez-Cànovas, L., & López-Nogales, S. (2020). Economic Assessment of Pig Meat Processing and Cutting Production by Simulation, *International Journal of Food Engineering*, 16(5-6), 20180100. doi: https://doi.org/10.1515/ijfe-2018-0100

- Nadal-Roig, E., Plà-Aragonès, L.M., Pagès-Bernaus, A.; Albornoz, V.M. (2020) A two-stage stochastic model for pig production planning in vertically integrated production systems. *Computers and Electronics in Agriculture,* 176, 2020105615. https://doi.org/10.1016/j.compag.2020.105615

- Mateo, J.L.; Pla, L.M.; Solsona, F. ; Adela Pagès (2019) A Scalable Parallel Implementation of the Cluster Benders Decomposition Algorithm. *Cluster Computing* 22: 877. https://doi.org/10.1007/s10586-018-2878-4

- Nadal, E.; Plà L.M. and Alonso, A. (2019) Production Planning Of Supply Chains In The Pig Industry. *Computers and Electronics in Agriculture*. 161 : 72-78 doi.org/10.1016/j.compag.2018.08.042

- Rodriguez, SV. ; L.M. Pla and R. de Castro (2019) Insights into marketing decisions on fattening farms. *Animal Production Science.* 59(6): 1126-1135 doi.org/10.1071/AN17360

- Nadal, E.; Pages, A. and Plà L.M. (2018) Bi-Objective Optimization Model Based on Profit and CO2 Emissions for Pig Deliveries to the Abattoir. *Sustainability*. 10 : 1782 dx.doi.org/10.3390/su10061782

- Soto-Silva, W. E.; M.C. González-Araya; M. A. Oliva-Fernández and L.M. Pla-Aragones (2017) Optimizing fresh food logistics for processing: Application for a large Chilean apple supply chain. *Computers and Electronics in Agriculture*. 136: 42–57 dx.doi.org/10.1016/j.compag.2017.02.020

- Lamnatou, Chr.; X. Ezcurra-Ciaurriz, D. Chemisana and L.M. Pla-Aragones (2016) Environmental assessment of a pork-production system in North-East of Spain focusing on life-cycle swine nutrition. *Journal of Clean Production.* 137: 105–115 dx.doi.org/10.1016/j.jclepro.2016.07.051

- Mateo, J.; L. M. Pla; F. Solsona and A. Pagès (2016) A Production Planning model considering uncertain demand using two-stage stochastic programming in a fresh vegetable supply chain context . *SpringerPlus* 5:

839. doi:10.1186/s40064-016-2556-z

- Soto-Silva, W. E.; E. Nadal-Roig; M.C. González-Araya and L.M. Pla-Aragones (2016) Operational Research Models applied to the Fresh Fruit Supply Chain. *European Journal of Operational Research*. 251: 345-355. doi: 10.1016/j.ejor.2015.08.046

- Fernandez, Y.; Bono, C.; Babot, D. and Pla, L.M. (2015). Impact of prolificity in sow replacement policies [Impacto de la prolificidad en las políticas de remplazo en explotaciones porcinas]. *ITEA* 11-2: 127-141. doi: 10.12706/itea.2015.009 (pdf)

- Nadal, E. and L.M. Plà (2014) Multiperiod planning tool for multisite pig production systems. 92:4154-4160. doi: 10.2527/jas.2014-7784

- Plà, L.M.; Sandars, D. and Higgins, A. (2014) A perspective on Operational Research prospects for agriculture. *Journal of the Operational Research Society*. 65: 1078–1089. doi:10.1057/jors.2013.45

- Rodriguez, S.; L.M. Plà and J. Faulin (2014) New opportunities in operations research to improve pork supply chain efficiency. *Annals of Operations Research*. 219: 5-23. doi: 10.1007/s10479-013-1465-6

- Lopez-Milan, E.and Plà-Aragonés L.M. (2014) A decision support system to manage the supply chain of sugar cane. *Annals of Operations Research*. 219: 285-297. doi: 10.1007/s10479-013-1361-0

- Rodriguez, S.; Plà L.M. and Albornoz, V. (2012) Modelling tactical planning decisions through a linear optimization model in sow farms. *Livestock Science*. 143: 162-171 (pp)

- Rodriguez, S.; Jensen, T.B.; Plà, L.M. and Kristensen, A.R. (2011) Optimal replacement policies and economic value of clinicla observations in sow herds. Livestock Science. 138: 207-219.

- Rodriguez, S.; Albornoz, V. and Plà L.M. (2009) A two-stage stochastic programming model for scheduling replacement in sow farms. *TOP*. 17(1): 171-189 (pp)

- Plà, L.M., F. J. Faulin and S.V. Rodríguez (2009). A Linear Programming Formulation of a Semi-Markov Model to Design Pig Facilities. *Journal of Operational Research Society.* 60: 619-625

- Plà, L.M. (2007). Review of matehmatical models for sow herd management. *Livestock Production Sciences*. 106: 107-119 (pp)

- López, E., Miquel S., and Pla, L.M., (2006). Sugar cane transportation in Cuba, a case study. *European Journal of Operational Research*. 174: 374-386

- Marín, J.M., Pla, L.M. and Ríos, D. (2005). Inference for some stochastic process models related with sow management. *Journal of Applied Statistics.* 32(8): 797-812

- Pla, L.M., Pomar, C. and Pomar, J. (2004). A Decision Support System based on a Markov decision sow model. *Computers and Electronics in Agriculture*. 45(1-3): 51-69

- Pla, L.M., Pomar, C. and Pomar, J. (2003). A Markov Decision Sow Model representing the productive lifespan of herd sows. *Agricultural Systems* 76: 253-272.

Other Scientific papers

- Rendon-Benavides, R., Perez-Franco, R., Elphick-Darling, R., Plà-Aragonés, L.M., Gonzalez Aleu, F., Verduzco-Garza, T. and Rodriguez-Parral, A.V. (2023) In-transit interventions using real-time data in Australian berry supply chains, *The TQM Journal,* 35 (3), 759-777 doi :10.1108/TQM-11-2021-0319

- Pla-Aragones, L.M., A. Pagès-Bernaus, E. Nadal Roig, J. Mateo-Fornés, (2020) A propósito del momento óptimo de envío de los cerdos de engorde al sacrificio. EUROCARNE. 284: 13pp

- Pla-Aragones, L.M., A. Pagès-Bernaus, J. Mateo-Fornés, P. Tarrafeta, D. Mendioroz (2018) Modelo de

simulación para salas de despiece. EUROCARNE. 270: 45-56

- Jesús E. Espinola, Lluis M. Plá, Eddy J. Montañez, Jorge W. Leyva y Vladimir A. Cáceres (2016) Evaluación de la sustentabilidad del sistema agrícola de la comunidad de Huapra (Perú). *Revista de Investigación Operacional*. 34(1): 91-100 (pdf)

- Ezcurra, X. and Plà, L.M. (2015) Application of Cost-Benefit Analysis To Evaluation Ex-Post of Agrarian Public Policy: Interventions of The Structural Funds for The Period 2000-2008 in Spain. Revista Galega de Economía, 24-3

- Mateo, J., Jordi Vilaplana, Lluís M. Plà, Josep Lerida and Francesc Solsona (2014) A Green Strategy for Federated and Heterogeneous Clouds with Communicating Workloads, *The Scientific World Journal* Article ID 273537 doi: 10.1155/8086

- Montufar Benítez, M.A., Plà Aragones, L.M., Serrato Garcia, M.A., Montaño Arango, O. and Corona Armenta, J.R. (2014) Evaluation of Replacement Policies in Sow Farms Using Arena^{TM} Simulation Software. Intelligent Control and Automation, 5, 126-135. (pdf)

- Plà-Aragonés L.M.; Rodriguez-Sanchez, S. and Rebillas-Loredo, V. (2013) A mixed integer linear programming model for optimal delivery of fattened pigs to the abattoir. *Journal of Applications in Operations Research.* 5: 164-175 (pdf)

- Montufar-Benítez, M. A.; Plá-Aragonés, L.M.; Serrato-García, M.A. and Braña-Varela, D. (2013) Analysis of replacement policies in sow farms by simulation. [Análisis y simulación de políticas de reemplazo en granjas de explotación porcina] *Revista de Investigación Operacional.* 34: 128-139 (pdf)

- Ezcurra, X. and Plà, L.M. (2011) AnaPorkDSS: A decision support system to evaluate pig production economics. *Proyecto Social*. 14: 23-44 (pdf)

- Soldevila, C., Abella, S., García, E., Hermida, B., Cortés, A., Ezcurra, X., Plà, L.M. y Babot, D. (2010) Survey of the Pig sector in Catalonia [Observatorio del porcino de Cataluña]. *Suis*. 71:54-59

- Plà Aragonés, L.M. (2010) OR in Agriculture. *ORMS Today* April 2010: 34-38 (html)

- Plà, L.M., Rodríguez, S.V., Fonseca, P., Juan, A. A. and Faulin, J. (2009). Learning Operations Research Online: Benefits, Challenges, and Experiences. *International Journal of Simulation and Process Modelling.* 5: 42-53

- Scarpari, M.S., Plà-Aragonés, L.M. and Ferreira de Beauclair, E.G. (2008). Optimisation of crop varieties of sugar cane [La optimización del cultivo de variedades de caña de azúcar]. *Revista de Investigación Operacional* 29(1): 26-34 (pdf)

- Pérez-Lechuga, G., Karelyn, A.A., Muñoz-Oran, M. and Pla-Aragones, L.M. (2005). Stochastic analysis of operations decoupling in flexible manufacturing systems. *WSEAS Transactions on Systems* 4(11): 2138-2143

- Pla, L.M., Babot, D. and Pomar, J. (2004). A mathematical model for designing and sizing sow farms. *International Transactions in Operations Research.* 11: 485-494

- Pérez-Lechuga, G., Alvarez-Suarez, M., Pla-Aragones, L.M. and Muñoz-Oran, M., (2004). Mathematical characterization of the performance in a CONWIP line as a function. *WSEAS Transactions on Systems* 3(3): 1176-1181

- Babot, D., Ferrer D., Andrés, N. and Pla, L.M., (2004). Management Information Systems for Sow Breeding Farms [Sistemas de información para la gestión de explotaciones de reproductoras porcinas]. *Avances en tecnología porcina* Vol I/Feb 2004: 42-52

- López, E., Miquel S., and Pla, L.M., (2004). The transportation problem of sugar cane in Cuba [El problema del Transporte de azùcar de caña en Cuba]. *Revista de Investigación Operacional* 25(2): 148-157 (pdf)

Some recent work under review

- Wladimir E. Soto-Silva, Nicolas Reyes Reyes, Marcela C. González-Araya, Lluís M. Pla-Aragonés, Esteve Nadal-Roig (2023) Cold chain management in fresh fruit supply chains using a metaheuristic modeling approach. Submitted to *Computers and Industrial Engineering*

- Mateo-Fornes, J.; Borrell, K.; Solsona, F.; Pla-Aragones, L.M.; Pages-Bernaus, A.; Vilaplana, J. (2022) SPOS, a new cloud-based service for solving optimization models. Submitted to *Software Tools for Technology Transfer.*

Refereed conference proceedings

- Plà, L.M., Conde, J. and Pomar, J. (1996). Stochastic Dynamic Programming, the sow replacement problem. In *Proceedings of the Third Catalan days on Applied Mathematics,* J. Chavarriga and J. Giné (eds.), Lleida, Spain.

- Plà, L.M. and Pomar, J. (1999). Practical problems on sow herd management optimisation. In *EFITA 99: Proceedings of the 2nd Conference of the European Federation for Information Technologies in Agriculture*, G. Scheifer, R. Helbig and U. Rickert (eds.), Bonn, Germany.

- Moltó, M. and Plà, L.M. (2000). Measuring technical efficiency in sow farms: a DEA approach. In *Proceedings of the International Symposium on pig herd management modelling and information technologies related,* L.M. Plà and J. Pomar (Eds.), Lleida, Spain.

- Plà, L.M., Babot, D. and Pomar, J. (2000). An application of a herd model in the sow farm designing and sizing. In *Proceedings of the International Symposium on pig herd management modelling and information technologies related,* L.M. Plà and J. Pomar (Eds.), Lleida, Spain.

- Plà-Aragones, L.M. (2005). A stochastic model for planning swine facilities. In *Proceedings of the 2005 Winter Simulation Conference*, Kuhl, Steiger, Armstrong and Joines (Eds), Orlando, Fl, USA (pdf)

- Plà-Aragones, L.M.; Flores-Marias, V; Rodríguez-Sanchez, S.V. (2008). A simulation model for intensive piglet production systems. In *Proceedings of the 2008 Winter Simulation Conference*, Miami, Fl, USA (pdf)

- Wladimir E. Soto-Silva, Marcela C. González-Araya, Lluis M. Pla-Aragones and Esteve Nadal-Roig (2016) Transport Planning in Processing Plants for the Fruit Industry. In Proceedings of 5th the International Conference on Operations Research and Enterprise Systems – ICORES (pdf)

- Plà-Aragones, L.M.; Pagès-Bernaus, A; Fraile-Sauce, L.; Abella-Falcó, G. (2018). Use of simulation to estimate economic performances of two phenotypes of sows. In *Proceedings of the 2018 Winter Simulation Conference*, Gotteborg, SE

Books & Book chapters

- Pla-Aragones, L.M. 2021. The Evolution of DSS in the Pig Industry and Future Perspectives. In: Papathanasiou J., Zaraté P., Freire de Sousa J. (eds) EURO Working Group on DSS. Integrated Series in Information Systems. Springer, Cham. https://doi.org/10.1007/978-3-030-70377-6_16

- Mateo J., Florensa D., Pagès-Bernaus A., Plà-Aragonès L.M., Solsona F., Kristensen A.R. 2021. A Cloud-Based Decision Support System to Support Decisions in Sow Farms. In: Krause P., Xhafa F. (eds) IoT-based Intelligent Modelling for Environmental and Ecological Engineering. Lecture Notes on Data Engineering and Communications Technologies, vol 67. Springer, Cham. https://doi.org/10.1007/978-3-030-71172-6_10.

- Pla-Aragones, L.M. 2015. Handbook of Operations Research in Agriculture and the Agri-Food Industry. Springer-Verlag. New York. XIV, 464 doi: 10.1007/978-1-4939-2483-7

- Pla, L.M. 2010. DSS in Pig Production Systems. In: Basil Manos; Nikolaos Matsatsinis; Konstantinos Paparrizos; Jason Papathanasiou (Eds), DSS in Agriculture, Food and the Environment. IGI-Global. New

York 101-117

- Montufar, M., H.R. Flores, N. Hein, J.F. López, O.F. Martinez, S. Miquel, J. Medina, L.M. Plà, A. Redchuck and G. Santori. 2009. Operational Research. [Investigación de Operaciones]. Ed. Patria. Mexico D.F. México.
- Pla, L.M. and Babot, D., 2009. Sizing housing facilities in sow farms: mathematical and simulation models [Dimensionamiento de alojamientos: utilización de modelos matemáticos y de simulación]. In: Forcada, F., D. Babot, A. Vidal and C. Buxadé (Eds), [Diseño de alojamiento e instalaciones]. Ed. Servet. Zaragoza. Spain.
- Pomar, J.; L.M. Plà, 2008. Evolución de las herramientas informáticas de ayuda en las tareas de gestión de las explotaciones porcinas. In: Babot, D. (Ed.), La Gestión Técnica de las Explotaciones Porcinas en España. Ministerio de Medio Ambiente, medio rural y marino. Madrid.
- Plà, L.M.; J. Pomar, 2008. Sistemas de ayuda a la toma de decisiones. In: Babot, D. (Ed.), La Gestión Técnica de las Explotaciones Porcinas en España. Ministerio de Medio Ambiente, medio rural y marino. Madrid.
- Pla, L.M., Moltó and M. Ezcurra, X., 2006. Use of DEA to measure technical efficiency on sow farms. In: Estany, J. (Eds), Agriculture and Agri-food Production in Perspective. Profile of the Sector in Catalonia. Edicions de la UdL, Lleida, Chapter 11.
- Plá, L.M. 2001. Aplicación de los modelos de simulación en la toma de decisiones. In: D. Babot: Gestión de Empresas de Producción Porcina. UdL. Lleida. pp 197-220.
- Plá, L.M. ; Conde J. and Pomar, J., 1998. Sow model for decision aid at farm level. In: Giron, F.J. (Eds.), Applied Decision Analysis. Kluwer Academic Publishers, Boston, 47-62.

PhD Dissertation

Plà, L.M. (2001). *Sow herd modelling for practical on-farm decision support.* PhD Dissertation, Dep. of Mathematics, University of Lleida.

Teaching

Mathematics (1st quarter), Faculty of Law and Economics, UdL.

Operational Research (1st quarter), Faculty of Law and Economics, UdL.

Applied Statistics (2nd quarter), Agronomic School, UdL

Simulation Methods applied to agricultural Engineering (Doctorate course), UdL.

Conference Presentations

COMPSTAT, Barcelona, Spain (09/96); EFITA 97, Copenhaguen, Denmark (07/97), Workshop on Decision Analysis Applications, Madrid, Spain (6/97), EFITA 99, Seminar on Herd Management Optimisation, Bonn, Germany (7/99); EURO, Budapest, Hungary (6/00); IFORS meeting, Edinburg, UK (7/02); CLAIO, Concepción, Chile (11/02); EURO, Istanbul, Turkey (7/03); INFORMS annual meeting, Atlanta, USA (10/03); CLAIO, La Havana, Cuba (11/04); APMOD, Madrid, Spain (06/06); EURO, Reykjavik, Iceland (7/06); CLAIO, Montevideo, Uruguay (11/06); EURO, Prage, Czech Rep.(7/07); CLAIO, Cartagena, Colombia (09/08);OR50, York, UK (09/08);INFORMS Washington, USA (10/08); EURO, Bonn, Germany (07/09); EURO, Lisbon, Portugal (07/10); IFORS, Melbourne, Australia (07/11); EURO, Vilnius, Lituania (07/12); EURO, Rome, Italy (07/13) ; IFORS, Barcelona, E (07/14); EURO, Glasgow, UK (07/15), EURO, Poznan, PL (07/16), CLAIO, Santiago, CL (09/2016), BigDSSAgro, Montevideo, U (09/2017), EURO,Valencia, E (07/2018), BigDSSAgro, Lleida, E (07/2018), CLAIO, Lima (09/2018), BigDSSAgro, Valparaiso, CL (09/2019), Athens, Greece (07/2021), EURO, Helsinki, Finland

(07/2022), IFOR, Santiago, Chile (07/2023)

and more thirty nine presentations in national congress or meetings on Statisitcs and Operational Research and Agricultural Economics.

Invited Seminars & Talks

Université de Perpignan (3/98); University of Bonn (6/99); Rey Juan Carlos University (12/00 and 11/01). University of Sevilla (5/05); Public University of Navarre (6/05); Benemérita Universidad de Puebla (Mx, 01/06); Universidad de Chile (11/06); Cranfield University (04/08); Universidad de Holguin (Cu, 02/09); Universidad de Talca (Ch, 10/09); Tilburg University (NL, 07/10); Mendel University (Cz, 09/10); Copenhaguen University (DK, 05/11); Tilburg University (NL, 09/12); Universidad de Talca (Ch, 09/13); Universidad Nacional Santiago Antunez de Mayolo (Pe, 09/2013); Universidad de Talca (Ch, 04/14); University of Leeds (UK, 07/15), Public University of Navarre (2/16); Pontificia Universidad Católica, Santiago (CL 03/2018); ELAVIO Chile (03/2018); Landscape Management Praha (CZ 09/2018); Universidad Tecnica Federico Santa Maria, Santiago (CL 09/2019); Pontificia Universidad Católica, Santiago (CL 09/2019)

Others

Co-ordinator of the EURO Working Group of Operations Research in Agriculture and Forest Management

Co-ordinator of the BigDSS Agro project: Big Data and Decision Support Systems in Agriculture

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