XUNTA DE GALICIA
CONSELLERÍA DE EDUCACIÓN, UNIVERSIDADE E FORMACIÓN PROFESIONAL

USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

CAMPUS TERRA

CAMPUS VIDA
CAMPUS DE EXCELENCIA INTERNACIONAL

Agrupación Estratéxica de Investigación do Campus Terra da USC **Biorrecursos: Desenvolvemento e Producción Sostible 'BioReDes'**

Grupo de investigación:

BioMODEM GI-1720

"MODelización, Enerxía e Mecanización en Biosistemas"

MODelización, Enerxía e Mecanización en Biosistemas

BioMODEM

Grupo de Investigación - 1720

María Dolores Fernández

Departamento de Enxeñaría Agroforestal

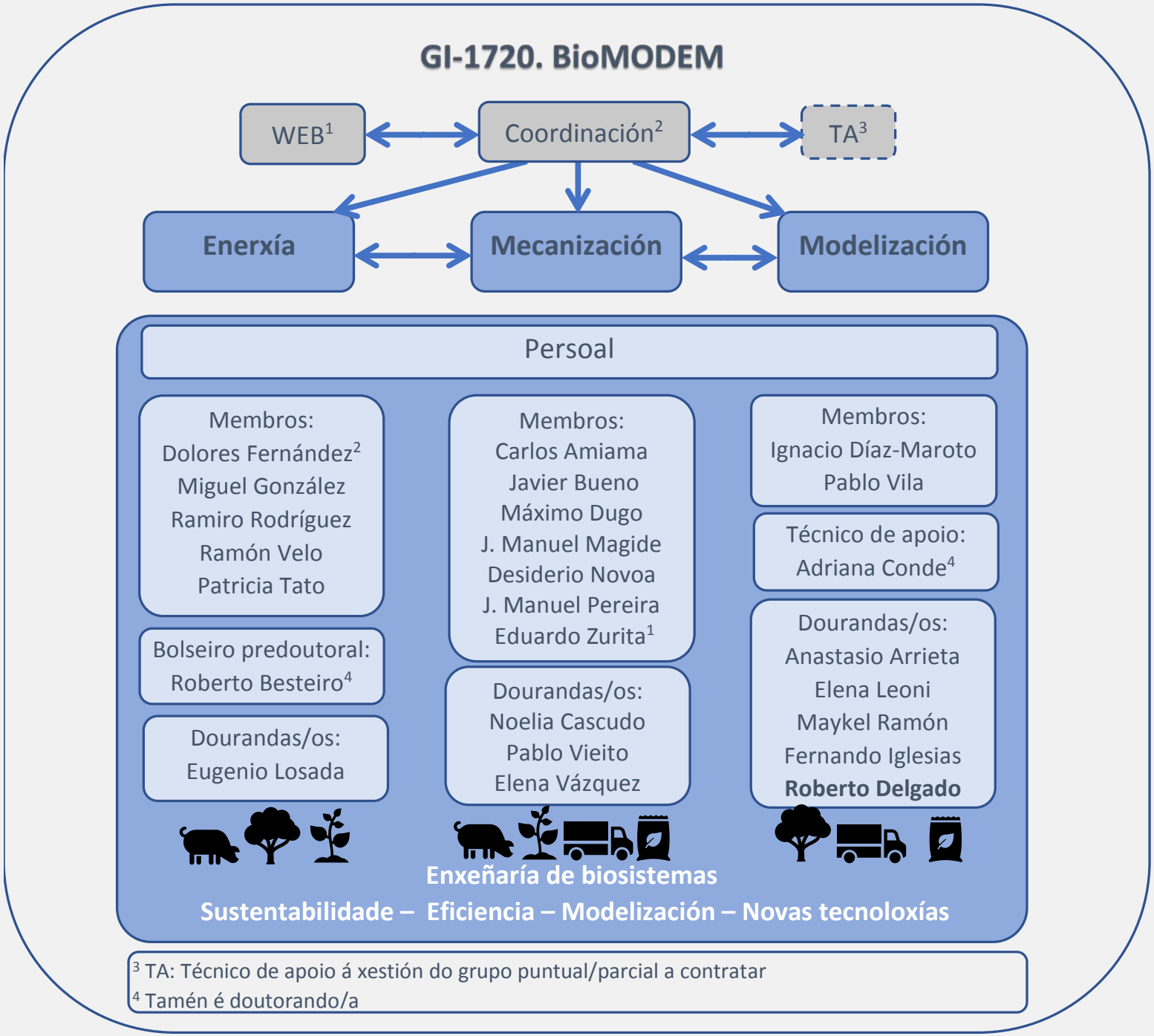
Presentación

BioMODEM

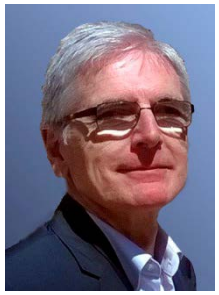
MODelización, Enerxía e Mecanización en Biosistemas

- 14 profesor@s de enxeñaría, 10 deles doutores
- 17 sexenios
- 2 investigadores en formación
- 6 TD lidas no período 2015-2017
- 9 doutorand@s

Organigrama



Persoal do grupo


Ramón Velo


Miguel González


Ramiro Rodríguez


Dolores Fernández


Patricia Tato


Roberto Besteiro


Carlos Amiama


Javier Bueno


Máximo Dugo


José M.Magide


Desidero Novoa


José M.Pereira


Eduardo Zurita


Ignacio Díaz-Maroto


Pablo Vila


Adriana Conde

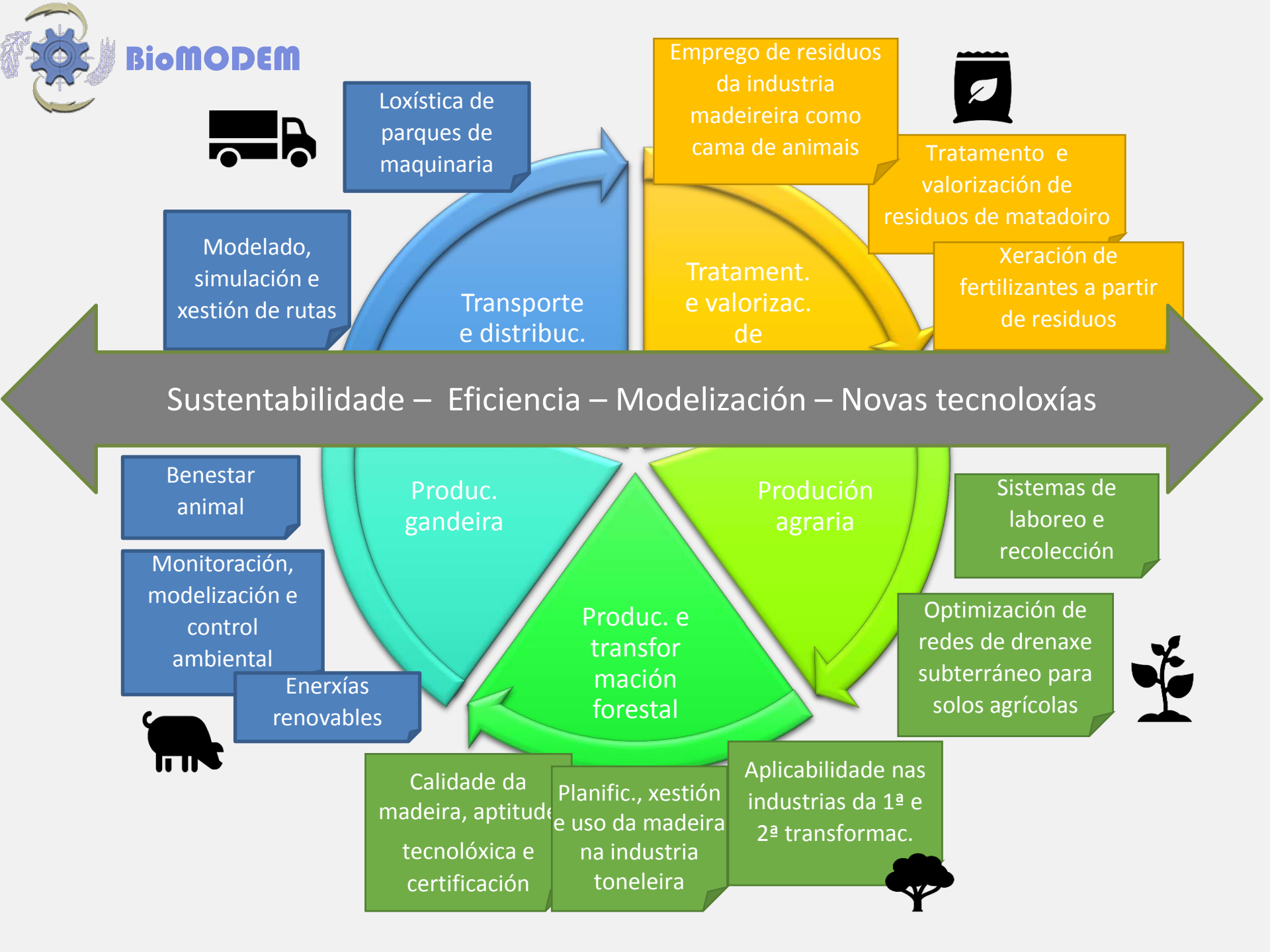
Liñas de investigación

BioMODEM

MODelización, Enerxía e Mecanización en Biosistemas

Multidisciplinar cun enfoque de bioeconomía circular dos biosistemas agrícola, gandeiro e forestal

Visión integral de explotación


BioMODEM
Loxística de parques de maquinaria
Modelado, simulación e xestión de rutas
Transporte e distribuc.
Emprego de residuos da industria madeireira como cama de animais
Tratamento e valorización de residuos de matadoiro
Xeración de fertilizantes a partir de residuos
Tratament. e valorizac. de
Sustentabilidade – Eficiencia – Modelización – Novas tecnoloxías
Benestar animal
Monitoración, modelización e control ambiental
Enerxías renovables
Produc. gandeira
Produc. e transfor mación forestal
Produción agraria
Sistemas de laboreo e recolección
Optimización de redes de drenaxe subterráneo para solos agrícolas
Calidade da madeira, aptitude tecnolóxica e certificación
Planific., xestión e uso da madeira na industria toneleira
Aplicabilidade nas industrias da 1ª e 2ª transformac.

Resultados

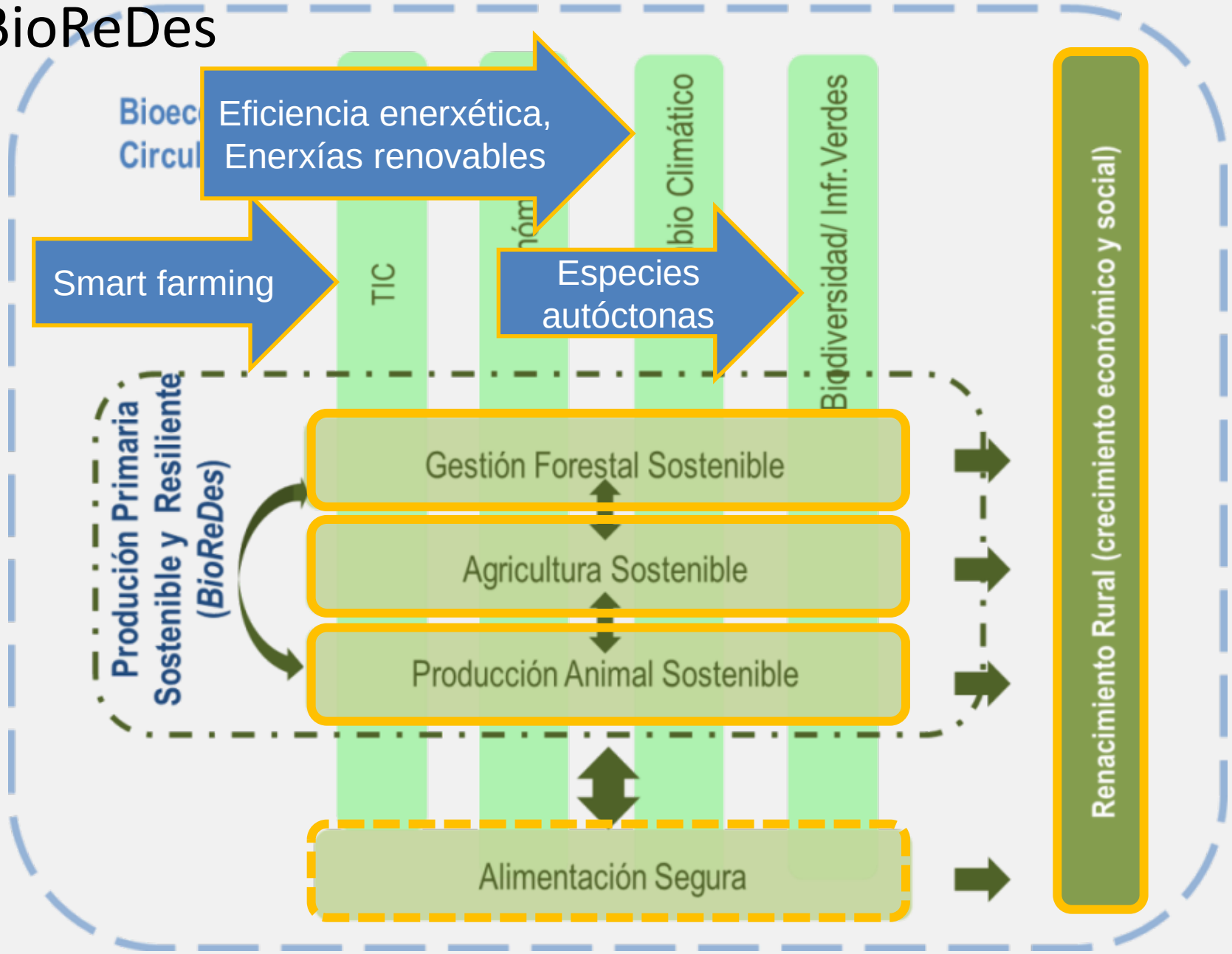
- 15 publicacións indizadas no WOS no período 2015-2017
- máis de 100 congresos e reunións científicas
- 2 Patentes en explotación
- Relación con numerosas empresas: Feiraco, Irmandiños, NORTAGRO, EXPORGONDO, General Ganadera Gallega, Irish Distillers Limited, etc.
- Captación de fondos nos últimos 3 anos de 159.862,64 €

- **Captación de fondos en infraestruturas en de 115.000,00 €: Monitor multigás fotoacústico para a medición de concentracións de NH_3, NO_x, CH_4 y CO_2 no ámbito agropecuario e agroindustrial**

Outras actividades

- Estadías en distintos países e grupos de investigación: Universidade de Wageningen, Escola Superior Agrária de Coimbra, Universidade de Aarhus e Escola Superior Agraria de Ponte de Lima.
- Premio Empresa EBT no XVI Concurso de Proxectos Empresariais Innovadores da USC e o primeiro premio nos III Premios á Transferencia de Tecnoloxía en Galicia, na modalidade de Grupos Científicos de Investigación Aplicada.
- Pólo de Innovación Dixital de Galicia de Campus Terra e Gradiant

BioReDes


Eficiencia enerxética,
Enerxías renovables
Smart farming
Especies
autóctonas
TIC
bio Climático
Biodiversidad/ Infr.Verdes
Renacimiento Rural (crecimiento económico y social)
Producción Primaria
Sostenible y Resiliente
(BioReDes)
Gestión Forestal Sostenible
Agricultura Sostenible
Producción Animal Sostenible
Alimentación Segura

Renewable and Sustainable Energy Reviews 39 (2014) 883–890

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

An economic analysis of a stand-alone and grid-connected cattle farm

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ARTICLE INFO

Article history:
Received 12 February 2014
Received in revised form
27 May 2014
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Keywords:
Off-grid
Stand-alone system
Hybrid system

ABSTRACT

This paper presents an economic study of electricity supply to a dairy cattle farm of 50 livestock units. We compared a stand-alone battery-wind-diesel hybrid system with an only-grid connected system and we analyzed four locations in Spain with different average wind speeds. The farm's electricity demand is 63 kWh/d and the hybrid system designed for its supply is made up of a 20 kW wind turbine, a diesel generator and a battery. All simulations were made with the HOMER© (Hybrid Optimization Model for Electric Renewables) software. Through a sensitivity analysis we can determine the economic viability of different options and sizes of the components of the installation.

In locations with an average wind speed higher than 7.39 m/s, a stand-alone system is profitable as long as the distance to the grid is higher than 7 km, the price of electricity is 0.192 €/kWh and diesel price is 1.8 €/L. If 800 Ah-battery is used instead of 200 Ah, the COE will be reduced by 18% in location with 7.39 m/s average wind speed.

Journal of Cleaner Production 142 (2017) 4327–4338

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Life Cycle Assessment of pig production: A case study in Galicia

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ARTICLE INFO

Article history:
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Keywords:
Environmental profile
Spain
Pigmeat production
Intensive pig farming
ep-EROI

ABSTRACT

The environmental assessment of a pig farming system from a cradle-to-farm gate perspective was carried out in this study. To do so, two separated farms destined to the weaning and fattening of pigs were analysed in Galicia (Northwest Spain). The standard framework of the Life Cycle Assessment (LCA) was followed to assess the environmental performance of the global process. Six impact categories were selected, including climate change (CC), terrestrial acidification (TA), freshwater eutrophication (FE), marine eutrophication (ME), agricultural land occupation (ALO) and fossil depletion (FD). The edible protein energy return on investment ratio (ep-EROI) was also considered. The fattening farm related activities were the main contributor to the global environmental burdens in almost all impact categories, with contributions higher than 72%. Both concentrate feed production and on-farm emissions were detected as the principal *hotspots*, mainly due to the burdens associated with concentrate feed ingredients production as well as those derived from the manure management process, respectively. The characterisation results in terms of CC (3.4 kg CO_2 eq), FD (12.5 MJ) and ALO (5.0 m^2 yr) were consistent with similar European LCA studies on pigmeat production while uncertainty in LCA choices was the main responsible of minor variability on TA, FE and ME. The ep-EROI value (7.3%) was also in line with published data. Due to the relevance of concentrate feed production on the global environmental profile, several feeding strategies were proposed as potential environmental improvements, of which the introduction of local ingredients seemed the most promising alternative.

Computers and Electronics in Agriculture 143 (2017) 201–207

Contents lists available at ScienceDirect

Computers and Electronics in Agriculture

journal homepage: www.elsevier.com/locate/compag

Original papers

Prediction of carbon dioxide concentration in weaned piglet buildings by wavelet neural network models

Roberto Besteiro*, Tamara Arango, J. Antonio Ortega, M. Ramiro Rodríguez, M. Dolores Fernández, Ramón Velo

Department of Agroforestry Engineering, University of Santiago de Compostela, Campus Universitario, 27002 Lugo, Spain

ARTICLE INFO

Keywords:
Wavelet transform
Neural network
CO_2 concentration
Piglets
Prediction

ABSTRACT

Carbon dioxide concentration is a major factor in air quality, animal welfare and air exchange rates inside livestock buildings. CO_2 concentration series show a dynamic, non-linear and non-stationary behavior. This type of process can be handled by Wavelet Neural Network (WNN) models, which have been developed in recent years. The purpose of this paper is to develop WNN models capable of predicting the dynamics of CO_2 in weaner buildings.

Outdoor temperatures, CO_2 concentration and temperature in the animal zone and animal activity were recorded in a commercial piglet farm during two complete production cycles. Two WNN models were generated from the recorded data: an autoregressive model (AM) that used the CO_2 series and outdoor temperatures for the prediction, and an explanatory model (EM) that used only exogenous variables, namely outdoor temperature, temperature in the animal zone and animal activity.

Because CO_2 is a highly autoregressive variable, the best results are obtained with the AM. The AM yield an RMSE of 26.330 ppm and a Pearson's r of 0.995. The EM, with an RMSE of 154.361 ppm and a Pearson's r of 0.895, reveal the importance of indoor and outdoor temperatures and, consequently, of ventilation rate, for CO_2 concentration inside the building. In addition, our results show the effects of animal activity on CO_2 concentration, which are delayed by 40–50 min. Based on these results, the CO_2 concentrations in the animal zone of weaner buildings can be accurately predicted by WNN models. Therefore, WNN modeling could be widely used to predict and understand the dynamics of environmental variables inside livestock buildings.

BIOSYSTEMS ENGINEERING 173 (2018) 85–92

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/issn/15375110

Special Issue: Engineering Advances in Precision Livestock Farming

Research Paper

Estimation of patterns in weaned piglets' activity using spectral analysis

*Roberto Besteiro**, *Tamara Arango*, *Manuel R. Rodríguez*, *María D. Fernández*, *Ramón Velo*

Department of Agroforestry Engineering, University of Santiago de Compostela, Campus Universitario, 27002 Lugo, Spain

ARTICLE INFO

Article history:
Published online 29 June 2017

Keywords:
Piglets
Activity pattern
Frequency analysis
Wavelet analysis
Passive infrared detector

The activity level of weaned piglets provides a useful tool for farmers to control animal welfare and pollutant emissions. In addition, data for weaned piglet activity can be used as an input signal in real-time ventilation control systems because of its relation to temperature and CO_2 levels. This paper characterises the daily activity pattern of piglets from 6 to 20 kg live body mass based on data obtained by a passive infrared detector on a conventional farm. Activity level of piglets was at its maximum at the beginning of the experimental period and at its minimum at the end of the period. The analysis of the Fast Fourier Transform revealed an average pattern with two activity peaks, at 10:00 h and 18:00 h, described by three cosine waves with 24-, 12- and 8-h periodicity. The Continuous Morlet Wavelet Transform revealed variations in frequency spectrum with time between the first and second half of the cycle, defining two distinct activity periods. The predominant pattern during the first half was a single-peak pattern, whereas the predominant pattern during the second half was a two-peak pattern. Accordingly, two models for the prediction of piglet activity are proposed. Animal age and mass are essential to define behaviour patterns, which explains the existence of various models in the literature and the need to perform continuous measurements to establish accurate models for predicting activity in growing piglets. Passive infrared detectors are simple and cost-effective, and allow for the incorporation of animal activity into real-time control on conventional farms.

Biosystems Engineering
Volume 134, June 2015, Pages 94-104

Research Paper

A decision tool for maize silage harvest operations

Carlos Amiama [a], Noelia Cascudo [a, 1], Luisa Carpente [b], Ana Cerdeira-Pena [c]

Show more

https://doi.org/10.1016/j.biosystemseng.2015.04.004

Highlights

- Decision support tools for silage harvest operations improve manual scheduling.
- Specifying the right amount of transport is essential to minimise harvest costs.
- Harvesting is more sensitive to correct transport management than route management.

Journal
Transportation Letters ›
The International Journal of Transportation Research
Volume 7, 2015 - Issue 5

Original Article

Spatial decision support system for the route management for milk collection from dairy farms

C. Amiama, J. M. Pereira, L. Carpente & J. Salgado

Pages 279-288 | Received 28 Apr 2014, Accepted 21 Feb 2015, Published online: 05 May 2015

Abstract

In this research, a new spatial decision support system (SDSS) was developed, which solves the milk collection problem in two stages. First it applies an algorithm, employing heuristic techniques, generating solutions in a short period of time. In a second step, a graphic interface has been developed, which allows interaction and changes to be carried out in a rapid and intuitive way on the routes generated by the routing algorithm. The route manager can also carry out a broad range of "What if" simulations to find the solution that minimizes cost.

With the use of this tool, significant savings have been obtained in terms of the collection time and kilometers covered by freight, while still keeping the current fleet of vehicles. Sensitivity analysis shows that the total cost of the process is more sensitive to increasing truck capacity than duplicating vehicle working shifts. The existence of farms with difficult access increases the collection costs substantially.

Keywords: Fleet management, Milk collection, Spatial decision support systems, Location-routing, Logistics, Transportation costs, Transport planning, Heuristics

Spanish Journal of Agricultural Research
SJAR
INIA Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria

Mastitis diagnosis in ten Galician dairy herds (NW Spain) with automatic milking systems

Angel Castro, Jose M. Pereira, Carlos Amiama, Javier Bueno

Abstract

Over the last few years, the adoption of automatic milking systems (AMS) has experienced significant increase. However, hardly any studies have been conducted to investigate the distribution of mastitis pathogens in dairy herds with AMS. Because quick mastitis detection in AMS is very important, the primary objective of this study was to determine operational reliability and sensibility of mastitis detection systems from AMS. Additionally, the frequency of pathogen-specific was determined. For this purpose, 228 cows from ten farms in Galicia (NW Spain) using this system were investigated. The California Mastitis Test (CMT) was considered the gold-standard test for mastitis diagnosis and milk samples were analysed from CMT-positive cows for the bacterial examination. Mean farm prevalence of clinical mastitis was 9% and of 912 milk quarters examined, 23% were positive to the AMS mastitis detection system and 35% were positive to the CMT. The majority of CMT-positive samples had a score of 1 or 2 on a 1 (lowest mastitis severity) to 4 (highest mastitis severity) scale. The average sensitivity and specificity of the AMS mastitis detection system were 58.2% and 94.0% respectively being similar to other previous studies, what could suggest limitations for getting higher values of reliability and sensibility in the current AMSs. The most frequently isolated pathogens were *Streptococcus dysgalactiae* (8.8%), followed by *Streptococcus uberis* (8.3%) and *Staphylococcus aureus* (3.3%). The relatively high prevalence of these pathogens indicates suboptimal cleaning and disinfection of teat dipping cups, brushes and milk liners in dairy farms with AMS in the present study.

Keywords

automatic milking system; mastitis detection; pathogen

Full Text:

PDF HTML XML

References

Barrett DJ, Doherty ML, Healy AM, 2005. A descriptive epidemiological study of mastitis in 12 Irish dairy herds. Irish Vet J 58: 31-35. http://dx.doi.org/10.1186/2046-0481-58-1-31

WOOD RESEARCH
61 (5): 2016
683-696

ANALYSIS OF PHYSICAL PROPERTIES OF WOOD IN THREE SPECIES OF GALICIAN OAKS FOR THE MANUFACTURE OF WINE BARRELS PART I: WOOD INFRADENSITY

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Universidad De Santiago De Compostela, Escuela Politécnica Superior
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Tahir Sylvain
École Superieure Du Bois
Rue Christian Pauc
Nantes, France

(Received February 2016)

ABSTRACT

The current study about physical properties of wood of *Quercus robur* L., *Q. petraea* (Matt.) Liebl., and *Q. pyrenaica* Willd. in Galicia (northwest of Spain) was based on the determination of proportion of sapwood, heartwood, infradensity, and porosity to understand and estimate the variation of these characteristics and/or properties in the Galician oaks. For this, it was necessary to fell several trees within the study area. In total, 45 trees were chosen in 15 different stands of provinces of Lugo and Ourense, i.e., we have obtained 45 wood slices of *Quercus* at 60 cm tall on the trunk of the tree, and 194 wood samples with a parallelepiped shape and dimensions of 2×2×4 cm ± 1 mm.

The infradensity characterization reveals that oak wood from Galicia has a greater infradensity than French oaks, and *Quercus pyrenaica* has a higher infradensity than *Q. robur* and

Finalidade

BioMODEM

Modelización, Enerxía e Mecanización en Biosistemas

Implementación de técnicas de modelización nas novas tecnoloxías poden xerar ferramentas básicas no desenvolvemento do mundo rural mediante a transferencia da investigación.

Vocación de servizo cos sectores agrario, forestal e gandeiro.


USC
50 ANOS de ENXEÑARÍA AGRÍCOLA en GALICIA
ESCOLA POLITÉCNICA SUPERIOR
1967-2017
CAMPUS TERRA

Grazas!

BioMODEM

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www.biomodem.es