

A framework to analyse agricultural innovation systems applied to the sheep sector*D. Martin-Collado¹, A. Caudevilla Pérez², A. Bernués¹ and I. Casasús¹**¹Ctr Invest y Tecnol Agroal Aragón (CITA), Unidad de Producción y Sanidad Animal, Avda. Montañana, 930, 50059, Zaragoza, Spain, ²Aragonesa de Imagen y Comunicación, Albareda 7, 50004, Spain; dmartin@cita-aragon.es*

Agricultural innovation studies have evolved from the Innovations Diffusion model approach to the actual Agriculture Innovation Systems (AIS). AIS perspective considers all stakeholders and factors that affect the development and adoption of innovation. Innovation is not just technology but a comprehensive view of what production systems should look like in the future. Although the AIS concept draws a realistic view of the innovation process, it also highlights its complexity. To tackle this complexity researchers have developed several approaches to analyse and assess AIS inefficiencies, and to suggest improvements. We present a methodology to analyse livestock innovation system by disengaging its components and interactions, and identifying the drivers and constraints for an efficient development and dissemination of innovations. We adapt previous work into a methodology tuned up to the sheep sector. Central to this method is the assessment of the functions that AIS should fulfil: (1) guidance of the search; (2) knowledge development; (3) field experimentation; (4) knowledge diffusion; (5) resources mobilisation; and (6) innovation brokering. The methodology is based on a multi-stakeholder consultative process with the following consecutive steps: (1) 'Sheep Innovation System definition' in which the system boundaries (geographical area, species, innovation types) are defined and stakeholders are identified; (2) 'Stakeholder and social network analysis' which involves an analysis of stakeholder functions and areas of interest, and an indicator-based social network analysis; (3) 'Assessment of AIS function performance' which consists of a stakeholder consultative assessment of functions and identification of key enablers and disablers of the innovation system performance. Finally, we show how the methodology can be implemented in practice using the case of the sheep sector in Spain. The Spanish analysis highlighted the lack of a common vision across the sector stakeholders and the central role of breed associations in improving sector linkage and information flow among AIS stakeholders.

How an on-farm experimentation may improve attitudes and practices of dairy farmers*B. Mounaix¹, M. Guédeur¹, T. Jozan² and S. Assié³**¹Institut de l'Élevage, Health and Welfare, 149 rue de Bercy, 75595 PARIS cedex 12, France, ²MSD Santé Animale, 12 rue Olivier de Serres, 49070 Beaucouze, France, ³INRA Oniris, UMR BioEpAR, Site de la Chantrerie – route du Gachet, 44307 Nantes, France; beatrice.mounaix@idele.fr*

Vaccination of dairy herds is often too late to be fully efficient. This paper reviews the impact of a full-scale experimentation of dairy cattle vaccination in French farms on farmers' attitude and their practices regarding calves health. Before the experimentation (2017), one-on-one conversations were carried out with 36 farmers involved in the experimental design; 29 of them were interviewed at the end of the experiment (2018). Before the experimentation, farmers had a positive attitude towards vaccination. They associated it to prevention (77% of answers) to limit health issues (64%), to decrease time spent for sick animals (44%) or to save on treatments (11%). Though, vaccination of cows was mainly implemented when several calves already suffered from diarrhoea, and should then be qualified as a curative approach. Hence, cow vaccination was never cited as a mean to improve the quality of calves. The experimentation had a positive effect on the attitude of farmers towards the colostrum. 75% of them now consider that the colostrum is involved into the cow-calf immunity transfer. They now give more importance to the timing between the calving and the distribution of colostrum (72% of answers) and to the quantity taken by the calf (65%). They still consider as less important the quality of colostrum (50%), mainly because of the lack of references and/or practical solutions when quality is low. As a consequence, 41% farmers indicated that, after the experimentation, they changed their way to distribute the colostrum to better control the quantity which is really taken by the calf. A lower impact was observed on farmers' attitude towards the vaccination of cows. Although 58% of farmers showed interest in the experimentation and 41% could observe positive impacts on calf health, only 44% of them declared that they would put it in practice, and only during winter as a risky period (curative measure). Growth of calves was not considered by farmers as a motivation to implement cow vaccination although we could measure positive effects, mainly because growth is rarely monitored by dairy farmers.

Session 73. Innovative farm systems to meet societal demand

Date: Friday 4 December 2020; 13.45 – 17.30

Chair: Siqueira

Theatre Session 73

| | | |
|----------------|--|-----|
| Invited | Developing cross-boundaries based innovations to design diversified and integrated livestock systems | 632 |
| | <i>M.A. Magne, M. Duru and B. Dedieu</i> | |
| | Preconditioning programs: a solution to reduce bovine respiratory diseases in fattening units? | 632 |
| | <i>E. Vanbergue, G. Foucras, M. Guiadeur, N. Cebron, G. Meyer, R. Maillard, B. Mounaix and S. Assié</i> | |
| | Rapeseed-oil as ω 3-rich natural sources for livestock feeding to obtain differentiated meat products | 633 |
| | <i>N. Mandaluniz, I. Olazaran, J. Arranz, E. Ugarte and R. Ruiz</i> | |
| | Sustainability of extensive livestock production systems: the challenge of PA technologies | 633 |
| | <i>J. Serrano, S. Shahidian, E. Carreira, J. Marques Da Silva, A. Pereira and M. Carvalho</i> | |
| | A framework to analyse agricultural innovation systems applied to the sheep sector | 634 |
| | <i>D. Martin-Collado, A. Caudevilla Pérez, A. Bernués and I. Casasús</i> | |
| | How an on-farm experimentation may improve attitudes and practices of dairy farmers | 634 |
| | <i>B. Mounaix, M. Guiadeur, T. Jozan and S. Assie</i> | |
| | Planning farm efficiency at territorial scale to improve environmental performance of dairy sheep | 635 |
| | <i>A.S. Atzori and A. Cannas</i> | |
| | Resilience of three farming systems to decline in synthetic nitrogen and feed imports availability | 635 |
| | <i>C. Pinsard, F. Accatino, S. Martin and F. Leger</i> | |
| | Can collective brands push dairy farms to adopt innovative practices? | 636 |
| | <i>T.T.S. Siqueira, A. Gonçalves and L. Mur</i> | |
| | Green Finance: a tool for assessing the environmental impacts of investments in livestock farming | 636 |
| | <i>M. Nugues, A. Bell, C. Kauffmann, M. Fert, C. Nzally, I. Taurou, J.-Y. Dourmad, H. Guyomard and J.-L. Peyraud</i> | |

Poster Session 73

| | | |
|--|--|-----|
| | Short supply chains of Bísaro pig – TREASURE project as a reference of knowledge and networking tool | 637 |
| | <i>J. Santos Silva, J.L. Cerqueira, M. Čandek-Potokar and J.P. Araújo</i> | |
| | Horizontal arrangements, technologies and productive capacity of Brazilian dairy farmers | 637 |
| | <i>R.R. Martinelli, J.C. Damasceno, V.D.V. Da Costa, T.T.S. Siqueira and F.I. Bánkuti</i> | |
| | Comparison of organic and traditional lamb production systems by meta-analysis | 638 |
| | <i>R. Catani, J.P. Araújo and V. Cadavez</i> | |
| | Life cycle assessment of the Iberian pig systems in the Spanish dehesa | 638 |
| | <i>C. Reyes-Palomo, E. Aguilera, M. Llorente, C. Diaz-Gaona, G. Moreno and V. Rodriguez-Estévez</i> | |
| | A study of growth performance of Bordaleira de Entre Douro e Minho lambs breed | 639 |
| | <i>R. Catani, J. Cerqueira, J.P. Araújo and V.A.P. Cadavez</i> | |

Book of Abstracts of the 71st Annual Meeting of the European Federation of Animal Science



Book of abstracts No. 26 (2020)
Virtual Meeting
1-4 December 2020

Book of Abstracts of the 71st Annual Meeting of the European Federation of Animal Science

Virtual Meeting, 1st–4th December, 2020



EAAP Scientific Committee:

E. Strandberg
L. Pinotti
S. Messori
H. Sauerwein
M.R.F. Lee
J.F. Hocquette
J. Conington
S. Millet
A.S. Santos
T. Veldkamp
I. Halachmi
G. Pollott



A framework to analyse agricultural innovation systems applied to the sheep sector

Martín-Collado, D.^{1,2} Caudevilla Pérez, A.³, Bernués, A.^{1,2}, Casasús, I.^{1,2}

¹Unidad de Producción y Sanidad Animal. Ctr Invest y Tecnol Agroal Aragón (CITA), Spain

²Instituto Agroal Aragón –IA2 (CITA-Universidad de Zaragoza), Spain

³Aragonesa de Imagen y Comunicación, Spain

What is an innovation?

“The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations which can be new to the firm, new to the market and new to the world” (OECD)

- Depends on the system/situation analyzed
- Innovation refer to:
 - Products and equipment
 - Structure and organization
 - Method and ideas for practice changes

Approaches evolution

| | Diffusion & adoption | Farming system research | Agricultural Knowledge & Information System | Agricultural Innovation System |
|---------------------------|--|---|---|--|
| Era | Central since 1960's | From 1970's/1980's | From 1990's | From 2000's |
| Mental model | Supply technologies through pipeline | Learn farmers constraints through surveys | Collaborate in research and extension | Co-develop innovation in partnerships |
| Knowledge and disciplines | Single discipline driven (e.g. breeding) | Multi-disciplinary (agronomy and economics) | Inter-disciplinary (plus sociology and farmers) | Trans-disciplinary, holistic systems perspective |
| Role science | Innovators | Experts | Collaborators | Partners, one of many responding to demands |
| Role farmers | Adopters/laggards | Sources of information | Experimenters | Partners, entrepreneurs, innovators exerting demands |

Klerks et al. (2012)



The Agricultural Innovation System

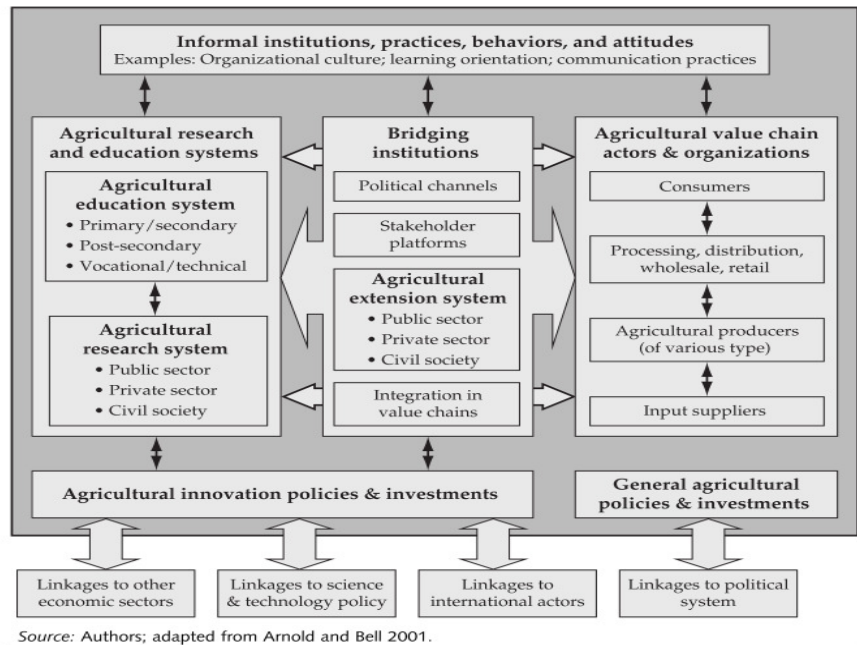
“A network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance” (The World Bank, 2006)

Goes beyond the creation of knowledge to...

... the factors affecting demand for and use of knowledge



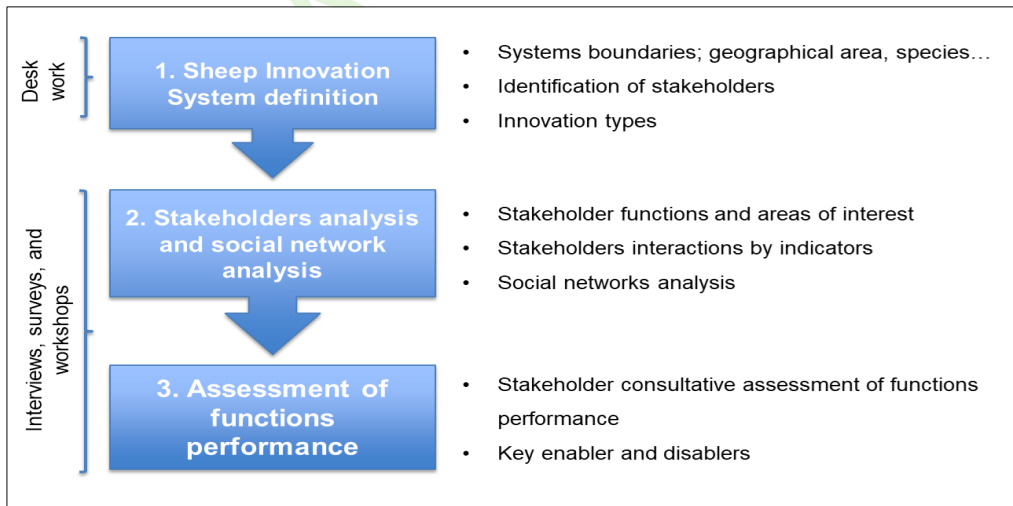
An AIS conceptual diagram



AIS research approaches

1. Benchmark analysis
2. Social network analysis
3. Functions of innovation system approach
 - a) **guidance** of the search: identification of problems, potential and direction of change
 - b) **knowledge development**: research or learning by doing
 - c) field **experimentation**,
 - d) knowledge **diffusion**/transfer,
 - e) **resources** mobilization; monetary and non monetary
 - g) innovation **brokering**: networking, trust building

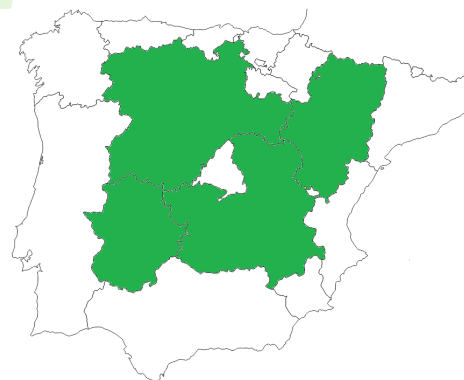
Sheep Sector Innovation System analysis method



The Spanish Sheep Innovation System

1. System definition

| Stakeholders | n |
|---|-----------|
| Farmer cooperatives | 4 |
| Individual Farmers | 2 |
| Agriculture Unions | 1 |
| Breed Associations | 5 |
| Inter-branch Organizations | 4 |
| Certification bodies | 4 |
| Livestock farming consultancies | 2 |
| Service Providers | 7 |
| Transfer and communication stakeholders | 3 |
| Public Research Centres | 5 |
| Superior education system and professional training | 4 |
| Governmental Agencies | 5 |
| | 46 |



2. Stakeholder analysis

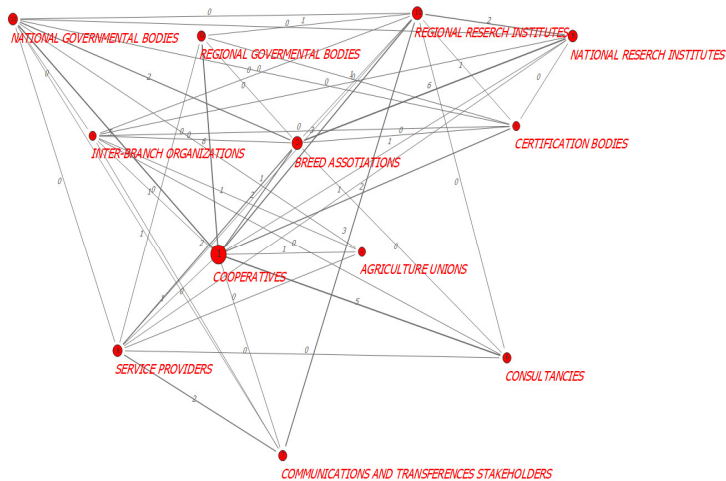
| | Guidance | Knowledge development | Experiment | Knowledge diffusion | Funding | Non-monetary resources | Brokering |
|---------------------------------|----------|-----------------------|------------|---------------------|---------|------------------------|-----------|
| Farmer cooperatives | Low | Low | High | High | | Low | Low |
| Individual Farmers | | Low | High | | | | |
| Agriculture Unions | Low | | | Low | | | Low |
| Breed Assotiations | Low | Low | High | High | | Low | Medium |
| Inter-branch Organizations | Low | | | Medium | | Low | Medium |
| Certification bodies | | | Medium | Medium | | Low | |
| Livestock farming consultancies | | Low | Low | Medium | | Low | Low |
| Service Providers | Low | High | High | High | Medium | Medium | High |
| Transfer and comunication | | | | High | | | |
| Public Research Centers | High | High | Medium | High | Low | High | Medium |
| Superior education system | Low | High | Medium | High | | Medium | |
| Governmental Agencies | High | Low | | Medium | High | | High |

2. Stakeholder analysis

| | Nutrition and feeding | Reproduction | Animal health | Breeding | Product quality | Facilities and equipment | Environment |
|---------------------------------|-----------------------|--------------|---------------|----------|-----------------|--------------------------|-------------|
| Farmer cooperatives | Medium | Medium | | High | High | | |
| Individual Farmers | Medium | Medium | Low | | Low | Medium | |
| Agriculture Unions | | | | | Low | | Medium |
| Breed Assotiations | High | High | High | High | High | | Low |
| Inter-branch Organizations | | | | | High | | |
| Certification bodies | | | | High | High | | |
| Livestock farming consultancies | High | High | High | | | Low | |
| Service Providers | High | Medium | High | | | High | |
| Transfer and comunication | High | High | High | Medium | Medium | Low | Low |
| Public Research Centers | High | High | High | High | High | | High |
| Superior education system | Medium | Medium | Medium | Medium | Medium | | Low |
| Governmental Agencies | Low | Low | Low | Low | Low | | Low |

2. Social Network analysis

- Indicator: n of common innovation project or activities



| Node ↓ | Label ↑ | DC ↑ |
|--------|-------------------|--------------|
| 2 | AGRICULTURE UNIO | 2.000000000 |
| 4 | INTER-BRANCH ORG | 2.000000000 |
| 5 | CERTIFICATION BO | 3.000000000 |
| 6 | CONSULTANCIES | 5.000000000 |
| 7 | COMMUNICATIONS A | 6.000000000 |
| 8 | SERVICE PROVIDER | 7.000000000 |
| 12 | REGIONAL GOVERME | 7.000000000 |
| 11 | NATIONAL GOVERN M | 8.000000000 |
| 9 | NATIONAL RESEARCH | 10.000000000 |
| 10 | REGIONAL RESEARCH | 12.000000000 |
| 3 | BREED ASSOCIATIO | 13.000000000 |
| 1 | COOPERATIVES | 27.000000000 |



3. Functions performance: Guidance

- There is **not a clear common** innovation **strategy** at national level
- **Many forums** about priorities. **Do not materialize.**
- **Disconnection and segmentation** across stakeholder and regions...
... and even among regional research institutions
- Farming stakeholder perceive a **lack of communication** between the agents that are supposed to guide the innovation
- Private sector respond to short term demand that can be monetarized

3. Functions performance: Knowledge development

- Well-developed human capital both at public and private sectors
- Public sector focus on highly vulnerable systems and aspects related to sustainability...
 - ... not always tackle farmer needs
- Private sector focus on innovations with market value...



3. Functions performance: Transfer and communication

- There is not an organized and structured extension strategy
- Many stakeholder involved, however farmers perceive...
 - ...that transfer in deficient, scarce and dispersed
- Digital revolution key to avoid isolation of many stakeholders
- New models such us Cooperative groups enhance communication between value chain actors
- Cooperatives and breeds associations are key



3. Functions performance: Funding

- Despite getting a larger share than other sectors...
 - ...stakeholders perceive a lack of funding
- Funding is too much focused on knowledge development...
 - ...and too little in implementation of innovations
- Bureaucracy for funding leave out individual farmers and small scale cooperatives and associations
- Limited private funding due to low economic return related to low farm profitability



Conclusions

- Innovations are rarely analyzed with a systemic approach
- The proposed methodology generates a comprehensive view that goes beyond...
 - ... the creation of knowledge and the adoption of technology
- Based on structured interviews easily applicable
- Rely on a solid selection of representative stakeholders



A framework to analyse agricultural
innovation systems applied to the sheep
sector

THANK YOU!