



Innovation for Sustainable  
Sheep and Goat  
Production in Europe



# INNOVATION AND PARTICIPATORY RESEARCH IN SHEEP AND GOAT FARMING

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TRAINING COURSE

Innovation to enhance the sustainability of sheep and goat production systems

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# The session

1. Background (30')
2. Overview of iSAGE approach and findings (15')
3. Innovation and participatory research in Oviaragon (30')
4. Questions and discussion (15')



# Agriculture innovations

What is an innovation?



# What is innovation?

- It is not just technology, but...

*“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)

- The definition of an innovation depends on the system/situation analyzed



# What is innovation in agriculture?

- Technology: usually refers to equipment
- Innovation:
  - Products and equipment
  - Structure and organization
  - Method and ideas for practice changes
- Innovations are not always totally “new”
- “New” is not always good
- Innovations present opportunities but also threats:
  - ➡ Technology innovations produce winners and losers



# Innovation types

There are many perspectives to look to  
innovations



# Innovation types

## 1. Embodied in good and products: Private interest



- ## 2. Disembodied, as organizational or management schemes changes: area for public actions
- e.g. management practices to make farms more sustainable



# Innov. types. **Physical form**

Each raise different political issues

- Mechanical → May negatively affect labor
- Biological → Problems of public acceptance and environmental concerns
- Chemical → Problems of public acceptance and environmental concerns
- Agronomic → New management practices
- Biotechnological → Ethical and public acceptance problems
- Informatics → High support by agencies; too much expectations?



# The Gartner Hype Curve (1995)





# Innovation types

- **Process innovations:** e.g., a way to modify a gene
- **Product innovations:** e.g., a new cheese type, new meat cuts
- **Marketing innovation:** e.g., internet marketing, home delivery
- **Organization innovation:** e.g., Operational groups, inter-professionals



INTEROVIC  
ORGANIZACIÓN INTERPROFESIONAL  
AGROALIMENTARIA DEL OVINO Y EL CAPRINO

Buy Lamb Online from Campbells Prime Butchers



Rack Of Lamb French Trim

Price from  
Now £10.03 Was £10.98



SHOW 20 ITEMS PER PAGE SORT BY BEST SELLING



Scotch Lamb Leg Steaks Bone In

Price  
Now £3.85 Was £4.53





# Innovation process

How are innovations created, disseminated and used by farmer community?



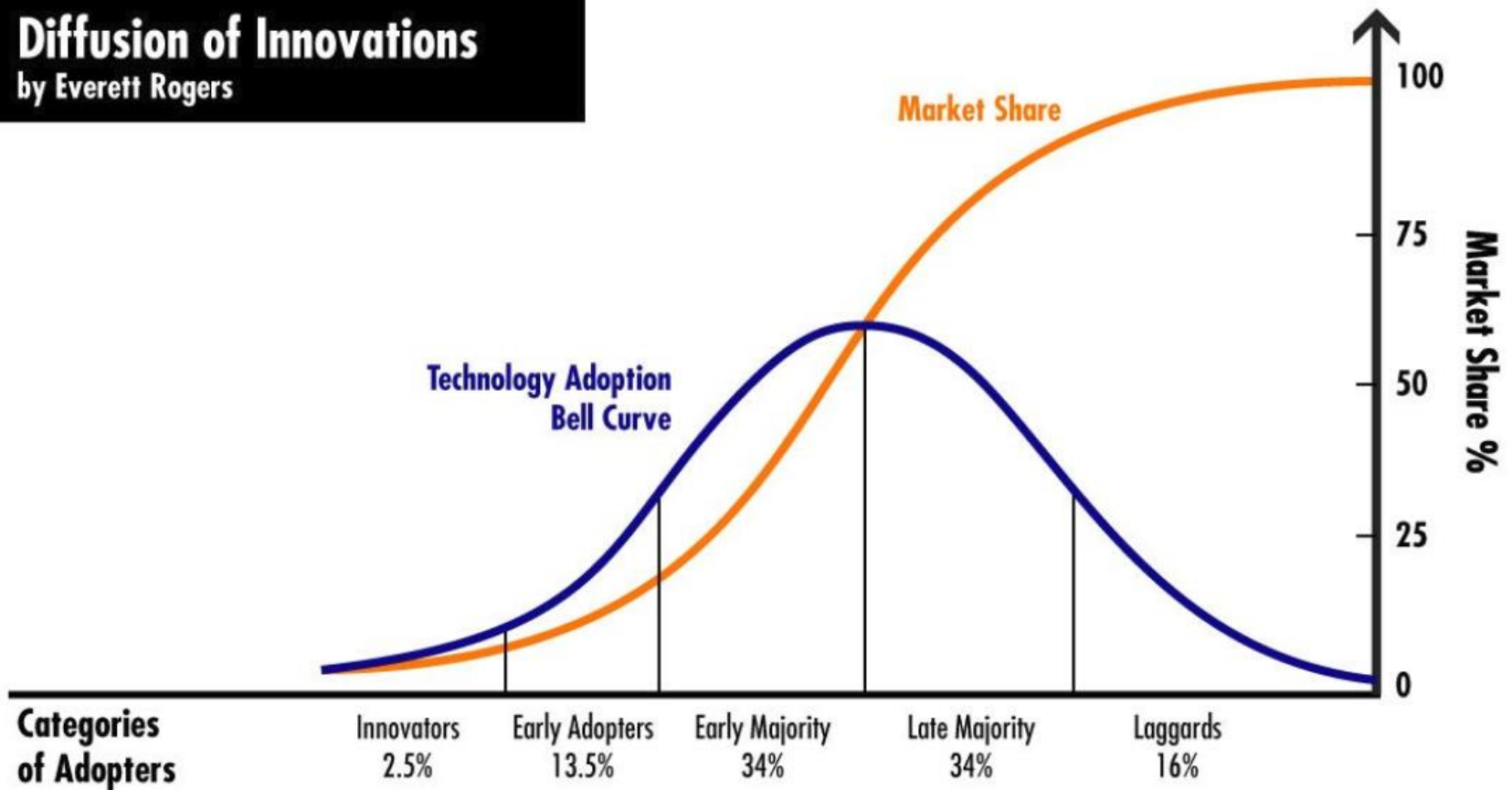
# Innovation diffusion model

Diffusion is a process where:

1. an **innovation**
2. is **communicated** through certain channels
3. over **time**
4. among the members of a **social** system

# Roger's Innovations diffusion model (1957)

## Diffusion of Innovations by Everett Rogers





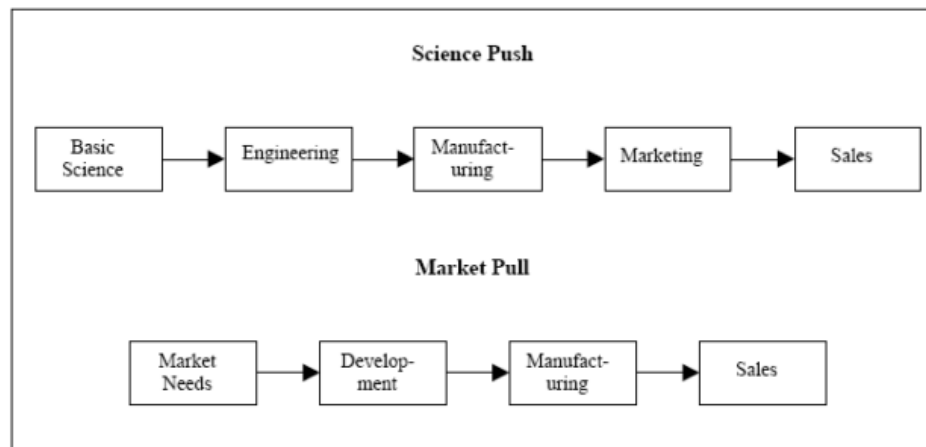
# Innovations diffusion model

What do you think of the diffusion of innovations model?

# Critics to the model

- Linear view of innovation process

## Linear models



- Top-down approach. Researchers → farmers
- Farmers would be merely end users of technology
- Not applicable to most agriculture innovations



# Other Agriculture innovation models

Difusion of  
innovation

1960...

Farming system  
research

1970...

Agricultural  
knowledge and  
information  
system

1990...

Agricultural  
Innovation  
System

2000...





# Other Agriculture innovation models

		Farming system research	Agricultural knowledge & information system	Agricultural Innovation System
Diffusion & adoption				
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)



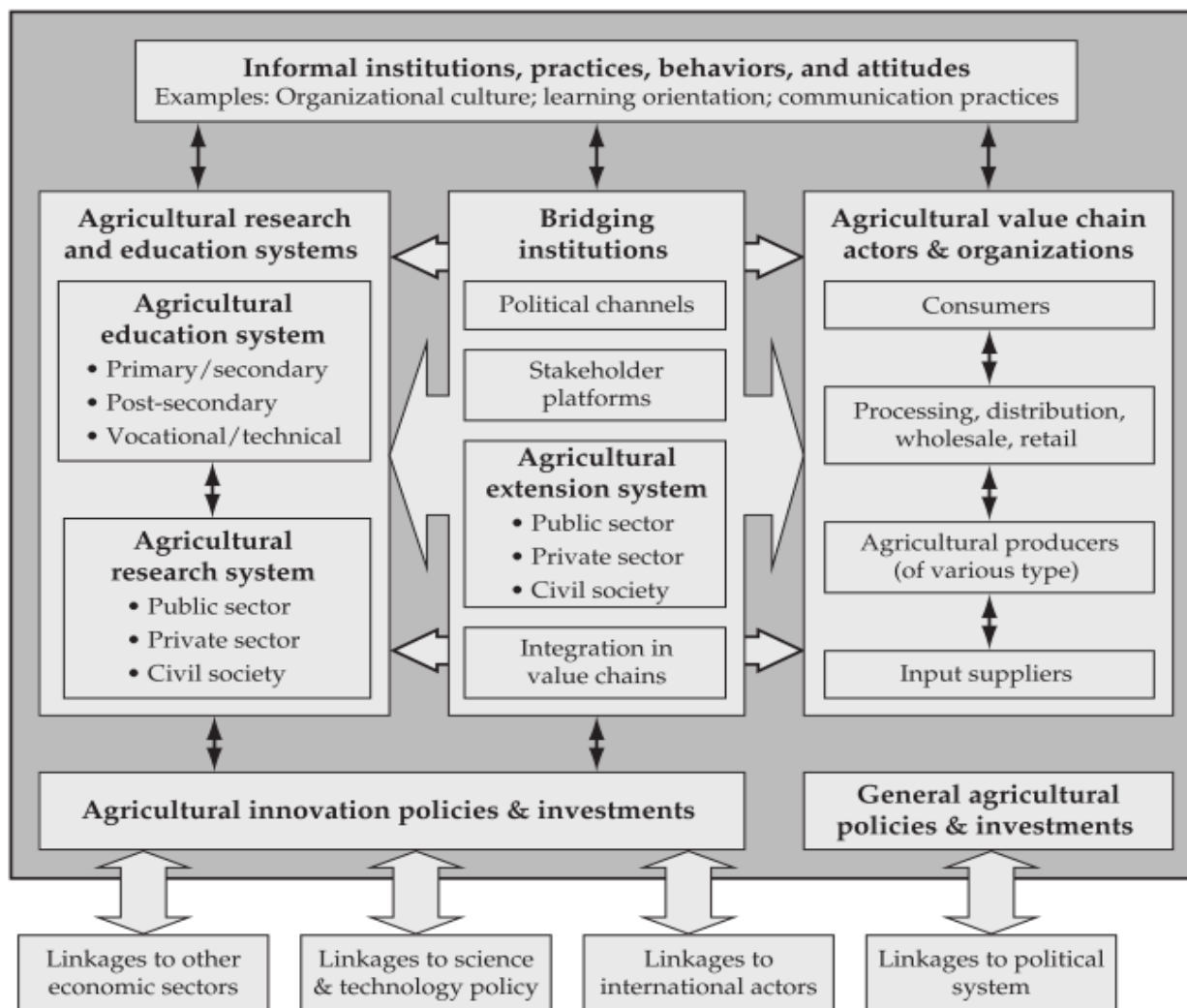
# The Agricultural Information System

*“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)

- Embraces the science suppliers and all stakeholders involved
- Goes beyond the creation of knowledge to...  
... the factors affecting demand for and use of knowledge.

# An AIS conceptual diagram



Source: Authors; adapted from Arnold and Bell 2001.



# AIS research methods

Three approaches:

1. Benchmark analysis
2. Social network analysis
3. Functions of innovation system approach

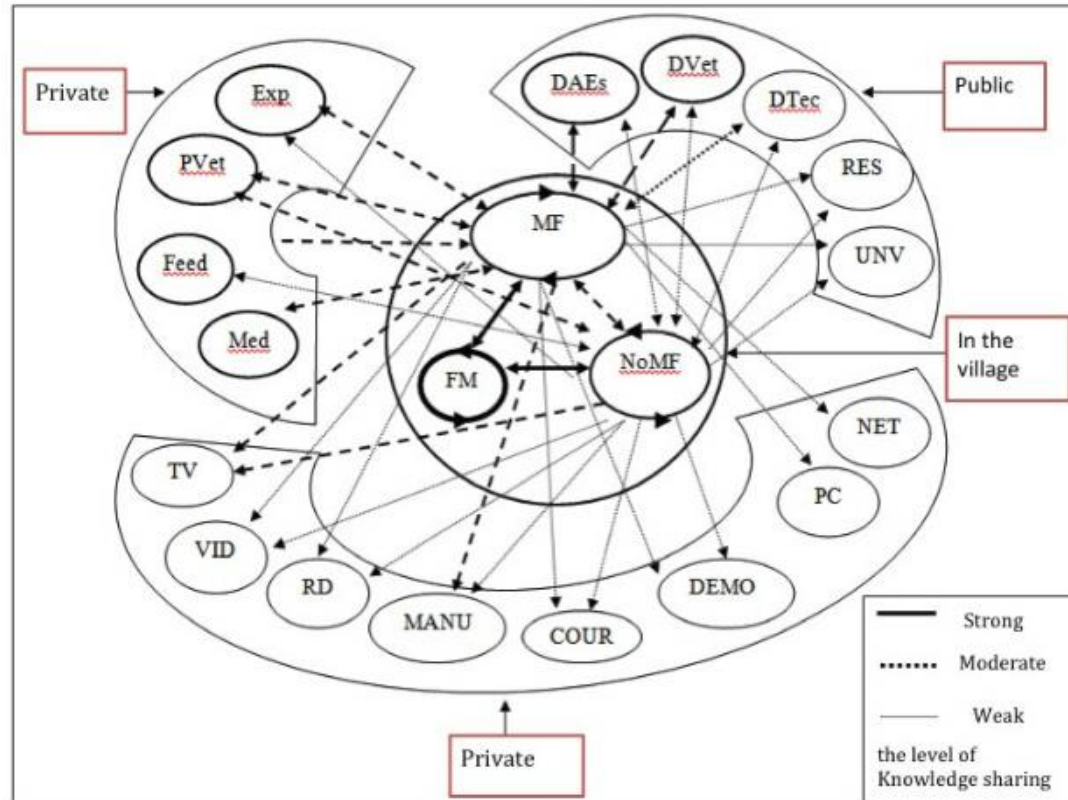


# Benchmark analysis

- Uses indicators:
  - Patents
  - R&D expenditures
  - Numbers of researchers
  - Number of extension activities staff
  - Type of projects
  - Innovation adoption rate
  - Input-output/spill-over analysis on R&D investment
  - Returns on risk capital
  - ...

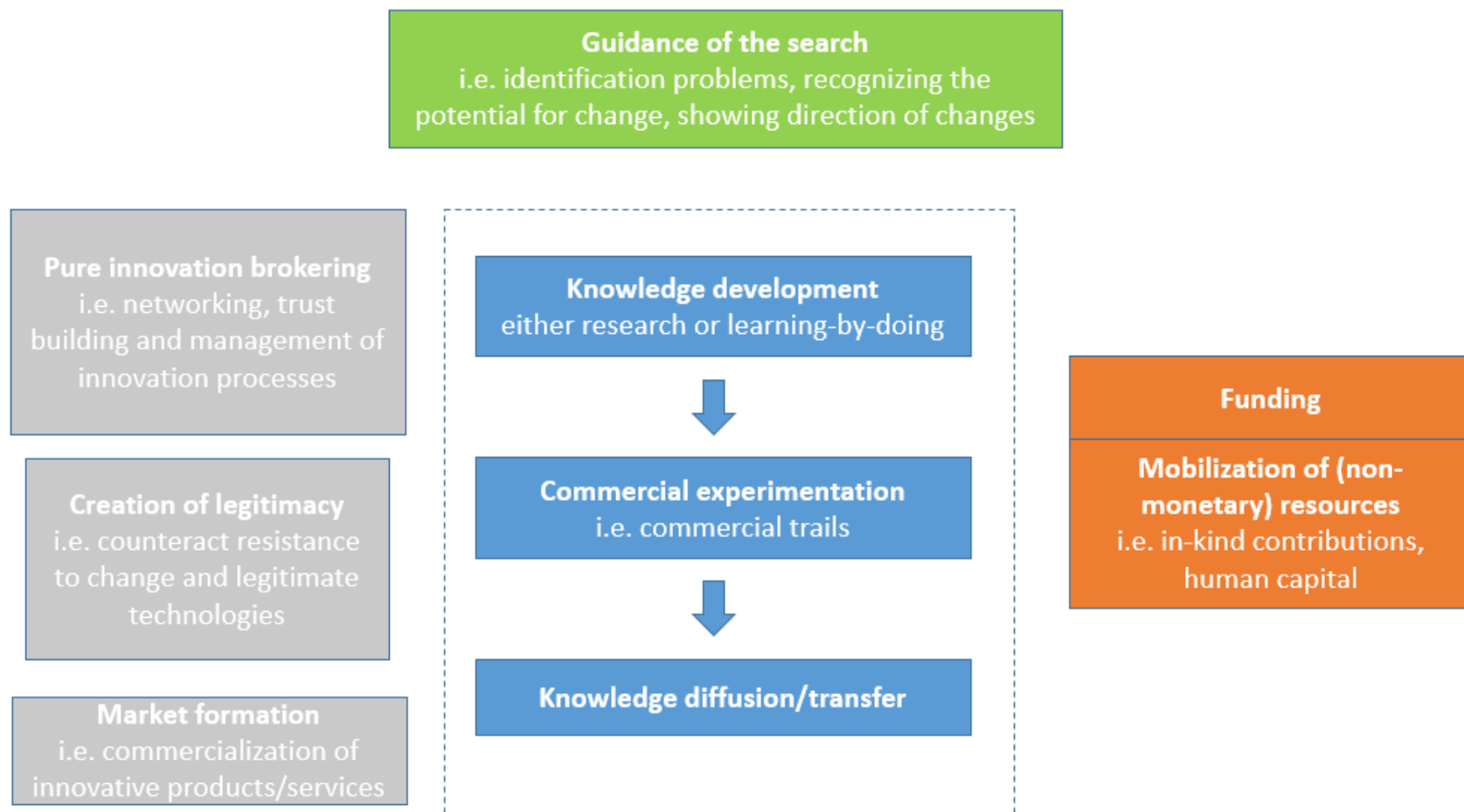
# Social network analysis

- Visualizes the network of relationships between stakeholders and assesses the position of actors within the system





# Functions of Agricultural Innovation System





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# Participative research in agriculture





# Participative research projects

Research strategies which emphasize participation are increasingly common



*PRIMA initiative is based on an extensive participatory process that will target a critical mass of key players at international level and all relevant stakeholders of the food and water sectors.*

**WHY PARTICIPATIVE RESEARCH?**



# The problems of “conventional” research

- Lack of relevance for the sector
- Stakeholders knowledge not considered if does not follow the scientific protocol
- Need to make simplification of reality:
  - Theoretical paradigms avoid researchers seeing much of reality
- Inappropriate recommendations; failure to take account of stakeholders/farmers priorities



# New research challenges

1. Governments are demanding more cost-effective research outcomes to shrink funding
2. Private sector is becoming a provider of extension and research
3. Pro-active farmers groups are initiating their own research



# Participative research projects

**WHAT IS PARTICIPATIVE RESEARCH?**



# Basis of participative research

- Stakeholders have different knowledge and skills that complement each other
- Working together might get better results
- Constraints and limitations of one group compensated by strength of the other

Requires a sound understanding of both one's own and the other groups knowledge, skills and constraints



# What is COLLABORATIVE research?

- It covers a wide variety of approaches and applications
- Participative research is not stakeholders (i.e. farmers) participating in a research project
- Stakeholders knowledge and perspectives not only acknowledged but the basis for research and planning
- Focus on all stakeholders priorities and perspectives



# What is collaborative research?

- The key difference lies in the location of “power”:

The control over the research process

- WHO, is the key question
- Raises personal, professional and political challenges which go beyond the production of information



# WHO is the key question

- Who defines the reserch problem/question?
- Who generates the information?
- Who analyse the information?
- Who owns the outcomes or the knowledge generated?





# Critics to participative research

- The panacea to solve all problems of conventional research
- Biased, lack of rigour and unreliable

## Assumptions

- 'More' participation is always better.
- Researchers should work on the research priorities identified by farmers.
- Local innovation should be strengthened by farmers doing formal experimentation.



# Innovations case studies in iSAGE

## Approach and main findings



# iSAGE is a fully participative project

Stakeholder type	Description	Number
Farmer/ breeder groups	Co-operative that assists and works with farmers or breeders directly i.e. manages breeding program, records data and advisors farm management	10
Farm	Commercial farms or breeders that work with research institutions	3
Industry	Large organisation that represents the commercial interest of farmers, including promotion, marketing and dissemination	4
University	Research group from a University that specialises in sheep and goats	5
Public research	Research group from a public organisation that specialises in sheep and goats	5
Farmer research	Non-profit, non-governmental research organization funded by farmer levies	3



# Innovation case studies

- Test selected innovations in case studies...
- ... to increase sustainability and viability of sheep and goat farming
- Innovations are selected in a participatory process
- Get feedback on effectiveness and implementation constraints



# Participative selection process

1. Analysis of challenges to be addressed
2. Case study protocols
3. Review of proposals
4. Implementation and monitoring
5. Reporting and dissemination



# Innovation case studies

- 31 case studies
- Selection depended on:
  - Resources available
  - Organizational constraints
  - Interest and expertise
  - Challenges considered critical for each case



# Case study leaflets

## FINE-TUNE FLOCK MANAGEMENT

Mobile flock management of intensive sheep farm

**300%**

Total productivity of ewes was increased 30% with Precision Mobile Flock Manager by reducing lamb mortality, increasing reproductive performance of ewes and saving from feed sources

**LAMB MORTALITY DROPPED TO 5%, ACCELERATED LAMBING PERFORMANCE INCREASED 20%, BARREN EWES RATIO IS ONLY 3% SMART SHEEP MANAGER**

Productivity of livestock production fluctuates due to lack of proper data recording systems. Measuring outputs of the farm operations is not and almost no optimization. The larger the flock, however the harder it gets to optimize the operations, labor and feed ration. This innovative...

## INDIVIDUAL DATA COLLECTION TECHNOLOGIES

THE ESKARDILLO TOOL

How individual animal data recording and interpretation can improve management of dairy goat farms

**+100**

More than a hundred goat farms of Florida, Malaga, Murcia, Granada, and Pinar de Baza, belonging to the Federation of Goat Breed Associations of Andalusia (Cabravanduc), are using the Eskardillo tool.

THE ESKARDILLO TOOL IS A NEW TECHNOLOGY AIMING TO OPTIMIZE FARM MANAGEMENT BY MAKING USE OF "BIG DATA" GENERATED IN DAIRY GOAT FARMS

Dairy goat production systems in developed countries are experiencing an intensification process in terms of higher farm size, electronic identification, reproductive intensification, genetic selection and milking automation.

This new situation generates "big data" that can be used to aid farmers during the decision making process. Precision Livestock Farming and individual data management technologies offer a great opportunity to optimise farm management

## GROWING TREND FUNCTIONAL FOOD

Functional food production from goat milk and lamb meat

**400%**

Lamb chops are 400% richer for CLA and 1 glass of goat milk provides recommended adult daily CLA intake with strategic feeding and breeding

**GOAT MILK AND LAMB MEAT CAN BE HEALTHIER**

Dairy products and meat from ruminant animals have conjugated linoleic acid (CLA). CLA has many health benefits. CLA can be increased by feeding animals which change the rumen environment and the production of biohydrogenation of fatty acids.

## BOOSTING GENETIC IMPROVEMENT

Testing Assisted Reproductive Technologies in dairy goats and maternal sheep

**50%**

Laparo-scopic assisted insemination (LAI) was used to split the frozen semen from a superior genetic buck to reduce cost of semen 50% for genetic improvement in dairy goats

**ONE KID PER LATE DOE WAS OBTAINED WITH HALF DOSE OF SUPERIOR FRENCH ALPINE BUCK FROZEN SEMEN**

The Damascus goat, also known as Aleppo, Halepi, Baladi, Damascene, Shami, or Chami, is a breed of goat with a unique head and month without detrimental effect on milk fat and protein content. French Alpine superior buck LAI program by splitting frozen semen into two semen for establishing acceptable pregnancy rates. An average 70% of pregnancy rate was achieved.

## NSA NEXT GENERATION AMBASSADORS

Strengthening the sheep sector as a whole, as well as developing individuals' skills

**THE NSA NEXT GENERATION PROGRAMME**

The National Sheep Association (NSA) is committed to ensuring the sustainability of the sheep industry in the UK. To this end the NSA Next Generation Programme is designed to support innovative, enthusiastic and professional young people. Encouraging and supporting the young shepherds of the future to look forward positively and enthusiastically to a career in a sector that is crucial to UK livestock production. The programme provides training, events, advice and the opportunity to apply for a place on the NSA Next Generation Ambassador programme.

**THE NSA NEXT GENERATION AMBASSADOR PROGRAMME**

Launched in 2014 the NSA Next Generation Ambassador programme aims to equip young people with the skills to manage profitable and sustainable sheep flocks, alongside the ability to support and promote the sheep industry. Twelve applicants from across the UK are selected each year to participate in the programme. They are given five training sessions covering a diverse range of topics, including practical demonstrations and farm walks. The programme encourages them to form friendships and networks and introduces them to key people in the industry.

Ambassadors are encouraged to share their experiences with others - this may be joining an NSA regional committee, speaking at farmer meetings, taking on a role within the farming community or getting involved in organising an event

## PROLIFICACY GENES THE ROA ALLELE

Managing the ROA allele to improve sustainability of Rasa Aragonesa sheep by increasing prolificacy

**2007**

In 2007 a new allele of the BMP15 gene was discovered in the Rasa Aragonesa sheep breed. The allele (FecX, ROA) was not described before that date.

**FEMALES CARRYING THE FecX<sup>ROA</sup> IN HETEROZYGOUSITY INCREASE PROLIFICACY BY AN AVERAGE OF 0.36 LAMBS PER PARTURITION**

Rasa Aragonesa is a local meat sheep breed raised in extensive systems in Aragón, Northeast Spain. It produces a high quality lamb which is marketed under the PGI label "Ternasco de Aragón".

The breed has a well-established breeding programme and an organism that manages the flock. Book, the UPRA, Prolificacy has been managed since 1994. Since its discovery in 2007, the ROA allele has been used to increase prolificacy in Rasa Aragonesa sheep. Artificial insemination is used to disseminate the allele across interested farms.

## EVALUATING THE IMPACT OF FLOCK HEALTH CLUBS

Sharing the cost of veterinary services & expertise within a local community of sheep farmers

**FLOCK HEALTH CLUBS**

Flock Health Clubs (FHCs) were initiated in 2016 by Flock Health Ltd to improve communication and relationships between sheep farmers and veterinarians and to offer the first access to cost effective veterinary services.

In return for a monthly subscription paid to their practice, farmers receive access to regular discussion groups with other producers and a sheep focused vet. Resulting in increased sheep expertise and better relationships for both.

Approximately two thirds of sheep farmers only contact their veterinarian for emergencies and one fifth have all year-round contact

Kaler & Green, 2013

**THE CASE STUDY**

Flock Health Ltd believe that FHCs provide benefits but have no external evidence; this case study investigated if sheep farmers are actively getting involved in FHCs, the benefits they obtain whether the concept has been useful to veterinary surgeons.

In order to ask both producers and veterinary surgeons for their opinions, interviews were conducted with 27 farmers surveyed during FHC meetings across the UK.

## FARM ASSESSMENT TOOLS FOR MONITORING AND IMPROVING SUSTAINABILITY

The benefits of incorporating holistic practices and the barriers to adoption

**HOLISTIC MANAGEMENT AND SUSTAINABILITY**

Current figures suggest many UK farmers are struggling economically. With future policy changes focusing on the delivery of 'public goods' UK farmers need to address how they manage their farms in a more holistic manner.

The benefits of holistic farm management and a more 'whole farm' view are beginning to be incorporated across the UK, but adoption rates are low and there is still a lot of distrust in the true value of 'holistic'.

In the UK, 71% (or 17.4 million hectares) of land is classified as utilised agricultural area. 60% of which is suitable for growing grass. Livestock can convert this land/forage into a healthy human food source

**THE CASE STUDY**

The Savory Institute through 3LM offer a graded series of Holistic Management (HM) courses in the UK. Initially farmers undergo HM training, they can then apply for Ecological Outcome Verification allowing produce to achieve premiums through the Land to Market Scheme.

Sheep farmers opinions were sought on the value of participation in HM training offered by 3LM. They were also offered the opportunity to participate in a simple sustainability assessment using the Public Goods (PG) tool and invited to comment on the value of the tool.



# Innovation case studies

Type	Innovation case study	Country
Breeding & genetics	1) Evaluation of reproductive performance of crossbreeds of Romanov and Turkish Native Breed	Turkey
	2) Potential, drivers and constraints of genomic selection in sheep and goat sector	Spain, France and Greece
	3) Analysis of farmers perception of the drivers and constrains for the uptake of a new selection index for ewe productivity	Finland
	4) Assessing parasitic resistance of UK local and newly introduced sheep breeds in organic/low input and conventional farms.	United Kingdom
	5) Assessment of ROA GENE effect on Rasa Aragonesa breed productivity	Spain
	6) A new longevity breeding goal for Lleyn sheep	United Kingdom
Feeding	7) Better utilisation of farm forage– reduce reliance on imported concentrates and forages on the farm	France
	8) Assessment of feeding alternatives in sheep and goat farms in Turkey	Turkey
	9) Grazing in arable rotations	United Kingdom



# Innovation case studies

Type	Innovation case study	Country
IT technologies and individual recording	10) Extension activities for individual recording	Greece
	11) Mobile flock management of intensive sheep farm	Turkey
	12) Reproductive performance recording in intensive dairy goat farming	Turkey
	13) Assessment of Eskardillo: a platform based on individual data collection to improve decision making and management in dairy goat farms.	Spain
	14) Individual data collected from RFID for several purposes	France
	15) Training and implementation of farm management application (AWIN )	Greece
Environment	16) Ecological knowledge transfer and sharing expertise from Transhumance	Turkey
	17) Carbon efficiency and footprint comparison for various farming systems	Turkey
	18) Small ruminant farmers' perception on climate change impact and assessment of adaptation innovations	Turkey
	19) Holistic Management and Farm Sustainability Assessment Tools	United Kingdom



# Innovation case studies

Products and marketing	20) Participatory Guarantee System for Brogna sheep Association in Lessinia	Italy
	21) Functional food production from goat milk and lamb meat	Turkey
	22) Marketing innovations for transhumance dairy products	Greece
Reproduction	23) Testing of a new sheep and goat AI speculum	Spain, France and Greece
	24) Controlling reproduction in sheep and goats and developing easycare breeds	Turkey
	25) Testing assisted reproduction technologies in dairy goats and maternal sheep	Turkey
	26) Drivers and farmers perception on hormonal control uptake in extensive farms in Turkey	Turkey
Farmer training	27) Assesment of Ambassador programme	United Kingdom
	28) Assessment of Flock Health Programme	United Kingdom
Others	29) Controlled weaning in organic goat rearing	Italy and Greece
	30) Managing Haemonchus burden in lambs using a copper oxide bolus	United Kingdom
	31) Portable milking machine in different farming systems	Turkey



# Challenges and dilemmas

- Multi-stakeholders participative work is far from easy
- Control over the research is rarely devolved completely onto the “stakeholders”...  
...nor do ‘stakeholders’ always want it
- Who participates influence the type, focus and usefulness of the research outcomes



# Challenges and dilemmas

- Participative research aims to work with all stakeholders:
  - Assumption stakeholders exist as distinct entities: small, well-bounded, homogeneous and integrated.
  - Within these needs, values, sentiments and ideologies are shared
  - This is invariably not the case



# Challenges and dilemmas

- (Long-term) motivation is key
- Farmers skeptical as to whether it is worth investing their time and energy in research...
  - ...particularly if it seems to offer little in terms of direct benefit
- Farmers (and researchers) have to weigh their input or time investment with the expected output



# Challenges and dilemmas

Participative research implies  
a sharing of aims  
between stakeholders