



**NIBIO**

NORSK INSTITUTT FOR  
BIOØKONOMI

# To EU-prosjekt på teknologi, småfe og dyrevelferd: TechCare og Sm@RT

Lise Grøva, Grete Jørgensen, Inger Hansen, Unni Støbet Lande, NIBIO



Integrating innovative **TECH**nologies along the value Chain  
to improve small ruminant **welFARE** management



# Det finnes mye teknologi der ute...:



**FEVERTAGS  
TEMPVERIFIED**

REDUCED  
SIZE AND WEIGHT

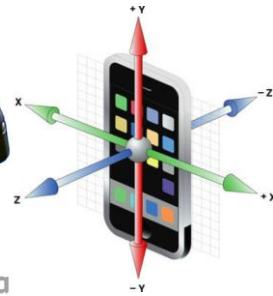
UPDATED  
SOFTWARE

SPECIFIC  
INSTALLATION  
LOCATION

WATER PROOF  
ENCAPSULATION



i samarbeid med Telia



# Sau – Geit - Teknologi

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# TechCare

**Startdato:** 2020 - 2024

**Varighet:** 4 år

**Tema:** Bedre dyrevelferd

## Samarbeidspartnere:

### 9 land og 19 partnere:

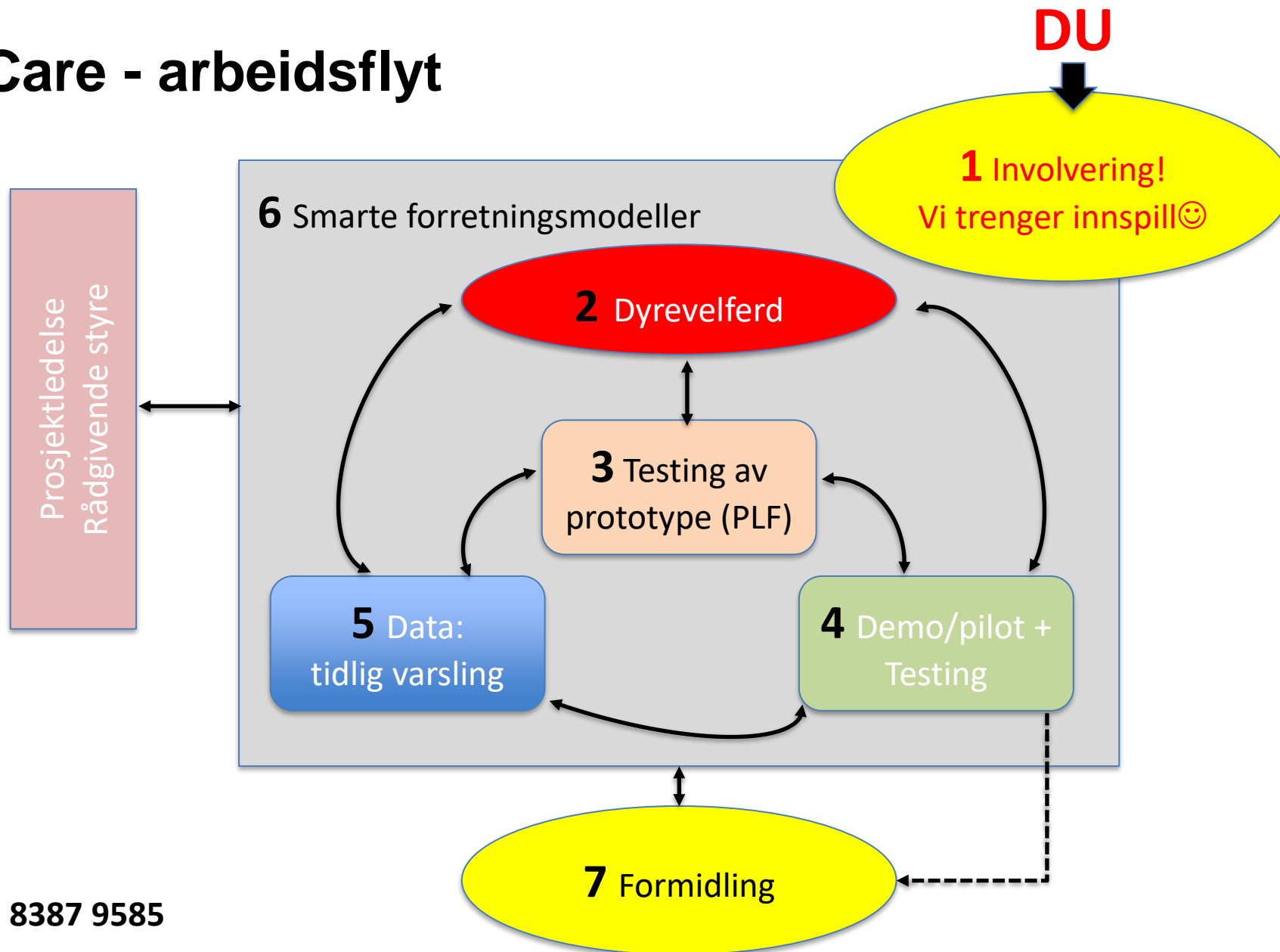
UK, Frankrike, Norge, Italia, Hellas, Isreal,

Spania, Romania, Irland

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# TechCare - arbeidsflyt

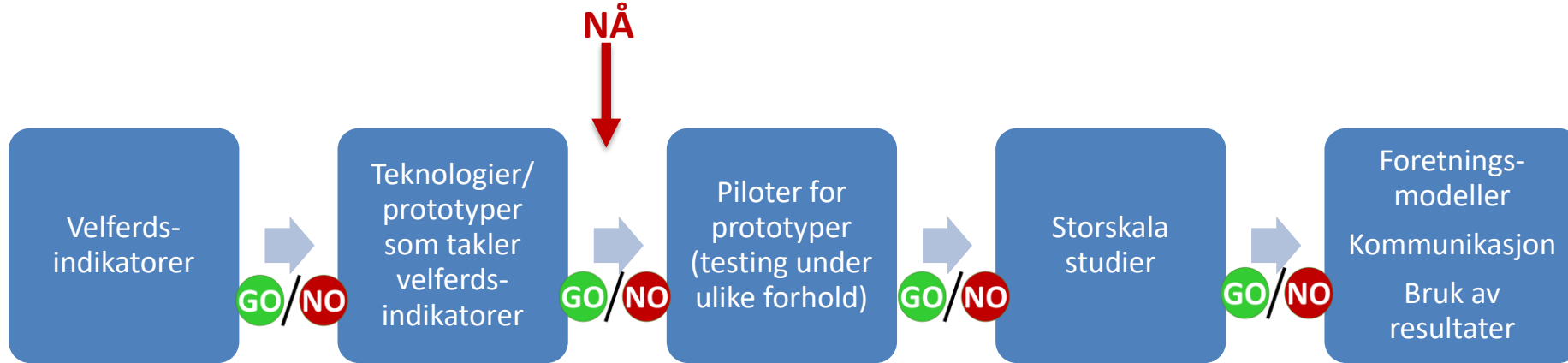


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# TechCare steg 1: Prioritere velferdsutfordringer

# TechCare steg 2: Prioritere teknologi til videreutvikling



**Bestemmes i arbeidsgrupper med næringsaktører**

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## Top 3 velferdsprioriteringer i Norge

- 1 *lammedødelighet*
- 2 *dyr som blir borte på beite*
- 3 *sjukdom generelt*



## Velferdsprioriteringer alle land (sau)

- 1 Mangelfull ernæring
- 2 Jurbetennelse
- 3 Innvollparasitter
- 3 Halthet
- 5 Utvendige parasitter
- 6 For lite vann
- 6 Fruktbarhet  
Morsegenskaper  
Gulv/liggeareal  
Luftveissykdommer  
Død (sykelighet og dødelighet...)



## Top 3 velferdsprioriteringer i Norge (geit)

- 1 *mastitt (jurbetennelse)*
- 2 *parasitter*
- 3 *sosiale interaksjoner/krangling*

## Velferdsprioriteringer alle land (geit)

- 1 Mastitt
- 2 For lite mat og vann
- 3 Sosiale interaksjoner og krangling om mat
- 4 Dårlig fjøsmiljø
- 5 Innvollparasitter
- 5 Utvendige parasitter
- 7 Halthet/kløvhelse



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# Elektronisk lesestav (kort avstand/low frequency) RFID

Gallagher SmartReader HR5 portable hand-held reader



Tru-Test® XRS2 stick reader



Agrident AWR300 stick reader



Datamars Airstick EID stick reader



Allflex RS420 Stick reader



HHR 3000 Pro



Shearwell SDL440 Ear Tag Reader



Gallagher EID Reader Controller HDX FDX

Fixed



XRP2 Panel Reader



SDL150S - Small Race Reader - Single



Panel reader

Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat					
<b>EID reader (low frequency) - RFID</b>	X (4)	X		766-868,87		RS420	RFID	Allflex/Aleis
				1949,00		SmartReader HR5	Nederland	Gallagher
				972,6		AWR300 A	Germany	Agrident - Allflex
				1709,8		Tru-Test® XRS2	NZ- Switzerland	Tru-Test- Datamars
				1332,08		Datamars Airstick EID	Switzerland	Datamars
				600,02		Biopcontrol HHR 3000 Pro V2	Norway	<a href="#">Biocontrol</a>
				909,09		Agrident		Allflex/Agrident
				1644,95		XRP2	NZ- Switzerland	Tru-Test- Datamars
				850		Shearwell Data SDL440S		
				2393,11		Gallagher EID Reader Controller HDX FDX	Nederland	Gallagher
1886,71		SDL150 S	UK	TePari				



# Elektronisk lesestav (UHF – lang avstand) RFID

UHF reader for cattle pig sheep  
Laipson (10m)



UHF reader With 4 Channels  
Laipson (10m)



RFID UHF Impinj  
Speedway  
Revolution Reader R220



AniGate



Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat					
<b>EID reader (UHF) - RFID</b>						UHF reader for cattle pig sheep	Chine	Laipson
						UHF reader with 4 channels	Chine	Laipson
	X (2)	X (1)	X (2)			RFID UHF Impinj Speedway Revolution Reader R220	Chine	IMPINJ
				2000 euros	5 euros/tag	Page Up	France	Page Up
						AniGate	USA	AniTrace



# GPS + akselerometer + 'lammennode' (proximity sensor)



Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat					
<b>GPS + proximity sensor</b>			X (3)	108,89	11,5 - 21,3	Radiobjella	Norway	Telespor
				223,86	22	E-Bjella model2	Norway	FindMy
				115,03	9,6 or 23	Smartbjella 2	Norway	Smartbells AS
				179,95		Digitanimal	Spain	Digitanimal
				199- 480	38	Domodis®	Spain	Domodis
				290	16	GEOPOS	France	GEOPOS
				299	69	epasto®	France	Aguila Technologies



# Sorting

Combi clampo



Portillon de tri à trois directions



PM 91 PORTE DE TRI POUR OVINS



Technology/PL F tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat					
<i>Sorting gate</i>	X	X (5)		4932,47		Combi clampo	UK	Ritchie
				571,8		Portillon de tri à 3 directions	France	Veno
				3622		PM 91 PORTE DE TRI POUR OVINS	France	Marechalle-Pessage



# Veiing og sorteringssystem

3-Way Electric Slide Gate Auto Drafter Prattley



WSS3000



Sheep Auto Drafter



Prattley 3-Way Swing Gate Automatic Sheep Drafter



Te Pari Racewell HD3



Prattley 3-Way Swing Gate Automatic Sheep Drafter (Mobile)



Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy s	Meat s	Dairy g					
<b>Weighing and sorting crate</b>	X	X	X	14705,58		3-Way Electric Autodrafter	UK	Prattley
				13972,24		Automatic Drafting Crate	UK	Shearwell
						WSS3000®	Norway	Bio control AS
				16803,98		Sheep auto drafter	Nederland	Gallagher
				16260		Te Pari Racewell HD3 cage		Racewell
				16113,53		Prattley 3-Way Swing Gate Automatic Sheep Drafter (Mobile)	UK	Prattley



# Temperatur and fuktighetsmålere – inne i fjøs

EL-USB-2-LCD



Thermochron iButton© starter kit



TDHC 400 thermochron reader



DS1923-F5 Temperature/humidity logger

HT30 Wet Bulb Globe Temperature (WBGT)



EXTECH  
A FLIR COMPANY

Humlog 20

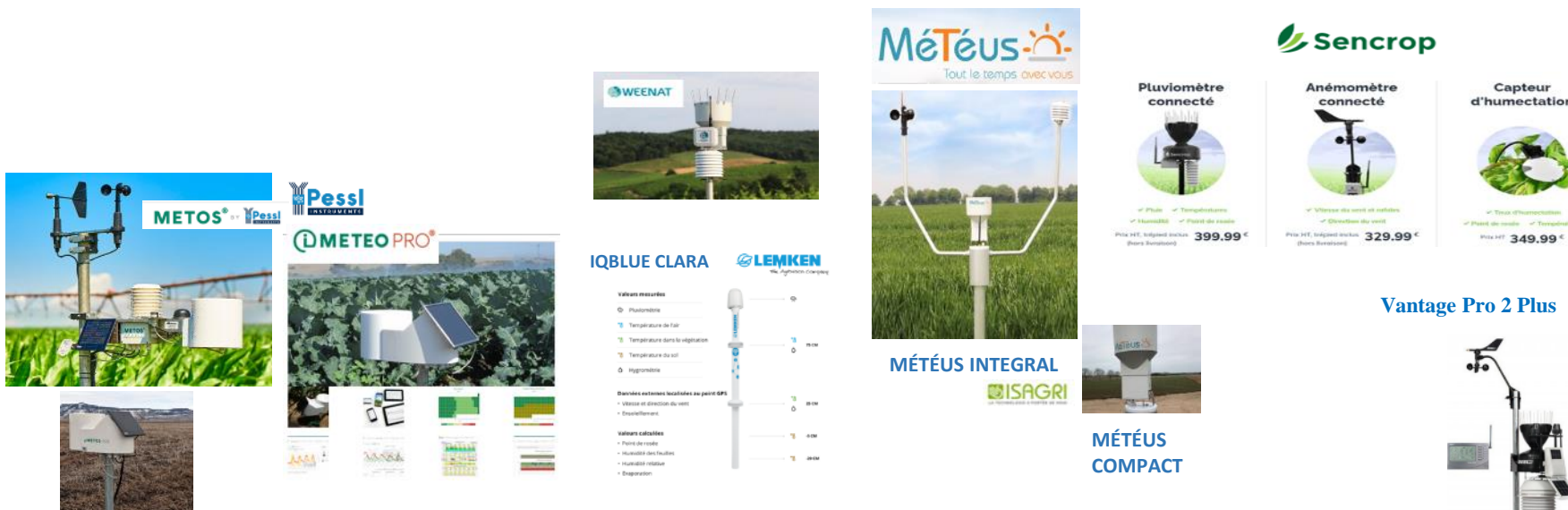


E-E  
ELEKTRONIK\*

Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat					
<i>Temperature and humidity sensors</i>			X	70,06		EL-USB-2-LCD+	UK	Lascar Electronics Ltd.
	X			93,67	94,73	Thermochron iButton©	UK	HomeChip
			X	199	8,99	HT30 Wet Bulb Globe Temperature (WBGT)		ExTech Instruments
				728,4-1354,8		HUMLOG20	Austria	E+E Elektronik

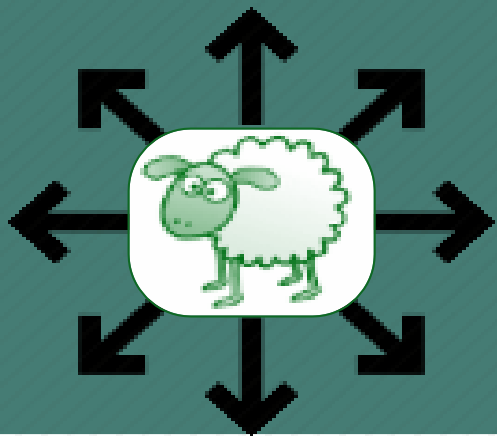


# Værstasjoner



Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy s	Meat s	Dairy g					
<b>Weather station</b>	X	X	X	960	227-385	METEOS® 3.3	Austria	Pessl Instruments
				695		iMETEOS® eco D3	Austria	Pessl Instruments
				589,05		iMETEOS® Lora SOIL	Austria	Pessl Instruments
				495,00	30	METEOPRO®	Austria	Pessl Instruments
				1349,00		Davis Vantage Pro2 Plus	France	Davis Météo
				329,99-399,99	79-229 (€/year)	Sencrop®	France	Euratechnologies
				549,00	150 (€/year)	Station météo LEMKEN	France	Lemken
				390,00	192 (€/year)	Station meteo Météus	France	ISAGRI
				498,00	119 (€/year)	Station meteo Weenat	France	Weenat





## Teknologier SAU

Elektronisk lesestav – lang rekkevidde

GPS

Akselerometer (GPS + 'proximity' sensor)

Elektronisk lesestav – kort rekkevidde

Vekt (sortering mm)

Miljø sensorer (temperature, fuktighet)

Kamera jurhelse

Sensorer på sauene for helseobservasjoner (temp + hjerterate)

**Hvilken teknologi skal vi videreutvikle til sau ifht:**

- Vekt / hold
- Atferd (fôr/vann inntak, aktivitet, mm)
- Jurhelse
- Miljø + oppstalling

# Elektronisk melkemåler

AfiFree™ 155i  
(Afimilk)



Lactocorder-S®  
(WMB)



MM25SG®  
(DeLaval)



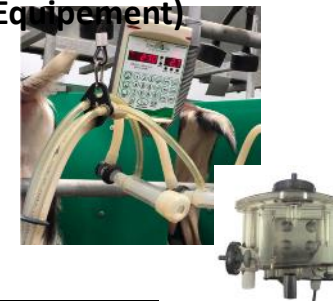
F17  
(DeLaval)



DemaTron 75  
(Gea Westfalia  
Surge)



Greenoak  
(Dairy  
Equipment)



Technology/PLF tool	Animal species			Cost per item (€)		Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat		Additional costs (€)			
<i>Electronic milk meter</i>	X (1)		X (1)			AfiFree™ 155i	Israel	Afimilk®
					556,8	Lactocorder-S®	Switzerland	WMB
						MM25SG®	Sweden	DeLaval
				1500		F17 milk meters	Sweden	DeLaval
				732	12,95	Dematron 75 GEA		GEA Westfalia Surge
				1553,18		Milk recording Kit	UK-CA	Greenoak



# Infrarød melke analyse



Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat					
<b>FTIR - infrared milk analyzer</b>				3840		DeLaval DCC®	Sweden	DeLaval
				1200		Afilab	Israel	<a href="#">Afirmilk</a>
				33990		Mira Infrared (IR) Milk Analyzer	USA	<a href="#">Bruker</a>
	X (3)		X (3)			FT-IR Milk Analyzer	France	Perkin Elmer (HTDS)
						LACTOSCOPE™ FT-A LIQUID DAIRY PRODUCTS ANALYZER	France	HTDS
				41749,54		MilkoScan FT2 – infrared milk analyzer	Denmark	Foss



# Amoniakknivå i fjøset

INNOVA 1314i  
The Photoacoustic Gas Monitor



Advanced Energy

PICARRO  
G2103 Gas Concentration Analyzer



Rosemount™ CT5100  
Continuous gas analyser



CX4000 gaset

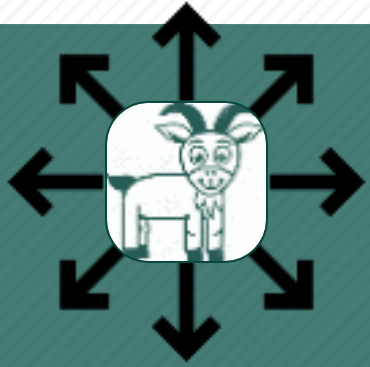


Axetris LGD F200P2



Technology/PLF tool	Animal species			Cost per item (€)	Additional costs (€)	Model name	Country	Company
	Dairy sheep	Meat sheep	Dairy goat					
<b>Ammonia levels</b>	X		X			INNOVA 1314	Denmark	Advanced Energy
						Picarro G2103	USA	PICARRO
						Rosemount™ CT5100	USA	Emerson Electric Co
						Gasmet CX4000	Finland	Gasmet
						Axetris LGD F200-A	Switzerland	Axetris





## Teknologier mjølkegeit

Elektronisk melkemåler

Elektronisk lesestav – lang rekkevidde (UHF) - RFID

FTIR - infrarød melkeanalyser

GPS og akselerometer

Miljøsensorer (Temperatur og fukighetsmålere)

Amoniakk nivå

Dyretransport + slakteri: Overvåking av miljø og atferd

Infrarødt kamera - jurhelse

**Hvilken teknologi skal vi videreutvikle til GEIT for å få mer informasjon om:**

- Vekt / hold
- Atferd (fôr/vann inntak, aktivitet, mm)
- Jurhelse
- Miljø + oppstalling

# Prioriterte teknologier sau og geit for bedre dyrevelferd:

Land	Sau	Geit
<b>Spania</b>	Luftkvalitet / værstasjon Elektronisk vekt Elektronisk øremerke + lesestav (RFID)	Luftkvalitet / værstasjon Elektronisk melkemåler Elektronisk øremerke + lesestav (RFID)
<b>Romania</b>		Luftkvalitet / værstasjon Elektronisk vekt Elektronisk øremerke + lesestav (RFID)
<b>Frankrike</b>	Elektronisk øremerke + lesestav (RFID) Elektronisk vekt Akselerometer + GPS	Luftkvalitet / værstasjon Måle vannopptak Elektronisk øremerke + lesestav (RFID)
<b>Irland</b>	Akselerometer + GPS Luftkvalitet / værstasjon Elektronisk øremerke + lesestav (RFID)	
<b>Hellas</b>		Weather/Air quality Sensors Electronic Milk Meter Elektronisk øremerke + lesestav (RFID)
<b>England</b>	Elektronisk vekt Elektronisk øremerke + lesestav (RFID) Luftkvalitet / værstasjon	
<b>Italia</b>		Electronic Milk Meter Automatic Weight Platform Elektronisk øremerke + lesestav (RFID)
<b>Israel</b>	Elektronisk øremerke + lesestav (RFID) Elektronisk vekt Elektronisk sorteringssystem	
<b>Norge</b>	Akselerometer + GPS Elektronisk vekt og sorteringssystem Elektronisk øremerke + lesestav (RFID)	Akselerometer + GPS Elektronisk melkemåler Elektronisk øremerke + lesestav (RFID: Dyreflyt)

# Internationalt nettverk: Dele erfaringer med bruk av teknologi i sau- og geiteholdet



3 år: 2021 – 2023

11 partnere, 8 land

- **UK** – SRUC, MRI
- **Frankrike** – Idele, INRAe, IEIC
- **Italia** – Agris Sardegna
- **Norge** – NIBIO
- **Irland** – Teagasc
- **Estland** – Estonia University of Life Science
- **Israel** – Agricultural Research Organisation
- **Ungarn** – University of Debrecen



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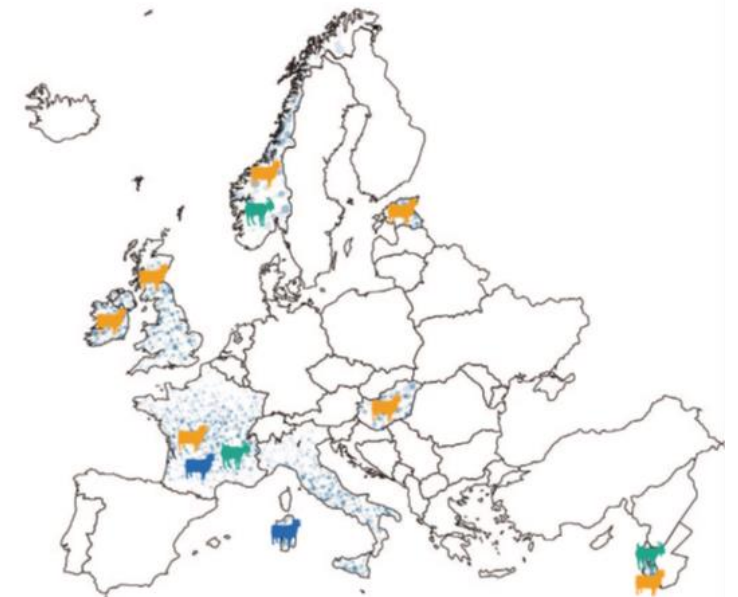
# Internasjonalt nettverk

## - dele erfaringer med bruk av teknologi i småfenæringa

### 5 mål:

1. Avdekke **behovet** for nye teknologier i småfesektoren
2. Lage **oversikt** over eksisterende digitale løsninger og bruk
3. Avdekke **mangler** og flaskehalsar for å ta teknologi i bruk
4. Vurdere den tekniske, økonomiske, miljømessige og samfunnsmessige **betydningen** av ulike teknologier
5. **Kommunikasjon og deling av ideer mellom gardbrukere og forskere**

**Hva trengs?**  
**Hva fins?**  
**Hva fungerer?**



Carte réalisée avec Cartes & Données - © Artique

# Fôring

Topic	Needs / What is complicated ?	Votes	Solution
Fattening	Lamb weighing (in barn and also in pasture)	19	EID tags & EID-enabled weigh crate
Fattening	Animal sorting, manipulations, moving	13	EID tags & EID-enabled weigh crate
Fattening	Parasitism détection/Faecal egg sampling/when to treat	10	EID tags & EID-enabled weigh crate Faecal egg count testing technology (eg FecPakG2).
Fattening	Outdoor condition / barn condition to monitor / adapt	6	Electronic weather stations. Quad bike mounted grass measure.
Fattening	Help for the farmer to know when the lamb is ready for slaughter	5	EID tags & EID-enabled weigh crate
Fattening	Drafting fat lambs /lamb to keep	5	EID tags & EID-enabled weigh crate
Fattening	Aditonal feeding lambs during weaning time	5	Ration software
Fattening	Added value of digital technologies (cost, use of technologies at some periods)	4	Farm management software
Fattening	Ration formulation	4	Ration software
Fattening	Timely weaning	4	EID tags & EID-enabled weigh crate. Quad bike mounted grass measure.
Fattening	Lamb self weighing whilst feeding – and drafting	3	EID tags & EID-enabled weigh crate
Fattening	Ration allocation/trough management	2	Ration software. Feed intake system.
Fattening	Performance recording (growth rates, slaughter data etc.)	1	EID tags & EID-enabled weigh crate. Hand-held data loggers. Farm management software

# Beitebruk



Topic	What is needed/complicated	Votes	Solutions
Feeding / Grazing	Moving electric fences is very time-consuming and complicated - and issue of no fences on the hill ground/fencing, wolf free fences	15	Virtual fencing.
Feeding / Grazing	Grazing monitoring (pasture optimisation, virtual fences, connected fences, grass growth...)	7	Quad bike mounted grass measure. Relevant softwares.
Feeding / Grazing	Knowing how much sheep grazing days are left in a field/Grass allocation/measurement	5	Quad bike mounted grass measure. Relevant softwares.
Feeding / Grazing	Deciding on feeding groups/Link between the state of the animals & feeding	5	EID tags & EID-enabled weigh crate
Feeding / Grazing	Auto drafting ewes for nutrition management	5	EID tags & EID-enabled weigh crate
Feeding / Grazing	Lamb surveillance on pasture	5	Drone
Feeding / Grazing	Measuring grass heights (time-consuming)/Automatic grass measuring	4	Quad bike mounted grass measure. Relevant softwares.

# Helse - velferd

Topic	What is needed/complicated	Votes	Solutions
Health / Welfare	Early detection of health issues /identifying disease issues	19	EID tags & EID-enabled weigh crate
Health / Welfare	Detection common parasites/manage external parasites/and treatment	17	EID tags & EID-enabled weigh crate; Feecal egg count testing technology.
Health / Welfare	Identification of sick animal for a better follow (mastitis, worm, etc.)	10	EID tags & EID-enabled weigh crate. Hand-held data loggers. Farm management software
Health / Welfare	Recording/collecting/analysing health data is time-consuming/recording tags health issues, including withdrawal period	9	EID tags & EID-enabled weigh crate. Hand-held data loggers. Farm management software
Health / Welfare	Combining of individual health data and all other data	8	Farm software
Health / Welfare	Not overdrenching - so having an autodrench gun based on weight would be great/ dosing & FEC monitoring	5	Autodrench gun
Health / Welfare	Need tools to observe animals and help the farmer for the decision	4	Drone
Health / Welfare	Following of water consumption	4	Water intake recording crate / flow meter
Health / Welfare	Physicality of treating lameness (turning the animal)/footbathing & treating lameness	4	Conveyor or other handling systems
Health / Welfare	How to separate the animals who are lame?	4	EID tags & EID-enabled weigh crate

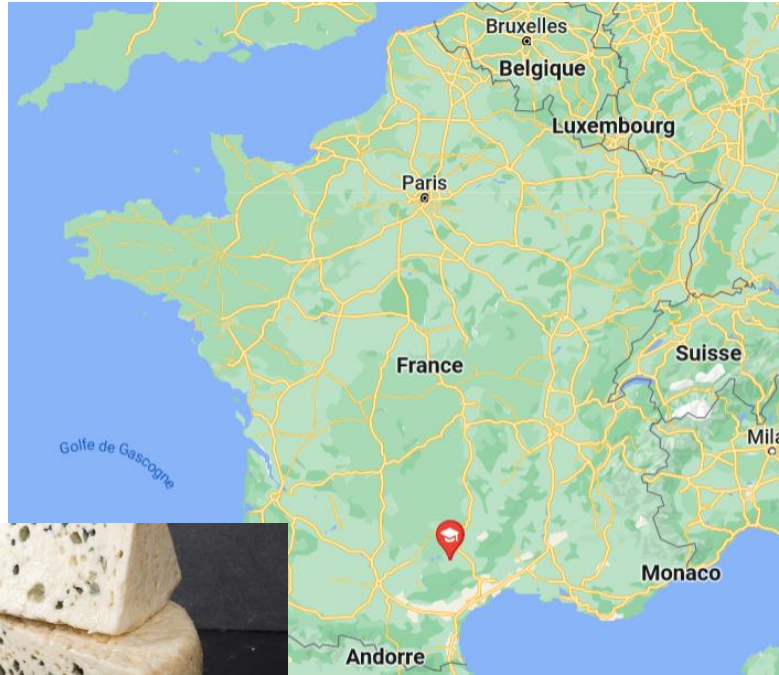
# Avl og flokkstyring

Topic	What is needed/complicated	Votes	Solutions
Reproduction	Difficult to manage flock with different mating groups	5	Genomic parentage
Reproduction	Selecting/drafting ewes for rams/replacements	5	EID tags & EID-enabled weigh crate
Reproduction	Lambing records/ewe performance	4	EID tags & EID-enabled weigh crate. Hand-held data loggers. Farm management software
Reproduction	How to collect IDs automatically outside (through gates?)	4	EID tag readers
Flock monitoring	Recognising and/or weighing your sheep automatically	10	EID tags & EID-enabled weigh crate
Flock monitoring	Difficulties foot-trimming	4	Conveyor or other handling systems

## Driver du med sau eller geit:

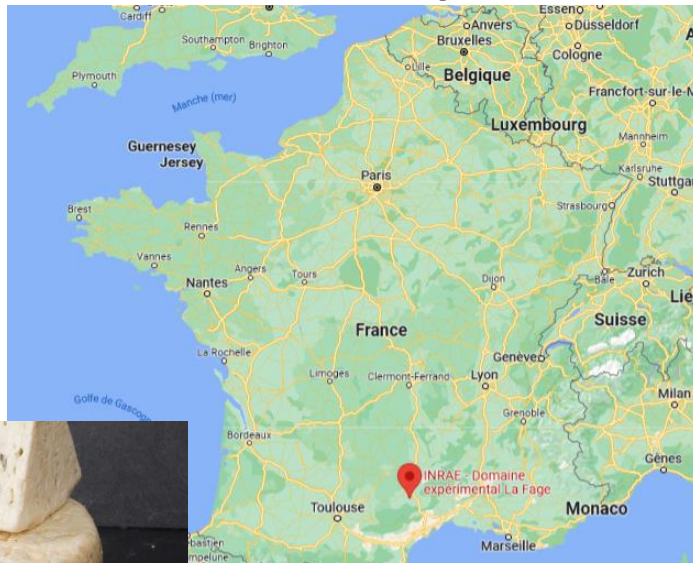
- Vil du fortelle hvordan du bruker teknologi: Hva som fungerer til hva? (Demofilm)
- Blir demogård / innovasjonsgård (markdag mv)?
- Delta på 'workshop' – Frankrike Juli 2022

# La Cazotte – Dairy sheep Digifarm and meat sheep farm



- 220 ha
- 600 dairy sheep : milk for Roquefort
- 100 meat sheep
- Breed : Lacaune for milk and lacaune for meat
- Some tools :
  - Feedcar (automatic concentrate distributor in sheepshed)
  - breeding harness (tested)
  - Herd management software
  - RFID UHF tags (tested)

# La Fage – Experimental Dairy and meat sheep farm



- 380 ha
- 600 dairy sheep : milk for Roquefort
  - Breed : Lacaune
- 400 meat sheep
  - Breed : INRA 401
- Some tools :
  - Herd management software
  - Walk over weighing
  - Individual trough



## Neste aktivitet:

Workshop i Frankrike Juli 2022

Hvem vil bli digigård?

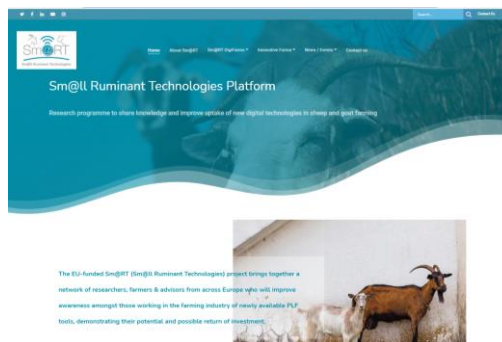
Hvilke demovideoer skal vi lage?

Vil du dele?

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-  @H2020Smart
-  H2020-smart
-  h2020smart
-  H2020-Sm@RT



-  @TechCareproject
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Integrating innovative **TECH**nologies along the value Chain  
to improve small ruminant **welFARE** management

