Geographical location:
United Kingdom

Main geographical location (NUTS3):
Edinburgh, City of

Keywords:
Farming equipment and machinery
Farming practice
Animal husbandry and welfare

Main funding source:
Horizon 2020 (EU Research & Innovation programme)

Project Identification:
Thematic network

Project type:
Research project

Starting date:
2021

End date:
2024

Project status:
Ongoing

Website:
Project website

Title (in English):
Sm@RT: Small Ruminant Technology - Precision Livestock Farming and Digital Technology for Small Ruminants

Objective of the project (native language):
see objectives in English

Objective of the project (in English):
Sm@RT aims to improve understanding, awareness and uptake of the different technologies currently available to the small ruminant sector, and further to facilitate ‘solutions to needs’ and identification of technology gaps. The project will develop a long-term, self-sustainable European/International network to encourage the use of Precision Livestock Farming (PLF) and Digital Technologies (DT) across the small ruminant sector. The network will stimulate knowledge
exchange and cross-fertilisation amongst a wide range of stakeholders, including drawing upon the valuable input and knowledge of farmers to farmers, to help increase uptake across the industry.

**Description of activities (in English):**

Sm@RT uses an original interactive transdisciplinary and multi-actor approach, relying on 3 levels of networking: 1) a network of well equipped demonstration farms (‘digifarms’), 2) a network of innovative commercial farms to foster exchanges with 3) the small ruminant industry in each country. Needs/barriers of farmers in terms of technology use will be assessed, through a global survey and a series of workshops. Solutions to these needs will then be proposed during workshops. Training and demonstration opportunities will be offered through the digifarms and the innovative farms networks with testimonies being collected to boost dissemination and communication in a trusting environment.

---

**Practice abstract 1**

**Short title (in English):**
Genomic parentage (DNA test)

**Short summary for practitioners (in English):**

One of the needs identified by farmers in Sm@RT [1] was the difficulty to determine the parentage of lambs in an extensive setting. One innovative tool that was proposed by the UK partners is the use of a DNA test to know the pedigree of a lamb. The test is a service that provides animal parentage information using DNA collected as a tissue sample, thus allowing the identification of the sire and dam of a lamb. To implement the tool, you need to DNA test all of your ewes and rams prior to mating. At lambing (or marking), take a sample from the lamb’s ear with a special tagger provided. You can then send the tissue samples for DNA testing, and you will receive the results of your lamb parentage. Such a tool is useful for flocks that lamb in extensive systems or that are not routinely lambed indoors. It is also beneficial for flocks that use multi-sire mating groups. With such a tool, the farmer can assess the ram success rate, as well as assessing ewe rearing performance when monitoring lamb growth and survival of lambs allocated to each ewe. This information is useful to manage flock reproduction management.

**Short title (native language):**
Genomic parentage (DNA test)

**Short summary for practitioners (native language):**

One of the needs identified by farmers in Sm@RT [1] was the difficulty to determine the parentage of lambs in an extensive setting. One innovative tool that was proposed by the UK partners is the use of a DNA test to know the pedigree of a lamb. The test is a service that provides animal parentage information using DNA collected as a tissue sample, thus...
allowing the identification of the sire and dam of a lamb. To implement the tool, you need to DNA test all of your ewes and rams prior to mating. At lambing (or marking), take a sample from the lamb’s ear with a special tagger provided. You can then send the tissue samples for DNA testing, and you will receive the results of your lamb parentage. Such a tool is useful for flocks that lamb in extensive systems or that are not routinely lambed indoors. It is also beneficial for flocks that use multi-sire mating groups. With such a tool, the farmer can assess the ram success rate, as well as assessing ewe rearing performance when monitoring lamb growth and survival of lambs allocated to each ewe. This information is useful to manage flock reproduction management.

Practice abstract 2

**Short title (in English):**
EID tags & EID-enabled weigh crate

**Short summary for practitioners (in English):**

Some of the main issues identified by farmers were to do with lamb weighing (inside/outside); sorting and moving animals, drafting fat lambs for selling and timely weaning. Most of these issues can be helped with the use of electronic ID tags and an EID-enabled weigh crate. The aim for this tool is to collect individual animal data and draft groups of animals (manually or automatically). When the animals go through the crate, and in front of an RFID antenna, they are identified via their EID tag/bolus. The weigh crate (mobile or fixed) collects individual data (e.g. weights) linked to the animals tag/bolus. If the crate has an auto-shedder, the sheep can also be sorted automatically. To implement this solution, you need a) to have all your animals tagged and their individual information entered into a software (Tru-Test or other); b) to have a crate set-up in your shed or on pasture; and c) to know how you want your animal to be split automatically (e.g. by weight threshold for weaning, weight gain, breed, etc.). There are benefits to using that tool. First of all, it reduces stress and improves the safety of both the animal and shepherd, it can be permanently fixed in position or mobile, and it allows easy data collection for management decisions. The only prerequisite to using this tool is that all animals need to be EID tagged or have an EID bolus.

https://www.youtube.com/watch?v=ctdGwHzacQ0 [2]

**Short title (native language):**
EID tags & EID-enabled weigh crate

**Short summary for practitioners (native language):**

Some of the main issues identified by farmers were to do with lamb weighing (inside/outside); sorting and moving animals, drafting fat lambs for selling and timely weaning. Most of these issues can be helped with the use of electronic ID tags and an EID-enabled weigh crate. The aim for this tool is to collect individual animal data and
draft groups of animals (manually or automatically). When the animals go through the crate, and in front of an RFID antenna, they are identified via their EID tag/bolus. The weigh crate (mobile or fixed) collects individual data (e.g. weights) linked to the animals tag/bolus. If the crate has an auto-shedder, the sheep can also be sorted automatically. To implement this solution, you need a) to have all your animals tagged and their individual information entered into a software (Tru-Test or other); b) to have a crate set-up in your shed or on pasture; and c) to know how you want your animal to be split automatically (e.g. by weight threshold for weaning, weight gain, breed, etc.). There are benefits to using that tool. First of all, it reduces stress and improves the safety of both the animal and shepherd, it can be permanently fixed in position or mobile, and it allows easy data collection for management decisions. The only prerequisite to using this tool is that all animals need to be EID tagged or have an EID bolus.

https://www.youtube.com/watch?v=ctdGwHzacQ0 [2]

Practice abstract 3

Short title (in English):
Automated grass measurement devices

Short summary for practitioners (in English):
When ewes and lambs are grazing in outdoor conditions, it is useful to understand how much grass is available to ensure optimum grazing conditions for the ewes and a timely weaning of lambs. One of the solutions proposed by Sm@RT [1] is to use automated grass measurement devices to answer these needs. The aim is therefore to monitor grass growth and condition to make the relevant management decisions. These tools can be either hand-held or attached to the back of a quad bike, and are automatic methods for collecting grass height / biomass information, with a link to a mobile phone app / computer software (e.g. AgriNet). If using the hand-held reader, you just need to walk in the field and take regular measurements, or, you can use the device that attaches behind a quadbike and drive to the field. There are many benefits to using these automated grass measurement devices. They are useful for monitoring and assessing grass growth and for assessing the number of days grazing available. They are also useful for rotational grazing systems & systems that have a large number of fields. They should improve farm decision making, and help with grazing management, especially when fattening lambs. They are also valuable to monitor flock performance, and the data collected can be stored and accessed easily.

Short title (native language):
Automated grass measurement devices

Short summary for practitioners (native language):
When ewes and lambs are grazing in outdoor conditions, it is useful to understand how much grass is available to ensure optimum grazing conditions for the ewes and a timely weaning of lambs. One of the solutions proposed by Sm@RT [1] is to use automated grass measurement devices to answer these needs. The aim is therefore to monitor grass growth and condition to make the relevant management decisions. These tools can be either hand-held or attached to the back of a quad bike, and are automatic methods for collecting grass height / biomass information, with a link to a mobile phone app / computer software (e.g. AgriNet). If using the hand-held reader, you just need to walk in the field and take regular measurements, or, you can use the device that attaches behind a quadbike and drive to the field. There are many benefits to using these automated grass measurement devices. They are useful for monitoring and assessing grass growth and for assessing the number of days grazing available. They are also useful for rotational grazing systems & systems that have a large number of fields. They should improve farm decision making, and help with grazing management, especially when fattening lambs. They are also valuable to monitor flock performance, and the data collected can be stored and accessed easily.
much grass is available to ensure optimum grazing conditions for the ewes and a timely weaning of lambs. One of the solutions proposed by Sm@RT [1] is to use automated grass measurement devices to answer these needs. The aim is therefore to monitor grass growth and condition to make the relevant management decisions. These tools can be either hand-held or attached to the back of a quad bike, and are automatic methods for collecting grass height / biomass information, with a link to a mobile phone app / computer software (e.g. AgriNet). If using the hand-held reader, you just need to walk in the field and take regular measurements, or, you can use the device that attaches behind a quadbike and drive to the field. There are many benefits to using these automated grass measurement devices. They are useful for monitoring and assessing grass growth and for assessing the number of days grazing available. They are also useful for rotational grazing systems & systems that have a large number of fields. They should improve farm decision making, and help with grazing management, especially when fattening lambs. They are also valuable to monitor flock performance, and the data collected can be stored and accessed easily.

Practice abstract 4

Short title (in English):
Drone with thermal camera

Short summary for practitioners (in English):

When sheep graze on vast unfenced rangeland mountain areas it is challenging to attend to the animals regularly and to have information about their whereabouts, individual health and welfare. A main challenge in this farming system is regular surveillance of individual animals and finding all animals when collecting them in the autumn before winter. Both these two challenges can be helped with a number of different approaches i.e. the use of GPS collars and proximity tags to know where the sheep are, and drone with thermal cameras for automatic image detection of sheep in the landscape. The aim of using a drone with a thermal camera is to identify sheep in vast rangeland areas. Identifying potential sheep in the landscape with a drone has potential to save work hours for the farmer when gathering sheep in the autumn and to improve the welfare of sheep as sheep that were perceived to be lost may be found before winter. Commercial companies may provide thermal image cameral services, however the software of identifying sheep automatically from these images is not verified and commercially available as of today to our knowledge. Benefits of using the tool: It improves work load of the framer and the welfare of the animals. The prerequisite to using this tool is that there is a drone company available with certificate to use the drone and that legal regulations allow drone in the grazing area.

https://www.gardsdrift.no/desember-2015-droner-gardsdrift/varmesokende-d... [3]

Short title (native language):
Drone med termisk kamera

Short summary for
practitioners
(native language):

Når sauer beiter i utmarka er det utfordrende å ha tilsyn med alle dyr regelmessig; hvor er de og er de friske. En utfordring med sau i utmark er regelmessig overvåking av enkeltddy og å finne alle dyr ved innsamling høsten før vinteren. Bruk av GPS-halsbånd og aktivitetsmåler for å vite hvor sauene er, samt bruk av drone med kamera og termiske kamera for automatisk bildegjenkjenning av sauer i landskapet er relevant som hjelpemiddel for bonden. Målet med å bruke en drone med et termisk kamera er å identifisere sau i store utmarksområder, spesielt om høsten. Å automatisk kunne identifisere sau i landskapet med en drone har potensiale til å spare arbeidstimer for bonden i fom sanking om høsten. Det er viktig i hth velferd til sauer som ikke kommer ned fra fjellet om høsten og dermed oppfattet tapt, kan bli funnet før vinteren. Kommersielle selskaper kan tilby varmebildekameratjenester, men programvaren for å identifisere sau automatisk fra disse bildene er ikke verifisert og kommersielt tilgjengelig per i dag så vi vet. Fordeler med å bruke verktøyet: Redusert arbeidsmengden i fom sankeing og økt dyrevelferd. Forutsetningen for å bruke dette verktøyet er at det er et droneselskap tilgjengelig med sertifikat for å bruke dronen og at lovbestemmelser tillater drone i beiteområdet.

Practice abstract 5

Short title (in English):
Virtual fence

Short summary for practitioners (in English):

Fencing is a costly and time consuming work load for the farmer, and a limiting factor for access to grazing areas. Access to good quality grazing areas that provides feed for ruminants is an important resource in the small ruminant sector and is of economic important. Access to such grazing land also has potential for welfare improvement as it gives access to feed and free roaming activity. The Nofence virtual fencing system consists of an app and a solar-powered collar that communicates on mobile phone networks. The collar provides GPS position data. The fencing function relies on the GPS, but it is recommended having mobile coverage in the major parts of the pasture for monitoring and control in the app. The Nofence collar trains the animals to turn around on audio. To implement the tool you need to follow the instructions from the technology provider. For the Nofence system you need to: 1) Download the Nofence-app and define the pasture, 2) Place the collar on all adult animals in the herd 3) Teach the animals to respond to the audio warning and 4) Monitor the animals in the Nofence-app. Benefits are access to new areas and fresh pastures whenever the farmer decides, allows exclusion zones to prevent animals from entering, gives access to land that does not have a permanent fence. Further, it lets you track your animals’ movements in real-time. https://www.youtube.com/channel/UCyOb6_pFOkvJnko2jlkJTnw [4] https://www.nofence.no/en-gb/what-is-nofence [5]
Virtuelt gjerde


https://www.youtube.com/channel/UCyOb6_pFOkvJnko2jklTnw [4]

GPS & proximity loggers

When sheep graze on vast unfenced rangeland mountain areas it is challenging to attend to the animals regularly and to have information about their whereabouts, individual health and welfare. The use of GPS collars gives information about where the animals are. The aim of using GPS-collars to get information on the whereabouts of sheep in vast rangeland areas, and further to get behaviour information at flock and individual level for health and welfare monitoring. It has potential to save work hours when gathering sheep in the autumn and to improve the welfare of sheep as sheep that were perceived to be lost may be found before winter. There are a number of companies providing GPS collars for sheep and goats. You need to know if there is mobile coverage in the grazing area or not in order to select the appropriate product for your farm. There are different GPS collars that communicate position through satellite or through GSM. To implement GPS tracking on your animals you need to have access to PC or smartphone, get login information to the relevant platform and register correct information to each collar. Costs of a GPS-collar are quite high if put on all animals in a flock, and thus a system of
ear tags being proximity loggers that are read by a few GPS collars is a proposed solution. Introducing proximity loggers together with GPS-collars is expected to reduce costs and enhance implementation in the small ruminant sector.

Short title (native language):
GPS klaver og øremerker som 'nærhetsloggere'

Short summary for practitioners (native language):
Matter), Starch, Crude Protein, ADF, NDF, Ash, Crude Fat and many other nutrients in seconds.
This instrument monitors the dry matter content of feed ingredients, improving the consistency of the rations. It checks the dry matter of forages in the field, helping to determine the right time for the harvest. It assesses the quality of the feed purchased and stocked.
To implement the tool you need to put the feed sample in to the cup analyser and read the results of the analysis in the display, print or store them in a USB key. Its functioning is possible with a power supplier and a software to be installed in a PC. For some feedstuff (e.g. some fresh forages) may need a calibration based on wet chemistry. The expected benefits for farmers and technicians are several: for example, there is no sample preparation; it is portable and can be moved easily by a trolley; it needs less the one minute to read the results and it allows to make real time decisions.

Short title (native language):
NIR portatile

Short summary for practitioners (native language):
La valutazione della qualità del foraggio e il confronto in azienda con i valori ottenuti dalle analisi chimiche dei mangimi è una necessità manifestata da molti agricoltori. AgriNIR è un analizzatore NIR portatile per foraggi freschi o conservati e cereali che misura la percentuale di umidità (sostanza secca), amido, proteine grezze, ADF, NDF, ceneri, grassi grezzi e molti altri nutrienti in pochi secondi. Questo strumento controlla il contenuto di materia secca degli ingredienti dei mangimi, migliorando la formulazione delle razioni. Controlla inoltre anche la sostanza secca dei foraggi sul campo, aiutando a determinare il momento giusto per il raccolto oltre che valutare la qualità del mangime acquistato e stoccato. Per implementare lo strumento è necessario mettere il campione di mangime nell'analizzatore e leggere i risultati dell'analisi sul display, stamparli o memorizzarli in una chiave USB. Il suo funzionamento è possibile con un alimentatore di corrente e un software da installare in un PC. Per alcuni mangimi (ad esempio alcuni foraggi freschi) può essere necessaria una calibrazione basata sull'analisi chimica. I benefici attesi per gli agricoltori e i tecnici sono diversi: per esempio, non c’è preparazione del campione; è portatile e può essere spostato facilmente con un carrello; ha bisogno di meno di un minuto per leggere i risultati e permette di prendere decisioni in tempo reale.

Practice abstract 8

Short title (in English):
Environmental station + fan cooler

Short summary for practitioners (in English):
Summer heat stress and the resultant hyperthermia are important challenges facing the dairy sheep farms that result in economic annual losses due to reduced milk yield, lowered reproductive rates, and depressed immune function. The environmental station, coupled with fan cooler system, allows to check the microclimate of the farm and helps the animals to overcome unscathed the periods characterized by high temperature by moving uniformly a high air flow. The ventilation system can be managed in automatic mode to regulate the functioning of the entire system based on air temperature and humidity index (THI index) detected by appropriate probes. To implement the tool is needed a humidity and temperature control unit system. Air ventilation is set up to start when air humidity and temperature conditions overcome certain limits.  
https://www.youtube.com/watch?v=lcK_w_uGANU [10]

**Short title (native language):**
Stazione meteorologica con ventole

**Short summary for practitioners (native language):**
Lo stress da calore estivo e la conseguente ipertermia sono problemi importanti nell'e aziende ovine da latte poichè comportano perdite economiche annuali dovute alla riduzione della produzione di latte, alla diminuzione dei tassi di riproduzione e alla depressione della funzione immunitaria. La stazione meteorologica, abbinata al sistema di raffreddamento a ventola, permette di controllare il microclima dell'allevamento e aiuta gli animali a superare indenni i periodi caratterizzati da temperature elevate mediante lo spostamento uniforme di flussi d'aria. Il sistema di ventilazione può essere gestito in modalità automatica per regolare il funzionamento dell'intero sistema in base all'indice di temperatura e umidità dell'aria (indice THI) rilevato da apposite sonde. Per implementare lo strumento è necessario un sistema di unità di controllo dell'umidità e della temperatura. La ventilazione dell'aria è impostata per partire quando le condizioni di umidità e temperatura dell'aria superano determinati limiti.  
https://www.youtube.com/watch?v=lcK_w_uGANU [10]

**Practice abstract 9**

**Short title (in English):**
Milk meter

**Short summary for practitioners (in English):**
The collection of individual animal milk production automatically and the management of animal’s data is a need showed by most farmers who want to manage their flock precisely. The milk meter displays easy-to-read individual data on milk yield, instant milk flow and milking time duration in clear red digits (e.g. DeLaval) to simplify effective, daily flock management. Milk conductivity and temperature may be also recorded (e.g., AfiMilk, Lactocorder). To implement the flow milk meter you must position it in the
milking parlour equipped with automated drop-off, have all animals tagged and their individual information entered into a software (DeLaval, AfiMilk or others). This instrument allows to monitor the milk yield individually at each milking. Animal’s data are managed by a flock management software so that individual warnings may be set based on milk yield drops and/or conductivity raising for an early detection of mastitis and other pathologies or distress conditions. Farmers may also formulate adequate feeding plans according to animal's requirements. The calibration of the instrument is a necessary procedure to guarantee the accuracy of the tool throughout the entire lactation. https://www.youtube.com/watch?v=8B_0V0S5bVw [11]

**Short title (native language):**
Flussimetri

**Short summary for practitioners (native language):**
La misura della produzione di latte dei singoli animali in modo automatico e la gestione dei dati degli animali è una necessità mostrata dalla maggior parte degli allevatori che vogliono gestire il loro gregge in modo preciso. Il flussimetro visualizza i dati individuali di produzione di latte, il flusso di latte istantaneo e la durata del tempo di mungitura in chiare cifre rosse (es. DeLaval) per semplificare la gestione quotidiana del gregge. Anche la conduttività e la temperatura del latte possono essere registrate in alcuni modelli (ad esempio, AfiMilk, Lactocorder). Per implementare il flussimetro è necessario posizionarlo nella sala di mungitura dotata di caduta automatica dei gruppi prendicapezzoli, avere tutti gli animali individuati elettronicamente e le loro informazioni individuali inserite in un software (DeLaval, AfiMilk o altri). Questo strumento permette di monitorare la produzione di latte individualmente ad ogni mungitura. I dati degli animali sono gestiti da un software di gestione del gregge sul quale possono essere impostati degli allarmi che avvisano l'allevatore su cali di produzione di latte e/o sull'innalzamento della conductività, che può servire per un rilevamento precoce della mastite e di altre patologie o condizioni di stress. Gli allevatori possono anche formulare piani di alimentazione adeguati in base alle esigenze degli animali. La calibration dello strumento è una procedura necessaria per garantire la precisione dello strumento durante tutta la lattazione. https://www.youtube.com/watch?v=8B_0V0S5bVw [11]

**Practice abstract 10**

**Short title (in English):**
Somatic Cell Counter Delaval DCC

**Short summary for practitioners (in English):**
This instrument enable the early detection of troubles such as clinical and sub-clinical mastitis. The monitoring of mastitis and the udder health management is possible by a rapid on-farm determination of somatic cell count. It allows to detect mastitis at an early
stage resulting in a cost effective control of mastitis and easier flock management. The DCC is a portable instrument that gives results in just 45 seconds with simple to use disposable cassettes with DNA-specific fluorescent reagent to read the milk sample. The farmer only has to take a milk sample from the teeth, insert the cassette and read the result (no. cells/μL of milk). The treatment of mastitis at an earlier stage is very important for farmers to have a quicker recovery and less production loss. Moreover it is possible to control more efficiently the spread of mastitis and lower the risk of penalties or loss of bonus payment.

**Short title (native language):**
Conta cellule somatiche portatile (Delaval DCC)

**Short summary for practitioners (native language):**
Questo strumento permette l'individuazione precoce di problemi come la mastite clinica e subclinica. Il monitoraggio della diffusione della mastite e la gestione della salute della mammella è infatti possibile grazie a una rapida determinazione in azienda della conta delle cellule somatiche. Permette di rilevare la mastite in una fase precoce con conseguente controllo economico della mastite e una più facile gestione del gregge. Il DCC è uno strumento portatile che fornisce risultati in soli 45 secondi. E' dotato di cassetìne monouso semplici da usare con un reagente fluorescente specifico per il DNA per leggere il campione di latte. L'allevatore deve solo prendere un campione di latte dalla mammella, inserire la cassetta e leggere il risultato (numero di cellule/μL di latte). Il trattamento della mastite in una fase precoce è molto importante per gli allevatori per avere un recupero più rapido e meno perdite di produzione. Inoltre è possibile controllare in modo più efficiente la diffusione della mastite e abbassare il rischio di sanzioni o di perdita del pagamento del latte per la sua qualità.

**Practice abstract 11**

**Short title (in English):**
EID enabled weighing trough

**Short summary for practitioners (in English):**
One of the main issues identified by farmers was weighing. Selecting optimal lambs for marketing is a crucial aspect in making profit. The aim of the weighing trough is to collect individual animal data and (per farmer demand), analyse the data and mark (spray paint) animals automatically according to farmer demands (e.g. - mark all animals that are over 60KG). When the animal comes to drink, the various sensors collect individual id, weight, water consumption and more. Following data collection, sophisticated algorithms derive various insights (e.g. - abnormal drinking pattern that suggest illness) and alerts the farmer via mobile
application. The farmer will get a message stating the ID of the animal and the relevant issue to be looked at.
To implement this solution, you need
a) to have all your animals tagged and their individual information entered into a software
b) To have a device mounted in your shed on the water trough and
c) to advise which alerts you want to receive automatically from the system (e.g. - weight alert for marketing, insufficient weight gain, etc..).
Some of the benefits to using that tool are -
1. It automates data collection for management decisions while not adding stress to animals or farmer (Zero effort from both).
2. Reduces labour effort by marking animals automatically
3. Allows for effective and efficient management that saves a lot of money

Short title (native language):
רנטגן
Short summary for practitioners (native language):

Practice abstract 12

Short title (in English):
Rangeland usage recording system (GPS based)

Short summary for practitioners (in English):

When sheep are out on rangeland with a shepherd it is challenging to record continuous information about their whereabouts for usage analysis.
A GPS tracking device can record geographic information about where the animals are/were and durations of stay in various locations.
The aim of using GPS-collars to get information on the geographic location is for management of the grazing land resource.
Since the solution records the data for later use it can be battery operated, and
information downloaded periodically – which means - no need for wireless connection for data upload.
if there is mobile coverage in the grazing area the downloading of the data maybe automatic and easier.
To benefit from GPS tracking on your animals you need to have access to PC and to install (the included) map software that allows to track historic locations of the herd (to be able to manage the rangeland),
Since cost of a GPS-collar is relatively high, it is usually put on one member in a flock rather than individually - benefits remain.

**Short title (native language):**
מערכת מעקב מרעה

**Short summary for practitioners (native language):**
כאשר הכבשים יアウץ למרעה, מנהל המשק עשוי לרצות לנהל את המרעה בצורה חכמה - בכל תקופה לשכלית את אזורי המרעה בכדי לאפשר תחלופה ושיקום. מערכת GPS מאפשרת מעקב היסטורי אחרי העדר וต์ה המרעה ולתרום יכולת חכמה לניהול המרעה. בכדי להשתמש במערכת יש להלביד קולר GPS על אחת הכבשים/עיזים ובעת חזרה מהמרעה להעתיק את המידע הנצבר אל המחשב במשרד. לאחר העתקת המידע ניתן באמצעות התונה המצורפת לצפות במיקומי הרעיה המדוייקים על גבי המפה המצורפת בתוכנה ולקבל החלטות לגבי המרעה בימים הבאים.

**Practice abstract 13**

**Short title (in English):**
Sheep management software

**Short summary for practitioners (in English):**
Recording information about the herd is vital for management.
With the endless benefits of computerization – such as automation, better accuracy, less data loss, ability to compare current and historic outcomes, and more, livestock farming has seen the usage of management systems go into every aspect of the work.
Today with the advancement of mobile (handheld) application for collecting and analyzing data and presenting insights a farmer may easily introduce a sheep management software into its farm no matter its size.
The solution is relatively cheap and easy to install (phone application) and self-explanatory in its basic usage. Moreover, it allows for later upgrades and connection to much more advanced systems and abilities (such as weighing and sorting systems, veterinary reporting and government systems)/

Main benefits of such management system are – 1. Cheap 2. Easy to use 3. No need for any infrastructure – smartphone will do. 4. Enjoy best practices from other farmers, which are implemented into the software screens and processes.
Needs identified by farmers in Sm@RT [1] included the detection of internal parasites and their treatment, and the dosing/vaccinating of sheep. The sheep conveyor was proposed by the Irish partner to help with this need/challenge. The sheep conveyor moves and restrains sheep while enabling the operator to administer vaccines, drenches, etc. with minimal physical strain by the farmer. It moves sheep along a race at a speed pre-determined by the operator. The sheep are held upright and cannot move forward or backward in the conveyor. This allows the farmer to stay in one position on either side of the conveyor and administer treatments to sheep as they approach him/her on the conveyor. The conveyor speed can be adjusted by the operator and the sheep can be moved forward, held in a static position, reversed on the conveyor or held on their back as required. This tool reduces physical strain on the farmer and allows multiple treatments to be administered at once by a number of operators to save time. Some limits to the conveyor include; some sheep may need to be pushed onto the conveyor, it is not suitable for heavily pregnant ewes and operators are unable to carry out body condition scoring while animals are in the conveyor.
Flock recording apps were proposed by the Irish partner to solve needs/challenges identified by farmers in the Sm@rt [12] project, which include:

- Recording/collecting/analysing health data is time-consuming, recording tags health issues (including withdrawal period), combining of individual health data and all other data, lambing records/ewe performance, performance recording (growth rates, slaughter data etc.), and added value of digital technologies (cost, use of technologies at some periods).
- Flock recording apps (e.g. Sheep Ireland) can be used to performance record individual animals in a flock. Depending on the app, data recorded can include body condition score, weight, mating information, litter size, parentage, medicine use etc.
- Performance information facilitates the comparison of animals within and between flocks. Data can be input manually or the app can be linked to an EID reader through Bluetooth to record animal EID/tag number automatically. The app will store recorded information and reports can be generated depending on data input e.g. growth rates, medicine use, ancestral data etc. All animals need to be individually identified (i.e. tagged) to use flock recording apps. The app needs to be downloaded to a smartphone, then the animal ID can be input or their tag can be scanned with an EID reader to record data as required. The data is subsequently uploaded and saved online when the phone is connected to the internet. This tool saves time compared to manually writing and enables the data to be uploaded to data bases to facilitate the creation of flock reports, which can be used for selecting replacements, culls, rams, drafting for slaughter etc. The app can also collate all data to provide ancestral information to facilitate mating groups.
Short summary for practitioners (native language):

Flock recording apps were proposed by the Irish partner to solve needs/challenges identified by farmers in the Sm@rt [12] project, which include: recording/collecting/analysing health data is time-consuming, recording tags health issues (including withdrawal period), combining of individual health data and all other data, lambing records/ewe performance, performance recording (growth rates, slaughter data etc.), and added value of digital technologies (cost, use of technologies at some periods). Flock recording apps (e.g. Sheep Ireland) can be used to performance record individual animals in a flock. Depending on the app, data recorded can include body condition score, weight, mating information, litter size, parentage, medicine use etc. Performance information facilitates the comparison of animals within and between flocks. Data can be input manually or the app can be linked to an EID reader through Bluetooth to record animal EID/tag number automatically. The app will store recorded information and reports can be generated depending on data input e.g. growth rates, medicine use, ancestral data etc. All animals need to be individually identified (i.e. tagged) to use flock recording apps. The app needs to be downloaded to a smartphone, then the animal ID can be input or their tag can be scanned with an EID reader to record data as required. The data is subsequently uploaded and saved online when the phone is connected to the internet. This tool saves time compared to manually writing and enables the data to be uploaded to data bases to facilitate the creation of flock reports, which can be used for selecting replacements, culls, rams, drafting for slaughter etc. The app can also collate all data to provide ancestral information to facilitate mating groups.

Practice abstract 16

Short title (in English):
FECPAK G2

Short summary for practitioners (in English):

Detection of internal parasites and faecal egg sampling were some of the needs identified by farmers in the Sm@rt [12] project. The FECPAK G2 was proposed by the Irish partner to address these needs. The FECPAK G2 kit is a diagnostic platform which facilitates the undertaking of faecal egg counts without the requirement for a laboratory or the need to send faecal samples to a laboratory. It is image based which enables sampling to be undertaken at any time and uploaded through computer software. To use the FECPAK G2 kit, a detailed guide on sample preparation, connecting the device to the internet and uploading the images through the FECPAK software need to be followed. Results will be sent back to the person who uploaded the sample images within 24 hours. The tool doesn't diagnose the presence of liver fluke and requires a computer with internet access, but has the advantage of being able to be undertaken without laboratory facilities and results are fast.

Short title (native
FECPAK G2

**Short summary for practitioners (in English):**

Detection of internal parasites and faecal egg sampling were some of the needs identified by farmers in the Sm@rt [12] project. The FECPAK G2 was proposed by the Irish partner to address these needs. The FECPAK G2 kit is a diagnostic platform which facilitates the undertaking of faecal egg counts without the requirement for a laboratory or the need to send faecal samples to a laboratory. It is image-based which enables sampling to be undertaken at any time and uploaded through computer software. To use the FECPAK G2 kit, a detailed guide on sample preparation, connecting the device to the internet and uploading the images through the FECPAK software need to be followed. Results will be sent back to the person who uploaded the sample images within 24 hours. The tool doesn't diagnose the presence of liver fluke and requires a computer with internet access, but has the advantage of being able to be undertaken without laboratory facilities and results are fast.

**Practice abstract 17**

**Short title (in English):**

Pregnancy Scanning

**Short summary for practitioners (in English):**

Deciding on feeding groups pre-lambing, distribution/management of concentrate allocation during lambing, lambing records/ewe performance, and scanning and dividing ewe groups for appropriate nutrition were needs identified by farmers in the Sm@rt [12] project. To address these needs the Irish partner proposed pregnancy scanning as a solution. Pregnancy scanning is used to diagnose pregnancy and expected litter size, thus facilitating the nutrition plan pre-lambing. A trained operator uses an ultrasound scanner and specially designed crate to quickly identify pregnancy in ewes and expected litter size. Ewes should be restricted from feed for about 10 hours in advance of scanning. At scanning, ewes are marked and/or EID recorded to record litter size. Pregnancy scanning is quick and stress-free for ewes as it is carried out with sheep in a standing position. It is highly effective at identifying barren ewes which can be culled or removed from the pregnant ewes. Subsequently ewes can be grouped according to the expected number of lambs scanned to avoid under or over feeding. The farmer needs access to a trained operator to carry out pregnancy scanning and subsequently requires facilities to group ewes according to litter size and feed accordingly.

**Short title (native language):**

Pregnancy Scanning

**Short summary for practitioners (native language):**

Deciding on feeding groups pre-lambing, distribution/management of concentrate allocation during lambing, lambing records/ewe performance, and scanning and dividing ewe groups for appropriate nutrition were needs identified by farmers in the Sm@rt [12] project. To address these needs the Irish partner proposed pregnancy scanning as a solution. Pregnancy scanning is used to diagnose pregnancy and expected litter size, thus facilitating the nutrition plan pre-lambing. A trained operator uses an ultrasound scanner and specially designed crate to quickly identify pregnancy in ewes and expected litter size. Ewes should be restricted from feed for about 10 hours in advance of scanning. At scanning, ewes are marked and/or EID recorded to record litter size. Pregnancy scanning is quick and stress-free for ewes as it is carried out with sheep in a standing position. It is highly effective at identifying barren ewes which can be culled or removed from the pregnant ewes. Subsequently ewes can be grouped according to the expected number of lambs scanned to avoid under or over feeding. The farmer needs access to a trained operator to carry out pregnancy scanning and subsequently requires facilities to group ewes according to litter size and feed accordingly.
practitioners (native language):

Deciding on feeding groups pre-lambing, distribution/management of concentrate allocation during lambing, lambing records/ewe performance, and scanning and dividing ewe groups for appropriate nutrition were needs identified by farmers in the Sm@rt [12] project. To address these needs the Irish partner proposed pregnancy scanning as a solution. Pregnancy scanning is used to diagnose pregnancy and expected litter size, thus facilitating the nutrition plan pre-lambing. A trained operator uses an ultrasound scanner and specially designed crate to quickly identify pregnancy in ewes and expected litter size. Ewes should be restricted from feed for about 10 hours in advance of scanning. At scanning, ewes are marked and/or EID recorded to record litter size. Pregnancy scanning is quick and stress free for ewes as it is carried out with sheep in a standing position. It is highly effective at identifying barren ewes which can be culled or removed from the pregnant ewes. Subsequently ewes can be grouped according to the expected number of lambs scanned to avoid under or over feeding. The farmer needs access to a trained operator to carry out pregnancy scanning and subsequently requires facilities to group ewe according to litter size and feed accordingly.

Practice abstract 18

Short title (in English):
Postdried hay technology

Short summary for practitioners (in English):

To get quality hay with high protein and energy content harvested grass should be at the right growth stage. However, quite often the rainy period makes it impossible to make hay at the correct growth stage. Another aspect is that many dairy goat and sheep farmers prefer to feed their animals with hay diets (without silage) to reduce the exposure of bacteria to milk. This solution optimises the time of hay cutting at the ideal growth stage regardless of the weather conditions and ensures consistent high quality hay for dairy goats throughout the year. After the cut, the grass is allowed to wilt for one day (or less) on the field and is then transferred to bunkers. The bunkers include a ventilation system from beneath which regulates the humidity of the air entering the bunker, and that leaving the bunker. This is powered mainly from solar panels. The roof is retractable to allow natural drying on dry days. When dried the hay is delivered by a suspended forklift on overhead rails. This system ensures year-round high quality hay for the feeding of dairy goats. Labour demands for the delivery and management of feed are reduced. Hay-making time is shortened, from cutting to storage it can be completed in one/two days irrespective of the weather. The feeding process is more efficient, taking less time than were it done manually. As the post-cut hay spends little time on the field, there is less contamination of the hay from soil and atmospheric microbes, and in addition the nutritional quality parameters (including protein and energy) of the hay are higher and there is less need for concentrate feed. Limitations to this system include the availability of necessary space and suitability of housing and unpredictable costs of energy required to ventilate the drying bunkers.
Short title (native language):
Järelkuivatatud heina tehnoloogia ja selle söötmine kitsedele

Short summary for practitioners (native language):

https://www.youtube.com/watch?v=RWV-82AOBMU

Practice abstract 19
Short title (in English):
Automatic Milk Feeder for Goat Kids

Short summary for practitioners (in English):
This system involves a milk replacer unit that mixes milk powder and water and warms it to a temperature that can be determined and regulated by the farmer. Eight pipes lead from this unit to eight teats that the goats can suckle from ad lib 24 hours a day. This optimizes the intakes of milk replacer by goat kids while group housed by ensuring easily accessible ad lib feeding of pre-weaned goat kids. Multiple feeding points and all-time access means that there is less likelihood of aggression among the kids than if there was only one feeding point and/or if milk replacer were only offered at intervals during the day. It allows the kids to feed when they are motivated to do so. It also reduces labour
costs and time for staff feeding the kids. This system also allows the satisfaction of goat kids’ motivation to suckle, so reducing cross-sucking and other sucking vices. The kids are removed from their dams at around 6 days old (earlier removal can lead to scouring and higher mortality). From then until they are two months old the kids are offered milk replacer ad lib from the teats. They are also offered clean hay, concentrates and clean water. The kids may need some training to use the teats, but soon learn. Benefits include: consistent quality of milk replacer offered and the means of access. Higher intakes of the kids, less scouring, less disease and mortality. Reduced aggression. Reduced labour costs and time. Can be used for sheep lambs also. Problems with this system are the availability of necessary space and suitability of housing to fit requirements. Additionally, the kids may show preference for one teat, and queue up to use this preferred teat rather than suckling on the other teats.

https://www.youtube.com/watch?v=ve5qyDqdbuo [14]

Short title (native language):
Automaatne piimajootur kitsetallede

Short summary for practitioners (native language):

Practice abstract 20
Short title (in English):
Cameras for animal monitoring
Short summary for practitioners (in English):
During the first national workshops, farmers identified the need to be able to identify a behavior changing of their animals without the need to be on the farm. The identification and alert of a behavior changing can answer to different uses such as monitoring heats or lambing and kidding, the identification of troubles in feeding or health problems or even answer to questions around animal welfare. The cameras answer these different questions by allowing the farmer to look at and monitor his lots of animals on his computer or smartphone and to be able to intervene if necessary and at the right moment while limiting labour and presence on farm. There is currently no camera in small ruminants with automatic image processing that alerts the farmer of a behavior changing, but artificial intelligence and machine learning could improve this point.

Short title (native language):
Cameras for animal monitoring

Practice abstract 21
Short title (in English):
Monitoring of water consumption with water meters

Short summary for practitioners (in English):
The watering of ewes, goats and their followers is a key point in the management of animal health and milk production. Nevertheless, there is a lack of references and objectified knowledge around the water consumption of sheep and goat. The installation of water meters at the trough linked to an RFID identification antenna allows the recording of individual watering data and thus the monitoring of the drinking behavior of the animals. Access to this data makes it possible to approach the detection of health
The watering of ewes, goats and their followers is a key point in the management of animal health and milk production. Nevertheless, there is a lack of references and objectified knowledge around the water consumption of sheep and goat. The installation of water meters at the trough linked to an RFID identification antenna allows the recording of individual watering data and thus the monitoring of the drinking behavior of the animals. Access to this data makes it possible to approach the detection of health problems by identifying behavior of abnormal lots, behavior of abnormal individuals or even a change in the behavior of an animal.

The monitoring of milk production is an important indicator of the good health and good nutrition of dairy sheep and goat. Nevertheless, individual monitoring requires milk meters and an electronic identification by an RFID antenna of the animal in the milking parlor and are solutions that are often too expensive and complex to implement for farmers. On the other hand, tanks generally only allow the visualization of their capacity and not the recording and feedback of this information. The installation of weigh sensors under the milk tank makes it possible to have the weight of the tank continuously and therefore the milk production of the different lots. Thus the breeder can hope to detect health problems, food or other problems thanks to the weight data of the tanks recorded and the order of passage of his lots / animals in the milking parlour.

The monitoring of milk production is an important indicator of the good health and good nutrition of dairy sheep and goat. Nevertheless, individual monitoring requires milk meters and an electronic identification by an RFID antenna of the animal in the milking parlor and are solutions that are often too expensive and complex to implement for farmers. On the other hand, tanks generally only allow the visualization of their capacity and not the recording and feedback of this information. The installation of weigh sensors under the milk tank makes it possible to have the weight of the tank continuously and therefore the milk production of the different lots. Thus the breeder can hope to detect health problems, food or other problems thanks to the weight data of the tanks recorded and the order of passage of his lots / animals in the milking parlour.
nutrition of dairy sheep and goat. Nevertheless, individual monitoring requires milk meters and an electronic identification by an RFID antenna of the animal in the milking parlor and are solutions that are often too expensive and complex to implement for farmers. On the other hand, tanks generally only allow the visualization of their capacity and not the recording and feedback of this information. The installation of weigh sensors under the milk tank makes it possible to have the weight of the tank continuously and therefore the milk production of the different lots. Thus the breeder can hope to detect health problems, food or other problems thanks to the weight data of the tanks recorded and the order of passage of his lots / animals in the milking parlour.

**Practice abstract 23**

**Short title (in English):**
Aptimiz to track your working time

**Short summary for practitioners (in English):**
Aptimiz is an application installed on smartphones that permit to measure the time spent on each task / part of the farm. The application works thanks to the GPS which records the time spent in a given place of the farm which is previously divided into several working areas. Each zone is linked to a particular building, part of the farm or task. The GPS recording must be done continuously throughout the day and for the time desired by the farmer to have enough data to answer his questions about the organisation of the work. The application can be used by the farmer and/or his employees to have an overview of the organization of work on the farm. The results can allow the farmer to point out the tasks that take more time, the routes or organisations that are not optimal or even plan the time and distribution of employees.

**Short title (native language):**
Aptimiz to track your working time

**Short summary for practitioners (native language):**
Aptimiz is an application installed on smartphones that permit to measure the time spent on each task / part of the farm. The application works thanks to the GPS which records the time spent in a given place of the farm which is previously divided into several working areas. Each zone is linked to a particular building, part of the farm or task. The GPS recording must be done continuously throughout the day and for the time desired by the farmer to have enough data to answer his questions about the organisation of the work. The application can be used by the farmer and/or his employees to have an overview of the organization of work on the farm. The results can allow the farmer to point out the tasks that take more time, the routes or organisations that are not optimal or even plan the time and distribution of employees.
Practice abstract 24  
Short title (in English):  
Using a drone in the pasture  

Short summary for practitioners (in English):  

Nowadays it is not necessary for the shepherd to be present on the pasture as he can even guide the sheep with the help of a drone. With a GPS tracker You are able to monitoring the sheep individually on the grassland. With a GPS tracker (collars) You can monitoring the sheep location and movement history. With these You can get more individual information from the grassland, guide the flock without being on the grassland.

Practice abstract 25  
Short title (in English):  
Automatic feeder  

Short summary for practitioners (in English):  

An automatic feeder can make the shepherd’s work easier. With a use of precision technologies like this productivity can be increased. Precision solutions can help increase feed use efficiency. Results a uniform quality blend and also reduces loss. If here is any feed left between the two feedings can be easily transported using the conveyor belt. With this technology we can increase feed use efficiency and can increase productivity and the profitability of the farm. It may cost a lot to invest in such a technology, but it pays off over time.

Short title (native language):  
Drón alklmazása a legelőn  

Short summary for practitioners (native language):  

Ma már nem szükséges a pásztor jelenléte a legelőn, hiszen akár drón segítségével is irányíthatja a jnyájat. GPS nyomkövetővel egyedileg figyelheti a juhokat a legelőn. GPS nyomkövetővel (nyakörvek) nyomon követheti a juhok helyét és legelési útvonalát. Ezekkel több egyéni információt kaphat a gyepről, irányíthatja a nyájat anélkül, hogy a kinn a legelőn tartózkodna.
**Automata etető rendszer**

**Short summary for practitioners**
*(native language):*

Az automata etető megkönnyítheti a pásztor munkáját. Az ehhez hasonló precíziós technológiák alkalmazásával növelhető a termelékenység. A precíziós megoldások segíthetnek növelni a takarmányfelhasználás hatékonyságát. Egyenletes mennyiségű adagokat eredményez, segít csökkenteni a veszteségeket. Ha marad takarmány a két etetés között, könnyen szállítható a szállítószalag segítségével. Ezzel a technológiával növelhetjük a takarmányfelhasználás hatékonyságát és növelhetjük a termelékenységet és a gazdaság jövedelmezőségét. Sokba kerülhet beruházni egy ilyen technológiára de idővel behozza az árát.

---

**Project coordinator**

**Contact person:** Claire Morgan-Davies  
**Address:** SRUC, West Mains Road, Edinburgh, EH93JG, Scotland, UK  
**E-mail:** claire.morgan-davies@sruc.ac.uk  
**Phone:** +44 1838323967  
**Partner category:** Researcher

---

**Further details**

**Audiovisual material:**

- [H2020SmaRT YouTube channel](https://www.youtube.com/watch?v=ctdGwHzacQ0)  
- [EID crate and autosorter](#)  
- [Environmental station and fan](#)  
- [Milk meter](#)  
- [EID enabled weighing trough](#)  
- [GPS collars](#)  
- [Sheep conveyor](#)  
- [Pregnancy scanning](#)  
- [Hay drying technology for goats](#)  
- [Automatic Milk Feeder](#)

---

**Links**

[1] mailto:Sm@RT  
[2] https://www.youtube.com/watch?v=ctdGwHzacQ0  
[3]