



European Network for interactive and innovative knowledge exchange on animal health and nutrition between the **sheep** industry actors and stakeholders

Synthesis of the acceptability of the solutions selected and implemented during the project



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1. Summary

The end-user assessment information in this document has been compiled from the data gathered through the end-users assessment reports provided by the Network Facilitator (NF) from each partner country participating in the EUROSHEEP project.

2. Introduction

One of the most important specific objectives of the EuroSheep project is to assess the end-users acceptance on the solutions proposed and to identify factors influencing their acceptance considering the regional/national specificities. Within this framework, EuroSheep tries to identify the barriers, constraints, and conditions for the implementation of the proposed solutions.

In the first half of 2022, we began collecting feedback from end-users on the solutions they were testing in the flocks. The initial results of the surveys were discussed at the 4th National Workshop held in each country in May-June; later, after the transnational workshop held in Greece in June 2022, each NF reported back the main best applicable practices identified to the local and national sheep EIP Operational Groups or equivalent networks. The objective of those local and national discussion groups (DG) was to discuss with the stakeholders the suitability of all these practices, as well as the particular requirements and challenges to be adapted and implemented in each farming system and to share best applicable practices between partner countries. Finally, a targeted survey to end-users (farmers, advisors and vets) was conducted in order to assess widely their perceptions regarding the implementation of the solutions proposed by EuroSheep.

The commitment for each country was to get at least 20 surveys (10 regarding health and 10 nutrition) on the solutions that the stakeholders had chosen for implementation, to be able to identify potential constraints to end-users' acceptance of the solutions.

3. Survey Assessment and Methodology

During the 3rd NWS (October 2021), the participating farmers and advisors voted on the solutions (according to their particular needs and potential interest) and decided which ones they wanted to assess. Farmers/advisors/veterinarians who expressed their interest in the assessment of solutions were then individually contacted and interviews were carried out to complete the end-user assessment survey. If needed, some complementary assessments have been done during the 4th and the 5th NWS where the solutions implementation have been presented.

The end-user assessment template (Appendix I) was designed by the task leader, with feedback and comments from all the other countries NFs. The final version it was available at the end of January. When necessary, additional information on calculations of the implementation costs was provided to facilitate the interpretation of results (for example, costs per hectare for solutions related to crops, and other essential criteria for cost estimation). When provided by participants, exact costs were also added as supplementary information. Most of the solutions were carried out by farmers (85%). These solutions were tested in either commercial or experimental farms. A total of 8 countries (Table 1) (France,

Hungary, Spain, Italy, Greece, UK, Ireland and Turkey) participated to the assessment and each country tried to fill a minimum of 20 surveys for several solutions. In total 167 surveys, corresponding to 27 different solutions for health and 24 for nutrition-related issues, have been assessed by farmers, advisors and vets. The main focus on the assessment was to find out the expected benefits for each solution, plus the impact in terms of labour requirement, cost, how much time it required before noting the results and if there was any particular difficulty/barrier to implement the solutions.

Table1. Number of surveys completed, including the number of different solutions assessed in each country, and the provider of the survey (either a commercial farm, a research farm, or a veterinary/advisor)

Country	Total number of surveys	Number of different solutions	Surveys provided by		
			Commercial farms	Research farms	Veterinarian or Advisors
France (FR)	20	12	6	3	11
Greece (GR)	21	12	17	1	3
Ireland (IR)	20	15	17	0	3
Italy (IT)	20	10	9	1	10
Spain (SP)	25	9	21	3	1
Turkey (TR)	20	8	14	3	3
United Kingdom (UK)	21	6	16	2	3
Hungary (HU)	20	17	5	15	0

Thirty-eight of the 51 solutions received good evaluations, 3 solutions were not deemed satisfactory by the evaluators in their circumstances and 10 solutions received mixed reviews, depending on the context of system that they had been evaluated in.

4. Solutions Assessment by Country

Table 2 shows the list of solutions proposed (for either nutrition or health related needs), with the country of origin of each one, indicating which ones have been tested in each country and the number of surveys collected for each of them per country (in brackets).

5.1. FRANCE

In total 10 surveys were collected by France regarding 6 solutions for nutrition and another 10 for 6 health/management solutions.

Regarding health-related problems, the main solutions tested tried to overcome the impact of lameness, internal parasites, biosecurity management and mastitis. The cost of the implementation of these solutions ranged between (100-500 €), and, although usually 1 person was enough to test the solution, they were considered to be quite time consuming. For some of the solutions, respondents considered that further translated information was required.

For solutions related to lameness, ie. footbath and booklet on how to recognise lameness, the booklet has been evaluated as very relevant by veterinarians and will be translated and

adapted into French to be used by farmers. The 2 footbath solutions have been evaluated as very constraining and not enough practical by advisors and farmers.

Regarding flock health plan and udder morphology, solutions proposed were quite closed to solutions already implemented in France but it was interesting to see differences between them.

Finally, the solution regarding TST is very interesting in the context of anthelmintic resistance even if it seems to need some adaptations (of the solution and on the farmers' sheep health management) to be implemented.

The solutions tested for nutrition were related to the grazing management, the weaning and post weaning management, setting growth targets for the flock and about the control of urea levels in milk.

The solutions related to grazing management and rotational grazing has received 2 very different assessments. The main difference of those 2 farmers was the way they were ready to change all their system to implement this solution, especially to manage the watering of the ewes, which is the critical point of this solution. Farmer who invested to put in place a performant watering network was very happy (even regarding the cost), while the other was not satisfied because of the time consuming of the daily watering.

For the other nutrition solutions, the purchase of several materials or equipment was requested (seeding items, creep feeders, weighing scales etc.) to test the solution. Most of the end users were fully satisfied with these solutions, and it was also mentioned the results were observed after 3 months after their implementation.

Regarding the solution proposed to control urea levels in milk, respondents seem to be satisfied with it. The main barrier for this solution was again the varying farm conditions and the cost for the urea milk kit.

5.2. IRELAND

In Ireland, 11 surveys were assessed by Irish farmers, advisors and vets corresponding to 8 solutions for health, plus 10 for 6 nutrition solutions.

The solutions tested for health were against lameness, poor body condition, better control of orf, internal parasitism and clostridial disease, and more than 90 % of these solutions provide results in less than 3 months.

Most of the opinions about the solutions against lameness, indicated that respondents were fully satisfied, that just 1 person was required to put it into practice in less than a day, and that the results in the farm could be observed in <3 months. However, these solutions seem to need slight modifications on-farm, such as getting a sheep race done, and the purchase of plastic baths and some consumables. Also, the disposal of consumables should be carefully handled. The expectations with these solutions were reducing the incidence of lameness, but also reducing labour and improving animal welfare.

Initially, most of the respondents for the solutions about the prevention strategies against clostridial disease were satisfied, expecting to decrease new-born losses and eliminating the use of antimicrobials. The solutions request to get sheep handling equipment and vaccine gun. However, some respondents seem to doubt about the real interest and suitability of this solution for the Irish systems, since lambs in Ireland usually do not consume hay or silage. There needs to be some advice in the solution regarding awareness of the stressors that trigger clostridial vaccine such as rapid and big changes in management, nutrition, environment etc.

Solutions against internal parasitism were also assessed as satisfactory, provided some costs (e.g. purchase of some consumables, equipment and lab cost) and with only 1 person to practice in less than a day.

The solutions tested for nutrition were on post weaning management, forage feed value, grassland and grazing management, knowledge on nutrition requirement, growth target at 1st lambing and conserve forage production.

The general opinion on grassland and grazing management were satisfying but involved needing a computer with excel software, which was rated as not-user friendly, since it requires a lot of time for recording information and data to be input. According to the respondents, 1 day-1 week is required to implement the solution and <3 months to observe the impact on the farm.

A solution to improve the quality of the conserved forage, and therefore animal nutrition, was also tested and rated as fully satisfied. However, it required equipment such as baling, wrapping and stacking. It requires 1 day-1 week to operate and less than 3 months to observe the impact on the farm.

Regarding improving the knowledge on nutrition requirement to set growth targets to achieve the 1st lambing of the yearling at 1 year of age, the solutions proposed were fully satisfying to achieve a better performance of the flock and better feed and nutrition management. The availability of weigh scales, scanning services and a sheep race are necessary for these solutions. Just 1 person is enough to put them into practice and it might take more or less than 3 months to notice the effect on the farm.

5.3. ITALY

In total 10 different solutions (5 health and 5 nutrition) were tested by Italy, and 2 end-users assessed each one of them, making a total of 20 surveys completed.

The main solutions tested for health were related to the management of biosecurity, the cross comparison of feed catalogue value with animals' blood test, deworming program for sheep, internal parasitism, the design and management of a hoof bath, and the implementation of a targeted drainage system in the grassland.

The general opinion for the implementation of a biosecurity management in the farm is that is relatively too costly, ranging from 500-10000 € for the serological sample analyses, depending on the flock size. Its implementation requires more than 1 day, and 1 person to practice the solution. Farmers were generally satisfied with the result with an expected benefit on better feed efficiency in the farm. However, the main limitations mentioned were:

- For some diseases there are only diagnostic tests with low specificity and sensitivity;
- Many of the analyses are expensive;
- The waiting times for the results are long;
- There are few disease-free farms from which to purchase healthy animals.

Other tested solutions like cross comparison of feed catalogue value with animals' blood test were found interesting; however, due to the high cost for lab analyses and difficulties to get technical advice on the features of regional breeds were considered as barriers.

Deworming program for sheep, aiming at decreasing the risk of resistance to anthelmintics and improving animal health and welfare, was considered to be implemented in more than 1 week and by more than 1 person. The veterinary and laboratory cost (between 100 and 500 €) were considered high for this solution. However, the lack of possibility to carry out the qualitative and quantitative coprological analyses (vet not able to carry them out personally or lack of a laboratory services in the area) were some of the limitations for its applicability.

Targeted drainage system in the grassland was also tested aiming to reduce the incidences of lameness, treatment costs and to improve animal welfare and overall flock productivity. However, the high cost for the implementation of the solution (500-1000 €) was considered as a limitation.

The solutions tested for nutrition were mainly related to the need of better forage feed value, grassland, and grazing management. For both solutions, the main expectations were better grazing management, improved grazing areas, multi-flock management and cooperation.

5.4. SPAIN

In total 25 surveys were gathered, corresponding to 4 different solutions for health-related issues and 5 for nutrition.

The health solutions tested were related to the parasitism management in grazing animals, the maintenance of the milking machine, the appraisal of udder morphology to prevent high somatic cell count and mastitis, and to well ventilated buildings.

The expected benefit from well ventilated buildings was mainly the reduction of respiratory problems and coccidiosis. The main costs were assessed to be between 1000-10000 € to renew and improve the existing buildings. It was considered that between 1 day and 1 week was required for this solution to be implemented by 1 person. Respondents were fully satisfied and expected to notice the effect in their farm in less than 3 months.

The main opinion on the appraisal of udder morphology (which was assessed by 3 respondents) as a solution to prevent high somatic cell count and decrease the incidence of mastitis agreed that they were also satisfied. Since the implementation of this solution should involve all the milk recording and the breeding scheme for a certain breed, it was estimated that the total costs would be between 1000 and 10000 € to test the CMT, including microbiological and milk quality analyses, and the availability of technical or veterinary services for udder evaluation. More than 1 week and 1 person was considered to be necessary to test the solution and more than 3 months to see the effect on the farm.

The expected health benefit for the solution related to the management of grazing animals was the reduction of parasitism rates and to achieve higher productivity and quality forages (hay and/or silage). The main expected costs were for the coprological analyses, and the veterinary services, which is considered below 100 € to be implemented by one person in less than 1 day. Farmers were fully satisfied and considered that the effect can be observed on their farm in more than 3 months.

The last solution tested for health was related to the maintenance of the milking machine, expecting to prevent the incidence of mastitis and to reduce somatic cell count. The implementation costs were to pay for the technical service of the milking machine, plus oils and filters, which were estimated to be less than 100 €. Farmers were satisfied with this solution and noted that they need more than 3 months to see the effect in their farms.

Regarding nutrition, 2 solutions were tested by 3 farmers related to the implementation of rotational grazing. With these solutions, farmers expected to make a better utilization of grasslands, achieve higher grass production, improve sward quality and higher feed value of the silage produced; all these improvements would finally contribute to increased animal performance, to reduce feeding costs, decrease the incidence of internal parasites and to enhance animal welfare. Farmers were satisfied with the results and the implementation cost for these solutions were considered between 500 and 10000 € (to purchase material to divide

the plots, posts, wire fences, electric shepherd, electrified wire, water tanks, etc.). Regarding labour, 1 person in less than 1 week was enough to implement it.

Also, the solution related to BCS was tested by 4 farmers as a tool related to the nutrition requirement of ewes, in an attempt to achieve better nutrition and feeding management, avoid gestational toxemia and better flock performance. It was stated that this solution requires further training of the staff in the topic. Farmers were fully satisfied and consider that it takes more than 3 months to notice the effect on the farms. Some farmers indicated that expenses between 100 and 500 € are necessary to purchase fences to divide lots.

Another solution tested, was related to the publication “Feeding the ewe”, based on the existing scientific and technical knowledge, and tries to improve feeding planning. Respondents to the survey were fully satisfied with this solution, considered that just 1 person in less than 1 week was required to implement the solution, and assessed that the implementation costs related to agricultural labour, purchase of seeds, fertilizers and laboratory cost ranged between 1000-and 10000 €.

Regarding the implementation of a nutrition plan for the lambs from weaning to mating, and the rationing of ewe lambs to achieve a better udder development, it was tested by 3 farmers which expected to breed healthier animals and achieve higher milk production at first lactation. They were fully satisfied with the solution and the main cost associated might range between 100 and 10000 € to cover feeding costs, plus the installation of automatic concentrate dispensers, and the utilization of good quality preserved forages. Farmers also considered that the positive impact on the flock is achieved in more than 3 months.

Finally, the implementation of guidelines for the interpretation of milk urea concentration in sheep milk was tested by 4 farmers aiming to have a more productive and healthier flock. Results were satisfactory for them, and the associated costs for the laboratory analysis would mean between 100 and 10000 €.

5.5. GREECE

In Greece, 9 surveys were completed for 7 solutions tested related to health issues, and 12 surveys corresponding to 5 nutrition solutions.

The nutrition solutions tested were the inclusion and management of Sulla (*Sulla coronaria* (L. medik)) in the forage systems; artificial feeding for lambs; guidelines for the interpretation of milk urea concentration in sheep milk; good practices from mowing to storing to ensure proper conservation of silage (preventive) and indicators of quality, and online tools for management of grazing routes (including wikiloc, but also an adaptation of the solution using google maps).

Regarding the inclusion and management of Sulla (*Sulla coronaria* (L. medik)) in the forage systems, it was tested by a farmer aiming to increase milk production in sheep, to improve animal welfare (decrease the urea content of milk compared to the content after grazing on other legumes), to extend the grazing period, to improve the quality of herbage on offer and to decrease the cultivation costs. The farmer was satisfied with this solution, considering that it required between 1 day and 1 week to be implemented (ploughing and sowing), assessed an associated cost between 500 and 800 €, and considered that the results are achieved at least 3 months after its implementation. However, the main constraint to be implemented seems to be the availability of *Rhizobium Sullare* and the lack of technical advisors available knowing about the crop and the rhizobium. Despite this, the farmer considered the crop as promising and decided to make a new try on the following year.

Three farmers implemented the solution related to the artificial feeding for lambs, who expected to improve lamb production, lower incidence of mastitis or to apply a Maedi-Visna eradication/control protocol. They acknowledged that they were satisfied with the solution and considered that. Including the cost for the purchase of machine for artificial rearing (1.000-10.000€) or buckets (200€), milk powder, water and electricity, the total cost ranged between 10.000 and 20.500 €, depending on the flock size. Although the main limitation was related to labour availability, they considered that between 1 day and 1 week is enough to implement the solution by 1 person. They pointed out that the several benefits for the farm (economic benefit and better lamb management) can be envisaged in less than 3 months.

As for the implementation of guidelines for the interpretation of milk urea concentration in sheep milk, this solution was tested by 2 farmers who expected to decrease waste of protein-based concentrates and nitrogen losses. Farmers were fully satisfied with the solution. The estimated cost was assessed to be 100-500 €, to purchase a milk sample collector (urea test strip) and the laboratory analysis for the milk samples. Regarding labour, 1 person in less than 1 day was enough to implement the solution, and less than 3 months was enough to see the effect on the farm.

A solution to improve the conservation of forages – (hay or silage) was tested by 3 farmers and 1 advisor, with the expected benefit of achieving a better nutritional value of the silage produced and to reduce the level of supplementation, 75% of the respondents being fully satisfied. According to them, more than 1 week and more than 1 person was needed to implement the solution. The cost associated with this solution was set between 1,000 and 10,000 € to pay for the fuel, seeds, consumables, inoculants or even the services from others (for harvesting, bales making, etc.).

Also, free grazing management tools (wikiloc or google maps) were tested as a solution by 2 farmers to improve grazing management. They recognized that 1 person in less than a day was enough to test the solution, free of any cost, and considered it as satisfactory.

The 7 solutions tested for health related needs were: good machine-milking practices for prevention of mastitis; vaccination against clostridium and pasteurella; detailed data keeping for health management to organize farms' health plan, or the use of smartphone or/and computer applications to get reminders; bedding management and relative humidity references; performing coprological analysis after a antiparasite treatment; vaccination against contagious agalactiae, and design and strategy of the hoof bath.

The solution on good machine-milking practices for prevention of mastitis was tested by 1 farmer and 1 advisor, with the aim of improving milk quality and yield. The labour of only 1 person for less than a day was enough to implement the solution. The solution basically consists of checking the items included in a list (a check list sheet), so no cost is associated. The farmer was fully satisfied with this solution, while the advisors' opinion was poorly satisfaction. The reason for this contradictory opinion was noted by the advisor as; milking staff, animals are stressed during milking, overmilking (stimulation of udder with both hands and milking machine, and liners are left for too long on animals), no use of gloves for milking. This is why the advisor is satisfied with the theoretical conception of the solution but not in practice. The advisor also noted some cost around 500-1,000 € a year for the disinfections consumables and annual milking equipment inspections.

Also, vaccination against clostridium and pasteurella was implemented by one farmer, who expected to decrease mortality due to clostridium and Pasteurella, with fully satisfactory results according to his/her opinion. The vaccination cost was considered between 1,000 and

10,000 € depending on the flock size, and more than 3 months was necessary before the positive effects were obtained in the farm.

In order to keep more detailed data for health management and to organize the farms' health plan, the use of smartphone or/and computer applications was considered by 2 farmers to get reminders. They considered the tool as an interesting option to achieve a better management of flock's health plan and long-term health and welfare of the flock through disease prevention and control.

Another farmer implemented a solution related to the management of the bedding material and the utilization of relative humidity references. The farmer was trying to improve animal welfare and health and was finally satisfied with the solution. The associated cost was estimated between 100 and 500 €, and the effect was observable in more than 3 months.

Also, the implementation of faecal analysis after the application of an antiparasite treatment was tested, expecting to achieve a more efficient pest control and to avoid the effects of resistance against the treatment. The estimated cost for this solution was approximately below 300 €, and the results were fully satisfactory.

To prevent the negative effects of contagious agalactiae, vaccination was applied as a solution by a farmer. A specific trap (sheep race, handling unit or similar) had to be built for handling the animals, and the results were fully satisfactory.

Another farmer innovated with the design of a hoof bath and followed the recommendations proposed by the solution, also with satisfactory effects. The expected benefit was to improve animal health and welfare. The cost was considered as 100-500 €, and 1 person in 1 day was enough to implement the solution.

5.6. TURKEY

In Turkey, 10 surveys were completed for 4 health-related solutions, and 10 surveys for 4 nutrition solutions were implemented in 20 case farms.

Controlling lameness, design and strategy of the hoof bath, reducing anthelmintic resistance, and deworming program for sheep solutions were the **solutions tested for health**.

The solution proposed to control lameness was tested by 3 farmers with full satisfaction. The expected benefit for this solution was to improve animal health, welfare and profitability in the farm. The implementation cost was considered between 100 and 500 € depending on the farm capacity, and one day of labour by more than 1 person was considered necessary to implement the solution. The impacts can be seen in >3 months in the farm.

Design and strategy of the hoof bath was tested by 3 farmers and one advisor with an expected benefit on improving health, fertility, weigh gain, with a decrease in the workload and had full satisfaction. The main associated cost for this solution was assessed in 500 € and more than 1 person in 1 day was requested to implement the solution. Technical advice was noted as a necessary element.

Deworming program for sheep solution was tested by two farmers with the expected benefit on improving welfare and health with satisfaction. Laboratory analyses and veterinary cost were considered as 250 € associated with this solution. 1 person in 1 day-1 week was enough to implement the solution. It was noted that faeces collection needs effort.

Reducing anthelmintic resistance solution were tested by 2 farmers and one advisor with an expected benefit on improving flock performance with full satisfaction. The associated cost was between 100-500 €, as implication cost for laboratory analyses & veterinary services. The effect was observable in more than 3 months.

Nutrition plan of lambs from weaning to mating, producing high feed value grass silage, replacement management tool, Rotational grazing systems (establishment and management) were the **main solutions tested**.

Nutrition plan of lambs from weaning to mating solution was tested by two farmers with an expected benefit of healthier udder and higher milk production with full satisfaction. More than 1 person in 1 day was considered enough to implement the solution. More than 3 months was necessary to see the impact in the farm. It was noted that to train the shepherd and observe that the workers follow the precise proportions of the ratio and weigh those animals regularly was essential.

Producing high feed value grass silage solution was tested by a farmer with an expected benefit on increasing animal performance and profitability, reduce feed cost and improve efficiency with satisfaction. Fertilizer and soil analyses made up the main cost between 100-500 € per ha. More than 1 week with one person was enough to implement the solution. It was noted experience was needed to reach the goal, it is not easy to calculate the DM and digestibility, laboratory analyses are costly.

Replacement management tool (software) solution was tested by two farmer and by an advisor with an expected benefit on better planning of feed and cost-effective farming operations with full satisfaction. Computer and technical advice were necessary for this solution to implement. 1 person was enough to implement the solution in more than 3 months. Slight modifications were made according to feed and hay availability.

Rotational grazing systems (establishment and management) solution was tested by two farmers with the expectation on reducing the feed cost and higher grass quality with satisfaction. Approximately 500 € was foreseen to implement this solution. One day with more than 1 person was necessary to implement the solution and the impact on the farm was observable in less than 3 months.

5.7. UNITED KINGDOM

In UK, the following 2 solutions were tested by 4 case study farms against **health-related issues**: performing faecal analysis after an antiparasite treatment and the development of flock biosecurity –health plan.

Performing faecal analysis after an antiparasite treatment was tested by one farmer and a vet, with the expected benefit of adapting the pest control strategy by reasonably using a molecule proved to be efficient or by changing the chemical family if the first one proved to be inefficient. The expected cost associated with this solution was less than 100 €, and only 1 person in 1 day was enough to implement the solution. The effects were noticeable in less than 3 months, and the overall stakeholders' acceptance was satisfied/fully satisfied.

Regarding flock biosecurity, the solution proposed related to the development of a health plan, and was tested by two farmers, who expected to reduce the introduction and spread of disease and anthelmintic resistance on farm, which negatively affects animal productivity. They were fully satisfied with the solution, which involved an associated cost of between 500 and 1,000 €. It was considered that the labour of more than 1 person in one day was required to implement the solution, and that the positive effects can be noticed in less than 3 months.

Regarding the solutions existing for nutrition related issues, 4 solutions were tested in 17 farms: Mixed grazing, replacement management tool, Wikiloc, and two successful combinations of legume/cereal winter forage crops.

Mixed grazing was tested by two farmers and a vet, expecting to achieve a better control of grass quality, better growth of lambs and of replacement ewe lamb. The opinions were quite

variable for the different respondents (poorly satisfied/satisfied/fully satisfied). The cost was considered to be below 100 €, because the farmers had already electric fenced paddocks. Regarding labour requirements, 1 day-1 week with one person was considered enough to implement the solution and >3 months necessary to see the effect in the farm.

The replacement management tool was tested by 5 farmers and a vet, with the objective of a better planning and feeding animals during the rearing period and to better calculate the costs. Most of the end-users were satisfied with the solution. A computer and software are necessary for this solution, but more importantly, a nutritionist is required to provide technical advice. It is noted that the solution needs specific tailoring according to the particular breed and translation of the tool might also be helpful.

Wikiloc was used as a solution by 6 farmers and one advisor, who expected to record the grazing route with zero cost and to accelerate communication between farmers. Respondents were satisfied with this solution, which just requested using the smartphone, and one person was enough to implement the solution.

Finally, two successful combinations of legume/cereal winter forage crops were tested by one farmer, who considered that satisfactory results were achieved after facing implementation costs of 500 to 1000 € (for the purchase of lime, muck and fuel). Regarding labour requirements, 1 person in 1 day to 1 week is enough to implement it, and the impacts can be observed on the farm in more than 3 months.

5.8. HUNGARY

In Hungary, we collected a total of 20 surveys on 17 different solutions. We conducted 9 health-related surveys (about 8 solutions) and 11 nutrition-related surveys (about 9 solutions). Health-related problems were: internal and external parasites, lameness and mineral and vitamin supplementation and related problems. The price of these solutions ranges from less than 100 euros to 500 euros. Most of the costs of the more expensive solutions were due to consumables and the veterinarian's laboratory. Treatments required more than 1 person, due to moving and herding the animals. We tried several lameness solutions. Every hungarian farmer praises the foot-bathes, likes to use them, and constantly promotes them. In relation to parasites, several solutions have been tried and some are being introduced. So far, farmers are satisfied with all methods.

We looked for solutions to several problems related to nutrition. These were: knowledge of nutritional requirements, forage value, conserve forage product, lamb feeding, forage and grass availability – quantity.

Preparation of conserved forage and body condition scoring are methods well known to farmers. The more expensive solutions are due to the high price of feed and consumables. These solutions require sufficient experience and care. For every solution need more than 1 person, except body condition scoring at which important to do the same person in every time. Some solutions are implemented and some solutions implementation is going. Farmers are satisfied or fully satisfied with the solutions. Hungarian farmers are trying to find as wide a range of information as possible and to find solutions for feeding, as the available feed is limited and expensive due to climate change.

Table 2. List of tested solutions per topic by countries

N	Topic	Solution name (Country of origin of the solution)	FR (20)	GR (21)	IT (20)	IR (20)	SP (25)	TR (20)	UK (21)	HU (20)
1	Health	Appraisal of udder morphology to prevent high somatic cell count and mastitis (IT)	X (1)				X (3)			
2		Bedding management and relative humidity references (SP)		X (1)						
3		Best practice guidelines for biosecurity and iceberg diseases (UK)			X (2)					
4		Better control of contagious ectima/orf (FR)				X (1)				
5		Booklet on how to recognise lameness (UK)	X (1)			X (2)				
6		Controlling external parasites (IR)								X (1)
7		Controlling Lameness (IR)						X (3)		X (2)
8		Detailed data keeping for health management to organise farms' health plan / Use of smartphone or/and computer applications to get reminders (GR)		X (2)						
9		Design and strategy of the hoof bath (SP)	X (1)	X (1)	X (2)	X (1)		X (4)		X (1)
10		Deworming program for sheep (SP)			X (2)			X (2)		
11		Flock biosecurity- develop a health plan (IR)	X (2)							X (2)
12		Good machine-milking practices for prevention of mastitis (IT)		X (2)						
13		Guidelines to manage foot-bathing (IT)	X (4)			X (1)				X (1)
14		Maintenance of the milking machine (video) (FR)					X (2)			

15		Mixed grazing for cattle–sheep as a solution to limit parasite infestation (FR)				X (1)			X (3)	
16		Parasitism management in grazing animals (GR)					X (3)			X (1)
17		Performing a coproscopic analysis after an antiparasite treatment (FR)		X (1)		X (1)			X (2)	
18		Practical information on Iceberg diseases (UK)				X (1)				
19		Prevention strategies against Contagious agalactia (GR)		X (1)						
20		Prevention strategies against Clostridial diseases (GR)				X (2)				
21		Reducing anthelmintic resistance (IR) / Guidelines on how to deal with anthelmintic resistance (UK)						X (3)		X (1)
22		Targeted drainage system in the grassland (TR)			X (2)					
23		The FAMACHA score assessment (TR)								X (1)
24		Use of Targeted Selective Treatment (TST) for ewe lambs (UK)	X (1)		X (2)					
25		Vaccinating against Clostridia and Pasteurella (IR)		X (1)						
26		Well ventilated buildings (FR)					X (2)			
27		When and how to provide minerals? (FR)								X (1)
1	Nutrition	Artificial feeding for lambs (GR)		X (3)						
2		BCS as a tool for nutrition requirement of ewes (TR)				X (1)	X (4)			X (1)

3	Cross comparison of feed catalogue value with animals' blood test (TR)			X (2)					
4	"Feeding the ewe"- feed planning (UK)					X (1)			
5	Good practices from mowing to storing in order to ensure proper conservation of silage (preventive) and indicators of quality (GR)		X (4)						
6	Gradual weaning protocol for lambs (TR)	X (2)							X (1)
7	Guidelines for implementing rotational grazing / Rotational grazing systems (establishment and management) (UK/IR)	X (2)		X (2)		X (3)	X (2)		
8	Guide for replacement nutrition at first lambing (TR)				X (1)				
9	Guidelines for the interpretation of milk urea concentration in sheep milk (IT)	X (3)	X (2)			X (4)			
10	HerbValo- knowing the valorisation of grass on your grassland (FR)			X (2)	X (2)				
11	How to produce high-quality grass-silage (IT) / Producing high feed value grass silage (IR)			X (2)	X (1)		X (1)		X (2)
12	Lamb growth protocol for performance target (TR)								X (1)
13	Guidelines on how to manage transition between milk & grass (UK)	X (1)			X (4)				
14	Inclusion and management of Sulla (Sulla coronaria (L.) medik.) in the forage systems (IT)	X (1)	X (1)						
15	Managing ewe replacements to lamb at 1 year old (IR)	X (1)							
16	Nutrition plan of lambs from weaning to mating/ Rationing ewe lambs for better udder development (IT/FR)					X (3)	X (2)		X (3)
17	Online history of grazing routes to remember and improve grazing routes in the next year (GR)			X (2)					

18	Replacement management tool(software) (SP)						X (3)	X (6)	
19	Protocol for forage analysis (UK)				X (1)				X (1)
20	Sward measurement (IR)								X (2)
21	Two successful combinations of legume/cereal winter forage crops (GR)							X (1)	
22	Wikiloc - a free grazing management tool (TR)							X (7)	

5. Summary of end-users' general assessment on the different solutions tested.

Next, the results of the survey for each tested solution are summarized in terms of adaptation, benefits, lack of limits to its application, the need for investments or additional costs for its implementation, as well as the degree of satisfaction expressed by the end users.

5.1. Health

Appraisal of Udder Morphology to Prevent High Somatic Cell Count and Mastitis

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes, automate the process for assessing milk control data	-Reducing mastitis -Reduce the somatic cells -Better efficiency of the machine milking.	None	Test CMT, Microbiological and milk quality analyses, Vet. services for udder evaluation. Breeding scheme, trait in selection (1000-10000 €)	Fully satisfied and Satisfied

Best practice guidelines for biosecurity and iceberg diseases

Adaptation	Benefits	Limit	Additional costs	Satisfaction

Yes Monitoring only some diseases (Johne's disease, and M-V)	Better feed efficiency, Increased the welfare and longevity of the breeding stock. Absence of disease in homebred replacements. Absence of disease in stock for sale. Decreased production losses	For some diseases, quarantine is not applicable considering the incubation times. For some diseases there are only diagnostic tests with low specificity and sensitivity. Many of the analyses are expensive. The waiting times for analyses are long. There are few free farms from which to purchase animals.	500-10000 € Materials for serological sampling, laboratory analyses	Fully satisfied and Satisfied
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Bedding management and relative humidity references

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes	Improve animal welfare and health	Number of devices needed for large-scale farms	Devices for humidity and temperature measurement	Satisfied

Better control of contagious ecthima / orf

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes, Use alternative vaccine- Scabivax	Minimise losses due to contagious ecthyma among lambs and mammary forms of the disease among ewes. Reduce losses and labour costs. Less risk of other disease outbreaks.	None	Vaccine, Ensure correct diagnosis, vet, lab	Fully satisfied

Detailed data keeping for health management to organise farms' health plan

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes The solution was adapted and simplified by the Greek team because it was not possible to use the Scottish software.	Solid management of the farm's health plan. Long-term health and welfare of the flock through disease prevention and control.	No individual data are collected on the flock, so application is limited to prophylaxis by groups of animals (vaccines, etc.). The vet of the farm consider that this system will not avoid multiple phone calls to plan prophylaxis and get all necessary data.	none	Satisfied

Booklet on how to recognise lameness

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes The farm implements a vaccination programme. It would be useful in any future updating of the guide to provide information on optimum vaccination strategies. Also the farm in question purchases hill cross sheep annually as foundation breeding stock. This poses a high risk of undoing all of the good work in the QMS document and I think it would be an invaluable addition to address these risks and	The correct diagnosis and treatment of lameness will improve welfare & productivity. Possibly reduce the amount of antibiotics used. Reduce the labour input required in treating lameness across the entire flock and eliminate the potential for related health issues such as twin lamb disease for example.	None	Latex gloves, measuring jug, mobile weighing scales for weighing foot bathing products, injection equipment for administering vaccines or targeted antibiotic treatment.	Fully satisfied

provide management advice to update the guide.				
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Controlling external parasites

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes	Controlling external parasites improves feed efficiency as the animals have an improved growth rate and are slaughtered earlier. Improves animal welfare, performance and possibly lowers mortality rate, no scabies develop, keeps flies away. The control of external parasites reduces labour and veterinary/antibiotic costs from parasite damage.	We don't have „dipping equipments”	Plunge dipping, dipping facilities, solvent and vet	Satisfied

Controlling Lameness

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes we built special quarantine unit and handling unit.	Improving health and welfare. Improving profitability.	Sheep handling facilities and experience of shepherd	Lab and chemical costs	Fully satisfied and satisfied

Design and Strategy of The Hoof Bath

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Use of plastic footbaths rather than concrete. Pool length of 3 m instead of 1.5 m.	Control/reduce the incidence of lameness and treatments. Reduced costs and labour. Improving body condition, improving feeding efficiency, higher growth rate and Production.	Very restrictive if the farmer should manage different flocks. It is not always easy to find a suitable area to build footbath that are also easy to access for livestock. Prior planning and working with an experienced technician is necessary, waste disposal is has to be considered carefully.	Purchase of formalin foot solution. Health monitoring by the vet and any therapies 500-1000 €	Poorly satisfied to Fully satisfied

Deworming program for sheep

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes we need more people on the farm to collect the faeces. Too much workforce needed. Adaptation of the sample collection schedule to the lactation schedule, 1 more in mid-lactation, and in ewe lambs 1 control one month before laying ewe lambs.	Healthy and productive flock, improving welfare and feeding efficiency. Decrease the risk of resistance to anthelmintics. Cost efficient production.	Effort to collect the faeces-take to the lab Lack of possibility to carry out the qualitative and quantitative coprological analyses (vet not able to carry them out personally or lack of a laboratory in the area)	Veterinary advising and laboratory analyses. 100-500 €	No to Fully satisfied

Flock biosecurity- develop a health plan

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Adapted to individual farm needs-chances of resistance.	Avoid to have new pathogenes. Reduce the introduction and spread of disease and anthelmintic resistance on farm, which negatively affects animal productivity.	Knowing the health status of farms selling breeding stock is not always easy (health obligations vary from one department to another)	None	No to Fully satisfied

Some users had not implemented this solution, due to lack of knowledge, and the need for farmer advice.

Good machine-milking practices for prevention of mastitis

Adaptation	Benefits	Limit	Additional costs	Satisfaction
YES Nobody checks the first milk jets (Strip-test) on sheep in Greece, only if the farmer already knows that there is a problem in the udder. Noise can't be avoided.	Standardise approach for control mastitis, improve welfare of ewes and economic performance of the flock (increased milk production and milk quality).	The milking staff: animals are stressed during milking, overmilking (stimulation of udder with both hands and milking machine, and liners are left to much time on animals), No use of gloves for milking.	Machine washing Annual inspections / according to the hours of milking and change of milking clusters Deeping	Poorly satisfied to fully satisfied

Guidelines to manage foot-bathing

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Much higher feed conversion, weight and carcass gain. Standardized approach for the control and eradication of footrot and related lameness which allow to reach optimal well-being and economic benefits, including milk production and lamb growth rates. Much less individual treatment for lameness Huge time and labour savings	Very constraining and costly Need sheep to stand in dry area 20 minutes after treatment. Difficult to implement for big flocks	Two bags of zinc sulphate to fill the footbath (€45 each), approximately 3 times per year. Two bags of zinc sulphate to fill the footbath (€45 each), approximately 3 times per year. Requires a lot of space for the animals. Requires very high water consumption.	Poorly satisfied to fully satisfied

Some users had not implemented this solution as it was economically impossible for the moment, very time-consuming, and lack of labour resources available

Maintenance of milking machine (video)

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Prevention of mastitis and increase in somatic cell count, Increased machine lifetime	Knowledge of the machine and its operation	oil and filters, technical service of the milking machine	satisfied

Mixed grazing for cattle-sheep as a solution to limit parasite infestation

Adaptation	Benefits	Limit	Additional costs	Satisfaction
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<p>Yes- The cattle were integrated into the existing rotational grazing plan, they grazed behind the ewes and lambs.</p>	<p>Mixed species grazing helps control grass quality, the cattle can graze behind the lambs to improve the quality of the grass left behind. -The cattle were integrated into the existing rotational grazing plan, they grazed behind the ewes and lambs.-Less need to drench lambs and better control of pasture quality. Decrease in egg excretion often exceed 50% and sometimes as high as 75%; mostly seen on Haemonchus contortus; Better growth of lambs and of replacement ewe lambs; The positive effect of mixed grazing is not as apparent on cattle. Reduced anthelmintic use. Much less treatment of lambs with anthelmintics.</p>	<p>Land suitability to cattle grazing during wet periods. Stocking rates of cattle and sheep. Fencing and water troughs. Sward lengths different for cattle and sheep. Monitoring FEC will help a lot</p>	<p>3-4 FEC tests for lambs during the grazing season to justify dosing.</p>	<p>Poorly satisfied to fully satisfied</p>
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Performing a coproscopic analysis after an antiparasite treatment

Adaptation	Benefits	Limit	Additional costs	Satisfaction
<p>Yes performed FEC before and after treatment. The doses of anti parasite treatment based on the estimation of the weight of the heaviest ewe, because it was not possible to weigh ewes on the farm.</p>	<p>Know how efficient an anthelmintic group is on farm Adapting the parasite control strategy: - using an anthelmintic proven to be effective - changing the chemical family if the first one proves to be ineffective.</p>	<p>Animals should have not be treated with anthelmintic for at least 6 weeks before the experiments, and to have at least 200 eggs/sample to be included in the experiment.</p>	<p>Gloves, sample container and postage, Faecal sample cost approx (€15). Vet (3 visit)</p>	<p>Satisfied and fully satisfied</p>

Parasitism management in grazing animals

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Reduction of internal parasites. Easier harvesting, higher productivity and quality of forage, hay and/or silage.	None	<100 € coprological analyses, and veterinary services	Fully satisfied

Practical information on Iceberg diseases

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Better feed conversion efficiency, reducing the prevalence of disease will improve flock productivity, ewe welfare and longevity. Replacement breeding stock will be healthier. Eradication of disease may be possible in some cases. Less health and welfare problems, Increased profitability.	Need sheep to stand in dry area 20 minutes after treatment.	Lab analysis, post mortem	Fully satisfied

Prevention strategies against Clostridial diseases

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Adapt it to the feeding plan of the flock.	Eliminating the newborn loss, decreasing of adults loss, and eliminating the use of antimicrobials. Lower mortality.	no	Vaccine purchases and gun	Fully satisfied

Prevention strategies against Contagious agalactia

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Design a specific trap- cage to handle the animals	Prevention against contagious agalactia	none	vaccination	fully satisfied

Reducing anthelmintic resistance / Guidelines on how to deal with anthelmintic resistance

Adaptation	Benefits	Limit	Additional costs	Satisfaction
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Yes A small animal handling unit for faeces collection was built	Reduce the risk of anthelmintic resistance. Improving flock performance.	Technical knowledge and some structural changes in the farm.	Digital scale for accurate dose, Lab analyses. Vet services	Fully satisfied
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Use of Targeted Selective Treatment (TST) for ewe lambs

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes -applied on adult ewes -indicators were BCS and diarrhoea score	The animal growth is not compromised by the lack of treatment. Slowing down/prevention of the phenomenon of anthelmintic resistance. Less labour spent for anthelmintic treatment of animals. the amount of product used can be reduced by up to 40%.	Lack of availability of a scale for weighing lambs on the farm, lack of references for dairy sheep. It is necessary to define the relationship between the weight of the lamb and the degree of infestation through specific tests that could not be carried out. -need for "trust yourself" -less reassuring than treatment	500-1000€ Anthelmintic drugs. Disposable gloves for individual coprological sampling, indelible marker to identify the collected sample, containers for individual faeces collection. Qualitative and quantitative coprological microscopic analysis and veterinary advising	Not satisfied to Satisfied

Targeted drainage system in the grassland

Adaptation	Benefits	Limit	Additional costs	Satisfaction
None	Reducing lameness. Improved animal welfare and productivity and reduced treatment costs and the amount of antibiotics used	It is necessary to find farms with non-ploughing areas for the setting of the mounds. The resting areas would have damaged the grazing areas.	500 -1000 € sand or gravel	Poorly satisfied

The FAMACHA score assessment

Adaptation	Benefits	Limit	Additional costs	Satisfaction
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Yes	Better feed intake, improvement in animal welfare and reduction in economic losses, number of health treatments reduce	We have to buy the FAMACHA test. All assessments need to be by the same person	None	Satisfied
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Vaccination against Clostridium and Pasteurella

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes For replacement ewes, first doses when 1 month-old and booster when 2 months-old. On lambs slaughtered for meat, since they are slaughtered at 1 month-old, no vaccine is applied.	Decrease of mortality due to clostridium and Pasteurella	Vaccination need to be performed according to lambing groups. I have 4 lambing groups and 1 group of replacement females, on adult ewes vaccination is performed 1 month before lambing	Vaccine clostridium + pasteurella (Dialuene P) for 1100 adult ewes and 200 replacement ewes, 1€/dose	fully satisfied

Well ventilated buildings

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Reduction of respiratory problems, and coccidiosis. Less treatments. Improving flock performance	none	building material, renovation company, windows, roofing technical consulting and construction company	fully satisfied

When and how to provide minerals?

Adaptation	Benefits	Limit	Additional costs	Satisfaction
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Yes	To satisfy the vitamin and mineral needs of animals, better health condition, better reproduction rate, efficient production	none	premix	fully satisfied
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5.2. Nutrition

Artificial feeding for lamb

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Lambs were separated from ewes after colostrum consumption, minimum 3 days after birth, in order to facilitate their adaptation to the artificial feeding machine	Lamb development, less mastitis, possibility to apply Maedi-Visna eradication/control protocol. Milk cannot be sold until 5 days after lambing.	Access to electricity and drinking Water. Requires much labour.	Machine for artificial feeding, milk powder, electricity, water, vet services	Satisfied

BCS as a tool for nutrition requirement of ewes

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes, Animals are classified into three categories, lean, fine and fat.	Homogenize feeding according to BCS and milk production. to avoid gestational toxaeimias and skinny animal problems. Management becomes more complicated as the number of batches of animals increases. Improved animal welfare and a reduction in the economic cost of feed consumption. Much better flock performance.	Management of animals in several lots	100-500 € Purchase of fences to divide the lots Training Bolus reader, Paint for the sheep	Fully satisfied

"Feeding the ewe"- feed planning

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Geographical and climatic conditions	Improved planning and predictions based on science	Grassland size and weather conditions in the area	Agricultural works, seeds and fertilizers, Lab analysis (2-20 analysis/year)	fully satisfied

Cross comparison of feed catalogue value with animals' blood test

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Balanced nutrition in terms of vitamins and minerals. Determination of the amount of vitamins and minerals supplementation actually needed. Over-supplementation would be avoided and can reduce feed costs	Accredited laboratories	N/A, Material for collecting the blood	None

Good practices from mowing to storing to ensure proper conservation of silage (preventive) and indicators of quality

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Target 30-35% DM, well chopped, use of inoculant. Adaptation of crops to climatic conditions, eg, sowing oats in October for harvesting in May, and also the management of mown grass, if there are many hours of sunshine, it is not spread, and it is harvested the next day.	Silage of high nutritional value improves the performances of sheep and reduces the level of supplementation, Increased profitability	Labour	Fuels for sowing and soil preparation, Seeds (oat), Fuels for cutting, Consumables for preparing the bales, sausage rolls and inoculant. Fuels for transferring and storage	fully satisfied

Gradual weaning protocol for lambs

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes concentrates bring ad lib, objective of 500g/day consumed before weaning.	good lambs performances -prepare the nutrition transition at the weaning -simplifying labour, adaptation to the animal rhythm	need a learning of the creep feeders inside when the lambs are 2 weeks old, pay attention to the place of the creep feeder (shadow, need the water for the ewes) Need equipment (creep feeders)	None (using of material present in sheep shed)	fully satisfied
<i>One user has not implemented this solution</i>				

Guidelines on post-weaning management (1)

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Improved lamb performance. Reduction in weaning check during this period of transition. Higher live-weight gains. Better health of weaned lambs. Better management of weaned lambs. Faster finishing of weaned lambs.	none	FEC testing at lab	fully satisfied

Guidelines on post-weaning management

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Improved lamb performance. Reduction in weaning check during this period of transition. Higher live-weight gains. Better health of weaned lambs. Better management of weaned lambs. Faster finishing of weaned lambs. Improved marketing of lambs.	It need to be implemented from the start of the year at lambing time and continued until lambs are sold.	FEC testing Lab analysis Additional spray and a notebook to record lamb weights for grouping-	fully satisfied

Guidelines for the interpretation of milk urea concentration in sheep milk

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes, Depending on the users, it has been tested at different stages of the ewes' lactation, early, mid or full lactation.	Management of feeding at early lactation Better health of the flock, Better farm hygiene, Better productive and reproductive results. Less waste of protein-bases concentrates	Semi-quantitative method	Lab analysis (1 every 15 days/ 7,5 months) 4,97 + HC)	Satisfied to fully satisfied

Rotational Grazing Systems

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes adapt to the parcels, the grasslands or grazing ties to the size of the parcel.	<ul style="list-style-type: none"> -Feeding self sufficiency -internal parasitism management -better management of the BCS of the animals on pasture -better grass production (reduce feed and forages distributed to the ewes) and increased sward quality -Increased animal performance -No more use of hay and concentrate -free range -Lameness management 	<ul style="list-style-type: none"> A lot of work, especially for watering very restrictive if the farmer should manage different flocks Distribution and size of the paddocks Cost of the material need 	<ul style="list-style-type: none"> Mobile fences, electric, batteries, water tanks Underground water system, restraining corridor in the middle of the paddocks. <100- 1000 € 	not satisfied at all to fully satisfied

HerbValo- knowing the valorisation of grass on your grassland

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Changing some formulas in the excel file to adapt them to the dairy sheep production system but not in satisfying way	Increase grass utilization and farmers' confidence in their practices. Maintain ewe BCS. Practitioners can adapt their parcels' management system: by comparing parcels' valorisation levels, as an indicator for over/undergrazing. enables the comparison between different production systems (sheep vs. cows, etc.). Evaluate what benefits could bring some of the resources that are available in the plots (leaves and young stems of shrubs).	Requires a lot of data to be input and time to record everything. There are no references for dairy sheep.	<100€ printed sheet to fill to systematic recording of information concerning the chosen parcels	No satisfied to fully satisfied

How to produce high-quality grass-silage/ Producing high feed value grass silage

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Needs experience to reach to the goal, not easy to calculate the DM and digestibility, a lot of cost for lab analyses	Improvement the quality of conserved forage and animal nutrition. Easier to cut silage at any time/opportunity. Aids better grassland management. Higher nutritive value of the diet, Decreased diet costs.	Need to have a bunker or trench to fill with grass	500-10000€ fertilizers, seeds, silage plastics, cutting, harvesting and transport contractors, soil analyses	No satisfied to fully satisfied

Lamb growth protocol for performance target

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes	Rapid lamb growth in a short time and early weaning. Postnatal survival rate of lambs is increased. Lamb rearing costs are reduced.	None	navel antiseptic, emasculator, nursery, chemical, forage 100-500 €	fully satisfied

Guidelines on how to manage transition between milk & grass

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes to have dairy sheep	-Adaptation to a new diet -Better weight gain after weaning	None	None	fully satisfied

Inclusion and management of Sulla (*Sulla coronaria* (L. medik)) in the forage systems

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes for the test, Sulla seeds on a 30 m ² plot-	a good forage production, proteins self sufficiency The inclusion of sulla in the forage system increases milk production in sheep, improves animal welfare (decrease the urea content of milk compared to the content after grazing on other legumes), extends the grazing period, improves the quality on herbage on offer, it decreases the cultivation costs.	Seeds are not sold in France, or Greece, inoculation is time-consuming	Seeds, fuel for ploughing, fuel for preparing soil, Fuel for sowing and cylinder	Satisfied to fully satisfied

Managing ewe replacements to lamb at 1 year old

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes objective: minimum 70% of the adult live weight, matting at 9 months in February	better efficiency of the nutrition of the flock -better productivity of the flock -rapid entry in production of the replacement, mating during the sexual season, improve fertility results	- to have a level of growing sufficient during the first year, have a good BCS before matting	None	Satisfied

Nutrition plan of lambs from weaning to mating/ Rationing ewe lambs for better udder development

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Growths adapted to the breed	Healthier animals, Early entry into Production, Higher milk production at first lactation	training the shepherd and observe that the workers follow the precise proportions of the ratio and weighs them regularly.	Concentrated feed (5,4 €/Animal) Digital scale Automatic feed concentrate dispensers (100 €/dispenser). Concentrate storage silo (2500€). Different concentrates for different stages and good quality preserved forages	fully satisfied

Replacement management tool (software)

Adaptation	Benefits	Limit	Additional costs	Satisfaction
yes- we tried to choose the 'autochthonous' breed to reflect our native meat breeds, and tried to change the feeds to forage only (but it didn't work); modifications according to feed and hay availability	Planning and feeding properly animals during the rearing period and calculation of costs Knowing the feed cost prior to the production period.	Quite happy with current management, avoids feet issues etc. Language	laptop/PC with software >100 £ nutritionist adviser	No satisfied at all to fully satisfied
<i>Some users have not implemented this solution</i>				

Online history of grazing routes to remember and improve grazing routes in the next year

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes The solution was applied on a private farm and, therefore, on a pasture used only by one flock and not by several flocks (i.e. on communal land used by several farmers). On the other hand, the solution seems useful in this situation where a group of lambs grazed a large paddock (about 70 hectares) and therefore it can be very useful to check for over- or undergrazed areas under these conditions. Using a strap system to tie the telephone to a sheep in the flock	Better grazing management, improved grazing areas, multi-flock management and cooperation. Increased production in adult animals, increased fertility, increased average daily gain in lambs. Reduced costs, treatments and labour	The cost of the individual GPS, if it is planned to use it for all animals on the farm. However, given the highly gregarious attitude of the sheep, it is possible to use GPs on a percentage of animals. Battery life if a high frequency of localization is desired (e.g. 1 animal geolocation every 3 minutes), useful for a better understanding of grazing behaviour.	100-1000€ plastic collars or similar so that GPSs are placed on the animal's neck	No to satisfied

Protocol for forage analysis

Adaptation	Benefits	Limit	Additional costs	Satisfaction
No	Forage analysis allows full assessment of the ration to ensure nutritional requirements are being met, therefore improving production and efficiency. Improved uptake of forage analysis provided by the guidance on how to sample and interpret results	none	<€5, plastic bags and label. €20/sample	fully satisfied

Sward measurement

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes	Higher grass production, improved sward quality, extended grazing season, high feed value silage production. Higher production level. Reduce feed costs.	This measurement has a specific technique	Measuring equipment 100-500€	satisfied

Two successful combinations of legume/cereal winter forage crops

Adaptation	Benefits	Limit	Additional costs	Satisfaction
NO	A barley, oats, vetch and pea whole crop mix would meet the dietary requirements of pregnant ewes in mid pregnancy. A full, rumen .healthy balanced forage feed. The wholecrop helped meet the needs of the pregnant ewe flock in mid-pregnancy which meant the pasture was rested to provide quality nutrition later in pregnancy. The crop was undersown with grass therefore effectively nursing a new reseed.	Needs to be good ground to get a good crop.	500 - 1000€ Fuel, lime, muck Lab analysis	Satisfied

Wikiloc - a free grazing management tool

Adaptation	Benefits	Limit	Additional costs	Satisfaction
Yes Has other applications in UK, eg share information with co-workers or contractors.	recording all your grazing route data, better management of grazing with zero costs, useful communication between farmers so less environmental degradation	need a GPS on phone	Smartphone	fully satisfied

6. Appendix I. The end-user assessment survey - Word file to gather information.



**End-user Acceptance Survey
(Country)**

Topic	
Need/Issue	
Solution name/Origin	

Applied by	Farmer	Vet	Adviser	Other
Production system (meat/dairy)				
Number of animals	<100	100-500	500-1000	>1000
Type of farming system?	Shepherded	Extensive	Semi-extensive	Intensive
Targeted type of animal (adult sheep, replacement females or lambs)				
Expected benefit on nutrition	Planning and feeding properly animals during the rearing period and calculation of costs			
Expected benefit on health	N/A			
Expected benefit on management	as above			
Other expected benefit	N/A			

<u>Implementation of the solution</u>						
Did you implement the solution?	Yes / No					
if not, why?						
What kind of equipment do you already have to implement the solution?						
What are the implementation costs of the solution	<100€	100 - 500€	500 - 1000€	1000 - 10000€	>10000€	N/A
Consumables						
Other services (lab analysis, vet,...)						

Labour

How much time is required to prepare and implement the solution	Few hours or less than 1 day	1day	1 d-1 week	>1week
How much labour is needed to implement the solution?	1 person		>1 person	
Other specific prerequisites				

Is there any particular regulation linked to the solution?				
Overall stakeholder's acceptance	fully satisfied	satisfied	poorly satisfied	not satisfied at all
Was it easy to implement (Y/N)	Yes / No			
Any limits to its applicability				
Did you need to adapt the solution? (Y/N)	Yes / No			
If yes, how?				
Observed benefits (in comparison with the list of expected benefits)				
How long did it take time to see an effect on the farm	<3 months		>3 months	
Will you continue to implement it?	Yes/No			
If not, why?				
Do you recommend the solution to anyone else?	Yes/No			
Any comments/additions				



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7. Appendix II. The end-user assessment survey - Excel file for data analysis.

WP2 / Task:2.3 End-user Acceptance Survey										
Country										
Topic (Nutrition, Management, Health)										
Need/Issue										
Solution name/Origin										
Applied by (Farmer,Vet, Adv. etc.)										
Production system (Dairy-Meat-Dual Purpose)										
Number of animals										
type of farming system										
Targeted type of animal (adult sheep, replacement females or lambs)										
Have you implemented the solution? (Y/N)	Yes	Implementa tion is on going	Not yet							
Expected benefit on nutrition										
Expected benefit on health										
Expected benefit on management										
other expected benefit										
Implementation of the solution										
Did you impplement the solution?										
if not, why?										
What kind of equipment do you already have to implement the solution?										
What are the implementation costs of the solution	type	Cost*	Period (initial purchase/ per year cost)							
								* for the cost we use the categories to select		
								<100€	100-500€	500-1000€
								1000-10000€	>10000€	"does not apply"
								<50 €	50-100€	100-500€
								500-1000€	>1000€	"does not apply"
Equipment										
Consumables										
Other services (lab analysis, vet,...)										
Labour										
How much time is required to prepare and implement the solution	Few hours or less than 1 day	1day	1 d-1 week	>1week						
How many labour is needed to implement the solution?										
Other specific prerequisites										
Is there any particular regulation linked to the solution?										
Overall stake-holder's acceptance	fully satisfied	satisfied	poorly satisfied	not satisfied at all						
Was it easy to implement (Y/N)										
Any limits to its applicability										
Did you need to adapt the solution? (Y/N)										
If yes, how?										
Observed benefits (in comparison with the list of expected benefits)										
How long it takes time to see an effect on the farm	>1 month	>3 months								
Will you continue to implement it?										
If not, why?										
Do you recommend the solution to anyone else?										
Any comments/additions										