INITIATIVE ON Agroecology

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Applying the AWIN Protocol for Animal Welfare Assessment for Sheep in Kef and Siliana, Tunisia

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1. Background

- As defined by the World Organization for Animal Health (WOAH), Animal Welfare is ***"the physical and mental state of an animal in relation to the conditions in which it lives and dies"***.
- This optimal state can be achieved by applying four main principles: providing good feeding, good housing, good health, and appropriate behavior (Dwyer & Ruiz, 2015).
- Assessing animal welfare is an important approach to livestock farming, as it:
  - Provides farmers with scientific evidence of the results of management deficiencies and enables experts to guide them in improving their practices;
  - Offers a low-cost and low-input strategy to enhance livestock raising conditions, and consequently, flocks' productivity;
  - Responds to the growing interest of consumers in ethically raised livestock.
- Animal Welfare Indicators (AWIN) protocol is a practical tool to be used for this purpose. It consists of several indicators to evaluate both flock-level conditions and individual welfare. Interpreting the assessment findings allows us to identify management gaps and suggest targeted solutions.
- In Tunisia, efforts to improve welfare conditions for sheep have been limited under the livestock's law "Loi de l'Élèvage" of 2005, which, although providing a considerable regulatory basis, focused on setting rules for livestock housing and transport rather than specifically addressing animal welfare.
- Only one previous work on sheep welfare assessment using AWIN protocol was done in Tunisia on 2021 (M'Hamdi et al., 2021). The study assessed welfare in Tunisian meat-type sheep using animal-based measures. It concluded that indicators like body condition score, cleanliness, health issues, and human-animal interactions effectively identified welfare concerns and reflected potential issues related to nutrition, cleanliness, and health in many flocks. It also highlighted the importance of human-animal relationships in reducing stress.
- Under CGIAR's Agroecology initiative, this work constitutes a first attempt to evaluate the sheep welfare status in the Tunisian Agroecological Living Landscape (ALL), El Kef and Siliana, with the aim of providing farmers with low-cost and low-input targeted solutions to improve their sheep flocks' management practices at first place and initiating the elaboration of an animal welfare guideline for sheep farming in Tunisia at second place.
- This document provides a brief summary of the most relevant findings of the sheep welfare assessments conducted in El Kef and Siliana in October 2024;

2. What did we do?

2.1. Overview

- In collaboration with the department of Veterinary Medicine and Animal Sciences of the University of Milan in Italy and the National School of Veterinary Medicine of Sidi Thabet, and under the Agroecology initiative, ICARDA team launched an attempt to evaluate the animal welfare status in some sheep flocks in the Tunisian ALL, namely El Kef and Siliana.
- Two training sessions were organized as a first step to familiarize potential involved stakeholders with the tool:
  - The first session was held online on the 23rd and 25th of September
  - The second training session was held on-field on the 15th and 16th of October
- Following these training sessions, field visits were conducted on the 29th and 30th of October to four flocks in Sers region in El Kef to have a preliminary description of the sheep welfare status in the area.

2.2. Online training session

- This session was organized online, in collaboration with the University of Milan, on the 23rd and 25th of September.
- 8 participants, 7 of whom were females, attended in this training. These participants came from different institutional backgrounds, namely ICARDA, National School of Veterinary Medicine of Sidi Thabet (ENMV), National Institute for Agronomic Research of Tunis (INRAT), Office of Livestock and Pasture (OEP), and Higher Agronomic Institute of Chott Mariem (ISA-CM).
- The main focus during the first session of this training was on theoretically introducing the AWIN protocol to participants. An overview of the protocol as well as a detailed explanation of its different indicators were delivered by Dr. Elie Atallah from the University of Milan through an interactive presentation.
- The second session's focus was to discuss the potential adaptability of this protocol to Tunisian context. A first presentation on the overall welfare conditions of Sheep in the Tunisian ALL, compared to AWIN protocol indicators, was delivered by Dr. Ons Tebourbi and Pr. Imène Ben Salem. This presentation was followed by a discussion to develop a preliminary protocol adapted to the context in El Kef and Siliana governorates. This preliminary protocol was meant to be used during the on-field training which will follow this online session, and may be subject to further modifications based on the field observations.

2.3. On-field training session

- This session was organized on-field, in collaboration with the University of Milan, on the 15th and 16th of October.
- Three participants, all females, from ICARDA and ENMV, were present during this session.
- The main focus during both field sessions was to have the participants working practically on evaluating the different indicators of the AWIN protocol, with the aim of generating data while being trained for the animal welfare assessment trials to be held in the future, and introducing the concept of Animal Welfare and its usefulness to champion farmers in the Tunisian ALL.
- The first step was to evaluate the overall welfare condition of the flock. This evaluation included indicators on the composition of the flock, the housing conditions, the overall cleanliness of the flock, the behavior of the animals, the presence/absence of health deficiencies (cough, lameness, etc.), the availability of feeders, feed, and water, etc.
- The second step was to individually evaluate the welfare conditions of ewes. The evaluation included indicators on the physiological condition of the ewe (age, pregnancy, lactation), the nutritional condition of the ewe (body condition score, anemia), the overall health condition (lesions, ocular discharge, nasal discharge, coughing, fecal soiling, abscesses, etc.), and the housing and management conditions (fleece cleanliness, panting, etc.).
- A score was attributed to each indicator – For some indicators, the score was absence/presence as 0 or 1; or level of the condition as a score from 0 to 3, 4 or 5.
- Following this training, a final discussion was held to summarize the preliminary field observations and to come up with a final version of the protocol to consider in the upcoming evaluations.
- During this session, **03 sheep flocks** with a total of **35 ewes** were assessed.

Figure 1. Individual assessment and data recording

2.4. Field visits

- To have a better preliminary overview on sheep welfare status in the Tunisian Agroecological Living Landscape, serving as a keystone for a future larger welfare assessment, two field days were organized to evaluate the animal welfare conditions in **04 sheep flocks** in Sers, El Kef on the 29th and 30th of October.
- The same steps of the on-field training session were followed during these visits, and a total of **64 ewes** were examined.

Figure 2. An assessed flock in Sers region

3. Outputs

- To implement Animal Welfare principles, appropriate physical and environmental resources must be provided at the farm level and monitoring schemes should be applied to assess the adequacy of these resources. These schemes include resource-based and animal-based measures.
- Resource-based measures identify risk factors affecting the individual welfare of animals, while animal-based measures allow for evaluating the adequacy of these resources and their effect on each animal in the flock.
- During the on-field training and the field visits, both resource-based and animal-based indicators were assessed. However, the main focus is to discuss the most relevant findings from the individual welfare assessments conducted in the visited sheep flocks.
- The results are organized according to the animal welfare principles associated with each indicator.

3.1. Good feeding

- **Body Condition Score (BCS)** is a standardized and easy tool to evaluate how fat or thin animals are, based on Russel scale that goes from 0 to 5. It provides a quick quantified estimation of the nutritional wellbeing of ewes. Animals are considered thin if they score below 2 on this scale, emaciated if they score at or below 1, and obese if they score above 4.
- To simplify our results, we classified them into three categories, namely "Thin" if the score is below 3, "Good" if the score is equal to 3, and "Fat" if the score is above 3.
- Only **48.5%** of the examined ewes across the seven flocks had an optimal body condition score, while **32.3%** were thin and **19.2%** were obese.
- This finding indicates that current feeding management practices are not adequately meeting ewes' nutritional needs during late pregnancy and lambing season and need to be improved. In addition to that, a scarcity in feed resources associated with very high prices has been observed during the last years due to successive long droughts.
- The following graph provides a detailed summary of BCS records for each farm:

Figure 3. Evaluation of BCS

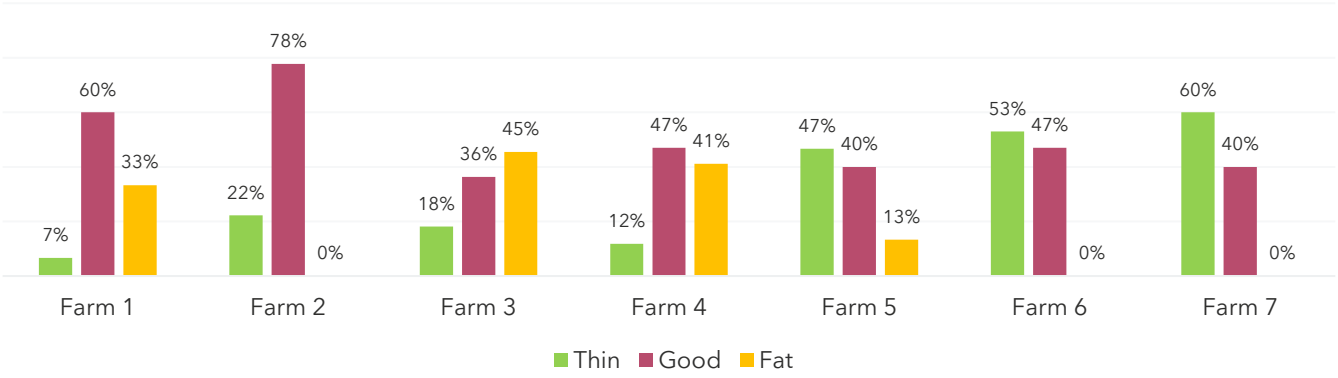

Figure 4. BCS records for each farm

3.2. Good housing

Figure 5. Fleece cleanliness - Score 2

- **Fleece cleanliness** indicates whether sheep have been able to lie down in a comfortable and dry place. To assess this indicator, the regions of the belly, legs, flanks, back and head should be inspected. According to the AWIN protocol, a five-level scale ranging from "Clean and dry (0)" to "Filthy (4)" is used to assess sheep fleece cleanliness.
- A score from 0 to 4 was attributed to each ewe examined individually in the seven flocks. However, to simplify the results, they were categorized into two groups "Clean" for a score of 0 and "Dirty" for scores of 1 or higher.
- **66.7%** of examined ewes in the seven flocks had dirty fleece, with different scores, while only **33.3%** of them had clean fleece. Many risk factors like wet conditions and poor shearing practices could be associated with this finding. Nevertheless, given the general context, inadequate bedding hygiene is likely the most plausible explanation for these results.

Figure 6. Presence of hoof overgrowth

- **Hoof overgrowth** occurs when sheep walk on soft bedding and results in distorting the shape of the foot, thus leading to movement difficulties and lameness. According to AWIN protocol, this indicator is evaluated as "Absent (0)" or "Present (1)".
- Hoof overgrowth was not significant across the seven flocks and only **20.4%** of the examined ewes presented this abnormality. Notably, some flocks showed no cases of hoof overgrowth, whereas one flock presented an exceptionally high prevalence of **88%**. This observation is explained by the effects of very soft bedding, which does not provide sufficient natural wear for the hooves, in addition to inadequate hoof trimming practices, that allow overgrowth to go unchecked.

- The following graph summarizes the observations for both fleece cleanliness and hoof overgrowth in the seven farms:

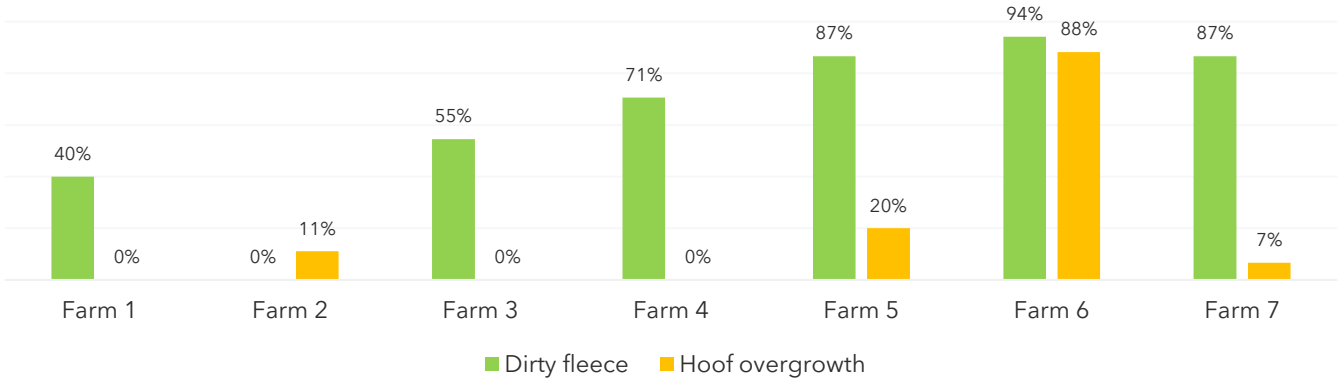

Figure 7. Fleece cleanliness and hoof overgrowth records for each farm

3.3. Good health

Figure 8. Ear lesion due to ear tag dop off

- **Lesions** are observable injuries or skin damage occurring on various parts of the animal's body, such as the head, neck, ears, eyes, mouth, legs, udder, or other regions. Their presence reflects poor housing conditions, rough handling, or aggressive social interactions within the flock or with other animals. According to the AWIN protocol, lesions are evaluated by counting the number of lesions for each area and estimating their size (minor or major).
- When assessing the seven sheep flocks, the most significant observed lesions, although with a low prevalence, were ear lesions at **8.1%**, and neck lesions at **18.2%**.
- In this context, ear lesions were mainly caused by three factors: identification ear tags that can drop off, cause inflammation, or get stuck in metal fence; mange-related lesions; and incisions made by farmers in the sheep's ears to treat acidosis.
- On the other hand, neck lesions were mainly caused by: metal fence, conflicts with other ewes or animals (goats, dogs), and incisions made by farmers in the sheep's neck to treat caseous lymphadenitis.
- The details of our findings on ear and neck lesions are summarized in **figure 16**, along with other health indicators.

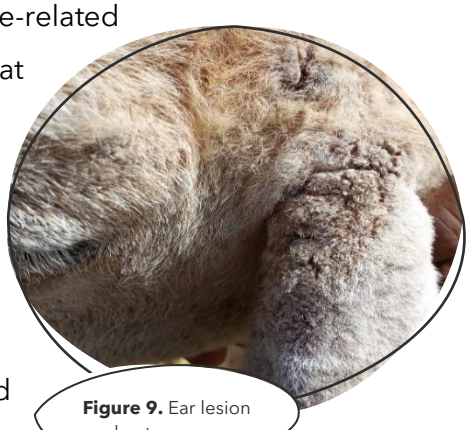

Figure 9. Ear lesion due to mange

- **Skin abscesses** are localized collections of pus caused by bacterial infections introduced through wounds, abrasions, or injections. Their presence often indicates poor environmental hygiene. According to the AWIN protocol, skin abscesses are evaluated as "Absent (0)" or "Present (1)".
- Skin abscesses were not significantly prevalent across the seven flocks, and only **11.1%** of examined ewes were affected. However, it is worth noting that farmers frequently raise inquiries about this issue, and express frustration mainly due to contamination risks and the reduced market value of lambs with skin abscesses.
- In this context, the problem mainly arises from inadequate health management, such as contamination of the bedding by *Corynebacterium pseudotuberculosis*, the agent of caseous lymphadenitis; or improper use of needles during vaccination.

- **Ocular discharge** is an abnormal accumulation of fluid, mucus, or pus around the eyes. It usually indicates the presence of irritation or eye disease. According to the AWIN protocol, eye discharge is evaluated as "Absent (0)" or "Present (1)".
- Across the seven flocks, ocular discharge was observed in **19.2%** of examined ewes. This finding could be contextually linked to two main factors, namely the presence of environmental irritants, particularly in grazelands, and a relatively low prevalence of eye infections within the flocks.

Figure 10. Presence of ocular discharge

- **Nasal discharge** is an abnormal flow of fluid, mucus, or pus from the nose. It usually indicates the presence of irritation or respiratory disease. According to AWIN protocol, nasal discharge is evaluated as "Absent (0)" or "Present (1)".
- Across the seven flocks, nasal discharge was significant at **32.3%**. In this context, this finding can be attributed to the presence of dust in shelters and/or environmental irritants in grazing areas.

Figure 11. Presence of nasal discharge

- **Fleece quality**, according to the AWIN protocol, refers to the degree of fleece cover over the body. This indicator is evaluated through noting any areas of loss, thinning, lumpiness, scurf, or shedding and occurs due to some diseases (e.g., ectoparasites, fever), nutritional deficiencies, and wool-pulling. A three-level scale score ranging from "Good (0)" to "Significant fleece loss (2)" is attributed to each examined ewe. A score from 0 to 2 was attributed to each ewe examined individually in the seven flocks. However, to simplify the results, they were clustered into two groups "No fleece loss" for a score of 0 and "Presence of fleece loss" for scores of 1 or 2.
- Only **15.2%** of the examined ewes across the seven farms presented fleece loss.

- **Fecal soiling** is the presence of fecal material on the wool around the anus, breech area, tail, and hindlegs. This indicator is associated with diarrhea and can increase the risks of cutaneous myiasis or flystrike. According to the AWIN protocol, a five-level score ranging from "Not present (0)" to "Extensive soiling and dags (4)" is attributed to each examined ewe.

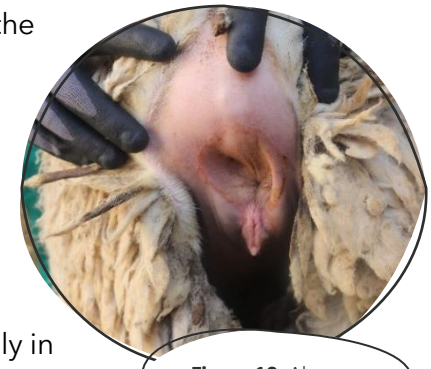

Figure 12. Absence of faecal soiling

- A score from 0 to 4 was attributed to each ewe examined individually in the seven flocks. However, to simplify the results, they were categorized into two groups "No fecal soiling" for a score of 0 and "Presence of fecal soiling" for scores of 1 or higher.
- Fecal soiling was observed in **27.3%** of the examined ewes across the seven farms, with one farm reaching a prevalence of **91%**. In this context, this finding could mainly be related to digestive parasitic infections, likely resulting from inadequate deworming protocols and poor biosecurity in common grazing areas, where contaminated pastures, high stocking density, and lack of proper quarantine practices increase the risk of helminth infections.

Figure 13. Faecal soiling - Score 3

- **Mastitis** is the presence of infections, acute or chronic, in the udder of lactating ewes. This pathologic observation is caused by poor hygiene conditions in the shelters and inadequate weaning practices. According to the AWIN protocol, a three-level score ranging from "No mastitis or lesions (0)" to "Mastitis and/or severe lesions (2)" is attributed to each examined ewe.

Figure 14. Evaluation of udder

- A score from 0 to 2 was attributed to each ewe examined individually in the seven flocks. However, to simplify the results, they were categorized into two groups "Absence of mastitis" for a score of 0 and "Presence of mastitis" for a score of 1 or 2.
- The prevalence of mastitis across the seven farms was **16.2%**. Although not relevant, this issue must be raised given its important negative impact on flocks' productivity. In this context, affected ewes are housed in shelters where fecal material is always present in bedding and frequently comes into contact with the udder when ewes lie down. Additionally, weaning practices contribute to mastitis, as milk accumulates in the glands after lambs are weaned. Most of the infections are left untreated, leading to chronic mastitis and cessation of milk

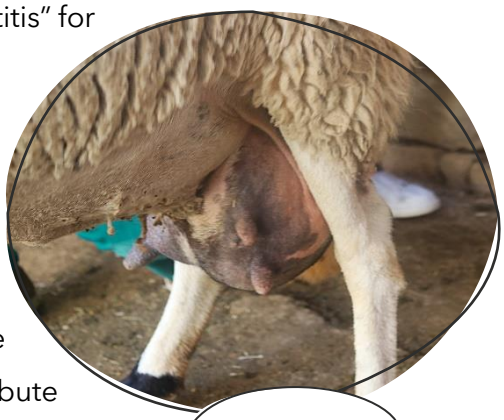

Figure 15. Chronic mastitis

secretion in the affected teat. This situation causes a decrease in the ewe's milk production, and consequently, affects the growth of its offspring.

- The following diagram provides an overview of the observed percentages of the above-mentioned health indicators across the seven farms:

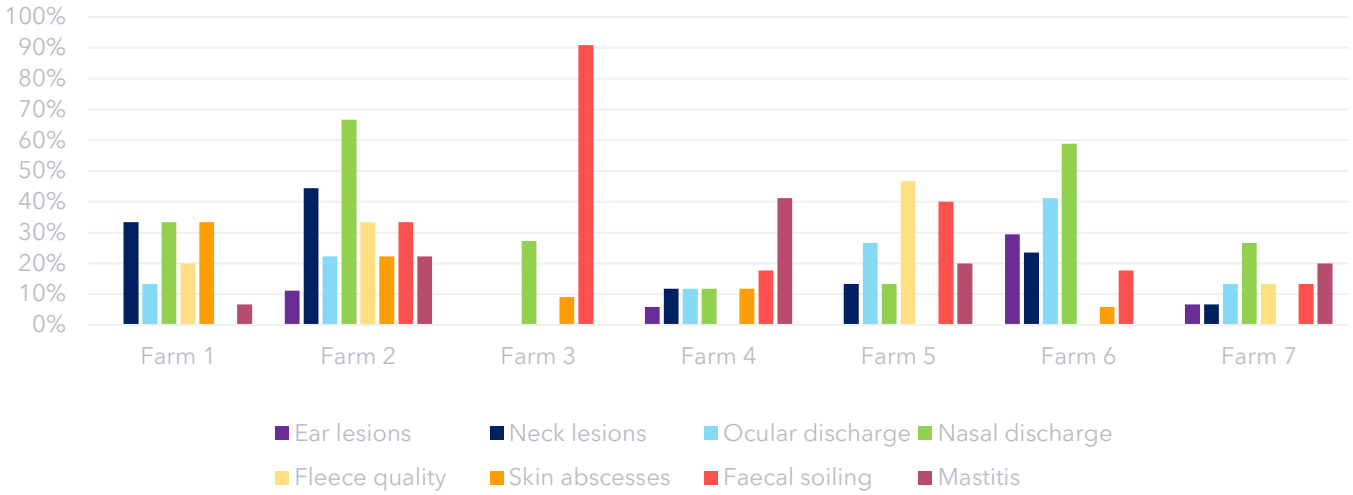

Figure 16. Recordings of health indicators in each farm

- Other health findings were not very relevant. For instance, we only observed few cases of ewe lesions (2%), mouth lesions (8%), udder lesions (2%), anemia (3%), coughing (4%), and tail docking (9.1%). The remaining indicators, namely leg lesions, body lesions, myiasis, and lameness were not observed in the sample that was used.

Figure 18. Presence of anaemia

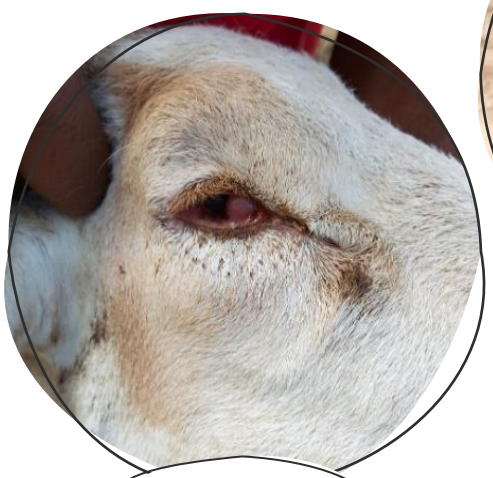

Figure 19. Presence of eye lesion

Figure 17. Tail docking - The vulva area is not covered

4. Concluding remarks

- Assessing sheep welfare is a **valuable tool** that allows the **identification of gaps** in flock overall management practices.
- The **AWIN protocol** allowed us to accurately **detect significant deficiencies** in the assessed farms and provide farmers with **scientific evidence** of the importance of adequately **meeting their sheep's nutritional, health, and management needs**.
- The key gaps identified through our findings are:
    - **Inadequate feeding management** – This was evident from the high percentage of non-optimal BCSs.
    - **Poor housing conditions**, characterized by inadequate bedding and lack of hygiene – As indicated by dirty fleeces, hoof overgrowth, ocular and nasal discharge, and mastitis.
    - **Improper health management and lack of awareness about biosecurity** – This was reflected in the high prevalence of many health issues including neck lesions, fecal soiling, skin abscesses, mastitis, etc.
- **Addressing these gaps** is crucial to **improving the welfare, health, and productivity** of sheep flocks in the region, as the animal welfare component makes part of the Integrated Herd Health Package that is being implemented in El Kef and Siliana.

5. Way forward

- Increasing the number of assessed flocks to have a more representative sample across the two governorates of El Kef and Siliana, and eventually across Tunisia and evaluating the flocks in different seasons to account for variations in environmental conditions, nutritional resources, and flock health throughout the year …
- Creating a user-friendly guideline tailored to farmers, focusing on achievable and cost-effective solutions for common welfare issues such as feeding, housing hygiene, and health management. The guideline should actively involve farmers by integrating their perspectives, challenges, and proposed solutions…
- Organizing training sessions for farmers to raise their awareness about animal welfare principles and encourage them to improve their overall flock management by adopting practices that respect the welfare of their sheep…
- Integrating the animal welfare component into DTREO, a cloud-based platform designed to collect and store data on livestock productivity and health to support decision-making for sustainable and efficient farming practices. This integration will ensure a continuous monitoring and guide farmers in implementing welfare improvements.

6. References

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