Supplemental material for

"Ilemchane Transhumant Pastoralists' Traditional Ecological Knowledge and Adaptive Strategies: Continuity and Change in Morocco's High Atlas Mountains", by María E. Fernández-Giménez, Ahmed El Aich, Oussama El Aouni, Ilhame Adrane, and Soufiane El Aayadi, published in *Mountain Research and Development* 41(4), 2021. (See https://bioone.org/toc/mred/41/4)

APPENDIX S1 Detailed Data Collection Methods

For this holistic exploratory TEK study, we used a mixed-methods ethnographic approach involving both qualitative and quantitative methods over the course of 10 months from September 2018 through June 2019. In September 2018, we initiated the research with introductory semi-structured interviews in the Ait Bougemez Valley and a focus group with an association of Ilemchane transhumants in their fall pasture area in the Saghro Mountains (1st, 2nd and 5th authors). In winter and spring of 2019, the 3rd author conducted a survey of Ilemchane households in their winter pasture area in the Saghro Mountains. The survey focused on herd structure, production and economics, comparing transhumant and settled Ilemchane households (see Appendix S5, household production survey instrument). In May 2019, the 3rd author accompanied one of these households on their 10-day spring migration on foot from the Saghro Mountains to their summer pastures in the High Atlas Mountains, documenting vegetation, herd management, and herders' social interactions. The 3rd author photographed as many individual plant species as possible during the migration, and collected information on their Tashelhit names. These photos were later used in the plant sort activity. In June 2019 the 1st, 3rd and 4th authors spent three weeks with Ilemchane transhumants in their summer pastures in the High Atlas, travelling to three different summer grazing areas within the general area used by the Ilemchane. Here, we carried out 1) additional participant observation with herders doing their daily tasks, 2) semi-structured interviews with women (n=13) and men (n=8) transhumants focused on ethnobotanical knowledge, pasture ecology, management and governance and the transhumant lifeway, seven of which included free lists of plants; 3) a structured survey on herders' observations of environmental change (n=23, 7 with women); and 4) a pile sort activity where herders were invited to sort plant photos taken during the transhumant journey into piles according to their perceptions of their ecology and utility (n=3). Free lists and pile sorts followed established ethnobotany methods (Martin 2004). The short field time and difficult field conditions accessible only on foot and with pack animals, precluded a full systematic ethnobotanical survey and collection of associated voucher specimens. Semi-structured interviews used a protocol similar to those used by Fernandez-Gimenez and Fillat (2012) and Bruegger et al. (2014) (Appendix S2), and ethnobotanical interview guidelines (Martin 2004) (Appendix S3). The structured environmental change survey questionnaire was similar to a survey used in Mongolia (Fernández-Giménez et al. 2015), and included a series of closed ended questions using a Likert-type scale asking herders about changes in pasture and climate conditions over the previous 25 years (from 1993 to 2018). The survey also included opportunities for qualitative comments and a few open-ended questions (Appendix S4).

All interviews and surveys with women participants were conducted by the lead author (a woman) through a native Tashelhit-speaking woman interpreter/co-researcher (the 4th author). Interviews and surveys with men were conducted in Moroccan Arabic or Tashelhit by a native speaker (Moroccan Arabic) or with an interpreter (Tashelhit). Researchers took notes and audio-recorded all interviews and surveys. All data collection activities, except for the livestock production survey, were conducted under CSU IRB Colorado State University IRB 350-18H with participants' free prior and informed consent and research permission from the Government of Morocco. The livestock production survey was led and implemented independently by the Institute Agronomique et Veterinaire Hassan II.

References

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APPENDIX S2 Traditional Ecological Knowledge, Management Practices, and Governance Interview Questions

[Note: as a semi-structured interview guide, this instrument provides a general overview of the types of questions asked in the interviews. The interview guide was implemented flexibly depending on the experiences and context of each participant. Interviews were conducted in Tashelhit through a native Tashelhit and English speaking interepreter or in Moroccan Arabic.]

Introduction:

Hello, my name is_____. I am a researcher with (Colorado State University and/or the Institut Agronomique et Veterinaire Hassan II). I am working on a research project to document herders' traditional ecological knowledge and practices and understand how this knowledge is passed on within and between generations.

You have been asked to participate in this interview to share your knowledge about the environment and the management of land and livestock. I would also like to gather information from you about your community and how you get and share information with other herders, livestock owners and people in your valley. This interview includes four broad types of questions. The first section will ask you a little more about yourself, the second section will address your knowledge about the mountains and your management, the third focuses on socio-economic and environmental changes in your community, and the final section asks about how your community makes decisions about pastures and natural resource management.

Before we begin, would it be okay if I voice record our discussion? This ensures greater accuracy in the data. Do you have any questions before we begin?

Personal Attributes and Community Characteristics

1. Could you tell me a little about your history in this community?

    a. How long have you (or your family) lived in this community?
    b. Were you born in this community? If not, where?
    c. How long have you herded livestock in this community?
    d. Were your parents also livestock owners or herders?
    e. What is your level of formal education?
    f. Do you have any formal education related to agriculture, livestock husbandry, or natural resource management?
    g. How else did you learn about herding and livestock?

2. What kind of operation do you run?

    a. Grain/Crops
    b. Livestock
    c. Mixed

3. What type of livestock do you keep? About how many head of each type?

    a. Cattle _____
    b. Sheep _____
    c. Goats _____
    d. Horses _____

4. Do you run a specialized operation?
    a. Vegetables
    b. Horticulture
    c. Permaculture
    d. Extensive livestock production
    e. Intensive livestock production

5. When did you take over or start this operation (year)?

6. How long has your family (including parenst, grandparents, etc.) had this operation?
    a. $\leq$ 2 generations
    b. > 2 generations

7. To what degree do you (and your family) depend on this income from your operation (excluding earnings from tourism, etc. not directly related to the agricultural operation)?
    a. 100%
    b. 75-99%
    c. 50-74%
    d. 25-49%
    e. < 25%

<u>Ecological Knowledge</u>

Land and Natural Resources

8. What kinds of land or pastures do you have in your territory/community? (vegetation type/ownership/use)

9. Please explain to me the main characteristics and uses of each type of land/pasture that you mentioned and how they are different from each other.

(soils, vegetation, productivity, diversity, use, condition, importance)

10. Are there any other natural resources that are important for livestock husbandry, the local economy or culture, or for the health of the landscape? Which ones?

(wildlife, water, trees, wild food/medicinal plants, etc.)

11. Are there aspects of infrastructure that are important for livestock husbandry? (e.g. fences, barns, irrigation systems, stock driveways, etc.)

Ecological Conditions, Dynamics and Changes

12. Consider which land/pasture areas are most essential to your operation. How do you evaluate their condition or quality? For example, for your summer mountain pastures, how do you determine if they are in good or poor condition?

- How do you define "good condition"? (indicators)
- How do you define "poor condition" (indicators)
- Do areas in poor condition have the possibility to change (why/why not)?

13. What changes in vegetation types or conditions have you observed during your lifetime in your territory/community?

    For each change:

- What do you think caused this change?
- What signs indicate that a change has occurred?
- Do you think this change in the ecosystem is reversible? Or is it a permanent change? Why/why not?

14. How have these changes in vegetation types or conditions affected the use, management, and productivity of land in your territory/community?

15. Are there other ecological changes you have observed in your territory/community during your lifetime, for example, changes in water, soils, or wildlife?

    For each change:

- What do you think caused this change?
- Are there indicators you look for to mark this change?
- Do you think this change in the ecosystem is reversible? Or is it a permanent change? Why/why not?

16. In your territory/community, what factors in the environment or management have the biggest influence on the kinds of plants (composition) that grow in each pasture type and the amount of production? (climate/weather, soil type, management, etc.)

17. What are the major environmental events (natural disasters), or repeated disturbances, that have affected the land/pastures in your territory/community during your lifetime? (e.g. droughts; floods; severe or long winters; insect, pest or disease infestations; wildfires; rock slide; avalanche, etc.)

18. When these events occurred, how did they affect your livestock?

- How did you cope with/respond to this type of event?

<u>Management Practices</u>

19. What are your goals for raising livestock? (Management goals.)

20. You mentioned that you raise_____type of livestock [question 3)

- Have you always had this type of animal or did you change the species or breed?
- Why do you raise this type of animal? (What factors influenced you to raise this species and breed of animal?)

21. Earlier you mentioned that you keep about_____cattle/sheep/etc.

- How do you determine the appropriate number of animals to keep? (What factors influence the number of animals that you keep?)

22. Please explain to me the seasonal production cycle for your herd(s). [May ask participant to draw a seasonal activity diagram]

    - What activities do you do in each season?
    - What do your animals eat in each season and where do they graze?

23. Who herds your animals (takes them to pasture and watches out for them)?

24. How do you decide when and where to move your animals each season/day/time of day?

    - What are the signs that indicate it is time to move your animals to a different seasonal pasture?
    - What other factors influence when and where you move your animals?
    - Within a seasonal pasture, how to you decide where you graze your animals each day?
    - During a given day, do you move your animals to different places in the pasture at different times of day?

25. Are there other practices or activities you do on the land or with your animals that are important for the success or sustainability of your enterprise or for the health of our land and animals?

26. What are the main management challenges or issues that you face today?

27. How are you or how will you address these challenges?

Management Institutions

28. Please explain to me who owns or has rights to use the different types of land/pasture in your territory/community, and what is the nature of these rights? (private, government, community, other?)

    - How can newcomers or outsiders gain access/use rights?
    - Is there any way you can lose the right of use?

29. On common pastures that are grazed by more than one household, how is it decided when animals can begin grazing the area and when they should leave? [what land under other types of use/ownership]

30. How is it decided how many animals each livestock owner can put on the common pastures?

31. What are the other important rules or customs regarding the use of pastures?

    - Which of the rules that you have described are written down and which are informal "unwritten laws" that everyone knows about and understands?

32. How is compliance with these decisions monitored and enforced?

    - What are the penalties or consequences for violating these rules/decisions? (ask for examples)

33. What are the roles of different government and non-governmental organizations in making decisions about pastures, livestock and other natural resources in your territory/community?

    - How much influence does the government or other entities have over the use or management of private or communal lands?

34. What sorts of conflicts occur over the use or rights to pasture in your territory/community? (can you give me an example?)

    - Have conflicts become more or less frequent over the past 20 years?
    - How have the nature or topics of conflicts changed?

35. How are conflicts over pastures or livestock (or natural resources) managed or resolved?

36. How have the social and economic changes over the past 30 years (e.g. depopulation, reduction in the economic importance of livestock husbandry) affected the institutions for managing pastures and livestock?

Social and Economic Changes and Adaptations

37. What major social, economic or cultural changes have taken place in your territory/community during your lifetime?

    - How did each of these events affect the use or management of the land?
    - How have each of these changes affected the types, amount or condition of different land/pasture types in your territory/community?

38. How did you respond to each of these changes?

    - Did you change the type of livestock you raise?
    - What you feed them?
    - The timing, distance or location of seasonal movements?
    - The amount of land you cultivate or types of crops you grow?
    - Your occupation or livelihood? (i.e. did you change how you make a living or add new activities or enterprises?)
    - Other responses/adaptations?

39. What other factors have helped you to survive disasters or adapt to major environmental or socio-economic changes?

40. In your community do people (herders) usually work together or do they usually work alone?

    - What are some examples of when people work together?
    - Do people every work together to solve a problema or issue in your community?

41. What do you see as the future of livestock production in your community?

Is there anything else that you would like to tell me or that it is important for me to know?
Thank you very much for your time.

APPENDIX S3 Ethnobotanical Interview Questions

[Note: as a semi-structured interview guide, this instrument provides a general overview of the types of questions asked in the interviews. The interview guide was implemented flexibly depending on the experiences and context of each participant. Interviews were conducted in Tashelhit through a native Tashelhit and English speaking interepreter or in Moroccan Arabic.]

Introduction:
Hello, my name is_____. I am a researcher with (Colorado State University and/or the Institut Agronomique et Veterinaire Hassan II). I am working on a research project to document herders' traditional ecological knowledge and practices and understand how this knowledge is passed on within and between generations.
You have been asked to participate in this interview to share your knowledge about the environment and especially plants. Before we begin, would it be okay if I voice record our discussion? This ensures greater accuracy in the data. Do you have any questions before we begin?

Informant information:

Name, age, gender, tribe/fraction, home village, occupation (herder, farmer other), transhumant/non-transhumant

Part 1. General Plant Knowledge

1) What are the most important or useful plants in your area? (Free list)

2) Here are some plants that grow in this region (Pile sort). Can you tell me which ones you recognize and their names? Then, sort them into piles according to how you would rate their usefulness for livestock grazing (could also do food, medicine, dye).

3) Which plants that used to be common that are getting less abundant? Why?

4) Which plants that used to be rare are getting more common? Why?

5) How do these changes in the plants affect your life and work as a pastoralist?

6) [If the changes are perceived as a problem] Is there anything that can be done to improve the situation?

Part 2. Specific Plant Knowledge

Show a photograph or an example of each plant.

1) What do you call this plant (Tashelhiit)?

- Does it have any other names?

2) Where does this plant grow? (habitat, soils, etc.)

- Is it common or rare?
- Is it getting more or less abundant?

3) What time of year do you see this plant?

4) How do you use this plant? (list as many different uses as you know).

5) For each use listed:

- For [use], what part of the plant do you use?
- What time of year do you harvest it?
- How do you prepare the plant to use it?
- How do you use it?
- From whom did you learn about this plant?

6) Is there anything else you can tell me about this plant? (are there any stories, cultural significance, symbolism of this plant)?

Part 3. Environmental Conditions and Climate Change

1) How do you evaluate the condition or quality of your pastures? What are the indicators of "good" condition pasture? What are the indicators of "poor" condition pasture? Do areas in poor condition have the possibility to improve or not? Why or why not?

2). What changes in vegetation or pasture conditions have you observed in your lifetime in this valley? What do you think caused this change? What signs indicate that a change has occurred? Is this change permanent or reversible?

- Amount of production
- Timing of green-up/brown down
- Number of plant species
- Types of plant species
- Poisonous or invasive species
- Erosion

3) How have these changes affected your management, your animals or your livelihood?

4) Have you observed any other changes in the environment during your lifetime?

5) How has the climate changed since you were a child?

- How has winter temperature changed (getting warmer or colder)?
- How has spring weather changed (getting warmer or colder? Earlier or later)?
- How has summer weather changed (getting warmer or colder)?
- How has fall weather changed (getting warmer or colder? Earlier or later)?
- How is the amount of rainfall changing (increasing or decreasing)?
- How is the intensity of rainfall changing (more intense, less intense)?
- How is the frequency of rainfall events changing (more or less frequent)?
- How is the wind changing (more windy, less windy, different direction)?
- How has the amount of water in the rivers changed?
- How has the amount of water in the lakes changed?
- How has the amount of water in the springs changed?
- How has the amount of snow in winter changed?
- Any other changes?

6) How are these changes affecting the pastures? Your animals? Your livelihoods?

7) How have you changed your management to adjust to these changes?

8) Do you have any ideas for what you will do in the future if these changes continue?

9) What kind of programs or support would help herders to adapt to these changes?

APPENDIX S4 Survey Questionnaire on Observations of Environmental Conditions and Changes

Hello. My name is_____and I am working with a research team from the Institute of Agronomy and Veterinary Science Hassan II and Colorado State University. We are studying herders' knowledge of pasture and experience of ecological change. Today in this interview we are asking for your knowledge of pasture and the changes you've seen. Participation is completely voluntary. In this interview, we are interested in your thoughts and opinions, and there is no right or wrong answer to the questions. Before starting, do you have any questions? If you have questions during the interview, you should feel free to ask. In order to document your comments, is it OK if I record this interview? Thank you!

Name_____
Age_____
Sex Male Female
Location (GPS) (decimal degrees, Datum= WGS 84) _____
County_____
Village_____
Tribe_____
Faction_____

Do you belong to a cooperative? Yes No
If so, name of group_____

1. How long have you lived in this area? Since which year have you lived here? _____
   Write year

For the next series of questions, please think about the conditions now in your area compared to 25 years ago (1993). For each question we will give you a series of choices, and you will chose one.

Pasture Variable	**Perceived Amount of Change**					
2. The amount of pasture growth compared to 1993 is	1. Much lower	2. Somewhat lower	3. About the same	4. Somewhat greater	5. Much greater	6. Don't know/Not old enough to remember
3. The amount of pasture growth compared to 10 years ago is	1. Much lower	2. Somewhat lower	3. About the same	4. Somewhat greater	5. Much greater	6. Don't know/Not old enough to remember
4. The number of different kinds of plants that grow here now compared to 1993 is	1. Many fewer types of plants	2. Somewhat fewer	3. No change	4. Somewhat more types	5. Many more types of plants	6. Don't know/Not old enough to remember
5. The specific kinds (species) of plants are	1. The same as in 1993	2. We see new plants that were not here in 1993 Names of plants_____			3. Some plants that used to grow here have disappeared or become fewer Names of plants_____	
6.The forage quality now compared to 1993 is	1. Much worse	2. Somewhat worse	3. Not changed	4. Somewhat better	5. Much better	6. Don't know/Not old enough to remember
7. The amount of bare ground now compared to 1993 is	1. Much less	2. Somewhat less	3. No change	4. Somewhat more	5. Much more	6. Don't know/Not old enough to remember
8. The amount of erosion now compared to 1993 is	1. Much less	2. Somewhat less	3. No change	4. Somewhat more	5. Much more	6. Don't know/Not old enough to remember

9. Please describe any other major changes in pasture conditions you have noticed in the past 25 years? [post-code]
   1. No other changes in pasture conditions have occurred
   2. Other changes in pasture conditions have occurred (describe below).

10. Thinking about all the changes you have mentioned so far (remind them of changes mentioned). Please tell me why (what causes) explain these changes? (list). Please rank the importance of each cause from 1 = not very important to 5 = very important.

Causes	Ranking (1 = less important, 5 = most important)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

11. A) Think of the most degraded pasture you have seen. Describe its characteristics.

    B) Could the condition of the soils and vegetation of this pasture be improved or is it impossible to improve? (Is the degraded state permanent?)_____Yes it can be improved. _____No it cannot be improved

    C) If yes, what could improve the conditions? (prompts: management practices, weather)

    D) If yes, how long would it take for this pasture to recover?

    E) If conditions cannot be improved, why not?

In the following questions please think about the weather and water flow in your area compared to 25 years ago (1993).

Climate Variable	**Perceived Amount of Change**					
12. The amount of rainfall has	1. Decreased a lot	2. Decreased a little	3. Not changed	4. Increased a little	5. Increased a lot	6. Don't know/Not old enough to remember
13. The rains have become	1. Much less intense	2. Less intense	3. No change	4. More intense	5. Much more intense	6. Don't know/Not old enough to remember
14 The duration of rainfall events has become	1. Much shorter	2. Shorter	3. No change	4. Longer	5. Much longer	6. Don't know/Not old enough to remember
15.The amount of snow has	1. Decreased a lot	2. Decreased a little	3. Not changed	4. Increased a little	5. Increased a lot	6. Don't know/Not old enough to remember
16. Snow melts	1. Much earlier	2. Earlier	3. No change	4. Later	5. Much later	6. Don't know/Not old enough to remember
17. The timing of when the grass turns green is	1. Much earlier	2. Earlier	3. No change	4. Later	5. Much later	6. Don't know/Not old enough to remember
18. The timing of when the grass turns brown is	1. Much earlier	2. Earlier	3. No change	4. Later	5. Much later	6. Don't know/Not old enough to remember
19. The volume of river flow is	1. Decreased a lot	2. Decreased a little	3. Not changed	4. Increased a little	5. Increased a lot	6. Don't know/Not old enough to remember
20. The timing of peak river flow is	1. Much earlier	2. Earlier	3. No change	4. Later	5. Much later	6. Don't know/Not old enough to remember
21. Water levels in lakes are	1. Much lower	2. Lower	3. No change	4. Higher	5. Much higher	6. Don't know/Not old enough to remember
22. Water availability in springs is	1. Much less	2. Less	3. No change	4. More	5. Much more	6. Don't know/Not old enough to remember
23.Water availability in wells is	1. Much less	2. Less	3. No Change	4. More	5. Much more	6. Don't know/Not old enough to remember
24. Average spring temperatures are	1. Much cooler	2. Cooler	3. No change	4. Warmer	5. Much warmer	6. Don't know/Not old enough to remember
25.Average summer temperatures are	1. Much cooler	2. Cooler	3. No change	4. Warmer	5. Much warmer	6. Don't know/Not old enough to remember
26.Average fall temperatures are	1. Much cooler	2. Cooler	3. No change	4. Warmer	5. Much warmer	6. Don't know/Not old enough to remember
27.Average winter temperatures are	1. Much cooler	2. Cooler	3. No change	4. Warmer	5. Much warmer	6. Don't know/Not old enough to remember
28. The frequency of dust storms has	1. Decreased a lot	2. Decreased a little	3. Not changed	4. Increased a little	5. Increased a lot	6. Don't know/Not old enough to remember
29. The frequency of sand storms has	1. Decreased a lot	2. Decreased a little	3. Not changed	4. Increased a little	5. Increased a lot	6. Don't know/Not old enough to remember

30. How are changes in climate and pasture affecting your life and livelihood?

31. What measures are you taking to adapt to these changes?

This is the end of the survey. Thank you for your time and information. Is there anything else you would like to tell me or any questions you have for me?

APPENDIX S5 Household Production Survey

Note : This survey was conducted in Moroccan Arabic by the researcher or in Tashelhit via an informal Tashelhit and Moroccan Arabic interpreter.

Enquête sur les systèmes d'élevage des Aït Atta

I- Détails de l'enquête

1. Date de l'enquête : / /____

2. Lieu :

3. Enquêteur :

II- IDENTIFICATION DE L'ELEVEUR

1. N° de l'éleveur :

2. Nom de l'éleveur :

3. Age :

4. Douar :

5. Fraction :

6. C.R.

7. Caïdat :

8. Localisation (GPS) (degrés décimaux, Donnée = WGS 84**)** :

9. Transhumant ou sédentaire?

10. Si sédentaire, depuis quand?

1. LA TERRE

* Vous cultivez des terres? ces cultures servent à nourrir le cheptel? Sinon, vous pâturez sur des terres cultivées (chaumes)? Mode de faire valoir(et le payement)?

Superficie Melk (ha ou (u.1) ») :

En association :

En location :

Total =

Dont en irrigué :

Bour :

Les cultures :

Le rendement annuel de ces cultures (en bonne et en mauvaise année):

Les terres jachères :

2. LE CHEPTEL

2.1. Description des effectifs des troupeaux exploités

* L'effectif de chaque espèce et de chaque race?

Troupeau ovin :

	Brebis	Béliers	Antenais	Antenaises	Agneaux	%en propriété
Effectifs						
Race						

Troupeau caprin :

	Chèvres	Boucs	Chevreaux	Chevrettes	(non sevrés)	%en propriété
Effectifs						
Race						

Troupeau bovin :

	Vaches	Taureaux	Taurillons	Génisses	Veaux	%en propriété
Effectifs						
Race						

Troupeau camelin :

	Chamelles	Géniteurs	Chamelons sevrés o->	Chamelons sevrés °+	Chamelons	%en propriété
Effectifs						
Race						

S'il y a des animaux en association :

Quelle est leur origine ?

2.2. Evolution des effectifs

Année	Nature	Ovins	Caprins	Bovins	Camelins
2014					
2015					
2016					

2017					
2018					

III. Conduite des troupeaux

1. Bâtiments d'élevage

Type de bâtiment : > Bergerie en dur

> Zriba en murette de pierre

> Grotte avec zriba

Description détaillée de chaque bâtiment : "en cahier de notes"

Localisation : Prés dès du lieu d'habitation Loin du lieu d'habitation

Appréciation : Dimensions (longueur et largeur) :

Ventilation (nombre et longueur et largeur des fenêtres) :

Hygiène (Fréquence de nettoyage du fumier) :

Utilisation du fumier :

2. Reproduction chez les ovins

* Est ce que les béliers sont toujours avec le troupeau? Sinon pendant quelle période ils sont introduits?

- Période de lutte :
- La lutte se fait pendant : La nuit Toute la journée

* Nombre de béliers :

- Age moyen des béliers :
- Durée d'utilisation :
- Période d'isolement :
- Origine des béliers :
- Critères de choix du bélier : "discussion"

* Nombre de brebis reproductrices :

- Nombre d'antenaises présentés au bélier pour la première fois :
- Age à la première mise bas :
- Le bélier utilisé pour la sailli des antenaises : Lourd Léger (jeune)
- Nombre de brebis ayant agnelées :
- Nombre de brebis ayant données des doubles :
- Nombre de femelles vides :
- Nombre de femelles ont avortés :

* Nombre total d'agneaux nés :

- Nombre d'agneaux nés vivants :

- Nombre d'agneaux nés morts :

* Période(s) d'agnelage?

Bekri (préciser période) : Nombre d'agneaux nés bekri :

Wasti (préciser période) : Nombre d'agneaux nés wasti :

Mazouzi (préciser période) : Nombre d'agneaux né mazouzi :

Age de sevrage :

Age de vente :

3. Reproduction chez les caprins

* Est ce que les boucs sont toujours avec le troupeau? Sinon pendant quelle période ils sont introduits?

- Période de lutte :
- La lutte se fait pendant : La nuit Toute la journée

* Nombre de boucs :

- Age moye des boucs :
- Durée d'utilisation
- Période d'isolement :
- Origine des boucs :
- Critères de choix du bouc : "discussion"

* Nombre de chèvres reproductrices :

- Nombre des Chevrettes présentés au boucs pour la première fois :
- Age à la première mise bas :
- Le bouc utilisé pour la sailli des chevrettes : Lourd Léger (jeune)
- Nombre de chèvres ayant mis bas :
- Nombre de chèvres ayant données des doubles :
- Nombre de femelles vides :
- Nombre de femelles ont avortés :

* Nombre total de chevreaux nés :

- Nombre de chevreaux nés vivants :
- Nombre de chevreaux nés morts :

* Période(s) de mises bas?

Bekri (préciser période) : Nombre d'agneaux nés bekri :

Wasti (préciser période) : Nombre d'agneaux nés wasti :

Mazouzi (préciser période) : Nombre d'agneaux né mazouzi :

Age de sevrage :

Age de vente :

4. Mortalité

* Dans quelles mois de l'année peut-on voir que la mortalité est élevée? (pour chaque tranche d'âge)

4.1. Chez les ovins

Age Périodes	Automne	Hiver	Printemps	Eté
0 – 1 mois				
1 mois – sevrage				
Sev. – 1an				
> 1 an et adultes				

* Les principales causes de cette mortalité :

4.1. Chez les caprins

Age Périodes	Automne	Hiver	Printemps	Eté
0 – 1 mois				
1 mois – sevrage				
Sev. – 1an				
> 1 an et adultes				

* Les principales causes de cette mortalité :

5. Réforme et renouvellement dans le troupeau (de cette compagne agricole)

5.1. Réforme

5.1.1. Des ovins

	Age moyen de réforme	Effectif réformé			Cause de réforme
		Cette année	Bonne année	Mauvaise année	
Mâles					
Femelles					

5.1.2. Des caprins

	Age moyen de réforme	Effectif réformé			Cause de réforme
		Cette année	Bonne année	Mauvaise année	

Mâles					
Femelles					

5.2. Renouvellement dans le troupeau

* Quelle est la source des animaux de renouvellement?

5.2.1. Des ovins

		Renouvellement			Âge moyen des animaux achetés
		Cette année	Bonne année	Mauvaise année	
Mâles	Effectif				
	Source: 1: jeunes du troupeau 2: achat				
Femelles	Effectif				
	Source: 1: jeunes du troupeau 2: achat				

5.2.2. Des caprins

		Renouvellement			Âge moyen des animaux achetés
		Cette année	Bonne année	Mauvaise année	
Mâles	Effectif				
	Source: 1: jeunes du troupeau				

	2: achat				
Femelles	Effectif				
	Source: 1: jeunes du troupeau 2: achat				

6. Conduite alimentaire

6.1. Calendrier alimentaire (avec quantités distribuées)

- En bonne année
  - Les ovins

Catégories des ovins	Aliments	O	N	D	J	F	M	A	M	J	A	S

  - Les caprins

Catégories des caprins	Aliments	O	N	D	J	F	M	A	M	J	A	S

- En mauvaise année
  - Les ovins

Catégories des ovins	Aliments	O	N	D	J	F	M	A	M	J	A	S

  - Les caprins

Catégories des caprins	Aliments	O	N	D	J	F	M	A	M	J	A	S

6.2. Complémentation alimentaire

6.2.1. En fonction de l'année (bonne ou mauvaise année)

- Bonne année

Aliment	Qté produite En exploitation	Qté achetée	Qté Distribuée/j	Période D'utilisation	Prix Unitaire	Période d'Achat	Lieu D'achat

- Mauvaise année

Aliment	Qté produite En exploitation	Qté achetée	Qté Distribuée/j	Période D'utilisation	Prix Unitaire	Période d'Achat	Lieu D'achat

6.2.2. En fonction du stade physiologique

- En période de lutte :

Est-ce que l'éleveur pratique la préparation à la lutte ?

- Pour les brebis : Oui Non
- Pour les béliers : Oui Non

Si oui, quelles sont la période et la durée de la préparation :

- Pour les brebis :
- Pour les béliers :

Type et proportions d'aliments distribués :

Quantités apportées à chaque brebis ou groupe de brebis :

Quantités apportées à chaque bélier ou groupe de béliers :

- En période de gestation :

Est-ce que l'éleveur distribue une complémentation alimentaire aux brebis en fin de gestation ? Oui Non

Si oui, type et proportions d'aliments distribués :

Quantités apportées à chaque brebis ou groupe de brebis :

- En période de lactation :

Est-ce que l'éleveur distribue une complémentation alimentaire aux brebis en lactation ?

Type d'aliments distribués (avec proportions) :

Quantités apportées à chaque brebis ou groupe de brebis :

6.3. Parcours mises à la disposition

- Circuit de mobilité sur l'année 2018/2019

Liste des parcours	Localisation et type de construction	Raison de choix, date d'utilisation (dp qd)	Période d'utilisation

Observations supplémentaires:

6.4. Caractérisation des espèces de chaque parcours:

	Nom	Abondance "1 à 5"	Caractéristiques	Période de disponibilité	Lieu de disponibilité
Les plus appréciées par les petits ruminants					
Les moins appréciées par les petits ruminants					

6.5. Evolution chronologique de l'utilisation des parcours:

- Les zones où les éleveurs transhument en fonction de l'année:
- Pour chaque parcours, on pose les questions suivantes :
  - Comment jugez vous ce parcours? Pourquoi? 1: Bon 2: Moyen 3: Mauvais
  - Appartenance tribale du parcours :
  - Localisation des points d'eau.
  - Décrire l'itinéraire emprunté et comment ils ont pris la décision de s yrendre.
  - Caractériser la végétation de chaque zone. (
- A cette zone:
  - Discuter les préférences de l'éleveur pour les endroits de transhumance et pourquoi?
  - Est-ce qu'il fait de la supplémentation des animaux lors des transhumances? ou non?
- Abreuvement

Modalité d'abreuvement :

Fréquence d'abreuvement selon période :

Hiver : Eté :

Prix de l'eau :

7. L'engraissement (pour El Aid et pour la boucherie)

Nombre d'antenais engraissés :

Nombre d'antenais engraissés pour El Aid :

Nombre de brebis de réforme engraissées :

Période d'engraissement :

Origine des animaux engraissés : Achat Troupeau

Race des agneaux engraissés :

Age des agneaux au début de l'engraissement : Poids :

Durée de l'engraissement :

Composition de la ration d'engraissement :

Quantités d'aliments apportés par animal ou groupe d'animaux :

Période de vente des animaux engraissés :

Poids à la vente :

Age à la vente :

Lieu de vente :

Prix moyen de vente :

8. Gardiennage des troupeaux :

* Qui a gardé le troupeau ?

Quels sont les liens du berger avec le propriétaire ?

Depuis quand il garde le troupeau ?

Type et durée de contrat :

Rémunération :

Depuis quand exerce t-il ce métier ?

Garde t-il d'autres troupeaux ? Si oui lesquelles ?

9. La conduite sanitaire:

* Quelles sont les maladies fréquentes?

Maladies fréquentes	Période de l'année	Causes probables	Age des animaux atteints

L'éleveur fait des vaccins : Oui/Non

Si oui, pour éviter quelles maladies ?

L'éleveur traite son troupeau ? Oui/Non

Si oui, contre quelles maladies ?

L'éleveur fait appel à un vétérinaire ? Oui/Non

L'éleveur fait appel à un technicien ? Oui/Non

Frais de traitement et vaccination (Dh/an) :

IV. Destination des produits :

1. Vente et achat des animaux :

Achats						Ventes					
Période	n	Type	prix	lieu	Motif	Période	n	Type	Prix	Lieu	Motif

* Critères de choix de l'animal en vente.

2. La laine :

Période de tonte :

Poids de la toison :

Destination :

Prix :

3. Le lait :

Y' a-t-il des chèvres traitées (leur effectif?) :

Si oui : estimation de la production / chèvre :

Destination du lait :

4. Description des produits typiques :

* Avez vous des produit locaux et typiques?

V. Caractéristiques du groupe familial

Nombre de personnes en charge :

Nombre de personnes travaillant sur l'exploitation :
Nombre de personnes ayant quitté l'exploitation :

- Définitivement :
- Emigration saisonnière :

VI. COMMERCIALISATION DES ANIMAUX

- Les différents souks fréquentés par les exploitants

Nom du souk	Localisation	Type de souk*	Périodes de ventes	Frais de transport des animaux

* Préciser le type de souk :

- Les petits souks ruraux : c'est des souks, fréquentés par les éleveurs, où sont commercialisées moins de 400 têtes ;
- Les souks de collection locale : ce type de souks sont fréquentés par les éleveurs. Le nombre d'ovins commercialisés ne dépasse pas 20 000 têtes ;

- Les souks de répartition et distribution : ce type de souk est fréquenté surtout par les intermédiaires. L'offre et la demande sont de caractère régional et inter – régional.
- Les souks d'approvisionnement des villes : Ils sont fréquentés surtout par les intermédiaires et les chevillards.