THE CLOUD CATCHER

Environment, people, livestock and health among pastoralists of the Horn of Africa

(*Ahmed Di Ba/Flickr*)

A qualitative compendium of some One Health field researches in South-eastern Ethiopia, North-western Kenya and South-western Somalia

by Alberto Salza
Human Terrain Analyst
CCM Consultant

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Disclaimer: The opinions based on the findings in this paper are those of the author and do not necessarily represent those of CCM and HEAL consortium partners.

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List of acronyms and abbreviations

AICS – Italian Agency for Development and Cooperation
CAHW – Community Animal Health Worker
CCM – Comitato Collaborazione Medica
CCPP – Contagious Caprine PleuroPneumonia
CDR – Community Disease Reporters
CGIAR – Consultative Group for International Agricultural Research
CHV – Community Health Volunteer
CoBRA – Community Based Resilience Analysis
EID – Emerging Infectious Diseases
FGD – Focus Group Discussions
GHG – Global Health Governance
GIS – Geographical Information System
HC – Health Centre
HEAL – One Health Units for Humans, Environment, Animals and Livelihoods
HHA – Household Health Agent
HSU – Household Spotting Unit
IGP – Income Generating Project
ILO – International Labour Organisation
ILRI – International Livestock Research Institute
MSP – Multi-Stakeholder Platform
PLW – Pregnant and Lactating Women
OH – One Health
OHU – One Health Units
OR – Operational Research
SDC – Swiss Agency for Development and Cooperation
SES – Social-Ecological System
STD – Sexually Transmitted Disease
UNDRIP – UN Declaration on the Rights of Indigenous Peoples
VICOBA – Village Community Banking
VSF-Suisse – Vétérinaires Sans Frontières Switzerland
WASH – Water, Sanitation and Hygiene

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PREFACE

Comitato Collaborazione Medica, CCM, is an Italian non-governmental organisation that promotes the right to health. We started our work in 1968, building the capacity of health workers and supporting the local authorities in providing essential health care to their communities, in the most geographically and socially remote human contexts of Africa and Italy.

In Africa, our work mainly focuses on the vulnerable communities of East Africa, especially in Ethiopia, Kenya, Somalia and South Sudan, where we propose a sustainable model of action, that promotes a participatory approach to health. Our projects aim at strengthening the national health systems, to ensure the provision of essential services and, at the same time, at engaging the local communities in awareness and empowerment processes, that make them primary guardians of their own health. We act at local level, to contribute to global health.

In line with these principles, since 2005, we have embraced the One Health concept as ideal approach to achieve global health and sustainable development. Recognizing that human health is intrinsically linked to the one of the animals and the environment, the One Health approach encourages the collaboration and communication across multiple disciplines in order to achieve the best possible state of health for everyone: humans, animals and ecosystems. This appears even more relevant if we consider that the large majority of emerging infectious diseases is of animal origin, as in the case of Avian Influenza, SARS, Ebola, and lately COVID-19. Increased contact with domestic and wild animals or with "infected" environments; climate change; globalization of people, animals, vectors and foods; human interventions of deforestation, construction, abandonment of mountain areas; excess of human and animal density on increasingly limited territories, are all elements that are profoundly altering the health of the environment, animals and people, and that underline the importance of the One Health approach to attain and promote the health for all. No scientific discipline has enough knowledge and resources to tackle, individually and separately, the emerging health issues. The One Health approach supports the systemic integration of disciplines and stakeholders as working methodology, promoting the observation and analysis of health in the complexity of its determinants, and the co-creation of innovative, effective, and sustainable strategies to guarantee it.
CCM tested its very first project on One Health in 2005, among the pastoral nomadic communities of southern Ethiopia. Somali pastoralists show almost an intimate relationship with their livestock, and in particular their camels, whose health is privileged on the one of children, to protect the wellbeing of the entire household. Ten years later, the lessons learned during this pilot project allowed us to elaborate the objectives and methodology of several operational researches to test the feasibility, effectiveness and sustainability of the One Health approach in improving the health and wellbeing of nomadic pastoral communities in the East African region.

As organisation, we have always believed in the importance - and necessity - of building our actions in response to the actual needs on the ground, promoting the co-creation of interventions that stem from strong relationships of trust and collaboration among experts, international partners, institutional counterparts and local communities. The first step of this process requires an in-depth understanding of knowledge and perspectives of local actors and communities, and the joint identification of priorities and suitable solutions to address them.

We are, thus, particularly honoured to introduce *The Cloud Catcher*, a qualitative Compendium of the One Health field researches conducted by CCM in South-eastern Ethiopia, North-western Kenya and South-western Somalia between 2015-2020.

The document is a fundamental asset for CCM and, we hope, for all partners and stakeholders engaged in the implementation of One Health interventions in East Africa. Employing a multidisciplinary and participatory approach, the several studies reviewed in the Compendium explore needs, perceptions and behaviours of local pastoral communities towards human and animal health, and their strategies of adaptation to the environment. The narratives and testimonies of elders, women, religious and traditional leaders, as well as the recommendations and insights of frontline service providers and local actors, served to draw a comprehensive picture of the needs, knowledge and understanding of local communities, and to guide the design of effective and suitable One Health actions to support their health, wellbeing and development.

The document describes critical features and similarities identified in the local communities across the three countries; these have helped defining a common strategy to health, among nomadic pastoral areas in East Africa. On the other hand, important peculiarities are depicted and analysed for each context; these shall always be taken into account, to tailor any intervention to the social-ecological system and the specific needs of each community.

The Compendium was commissioned in the framework of the project One Health Units for Humans, Environment, Animals and Livelihoods (OH4HEAL), financed by the Swiss Development Cooperation, the Italian Agency for Development Cooperation, and other donors. The project is a key milestone for CCM. After over ten-year experience in the field of One Health, the organisation has engaged in a strong and sound consortium with Vétérinaires Sans Frontières (VSF) Suisse and the International Livestock Research Institute (ILRI), to operationalise the One Health approach among the pastoral communities of the Greater Horn of Africa. Through a regional Community of Practice, the OH4HEAL project encourages a continuous learning process across countries, organisations, experts and local communities, to guide the design and implementation of One Health solutions that will be endorsed and integrated in the national and regional policies for health and sustainable development.

We take this opportunity to thank the anthropologist Alberto Salza, for his incessant support to the development of CCM strategy on One Heath. His contribution revealed valuable and essential, since the first pilot project in southern Ethiopia and throughout the researches and projects implemented in the region. In particular, we would like also to thank Alessia Villanucci, who led the multidisciplinary research in 2015-2016, providing a fundamental framework for anthropological research to One Health.

Through *The Cloud Catcher*, Salza provides a critical review of the value and importance of the One Health approach in improving the health of pastoral communities, their livestock and the ecosystems that surround them, in the Greater Horn of Africa. We are particularly grateful to him, also, for the great coordination of all actors and researchers, that actively participated to the development of CCM One Health strategy.

Micol Fascendini, CCM OH Advisor
Daniela Rana, CCM Desk Officer Ethiopia-Kenya-Somalia

comitato collaborazione medica

A PROLOGUE: The Shadow Game

'Look. There's a cloud up in the sky!'
The young herders are scattered in the arid landscape, with their sheep and goats.
A strong wind is blowing the cloud away.
The herders start running, all of them; they hop and jump, negotiating the lava field.
They must keep staying under the drifting shadow of the cloud: that's the game. The last to remain protected from the Sun's rays is going to be the winner.[1]
It's difficult, really difficult: never fall down is the imperative.
The herders run with the wind, under the mobile shade of the cloud.
A girl moves towards them. She dons a colourful garment, and her ankle-bell is ringing.
She holds a high-tech device.
She aims the thin metal-box towards the cloud. The cloud is mirrored in.
The last young herder to remain under the mobile shade of the cloud stops near the girl. 'Who are you?', asks the game winner, breathless.
'I am the cloud catcher', says she.

This is a story of resistance, agility, improvisation. It is also 'a story of transformation of the harsh reality of a drought into a game'.[2] The fundament of the under-the-cloud run lies in a quick response to environmental change: paying attention to contours while chasing shadows.
In the Sahel, the sub-Saharan semi-arid ecotone, local pastoralists say: 'We are the sons and daughters of the clouds'.[3] This means flexibility, transformability, multidimensionality, mobility. For pastoralists, even shades must be on the move.

Around a simple form of children's play, it makes little sense elaborating functionalistic theories about a generalised "imperative to nomadism". On the other hand, pastoralists experience continuous phase transitions, connecting entirely different states of matter, like in a cloud build-up, from gas to solid, liquid in the future.[4] All in all, the "shadow line" is a 2D projection of a 3D macro-object.

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[1] "Chasing clouds" and their shadows is played by children worldwide. Witnessed by the author in Lake Turkana East, the game was confirmed by Enyes, research assistant, and reported in Semplici G, *Moving Deserts. Stories of mobilities and resilience from Turkana County, a Kenyan desertscape*, PhD Thesis, University of Oxford, Oxford 2020; p. 55.
[2] *Ibid.*
[3] The author worked in the region with the Kel Tamashek and WoDaaBe; about these populations see Bernus E, *Touaregs nigériens. Unité culturelle et diversité régionale d'un people pasteur*, Mémoires ORSTOM No 94, Paris 1981; p. 307; and Beauvilain A, *Les peuls du Dallol Bosso*, Études nigériennes No 42, CNRS, Niamey 1977; p. 106.
[4] Kaku M, *Parallel worlds: a journey through creation, higher dimensions, and the future of the cosmos*, Doubleday, Random House, New York 2004; p. 85.

SECTION 1: What the matter is

The sentence 'If livestock are well, pastoralists are well, and if people are well, animals are well' is a truism; it shapes the basic concept of One Health (OH).[5] During a field mission on foot among Somali pastoralists, a CCM team – composed of a medical doctor, a veterinarian and a human ecologist (the author) – obtained an interesting variation on the theme.[6]

From the field notes at Qu'ra Benale, Gode Zone, Somali Regional State of Ethiopia, March 13, 2004:

> We use verbal simulations: a person gets so sick not to be able to tend his livestock; what happens?
> Solution by informant: 'No problem. Some other member of the family is going to take great care of his livestock, till complete recovery'.
> Inverted situation: a milch camel gets sick; three people depend on its milk; what do you do?
> Answer: 'We get worried'.

Incrementing contacts with nomadic households, it became clear that the herder, even if ill, cannot leave his/her animals alone; therefore he/she would consider personal health at a different trophic level from the one of livestock. At the same time, livestock diseases might affect the whole community at great speed and force; therefore, animal health is preponderant in the scale of pastoralists' decision making. In a way, the health of animals and people is positioned inside a biunique, but asymmetrical relationship.

By then, considering only the animal-herder health CCM was working inside the logical framework of "One Medicine".[7] That meant a health "unity" for humans and animals. Following the biomedicine mainstream while researching healthcare among nomadic pastoralists, in the beginning CCM concentrated on zoonosis or diseases with zoonotic reservoir or transmission vector like malaria, considering also anthropological and geographical aspects.[8]

By the latter preconditions, CCM developed its "One Health Approach", inserting from the very beginning the systemic environmental component on the dipole people-cum-livestock. The appropriate management of the environment and, above all, of the specific ecologies at herder's level, is systemically connected to the health domain of the indivisible social-ecological system (SES),[9] and it must be taken into account. For instance, the erraticism of the climate in the Greater Horn of Africa may be used to redress the unbalance in the healthcare behaviour of pastoralists.

When rains are sufficient and grass is enough, the herder understands to be able to leave livestock in safety, while reaching any form of health facility (a hospital, but also a mosque, or the witchdoctor/herbalist's hut). Also, the inverted situation – when droughts come or pasture accessibility is reduced by floods – may be positively exploited in healthcare: the herder would be forced near health services (mobile or static) by his/her reduced mobility options. These seasonal and/or exceptional

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[5] A literature review about OH is available in Villanucci A, *Enhance the Health Status of the Nomadic Pastoralists in Filtu Woreda, Liben Zone, Somali Region, Ethiopia*. CCM Technical Report, Turin, April 2016. Full information about OH is in Zinsstag J *et al.* (eds.), *One Health: The Theory and Practice of Integrated Health Approaches*, CABI, Wallingford (UK) 2015.

[6] The mission was an activity of the CCM project "Provision of Health Services to Pastoralists in the Area of K'elafo, SNRS, Ethiopia", later extended to the area of Filtu, funded by the Austrian Embassy Development Cooperation (now Austrian Development Agency), 2004-2005.

[7] "One Medicine" is a concept developed by Calvin Schwabe in *Veterinary Medicine and Human Health* (1984); see Zinnstag J *et al*., "From 'One Medicine' to 'One Health' and systemic approaches to health and well-being", *Preventive Veterinary Medicine*, 101, 2011; p. 148-56; it was expanded by the anthropologist Bernard Helander in "Getting the most out of it: nomadic healthcare seeking and the State in southern Somalia", *Nomadic Peoples*, No 25/27, 1990; pp. 122-132.

[8] Tangerini S, *Geografia della salute: percezione della malaria e strategie di cura presso la popolazione somala dell'Etiopia*, Università di Torino, Laurea in Scienze Politiche, 2005.

[9] A SES is a bio-geo-physical unit plus its associated social actors and institutions; SESs are complex, multivariable, nonlinear, cross-scale, and changing; see: Berkes F, Colding J and Folke C (eds.), *Navigating Social–ecological Systems: Building resilience for complexity and change*, Cambridge University Press, Cambridge 2003.

movements by pastoralists are weather-related. The consequent fission/fusion mobility model[10] is the determinant in deploying and positioning One Health Units (OHU), mobile and static. That is why CCM highly values and employs high-tech devices for the implementation of a bottom-up system of climate/ecology information, monitoring and feedback.[11]

According to CCM, OH is not based on a *sum* of competences about human, animal and environmental health, but is a *product* of interrelated researches and activities in the three domains. Without this entanglement[12] (not 1+1+1=3, but 1x1x1=1), a OH project might implode in self-referential activities.[13]

Most development agencies in the Greater Horn of Africa deal with the task of understanding strategies, needs, perceptions and behaviours of local pastoral communities towards human and animal health, and their strategies of conservation of – and adaptation to – the environment, also in relation to climate change (now to be named a climatic worldwide crisis). The role of anthropology in development and health interventions started to be considered 30 years ago.[14] Anthropologists may identify and describe local knowledge/understanding of disease (cause, treatment and control), thereafter suggesting axes of intervention by health policy makers (e.g., awareness building, communication, education) and appropriate insertion of biomedicine in the local context.

In order to explore – among pastoralists and their derivatives – the infinite variability of social and ecological responses to health stresses in the three OH domains, CCM employed, as a tool, a number of participatory operational researches (OR), before designing projects with a due anthropologic background. This paper summarizes methodologies and results of ORs in three locations where CCM's approach is significant still: Filtu (South-eastern Ethiopia), North Horr (North-western Kenya) and Gedo (South-western Somalia).[15] The choice is bound to the cross-border scope of the project "One Health Units for Humans, Environment, Animals and Livelihoods" (HEAL), where CCM is a partner.

The three locations are: i) neighbouring inside the Greater Horn of Africa (Ethiopia, Kenya, Somalia); ii) their population is pastoral at high percentages; iii) they are similar – but not equal – in the three OH domains, allowing comparison of data, but not their flattening.

Methodologies to One Health

The field methodologies of CCM in the three locations mirror the above-mentioned parameters. Hereafter, we relate some indications the researchers provided about methodological issues and related activities.

Filtu area (May 2015-February 2016 and January 2018): prolonged field research, with ranked emphasis on 1) anthropological issues; 2) animal-human health relationship; 3) GIS elaboration of OH features; 4) pastoral-related environmental features.[16]

> The activities were conducted by a multidisciplinary team of experts in anthropological, veterinary, environmental and medical sciences, cultural mediators and workshop and focus group facilitators. Community members were recruited to ease the interaction with pastoralists' household members.
>
> The OR involved the local population at different levels: herders and relatives (elders, men, women, youth, children); human/animal health professionals (biomedical, traditional); authorities, leaders and representatives (governmental, religious, customary). Information was mainly collected at household level.

[10] Model elaborated by the author and reported in Villanucci A, *op. cit.*; p. 37.
[11] See the activities (cited in Section 3) of TriM (Filtu and North Horr) and DIST (North Horr).
[12] Schneiderbauer L, *Entanglement or Separability. An introduction*, Bachelor Thesis, University of Wien, 2012.
[13] Salza A, *Don't Ask, Don't Tell. One-Health Seeking Behaviours among Pastoralists in a Semi-arid Land,* CCM Technical Report, Turin January 2019; p. 5.
[14] Manderson L, "Applying medical anthropology in the control of infectious disease", *Tropical Medicine and International Health*, Vol. 3, No 12, December 1998; pp. 1020-27.
[15] The author was an active field participant in all the three ORs.
[16] Derived from Villanucci A (2016), *op. cit.*; Filtu's 2018 mission is in Salza A, *Cloudless Skies and Whistling Thorns. Global Threats to Pastoralists and Livestock: Environment in One Health Perspective*, CCM Technical Report, Turin 2018.

After aligning with the concerned regional authorities, the field activities developed into 6 steps:

1. OR introduction to stakeholders at *woreda*[17] level (governmental authorities and NGOs representatives) and participatory selection of the main OR sites.
2. Introduction to leaders and elders of the selected *kebele*[18] and mapping of community and territory (through the support of TriM's applied-geography experts and the development of GIS thematic maps).
3. Qualitative data collection at community/household level (interviews, focus group discussions, participant observation of pastoralists' life), and secondary data collection in the OH concerned offices.
4. Ecology transects along the main roads, integrated in 2018 by field work on foot.
5. OR data analysis through the support of external experts and advisors.
6. Presentation and discussion of the OR findings and identified axes of intervention in a final workshop with concerned authorities and pastoral community representatives.

In the 2015-16 phase, the OR implemented a total number of 31 field missions (from 1 to 5 days each); 38 site visits (in both outreach areas and Filtu town's strategic locations); 5 workshops; 62 Focus Group Discussions and 61 semi-structured, qualitative interviews.

By the participatory involvement of pastoral community members and representatives in both data collection and decision-making processes, CCM methodology allowed to ensure the acknowledgement, ownership and accountability of future OH actions. A continuous, open dialogue with *woreda* and regional authorities was maintained throughout the OR implementation.

According to an independent evaluation, 'The research was reliable, valid and can be used on other similar pastoral communities. The roles and responsibilities of the research team and participants were clear and the respondents' rights, privacy, confidentiality and sensitivities were taken into consideration'.[19]

North Horr area (started in May 2018, ongoing): introductive, intensive, medium-long OR (October 04-November 10, 2018),[20] followed by rapid-assessment missions at intervals. Hereafter we solely deal with the 2018 mission, whose ranked priorities were: 1) overall anthropologic picture; 2) derived health-seeking behaviours; 3) human ecology transects; 4) local knowledge about weather/climate change; the mission had two side-objectives: local forms of visual perception and gender issues.[21]

The OR's scope was to balance the externalized, objective view of disease with the subjective perspective of illness, the "sufferer's experience", inside the multiple layers of health and illness. In the field we followed the framework of the "three bodies" metaphor:

1. The individual body constitutes the layer of lived experience.
2. The social body encompasses the way in which the individual body becomes a kind of canvas upon which environment, society, and culture are represented.
3. The politic body refers to 'the regulation, surveillance, and control of bodies (individual and collective) in reproduction and sexuality, work, leisure, and sickness'.[22]

Sickness, in this framework, is understood as a form of communication among all three bodies. Anthropology, by means of descriptive and qualitative methods, may identify context-specific factors to health/disease outcomes.

[17] The third-level territorial subdivision (after State and Region) in the Federal State of Ethiopia.

[18] The smallest administrative unit in Ethiopia, corresponding to a ward, or a localized and delimited group of people under local authorities.

[19] Out of the Box, *One Health Operational Research. Enhance the Health Status of Pastoralists in Filtu Woreda, Somali National Regional State, Ethiopia, External Evaluation Report*, Nairobi, May 2016.

[20] Reported in Salza A (2019), *op. cit.*

[21] Comberti G, *Sijui Kuchora*, *I Don't Know How to Draw. Image perception of One Health in schools and health facilities in the sub-County of North Horr*, CCM Technical Report, Turin 2019; and Comberti G and Shamo T, *Our Children Live with Animals, Drink Their Milk and Eat Their Meat: They are Healthy. The voices of pastoralist women in a One Health project*, CCM Technical Brief, Turin January 2019.

[22] Concepts derived and elaborated from Lock M and Scheper-Hughes N, "A Critical-Interpretive Approach in Medical Anthropology: Rituals and Routines of Discipline and Dissent", in Johnson TM and Sargent CF (eds.), *Medical Anthropology: Contemporary Theory and Method*, Praeger, New York 1990; pp. 50-51.

Another methodological contribution was the use of triangulation, the systematic application of multiple methods in order to reduce biases in situations where controlled comparison is not feasible.
The priority of the mission was to gather information in order to: a) have a bird's view of the project area; b) contact a variety of potential "beneficiaries" of the OH project; c) record narratives of health-seeking behaviours and decisions in the three OH domains; d) consider attitudes towards climate/environment; e) survey vegetation zones and understand attitudes towards the ecosystem; f) gather baseline data. The main field tools were:

- Surveys on foot (around North Horr town).
- High mobility by car, with roads used as human, animal and environmental transects.
- Unstructured informal interviews of individual laypeople (men and women), public health personnel, private health practitioners, teachers and others (exploration of livelihoods).
- Non-scheduled informal focus group discussions (FGD) at household cluster level.
- Scheduled meetings (intra-project and with local authorities at all levels).
- Structured seminars and workshops (also with TriM partner).
- Capacity building in a junior anthropologist (local), two assistants/interpreters, two drivers and other OH personnel (CCM and VSF-Germany).

This sequence was not linear in time and importance and a lot of overlapping occurred in time and space. Besides that, the CCM team assisted the partners of TriM in their activities concerning bio-climatologic events, extreme weather events, elaboration of maps (digital terrain). The researchers were not involved in the field activities of VSF-G, because there were none going on during the mission period.

As a result of these activities, after considering the micro-level of physician-patient relationships – as well as the human-animal relationship of pastoralists and the medium-level of healthcare systems in alien settings – we identified political, social, economic and environmental factors, anthropologically relevant, that impact the way local people consider health-seeking behaviours; we reached also a critical consideration about how physicians and veterinaries, local and not, are trained and prone (or not prone) to systemic ways when community medical care is enacted in human/animal health centres.[23]

Gedo Region (Nov. 08-Dec. 18, 2019): rapid-assessment mission in the field and from remote. Ranked issues (as per the ToR agreed within the HEAL project): 1) overview and insight of accessibility/affordability of the existing animal and human health services; 2) acceptability of new integrated service delivery (i.e., OH mobile/static units); 3) in-depth understanding of local pastoral communities' needs, perceptions and behaviours towards human/animal health; 4) relations and adaptation to the environment/climate change.[24]

The security situation in Somalia prevented an expatriate to fulfil an OR in the field. Therefore an alternative, innovative and experimental form of research was designed and implemented in the field and from remote. It is based on stringers and spotters. A spotter is someone trained to look for terrain features (community + livestock + environment) and to provide intelligence about them. A stringer is a freelance operator who contributes the referral organisation with field notes, reports, photos or videos about a difficult/isolated zone, on an ongoing basis. The term conveys the idea (see its etymology) of adding "pre-elaborated strings" to the raw field information by spotters, before being conveyed to the head researcher for scientific elaboration.

In the Gedo scenario, the spotter/stringer system can work for collecting news, but may be insufficient to provide information at various scales of interaction, as required by anthropology. That is why we did not use single spotters, but five Household Spotting Units (HSU), composed of members from the same family for each selected location and social-ecological system (nomadic pastoralists in hilly rangelands at Sulale, Luuq District; seminomadic pastoralists in plains rangeland at Malka Riyey, Belet Xaawo District; agro-pastoralists along the river at Bantaal, Dollow district; sedentarized pastoralists in an urban centre at Tulo Amin, Belet Xaawo District; destitute pastoralists in an IDP camp at Kabassa, Dollow District).

With one stringer and five HSU we have a basic structure on the ground; its advantages are security, speed, flexibility, coverage, low cost, community approval and scientific knowledge. It may also trigger a tree-like

[23] Regarding physicians' attitude, see Konner M, *Medicine at the Crossroads: The Crisis in Health Care*, Pantheon Books, New York 1993.
[24] AA VV*, One Health Units for Humans, Environment, Animals and Livelihoods (HEAL)*; inception report for the opening phase of the project (1. March 2019 - 30. May 2020), VSF-Suisse, CCM-Italy, ILRI, CGIAR, 2019.

exponential diffusion, if the case. Above such a structure we had the research operator (anthropologist/human ecologist) who, by remote, trained, guided and monitored all the stringer/spotter field-activities and data. The relational sequence by remote was of the following type, with the algorithm previously discussed, developed, ameliorated and continuously checked with the stringer, after having obtained an informed consent (FPIC)[25] by the communities. The "flexible protocol" was:

1. The research operator instructs the stringer from remote (*training*).
2. The stringer and HQ contact local authorities and get all necessary permits (*legal positioning*).
3. The stringer reaches the area and its communities (*inserting*).
4. Two-way contacts from operator and stringer to deal with local authorities and community governance (*tutoring*).
5. The stringer pinpoints and trains the HSU in the five SESs, with the help of the relevant communities and the research operator (*tutored capacity building*).
6. Operator/stringer's two-way contacts to build awareness and collaborative relationships with local authorities and community governance (*counselling*).
7. The stringer moves into the chosen localities, meeting the communities and their HSU (*trust building*).
8. The spotters start acquiring data that are transmitted to the stringer (*collecting*).
9. The operator follows all activities through the stringer (*monitoring and steering*).
10. The stringer downloads spotters' data, plus his/her own, and daily transmits them to the remote operator (*narrative flowing*).
11. The research operator corrects possible mistakes and twists, evidencing any missing information (*tuning*).
12. The interaction is reiterated with the maximum possible frequency (every day) in a data flux and pre-elaboration (*data cycling*).
13. The operator extracts from the research data-base a knowledge-base (data + management) for the project necessities (*elaborating*).
14. The operator, the stringer and the spotters – at various levels and with different modalities – share and communicate the final exit of the research (*reporting*).

We managed to keep this algorithm going. The main constraint was time (an implicit hindrance in rapid-assessments) and not security as we supposed. Our timeframe considered four weeks: i) one for stringer's training by remote (distance learning about anthropology, OH and OR); ii) one for spotter's insertion (local authorities and HSUs identified and trained); iii) two for field activities, data gathering, analysis and feedback.[26]

This OR in the field and by remote was an experiment. It also helped in trying to deal with the anthropologic myth of "detachment" when facing alien communities. In our case, the physical distance between the "academic" anthropologist and the field researcher, himself part of the cultural set to be studied, managed to avoid the effect "vulnerable observer vs. vulnerable observed" in gathering qualitative data from the field, information that remains anyway laden with alien values, in both sides.[27]

Note: for a table connecting the three localities about HEAL Study interests, see Section 3.

By describing the three different methodological approaches to analogous situations in Filtu, North Horr and Gedo (see end of Section 3 for comparisons), we intend to provide a sketch of the logical framework that CCM designed and implemented when dealing with health-seeking and health-care behaviours among pastoralists and local medical personnel (biomedical or traditional).

This can be useful only when and if project personnel are willing and able to catch up with the pastoral communities' narratives and style of communication. One Health is better understood when locally

[25] Free, prior and informed consent; the normative of FPIC consists on a series of legal international instruments including the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), the International Labour Organization (ILO) Convention 169, and the Convention on Biological Diversity (CBD), among many others, as well as national laws. Operative information in the manual: AA VV, *Free Prior and Informed Consent. An indigenous peoples' right and a good practice for local communities*, FAO, 2016.

[26] Full description of the methodology and following results is in Issack AI and Salza A, *Milking Health: a Pastoralist's View. Gedo Region of Somalia: Researching in the Field and from Remote*, CCM Technical Report, Turin 2019; see also Salza A, *Liquid Pastoralists & Health: From Camel Milk to Whatever it Takes. Anthropologic considerations after an Operational Research in the Gedo Region of Somalia*, CCM brief, Turin 2020.

[27] Behar R, *The Vulnerable Observer: Anthropology that Breaks Your Heart*, Beacon Press, Boston 1997.

meaningful metaphors are used. To make sense, though, signs must be space-oriented, inserted into a cultural context, referable to a set of values and related to language and meaning.[28] Imagery production and perception (in all senses) are the baseline for a shared interface OH/community.

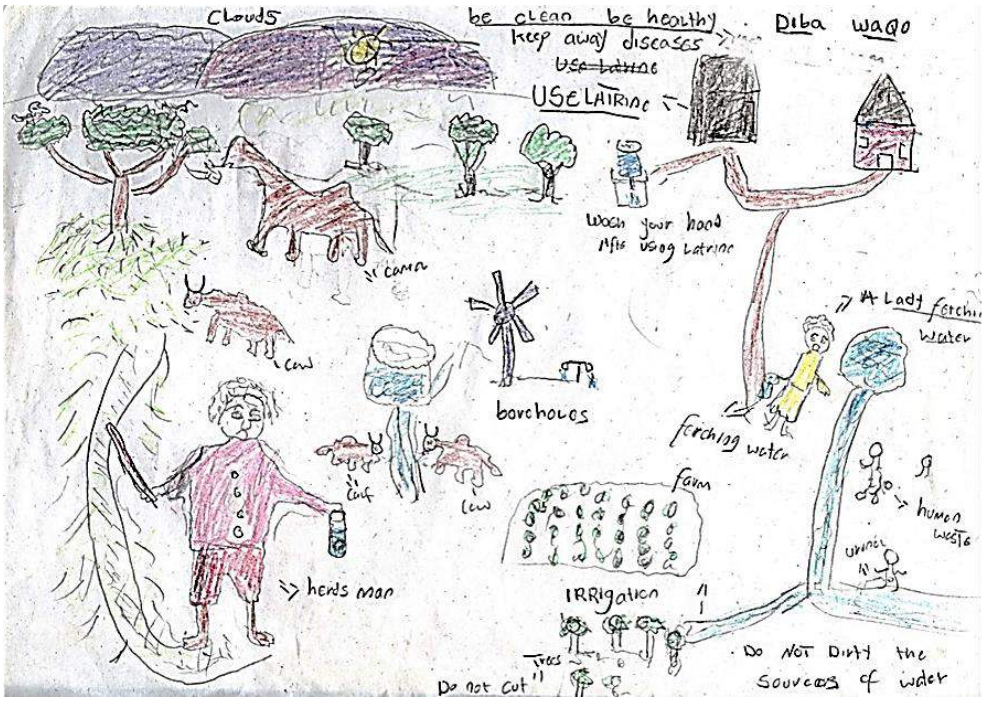
The following Section 2 deals with the possibility and potential of "seeing like a herder" while dealing with delicate matters like health and disease. All concepts and acts about them must be "translated" and made manageable inside a neutral space, where all stakeholders negotiate their identities inside a shared arena of languages.

As an example, we report a narrative elaborated to disseminate the concept of OH in the North Horr area at a nomadic household level.[29]

The Three Stones of One Health

> Once upon a time, a medicine doctor managed to cross the desert. In the evening he felt cold and tired: he needed some tea. Coming from a distant town, he didn't know the survival lore of the desert. Anyway, he manged to make a small fire with some dry branches. He placed his pot directly on the fire, but this put the fire off. A very old man was passing by: 'Use stones to keep your pot *above* the fire', he advised the doctor. So, the doctor took a single stone and placed it inside the newly-lit fire; then he tried to put the pot on the single stone, but it spilled all the water: fire out again. A young herder passed by with his livestock and advised: 'More stones work better'. So, the doctor added another stone. He re-lit the fire and put the pot over the two stones: imagine the result. A woman appeared, gave him a third stone and went away shaking her head. 'That's the trick!' exclaimed the doctor. He arranged the three stones around the fire, put his pot firmly on them, and eventually managed to prepare his tea.

Well, that is how the character understood the complex relationships inside the One Health components: people, livestock and the surrounding environment act together to keep the pot of health steady and working. If you provide at the same time health to people (first stone), to animals (second stone) and to the environment (third stone, the one that gives balance to the kitchen fireplace, not by chance suggested by a woman) you may provide global health to the community.



One Health ideal landscape by Diba Waqo, North Horr Primary school

[28] Comberti G (2019), *op. cit.*; p. 4.

[29] From an idea by Guyo Hama, North Horr Primary School teacher; text elaborated by the CCM OH team with the help of local informants.

SECTION 2: Health-seeking and Health-care Simulations

In the Greater Horn of Africa – Ethiopia and Somalia, plus Northern Kenya – all pastoralists recognise a basic unit: the household with its livestock. Individuals do not really count, and all primary strategies and implementations are planned and carried out at household level. Inside a household, the power balance may be leaning more on the male components, but the complementary position of women (reproduction and livelihood management) and children (investment for the future) is clearly accounted for in any decision-making. Therefore, health-seeking behaviours have a collective model that considers the wellbeing of livestock and herders at the same time, but under different ponderation.

This holds in a long-time median perspective, but in a landscape disrupted by extreme weather events, droughts, conflicts, locusts and other "common" disasters, decisions must be quick and flexible: by then, individuals count. A herder resting under an acacia tree with his/her animals, is busy considering a complex matrix of at least five dimensions: physical, climatic, ecological, territorial, social. With different thresholds, parameters and qualitative degrees, this matrix may offer about two million options to choose from.[30] It is his/her "taskscape",[31] the operative environment and the derived procedures where the herder's actions are performed. By this – when decision-making is considered – we can see the herder under a different perspective and consideration. This is one of the reasons to develop a supportive table plus matrix – like the one in Sections 3 and 4 – meant for healthcare practitioners and agencies.

Taking into account the scope of the HEAL project, we focus on what the author calls the "bodyscape" of people-cum-livestock while facing illness inside the terrain they inhabit ("lifescape"). Obviously, health is a priority in any household, pastoral or not. Beware, though. Pastoralists' households have to contemporarily maintain their focus on three domains: the health-keeping of humans, their animals and the ecosystems they live in, taking into account all variations during the local history ("timescape").[32] One Health in action.

Wherever the herder is, it is a place of and for action. In the words of Greta Semplici, former field researcher at the Oxford University:

> [The herder] is thinking about how to optimize water and food availability, personal safety and herd security. How to minimize discomforts for family members. He/she is looking for sociality, feasibility of crossing through new places and freedom of movement. Some criteria to such decisions include: texture, drainage and colour of soil; gradient of hills slope; vegetation reproduction rate; and neighbours, distant relatives, extended families.
> "Seeing like the herder" means seeing more than a bunch of resources spread over a geographical area. It means celebrating differences given by the heterogeneity and variability of resources; it means acknowledging movement, recognising space as mobile and moving along.[33]

This is usually lost in the geography of maps and pie charts applied by international development agencies while surveying the pastoral landscape with a bird's eye perspective. They miss the emotions of walking behind a dysenteric camel with a 30-knot wind; of feeling isolated inside the thorny bush or prey to *horror vacui* in the dryland; of drinking rotten water among killer-mosquitoes and stinging flies; of being hungry, thirsty, sick, hot, cold, dirty, whatever; of missing your AK-47. And appreciating the beauty of all of it.

In order to go deeper, you have to add uncertainty, the "what-tomorrow-brings" syndrome affecting all nomads: if you know their position, their speed remains unknown, and *vice versa*.[34] To bypass these constraints to a "deep research" in the domain of pastoralists, besides direct participation in the field during nomadic activities of all sorts we developed the tool of simulation. Simulation is defined by experts

[30] Salza A, *Atlante delle popolazioni*, UTET, Torino 1997; p. 215.

[31] The concept of "taskscape" comes from Ingold T, "The Temporality of the Landscape", *World Archaeology*, 25(2), 1993; pp. 152-174.

[32] All "scapes" were developed by the author during conversations with Greta Semplici.

[33] Semplici G, *op. cit.* (2020); p. 194; see also Semplici G, "Seeing like the Herder: Climate Change and Pastoralists' Knowledge – Insights from Turkana Herders in Northern Kenya", in Ahearn-Ligham A, Oelz M and K. D. Rishabh KD (eds.), *Indigenous Peoples and Climate Change: Emerging Research on Traditional Knowledge and Livelihoods*, ILO, School of Geography, Oxford 2019; pp. 65-82.

[34] In physics terms; see Lindley D, *Uncertainty. Einstein, Heisenberg, Bohr and the Struggle for the Soul of Science*, Doubleday Random House, New York 2007.

'the approximate imitation of a process or system, representing its operations over time'.[35] Its practice is also known in healthcare, because healthcare educators have always used patient surrogates to teach, assess, and conduct research in a safe and predictable environment. According to Adam Levine:

> Most medical disciplines now have a collective vision for how and why simulation fits into trainee education, and some have extended this role to advanced practitioner training, maintenance of competency, and even as a vehicle for therapeutic intervention and procedural rehearsal.[36]

Simulation is used in contexts such as scientific modelling of ecological or human systems to gain insight into their functioning. Simulation is useful to investigate, by approximation, the effects of alternative field conditions, especially when the real system cannot be engaged because not accessible or blurred by biases from the very actors in the system. This may be the case of health-related behaviour of pastoralists and the responses by health personnel and Public Health policy makers.

Simulation needs baseline data. In our case, they derive from the various Operational Researches that CCM applied in the field before designing projects or implementing activities among pastoralists. In the following simulations, our data derive from the three selected areas of Filtu (South-eastern Ethiopia), North Horr (North-western Kenya) and Gedo (South-western Somalia), with one exception (Ogaden Plateau, Somali Regional State of Ethiopia).

Hereafter, like in a flight simulator, we explore the healthcare system of individual herders and medical personnel in the cited study areas. Their experiences are reported in the first person, because we are trying to see like the herder and the health operator alike. All simulations are based on real characters, whose opinions and facts were recorded during CCM's field researches. The actual wording is obviously reconstructed: sometimes two or more informants are merged to provide a better insight.

As an interpretative tool, the narratives are followed by a brief *Gedankenexperiment*[37] – metaphorically titled *Sliding doors* – by which to explore a few (many more are left to the reader's hypothesis and question/answer cycles) of the various "What is best?" or "What if?" opportunities, options and problems about the future evolution of the system, following the basic protocol of any OR.

Seeing like a herder might not be enough: besides sight, smell, taste and touch, you should be able to hear like a herder. There local assistants and interpreters come in, with their indispensable but delicate work. Consider a fact: in all the following simulations, we cannot skip the intrinsic fault of the language barrier, the "lost in translation" effect, researchers' biases, and possible self-protecting dissimulations by informants. Simulation is virtual, not the reality.[38]

SIMULATION 1: Somali Male Traditional Healer, Tugbar settlement, Ogaden Plateau, Ethiopia, *March 2004*

> Accidents happen, mostly to men. Women and children do not move about so much. Women have their problems – that it's impolite to mention – but they can refer to the health facilities near the river when fetching water every fourth day. Men cannot leave livestock unattended. That is why accidents matter.
>
> Last year a man broke his leg. I treated him with the traditional method. I tied his foot to a tree, and then reduced the fracture. The leg, this way, is on traction, immobilized with sticks and ropes. Under the patient we dig a hole for his dejections. From a fortnight to a month, he sits there, while his animals are attended by relatives. In severe cases, the immobilization might last three months.
>
> Also a sheep with a broken leg gets fixation after having its hair burned. A camel is like a person, and a sheep is not much different. We do not classify animals. Animals are only the domestic ones. Maybe even a lion. Fish, lice and ticks, no. But who knows?

[35] Banks J, Carson J, Nelson B, Nicol D, *Discrete-Event System Simulation*, Prentice Hall, New York 2001; p. 3.

[36] Levine AI, DeMaria S Jr, Schwartz AD, Sim AJ (eds.), *The Comprehensive Textbook of Healthcare Simulation*, Springer, New York 2013; p. 3.

[37] "Thought experiment", a word coined by Hans Christian Ørsted, refers to 'a device with which one performs an intentional, structured process of intellectual deliberation in order to speculate, within a specifiable domain, about potential consequents (or antecedents) for a designated antecedent (or consequent)', from Yeates LB, *Thought Experimentation: A Cognitive Approach*, dissertation to a Graduate Diploma in Arts by Research, School of History and Philosophy of Science, University of New South Wales, Kensington 2004; p. 150.

[38] All simulations, but No 4, derive from the CCM Technical Reports cited throughout this paper.

Sliding doors 1. Regarding health and sickness,[39] pastoralists say that there are men's accidents (occasional) and women's problems (structural, like menstruation and pregnancy). It should be understood that accidents to men are affecting the whole pastoral community at large, just like the loss of a puerpera and/or her baby. Let us try a battery of questions: What if we merge the two impediments to health? What if we provide outreach activities to women and men at the same time and place? What if medical personnel are mainly male? A recorded reaction is the avoidance by elders of the unisex healthcare. On the other hand, women often refuse to be visited by male personnel.

The "optimum solution", obviously, lies in gender equality, but that is far to be reached among pastoralists. A sub-optimum solution can be achieved by interfering with the "show-no-weakness" syndrome that keeps men far from health posts after accidents or minor (according to their perception) diseases; in the meantime, women's "problems" should be connected to the whole household's functioning and environment control, therefore involving men. The household as a system (people-cum-livestock) is the baseline around which to develop an appropriate health-seeking behaviour, more so if we take into account the cultural concept of animals being like persons, as noted by the healer.

SIMULATION 2: Somali Medical Director, Dollow Health Centre, Gedo Region, Somalia, Dec. 2019

> Sorry, the sun is already hot at 9:25 am. My name is Buralle, acting director. This health centre (HC) has departments: outpatient, antenatal care, emergency unit, two outpatients for children (under 5 and over 5), pharmacy, delivery maternity both for pre-delivery mothers and those who delivered here. The activity is integrated with feeding programs, servicing pregnant and lactating women (PLW). This morning we have 24 children and 11 PLW, queuing for immunisation. The mothers receive maize, soya blend, oil and E vegetables.[40] One of my duties is also to promote delivery at the HC.
>
> This HC is type-B standard, with no in-patient unit; in case of complications – like obstetric emergencies and life-threatening conditions requiring oxygen and further care – patients are referred to an international NGO. We count on 8 nurses, 4 midwives, 2 lab technicians, 1 pharmacist, and 2 health officers. We have a proper store to arrange our drugs and document their use. They are for free, in our pharmacy. We have a vehicle, but not a standard equipped ambulance.
>
> I keep a top-ten diseases chart. In October 2019, this is the list: 1) Acute Respiratory Tract infections; 2) Pneumonia; 3) Malaria; 4) Urinary Tract infections; 5) Diarrhoea; 6) Sexually Transmitted infections; 7) Intestinal parasites; 8) Skin infections; 9) Dengue fever; 10) TB.
>
> I count also on 20 female community health workers who refer suspected TB people to the TB unit; then the lab technicians screen the suspects for three consecutive days and, if positive, they start treatment. This month we had 13 cases: 11 negative and 2 positive. The HC also refers the sputum cases to Beletxaawa to confirm for multiple drug resistant therapy (MDRT).
>
> We're doing our best, and I am proud of it.

Sliding doors 2. Note the use of numbers and capital letters. What is best for a sick pastoralist? To have local medical personnel that is highly qualified according to biomedicine standards and public health management, or to count on somebody who can "translate" and "crossbreed" science and local knowledge? Local health personnel, above all those involved in human biomedicine, is very proud of having achieved an international status: somehow they are separated from their patients. The optimum solution lies in training units where their scientific knowledge is integrated (and sometimes challenged) by "primitive" classifications and treatments. What if zoonoses are not recognised possible because camels are like persons? 'We are like our animals, and they can't harm us', they say. Are they right or not?

[39] In medical anthropology we refer to the triad "illness", "disease" and "sickness"; illness is the subjective experience of the event; the term "disease" indicates the body's dysfunctionality or pathology from an organic/biological point of view; sickness denotes the social dimension of the problem, *i.e.* the way each society conceptualizes and manages it. The triad shows the multidimensionality of the phenomena, often underestimated by biomedicine, that considers only the "disease". See Augé M and Herlzlich C. (eds.), *Le sens du mal : anthropologie, histoire, sociologie de la maladie*, Éditions des Archives Contemporaines, Paris 1983.

[40] It means that the equivalent of fifteen dollars is given to PLW every month to combat nutrition deficiency.

Resistance to the integrated approach was recorded in many occasions and places. One sub-optimum solution is in the existing procedure with traditional birth assistants (TBA), whose help and knowledge is highly recognised. But this solution remains in the domain of women, who are already the majority referring to health services with their children. Can it be replicated with men? If yes, in which domain?

It is imperative to develop and disseminate some form of household health assistants (HHA) who can merge at the same time men and women, traditional healers and medical doctors and veterinaries.

SIMULATION 3: Gabra Young Woman, North Horr Town, Kenya, October 2018

> This is what happened to Kame, my 71-year-old paternal grandmother. Last year, she was stung on her foot by a scorpion early in the morning. Scorpions and snakes are precise indicators of incoming rains, by the way.
>
> Members of the *olla*[41] gathered to find and kill the scorpion (*qanjibu*) under one of the three stones of the fireplace, but did not give much importance to the bite, even after a visit by the nurse, a relative of mine.
>
> The male elders prevented granny to treat the case at the North Horr Health Centre, saying that their culture was powerful enough to solve the problem as it always did before, no matter if you were a man or a woman. They gave my granny some Ultra Heat Treated milk from a carton.
>
> After a while Kame, a very healthy and strong woman, started shivering and drooling from her mouth. After two hours she was dead. When they went to bury my grandmother, rain started to pour down like never before.

Sliding doors 3. What if culture and tradition are killing weapons? Is it possible to consider patriarchy inside a double-edged myth?[42] In Gabraland, apparently yes. Gabra men (*d'ira*) say that women (*nad'eni*) are "half". They exclude women from political and ritual activities. They denigrate feminine things. Yet they regard their most prestigious men, the *d'abela* ritual agents, as women: with due time, a Gabra camel herder becomes an elder with a feminine identity.[43] In a popular folktale, a woman called Banoye had paramount power over Gabraland, but she lost it to men because of 'unreasonable demands'.[44]

Even if overtaking gender biases in power balance is the optimum solution for the future, some progress can be achieved by fishing inside cultural traditions: the sub-optimal solution is to highlight the role of "feminine things" from past traditions, activities that contain power in themselves.

What if the community is nudged[45] to highlight the four strands of society: solidarity, reciprocity, complementarity and compatibility? Why should women take care of the health of all the household members but themselves?

SIMULATION 4: Somali Mixed Group, Filtu Town, Ethiopia, 2009[46]

> *Abdullahi* (m): 'For me, pastoral life have advantages and disadvantages. From one side, livestock produces more milk in the bush, where grass is more abundant. On the other hand, there is no water and you are always thirsty. You have no access to "new foods" and feel hungry. No sugar in your tea'.
>
> *Halima* (w): 'A disadvantage is that a pastoralist in the bush is always on the move. It's a hard life, with no education, or communications, or health services. I had no help in pregnancy and child-birth. And, in our livestock, some diseases outbreak and spread rapidly, but no veterinarian around. Well, if compared to settled life, all in all you have less diseases. Ah, less insects and parasites too'.

[41] Extended family household's huts, sometimes translated as "settlement".

[42] Marler J, "The Myth of Universal Patriarchy: A Critical Response to Cynthia Eller's *Myth of Matriarchal Prehistory*", *Feminist Theology*, Vol. 4(2), 2006; pp. 163-187.

[43] Wood JC, *When Men are Women: Manhood Among the Gabra Nomads of East Africa*, University of Wisconsin Press, Madison, 1999; p. 5.

[44] Full narration in Comberti G and Shamo T (2019), op. cit.; p. 5.

[45] A "Nudge Theory" was elaborated by the economist Richard Thaler, considering innovative ways of changing public behaviour by soft "pushes"; this led him to win the Nobel prize in 2017; see: Thaler R, *Nudge. Improving Decisions about Health, Wealth and Happiness*, Penguin, London 2009.

[46] Modified from Vrålstad K, *Sedentarization in Filtu Woreda, Ethiopia: Impacts on Health, Ecology and Society*, Master Thesis, Norwegian University of Life Sciences, Noragric, Oslo 2010; p. 32.

Mohammed (m): 'In the bush I have to face droughts and sometimes conflicts. But there my animals grow and I have more opportunity to sell milk and livestock at the marketplace: towns are dependent from nomads' milk and meat. But everything is bound to how many animals you have, your capital'.
Hassen (m): 'Forget it, there are no advantages in the pastoral life anymore. Nowadays everything is unfortunate in the bush'.
Abdi (m): 'I'd settle down: you have water, schools, hospitals, vet pharmacies. You may rest and feel serene, at peace'.
Zaynab (w): 'I agree about water, even if there are too many users, and in the Filtu *birkad*[47] water is quite dirty and polluted. But in town you have almost no grass for livestock and less milk for your family. Many people in one place mean also more diseases and contagions. And it is not sure that health services work: it depends on where you settled'.
Qayrow (w): 'It's egoistic: in town, people sell milk instead of sharing. And maize-meal has no nutrients. Besides, no hygiene around the shacks'.
Adan (m): 'My family is now able to farm, and I can do some trading. We are registered by the Government and NGOs can assist us. Tea in my sugar'.

Sliding doors 4. Consider the territory, a piece of land shaped by the people that inhabit it. What if its economic destination (grazing land, cultivated field, industrial plant, residential area, wilderness, other) changes? What happens to environment, people, animals? Which are the health hazards[48] inside such a change?

Pastoralists look like stuck to two options: move or settle. How do we know? What if we interfere with the agency of a person who is in touch with a plurality of possible and experienced actions? Pastoralists do not live in a void; they negotiate identity every day, like everybody else: therefore, there is no optimum solution to the dilemma "move or settle". The proposed solution is often "settle or die": what if the whole population of a semiarid land settles near services? Which are the health threats in such a scenario?

A sub-optimum solution is the static-mobile provision of health services, while the population is oscillating between the "move or settle" paradigm, occupying the full possible taskscape.

SIMULATION 5: Somali Household Head, Dhaamole Mountain, Filtu Area, Ethiopia, January 2018

My children have *hargab*, common cold, but that happens after *deyr* rains[49], always. Even sheep have *hargab*, but that is dangerous. No veterinarian around, so I buy some vet drugs coming from Kenya, but they are not good. They are cheap, though. You see, my first wife has to buy food and clothes, before medicines. Now she wants money to buy malaria pills, because we are near the river now. But I have no money. I used most of my animals for the dowry of a second wife. Ills and pills can wait: have you seen how young and beautiful my spouse is?

Believe me, getting sick is a problem. Some years ago I was operated at the Filtu hospital. I had some stomach problem, but the doctor used a jargon I couldn't understand. Anyway, I had to stay there 15 days. My first wife assisted me and gave me food, but who took care of children and livestock in the bush? Relatives helped, but it took me three months to fully recover. Animals need care, they are my farm. I *needed* a second wife.

Money is not really a problem for drugs, but for transport. Aiynle is the nearest health centre. It takes five good hours of walk at a good pace to reach it and, surely enough, this is not possible for a sick person. Costs of transport, visit and treatment are too high. Now my old mother is very sick. She'll never make it to the hospital. I want to save the money, but my old father told me: 'Madhon, you're a cow defecating while lying on the ground.[50] Listen to this story: "A man carries his mother on his back, complaining about the fact that she is too old to walk and contain herself. God scolds him on the way: 'This woman carried you when you were a child, and you sucked her milk, while urinating and shitting on her. She never complained, and loved you." Do the same, and love her, instead of wishing her death to relieve you from the burden'.

I am going to slaughter a goat for that NGO *ferenji*[51] in visit. He is going to pray for my sick mother, inshallah.

[47] Open/covered, earth/cement-lined storage tank that collects rainwater and drainage, holding it for some time.
[48] In health jargon, according to the Canadian Centre for Occupational Health and Safety (CCOHS), a hazard is any source of potential damage, harm or adverse health effects; a risk is the combination of the probability of the occurrence of a harm and its severity.
[49] Short-rain period, generally from September to November.
[50] A serious insult.
[51] The word is used throughout Ethiopia meaning "foreigner", from the word "French".

Sliding doors 5. Money has no priority, people do. What if, given a certain amount of money, you, as a pastoralist woman have to choose "food or medicines"? The optimum solution is obviously "sell goats", but that is not in the mind of your husband, who prefers "beauty to medicines", and goats are part of the family anyway. How can we increase the amount of money for health in the pastoral circuit? Would more money in the pockets of this herder solve the problem, or exacerbate power unbalances? The optimum solution is to increase the money allocated to the Public Health service, in order to get free services both for humans and animals. No room for beauty there, though.

One sub-optimum solution (among many others) is the downsizing (but technically upgrading) to pastoral level of health services for humans and animals: rehabilitation of health posts, specific training of personnel (also in traditional medicine), "health-phones" and sims distributed, low-cost means of transport for health operators (from donkey to motorbikes) and patients (village motorbike-ambulance, but also donkey cart), appropriate village medicine stores with some form of protection from pests and heat (from shade to wet-charcoal refrigeration, if water is available). In this kind of simulation, consider the "killing assumption" in logical frameworks: if roads and track are impassable, forget about motorised transport.

The hidden meaning of this simulation is inside the immaterial domain: instead of health, I chose the beauty of my spouse; I saved my goat by not buying medicines; now I slaughter my goat for a prayer to a sick. Relationships count more than money.

SIMULATION 6: Somali Destitute Pastoralists in IDP Kabasa Camp, Gedo Region, Somalia, December 2019

> *Faisal* (m): 'There is a new human disease in our camp, called *kaduudiyow* or dengue fever'.
> *Mohamed* (m): 'How does dengue transmit?'
> *Adan* (m): 'From animals to man'.
> *Faisal* (m): 'I think that is not right: the dengue is transmitted by mosquitoes from man to man only'.
> *Najma* (w): 'Yes, by a kind of mosquito that bites people during day-time. How can we eradicate them?'
> *Zaytun* (w): 'By clearing the bushes around our shacks, or draining water and burning the empty cans, because this leftover water enhances the breeding of mosquitoes'.
> *Abdi* (m): 'Like for malaria, dengue eradication needs community involvement and efforts through mobilization and training'.

Sliding doors 6. What if you distribute mosquito nets to a far-off pastoral settlement? Would you expect a reduction in dengue and malaria cases? What if this doesn't happen? The optimum solution is to eradicate mosquitoes from the area, possibly with ecologic methods, if available, and community involvement. With best plans and all precautions, it never happened.

The sub-optimum solution is to enhance the scientific knowledge of pastoralists about vector-borne diseases, but at the same time increase the knowledge of health operators about the pastoral taskscape. If it is true (according to pastoralists' perception) that "dengue mosquitoes" bite during the day, nets are going to be considered useless. If it is true (according to entomologists) that malaria-bearing anopheles bite in the sunset timespan from 6 to 9 pm, then mosquito nets *are* useless, because in those hours most herders are leading their animals back to camp or are busy milking in the open.

SIMULATION 7: Old Gabra Pastoralist, olla *Shande Moocho, North Horr, Kenya, October 2018.*

> I am Diba Salesa. My name means "Born when the village had been long time in the same place". I'm 74 years old. For me, the camel is the animal number one; without a camel you cannot have a wife. Wives can be a trouble, they give you sex infections, you know. These come only from women to men, alas. When it happened to me, I was requested by the health worker to bring my wife to the health facility to be identified. No way, I prefer to stay with my infection and no treatment.

Sliding doors 7. Where gender biases contrast appropriate health-seeking behaviours and let loose dangerous contagion-spreaders like Mr Diba, the "What is best" quest clashes with the reference culture itself. Are we supposed to interfere with it? By what authority? What happens to women if we

demonstrate that they are not plague spreaders by definition? How is the male responsibility in sexually transmitted disease (STD) contagiousness going to be accepted by men *and* women?

A sub-optimum solution, among others, is a "thin" and progressive involvement in healthcare training activities outside health centres, at the periphery of the community. The dilemma we have to face is that advocacy is funded on the consent by victims.[52] A similar situation is about female genital mutilations. Women might be in danger if we abruptly alter from outside the local power balance. A lesson learned in the field is that human rights became global after growing local.[53]

SIMULATION 8: Gabra Community Disease Reporter, Gas Village, North Horr sub-County, Kenya, May 2020

> I am in charge of livestock health around this location. I am not supposed to declare which disease is out-breaking, but I have to report the symptoms of any animal disease to the authorities. Of course, I give herders some advice about their animals' health. To do so, I seek the help of elderly people, the ones who know everything. I call them "living meteo-stations", because of their knowledge about past weather and climate. They told me that history repeats itself.
>
> Last time locusts were seen in Gabraland was in *Kamis*[54] year of 1959; that particular year was surnamed *awanisa*, which means "locusts". The following year was *Gumaat*,[55] which was surnamed *siko*, "multitude of wingless locust offspring", hatching from eggs of the previous year. The old men told me that locust invasions – like the one we are experiencing now – are not linked with bad omen or environmental catastrophe. 'They are associated with timely rainfall and livestock prosperity and good human health, after their invasion', they say.
>
> But I see less grass, grass that cannot sustain the increasing numbers of livestock with an ever-increasing human population in Gabraland. With hunger, animals get sick; with too much rain they cannot access pasture or they bloat.[56] Forget the old people! Let us all participate in pushing these disastrous enemies down to Lake Turkana! [using the CCM *3map*[57] network on his smartphone].

Sliding doors 8. Are we sure that the governmental guidelines are viable in the taskscape of an animal-health worker left in the bush? How can he suspend action when his[58] fellow herders show him sick animals? Government times, like everywhere, do not have the fast pace of an outbreak, be it of "common cold" (*hargab*) or CCPP.[59]

When communities are directly involved, there is no prefigured "optimum solution". A sub-optimum solution would be a better scientific formation of the community-based health personnel, and the provision to them of a set of basic medicines for directly treating some common animal diseases (a similar interventions can be designed for human health operators too).

What if, like in our simulation, this upgraded empowerment collides with cultural deep structures (old people as best information source about environment and health) and operational drivers to control (of pests, environment, animals, people) and action. Are the inhabitants of Lake Turkana shores ready to welcome locusts? *Mors tua vita mea*[60] cannot be considered as a solution, but a diffused practice yes.

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[52] Ignatieff M, *Human Rights as Politics and Idolatry*, Princeton University Press, Princeton 2001; pp. 58-59.

[53] The author participated to a CCM project (funded by the European Commission in 2005-06) about the dissemination of Human Rights among the Somali pastoralists of Ogaden, Gode Zone, Somali Regional State of Ethiopia.

[54] Gabra name years after week-days. *Kamis* is Thursday, associated to a dead person; Tora S, "Changes in Knowledge of Time among Gabra Miigo Pastoralists of Southern Ethiopia", *Nilo-Ethiopian Studies*, Vol. 10, 2006; pp. 23-44.

[55] Friday.

[56] While eating wet leaves, like after the heavy rains of 2019, especially goats and sheep (shoats) get inflated bellies, a common disease often cured with forced ingestion of Omo powder (*sic*).

[57] TriM, a CCM partner, developed a dedicated application for pastoralists, now in use in the North Horr area, monitoring weather, health and environmental issues. Our simulation uses the registration of a Data Collectors WhatsApp conversation by CHVs e CDRs inside the CCM/TriM North Horr OH group.

[58] We have no knowledge of veterinary female personnel inside the communities of the study areas, although the author worked with a Somali female veterinarian in Filtu.

[59] Contagious Caprine PleuroPneumonia, a disease caused by Mycoplasma genus. It is extremely contagious by way of aerosol, with very high morbidity and mortality rates. Goats are the only species affected, therefore the disease is not a zoonosis.

[60] "Your death is my life", locution in medieval Latin.

SIMULATION 9: Pastoralist Woman, Sullale Settlement, Gedo Region, Somalia, December 2019

> I am Zamzam. All my children are well. The overall condition of our animals is OK, and they are doing good. My household has cattle, goats, sheep and camels. No problem.

Sliding doors 9. If sickness comes from God's punishment for my sins, or from some neighbour's envy, or from social misbehaviour, how can I confess it to strangers? What if education changes my children's attitude towards health? What if my household gets the reputation of being sick and unfortunate?

The questions lead us to the optimum solution, founded on intensive trust-building before expecting to unveil dissimulated pastoralists' (and not only) mind-frames about health and disease. The sub-optimum solution is the preparation of a two-ways conceptual dictionary about health (local and biomedical): the "words to say it".

The digital pathway

We intended to simulate also some effects of modernity that CCM and its partner TriM inserted in field-applied methodologies, like weather monitoring of project areas (in Ethiopia and Kenya), mapping of vegetation, water-points and health facilities (in Ethiopia), satellite-assisted predictive systems and environmental monitoring (in Kenya), community platforms (in Ethiopia), distance learning and research from remote (Gedo), augmenting local reality through the opportunity given by the diffusion of smartphones and their networks. At the moment, though, we have not enough feedback information and evidence to provide hard data about some change in pastoralists' perception and mind, while using high-tech tools. A creative use of modern media for pastoral application was operated by some herders in the Filtu rural area. In their words:

> We have traditional ways of preventing hyena attacks, like tying a big plastic sheet around the livestock pen to simulate a person, so the hyena be scared by its movement in the wind. We may also tie a torch on the head of some animal, or use radio noise to prevent hyenas to come near. We keep the radio on, with full-volume loudspeakers, all the night long. Hyenas are not going to come near: they think people are around and vigil.[61]

About the insertion of modern technology in every day's life, we observed that the increase of motor vehicles (above all motorbikes) changed mobility patterns, while an extended network modified completely the communications among pastoralists and settled communities: almost every household now has a cell-phone, by which it is possible to keep in touch with services (health, education, information, trade) and distant family members, like boarding students or migrant workers. In Kanacho,[62] Adano Guyo, responsible leader to 57 households, said: 'I've been living in this area eleven good years. Now it is different: every household has a phone. The network is patchy, but good inside our village. We locally recharge the batteries by solar power or we do it in town'.

This modernising process, involving both material goods (e.g., alien foods and beverages, tools, transport, cloth, cash economy and trade), immaterial concepts (e.g., social bonds, gender biases, movement patterns), and services (e.g., water, health, education, information) goes against prejudices by the local authorities, as exemplified by the Government-appointed chief of Dukana (Kenya), who sadly stated: 'Gabra pastoralists are almost unteachable as they cannot take in new knowledge easily. They cannot change their behaviour as required by development partners. Their change is going to be gradual'.

Tradition may be a killer during the evolution to modernity, but on the ground it looks we are far from the celebrated ICT[63] cube (Information & Communication Technology), that is full of flaws, exogenously managed, and not locally working (by now). General purpose technology for pastoralists is anyway the future to health-seeking and health-care (among many other behaviours). Beside appropriate telemedicine, its instruments might eventually give a self-image of pastoralists, without filters.

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[61] Melkahager, 25 December 2015; see Villanucci A, (2016), *op. cit.*; p. 52.

[62] North Horr sub-County, October 15, 2018; reported in Comberti G (2019); pp. 8-9.

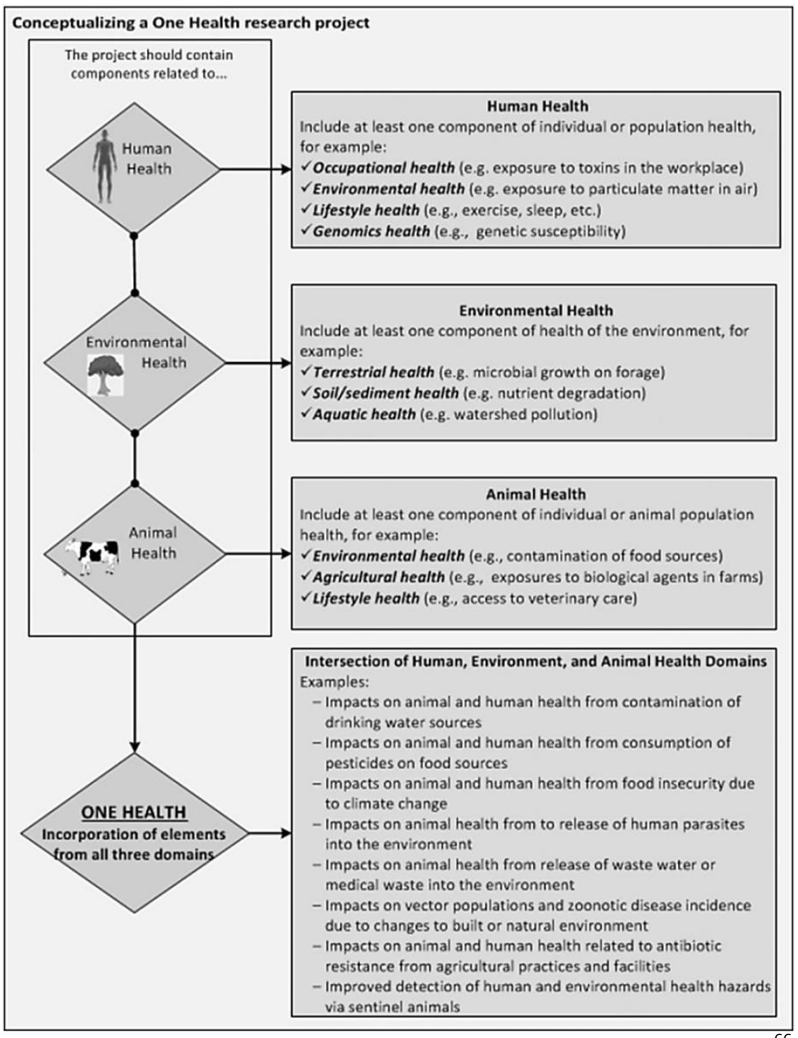
[63] A syllabus from Cambridge (IGCSE-certified) is in Brown G and Watson D, *Information and Communication Technology (ICT)*, second ed., Hodder, Cambridge 2019.

This is temporarily disputable, though. Does it exist a digital pathway in the herder's taskscape? Can a meteo-station fully replace an old man's memory? Can clan's oral/visual web be revived by intercontinental smartphones and then become a source for conflict? Can a young pastoral scout, looking for grass-promising rains, swap foot-, hand-, nose- and eye-sensitivity with a satellite map? Shall women be allowed by men to reach health services, previously alerted by phone about their diseases? Can a touchscreen become a surgeon? Can our heroine hold a tablet and catch a cloud?

Seeing like a One Health Operator

The operationalisation of OH has so far proven challenging, being hindered by dysfunctions characterising current forms of global health governance (GHG), namely institutional proliferation, fragmentation, competition for scarce resources, lack of an overarching authority, and donor-driven vertical programmes.[64]

If an OH practitioner is asked to "see like the herder", local health personnel in the three domains of OH should understand the lens by which OH operators see pastoralists. Training activities become therefore indispensable. As a guideline to a simulation of a OH operator, we propose a flow chart to conceptualize a OH research project.[65]



Concepts to a One Health Research[66]

[64] Lee K and Brumme ZL, "Operationalizing the One Health approach: the global governance challenges", *Health Policy and Planning*, 28(7), 2013; pp. 778–785.
[65] Lebov J *et al.*, "A framework for One Health research", Elsevier, *One Health*, June 2017, p. 44-50.
[66] Source: *Ibid.*, p. 46.

SECTION 3: Crossing worlds to a table

To highlight the complexity of the researched SESs in the Greater Horn of Africa, we elaborated the following table (see p. 23) like a toolkit. The derivative matrix is in the following Section 4. The objective is to correlate past and ongoing CCM's experiences among pastoralists in three localities of the macro-region (Filtu, North Horr, Gedo, respectively) with "Study interests", dealing with health-related topics like needs, perceptions, behaviours, adaptations, hindrances, therapeutic resources, climate changes, and others. These interests are particularly relevant inside the HEAL scope. A table – and consequent matrix – correlating homologous data from different, but analogous, places and people, may highlight singularities and underline similarities, both of interest in programme planning and performance.

Summing up, this toolkit contains: a) "magnifying lenses" (definitions of table/matrix, characteristics of socio-ecologic systems, environmental and behavioural drivers, etc.); b) "screwdrivers" (anthropology about pastoralism, mobility and health; ecology, mainly about climate change; psychology, about needs and perceptions; public health, about drugs and facilities); c) "workbenches" (a two-dimension table; a similarity/singularity bullet-point list, followed by a three-dimension matrix). These tools have been designed from pastoralist-derived information and CCM's field researches, in order to involve all stakeholders.

Approaching the future

The future of pastoralists in the Greater Horn of Africa depends on multivariate responses to a changing environment and a modernising society. To deal with it, a decisional matrix is necessary both to the micro-scale of pastoral household members and to the macro-region decision-makers.

To include the three entangled domains of OH, the field under scrutiny is defined a social-ecological system (SES). It must be understood – and inserted in any development project – the fact that 'the delineation between social and natural systems is artificial and arbitrary'.[67] This given, managing SESs for long-term and sustainable outcomes must take into account their intrinsic complexity and consequent non-linearity, uncertainty and adaptivity (a SES learns and mutates with experiences), all characteristics that make it difficult to forecast the future in any meaningful way.

Planning the future is nonetheless imperative in pastoral societies, and health-seeking behaviours are activities about the future. On the other hand, there are several reasons why uncertainties are difficult to plot and tackle, both for pastoralists and health managers/donors:

- Key drivers, such as behaviour, climate change and technology evolution, are unpredictable and non-linear.
- Human action is reflexive. If ecological or economic predictions are taken seriously, people will react in ways that will change the future, and cause the predictions to be incorrect.
- The system may change faster than its management, particularly during turbulent transitions (conflicts, climate crisis, environmental disasters, epidemics, animal disease outbreaks); so forecasts are most unreliable in precisely the situations where they are most wanted.[68]

Given these limits to scientific understanding and forecasting, pastoralists live *within* systems, rather than control them. Even if we are aware of the entanglement of the three domains of OH, pastoral communities are the best available data source about their future, because they responsively mutate attitude and behaviour, influencing (and according to) livestock and rangelands.

HEAL is a community-oriented project in a multi-faceted, cross-border human terrain and a highly diversified mosaic environment. Therefore, it is vital to develop appropriate systemic relationships and two-way communication tools with the local populations.

[67] Berkes F and Folke C (eds.) (1998), *op. cit.*; p. 4.

[68] Walker B *et al.*, "Resilience Management in Social-ecological Systems: a Working Hypothesis for a Participatory Approach", *Conservation Ecology*, 6 (1), 2002, art. 14; https://www.ecologyandsociety.org/vol6/iss1/art14/.

In a SES like the complex one of pastoralists, project's relationships function inside a framework built on:

1. Trust (bilateral relationship; open budget; informed consent)
2. Accountability (both stakeholders' and donors')
3. Reciprocity (status parity, with variables and variations involving communities, authorities and donors)

In the same operative situation, two-way communication tools need:

1. Compatibility (prepare "cultural adaptors")
2. Understandability (avoid the "lost in translation" effect)
3. Sharing (open and maintain a continuous flow of information, with feedback)

Such a SES-related framework has been orienting, throughout the years, CCM's operational field researches and the subsequent project activities among the pastoralists of Ethiopia, Kenya and Somalia. CCM considers this anthropologic and ecologic approach like the best-suited for sustainable development *from* local conditions and not *to* predefined exogenous objectives.

Crosstab analysis

Before getting to the poly-dimensional matrix, let us consider the elements of a bi-dimensional OH table. The aim is to compare three medium-scale localities and connect CCM's activities with four main Study interests about the health of environment, people and livestock (see table). To insert the reader in the local contexts, we give before some brief baselines about the three locations: Filtu, North Horr and Gedo. These baselines offer the type of research/intervention by CCM, glimpses of the environment, and the main characteristics of pastoral livelihoods in the area.

STUDY INTERESTS (Cross-border)	FILTU (Ethiopia) 2015-2019	NORTH HORR (Kenya) 2018, ongoing	GEDO (Somalia) 2019
1. Needs, perceptions, behaviours of local pastoral communities towards human/animal health, and strategies of adaptation to the environment, also in relation to climate change.	A.1	B.1	C.1
2. Hindrances preventing communities to access human, animal and rangeland health systems.	A.2	B.2	C.2
3. Different therapeutic resources, available and used/preferred for people and livestock care and keeping healthy rangelands (including traditional medicines, domestic and self-treatments).	A.3	B.3	C.3
4. Perceptions, acceptability, behaviours of pastoral communities to mobile/static OH units.	A.4	B.4	C.4

Table, crossing HEAL's headings and three locations of OH projects.

Analysing the table cells one by one, we are going to give first rating to the environment and pastoralists' attitudes towards it: animal and human health strictly depends on ecology (see the recent SARS-CoV-2 pandemics), but very little is done to prevent and "cure" the environmental alterations by people (e.g., climate change, deforestation, biodiversity reduction, global warming, etc.). After the environmental issues, we are going to deal with human and animal health. This order is maintained throughout the bi-dimensional table analysis.

Sometimes, study interests collide with local attitudes. For instance, when we deal with Study interest 1, point 1, we have to consider that need must not be taken for granted among pastoralists. Many African languages do not have a word for "poor": they use the Arabic *meshkin*. The given explanation is: 'If you are

poor [that is, for pastoralists, with no livestock], you're dead'.[69] The Turkana of Northern Kenya say: 'The poor are not us'.[70]

Like poverty, sickness is considered to come from misbehaviour, envy, or 'Allah's will'. Therefore, need (economic or medical) is not to be made explicit inside the community. Different is the case when facing strangers: the Turkana's answer to a greeting by a foreigner is always '*akoro*, I'm hungry'. On the other hand, the formal English greeting "How do you do?" is answered by the same words without the question mark: in that exchange, nobody appears really interested in somebody else's health.

In the field, this can lead to paradoxical situations. In the Gedo Region of Somalia, the Hubeer sub-clan shows a binary social composition, the "nobles" (*bilis*) and the intrinsically low-status adopted members (*boon*). Therefore, a rich person (a *bilis* by definition) may be poor, and a poor person (*boon* by standard), rich. By this social partition, a person may also be a sick rich or a rich sick, with considerable twists in the demography/health data, not to mention self-esteem and identity.[71]

Need is a touchy, culture-biased topic. Usually, *we* decide *a priori* what *they* need. According to Daniela Rana, CCM desk officer, 'when asked "What do you want?", any person is not going to identify his/her needs first, but the self-selected best solutions'.[72] That is why the author stopped asking 'What do you want?', substituting it with 'What do you not want?'. This might lead us from individual aspirations towards an ideal health to a definite, shared "sickness zone". There need counts.

Table columns: location baselines

Note: while reading, refer to the Table in the previous page.

Column A. FILTU: In the administrative area (*woreda*) of Filtu, Somali Regional State of Ethiopia, CCM has a long history of interventions to support the local health system, from hospital management, to health post (human and animal) rehabilitation, to mobile vaccination campaigns for pastoralists. After a re-elaboration of the concept of One Medicine and consequent Austrian Cooperation-funded field activities in 2004-05,[73] CCM was involved in Filtu in an extended Operational Research (OR) in the three domains of One Health, funded by the Swiss Agency for Development Cooperation, SDC (May 2015-February 2016).[74] The research was integrated by a Human Ecology assessment in the frame of the project "Emergency intervention to support drought-affected populations of Filtu and Dekasuftu, Liben Zone", funded by the Italian Agency for Development Cooperation, AICS (April 2017-Febbraio 2018).[75] This project was eventually followed by the AICS funded initiative "An integrated approach to improve the living conditions and strengthen the resilience of pastoral and agro-pastoral communities affected by drought in the Somali Regional State", Liben Zone (October 2018-March 2020).[76]

The environmental analysis of the Filtu area showed how this is almost a closed ecosystem, being surrounded by two permanent rivers (Dawa and Ganale) with a central runoff line. Two main hilly regions provide vertical potential to grazing seasonal shifts. Most of the area is wooded savannah, with encroaching bushy plants progressively substituting open grass prairies. Erratic weather conditions are compensated by water availability in the rivers and mountain vegetation refugia. Therefore, both short and medium range pastoralism is maintained active for most of the Somali-speaking population, with

[69] Ater, Dinka pastoralist in Southern Sudan, pers. comm., January 2009.

[70] Anderson DM and Broch-Due V, *The Poor Are Not Us*, Eastern African Studies, James Currey, Oxford 1999.

[71] Helander B, "Power & Poverty in Southern Somalia", in Anderson DM and Broch-Due V, *The Poor Are Not Us*, Eastern African Studies, James Currey, Oxford 1999; pp. 91-105.

[72] Daniela Rana, persona communications, August 2020.

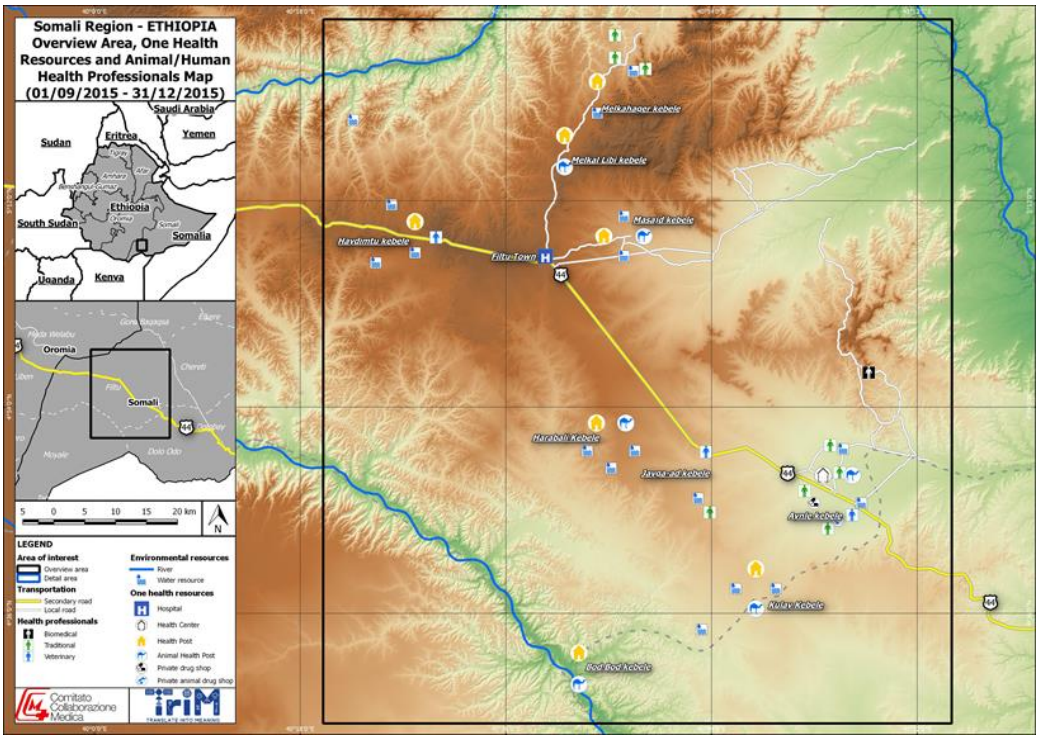
[73] Description in Rodighiero P *et al.*, *Extended Outreach Vaccination Mobile Module*, CCM Technical Report, Turin 2005.

[74] Full description in Villanucci A (2016), *op. cit*.; the OR was validated by Out of the Box, Kenya, in May 2016.

[75] Full description in Salza A (2018), *op. cit.*

[76] Mengistu A, Pasquale B *et al.*, "The experience of the Multi-Stakeholder Platforms to enhance the resilience of pastoral communities in the Somali Region of Ethiopia", communication for the VI CUCS Conference, University of Trento, September 2019.

sedentarisation prevalent only along the main road and rivers. Patterns of sedentarisation and agro-settlement are deeply influenced by the policies of the Ethiopian Federal Government, that tend to insert pastoralists in relocation villages with social, environmental and economic services available.



Filtu overview area, OH resources and Human/animal health professionals, by TriM

Column B. NORT HORR: Since May 2018, in the sub-County of North Horr, Marsabit County, Kenya, CCM and partners (VSF-G, TriM, DIST) have been implementing the AICS-funded project "One Health: Multidisciplinary approach to promote the health and resilience of pastoralists' communities in Northern Kenya".[77] The inception phase was preceded by an anthropologic and environmental OR, followed by weather, veterinary and geo-bio-climatic researches and activities.[78]

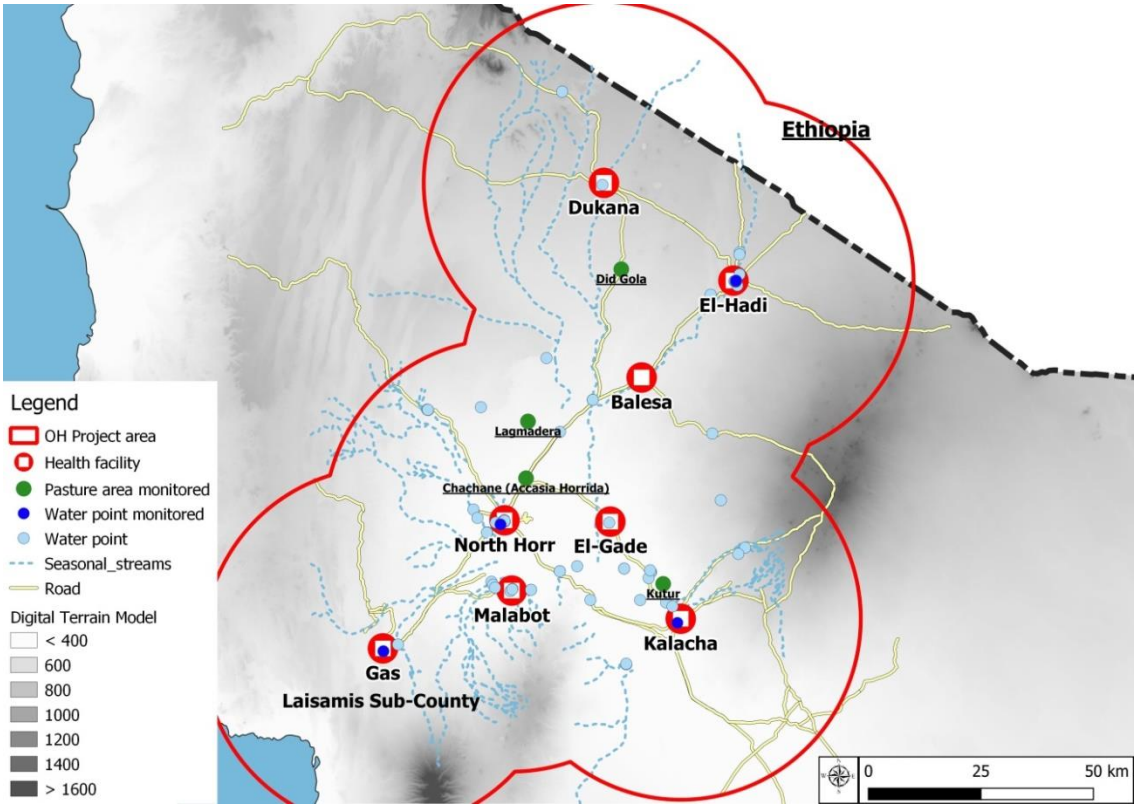
The ecosystem is of the type defined "plaid environment" (opposed to "striped").[79] This means that different habitats coexist in a mosaic texture, from a vast open, salty desert, liable to yearly flooding (Chalbi), to lava fields (Malabot); from elevated forests (Mount Kulal) to bushy hills (Dukana, Hurri) and grass-savanna plains (Kalacha).

[77] First annual report in Guarino A and Odhiambo A, *One Health. Approccio multidisciplinare per promuovere la salute e la resilienza delle comunità pastorali in nord-Kenya*, CCM Technical Report, Nairobi 2019. Anthropological information is going to be added by CCM consultant Erika Grasso's report about the January 2020 field mission (in writing).

[78] The human terrain analysis is in Salza A (2019), *op. cit*. The weather data collection and analysis by TriM are reported and discussed in Cristofori E, *Rapporto di Missione - ONE HEALTH, AID 011507*, missions 1 (December 2018) and 2 (March 2019) and Demarchi A, *Rapporto di missione* (February 2019). Climatic data were collected and analysed by DIST, Turin Polytechnic (*Climatic report for the study area of the project OH in Marsabit County, 2019*) and in Vigna I, Bigi V, Pezzoli A, Besana A, "Comparison and bias-correction of satellite-derived precipitation datasets at local level in northern Kenya", *Sustainability*, MDPI 2020. About veterinary issues, a research was conducted by Moirano G, *A Survey on Knowledge, Attitudes and Practices (KAP) Relating to Brucellosis in a Pastoral Community of Northern Kenya*, UNI.COO, Turin 2019.

[79] Gamble C, *The Palaeolithic Societies of Europe*, Cambridge University Press, Cambridge 1999; p. 112; see also Richerson PJ and Boyd R, "Rethinking Paleoanthropology: A World Qeerer than We Supposed", in Hatfield G and Pittman H (eds.), *Evolution of Mind, Brain, and Culture*, University of Pennsylvania Press, Philadelphia 2013; p. 288.

This environmental feature allows the Gabra people (the majority by far, speaking an Oromo language originated in Ethiopia) to successfully stick to their traditional pastoralism, with two animal circulation cycles: short range for 'shoats' (sheep and goats) around small settlements (women, children and old people) and long range for cattle and camels[80] in *fora* camps hosting youth and men. Modernisation and sedentarisation are ongoing in the few small towns, due to the provision of social and commercial services.



North Horr Project Area with catchment zones of 40-km-radius around the main health facilities (by TriM)

Column C. GEDO: In the northern area of the Gedo Region of Somalia, CCM and partners (VSF-Suisse and ILRI) carried out an anthropological OR (rapid assessment) – implemented in November-December 2019 – inside the project framework "One Health Units for Humans, Environment, Animals and Livelihoods (HEAL)" funded by SDC. The activity necessitated of an innovative methodology to get field data inside a security-sensitive area: an expert anthropologist trained a local health specialist and led him from remote throughout the field OR and following analysis.[81]

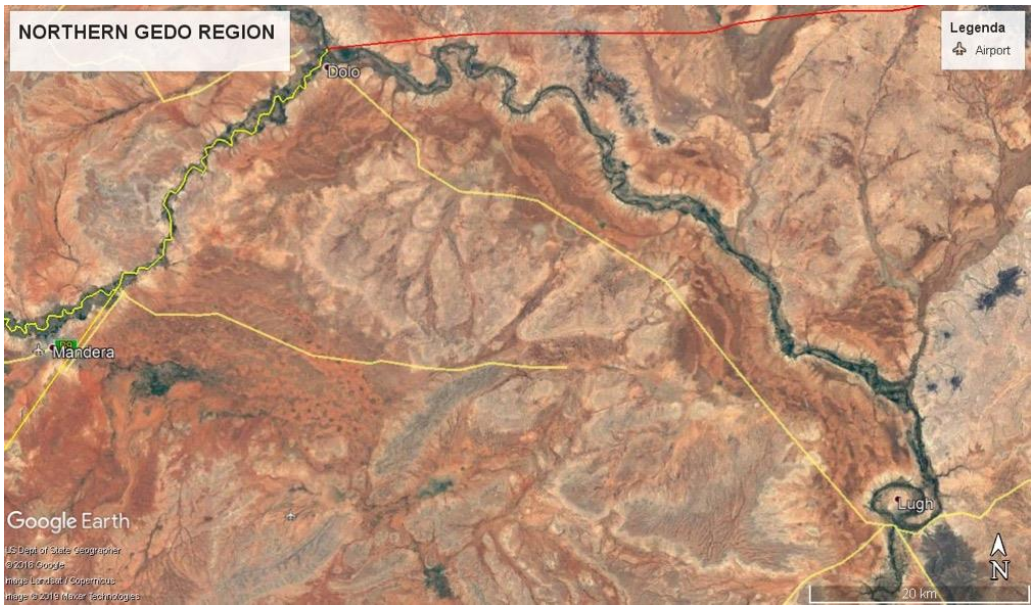
An environmental transect *in loco* was not possible due to lack of qualified personnel, but a literature survey showed a linear "striped" pasture zonation, with a greenbelt along the Jubba river, a wide alluvial plain and a few linear rangelands. The pastoral utilisation of such an environment by a liquid population (from settled farmers to nomads, with influx and outflux of IDPs and climatic migrants) is at the moment very difficult due to personal security (Al-Shabaab), food security (drought and locusts), conflict (internal displacement and consequent population density variations). The situation shows a diffused trend towards multiplex identities for an 'opportunistic pastoralism'.[82] This means that households may use livestock rearing part of the time, all the time, or even reduce it almost to nil (like in IDP camps), according to ecological and social strains and opportunities. These are to be considered not irreversible, while all niches

[80] The correct term is "dromedaries". The Middle East, the Sahara-Sahel belt and the Horn of Africa support a high population of dromedaries (*Camelus dromedarius*); they have one hump while, in Central Asia, proper camels (*Camelus bactrianus*) have two. About Africa, notwithstanding the difference, the use of the English word "camel" is prevalent, even in scientific literature.

[81] Issack AI and Salza A (2019), *op cit*.

[82] *Ibid.*; p.16.

are good refugia, from open rangelands to towns. A fact, though, is that camels, although numerous,[83] are losing their status of 'standing wealth'[84] (we prefer to add a mobility input: for Somali and other pastoralists, camels are a "walking capital"). Therefore, the pastoralism of the area is evolving according to history and not to ecology only.



Physical features in the northern Gedo Region (Source: Google Earth)

Table analysis: crossing rows & cells

ROW 1. Study interest 1: The needs, perceptions and behaviours of local pastoral communities towards human and animal health, and their strategies of adaptation to the environment, also in relation to climate change.

CELL A.1. In the Filtu area, the Somali-speaking pastoralists are integrated into the ecosystem, even if climate change is reducing available pasture, pushing towards agro-pastoralism and sedentarisation. The importance of weather is implicit in the fact that the major perceived risks are droughts and floods (even fires, but conflict or illness are considered less threatening); moreover, rapid climate changes affect the seasonal and geographic disease distribution, challenging traditional health prevention methods and behaviours.[85]

Local disease and environmental risk prevention methods (related to disease contagion/transmission; pest infestations; floods; droughts, etc.) were noted, but it emerged that they need more valorisation, sharing and dissemination. The local authorities' involvement was a priority, but a full OH operationalization is still to be achieved.[86] Climate change and global warming – even if quite often talked about – are far beyond any control by pastoralists, and not only. The impression is that the climate change topic is more media-related than actually perceived by the Somali-Ethiopian herders, who use the sentence

[83] According to the Ministry of Livestock of Somalia, in 2018 Gedo pastoralists had 545,980 camels, 302,851 cattle, 882,261 goats and 346,382 sheep, mirroring their preferences, needs and available niches.

[84] Definition by Krätli S, El Dirani OH, Young H, *Standing Wealth. Pastoralist Livestock Production and Local Livelihoods in Sudan*, UNEP report, Tufts, Khartoum 2013; see also Hjort af Hornäs A and Hussein MA, *Camel Herd Dynamics in Southern Somalia: Long Term Development and Milk Production Implications*, Camel Forum Working Paper No 13, Mogadishu 1986; pp. 1-32.

[85] Most of the information in A cells is elaborated from Villanucci A, *op. cit*., CCM 2016, about an OR the author was part to. See also Salza A (2018), *op. cit*. Recent information is derived from Pasquale B, *Iniziativa in risposta all'emergenza umanitaria causata dal fenomeno climatico el Niño*, CCM Technical Report for AICS, Addis Ababa, 2020.

[86] Full discussion about similar difficulties are in Lee K and Brumme ZL (2013), *op. cit*.

'It's all the fault of climate change' more like an alien mantra than effective local knowledge. Aden Dawud, a Somali driver on the way from Filtu to Kuralle: 'Inflation is because of climate change'.

Throughout the area, local everyday practices towards health and disease management are embedded in Islamic religious conceptions. Biomedicine's exclusive focus on organic and biological dimensions of sickness processes – and lack of consideration of their emotional and spiritual aspects – is one of the major factors preventing patients' compliance and referral to health systems, both governmental and private. Moreover, the socio-cultural context shapes local ideals of health and wellbeing. Meaningful examples are the persistence around Filtu of dangerous home-delivery practices and the unacceptability of family planning. Where local Islamic conceptions overlap the biomedical ones (as in the case of breastfeeding), behavioural change more easily takes hold.

The health system is made out of plural therapeutic resources, like: i) traditional healers and practitioners; ii) domestic treatments applied within the household; iii) biomedical resources, public and private; iv) environmental resources and their role in pastoralist's movement for health-seeking. Sickness is a social event that affects the entire social group; decisions concerning the treatment and the resources to apply are taken within the household group, and are related to family and gender roles and inter-relational dynamics (the father decides).

The quality of existing healthcare services is considered by people inadequate to respond to family needs. Main barriers are related to:

- social and economic costs of healthcare services (transport, admission, recovery, treatment fees; risks related to leaving livestock and children; fear of social stigma);
- the geographic distribution of health facilities and the lack of curative services;
- the bad perception of lower-level services and the lack of trust in health-workers' skills. Thereafter, pastoralists often privilege traditional/religious treatments, private services (pharmacies/mobile health workers) and self-administration of biomedical drugs, often obtained from contraband channels (above all for veterinary use, being pastoralists' health considered less important than livestock's; see Section 1).

Governmental health-workers face several challenges related to lack of resources (drugs and equipment, and sometimes water and sanitation) and transport means. Contrary to the interest shown by animal health workers towards human health, those in charge of human health seem to underestimate the importance of animal health and zoonosis-related hazards and risks. In most of the visited sites, the OR remarked the lack of awareness about the transmission of zoonotic disease and the persistence of harmful practices related to the use of infected livestock's meat, milk and hides. Moreover, both pastoralists and animal health workers complained about the presence of diseases – affecting especially camels – that appear not yet scientifically identified due to lack of research.

Filtu *woreda*'s animal health service system appears inadequate to respond to the existing needs and requests. Main gaps and barriers of the system appear related to: i) the shortage of drugs, vaccines and equipment supply; ii) lack of trained manpower; iii) bad conditions of facilities and infrastructures.

Urgent interventions are: i) the implementation of participatory epidemiological research to identify unknown or mis-considered human/animal diseases; ii) the enhancement of drug and vaccines supply and distribution, to balance the use of contraband of drugs; iii) forms of environment/weather monitoring.

To integrate the OH domains, CCM established Multi-Stakeholders Platforms (MSP), a place of exchange and community dialogue that gives the opportunity to all its members (people belonging to different sectors of the community, like: traditional and religious leaders, representatives of women groups, associations of merchants, Health Extension Workers and CAHWs) to participate in the identification of priority needs and common strategies to improve:

- agricultural productivity and nutrition;
- management and protection of natural resources;
- health and well-being of humans and animals;
- mitigation of environmental risks.

One MSP was established in each of 6 villages. MSPs – and through them the whole community – were trained in the application of new techniques, like conservative cultivation in arid areas and irrigation practices in river-bank zones. Moreover, MSPs were successfully involved in OH awareness activities about transmission risks and preventive measures of zoonotic diseases.[87]

CELL B.1. In the North Horr area, Public Health systems have critical relevance in the health status and health-seeking behaviour of communities. The Gabra pastoralists inside the area, although, show an interesting "denial strategy" when dealing about human health, if compared to animal health: they state 'We are all very well. No diseases around', and 'Remember: before vaccines for people, bring the ones for animals'.[88] This deviation from what medical doctors consider the "health norm" of self-preservation, must be understood in the pastoralist's principle that his/her animals keep the livelihood system "alive" in the environment, to the point that camels have the status of people and some trees are protected and called "bull trees" because of their strength and regenerative power. Therefore, it is imperative, before implementing OH, to build appropriate knowledge-bases (data + management) derived from culture/environment data background-baselines.

We contacted both nomadic and settled communities by means of: i) direct observation; ii) mapping; iii) environment transects; iv) non-structured interviews; v) focus group discussions. The field data concern human health responses (private and public); animal health diagnosing and treatment; environmental control of grasses and infesting plants; water local taxonomy, use and problems; weather and rain prediction by advanced technology; climate change issues.

The main findings are, starting from the environment:

- One Health is inherent the pastoral domain, but for the Gabra health-seeking behaviour is negative for people, positive for animals, neutral for environments.
- Water is believed good in itself ('It comes from God'); therefore, only quantity and rights of access – and not quality or safety – are considered important by Gabra pastoralists.
- Pollution is reaching threshold levels, above all in towns where plastics and pit latrine waste enter the high water table, while chemicals from pesticides make the household whereabouts dangerous for the health both of humans and animals, not to mention the damage to vegetation and wells.
- Technical weather knowledge is limited (no water cycle is understood), while traditional weather forecasting methods, like entrails reading, are still in use.
- Innovative means of weather forecasting are welcome, and most pastoralists are ready to use advanced smartphone technology to "understand rains".
- Climate change is mostly perceived not in increasing periods of drought, but at the micro-scale of alien plant encroaching, killing local grasses and preventing animals to feed.
- No quick response to climate change is envisaged, therefore trained personnel and technological tools are demanded.
- Special diseases like cancer and diabetes are more feared and recognised than the "common" ones.
- Zoonosis are not fully recognised by pastoralists, excluding anthrax and Rift Valley fever, notwithstanding brucellosis is everywhere; reason given: 'Animals are our life, they cannot harm us'.
- Bush accidents are a serious threat for male pastoralists, but not apparent in statistics at health facilities, where women look for service mostly (pregnancy and nutrition).
- Pastoralists are not environmentalists, but our concept of a "healthy" environment is not scientifically sound: they look for a *healthful* environment.
- New patterns of livelihood and density shall soon be exponentially connected to health by problems like pollution, conflict, epidemics, marginalisation.
- A Free, Prior and Informed Consent (FPIC) must be continuously obtained from the communities involved in the project area – not only from the local authorities – to prevent lack of awareness, participation and empowerment.

[87] Mengistu A, Pasquale B *et al*. (2019), *op. cit.*

[88] Most of the information in B cells derives from Salza A (2019), *op. cit.*; and Comberti G and Shamo T (2019), *op. cit*.

The North Horr semi-arid lands request a strict management of resources, women included. For Gabra pastoralists, girls are a blessing because they divert to the bride's family some bridegroom's livestock, becoming a capital-redistribution mechanism; besides, by such a dowry, both livestock and clan genic pools are shuffled. This influences the health status of both people and animals; furthermore, it prevents overgrazing due to livestock accumulation over one territory only.

The imbalance in expended energy by men vs. women may interfere with the health of people, animals and environments. Specific health-info and training packages should be delivered during outreaches to women and children to organise household units who may detect problems from their very insurgence. The fact that women are less mobile than men makes them good agents for management of local environmental resources, if gender biases about empowerment be bypassed by, as an example, diffused education.

Because of men's power over women, gender biases may even lead to women's death when health practices and decisions are involved. Gabra women deal with water: among them emerged a widespread non recognition of the relationship of water with disease. Animal health, being all livestock uniquely a men's property, is of little concern for Gabra women, although they recognise that it is more urgent to provide medicines for animals instead of curing people.

CELL C.1. In the Gedo Region of Somalia, like elsewhere, it is evident that people-cum-livestock *are* the environment they live in, with a totalising pro-action. In Gedo, Somali pastoralists perceive no difference when dealing with the three domains of OH: they might shift priorities and scales of single forms of health (e.g., by putting livestock health first, even against their own), but always consider them part of a *unicum*.[89] Need and sickness are considered by Somali pastoral communities of the area as shameful because they are caused by misbehaviour or envy; therefore, they are not to be fully manifested to strangers and may resound like white noise while planning public health interventions.

Local pastoralists have always been coping with uncertainty. In such a situation, change is the informative benchmark. But climate change is commonly perceived like by Nuur: 'There is no environmental change I noticed, starting from my young-hood'. Abdia concludes: 'This year it rained well, but this event comes only once every 10 years. You will see: next seasons will be with not enough rain. Anyway, no one can change the hotness, the coldness. Rain or no rain is out of our power. This is Allah's power'.[90]

As far as human health is concerned, the decisional process to access facilities is controlled by a sequence, clearly defined by all respondents: illness is recognised at household level (disorder) → the head (male) decides action → a sacrifice is needed (a-life-for-a-life reconstruction of order) → sacred people and places are called in (sheiks and mosques as moral regulators) → biomedicine is eventually approached (health workers and facilities). A common sentence – registered also in Filtu, where the health-seeking behaviour is quite similar – is 'disease comes from Allah' and therefore only Allah can cure it. All public health institutions have to deal with this self-feeding closed circuit.

About animal health, we compared our field data (perception) with VSF-Suisse's (hard info).[91] The respondents highlighted how some diseases remained common in local awareness (CCPP, mange and worms), while others were considered as not-existent any more in the area. As a cause, we have to consider the stereotyped answers reported by the CCM's spotter, who was not a veterinarian. There are also discrepancies in the perception of livestock diseases. For example, while common cold (*hargab*) in humans is not considered serious, CCPP (*hargab*, the same word used both for people and animals) is to be cured at all costs, vaccines included. Killer livestock diseases are taken lightly. Mohamed: 'Animals used to get meningitis and anthrax, but those diseases disappeared for good'.

[89] The C paragraphs, besides the cited full 2019 Gedo report, derive from Salza A (2020), *op. cit*.

[90] All quotes in C cells come from five locations selected by environment and pastoral economy: nomadic pastoralists in hilly rangeland, seminomadic pastoralists in plains rangeland, sedentarized pastoralists in an urban centre, agro-pastoralists along the river Jubba, destitute pastoralists in an IDP camp.

[91] VSF-Suisse, *LLRP-III Baseline Survey Report, Gedo Region of Southern Somalia. Focusing on Livestock, Veterinary Pharmaceuticals and other Medical Commodities (VPMC), Irrigation, Water supply and Hygiene Promotion Sub-Sectors*, Lifesaving & Livelihoods Restoration Project, Nairobi, February 2019.

Another important point is the fact that animal diseases are believed to be imported by migrants and improper management during transhumance. Ali: 'The diseases affecting our livestock originated from other animals that were not treated and vaccinated. They came from other areas'.

ROW 2. Study interest 2: Possible hindrances that prevent local communities to access the existing human, animal and rangeland health system.

CELL A.2. Besides distance and lack of money, in the Filtu area cultural biases, low availability of drugs and mistrust in health personnel are restraining pastoralists' health-seeking behaviour. Drug contraband across the borders with adjacent Somalia and Kenya is widespread, due to the higher availability and minor cost of illegal drugs. Negative aspects of this practice are related to the lack of control on drug composition, expiration date and conservation, with consequent minor efficacy and potential side-effects of treatments. All this triggers a negative feedback on the trust in "official" biomedicine.

Through the partner TriM, in Filtu it was conducted a thorough interactive mapping of health facilities, water points and artificial reservoirs (*birkad*), roads, flood-prone areas, open grass areas, pastoral trends in movement, main orographic features, all around 8 selected locations.[92] Besides that, in 2018-19, the above mentioned MSPs were engaged in mapping the different resources and services present in their territory. Each MSP group participated in transect walks aimed at creating a map of the community, highlighting: i) the general geographic features (rivers, water points, hills and mountains); ii) infrastructures (roads, public service structures, bridges and market places); iii) the human and animal health services; iv) the areas where animals live and move; v) other natural resources (vegetation and pasture). Discussions and group meetings within each MSP followed the mapping exercise, with the main objective of identifying the major problems affecting the entire community and suggesting feasible interventions that could become short-, medium- and long-term solutions. Identified priorities mainly refer to human and animal health, water sources and reservoirs to guarantee supply during droughts, and management of environmental resources.[93]

Regards to the access to human health facilities, the main obstacle is linked to the long distances that sick people are often forced to travel without being able to use public or private transportation. This is a form of triage, diffused throughout sub-Saharan Africa: only the medium severe cases reach referral health posts and hospitals; severe and minor cases are dealt with at home. In addition, at least some of the local Health Extension Workers (HEW) at health post level should be women; unfortunately, this is not always possible in the Somali region of Ethiopia. Thus, gender barriers arise, with village women who, not feeling comfortable in the presence of male personnel, prefer not to use the service.[94]

For the animal health sector there are very few operational structures at municipality level. The only functioning structures do not receive enough medical materials and technical support to respond to the requests of the communities.

After the implementation in Filtu and adjacent areas in Liben zone of the latest CCM OH project in 2018-19, while the baseline survey indicated that only 21.7% of the community had access to roads and transport services, at the end it was shown that 56.7% of the community has access to these services. Adequate health facilities passed from 46.6% to almost 100%, while the access to animal health facilities improved from 36.7% to almost 100%. These data are the result of interviews and questionnaires gathered by Ethiopian consultants using the CoBRA methodology;[95] they are not based on scientific data, but on the perception of the community, sometimes involved in the rehabilitation of roads and paths, an activity highly valued because it improves accessibility to the village and transport to health facilities. Similar results

[92] Cristofori E *et al*., in Villanucci A, *op. cit*., 2016.
[93] Pasquale B, *op. cit.*, 2020.
[94] Beatrice Pasquale, pers. comm., May 2020. Other parts of these Filtu cells derive from the work of CCM in the Liben zone of Ethiopia, reported in Pasquale B, *op. cit.*, 2020.
[95] See Abdulali S (ed.), *Community Based Resilience Analysis (CoBRA) Implementation Guidelines*, UNDP Global Policy Centre on Resilient Ecosystems and Desertification, New York 2017.

were obtained in the field of access to water and sanitation (latrines).[96] This highlights the feasibility and utility of long-term programmed interventions.

CELL B.2. The hindrances in North Horr – "shame syndrome" included – are systemic. Around the area, public health is somewhat structured by the sub-County, and health services are scaled in 5 levels: 1) CHV (a person with no facility); 2) Dispensary (Gas, Malabot, Balesa, El Hadi); 3) Health centre (North Horr and Dukana); 4) Referral hospital (Kalacha); level 5 is the General hospital in Marsabit, the County capital.

At community level, CCM is training health personnel: Community Health Volunteers (CHV: human health); Community Disease Reporters (CDR: animal health) and Household Health Assistants, in charge of OH strategy at community level. Notwithstanding these efforts, well integrated in the sub-County public health system, hindrances are the same we can see in cells A2 and C2 (Filtu, Ethiopia, and Gedo, Somalia).

For instance, private health services are flourishing and considered more efficient/available than public ones, if not cheaper. Medicines, both for humans and animals, are more and more diffused, but smuggled and counterfeited drugs are invading the area because of low costs; animal health posts are not contemplated throughout the area; human-animal health services combined are non-existent; likewise, diffused environmental control by local authorities is not available.

To bypass environmental health deficiencies, the partner TriM is implementing weather-monitoring activities, like weather-stations and systematic field reporting of location-based data using smartphones, where data are collected by means of the dedicated apps *TriM-Collect* and *3map*; they are then relayed by personnel and pastoralists, to be elaborated and rendered in predictive maps.[97] Another academic partner, DIST, is analysing climate history and trends.[98]

These ecologic activities may reduce some hindrances in OH management by pastoralists (e.g., foreseeing rains) and, therefore, are proactive to their referral to both human and animal health facilities, referral strictly bound to livestock necessities, that are considered a priority. Environmental issues, from droughts to floods, are very important for pastoralists' access to resources – health services included – but people appear rather fatalistic about climate change, although clearly identified in the progressive encroachment by exotic plant (e.g., *Prosopis* and *Calotropis*).

CELL C.2. In Gedo, access to human health facilities is not perceived as a big problem by the Somali population. Some people pinpointed a lack of drugs, but no complaints about costs. Distance might become the typical African triage system, if no transport is available. Nuria: 'We refer our sick children and adults to the available clinic and, if the patient is very ill, we refer to Dollow health centre using donkey carts for transport'.

Veterinary resources are very limited (above all, static facilities), and valued as non-existent. While in settled zones, like along the Jubba river, an informant can state that 'an animal-health post is available, with veterinary personnel visiting households every morning to identify the sick animals', a livestock market operator says: 'There are no veterinary clinics, not even in Luuq town'. Such discrepancies are mainly due to the features of the research from remote itself: although quite practical, it is inefficient in guaranteeing the consistency of the actual "wording" reported, while the stringer may be unable to convey the subtle difference between geographical idiosyncrasies and mere perceptions.

At the moment, vaccination campaigns are considered by the Somali in Gedo like the best available option for animal health, with some problems. Adan: 'Vaccines are not for sale. You will never find them anywhere. Only government or local NGOs give vaccines for free once a year'. We may infer that the lack of veterinary services is mirrored by the very narrow spectrum of animal diseases in people's descriptions.

Because of the rapid-assessment methodology, we did not manage to draw a map of the available human health and veterinary services in the 5 localities of the research; anyway a diffused community animal-

[96] Zewde F, Tsegay M and Beyene L, *End Line Study Report on Drought Resilience Capacity of Communities: Liben Zone of Somali Region, Ethiopia*, Daily Heroes Training and Consulting PLC, Addis Ababa, February 2020.
[97] Cristofori E *et al*., 2018 and 2019, *op. cit.*
[98] Vigna I, Bigi V, Pezzoli A, Besana A, (2020), *op. cit*.

health workers network appears to be somehow available at the private level,[99] while the Regional Government may provide the still-missing inventory of human-health facilities. The private sector is expanding, but contraband drugs (mainly veterinary) from Kenya are creating danger. This is a key issue in strategic healthcare provision.

ROW 3. Study interest 3: The different therapeutic resources, locally available and usually used/preferred for people and livestock care and keeping healthy rangelands (including traditional medicines, domestic and self-treatments).

CELL A.3. In Filtu, Somali pastoralists rely on a variety of practices to treat human and livestock diseases, like traditional medicine (use of herbs, manipulation, burning, etc.), religious treatments (*dua* prayers, amulets, other) and biomedicine (drugs and clinical procedures). We should not be enthusiastic about local remedies: in the mountains above Kuralle, the author witnessed extensive burns on the chest of children to deal with pulmonary problems; in another case, a mother said: 'Yellow vomit is a good sign of recovery from malaria'; her words were *matag dhacar*, where *dhacar* means "yellow", but only for disease: Somali pastoralists have a very specific vocabulary and classification about bio-systems, but a scarce knowledge about zoonosis.

Although incense, fat soup or camel milk (a panacea) are still used to reinforce human health, even biomedicine is becoming "traditional", generally by the use of human health broad-spectrum medicines (antibiotics, paracetamol, anti-helminths, antidiarrheal drugs, iron pills).[100]

Regarding livestock, the most diffused way of treatment is identified in self-care (administration of biomedical drugs like anti-parasites, tick-dip, or tetracycline, combined with traditional herbalism or religious practices), operated directly by livestock owners and/or "skilled" household members.

To manage rangelands, the utmost attention is obviously given to water catchment and maintenance. Some communities build terraces to prevent the soil from erosion, and may receive by projects and local authorities some agricultural tools and drought-resistant seeds ready to be planted. This might polarize population movements and densities towards the banks of Ganale and Dawa rivers, with an increase of hazard-prone agro-pastoral communities (floods and conflicts).

CELL B.3. In the North Horr area, the Gabra people stick eminently to traditional methods about health, even when the environment is concerned. Weather conditions, indispensable in deciding people's and livestock's movements in search of pasture, are controlled by predictive methods, like animal-entrails reading by specialists and horoscopes by traditional religion leaders (Gabra are not Muslims).

Climate change seems not to be worried about, but pastoralists are alert. Wario, aged 67: 'The climatic conditions? Everything is calm and going well. I am more worried about diseases, not climate change, but something strange is going on: *baddan* trees lost nutritional power in the last years'.[101] Guyo, aged 61: 'To forecast the weather we used entrails reading (*marumaan*), practiced by our specialist. Just after the rains, we send scouts (*aburu*) to find the best grazing areas, checking location, quantity and quality. Look at the clouds! That is the white sun inside a black cloud, the brilliant eye-of-the-storm!'. Ibrae, aged 58: 'Climate change is felt by everybody as an increase in temperature and reduction in the rain quantity and reliability. Weather forecasting is left to "future tellers" that can read the clouds for signs of rain. We use "sandal throwing" to divine future events of all kinds. Livestock behaviour is also attentively observed: for instance, if camels drink little and fast at the well-trough, it means rains are incoming. The small night-bird *bararato* chants signalling rain'. Salesa (El Hadi chief): 'With the elders we tried to design a partition of grazing areas to survive through the dry periods, but our rules were only partially followed by the herders'.

As far as human health is concerned, a mix of traditional and bio-medicine is the norm. Yattani, aged 61: 'When sick, we refer to Malabot dispensary, which is 18 km away. As far as I know, around here the most

[99] According to Ibrahim Awliyo of VSF-Suisse: 'There is no proper animal health system in place but there are private drugstores and also CAHWs who are providing treatments and disease reporting' (e-mail, September 2, 2019).
[100] Pasquale B., pers. comm., May 2020.
[101] All quotes in B3 come from Salza A (2019), *op. cit*.; pp. 34-49.

prevalent human diseases are malaria (*kando*), common cold, vomiting, pneumonia'. Ibrae, aged 58: '*Aloe vera* is boiled to a thick paste, and its crystals are dissolved in water and used as medicine for humans and livestock alike. For malaria, people are given this treatment because herders believe that bitterness kills the disease'. Isako: 'Here lives Buqata, a famous herbalist woman: people come to be cured by her traditional knowledge of natural medicine. To receive her healing, the procedure is to reach her house, accessible to everybody, no matter of age or gender; then you, as the sick person, first of all bring her incense (*lubadin*, a must) and then some presents, like tobacco, tealeaves, sugar'. Kame, a woman aged 30: 'I have delivered at home, the traditional way, being assisted by a trained birth attendant. When fever or cough are not strong, we use traditional medicines, like fuming; inside some boiling water we put leaves of a tree called *balsafi*, that we plant in front of our huts. We also use a seed called *fitto*, for running nose, headache and cold'.

Sickness is also considered a product of witchcraft. Talaso, a young woman: 'Once I put on a charm against the evil eye. It was made out of a flexible plant that can be divided and tied around somebody's left arm, together with a small piece of a black scarf; it contains substances like salt and special herbs for curing the evil eye. When I felt to be all right, I removed it'.

Hygiene is poor, as stated by a woman fetching water at the well: 'There is no use in teaching children to wash their hands: they have to drink water where human feet and animal paws mix'. Elema, a woman aged 67: 'Sometimes I get chlorine purifying tablets, but we may have to stay without chlorine supply up to 3 weeks. Anyway, we get no diseases from non-purified water: diarrhoea comes from food, not water'.

A similar mixed health-seeking is applied to livestock. Abutho, aged 67: 'To know a healthy animal, check its eyes, whether they are open and clear. A healthy animal looks healthy, throughout. The *itha* shrub gives problems to shoats because its thorns prick their lips and the sap causes ulcers: they end up being unable to drink milk or eat grass or leaves. We cure this by applying cooking fat on the animal lips'. Galgallo, aged 59: 'After rains we have a lot of bloating (*furfur*) of the livestock belly because of eating fresh grass, that is wet. We use Omo washing powder to induce burping'. An old vet-pharmacist assistant: 'I was a pastoralist myself: I understand all symptoms after so many years of experience with livestock. I help the clients: I sell all available veterinary drugs'. Chuluke, a woman aged 50: 'Animals are like farms for us. Whenever they get sick, we go to North Horr town to seek for medicines. However, if we manage to diagnose the disease, we use traditional medicine like tobacco (*tambo gese*). If we don't know the disease, we go to the pharmacy, explain the symptoms and get prescriptions and drugs from the vet shop'.

CELL C.3. Somali pastoralists of the Gedo Region are aware that very little is done for the environment at public health level; so people implement self-made practices of vegetation control (encroachment reduction by charcoal production), weather prediction (local knowledge about cloud colour and shape, and "star reading", notwithstanding Islamic vetoes) and self-awareness about dangerous man-made changes in the ecosystem. According to Shukri: 'A local form of adaptation is: leave the plants grow and do not cut tall trees'. Nuria: 'Important plants are disappearing, like the ones that gave us wild fruits when we became hungry. The only solution is to have rangeland in the responsibility of our village, because now it is no man's land'.

Traditional cures, both for humans and animals, were not thoroughly explored due to the limited time and scope of the research. Halima: 'Common cold, the disease we are all suffering from in this rainy season, can be prevented by eating protein food'. Nuurto: 'The only way we can prevent malaria is making smoke during evening time; then the mosquitoes disappear'. Mohammed: 'We have no bush doctors (*doctor baadya*) or herbalist healers: it is forbidden by religion'. Ali: 'Hygiene is different if you consider personal hygiene and family hygiene. Personal hygiene is to cut your hair or shave to protect yourself from lice infestation and skin diseases like scabies (*nadaamis*)'. Sumeya: 'We refer our sick people to Bantaal clinic for treatment; we also have another option, that we prefer: calling sheikhs from the mosque and reciting Quran on the sick person' (see cell C.1).

If compared to Filtu and, above all, North Horr, animal health is mostly left to veterinary biomedicine. Abdi: 'The vet drugs are provided from Beledxaawo. The community animal health worker keeps them in his house. When animals get sick or have problems, the pastoralists directly take them to him and he treats them'. Jamaal: 'Worms (*gooryaan*) are a common disease in Malkariyey. There is no traditional methods for treatment, rather than giving anti-worms tablets'. Husen: 'For mange (*cadho*) we can apply some plants

added with salt: it disappears and the skin of the animal becomes OK'. Naima: 'Ticks bite both animals and humans; they can bring disease from animals to human beings. What we do is that we take our animals to the CAHW and spray some poison: ticks will die, and no more troubles'.

ROW 4. Study interest 4: Perceptions, acceptability and behaviours of local pastoral communities towards mobile/static OH units (OHU).

CELL A.4. The long-standing practice in Liben zone and Filtu area of mobile vaccination campaigns and dedicated outreaches often clashes with the nomadic necessities of pastoralists. For instance, some vaccines need two separate administrations at one-month interval; the same applies to nutritional programs for lactating women and children. It may be almost impossible to know where the same households might be, due to the continuous movement (fusion and fission) according to weather (rain), resources (grass and water) and access (paths are sometimes impassable).

All in all, there is no opposition towards acceptability of OH Units, but they should be planned and integrated according to mobility probabilities (mobile OHU) and community decided-upon health-seeking hubs (static OHU). As Beatrice Pasquale puts it (pers. comm., May 2020): 'The concept of the mobile clinic is innovative and therefore requires time to be assimilated by the local population. Some perplexities remain on static clinics. Pastoral communities migrate, so one should identify a passage spot that does not change over time. If this location is not easily accessible, it could be complicated to develop and implement static OHU'. In any case, it is imperative to involve, in every step of the decisional process, members of the communities and the local authorities.

CELL B.4. One Health is a dynamic process, not a sequence of unrelated end-states. In North Horr we elaborated a 'pathway model' to be implemented among the communities. Like the mobile units of pastoralists, the OH project should move along 4 trajectories: 1) pathway to health; 2) pathway to water and pasture; 3) pathway to communication and social relationships; 4) pathway to modernity.[102]

With a OH mobile outreach clinic, CCM tends to support integrated health services (human and animal) in remote areas (40 target settlements) with trained staff at health-centre/dispensary level. The mobile clinic is considered very effective in emergencies and epidemic outbreaks. Main focuses are zoonosis, vaccinations, malnutrition in pregnant and lactating women (PLW) and children, common pathologies (diarrhoea, respiratory problems, malaria, salmonellosis, plus zoonosis like brucellosis and other common animal diseases). Mobile outreach activities include prevention campaigns and information dissemination about hygiene.

This mobile OH team counts on a veterinarian, a lab technician (when available), a nurse/clinical officer, a vaccination operator, a health-education expert, a nutritionist, an animal health supervisor, a community health supervisor. They are qualified to cure both people and their livestock and to perform first aid (accidents are common among pastoralists). The team supports community health committees and authorities, plus the CHV and CDR.[103]

Household Health Agents (HHA) are an innovation in the area. They are selected by the communities and are trained by CCM and VSF-G; specifically, they deal with participatory hygiene and sanitation (PHAST), mainly dealing with pollution of water and the use of pit latrines.

CELL C.4. No direct investigation was performed in Gedo about Study interest 4. Following the same indicators described in Cell A.4 (Filtu, Ethiopia), what can be inferred is a differential attitude: mobile OHU can be easily inserted in the communities' values (movement is a traditional imperative for pastoralists), while static units represent security and modernity, which can be considered an added value (by youth, women, IDPs) or not (by elders and old people). Consideration should also be given to the local feelings

[102] Elaborated from an idea of the OR assistant Abdikadir Kurewa, Kenyan anthropologist; see Kurewa AG, *Funerary Practices and the Materiality of Personhood in the Later Pastoral Neolithic Period in Kenya (3400-125 BP)*, thesis for the Department of Archaeology, University of York, 2018; pp. 15-16.

[103] From Guarino A (2019), *op. cit.*

about community ownership and expenses: the car involved in the mobile clinics might be considered herders' "property", and their management requested to be accounted for by the implementing health agents.

Comparing the table cells, similarities (common traits) and singularities (unique traits) do emerge. They are to be highlighted, in order to help preparing guidelines (local, based on singularities) and strategies (glocal and global, based on similarities). Hereafter we report some of these features, as an example to be expanded with further traits and information.

Similarities (among others) in Filtu, North Horr, Gedo areas:[104]

- Animal health and human health maintain a biunique relationship (traditional), but are not symmetrical: livestock's health matters more than the one of household members.
- Cultural features like shame (North Horr), religious fatalism (Filtu and Gedo), gender biases (throughout, and not only towards women; e.g., male accidents and the "bravery of the sick and the wounded") do count in health-seeking behaviours.
- Case seriousness, age, gender, distance, transport and costs are still the diffused "African triage" system.
- Environmental health is considered neutral by pastoralists: it is taken for granted even when it shows alterations (climate change, leaf nutritional loss, encroaching plants); due to the extreme variability of rainfall, temperature, grazing/water availability, uncertainty is here considered intrinsic to health (absence of disease).
- There is no or extremely limited implementation of Government/local authority environmental services; only some WASH activities are performed in the main settlements, plus awareness campaigns during outreaches.
- Traditional/religious healthcare and treatment are persistent and parallel to biomedicine.
- Veterinary resources are very limited (above all, static facilities), and valued as non-existent, although CHAWs are in some form available throughout (mainly private and self-learned).
- Both human and animal healthcare is relying more and more on privately acquired medicines than on referral to Government facilities; because of inferior costs and higher availability, this is leading to a diffused danger in using contraband, counterfeited, expired drugs.

Singularities (among others) per each location:[105]

In Filtu area:

- Human/animal health-related risks are ranked by pastoralists more in terms of environment (floods and bushfires) than of social hazards (conflict, disease).
- Water and grazing are considered reasonably available, when compared to medicines; in the meantime, human health facilities, as well as veterinary services, are being updated by local governments, and this is well perceived in the "health serenity" framework of the nomadic households.
- Cows are migrated to Oromya, and substituted by camels; probably related to plurennial shifts in the environment (climate change), this fact leads to a variation in movements (e.g., settling vs. long range pastoralism, disrupting the traditional routes) and nutrition (different values in milk production and nutrients), affecting both reachability to health facilities and personal health condition.
- Mobility is progressively and evidently reduced by services, like boreholes, livestock markets, agriculture incentives, schools, health facilities, pharmacies, shops (attractors).

In North Horr area:

- The mosaic pattern of ecosystems ("plaid" model) affects differentially the health-seeking behaviour; e.g., hilly places or salty water can influence movement patterns both of people and livestock.
- Socio-religious calendars highly influence pastoral timing; this is relevant both for animal health (overgrazing and disease-transmission during ceremonies, where all household's animals must attend) and for human health (impossibility to skip the ceremony, even if ill).

[104] For details, refer to the before-cited CCM technical reports.
[105] For details, refer to the before-cited CCM technical reports.

- The local population is still embedded in a healthcare milieu bound to traditional customs; for instance, common negative attitudes towards imperfection (left-handedness, evident disease, deformity, etc.) may prevent the proper healthcare to people.
- Gabra women have defined tasks in the livelihood management and no impediment to strangers (not so among the Somali); this allows easy access to information about the whole household's state of health (above all children); women are the more numerous in human health-facility referral and participation in outreach activities. On the other hand, animal health is the exclusive task of men.
- Motorbikes and smartphones are providing unexperienced technological assistance in health-seeking and weather control (a feature affecting all pastoral activities), with good results in terms of "health serenity".

In Gedo area:

- Density of population is at the base of changes in behaviours, even in healthcare; animal disease is attributed more to migrants than to endogenous outbreaks; human disease is correlated more and more to pollution, overcrowding and exhaustion of resources; as a response to density and composition shuffling, people become "opportunistic pastoralists".
- Women are being empowered by the possibility to work for a salary inside IDP camps.
- Camels are losing their status as "walking capital", disrupting traditional values and household power; this affects in many ways the healthcare decision-making.
- The health services of IDP camps, usually controlled by international NGOs, are preferred**,** becoming prevalent in distribution of services; "artificial" survival locations become attractors.

The table we drew and analysed allows a limited room for manoeuvre. Most of the immaterial values of importance for the herder are left out. These need to be plotted against the table to evaluate and control its expansion, reshaping and evolution. It is a complex operation, but let us try to answer the riddle by the Californian artist Bob Miller: 'How would you suspend 500,000 pounds of water in the air with no visible means of support? Answer: Build a cloud'.[106]

Study.com

[106] Cole KC, *The Universe in a Tea-Cup*, Harcourt Brace, New York 1998; p. 43.

SECTION 4: Adding volume, from a table to a matrix

The pastoral SES of the Greater Horn of Africa is not *Flatland*.[107] The above-analysed 2D table, useful in connecting Study interests (rows) with local responses (columns), needs a third dimension: the variables and processes of complexity. They lead to a 3D matrix, if we take into account qualitative drivers to system evolution (vertical dimension) on top of quantitative observations (horizontal dimension).

A matrix volume contains the dynamic rows and columns of a table (a surface), but this flat "fabric" expands to a third dimension in order to accommodate qualitative, non-linear data (culture, climate change, behaviours, health concepts, etc.) of the observed region. Therefore, as we highlighted before (p. 8), the systemic approach implicit in all OH operations – from data collection to rangeland management and the delivery of health services for humans and livestock – is not the sum of data about human, animal and environmental so-called "health", but their product. Adding numbers does not make a One Health System; the complex interactions of field data and their perception and interpretations do.

Because there are many possible mathematical solutions to a non-linear model of a SES evolution – and no one "correct" answer –, quantitative solutions, although useful, are only complementarily valid in the domain of cultural and individual perceptions and behaviours.[108] In our matrix, the third dimension is therefore related to change and evolution, with health-drivers connecting outer (environment and culture) and inner (perception and microbiota) dynamics.

The visual representation of change is difficult. You have to visualize our table: put it flat on the ground. In time, when under stress from drivers that are external (e.g., IDP migrations or good rains) or intrinsic (e.g., gender biases or health facilities conditions), each cell produces in the "air" above it a continuously variable volumetric "shape", representing the changes induced by the drivers.

Instead of being a rigid cube, the portion of space above all cells expands, mutates and dissolves like a cloud. It may look like a dust whirlwind, a swarm of locusts, a rain nimbus or a cybernetic data-store. In the Greater Horn of Africa, pastoralists follow an uncertainty-based fuzzy logic,[109] like clouds do. As Richard Feynman, physicist, said in Los Alamos in 1945: 'It is really like the shape of clouds; as one watches them they don't seem to change, but if you look back a minute later, it is all very different'.[110]

Mobile resources and derived misconceptions

For pastoralists, change (mutation of essence) and movement (mutation of position) are imperatives, due to their erratic environment. In this framework, they can count on what the author defines the fifth cardinal point: the "ego centre".[111] This means that nomadic pastoralists – like inside the majority of the households in the described areas – point their compass in a round, ever-changing horizon that is moving along with themselves and their animals. Therefore, their perception is always modified by perspective, colour, smell, sound. According to Greta Semplici:

> Space moves through continuous reconfigurations of the lived space-timescape across coexisting socio-ecological niches. Resources are co-produced by the joint action of biotic organisms (people, livestock, wild animals, insects, and many more operating in the territory) and abiotic factors (rain, water, soil, and the like) moving along with a mobile landscape. In this way, resources are more than mere "things", but are the product of a relationship.[112]

For pastoralists, all this holds in a "Perfect World". Alteration is in progress, though. Modernity is the main "matrix glitch" that chaotically alters the relationships in the herder's livelihood.[113] Modernity is both

[107] Abbott EA ("A Square"), *Flatland: A Romance of Many Dimensions*, Seeley & Co., London 1884.
[108] Berkes F, Colding J and Folke C (eds.) (2003), *op. cit*.; p. 7.
[109] Fuzzy logic deals with uncertainty, where truth values of variables may be any real number between 0 and 1; see Kosko B, "Fuzzyness vs Probability", *International Journal of General Systems*, Vol. 17, 1990; pp. 211-240.
[110] Cited in Ulam S, *Adventures of a mathematician*, Charles Scribner's Sons, New York, 1976; preface to 1983 edition.
[111] Salza A, *The fifth cardinal point. Mobile horizons in Africa*, paper for the VI edition of *Colloquia* festival, Foggia, 2014; see also Ingold T, *Lines: A Brief History*, Routledge, London 2011; p. 12.
[112] Semplici G (2020), *op. cit.*; p. 342.
[113] Glick J, *Chaos. Making a New Science*, Viking, Random House, New York 1986.

an attractor (when space is considered) and an accelerator (when time is considered). OH projects concur in modernising pastoralists' health-seeking and health-care behaviours; therefore, they increase the evolution of the system.

The matrix we have described is also altered in the third dimension by paradigms and misconceptions inside alien decision-makers. The fact may hamper the use of this matrix when OH projects' work-plans are to be transformed into practical actions. Like we did before about the taken-for-granted "need" among pastoralists (see pp. 23-24), as another example of misconception let us take Study interest 1 (Row 1), and the "perception" to be analysed. As a component of social cognition, perception is a qualitative variable, highly volatile and individual-response biased. According to neuroscience, perceiving is a way of acting.[114] Perception is not something that happens to us, or in us: it is something we do. In a feedback cycle, actions lead to enhanced perception by means of the working memory, expanding the person's imaginal world about health, to stick to our field of interest.

Household members-cum-livestock tend to what the author defines "health serenity", a state of mind about being reasonably safe and at ease inside the inner (biota) and outer (ecosystems) environments.[115] This attitude is not measurable, and if we do so, it is analytically wrong: the "quality" of behaviour is non-linear because it depends on the dimensions of sociality and culture. The very concept of "health" changes the shape of our matrix. According to James Trostle, of the Trinity College at Hartford:

> Rates of morbidity and mortality are determined in part by cultural scripts that specify how, where, and when to behave in certain ways. The influence of culture can be seen in how people care for symptoms before they receive a diagnosis. Groups vary in their willingness to undertake preventive measures; they vary in how they perceive and classify symptoms. Across the world, people employ diverse markers to decide who will be labelled disease-ridden or contagious; they differentially rank which diseases are seen as important or unimportant. What treatment, if any, sick people choose, whether they take medication, how they manipulate their diseases for other ends, whether therapy succeeds – culture influences diseases through these pathways as well as through the patterned work of nerves, muscles, and bones.[116]

Even down-to-earth situations contain – by the very nature of SESs – ambiguity. For example (Cell A2), in Filtu resettlement plans elicit twofold responses by pastoralists. On one side, the concentration of human and livestock population in areas equipped with services (water points, schools, health facilities, markets etc.) rips off the best grazing lands for an agriculture-based economy, increasing the human/animal density and reducing the availability of pastures; therefore they undermine the pastoral way of life. On the other hand, social services in resettled sites are ideally considered positive and attracting.[117] The choice is oscillating.

Sedentarisation trends and modernity cannot be stopped or deviated. Future planning and interventions should consider the coexistence, at the same time and place, of both nomadic and agro-pastoral communities, with the target to provide differential high-quality services (mobile/static) to an "augmented" multiplex pastoralist. In our matrix, an example is given by the Gedo Region where, for instance, density is altered by forced migration; many grazing lands are inaccessible because of conflict; women are getting jobs and cash; camels are not a status symbol anymore; pastoralism is liquid.[118]

Here time comes in: it is a high potency driver in SESs. Feelings, perceptions and behaviours change with time, just like weather and climate, influencing decisions about the future. Traditions are repeatedly invented during a community's history. Contrary to prejudice, pastoralists are well connected with time and

[114] Noë A, *Action in Perception*, MIT Press, Cambridge (Mass.), 2004, p 2.

[115] The concept was elaborated by the author after an experience in Burkina Faso, where a "food serenity" model was developed in 2012 at Ouagadougou, during the meeting "Erasmus Solutions in Cooperation (ESC)" with Yelamani (local NGO); food, like health, must be available, safe/sane and certain/secure.

[116] Trostle JA, *Epidemiology and Culture*, Cambridge University Press, Cambridge 2005; p. 2-3.

[117] Vrålstad K (2012), *op. cit*.; p. 32.

[118] Salza A (2020), *op. cit*.

change, living nowadays inside a "pastoralist-non pastoralist" *continuum*, with multiple identities based on accelerated community history and individual trans-performance.

Somali say: 'The world is like a shadow: in the morning it points towards one direction, in the evening towards the opposite one'. A SES is sensitive to initial conditions, and small variations can bring vast, rapid deviations in reality, perception and consequent behaviour. Therefore, the entanglement of time, change, adaptability and transformability shapes the future of a pastoral SES and its acceptability by a population (Cells A.4, B.4 and C.4). Adaptability is the capacity of actors in the system to manage change in time; transformability is the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable.[119]

For instance, in Kenya it may be extremely difficult to change the attitude of the Gabra towards their preferred animals. For them, camels – defined in Gabra language with at least 16 words[120] – are considered kin to people, as reported by Baraqo: 'Fever (*kando*) comes to humans and animals alike, after rains and before dry spells; for our brother camels, the agents are *kitan shilmi*, camel-flies'. On the opposite side, herders around Filtu now send their cows to the markets in Oromya, because camels are more resistant to incoming desertification. The same happens in the Gedo region, but for a different and more persuasive reason: there, all livestock seems to lose status-value while opportunistic pastoralists face the ubiquitous cash economy of modernity.

Even hazards are "different" in the herder's mind-set, if compared to our "worries" about them. A research in East Africa stated: 'The heterogeneity of pastoralists' risk assessments is apparent in our data. No one factor was cited as a risk by as much as 80 % cent of respondents, and only food and water access were cited by half the sample'.[121] This heterogeneity must be recognised: individuals' expressions of risk assessment reflect composite factors: biophysical characteristics of a hazard, respondents' socio-economic condition, and their cognitive understanding of and ability to dealing with the prospective risk.

In all the areas under scrutiny, planners and decision-makers are also facing the challenge to bypass the "Transhumance Route Myth". In North Horr, a field research dated back in 1985[122] already demonstrated that a household's movement-patterns are related to decisions by the family head, household composition (youth vs. women and old people), family ties, type of livestock, access feasibility, and not to functionalist invariants like seasonality or grazing areas. The length of two households' compared trajectories were, in the same period, season and area, 177 km and 25 km.

Few studies have taken up a landscape perspective; as a result, they give more attention to "places" rather than "paths", diverting attention from the very characteristics that distinguish nomadic from sedentarized societies. According to the Kenyan anthropologist Adikadir Guto Kurewa:

> The physical migratory paths across which livestock move and are exchanged represent a signpost that conjures the social landscape and the web of social relations and memories of the past, as well as building of future alliances along paths where animals are exchanged as gifts. The metaphor of "path" among pastoral societies is crucial for building real and symbolic capital in terms of both human relationships and herds. In addition, the metaphor also extends beyond the physical and social world to include anatomy and physiology – what one eats moves along the "food path".[123]

Plotting transhumance routes is not going to change the haphazard movements that pastoralists decide to follow according to their ritual calendar (North Horr), or density (Gedo), or risk reduction (Filtu). If we stiffen the "breathing system" of pastoralists along pre-determined routes – although derived from a number of individual statements – we are going to promote a socio-ecological emphysema.

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[119] Adapted from Walker B, Holling CS, Carpenter SR, Kinzig A, "Resilience, Adaptability and Transformability in Social-ecological Systems", in *Ecology and Society* 9 (2), 2004; art. 5.

[120] Tablino P, *The Gabra. Camel Nomads of Northern Kenya*, Paulines, Nairobi, 1999; pp. 297-98.

[121] Barrett C, Smith K and Box PW, "Not Necessarily In The Same Boat: Heterogeneous Risk Assessment Among East African Pastoralists", *Journal of Development Studies*, 37:5, 2001; pp. 8-9.

[122] See IPAL's technical report F-3, *Economics of Pastoralism in Northern Kenya: The Rendille and the Gabra*, Part 2, by O'Leary MF; UNESCO, Nairobi 1985; Maps 3.9 and 3.10; pp.182-185.

[123] Kurewa AG (2018), *op. cit*., p. 15.

Pastoralists are inside the world history: they *live* modernity. Pastoralists' versatility and fast response to innovation is demonstrated by the new technology that CCM, via their partner TriM, implemented in the Filtu and North Horr areas under scrutiny. There, bottom-up participatory data about weather and range condition are being collected and processed (top-down, from open source satellite information and dedicated platforms) to provide tools 'able to transform data into meaningful information for prompt reactions to change and disaster risk reduction'.[124]

Source: Google

Among pastoralists, oscillations and sudden events trigger transformations and adaptations. It is an everyday practice, where flexibility and resistance (not resilience) are constantly performed. In Filtu, people fear floods and bush-fires more than conflict. In Gedo, local pastoralists deal with the refugee "invasion". In North Horr, after the extreme rains of 2019-20, billions of locusts (*Schistocerca gregaria*) arrived in bursts. 'This is the end of the world!', commented a learned Gabra.[125] A perception, not necessarily the future.

[124] TriM (Translate into Meaning), *Know your weather, understand your risk*, brochure, Turin 2020.
[125] Cristofori E, pers. comm., February 2020.

SECTION 5: A Plural Health

In a world where "health zero" is death, health is not a right. Ask viruses. You have a right to the best available cures by the best possible health system, whatever it takes. That is all. And, as stated by WHO, health is not a mere absence of disease. The fact is that "disease" and derivatives (illness, sickness) are polysemic words: they sound differently according to places and people. For pastoralists, losing health is a social event that affects the entire social group and their animals; decisions concerning the treatment and the resources to apply are taken within the household group, and are related to family and gender roles and inter-relational dynamics.

That is why we further explore, hereafter, approaches, remarks, recommendations by CCM after the interventions in Filtu, North Horr and Gedo. As stated before (see p. 23), throughout the description of the integrative material, we deal with the entangled OH domains in a sequence: i) environmental health, ii) human health, iii) animal health.[126]

Filtu

In Filtu, Ethiopia, the three classical goals of OH – "healthy people, healthy animals, healthy environment" – have been researched by CCM under a different perspective, considering determinants as vectors:

- environment *for* health/disease;
- livestock *for* health/disease;
- people *in* health/disease.

Filtu environmental context is the feedback system for pastoralists seeking health for themselves and their livestock. This relationship is not peaceful, since it may elicit defensive responses. This means that a "healthy environment" is not necessarily providing health to pastoral communities: a repulsive disease could be the unwelcome answer. As noted before, we should think in terms of "healthful environments".

Pastoralists need grass and leaves, both derived from rains. The consequent hard strategy is 'We follow the rains, wherever they fall'. Environment is embedded in culture: throughout the Greater Horn of Africa, pastoralists developed a "vegetal geography", evident in the toponymy they use. Plants and features provide the herder a mental map to follow with patterns of land use: goats and camels must be driven to bushy areas since they are browsers; sheep and cows need grass, being grazers; both groups have to be taken to salt licks, a combination of minerals and water.

The construction of water points (boreholes and *birkad*) partially modified the paths of pastoralists, that now gather around these sources. Side effects of the process are i) overcrowding of adjacent grazing areas; ii) development and spread of water-borne diseases; iii) inadequacy and malfunctioning of the supply.

In Filtu area, the environmental perceived risks are droughts and floods; moreover, rapid climate changes affect the seasonal and geographic human/animal disease distribution, challenging traditional prevention methods and behaviours. When climate change combines with conflicts, farming land expansion, and unavailability of proper services, the multi-dimensionality of disasters poses actual threats to pastoralists' survival, not only health.

In Filtu, CCM analysed the structural and economic hindrances preventing pastoralists to access the human healthcare facilities. Local practices towards disease management are embedded in Islamic religious conceptions. Biomedicine's exclusive focus on organic-biological dimension of disease is one of the major factors preventing patients' compliance. Moreover, socio-cultural contexts shape local ideals of wellbeing.

Therefore, in the case of human health, pastoralists privilege traditional/religious treatments, private services (pharmacies and mobile health workers) and self-administration of biomedical drugs (often obtained by contraband).

[126] All information throughout the OH locations is derived and edited from the above cited technical reports and field notes.

Governmental health workers face challenges related to the lack of resources and transport. Contrary to the interest shown by animal health workers towards human health, they seem to underestimate the importance of animal health and the risks related to zoonotic diseases. Some recommendations:

- Reconsider the importance of spiritual/religious dimensions of health and sickness, and involve religious and customary leaders in health education campaigns, by a peer-to-peer negotiation of alternative perspectives.
- Valorise and enhance pastoralists' good practices towards hygiene and risk prevention.
- Enhance quality of services about drug and equipment supply, manpower skills and tools (*i.e.* transport means) and healthcare structures.
- Enhance healthcare workers' awareness of the importance of zoonotic diseases, of the need to cooperate with animal health workers and to establish relations of trust and compliance with patients.

Pastoralists' everyday practices are all meant to ensure the health of their livestock: from regulation of reproduction, care of new-borns, the nourishment and management of the herd, down to the treatment of diseases. In Filtu, the survey focused on local knowledge about animal sicknesses, compared with veterinary conceptions. Among all household members, CCM remarked a lack of awareness on zoonotic disease and the persistence of harmful practices related to the use of infected livestock's meat, milk and leather. As seen before, both pastoralists and animal health workers complained about the presence of diseases not yet scientifically identified. To partially redress the situation, a local team elaborated for CCM veterinary manuals and materials (translated also in Somali), combining local values with scientific methods.[127]

Recommended actions were:

- Valorisation of local good practices to livestock's health and implementation of awareness campaigns about side-effects of harmful practices.
- Training of animal health workers and valorisation of household members' vet skills.
- Implementation of participatory epidemiological research to identify unknown animal diseases.
- Enhancement of drug and vaccine supply and distribution, to counter-balance the use of contraband drugs.

The main result of the OR is the participatory identification, discussion and acknowledgement of intervention axes to guide future planning and intervention in the area (see also Section 6):

- Integration of the human and animal healthcare delivery systems.
- Enhancement of the animal and human health services.
- Training and capacity building of human resources involved in healthcare.
- Awareness and demand creation by Information and communication.
- Economic interventions (e.g., revolving funds, livestock marketing, insurance, access to credit).

North Horr

In North Horr, Kenya, we had evidence that, if medical doctors tend to consider the object of OH only any form of zoonosis, the veterinaries follow up (but they are more community-based and prone to listening to pastoralists), while environmental experts are utterly absent, if not for climate/weather issues. The ongoing project management is currently redressing this flaw, but results are still to be analysed.

The field OR understood that Gabra pastoralists depend on four main grazing areas which they exploit during the different seasons:

a) Didgalgalu-Huri hills: a vast grassland on lava plains, used as habitual grazing ground, but lacking water.

[127] Karato Kapitano B, *Training Manual on Zoonotic diseases for community-based Animal Health Workers and veterinary sub-professionals, Filtu, Liben Zone, Somali Regional state of Ethiopia*, CCM Technical Report, Addis Ababa 2017; see also his "Report on mapping veterinary services in selected *kebele* of Filtu and DekaSuftu *woreda*, conducted in August 2017".

b) Chalbi desert and the zone to the north east: it has water all down the east side, with wells but it has insufficient grass to support long periods of grazing; besides it is liable to regular floods.
c) Kanangos, Dukana and El-Yibo: lava scrub interspersed with sandy scrub country, with exceptional grass, but limited water yields.
d) Lake Turkana shore, sparsely grassed, with permanent water, used during severe droughts.

The vegetation around the main settlements had been negatively impacted, because formerly mobile households now permanently settle near water or trading points. Families around the settlements only keep from one to three camels and some shoats, just to provide milk.

The OR's information about vegetation health was scanty and not scientifically sound. A botanical and ecological expertise – about vegetation involved in livestock feeding behaviour and protein need – is to be recommended in any OH project, because of the global impact of grass and leaves on nutrition and health.

Indications about availability and condition of pasture are an obvious tool to enhance resistance in pastoralists' health control of their environment, but non-accessibility to grazing land is a sort of "environmental disease" in the perception of pastoralists (see their fear of floods).[128] Also special environments (sacred areas, buffer zones, disputed hotspots, hazard-prone vegetation associations, unhealthful ecosystems, others) should be dynamically mapped.

After grass, the second limiting factor for pastoralists is water. The modernity-induced density of people and livestock in towns and around boreholes or permanent water-points brings the concentration of faecal waste to health-affecting levels; as we witnessed during our mission, this happens mainly where the water table is almost at ground level – like in North Horr town and outskirts – or where ameliorated wells are excessively exploited with their previous natural filtering diminished by concrete reservoirs and high overtake.

In North Horr, pastoralists are not doing much about climate change, if not rearranging routes or evolving avoidance strategies against infesting "new" plants. At the moment, though, in Gabraland long-range pastoralism is being substituted by the polarisation of sedentary home-bases and long-distance forays in search of "new" grazing areas, with a lot of environment pollution (concentration of waste, plastics, chemicals, dip treatment for livestock, etc.). In the meantime, variations in temperature and rainfall are tending to values never experienced before, even if, in a dryland where only few drops fall in a rainy season, a drop more or one less may appear to be insignificant. But in a non-equilibrium environment, threshold levels are very sensitive: livestock and plants may be at their endurance limits, even if people do not perceive it.

Strict privacy about personal health *défaillances* is a responsive asset: it highlights the survival of the fittest, even if only as a social show. The pastoralists around North Horr were reluctant or vague about their health status and the most common diseases of their households. They tried to get rid of our indiscreet questions by a blunt 'malaria and common cold' (by men) and 'diarrhoea and stomach/backache' (by women). The local perception of diseases affected the field-observed poor health-seeking behaviours. Even local medicine and its remedies should be furtherly explored, in order to build a bridge, connecting disease with sickness and illness, i.e., hard medical science with the society and the individual in sufferance.

OH scientists inform us that 60.3% of emerging infectious diseases (EID) result from zoonoses and have been increasing in recent years; on the other hand, the majority have their origin in wildlife (71.8%), not in livestock.[129] The deep relationships with their animals might explain why pastoralists in Kenya (and Ethiopia and Somalia too) have a very low knowledge of a zoonosis like brucellosis, present everywhere in the area. We found out that pastoralists *do* live in a brucellosis-dense environment, being milk their staple food; of course, they know there is such a disease around, but they do not see how their animals might directly harm them. Additionally, having not acquired any awareness on causes/effects of certain human diseases, the locals still perceive that these could be associated to a curse from an elder or a malevolent witch.

[128] As a reference, use Map 15, "Ratings of restrictions in accessibility for livestock regarding landforms and soils", by GTZ-Ministry of Livestock Development of Kenya, *Marsabit District*. *Range Management Handbook, Vol. II,* Nairobi 1988.

[129] Frank D, "One world, one health, one medicine", *Canadian Veterinary Journal*, Vol. 49, November 2011; p. 1063.

Following this knowledge gap, an awareness program about zoonosis should be considered a priority in the OH project's development. Malaria (erroneously but firmly shared with the fellow-camel's health) was a common issue in interviews, but its cycle is not understood, leading to poor prevention.

Moving around in the North Horr area asking questions about human health facilities was a delicate matter. The fact that our random-based methodology did not take "appointments", permitted us to come up with "fresh" information, and the health personnel were all very cooperative and open. According to interviews, major improvements were asked about: i) simple laboratory services to facilitate accurate diagnosis of diseases, subtracting it from deregulated private practice; ii) public outreach programs, iii) awareness and actions about Water, Sanitation & Hygiene (WASH). For instance, the team observed that almost all visited health centres were equipped with malaria self-testing equipment, making it easy to diagnose the disease; but prior to this, it was diagnosed on certain symptoms, such as fever, headache and loss of appetite, which in most cases lead to misdiagnosis: therefore, people started to trust private laboratories more than the public-health ones. On the other hand, the diffusion of private pharmacies may lead to negative health (e.g., antimicrobial resistance).[130]

Human health facilities are particularly weak about "new" diseases like cancer. The patients are usually referred to hospitals with cancer-treating facilities, wherefrom most cases are referred to other hospitals in Nairobi. All this sums up to extra costs that can hardly be met by the affected persons and their families. In the project area, currently, only the hospital in Kalacha has cancer diagnostic and treatment facilities; however, locally there are not enough drugs and medical personnel with sufficient knowledge of the disease.[131]

Around North Horr, CCM tried to avoid an excessive focus on zoonosis during the OR. Zoonoses result from various anthropogenic, genetic, ecologic, socioeconomic, and climatic factors. These interrelated driving forces make it difficult to predict and to prevent zoonotic EIDs,[132] as demonstrated by the SARS CoV-2 pandemic, an extreme reminder of the role animal reservoirs play in public health. Therefore, a quick action towards filling the knowledge-gap about zoonosis was strongly recommended.

The North Horr sub-County does not have permanent animal health facilities, but only mobile interventions on demand, or during outbreaks, in addition to vaccination campaigns. Therefore, people mainly rely on traditional knowledge and experiences to both diagnose and treat sick animals. A further investigation about pastoralists' understanding (in any ways) of the transmission of disease and its agents, like bacteria, parasites and so forth, is recommended.

From the field data it became visible that the availability of modern livestock drugs and veterinary services, let the pastoralists learn a great deal about bio-medicine, and they are now using this knowledge to treat their animals, e.g. to contain ticks or cure worms. A delicate issue was raised about animal vaccinations. Gabra rely on few selected milch animals, that provide milk to the whole household (often the only available food); therefore it should be prudent to conduct the vaccination programs during the rainy season, when milk is in plenty, so as not to affect animals' capacity to feed especially the young ones (human and animal). We have been told by pastoralists that Community Disease Reporters recommend not to drink livestock milk for ten days after vaccination. This has no scientific validity according to Antonia Braus, veterinarian and desk officer from Berlin-based VSF-G, but our field data report the negative perception of the herders. A suggestion: conduct vaccination campaigns only during wet seasons, when milk is in plenty; this will allow the herders to plan the best schedule for the vaccination of a section of their animals, while utilizing the rest for milking purposes.

Gedo Region

In the Gedo Region of Somalia, the field data provided CCM researchers with a dynamic health system of a pastoralist-not pastoralist *continuum* (see p. 37), that is related to scale:

[130] See Zinsstag J *et al.* (2011), *op. cit.*; p. 153.

[131] Kurewa, AG, *Report from the Assistant Anthropology Expert of the One Health Operational Research Deployed in North Horr Sub-County*; CCM, Nairobi 2018: Ch. "Pathway to health".

[132] Jones KE *et al.*, "Global trends in emerging infectious diseases", *Nature*, 451, March 2008; pp. 990-994.

1. At micro-scale, the individual's health is not considered, and the household routine and consequent livestock care are prevalent.
2. At medium-scale, a specific and reliable interface between the community and the first-level health worker is the limiting factor about health knowledge and disease control/cure.
3. At macro-scale, the top-down, "health productive" public system ignores local cultural hindrances, and singles out undifferentiated individuals.

In this structure, the individual changes resolution – from micro to macro – according to his/her performance inside the Somali society's constraints about health/disease, that, in turn, shape the individual by its institutions and health systems.[133] The Somali society might have a strong pre-architecture, inserting children and adults into a defined cage of knowledge and prescriptions about health, but *negotiation* and *performance* provide a feedback *to change* the society and the lived environment.[134] This impermanence of society and culture permits the individual to perform at the different scales of his/her "perceived health", passing with ease from traditional healers to Quran reciting, from personal ties with community health-workers to hospital referral.

In Gedo, all respondents about the environmental issue seem to minimize climatic change: it is not perceived as a crisis (like it is), but a temporary variation in the season pattern, a weather phenomenon the pastoralists are well acquainted with. Of course, besides previous knowledge about climate uncertainty, religion comes in: not much to do against Allah's will about floods and droughts. This somehow contrasts with the repeated mantra in all locations that 'environmental problems are manmade'; to a finer reading, though, one clearly sees that deforestation is considered different from climatic variations. Agriculturalists are more knowledgeable about soil destruction, while pastoralists are predictably worried by fluctuations in rainfall.

All agree about a certain loss of nutritional power in plants and the disappearance of edible wild fruits, a question absent in all NGOs' agendas. Global warming is far beyond any control by pastoralists, and not only, but in Gedo, climate change is perceived differently than in other Greater Horn areas, where the topic appears more media-related than actually perceived by the herders.

From interviews and observations, it is clear that in all locations of the Gedo OR, modes of enquiry, types of pastoralists and environments, the perception of health, disease and cure is homogeneous and standardized even in wording (although this may be an outcome of the uniform translation by learned people like the stringer or some spotters). Respondents were sincere, but complacent. For instance, consider the two most common diseases according to the interviewed families: common cold and dengue. In the top ten diseases at Dollow HC, dengue, the most feared disease according to our informants, ranks only ninth (see p. 15).

An interesting fact is that both among the IDPs of Kabasa and the local population there was no self-indication of iatrogenic diseases, those generated by wrong practices and treatments by the health personnel. Apparently, this means that all respondents had a good degree of understanding, trust and satisfaction in the available health personnel, mainly lamenting about costs and lack of drugs and structures. Though, this may also reflect the incapacity of conceiving the idea of getting ill out of biomedical practices in hospitals or Health Centres.

For Gedo opportunistic pastoralists, animal rearing is still a priority, at least in their perception. Camels may have lost their status, but goats and poultry provide easy protein and are much more manageable in an increasingly dense and barren habitat. Once again, all typologies of respondents had a monochord discourse about animal health. It is conform-copy to a recent report from the same area by VSF-Suisse:

> The livestock diseases/cases that commonly featured were: in Goats (CCPP, Pneumonia, worms and PPR); Cattle (Black quarter, worms, and pneumonia); Donkeys (worms and mange) and in Camels (*Trypanosomiasis*, worms, *Haemorrhagic septicaemia* and mange). CAHWs and veterinary team's services were acceptable in the community, even though more households experienced difficulties in affordability of vet drugs due to poverty, low income and

[133] Wolf ER, "Inventing Society", *American Ethnologist*, Vol. 15, November 1988; pp. 752-61.

[134] Full discussion in Hinde RA, *Individuals, Relationship and Culture. Links Between Ethology and the Social Sciences*, Cambridge University Press, Cambridge 1987.

high cost. Most pastoralists sourced for veterinary pharmaceuticals from local private vet pharmacies that procured them mainly from Mogadishu and Nairobi.[135]

An important point is the fact that animal diseases are mainly believed as "imported" by migrants and improper livestock management during transhumance (overcrowding, mixing, poor control). Here we see the "invasion syndrome", typical of high-density locales. All in all, we may assume that the uniformity of our informants' answers is not simply due to quick translations or mischievous disguise, but to a perception of incoming "good times", a space-time where only common cold and worms may interfere with the wellbeing of all household members and their livestock.

"Waiting for food and rain" *David Verberckt*

[135] VSF-Suisse (2019), *op. cit*. ; p. 2.

SECTION 6: The Freewheeling Herder

The cloud catcher may get data about humidity and temperature; she may fail in getting a good picture of vegetation; but what she really wants is to divine the future: 'When is it going to rain?'.[136] Findings, Failures and Future are the core elements of any research narrative.

Above, we reported a compendium of CCM's findings in the three study locations. Some of them are of relevance, like the deep involvement of Filtu people, local authorities and researchers in One Health, or the willingness to employ high- and low-tech devices to monitor weather and environment around North Horr, or the discovery of the urban dweller-farmer-agropastoralist-nomadic pastoralist that appeared to be the "way of life" in the Gedo Region.

Failures are intrinsic in scientific and social research, but they were somehow contained by the full involvement of all stakeholders in elaboration, implementation and decision. The main failures, in most cases, were due to the experienced inability in *physically* reaching and following nomadic pastoralists along their grazing territories. This must necessarily be overcome by the diffusion of a model that employs a symbiotic field/remote researcher, like the one experimented in Gedo.

Past researches and actions provide us with projections of the future. Some Somali say: 'If you live long enough, you will see how the camels are born'. This is a city proverb, since the calving of camels is a normal thing for a pastoralist. It may be a dipole to decide the future of pastoralists in the Greater Horn of Africa: all urban or all nomadic. Of course, there are going to be in-betweens, like shades in a scenario, but the binary option is the most tagged by policy makers.

This is evident in the dangling policy about health facilities for pastoralists: are they going to be static (urban) or mobile (nomadic)? What about both? Do we have enough resources for this third solution? Is biomedical personnel ready for it? Can we know the mobility-related alterations in morbidity? And the environment? Sliding doors are everywhere, and they change the future of people, pastoralists and donors alike.

After the CCM's OR in Filtu, Alessia Villanucci, medical anthropologist, wrote:

> To design a re-ordering of the SES connected to health in humans and their livestock, we should consider the divergence of nomadic vs. agro-pastoral communities. Through specific assistance and training programmes we should go towards the final objective of an enhanced efficiency: "super agro-pastoralists" become complementary to "super nomad herders", both dealt with according to modern methods and tools (to be specifically designed). The idea is to enhance decision making at household level: some would redirect their lives towards settlements where they would find efficient social services (drinking water, schools and health facilities renovated and strengthened) and economic assistance to agriculture (housing, seeds, water, electricity, marketing etc.); others would rather remain nomadic, receiving thus full assistance with mobile services and innovative strategies (long-distance marketing, credit, mobile services – in the case of health).[137]

It is not a book of dreams, or wishful thinking: it is a decisional table. If we want to add volume, we might think of innovative One Health static facilities (with labs and no bats, as witnessed in Filtu health posts), where veterinaries and doctors daily cooperate with ecologists in dealing with whatsoever disease is reported by an active population of health-trained pastoralists.[138] Why not planning and designing such a structure now? On the opposite side of the dipole, a CCM's One Health mobile unit is already operating in the North Horr area (see Cell B.4, p. 35), and the environmental issues are being explored at community level. Let us wait for and check results, but apparently the pathway is open.

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[136] About the future of environments, see Evans MR *et al.*, "Predictive Systems Ecology", *Proceedings of the Royal Society*, B 280, September 2013.

[137] Villanucci A (2016), *op. cit.*; pp. 83-84.

[138] In Filtu, CCM promoted the implementation of Household Health Agents, selected among already acknowledged "skilled" household members (especially on animal/human health education, epidemic diseases and zoonosis prevention and monitoring, safe basic self-care, like the correct way to inject animals), trained by mobile team members; and working as satellite within their community.

About the future of pastoralists in the study areas, there are also OH-related problems that should become of concern and be tackled before it is too late for their health. A critical one is the regulation, by any means, of counterfeit or low-quality drugs (both for humans and animals, usually from contraband). These medicines are cheap (but often inefficient and badly stored in the hot environment) and may facilitate the approach by pastoralists to a fake bridge between traditional and bio-medicine. For instance, in malaria treatment the informants confirmed that they still make use of local herbal remedies such as *Aloe vera* and the neem tree. However, they are increasingly using bio-medicines: excellent, but that is why keeping watch on drug quality and distribution is imperative. The author suggested in Filtu (2016) the involvement of animal/human drug-producing international firms, sponsoring an experiment on equalizing drug prices to the local market (consider publicity).

Another issue sees nomadic pastoralists diluting pesticides and "wash" their animals with it. Sometimes they recycle discarded tins of chemicals to carry drinking water, while the environment around the pens – in proximity with huts – is receiving an excessive load of chemical pollution, just where animals are milked, children play with grass and soil, and young animals are kept. An education campaign about water pollution must be designed. There is a diffused ignorance of water as disease-bearing. For instance, apart some exceptions, malaria is thought by the majority of unlearned pastoralists to come from grass, not from mosquitoes that lay eggs in stagnant pools.[139] We need to disseminate simple methods of clearing pools around households, such as passing a thorny branch on their surface to sink and drown mosquito larvae.[140]

A third problem is the economic impact at OH level. According to the World Bank:

> Because the economic risk of disease at the human-animal-environment interface is already substantial, the expected rate of return on investments in prevention through strengthening of veterinary and human public health capacity is very high. […] The limited application of One Health in practice, however, limits data available to analyze its benefits […] Broadly, One Health may generate effectiveness and efficiency outcomes, which in turn can generate financial savings at global, national, regional, and local levels […] improving effectiveness of public health systems in achieving prevention, early detection, correct diagnosis, and control of outbreaks. The outcomes of more effective responses are lower morbidity, lower mortality, and lower economic costs. Effective responses may promote poverty reduction – especially given that many zoonotic diseases are called the "diseases of the poor".[141]

Zoonotic disease outbreaks and pandemics can lead to huge economic consequences, as we are going to experience for years after 2020. It is therefore surprising the very scanty reference to One Health at all levels, not to mention the absence of veterinarians and ecologists in the various task-forces. For the moment, it is impossible to evaluate Covid-19's impact on the pastoralists' livelihoods, both at health and economic level: no data from the ground.

Per methodology, increased mortality and morbidity during a pandemic are valued by experts at the market cost of labour: a premature death that shortens a working life by 10 years has an economic cost, which is equivalent to the foregone wages during 10 years. Now, we have a problem: how can we estimate a "market cost of labour" of a pastoralist? Does money have any operational meaning to One Health among pastoralists? What about if we modify the actual disconnection of a herder from the wage market?

Enhancing health (in all meanings) has an intrinsic economic value. For instance, around North Horr, CCM noticed a relatively recent commercialization of the livestock sector. This benefitted those with large herds (mostly the absentee livestock-owners), while those without sufficient herds to keep them mobile are hived-off the pastoral system. They settle and seek alternative forms of livelihoods such as jobs in town and casual employment. Settling habits forgo a return to nomadism, and they are more and more becoming a constraining factor for the mobility of households around trading centres. Furthermore, the livestock trade

[139] No surprise: the term 'malaria' itself comes from the Latin *mala aer*, 'bad air', because in Europe the sickness was believed coming from exposure to the mephitic atmosphere of swamps.

[140] The author experimented the technique in Samburuland, and noted a 30% reduction of malaria cases, without any use of chemicals or medicines.

[141] AA VV, *One Health. Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at their Interface*, International Bank for Reconstruction and Development/The World Bank, Report No. 122980-GLB, Washington 2018; p. 33-34.

is compounded with challenges as it lacks government support and incentives to tap into better pricing of the animals.[142]

A recommendation: if you need information about pastoralists and animals, use market places. Veterinaries are usually there; you get a full sample of the variety of livestock in the area; traders know the health situation all around; and pastoralists from outer zones are easily accessible and willing to talk.

We must realize, though, that fostering livestock commercial trade (traditionally vetoed, if not for shoats) would propagate the erosion of its status value in the social network, with unpredictable outputs at household level, like the enhancing of individualised cash economy vs. family bonds, or unprepared insertion in consumeristic trade/buying of "alien goods". That is why all traders, and not only livestock traders, should be involved in OH good practices.

There is a price: people dealing with structured economic activities cannot be nomads: they have to settle down and enter business, trade, commerce, receipts, order sheets, payment bills, money. Nobody wants to bar pastoralists from free access to modernity and leisure goods (satisfaction is part of well-being and health), but management practices should be careful in dealing with side-effects of entrepreneurial business. For instance, around North Horr, village community banking (VICOBA) targets mainly women in settled centres: because of power imbalance, in the long run men shall take over the money anyway (converting it in booze or goods, it makes no difference to their spouses), because of their progressive sedentarisation in towns to check women's business and profit. Women may become collateral victims, at the end.

Nowadays, cash is more and more needed by pastoralists, mainly for education and health purposes. Because in all studied locations the cost of services resulted the main barrier to health-facility access, a pastoral new economy should: i) widen market linkage to guarantee an easier access to cash; ii) introduce livestock banks/pawnshops and forms of vouchers to delay the need of cash and fasten the access to the nearest health services; iii) introduce insurances to sustain health services costs for both people and livestock; iv) test appropriate forms of Income Generating Projects (IGP).

Is there is any modern pastoralist out there?

All kinds of pastoralists, short- or long-range nomadic, partially or totally involved in agriculture, confined in IDP camps, or urbanised, need a specific, manageable, malleable territory where opportunistic behaviours be easily redirected and priorities inverted when facing good opportunities and innovative solutions. In fact, there is only one kind of pastoralist: a herder-livestock unit.

The modern evolution of this pattern is "opportunistic pastoralism". In the study areas, the ground situation is porous, with livelihoods changing values (from social-capital camels to cash economy), type of community (from nomadic to aggregate to urban), model of economy (meat and fodder for cash sale), scheme of nutrition (from proteins to starches), kinship (from closed clan to exogamous marriage), all this according to circumstances, in a "pendulum aggregation" where social change is liquid, expanding and retreating in all directions.

Like demonstrated in Gedo Region, the so called "pastoral identity" is nowadays negotiated almost every day, always under the paradigm of modernity. From the *complex* culture of pastoralists, we are witnessing the formation of the *complicated* society of mixed pastoralists, former agro-pastoralists, destitute pastoralists, subsistence agriculturalists, cash-economy farmers, trade agents, urbanized migrants and so on, most of them with an *ideal* identity way back in pastoralism, now based on history and performance.[143] Because agency and performance negotiate future community values, out there all herders are ready for change at a freewheeling speed, may it come from weather and climate, conflict resolution, development (sustainable or not), education, or whatever wind may blow over their households.[144]

[142] Kurewa AG (2018), *op. cit.,* Ch. "Pathway to modernity".
[143] Gamble C, *The Palaeolithic Societies of Europe*, Cambridge University Press, Cambridge UK 1999; p. 58.
[144] Edited from Salza A (2019), *op. cit.*: pp. 16-17.

Six hundred years ago, Ibn Khaldun[145] described the paradox of nomadic life – its superior character, morality, fortitude, and social cohesiveness – that was being undermined by the inexorable change from nomadic to sedentary life, not the opposite. It was Bedouins who sought the "luxuries" of urban life, not sedentarists who craved for the spiritually uplifting but demanding life of pastoralism.[146]

No longer does the critical triangle of human-livestock-environmental relations determine patterns of mobility and husbandry performed in a wide-range pastoral community: herders move not just to access pastures but schools, not just water but shops, or development projects or clinics and pharmacies. As John Galaty states: 'What is now at stake is not nomadism in a nomadic world, but continuing pastoralism in a world of sedentary sites and institutions'.[147]

The Somali experience of restocking while in famine or inside refugee camps to make possible the resumption of pastoral life, is a cautionary tale against reading the nomadic experience of settlement as historically unidirectional. Settled people are often not ex-pastoralists, but pastoralists-by-other-means.

We need further and better research about the freewheeling herder of the Greater Horn of Africa. During the Bosnia war of 1993, a UN British soldier said: 'Whoever thinks to know what is going on here, didn't pay much attention'.[148]

Source: Google

[145] Arab thinker (1332-1406) who introduced Islam to the notion of critic history, founded on profane factors generated by the natural tendency to weakness of the sedentarized generations, heir of the nomadic life, but prone to progressive decadence due to wealth and the urban way of life.

[146] Cited in Galaty JG, "Time, Terror, and Pastoral Inertia: Sedentarization and Conflict in Northern Kenya", in: Fratkin E & Abella E (eds.), *As Pastoralists Settle. Social, Health, and Economic Consequences of Pastoral Sedentarization in Marsabit District, Kenya*, Kluwer Academic Publishers, New York 2005; p. 53.

[147] *Ibid*.; p. 54.

[148] Cited in Loyd A, *My War Gone By. I Miss It So*, Doubleday, London 1999.

EPILOGUE: The New Common Cold

'Clouds are too fast', a boy said.
'Shadows are black and clouds are white, like my goats', said another.
'Did you catch that cloud with your box?', asked a third one.
'Of course', said the girl.
'What are you going to do with it?, asked the second boy.
'Let it rain', the girl answered.
'When is it going to rain?', all the young herders asked.
'I don't know yet, but the satellites[149] will let me know', said the girl.
And then she sneezed.
The girl wiped her nose.
It kept running.
The girl put the metal machine on her forehead.
I got a fever, she thought. I can measure humidity in the air and temperature at the ground, but not in my body.
She coughed.
Then, she wiped her nose again.
'It's common cold', she said, 'everybody has one, lately'.

[149] Obviously, weather satellites register rain and do not foretell it (that is done by predictive models), but the author wanted to use the actual wording by local herders, for whom "satellite" is an all-powerful entity in the sky.

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Alesssandro Demarchi