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Pastoral traditional ecological knowledge dynamicity: a global review

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Abstract

There is a significant knowledge gap concerning the extent to which pastoral traditional ecological knowledge (TEK) has changed. We conducted a systematic review of 152 papers on pastoral TEK, focusing specifically on 63 papers that explicitly mentioned types of knowledge transitions (retention, erosion, adaptation or hybridization). Studies on pastoral TEK represent less than 3% of all the scholarly literature on TEK. Geographical distribution of the case studies was largely biased. Knowledge domains of pastoral TEK such as herd and livestock management, forage and medicinal plants, and landscape and wildlife were relatively equally covered, however, climate-related knowledge was less studied. Out of the 63 papers explicitly mentioning transition of pastoral TEK, 83% reported erosion, and only 11 studies documented explicitly knowledge retention, adaptation or hybridization. We conclude that future research should focus more on the diverse dynamics of pastoral traditional knowledge, be more careful in distinguishing the four knowledge transition types.

Introduction

After the 1992 Rio Earth Summit, the importance of traditional ecological knowledge (hereinafter TEK) in the conservation of biological and cultural diversity has been increasingly acknowledged by both the scientific community and policy-makers around the globe (Maxted et al. 2002). TEK plays a vital role in the livelihoods of rural communities, and the sustainable management and use of natural resources by Indigenous peoples and local communities (Olsson and Folke 2001). Opinions towards TEK, previously rife with negative characteristics such as being static and archaic, are now appreciating the dynamic nature of this knowledge. There is mounting evidence showing that TEK is adaptive to changes in the environment and it is also fluid with social-economic and cultural changes (Berkes et al. 2000). Despite a myriad of cultural pressures, many aspects of TEK systems are resilient. That is, not all changes in Indigenous and Local Knowledge systems should be understood in terms of knowledge loss, but rather adaptation (Jandreau and Berkes 2016).

In this paper, we aim to synthesize the state-of-the-art of the knowledge on the dynamics of pastoral TEK, cutting across disciplinary topics and regions. To do so, we conducted a systematic review of scientific papers dealing specifically with changes in pastoral TEK. In particular, we addressed whether research is homogenous across knowledge domains (e.g. general ecological knowledge, knowledge on livestock management), and across main pastoral mobility types (i.e., sedentarism, transhumance and nomadism). We focused on four knowledge transition types (i.e., retention, erosion, adaptation and hybridization). Additionally, we documented the main research gaps that highlight the need for a global research agenda on pastoral TEK.

Methods and Study Site

The first step of the review process was to undertake a systematic literature search, for peer-reviewed scientific articles about pastoral TEK using Web of Science. We used the following Boolean phrase: TS = (("aborigin* knowledge" OR "traditional knowledge" OR "traditional local knowledge" OR "ecological knowledge" OR "traditional environmental knowledge" OR "Indigenous knowledge" OR "local knowledge" OR "folk knowledge") AND (pastoral* OR flock* OR herd* OR shepherd*)).

This led to the identification of 382 papers, from which 372 papers were traceable. In the next step of the study, title, abstract and material and method sections of all 372 papers were screened to omit papers unrelated to pastoral TEK. 84 papers were eliminated in this phase. For the remaining 288 papers, we reviewed: types of TEK transition (especially adaptation and hybridization), and the countries where each study was conducted.

In the third step, we proceeded to subsample papers for a more detailed, quantitative review. To do so, the 288 papers were sequentially numbered (1 to 288) and a random number generator was applied (Using the “=

RAND ()” function in Microsoft Excel 2019), selecting first ca. 102 papers, with a posterior addition of 50 more papers to assess the robustness of findings. For these papers we collected title, Journal, DOI and First author’s name, and four variables of interest: pastoral system type, studied knowledge domain, mention of TEK transition, type of knowledge transition and robustness of reported transition. Since the relative frequency of the investigated variables was not significantly different between the primary (102 studies) and the final set (152 studies), the remaining (136) papers were not considered in our quantitative analysis. All analyses in this study were conducted in R using Rstudio software [Version 1.2.5033] using ggplot2, dplyr and rworldmap packages. Wilcoxon rank sum test was used to assess the statistical significance of two-level variables (e.g. comparing primary and final database) and Kruskal-Wallis test for observed variables with more than two levels (i.e., pastoral system type) at 95 percent confidence interval.

Results

Pastoral TEK studies are few and geographically biased

The number of scientific studies on TEK in general showed an increasing trend over the last four decades, with a parallel trend for studies on pastoral TEK. However, the proportion of TEK studies focusing on pastoral TEK is low, only 3% of all scientific studies on TEK (Figure 1, A part). Looking at the geographical distribution of research on pastoral TEK (Figure 1, B part), the largely majority of studies were conducted in Africa (50%), followed by Asia (30%) and in Europe (14%). Studies on pastoral TEK were scant in Oceania (3%), South America (2%) and North America (1%). Overall, pastoral communities in 62 countries were studied, with Ethiopia (33 studies), Kenya (31), India (19) and China (18) being the most prominent ones.

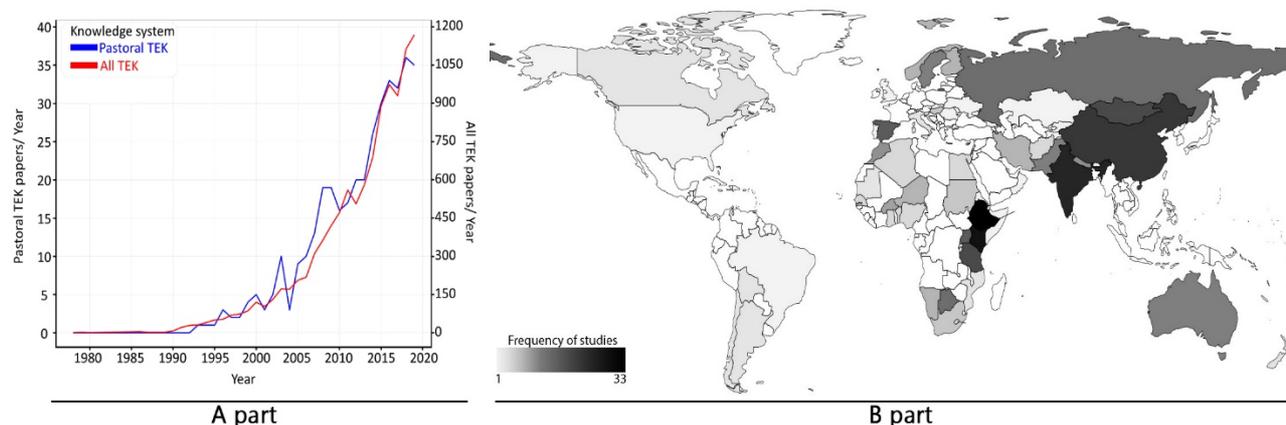


Figure 1. A part: Frequency of all TEK and pastoral TEK papers published from 1978 to 2019. Note there are two Y-axes: left axis shows pastoral TEK papers per annum and right axis shows all TEK papers per annum. B part: Frequency of pastoral TEK studies per country based on the reviewed 288 papers

Comparing the number of studies conducted on the five major knowledge domains of pastoral TEK, similar attention has been paid to TEK domains related to herd and livestock management knowledge, forage and medicinal plant knowledge and knowledge of landscape and wildlife (i.e., 73, 75, 70 studies, respectively). Interestingly, despite growing research interest on pastoral vulnerability to climate change, pastoral TEK about climate has received relatively scant scholarly attention, with only 15 studies on climate-related knowledge domains.

Transition in pastoral TEK: erosion vs. retention, adaptation and hybridization

Transitions in pastoral TEK were addressed in 41% of the 152 papers reviewed in detail (Figure 2, A part). Each of the four types of knowledge transition (i.e., retention, erosion, hybridization and adaptation) was mentioned in at least one paper, with erosion of knowledge being the transition type most often reported (83%). Retention, hybridization and adaptation were mentioned in five, six and six percent of papers, respectively. Out of all the transitions reported, 35% were based on robust empirical evidence, 17% were anecdotal and 48% lied on weak empirical footing, as no traceable form of evidence was provided in the paper. In general, the interest in studying transitions in pastoral TEK is growing in a similar way as the numbers of studies in pastoral TEK (Figure 2, A part). Knowledge erosion was reported in a relatively same frequency for all five major knowledge domains. However, we found a higher relative frequency for domains of Herd/Livestock (42%) and Forage/Medicine (44%) (Figure 2, B part). All domains were reported at least 25% with erosion of pastoral TEK. Without considering retention of TEK as a ‘change’, highest frequency for any type of TEK

transition was reported for Forage/Medicine (48%) and Social-cultural (47%) domains. Hybridization and adaptation were reported for only three knowledge domains each. Unfortunately, the small number of available studies makes it difficult to find robust global patterns.

Nomadic, transhumant and sedentary systems with 45% (24 papers), 33% (18 papers) and 22% (12 papers), respectively, were mentioned to be affected by some form of TEK transition (Figure 2, B part). In all three pastoral system types erosion was the most often reported transition, and in most cases retention, adaption and hybridization was found only in a few cases. Further research is called upon to obtain better and more representative understanding the differences in knowledge transitions across different pastoral mobility systems.

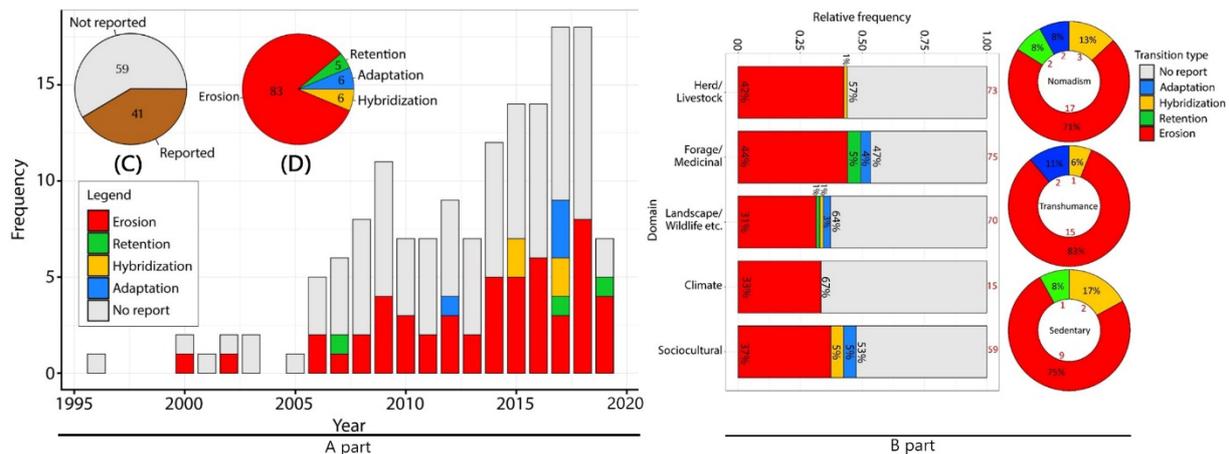


Figure 2. A part: Frequency of papers meeting review criteria by year considering TEK transition. Inserts: C) relative frequency of papers reporting TEK transition; D) relative frequency of papers reporting different types of transition. B part: Types of TEK transition reported for each major knowledge domain. B: TEK transition reported for different pastoral mobility types (Black labels show percentage values, while red labels the total number of papers)

TEK erosion was commonplace globally, but most often reported in Asia and East Africa (Figure 3). Europe, Asia and Africa had 55, 53 and 31% of their total number of studies, respectively, reporting some form of TEK transition. Reported transition showed Ethiopia, India, China, Kenya, Egypt and Spain with more reports of erosion. Although comparing the status of TEK transition between countries is difficult to the fact that research effort is far from being homogenous across countries, it is important to highlight that TEK erosion is reported in most of the studied countries, even in biologically and culturally diverse regions.

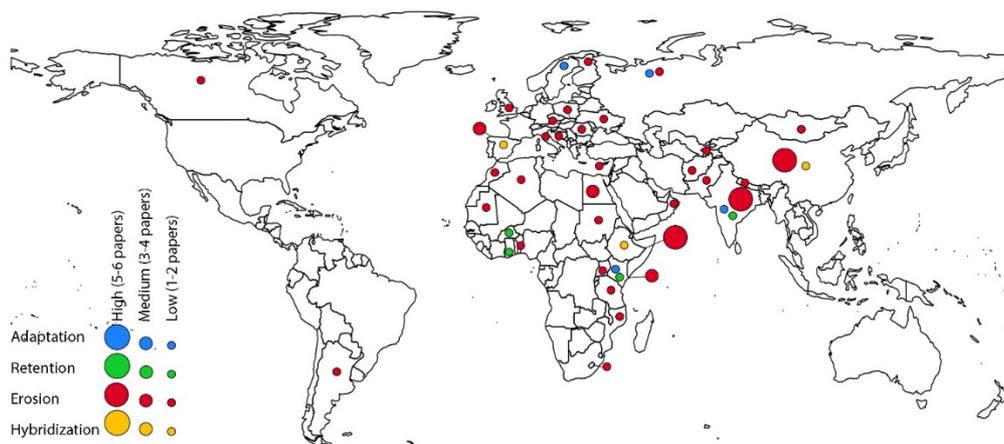


Figure 3. Number of studies reporting TEK transition types (based on 63 papers)

Discussion

Low number of studies on pastoral TEK provides further support to calls by Fernandez-Gimenez (2000) and Molnar (2014) to bring more into focus pastoral TEK. In line with our results, the UN Environment report on number of studies on rangeland and pastoralism confirms that compared to other topics, research on rangelands and pastoralism is substantially lower (96,414 records from 71 million records), and that pastoral TEK studies

cover only one percent of total studies and projects on rangeland and pastoralism (Johnsen et al. 2019). The relatively higher number of papers reporting pastoral TEK erosion may be alarming for local, national and international organizations aiming to promote sustainable use of rangelands and biocultural conservation of pastoral social-ecological landscapes. Aswani et al. (2018) and Hanazaki et al. (2013) have reported the same result with conducting reviews on TEK transition amongst other communities such as farmers, hunter-gatherers, fishers and found that 77% and 57% of the papers reported TEK erosion. Another research gap in pastoral TEK studies was that although different transitional types have been reported for pastoral TEK, most of the studies have called TEK transition as erosion. As it was also emphasized by Tian (2017), TEK transition is mostly evaluated linearly as gain or loss, however, adaptation and hybridization of TEK are also possible – and highly relevant - changes. Researchers have often assessed the transition of pastoral TEK by comparing the volume of the knowledge between or within generations (Oteros-Rozas et al. 2013) and referred to lower volume of knowledge of the younger generation as erosion. We argue that erosion of TEK concerning specific subdomains should not automatically imply the overall downward trend of communities' TEK. In fact, this change may originate from adaptive strategies and/or hybridization of knowledge due to exposure to other knowledge systems.

Constant long-term presence and monitoring by pastoralists of their social-ecological systems have enabled them to develop rich bodies of knowledge and practices about their local ecologies. Understanding this knowledge is pivotal for sustainable management and nature conservation. Yet, our result showed that studies on pastoral TEK cover only three percent of total studies on TEK. Despite the fact that pastoralists carry knowledge in several domains, our attention has been more fascinated by their knowledge regarding Herd/Livestock, Forage/Medicine and Landscape/Wildlife, leaving their perception from Climate and Sociocultural less represented. How international planning and management for rangeland and pastoralism is possible while our knowledge pertaining pastoral TEK covers spatial scale of their distribution, insufficiently. Notwithstanding this amount of studies on pastoral TEK, our review showed that knowledge erosion may be the dominant type of knowledge transition occurring among pastoralists worldwide. However, knowledge adaptation and hybridization proved to provide solutions to new challenges in many areas of the world, despite the fact that they continue to be under-researched. We argue that stronger research focus is needed on the transition of pastoral TEK to help the ongoing adaptation of pastoral systems including changes in their TEK among ongoing global changes. Scientific research should cast more light on different transition types. Furthermore, parallel to different changes such as land use-rights and economy of pastoralists, changes of pastoral TEK should be taken into consideration as one of the pivotal changes faced by pastoral communities around the world. Finally, documentation of pastoral TEK should continue as different changes in its transition from one generation to another may lead to new forms of knowledge about livestock, plants, soil and human interactions.

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