

# EATWELL: A Comparative Material-Semiotic Ethnography of Food Systems and More-than-Human Health in Bhutan

## 1 Excellence

### 1.1 State of the art, knowledge needs and project objectives

Climate change, environmental pollution, food insecurity and social inequity adversely affect health and alert us that food, health and sustainability are intimately intertwined (1-5). Hence, it is necessary to move beyond a narrow anthropocentric approach to health and adopt a more integrated approach as put forward in the concepts of Planetary Health (2-3,6) and One Health as further elaborated by The Lancet One Health Commission in Oslo in 2019 (1). They highlight how human health depends on the health of the natural life support systems (2) through “the interconnections between people, animals, plants and their shared environment” (1). The need for such an integrated attentiveness is perhaps most evident in food’s role in shaping health. Environmental factors affect the health of the plants and animals, and thus the food we eat, which in turn affects our health, as painfully illustrated by food-borne intoxications and the COVID-19 crisis (1,7-8). This integrated understanding calls for an examination that goes beyond specific health effects of food items and nutrition to include the health effects of each of the different aspects of the food system—production, processing, storage, distribution, preparation, and consumption, and their contexts (9). These aspects join in shaping One Health and Planetary Health as the *food-systems-for-health* agenda (6,10-11) and Agri-health (12) highlight. One Health and Planetary Health ally with the Sustainable Development Goals (SDGs) to push forward such a holistic health agenda. In a similar vein, Bhutan developed its unique policy of Gross National Happiness (GNH)—focusing on overall well-being rather than purely economic indicators and inspired by Buddhism—and has played a key role in the development of the SDGs (13-14). Hence, Bhutan is highly interesting and relevant to study matters related to overall health and wellbeing. Moreover, Bhutan’s emphasis on nature and biodiversity conservation, organic food production, and the availability of free healthcare and education as part of GNH seem a good fit with One Health and Planetary Health, strengthening these from a different cultural horizon. Hence, it is of global relevance to study how Bhutanese society approaches food, health, and sustainability and how they can enrich both health concepts and their undergirding assumptions.

One Health, Planetary Health, and the *sustainable-food-systems-for-health* agenda call for a multi-scalar, multi-sectoral and inter-disciplinary approach, and explicitly promote the inclusion of social and economic aspects (1-3,15). Yet, they remain predominantly grounded in biological and biomedical sciences, overlooking the fundamental and intimate entanglement of society, culture, food, and health requiring more attention (5,16). In our project, we intend to enrich these concepts and agendas by including both socio-cultural and biological factors *and* their complex interplay, deploying Bhutan as a critical case. Thus, we develop an *integrative* approach—entailing non-singular holism (17-18)—to the study of the entanglement of food systems and *more-than-human health*, emphasizing the multispecies world within and outside the human body upon which the body and its health depend (as exemplified by the gut microbiota within us (19)). We also expand this notion to include *other-than-human* entities and ontological categories (e.g. invisible forces and spirits) constitutive of people’s worldviews and ways of living (20-21). Hence, this project seeks to develop an integrated and interdisciplinary approach to the study of food systems and more-than-human health, taking into account the entire food chain and the multiple—social, cultural, religious, health, nutritional, (micro)biological, environmental, economic and political—aspects of each of these parts and their entanglements with more-than-human health (9,22). Thereby, we strengthen the attentiveness of the sustainable-food-systems-for-health, One Health and Planetary Health approaches to local cosmologies, socio-cultural processes, *alter-native* medical systems and *local biologies* (23). This finetuned attention is warranted since several of their underpinning concepts—nutrition, body, environment, and health—are predominantly global in orientation and universalizing in approach, meaning that global concerns and universal biological laws of health and environmental sustainability determine the search for solutions that nevertheless may be locally adjusted. As an example, the discourse of ‘healthy diet’ continues in locally adjusted dietary advice to feature the universal laws of nutrition and biological health of the decontextualized noncultural human body and in response to global concerns regarding non-communicable diseases (2-3,10,24-26). Yet, even the underpinning biology may not be as universal as is often assumed. Human bodies and health are also shaped by epigenetic processes—the molecular regulation of gene expression—and microbiomes—communities of millions of microorganisms—that are deeply affected by both social and natural environmental influences. Hence, biology is always *local* or rather *situated* and relational (23-24,27-28), demonstrating that the social and biological are inextricably linked in ever-*biosocial* processes (29). We will examine how nutritional intake is shaped by various events and relationships through investigating the relational effects of heterogeneous—both physical and meaningful—aspects of the food network-system as entangled with more-than-human health and the

biosocial environment. In this multidirectional network, food not only feeds the physical body as implicit in the notion of ‘diet’, but rather constitutes nourishment that enables people to fulfil their full (social, spiritual, psychological and economic) potential and to relate to their biosocial environments and contexts (30-31). Healthy and sustainable food systems consist of human beings entering into a reciprocal relationship with other human and non-human beings—for example, when eating beneficial food that feeds the gut microbiota that drive health. This view of eating *as relating* in a balanced way is what Jacques Derrida (32) defines as eating well. The global and universalist approach to food and health does not sufficiently consider that eating as relating occurs within multiple contexts/environments of different scales intermingling global and local forces into hybrid *glocal* biosocial phenomena where tensions and creative productions of scale emerge (33-34). Our groundbreaking approach seeks to integrate the multi-scalar and multi-dimensional aspects of food systems for more-than-human health to allow for a cross-cultural and ontological pluralization of One Health, Planetary Health and their associated cognates in the context of Bhutan.

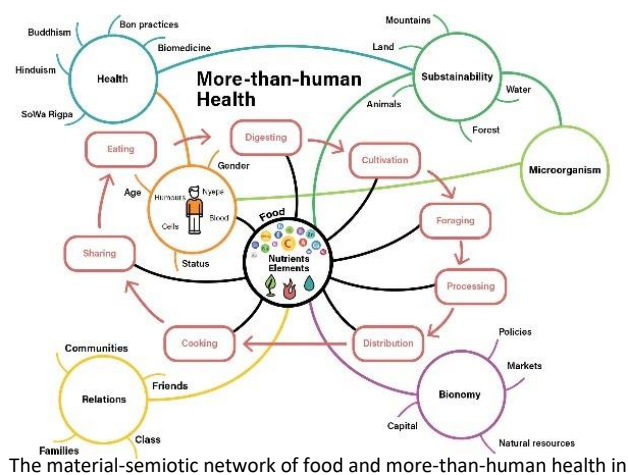
The primary objective is to develop an integrative approach to the study of the entanglements between heterogeneous aspects of food systems and more-than-human health through which to enrich the sustainable-food-systems-for-health agenda, One Health and Planetary Health. The five secondary objectives are: 1) Decentralize the global orientation and universalizing biology of health, nutrition, and environment through examining their situated and entangled biosocial nature. 2) Broaden the nutritional scope of ‘diet’ that underpins much of global food and health policy to look at the nourishment of full humanity in relation to biosocial environments. 3) Further develop a non-monistic integrative and interdisciplinary agenda, approach, and method for the study of food and health, enabling collaboration between nutritionists, microbiologists, sociologists, and anthropologists. 4) Establish a mutually enriching conversation between the Buddhist-informed Bhutanese approach to food and health through GNH and the global approaches to food systems for health as well as One Health and Planetary Health. 5) Prepare the necessary groundwork for developing future culture-sensitive and sustainable projects of food, health, and well-being, contributing to GNH in Bhutan and the SDGs (35) more generally and globally.

## **1.2 Research questions and hypotheses, theoretical approach, and methodology**

The project will investigate food’s diverse aspects throughout its production, distribution, preparation, and consumption and how these affect nutrient intake and co-shape more-than-human health through biosocial entanglements. Therefore, the research questions (RQs) are as follows:

- 1) What are the key factors shaping Bhutanese food habits and systems?
  - How do networks of heterogeneous factors shape the ‘agricultural side’ of the food system?
  - How do networks of heterogeneous factors shape the ‘consumption side’ of the food system?
- 2) How do cosmology, environment, health, and body entangle with the food system?
  - How are the body and personhood enacted in the networks of environment, cosmology, and health?
  - Which specific roles does food play in enacting this body multiple (36-37)?
- 3) What are the nutritional compositions and more-than-human health effects of the food habits and systems?
  - How do context-driven food habits in everyday life and special events shape nutritional intake?
  - What are the more-than-human health consequences of the patterned intake of food and nutrients?

This project will move beyond the state of the art by integrating the universalist premises of nutrition, health and ecology underpinning much of the sustainable-food-systems-for-health agenda, One Health and Planetary Health, on the one hand, and the local biosocial and cultural context and environment, on the other. As such, we enrich these approaches through an integrative understanding of the entanglement of food systems, health and sustainability, cosmology, socio-cultural processes and *situated biology* entangled with more-than-human being. We develop this integrative understanding by meticulously examining the *material-semiotic network-assembly* of food with its entanglements in ecology, economy, politics, religion and nutrients, and focus particularly on the various direct and indirect entanglements between food and health in our expanded sense (38-47). With a material-semiotic approach, we take the insight from semiotics that a word acquires a particular meaning in relation to other words and the context of the sentence, and apply this to heterogeneous aspects, including both: “the *stuff* and the social” (40). Hence, this approach foregrounds the insight that the different heterogeneous aspects of the food system acquire their specific physical form and significance *in relation to* other aspects and contexts. As such, we develop an integrative understanding of food habits and food systems as entangled with their glocalized biosocial contexts and as a key pillar of more-than-human health and well-



The material-semiotic network of food and more-than-human health in

being. The notion of entanglement is deployed along the lines proposed by Karen Barad (48) to highlight the bidirectional, or rather multidirectional, effects of the network through which aspects are related, affected, and shaped. This allows, us for instance, to investigate the distributed effect of cosmology on nutrition via the production and consumption of food through which different ontological categories affect each other, as in the case of spirits affecting nutrient intake through ritual cooking and eating. We advance the material-semiotic approach by investigating how it works in practice in a different cultural and biosocial context and by teasing out such unexpected connections and distributed effects through the network of food. The related method—material-semiotic ethnography—

builds further on the food-centered assemblage approach developed by Wim Van Daele (PI) during his PhD and postdoctoral research in Sri Lanka (44,46-47), allowing additional productive comparisons. Bhutan and its GNH policy framework have globally contributed to the establishment of the SDGs (13,49) and locally through agriculture and health policies which have led to drastic changes: Life expectancy increased by more than 30 years in just 50 years, from 40 in 1966 to 66 in 1999, to 70 in 2016 (13,50-52). Even so, malnutrition remains widespread though it has changed in nature due to changing trends in the food system. Whereas the group suffering from underweight reduced from 38% in 1990 to 13% in 2010, anemia continues to affect 55% of women and 81% of children, and 54% of women are now overweight with rising cholesterol and blood sugar levels, affecting health badly (53). It may also signal a changing relation to the environment around and within them (e.g. microbiological communities in the gut). Biosocial ethnographic proximity is thus required to better understand the evolutions and variations in nutrition and health problems, and their entanglements with food systems across different environments and contexts within this diverse nation. This research project will examine such specific entanglements between food and health in an integrative way.

The project consists of two main parts: **1)** answering the two first RQs through related work packages (WPs 1-2) via a comparative ethnography of food systems in Haa, Thimphu, Zhemgang, Bumthang, Gasa and 2-3 more sites to be selected according to their variation in ethnic groups, altitude and environment, urban vs rural setting, and related differences in food systems and health (54-58). **2)** answering the third RQ in WP3 through examination of nutrient intake in 2 selected sites. Finally, there will be an added pilot on the gut microbiome, further contributing to answering the second sub question of RQ3.

WP1: Conducting a comparative ethnography of the material-semiotic network of food in Bumthang, Haa, Thimphu, Zhemgang, Gasa and 2 more sites.

*What are the key material-semiotic factors shaping food habits and systems?* In WP1, Van Daele, Fjeld, Choden, Galay, Wangdi and our Anthropological PhD will answer RQ 1 through (participant) observations, (ethnographic) conversations and literature research to examine the material-semiotic network-assemblage of food. We are inspired by the work of Kunzang Choden (55-56,59) who wrote one of the rare accounts of food habits in Bumthang and Bhutan covering the 1950s to the 1990s where she meticulously described the use of butter, milk, *ara* (an alcoholic drink), buckwheat, chillies and other essential food items in different preparations served at funerals, weddings, festivals, healing rites but also in everyday life and as served to servants, elites and monks (56). Our material-semiotic ethnography of the food system of today's Bhutan, will examine the multiple lifelines and aspects of the food chain from before food items are regarded as food (e.g., seed) until after their digestion (e.g., stool and manure), and how these lifelines and aspects entangle with particular contexts (and mutually affect each other). More specifically, we will study key aspects on cultivation (e.g., rice, buckwheat, radish), cattle and yak herding (e.g., butter and milk), foraging (e.g., mushrooms, cordyceps), buying, cooking, and eating and how these vary according to everyday life (e.g., breakfast vs dinner), ritual events (e.g., harvest), traditional and biomedical practices (e.g., food prescriptions), gender, age, socio-economic status and the environment (54-58), thereby answering the two sub-questions regarding the 'agricultural' and 'consumption' sides of the food system. This also includes the examination of breastfeeding, sharing, caring, and parenting. Besides **1) Bumthang** (2700-4000m), called the cultural heartland of Bhutan, we will conduct research in the following sites as selected on the basis of specific variations shaping the food habits in each of these sites (54,56-58,61): **2) Thimphu** (2300m), the capital city where most processed and

imported food items are available and attracting people from across rural Bhutan in search of a job, education and a better life without the rural hardships. This area is confronted with new forms of malnutrition—obesity and Type 2 Diabetes—possibly pointing at a nutritional transition (9) taking place. Yet, in Dagala mountains nearby, there are yak herding communities that may be included should our preferred location of Laya and Lunana not be possible. **3) Zhemgang** (100-4500m), situated in central and southern Bhutan consisting of tropical and sub-tropical vegetation as well as higher mountain peaks. It is one of the poorest and remotest areas of Bhutan where foraging, forest cattle herding, rice cultivation, diverse horticulture and alcohol consumption are widespread. **4) Haa** (2700m) has the westernmost valley of Bhutan and is the only valley without rice cultivation. Buckwheat and wheat, alongside radish and Turnip as well as cattle and yak herding are common in the Haa valley. In southern Haa (1700m), where to some Haaps migrate during winter, the food landscape is more sub-tropical and marked by paddy and maize cultivation as well as cardamom as key cash crop. **5) Gasa** and more specifically Laya (3800m) and Lunana (4000m), which are surrounded by snow-covered peaks up to 7700 meters and where yak herding and the collection of medicinal Himalayan plants are common. Yet, seasonal migration during winter will also lead us to Punakha (1300m) where people produce and consume rice, maize and oranges. **6) Finally**, 2 more sites are still to be identified in the east and south (from Samtse, Samdrup jongkhar, Pemagatshel, Thrashigang and/or Trashi Yangtze) to fill further gaps in the overall food system so that we obtain a rather complete overview of the diversity in food systems across Bhutan and how they make up the overall food flows and patterns across the country. In this WP, we will thus gain an oversight of the Bhutanese food system in its diversity by following the food from seed to eating and its numerous entanglements within and across the different sites. This also entails including a focus on migratory patterns of both people and food (e.g., herds). Van Daele will first start training Choden, Galay and Wangdi in our approach to food systems and more-than-human health so that they can start the fieldwork in their assigned sites, and will do so equally with the two key Research Assistants (RA's), who will foremost accompany the foreign researchers as a formal obligation in Bhutan and to facilitate work in the communities. In times, when no foreign researchers are working, they will after their training be assigned their own site where non-national researchers are not allowed to work (probably all 'border' areas due to security concerns).

WP2: Examining the entanglements of the food system with cosmology, environment, health, and body.

*How do cosmology, environment, health, and body entangle with the food system?* As part of the anthropological phase of the project, WP2 entails a more in-depth examination of RQ 2 in all the selected sites. Van Daele, Fjeld, Choden, Galay, Wangdi, 2 key RA's and Anthro PhD will inquire and analyze through participant observation and ethnographic conversation how the material-semiotic network of food relates to health and well-being. Here, the focus will be on the entanglements of food with different conceptualizations and enactments of body and health as situated within the environment and cosmology informed by Buddhism. Given the close links between Buddhism, health and medicine in Bhutan, the project will investigate the roles of Buddhist teachings, practices, and monks in traditional healing in the region, with a particular focus on how food practices enact or materially condense these complex negotiations of health and well-being. The closely related *Bon* practices concerning ritual negotiations of health and well-being will also be investigated. The world of Bhutanese is replete with different categories of spirits (*tse*, *gyalpo*, *lu*, *dud*) and gods (*lha*) who must be appeased to sustain a healthy flow of life in the entanglement of environment, cultivation, foraging, herding, nourishment, health and well-being (56-62). Such cosmological practices may inspire a culture-sensitive approach to sustainability as enabled by life-regenerating relations among heterogeneous aspects, an approach which will supplement the scientific approach to sustainability and its syncretic implementation in Bhutanese policies (49,52). People's concerns with a balanced regeneration of life in human life-cycles and cultivation are evidenced in specific food offerings bringing about balanced reciprocity with the environment and non-human forces, appeasing greed and moral degeneration in death rites, and achieving health and well-being through the restoration of human and non-human relations. These key concerns might seem strikingly similar across both Sri Lanka and Bhutan, but the expressions of these concerns, materialized in ritual offerings, and the articulations with the different contexts diverge (44,47,56,63-65). The notion of a life-enhancing and healthy balance and the related emphasis on the balanced intake of food and its digestion recurs in the humoral theories found across South Asia, including Ayurveda in India and Sri Lanka, and *Sowa Rigpa* in Tibet. Both have influenced traditional Bhutanese medicine (66-69). Moreover, the influence of biomedicine in everyday and popular health practice will be explored, especially, how universalized metrics of nutrition and discourse-practice of *nutritionism*, as well as the universal body and disease-metrics of biomedicine, modify everyday food habits (24,70-72). This includes the study of how these biomedical conceptions of body and health interact with local health theories bringing about medical syncretism that again may furnish novel food prescriptions for health and well-being (37).

WP3: Examining the impact of cultural foodways on nutritional intake as a proxy for health.

*What are the nutritional compositions and more-than-human health effects of these food habits and systems?*

WP3 answers RQ 3 by examining the link between food and health by integrating nutrition and gut microbiomes to the material-semiotic/biosocial food ethnographies in three main ways: **1)** Øverby, Medin, Wangmo Torheim, Morseth, Van Daele, the nutrition PhD and ad hoc RA's will contribute to the comprehensive national and novel Health and Nutrition Survey to be conducted by the Ministry of Health (MoH) of Bhutan with planned start early 2023. We will give our inputs to the design to contribute to this national survey and to learn from it. This will furnish additional data for our research. Where the survey is conducted in 'our' sites we will furthermore cooperate closely by exchanging data where we can share more detailed aspects of nutrient intake obtained from our survey and our socio-anthropological data. By comparing and exchanging our data within the ethical confines in 'our' sites we aim to demonstrate the added value of our approach to the MoH and prepare a future collaboration on scaling up our nutritional survey and exchanging data and advice. **2)** Our nutritional survey (81-83) will include structured interviews (oral questionnaires) and 2-day dietary recalls. The latter will entail the collection of detailed recipes with the correct quantities in relation to specific meals to calculate how much energy (calories), macronutrients (e.g. proteins) and micronutrients are consumed during everyday meals and special events. Through this, we aim to get a wider overview of general trends, achieve a higher degree of representability, and detect intra-group variations in relation to gender and age. For the nutritional calculation of the dietary recalls we will need data on the nutritional composition of food items. We will use food composition tables from India (78), China (79) and Tibet (80), and if necessary, apply for additional funding to analyze additional key food items, selected on the basis of the broader ethnography and the ethnographic nutritional case study, at a lab in India. Moreover, we will estimate dietary intake using the food composition data in INDDEx tools and myfood24. The sample size will be 250 people selected from our ethnographies in 1-2 sites and the survey will be conducted once. The survey will be developed by the self-financed nutrition PhD student in collaboration with Morseth, Torheim, Wangmo, Medin and Øverby and will be carried out with the aid of ad hoc RA's. **3)** A sub selection of 10 people from these 250 people will be followed throughout one year with regular 2-day dietary recalls combined with qualitative interviews examining the socio-cultural contexts and activities that have shaped the meals ingested and the nutrient intake. As such, we will estimate nutritional intake and determine how age, gender, seasons, and various life events shape nutritional intake with possible health consequences (4,74-77). Van Daele, the nutrition PhD, Wangmo, Torheim and Morseth, aided by RA's will in this way build further on the food ethnographies and the nutritional case study method (73) to develop and conduct this *extended ethnographic nutritional case study*. Together, these three parts enable us to obtain a contextual understanding of the nutritional economy of food, body and biosocial environment shaping health. The nutritional calculation of food habits will allow us to tease out food habits and prescriptions in specific treatments, healing rituals, everyday eating and special events that are (un)healthy from a nutritional health perspective, so that healthy culture-specific habits can be promoted in future health programs and more generally in culture-sensitive and sustainable development. **4)** Finally, the Raeslab will from VIB-KULeuven Center for Microbiology will contribute in kind with the materials, collection and analysis of 1000 samples for metagenomic shotgun sequencing of human gut microbiomes as a pilot study to be attached to the EATWELL project. The samples will be collected among 3 different communities of 250 people, including the community or communities where we conduct our nutritional survey, and 250 samples will be collected from the 10 people (= 25 per person) who we will follow closely in the extended ethnographic nutritional case study. The samples will be collected simultaneously with the 2-day dietary recalls as these data will be correlated with each other (as the food intake of the 2 previous days shapes gut microbiome composition), and with the coded socio-cultural activities and eating habits from WP's 1 & 2. As such, this pilot, in combination with the literature demonstrating that gut microbiomes are highly responsive to diet and other environmental factors (refs), will furnish hypotheses about how socio-cultural activities and eating habits shape nutrient intake and gut microbiome composition and variation playing a key role in health and disease. The Raeslab will train our colleagues and ad hoc RA's from the national referral hospital and KGUMSB in the protocols of collecting the stool samples as proxy for the human gut microbiome.

WP4: Comparison across sites, interdisciplinary integration and ensuring post-project upscaling and continuity.

The success of the project is dependent on sustained comparison across the sites and thus similar ways of conducting the material-semiotic ethnographies of the site-specific food systems. Continued conversation and field visits among the project members will contribute to the quality of the research and ensure comparability in research and analysis. The anthropological part will lay the scientific and practical foundation of the

nutritional part and microbiome pilot, whereas the nutritional part and especially the 2-day dietary recall furnishes the necessary dietary data to understand microbiome composition and variation. The interdisciplinary integration in this project will indeed be ensured by adjusting the various disciplinary parts to each other to facilitate interdisciplinary communication and co-relations as a means to radical integration, entailing a solid understanding of the complex ways in which the socio-cultural aspects, food systems, nutrition and more-than-human health interplay. The integration of disciplines and sites will culminate in a conference on Bhutan to be organized in Oslo or online. This is also where we communicate our shared findings and analyses as well as suggestions for further sustained research on food, nutrition, health, and biosocial environments in additional sites and across several moments in time to enable closer detection of evolutions. Finally, we will ensure the upscaling and continuity through our extensive communication, exploitation, and impact strategies below.

Potential risks and solutions: A key challenge will be gaining access to some of the sites due to strict regulations on permits. Where access is restricted, we will send our 2 steady RA's and have a list of alternative sites with similar properties, except for the most accessible, Thimphu. Another risk is that delays likely will occur due to disruptive weather patterns, heavy administrative burden, and political evolutions. Finally, the COVID-19 pandemic and its aftereffects are likely to cause further disruptions. Since Bhutan has adequate internet access, we can proceed with the project thanks to our local partners and RA's, and by collaborating online. We can thus adjust the project implementation while still achieving the objectives. We also considered such potential disruptions in our application for a project duration of six years.

Interdisciplinarity: This project will be radically interdisciplinary in both subject, approach and method, integrating nutrition, food systems, biomedicine, traditional medicine, cosmology, environment, microbiology and society. These are integrated through detailed investigation of the food network and its entanglements aided by literature and expertise of different academic fields: Tibetan and Buddhist studies, sociology, ecology political-economy, medical anthropology, anthropology of food and nutrition, nutritional and biomedical science, and microbiology. The sheer scope of this interdisciplinary endeavor may seem to weaken disciplinary depth, yet it enables a more integrative understanding of phenomena and thereby contributes to an enrichment of each of the disciplines involved.

Ethics: The project will follow the ethical guidelines of the American Anthropological Association, Norwegian National Committees for Research Ethics, and the Economic and Social Research Council. We will obtain ethical approvals from the Norwegian Centre for Research Data (NSD), The Faculty Ethical research Committee at UiA (FEK), The Regional Committee for Medical and Health Research Ethics (REK), and the Research Ethics Board of Health (REBH) of the Ministry of Health in Bhutan.

Gender: Gender is a cross-cutting theme of interest that runs throughout this study of cultivation, procurement, preparation, and consumption of food. It is a key issue in studying the differential access to food at home and the division of tasks around food cultivation and preparation. Additional focus on gender is laid on our ethnographic study of parenting, caring and (breast)feeding and particularly so during the offspring's first 1000 days of life, which is a window of opportunity for achieving good health later in life (55,85).

### **1.3 Novelty and ambition**

First, the project will provide entirely new empirical data as a prerequisite basis for further groundbreaking research. It will be the first research in Bhutan examining in detail food habits and systems across several sites while determining their nutritional and microbiomic implications. The research will also enable the contextualization of these by studying food habits as entangled with other aspects of life relevant to the food-systems-for-health agenda, Planetary Health and One Health in these sites. Such new empirical and interdisciplinary data spur novel theorization and scientific learning. Second, the project will develop a novel integrative approach to food and health approaching these as entangled in a material-semiotic network shaping more-than-human health. Our approach is inspired by food systems, Agri-health, Planetary Health and One Health, and it seeks to enrich these by extending them into more heterogeneous and biosocial directions to increase attentiveness to situated biologies, socio-cultural dynamics and *alter-native* knowledge-practice systems, taking Bhutan as a critical informative case. The project also goes beyond the argument for just adding culture as an added layer to sustainable and healthy agriculture. Rather, culture is distributed across the network of food and biosocial entanglements whereby it becomes co-constitutive of more-than-human health emerging from these entangled networks. In investigating this extensive network, we focus in a radically interdisciplinary way on the cosmology-environment-food-nutrition-microbiome-body-health nexus to decentering the 'global', food system, nutrition, health, and sustainability to enmesh with different peoples and contexts. Hence, our integrative attempt seeks to enrich the holistic ambitions of food systems for health, Planetary Health, One Health and the like in pluralistic and syncretic ways. Third, it is cutting-edge at the

*methodological level.* Our material-semiotic ethnography examines things as different as nutrients and spirits by following the food and tracing heterogeneous and biosocial aspects of which the effects are distributed throughout the network. This method enables not only an examination of the separate parts, but also to investigate their interactions, feedback loops, and mutual transformational influences. As such, we obtain through the concept of more-than-human health a more detailed and culture-sensitive understanding of the vibrant entanglements between food systems and One Health/Planetary Health.

## **2 Impact**

### **2.1 Potential for academic impact of the research project**

*\*New field of research in a country that has been generally underresearched:* **1)** Developing cutting-edge research agendas on and in Bhutan and elsewhere. **2)** Academic capacity building to strengthen research agendas and educational quality in Bhutan, benefiting society through knowledge.

*\*Advancing radical interdisciplinarity:* **1)** Breaking down the silos of nutritional science, agriculture, biomedicine, (micro)biology, and ecology, on the one hand, and anthropology and the social sciences, on the other. **2)** Studying the multi-dimensional and biosocial nature of food systems and more-than-human health with a focus on their intimate entanglement. **3)** Exploring the connections and distributed effects across radically different ontological categories, including spirits and nutrients (86). **4)** Developing a methodological approach to interdisciplinary cooperation through the material-semiotic ethnography of food. **5)** Developing an exemplary approach that can be applied to other phenomena and countries, such as Norway.

*\*Breaking new grounds on complex entanglements and systems:* **1)** Fleshing out the less-apparent interactions between nutrients, microbes, animals, environment, society, and cosmology as well as the production, distribution, preparation, and consumption of food, since it is impossible to fully understand one without the other. **2)** Accounting for the integrated effect of heterogeneous elements (e.g. production, ritual, and consumption), co-producing the concerted effect of the complex entanglement (of the food system and more-than-human health) and feeding back on those elements. **3)** Explaining how one small transformation creates large ripple effects across the network (of food and more-than-human health). **4)** Developing an integrated approach accounting for both the heterogeneity of aspects and their creative interactions and entanglements. **5)** Applying this approach in the concrete and important case of food and health, pluralizing the food-systems-for-health agenda, One Health and Planetary Health.

### **2.2 Potential for societal impact of the research project**

*\*Improving our understanding of the entanglement of food systems and more-than-human health will critically contribute to the knowledge base undergirding the SDGs and facilitate their successful implementation sensitive to glocal contexts, situated biologies, inclusivity and socio-cultural dynamics:* **1)** Our project on *biosocially sustainable food systems as drivers of more-than-human health* is relevant to at least 12 of the SDGs, and especially SDG 2: ending hunger, achieve food security and improved nutrition and promote sustainable agriculture, SDG 3: Ensure healthy lives and promote well-being for all at all ages, and SDG 12: Ensure sustainable consumption and production patterns, (35). **2)** Distilling existing practices in food systems that are sustainable, healthy, and culture-sensitive to further develop these as the basis for future sustainability and health programs. Our findings will contribute to a holistic and integrated knowledge base to facilitate a multi-sectoral effort to make food systems drivers for more-than-human health and thereby enrich One Health and Planetary Health. **3)** To create this impact, we will organize a user-oriented workshop which will include local representatives of multilateral organizations as well as ministers and civil servants from the Ministry of Health and the Ministry of Agriculture and Forests, with whom we have contact through our partners, as well as Dzongkhag officials. We also include local representations of multilateral organizations to increase impact beyond Bhutan. **4)** Expected outcome: An institutional framework for future integrated research and monitoring of food and health systems which will point out avenues for sustained multisectoral cooperation between the concerned ministries for achieving good health and meeting the SDGs.

*\*Creating societal impact through academic and educational capacity building,* which will create ripple effects throughout wider society and affect policies and the lives of ordinary people: **1)** Sharing our new knowledge with academic partners through presentations of our results and lectures on the topics of food, health, and our method. **2)** A practice-based form of education and capacity building by training two PhD students at UiA, academic staff at partner institutions and RA's while conducting collaborative research with them, enabling a systematic collection of data related to food systems, health and well-being, cosmology and environment, socio-cultural dynamics, and policy-making in their specific entanglements with food. **3)** Outcome: Our partners continue to expand their research agenda on food and health, and contribute to the institutionalized research- and policy-framework established in the user-oriented workshop.

## **2.3 Measures for communication and exploitation**

*\*Reaching out beyond our community in academia through sustained peer conversations, publications, documentary films, conference participations, presentations and lectures:* **1)** 10 Conference presentations in international conferences in nutrition, health, anthropology and development and 14 articles and 2 books covering similar fields (includes contributions of all project members and RA's). **2)** 1 Anthropological film and 1 popularizing documentary. **3)** Presentations for our Bhutanese partner-institutions and additional academic and research institutes, such as the College of Natural Resources, RUB, and Centre for Bhutan and GNH Studies to reach staff and students in both medical and social sciences, impacting broader society in the long run. **4)** Publication of discussion papers and news items through newsletters and media societies of our universities. **5)** Peer discussions and presentations for partners and other institutes in Norway, including the Centre for Development and the Environment at UiO and the Nordic secretariat of the Lancet Commission for One Health at the Centre for Global Health at UiO. **6)** Peer discussions and presentations at the world's leading centres, including the Food Studies Centre at SOAS and the School of Public Health at Harvard University.

*\*Communicating about our project and results beyond the academic world through sustained conversation with stakeholders in Bhutan and beyond:* **1)** Besides regular informal contacts through ethnographic proximity with end-users (local people), stakeholders, NGOs, civil servants, and politicians in the field, we will have annual meetings with them, and these key targets will be invited to the academic events we organize. **2)** Key targets in Bhutan are the Ministry of Health, the Ministry of Agriculture and Forests, *Dzongkhag* and *Gewog*-level political representatives, and local civil society organizations (e.g. the Loden Foundation and the Bhutan Foundation) working on agriculture, culture, gender, children, and health, as well as local health institutions, such as hospitals, doctors, healers and BHUs (Basic Health Units that offer both biomedicine and traditional medicine). **3)** Key targets to create wider impact beyond Bhutan entail the local representations of INGOs such as the WHO, UNDP, UNICEF, FAO, IFAD, and WFP in South Asia through which we also seek to gradually reach higher echelons of decision-making within these multilateral institutions, affecting their programs by sharing our knowledge. **4)** A key event following from these conversations is the user-oriented workshop in Thimphu towards the end of the project to which all the stakeholders will be invited. **5)** A key element of exploitation will follow from this: The establishment of an institutional framework for continued research on food and health, broadened by our contribution to food-systems-for-health approaches, and a policy framework based on that ongoing research. The framework will include an integrated multisectoral cooperation in policy-making between the ministries, grounded in an interdisciplinary and culture-sensitive approach for achieving One Health, Planetary Health, GNH and the SDGs. This will inspire other countries and furnish further development of Planetary Health and One Health, as elaborated in Oslo. In this way, the continued monitoring of food, health and sustainability can benefit the well-being of human and non-human beings in Bhutan and beyond. **6)** We will launch a website with a regularly updated blog with content and images to furnish the embedded visualization of the complex food system and its heterogeneous aspects based on Prezi to reach both academics and interested parties. We will link this website to social media to reach a broader public. **7)** We will produce a booklet with key findings to distribute to stakeholders before the user-oriented event where we will also invite the local press, such as the Bhutan Broadcasting Service and Kuensel, to disseminate our results to a broader audience and boost our impact. **8)** Finally, we will actively reach out to established contacts at Al Jazeera, NRK, VRT (Belgium) and the BBC and invite them to report on Bhutan and our study.

## **3 Implementation**

### **3.1 Project manager and project group**

**1) *Wim Van Daele*** is an Associate Professor at the Department of Nutrition and Public Health at UiA, where he is developing and teaching new Bachelors and Masters courses on food, society, and sustainability. This project builds on initial observations of food habits across Bhutan grounded in the food-based approach he has developed and published during his PhD and postdoctoral research, and research stays at the Food Studies Centre at SOAS, The University of Chicago and Columbia University. He also worked in the food industry as a sensory research consultant and at the Norwegian Ministry of Food and Agriculture, expanding his knowledge of food systems and the methodological and interdisciplinary skills central to this project. He has extensive experience in interdisciplinary cooperation and development work, such as when cooperating with researchers in epigenetic and microbiome research in Ecuador and Sri Lanka, and with NGOs on deploying food systems as key drivers for health (DRC). In terms of managerial experience, he trained, coached, and supervised 50 workers in a development funding organization, and is currently supervising 2 PhD students. During earlier visits, he has established a unique network of project partners in Bhutan who co-ensure the successful completion of this project. He will coordinate, (co-)supervise and research.



2) Nina Cecilie Øverby is a Professor of Public Health Nutrition and Nutritional Epidemiology at UiA. Her main research focus is nutrition in the early phases of life in relation to health outcomes. She heads the UiA Priority Research Centre of Lifecourse Nutrition and is the PI of Nutrition Now. She is a PI of seven dietary interventions in young children and their parents aiming to improve diet and reduce levels of obesity. She is a member of the National Nutritional Council of Norway since 2015 and she headed the national work on evaluating current dietary guidelines according to sustainability between 2015 and 2017. She will advise the health and nutritional survey by the MoH and ensure the quality of our nutritional survey.

3) Heidi Fjeld is an Associate Professor in Medical Anthropology in the Department of Community Medicine and Global Health at the Institute of Health and Society, UiO. Her main expertise is Tibetan and Himalayan studies, focusing on culture, health, and healing among farmers in high altitude areas, which is relevant to this project. Fjeld is the co-organizer of the Tibetan and Himalayan research series at the UiO. She is also involved in culture-sensitive nutrition interventions in Malawi and is chair of the research group Engaged Community Medicine at UiO. She will conduct field research and co-supervise the Anthro PhD.

4) Anine Christine Medin is an Associate Professor at the Department of Nutrition and Public Health at UiA. Medin is an expert in dietary assessment methods, with extensive experience in developing new tools in different groups and validating these using biomarkers and observation techniques. She is the co-PI of Nutrition Now and is currently leading a project in which the Norwegian food composition table is adapted and integrated for use in myfood24. She will ensure the quality of our nutritional survey and co-supervise.

5) Neyzang Wangmo is the Founding Director of the Medical Education Centre for Research, Innovation and Training (MECRIT) at KGUMSB. She obtained her PhD at the Faculty of Health Sciences, La Trobe University, Melbourne, Australia. She is a key resource for the project owing to her experiences in committees and as Chairperson of the REBH at the Ministry of Health in Bhutan. Her in-depth and comprehensive knowledge of health issues and the health sector in Bhutan is of vital importance to the success of this project.

6) Tashi Choden is an Associate Lecturer in socio-cultural anthropology at the Royal Thimphu College in Bhutan, teaching at the first BA anthropology program in Bhutan. She comes from Bumthang where she has numerous contacts that can assist in bringing this project to fruition. She will conduct field research.

7) Paljor Galey is Lecturer at the Department of Arts and Humanities at Sherubtse College under the Royal University of Bhutan. He has a master's in social and Cultural Anthropology and has been conducting ethnographic studies on rituals and indigenous knowledge in Bhutan. He will conduct field research.

8) Sonam Wangdi is also a lecturer at the same institute as Paljor Galay. He will join him in the field research.

9) Liv Elin Torheim is Professor of Public Health Nutrition at OsloMet—Oslo Metropolitan University. Torheim has extensive experience studying dietary intake, food security and child and adult nutritional status in Asia (Nepal and India) and Africa (Mali and Algeria). Her expertise in global nutrition are key to this project.

10) Marianne Morseth is Associate Professor of Public Health Nutrition at OsloMet. Morseth has experience in researching nutrition among children in Nepal, which gives a comparative advantage. She will co-supervise.

11) 2 PhD students and 2 key and several ad hoc RA's, recruited based on knowledge on nutrition, food systems or social sciences, as well as knowledge of the region.

### **3.2 Project organization and management**

Van Daele (PI) will coordinate the network. Communication will occur via email, newsletters, WhatsApp, the UiA cloud in Teams, our website, and more sensitive data will be accessible to key team members in TSD. As such, we can converse through different time zones, share media and content, discuss difficulties and doubts. We aim to organize regular web meetings with the whole team, but this may be impossible during fieldwork and then we fall back on other forms of communication. There will also be physical meetings: The first collection of meetings will occur through our lectures at KGUMSB, RTC, and Sherubtse College where we will disseminate our (preliminary) results and findings from the research. After the fieldwork we will organize a conference and workshop in Oslo where we will share our initial findings and analysis, and finetune the research further. Finally, we will have a joint meeting with the stakeholders at the last user-oriented workshop setting up the institutional framework. In addition, there will be ongoing informal meetings, specific gatherings to update our blog, annual digital/physical meetings with stakeholders, and to write publications and present the project and its results. Apart from this, there will be supervisions and exchanges with the Department of Nutrition and Public Health as well as the Lifecourse Nutrition research center at UiA, where the PhD-students will follow the PhD-program and will spend at least several months for analysis. The PhD-students will also spend time at either OsloMet or UiO. The RA's from Bhutan will be supervised by Van Daele, Fjeld and Wangmo, who will facilitate this project, participate briefly in fieldwork, and give their invaluable scientific inputs. Students may be included to assist as part of their training exercises. Other roles and tasks are shown below.

work packages	2021		2022		2023		2024		2025		2026		2027		
	U1A	Osc	U1O	KGU	Sher	RTC	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
WP0 Ethical and administrative clearances required and annually renewed for each activity (all)															
<b>WP1: Investigating the material-semiotic network of food in 7 sites</b>															
MS1: Literature review (Van Daele, Fjeld, Choden, Galay, Wangdi, anthro PhD and 2 key RA's)															
MS2: training Choden, Galay, Wangdi & key RA's in our approach															
MS3: Fieldwork site 1, Zhemgang (Choden)															
MS4: Fieldwork site 2, Haa (Fjeld & key RA's)															
MS5: Fieldwork site 3, Gasa (Van Daele & key RA's + guide)															
MS6: Fieldwork site 4, Bumthang (Choden)															
MS7: Hiring and preparing anthropological PhD															
MS8: Fieldwork site 5, Thimphu (Van Daele and key RA's + guide)															
MS9: Fieldwork site 6 to be identified (Galay, Wangdi, anthro PhD)															
MS10: Fieldwork site 7 to be identified (Galay, Wangdi, anthro PhD)															
MS11: Conducting visits and supervision to fill possible gaps and ensure consistency between the researches (Van Daele, Fjeld, Choden, Galay, Wangdi, anthro PhD and 2 key RA's).															
<b>WP2: Examining the entanglements of the food system with cosmology, environment, health and body in 5-7 sites</b>															
MS1: Literature review (Van Daele, Fjeld, Choden, Galay, Wangdi, anthro PhD and 2 key RA's)															
MS2: training Choden, Galay, Wangdi & key RA's in our approach															
MS3: Fieldwork site 1, Zhemgang (Choden)															
MS4: Fieldwork site 2, Haa (Fjeld & key RA's)															
MS5: Fieldwork site 3, Gasa (Van Daele & key RA's + guide)															
MS6: Fieldwork site 4, Bumthang (Choden)															
MS7: Fieldwork site 5, Thimphu (Van Daele and key RA's + guide)															
MS8: Fieldwork site 6 to be identified (Galay, Wangdi, anthro PhD)															
MS9: Fieldwork site 7 to be identified (Galay, Wangdi, anthro PhD)															
MS10: Site-specific analysis and 1 article per site integrating WP1 and 2 (Van Daele, Fjeld, Choden, Galay, Wangdi & anthro PhD)															
<b>WP3: Examining the impact of cultural foodways on nutritional intake as a proxy for health in 2 sites</b>															
MS1: Hiring and preparing nutrition PhD															
MS2: formulating recommendations for national health and nutritional survey of MoH Bhutan															
MS3: Food composition table of key food items furnished by the anthropological observations (Torheim, Wangmo, Morseth, nutrition PhD, Øverby & Medin)															
MS4: Preparing and conducting nutritional survey (nutrition PhD, RA's, Wangmo, Torheim & Morseth)															
MS5: Analyzing data (nutritional PhD, Van Daele, Torheim, Morseth, Øverby, Medin & Wangmo)															
MS6: Publishing at least 3 articles (nutritional PhD, Van Daele, Torheim, Morseth, Øverby, Medin & Wangmo)															
MS7: 1 year ethnographic fieldwork conjoined with regular 2-day dietary recalls (Van Daele, anthro PhD, nutrition PhD, RA's, Wangmo, Torheim, Morseth, Øverby & Medin)															
MS8: analysis & 2 articles (Van Daele, anthro PhD, nutrition PhD, Wangmo, Torheim, Morseth, Øverby & Medin)															
MS9: contextualizing nutritional intake within cultural food habits in articles and book															
<b>WP4: Comparison across sites, interdisciplinary integration and ensuring post-project upscaling and continuity.</b>															
MS1: writing and publishing comparative articles across the sites and 1 edited book for full comparison															
MS2: User-oriented workshop to discuss institutional framework (anthro PhD, nutrition PhD, RA's, Van Daele, Torheim, Morseth, Fjeld, Galay, Wangdi, Wangmo & Choden).															
MS3: Booklet with key workshop conclusions on interdisciplinary and multisectoral cooperation (anthro PhD, nutrition PhD, RA's, Van Daele, Torheim, Morseth, Fjeld, Galay, Wangdi, Wangmo & Choden)															
MS4: Development and presentation of model for mapping complex food systems for valorisation to be used in planning further study, interventions, and policy-making of international NGO's, governments and multilateral bodies (Van Daele & hired firm)															
MS5: Film and documentary film															

## References:

- 1) *Reconnecting for our future: The Lancet One Health Commission*. Amuasi, JH, et al. 9 May 2020, The Lancet, Vol. 395, pp. 1469-1471.
- 2) *Safeguarding human health in the Anthropocene epoch: Report of the Rockefeller Foundation-Lancet Commission on planetary health*. Whitmee, S, et al. 2015, The Lancet, Vol. 386, pp. 1973-2028.
- 3) *Welcome to The Lancet Planetary Health*. The Lancet Planetary Health Commission. The Lancet, 1 April 2017, Vol. 1, p. e1.
- 4) *Global Nutrition Report: Shining a light to spur action on nutrition*. Bristol : Development Initiatives, 2018.
- 5) *Global Nutrition Report: Action on equity to end malnutrition*. Bristol : Development Initiatives Poverty Research Ltd., 2020.
- 6) *Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems*. Willett, W, et al. The Lancet, 2 February 2019, The Lancet, Vol. 393, pp. 447-492.
- 7) *A metabolic history of manufacturing waste: Food commodities and their outsides*. Landecker, H. 5, 2019, Food, Culture & Society, Vol. 22, pp. 530-547.
- 8) *Moran-Thomas, A. Traveling with sugar: Chronicles of a global epidemic*. Oakland, CA : University of California Press, 2019.
- 9) *HLPE. Nutrition and Food systems: A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome, 2017.
- 10) *FAO & WHO. Sustainable healthy diets: Guiding principles*. Rome, 2019.
- 11) *FAO, et al. The state of food security and nutrition in the world: Transforming food systems for affordable healthy diets*. Rome, 2020.
- 12) *The London Centre for Integrative Research on Agriculture and Health*. The London Centre for Integrative Research on Agriculture and Health. [Internet] 2019. <https://lci.rah.ac.uk/>.
- 13) *Schroeder, K. Politics of gross national happiness: Governance and development in Bhutan*. Palgrave Macmillan, 2018.
- 14) *Mahayana Buddhism and Gross National Happiness in Bhutan*. Givel, M. 2, 2015, International Journal of Wellbeing, Vol. 5, pp. 14-27.
- 15) *One Health Commission*. What is One Health? One Health Commission. [Internet] 2020. [https://www.onehealthcommission.org/en/why\\_one\\_health/what\\_is\\_one\\_health/](https://www.onehealthcommission.org/en/why_one_health/what_is_one_health/).
- 16) *Culture and health*. Napier, AD, et al. 2014, The Lancet, Vol. 384, pp. 1607-1639.
- 17) *Nancy, JL. Being singular plural*. [trans.] RD Richardson og AE O'Byrne. Stanford : Stanford University Press, 2000.
- 18) *Otto, T og Bubandt, N. Experiments in holism: Theory and practice in contemporary anthropology*. Malden, MA : Wiley-Blackwell, 2010.
- 19) *Young, E. I contain multitudes: The microbes within us and a grander view of life*. London : Vintage, 2017.
- 20) *Tsing, A. More-than-human sociality: A call for critical description*. [ed.] Kirsten Hastrup. *Anthropology and Nature*. London : Routledge, 2013, pp. 27-42.
- 21) *Ethnography beyond the human: The 'other-than-human' in ethnographic work*. Lien, ME. og Pálsson, G. 1, 2021, Ethnos, Vol. 86, pp. 1-20.
- 22) *Pelto, GH. et al. The Biocultural Perspective in Nutritional Anthropology*. [eds.] DL Dufour, AH. Goodman & GH. Pelto. *Nutritional Anthropology: Biocultural Perspectives on Food & Nutrition*. Oxford : Oxford University Press, 2013, pp. 1-6.
- 23) *Recovering the body*. Lock, M. 2017, Annual Review of Anthropology, Vol. 46, pp. 1-14.
- 24) *Lock, M & Nguyen, VK. An Anthropology of Biomedicine*. 2nd. Hoboken, NJ : Wiley Blackwell, 2018.
- 25) *Shaw, JD. Global food and agricultural institutions*. London : Routledge, 2009.
- 26) *Nierenberg, D. Nourished Planet. Sustainability in the global food system*. Washington : Island Press, 2018.
- 27) *MyNewGut*. Research. MyNewGut. [Internet] 2018. <https://www.mynewgut.eu/research>.
- 28) *Situating local biologies: Anthropological perspectives on environment/human entanglements*. Niewöhner, J & Lock, M. 2018, BioSocieties.
- 29) *Ingold, T & Pálsson, G. Biosocial becoming: Integrating social and biological anthropology*. Cambridge : Cambridge University Press, 2013.
- 30) *Mead, M. The problem of changing food habits*. [eds.] C Counihan & P Van Esterik. *Food and Culture: A Reader*. 2nd. New York : Routledge, 2008, pp. 17-27.
- 31) *Anthropologists respond to the Lancet EAT Commission*. Burnett, D, et al. 1, 2020, Bionatura, Vol. 5, pp. 1023-1024.
- 32) *Derrida, J. 'Eating well', or the calculation of the subject: an interview with Jacques Derrida*. [eds.] E Cadava, P Connor & JL Nancy. *Who comes after the subject?* New York : Routledge, 1991, pp. 96-119.
- 33) *Robertson, R. Glocalization: Time-space and homogeneity-heterogeneity*. [eds.] M

Featherstone, S Lash & R Robertson. *Global modernities*. London : Sage Publications, 1995, ss. 25-44. **34) Eriksen, TH.** *Overheating: An anthropology of accelerated change*. London : Pluto Press, 2016. **35) United Nations.** Sustainable Development Goals: Knowledge Platform. *Transforming our world: the 2030 Agenda for Sustainable Development*. [Internet] 2015. <https://sustainabledevelopment.un.org/post2015/transformingourworld>. **36) Mol, A.** *The body multiple: ontology in medical practice*. Durham : Duke University Press, 2002. **37) Taeae, J.** *The patient multiple: An ethnography of healthcare and decision-making in Bhutan*. New York : Berghahn Books, 2017. **38) After ANT: Complexity, naming and topology.** Law, J. S1, 1999, *The Sociological Review*, Vol. 47, pp. 1-14. **39) Law, J.** *After Method: Mess in Social Science Research*. London : Routledge, 2004. **40) —.** Actor network theory and material semiotics. [ed.] BS Turner. *The new Blackwell companion to social theory*. Malden, MA : Blackwell Publishing, 2009, pp. 141-158. **41) DeLanda, M.** *A new philosophy of society: Assemblage theory and social complexity*. London : Continuum, 2006. **42) —.** *Assemblage theory*. Edinburgh : Edinburgh University Press, 2016. **43) Actor-network theory: Sensitive terms and enduring tensions.** Mol, A. 1, 2010, *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, Vol. 50, pp. 253-269. **44) Igniting food assemblages in Sri Lanka: Ritual cooking to regenerate the world and interrelations.** Van Daele, W. 1, 2013, *Contributions to Indian Sociology*, Vol. 47, pp. 33-60. **45) —.** Oscillating between village and globe: Articulating food in Sri Lankan activism. [eds.] C Counihan & V Siniscalchi. *Ethnographies of food activism: Agency, democracy and economy*. London : Bloomsbury, 2014, pp. 211-224. **46) Vibrantly entangled in Sri Lanka: Food as the polyrhythmic and polyphonic assemblage of life.** Van Daele, W. 2018, *Found Sci*, Vol. 23, pp. 85-102. **47) Food as the holographic condensation of life: The case of Sri Lankan rituals.** Van Daele, W. 4, 2018, *Ethnos Journal of Anthropology*, Vol. 83, pp. 645-664. **48) Barad, K.** *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham : Duke University Press., 2007. **49) Tshewang, U, Morrison, JG & Tobias, MC.** *Bionomics in the dragon kingdom: Ecology, economics and ethics in Bhutan*. Springer, 2018. **50) Roder, W, Nidup, K & Chettri, GB.** *The potato in Bhutan*. Thimphu : Bhutan Potato Development Program, 2008. **51) WHO.** *WHO*. [Internet] <https://www.who.int/countries/btn/en/>. **52) Royal government of Bhutan.** *Sustainable Development and Happiness: Bhutan's Voluntary National Review Report on the Implementation of the 2030 Agenda for Sustainable Development*. Royal Government of Bhutan. 2018. **53) Atwood, SJ, et al.** *Nutrition in Bhutan: Situational analysis and policy recommendations*. The World Bank. Washington : The World Bank, 2014. Discussion paper. **54) Diversity in food ways of Bhutanese communities brought about by ethnicity and environment.** Dorji, K, Choden, K & Roder, W. 2013, *Journal of Bhutan Studies*, Vol. 28, pp. 30-46. **55) Barth, F & Wikan, U.** *Situation of children in Bhutan: An anthropological perspective*. Thimphu : The Centre for Bhutan Studies, 2011. **56) Choden, K.** *Chilli and cheese: Food and society in Bhutan*. Bangkok : White Lotus Press, 2008. **57) Pommaret, F.** *Bhutan: Himalayan mountain kingdom*. [trans.] EB Booz, H Solverson & H Mas. Hong Kong : Odyssey Books & Maps, 2018. **58) —.** *Ethnic Mosaic: Peoples of Bhutan*. [eds.] C Schicklgruber & F Pommaret. *Bhutan: Mountain fortress of the gods*. London : Serindia Publications, 1999, pp. 43-59. **59) Lo Gsar celebration: The significance of food in the noble and religious family of O Rgyan Chos Gling (Central Bhutan).** Choden, K. Brill, 2007. Proceedings of the Tenth Seminar of the IATS, 2003, Bhutan. Vol. 5, pp. 27-43. **60) Traditional and modern understandings of mental illness in Bhutan: Preserving the benefits of each to support Gross National Happiness.** Calabrese, JD & Dorji, C. 2014, *Journal of Bhutan Studies*, Vol. 30, pp. 1-29. **61) Phuntsho, K.** *The history of Bhutan*. London : Haus Publishing, 2013. **62) Dorji, T & Melgaard, B.** *Medical history of Bhutan: Chronicle of health and disease from bon times to today*. Thimphu : Centre for Research Initiatives, 2012. **63) Desiring foods: Cultivating non-attachment to nourishment in Buddhist Sri Lanka.** Van Daele, W. 2016, *Appetite*, Vol. 105, pp. 212-217. **64) The political economy of desire in ritual and activism in Sri Lanka.** Van Daele, W. 2013, *International Development Policy*, Vol. 4, pp. 159-173. **65) Fjeld, HE & Lindskog, BV.** Connectedness through separation: Human-nonhuman relations in Tibet and Mongolia. [eds.] JHZ Remme & K Sillander. *Human Nature and Social Life: Perspectives on Extended Sociality*. Cambridge : Cambridge University Press, 2017, pp. 68 - 82. **66) In search of trust and efficacy: Tibetan medicine in multiethnic Rebgong, Qinhai, China.** Nianggajia og Fjeld, H. 5, 2017, *Medicine Anthropology Theory*, Vol. 4, pp. 46-72. **67) Wujastyk, D.** *The roots of Ayurveda: Selections from Sanskrit medical writings*. New Delhi : Penguin Books, 2001. **68) Traditional Bhutanese medicine (Gso-Ba Rig-Pa): An integrated part of formal health care services.** Wangchuk, P, Wangchuk, D & Aagaard-Hansen, J. 1, 2007, *The Southeast Asian Journal for Tropical Medicine and Public Health*, Vol. 38, pp. 161-167. **69) The transnational Sowa Rigpa industry in Asia: New perspectives on an emerging economy.** Kloos, S, et al. 2020, *Social Science & Medicine*, Vol. 245. **70) Yates-Doerr, E.** *The weight of obesity. Hunger and global health in postwar Guatemala*. Oakland, CA : University of California Press, 2015. **71) Scrinis, G.** *Nutritionism: The science and politics of dietary advice*. New York : Columbia University Press, 2013. **72) Conceptualising metabolic disorder in Southern Africa: Biology, history and global health.** Vaughan, M. 2019, *BioSocieties*, Vol. 14, pp. 123-142. **73) The biocultural approach in nutritional anthropology: Case studies of malnutrition in Mali.** Dettwyler, KA. 1, 2010, *Medical Anthropology*, Vol. 15, pp. 17-39. **74) Dufour, DL, Goodman, AH & Pelto, GH.** *Nutritional anthropology: Biocultural perspectives on food and nutrition*. 2nd. Oxford : Oxford University Press, 2013. **75) Pelto, GH, Pelto, PJ & Messer, E.** *Research methods in nutritional anthropology*. Tokyo : United Nations University, 1989. **76) FAO/WHO.** *Preparation and use of food-based dietary guidelines*. Geneva : World Health Organization, 1998. WHO Technical Report Series. **77) Engeset, D, Torheim, LE & Øverby, NC.** *Samfunnsnæring*. Oslo : Universitetsforlaget, 2019. **78) Longvah, T. et al.** *Indian Food Composition Tables*. [Internet] 2017. <http://www.ifct2017.com/>. **79) CDC, National Institute of Nutrition and Food Safety China.** *China food composition. 2nd ed.* Beijing : Peking University Medical Press., 2009. **80) The relevance of food composition data for nutrition surveys in rural Tibet: pilot study in the context of Kashin-Beck Disease.** Dermience, M, et al. 1, 2013, *Biotechnology, Agronomy, Society and Environment*, Vol. 17, pp. 32-42. **81) Reproducibility and relative validity of a newly developed web-based food-frequency questionnaire for assessment of preconception diet.** Salvesen, L, et al. 2019, *BMC Nutr*, Vol. 5. **82) Validation of energy intake from a web-based food recall for children and adolescents.** Medin, AC, et al. 6, 2017, *PLOS ONE*, Vol. 12. **83) Evaluation of a web-based food record for children using direct unobtrusive lunch observations.** Medin, AC, et al. 12, 2015, *Journal of Medical Internet Research*, Vol. 17. **84) Deleuze, G.** *Difference and repetition*. [trans.] P Patton. London : Bloomsbury Academic, 2013. **85) Rosenfeld, CS.** *The epigenome and the developmental origins of health and disease*. London : Elsevier, 2016. **86) Giraldo Herrera, César E.** *Microbes and other shamanic beings*. Cham : Palgrave Macmillan, 2018.