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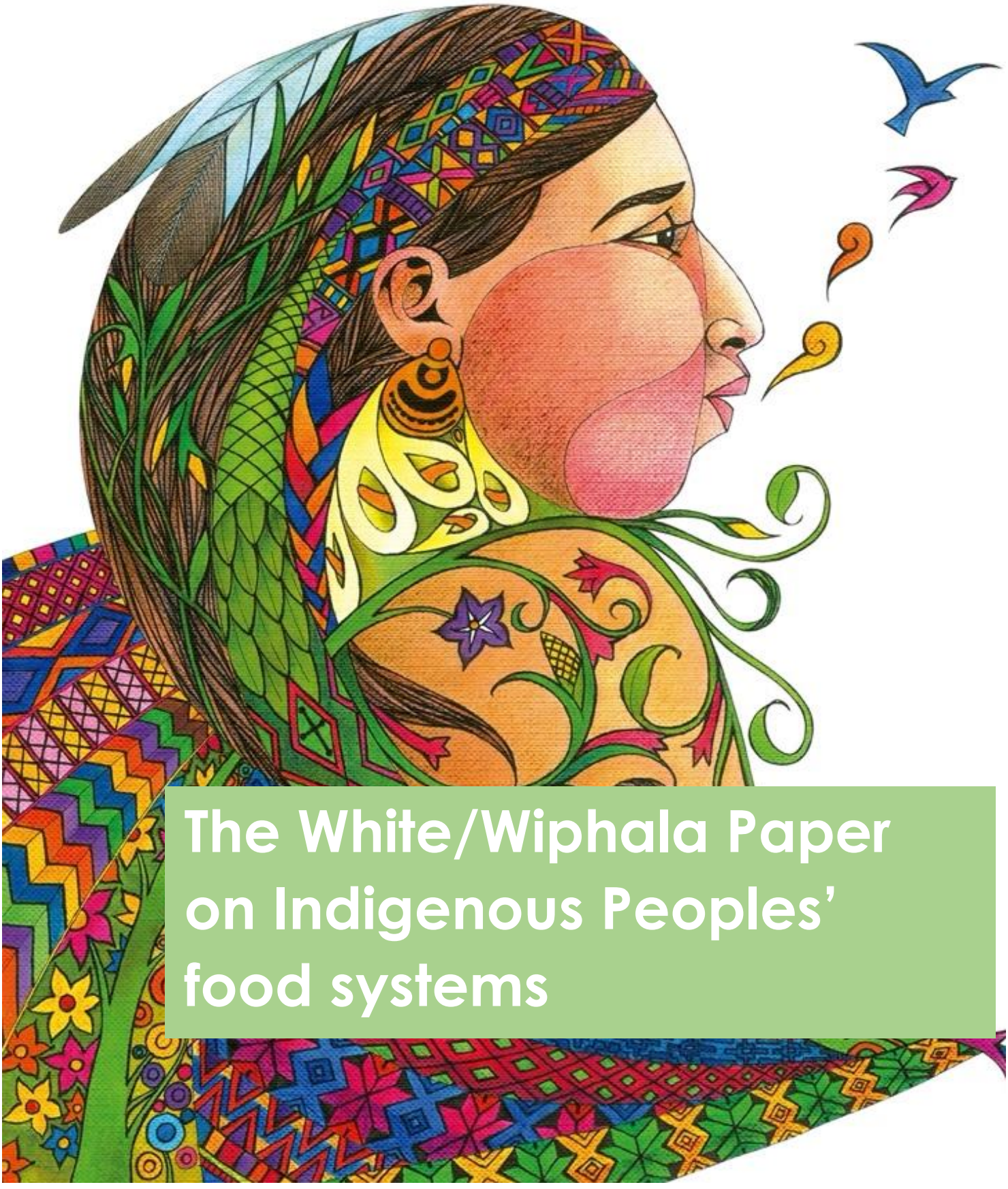

The White/Wiphala Paper on Indigenous Peoples' food systems

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Food and Agriculture Organization of the United Nations

Rome, 2021

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Foreword

Our life depends on nature and we contribute to nature through nurturing. This symbiotic relationship is something all of us are beginning to understand more and more.

Since millennia, Indigenous Peoples have been protecting their environment and biodiversity. Today scientists are telling us that 80 percent of the remaining world's biodiversity is in our lands and territories. We didn't know this. Our ancestors did not know about biodiversity, ecology, ecosystem services or CO2 trapping, but they knew that protecting the ecosystems, environment and biodiversity were essential for our wellbeing and sustainability. Our elders, mothers and fathers taught us this as a way to exhibit good behaviour in the community.

Good behaviour means following and practising the values and norms established by society as part of culture. It stems from our deeply held beliefs, which we act out by participating in religious rituals and customary practices, and in the respectful relationship we have with our communities. Further, respecting and honouring the living non-human nature and maintaining ecological balance is equally important to us because it elevates our wellbeing to another level. This belief in living in harmony with non-human life was seen to be fundamental to maintaining order in nature and in society. Looking at the holistic nature with a systemic lens was the way we have been observing and learning. This outlook allowed us to understand the flow of seasons, the arrival of rains, and the relationships between plants, animals, insects and fish as well as their healing power.

Today, everyone is talking about turning the world food systems into sustainable and resilient systems. But most of our food systems have always been resilient and sustainable for time immemorial because they were based on the objective of ensuring sustenance, including for future generations.

Our Indigenous Peoples' food systems are a result of long and keen observations of the processes and effects of nature. Such observations and knowledge have been passed down through personal, communal and experiential processes. Our food systems are anchored in our traditional wisdom and knowledge and are low risk, with only small changes or modifications taking place to ensure continuity. Consumption and solutions sought are always moderate and thoughtfully considered.

Our Indigenous Peoples' food systems consist of food generation and production techniques that incorporate mobility and mobile livelihoods and are blended with rights and responsibility over natural resources. Regulation and management of food systems and resources centre around rights and responsibilities that may be typically embedded in ownership and access rights of individual, family, collective and communal over lands and territories in our communities. Further, taboos and cultural prohibitions help regulate consumption by all or certain members of a community to ensure a conservation approach to change and development. The result is that more than 476 million Indigenous Peoples, living in more than 90 countries across the world in seven sociocultural regions, have developed unique territorial management practices that manage to generate food whilst preserving biodiversity.

Although we often face situations of discrimination and marginalisation that breach our rights, we have not come to the UN Food Systems Summit as vulnerable poor people. We come as indigenous women and men who believe that our knowledge systems deserve equal respect and dignity as those knowledge systems structured into formal education and written forms of transmission.

We cannot imagine that the world leaders will meet and try to discuss sustainability and resilient food systems without us when we are the ones practising these approaches successfully in our communities and ecosystems before these terms were conceptualised.

This paper drafted by the Global-Hub on Indigenous Peoples' Food Systems is important because it is written by Indigenous Peoples from across the world in a format that is understandable by non-indigenous scientists to explain why our food systems can contribute so much to the world.

The traditional food systems that we Indigenous Peoples have nurtured for centuries are the ones that have sustained our culture and identity despite the myriad challenges already faced and the ones ahead of us. I, therefore, believe that our food systems have given us the strength to continue protecting nature and our people for generations to come.

Indigenous Peoples' food systems rooted in our ancestral knowledge and territorial management practices are united by our profound spiritual connection with nature. Our spiritual awareness is where we find harmony with nature and develop solutions to the problems of climate change and biodiversity loss.

The value of Indigenous Peoples' food systems in terms of sustainability, nutrition and resilience is reflected in our biodiversity conservation and sufficient provision of means to sustain our households in harmony with nature and our cosmogony.

I recall the first meeting we had with the Scientific Group of the United Nations Food Systems Summit coordinated by the Global-Hub on Indigenous Peoples' Food Systems and FAO Indigenous Peoples Unit on September 14, 2020. I held in high consideration the proposition of Professor Joaquim Von Braun, Chair of the Scientific Group, to produce a white paper on Indigenous Peoples' food systems and determine how Indigenous Peoples' knowledge and conventional science could be integrated into the Scientific Group.

From that moment, the journey to create the White/Wiphala Paper began.

Through a co-creation process and sharing of scientific knowledge from indigenous leaders and non-indigenous researchers, the drafting of the White/Wiphala Paper started. Through an open consultation coordinated by the Global-Hub, more than 56 indigenous organizations, universities and individuals from the seven socio-cultural regions shared their knowledge and views to develop the White/Wiphala Paper.

On March 31, 2021, indigenous leaders and research centres comprising the Global-Hub on Indigenous Peoples' Food Systems hosted an Exchange of Knowledge with the Scientific Group of the United Nations Food Systems Summit.

In this event, indigenous leaders from the Global-Hub presented the White/Wiphala Paper on Indigenous Peoples' food systems, illustrating how our knowledge can contribute to local and global actions to transform food systems to be healthier, more equitable and sustainable.

In the representation of the Scientific Group, Professor Von Braun acknowledged and received the White/Wiphala Paper well and offered to publish it on the website as part of the five action tracks' technical papers. He recognised this moment as a starting point to continue collaborating with Indigenous Peoples to exchange knowledge.

Therefore, after such a remarkable and unique endeavor of drafting the White/Wiphala Paper and taking the words of Professor Von Braun, Indigenous Peoples will continue to work persistently, as we always do, to ensure we are included in discussions and beyond the summit.

We strongly believe that our food systems could crucially contribute to the upcoming United Nations Food Systems Summit discussion. We also see the summit as an opportunity to acknowledge the importance of protecting our territorial management, knowledge, governance, value systems, spirituality and collective rights, which is the basis for enhancing and promoting Indigenous Peoples' food systems.

In closing, I would like to thank all the indigenous women, men, experts and organizations that have taken the time to send their comments and contributions to shape and produce this White/Wiphala Paper on Indigenous Peoples' food systems. The paper is not a complete picture of the practices of our families and communities across the world. However, it does provide a good overview of what makes our indigenous food systems unique.

The fact that the Scientific Group has accepted the White/Wiphala Paper as deserving equal respect for our knowledge as well as to inform the way towards the UN Food Systems Summit is a step in the right direction to end centuries of discrimination and marginalisation of Indigenous Peoples' traditional knowledge.

My thanks to you all, indigenous and non-indigenous, who have worked on this collective paper.

Gam A. Shimray,
Secretary General, Asia Indigenous Peoples Pact
Member of the Global-Hub on Indigenous Peoples' Food Systems

Preface

The drafting of this White/Wiphala Paper was coordinated by the Global-Hub on Indigenous Peoples' Food Systems and edited by a Technical Editorial Committee that summarised the main points received. The White/Wiphala Paper on Indigenous Peoples' food systems is the result of collective work by indigenous and non-indigenous experts, scientists and researchers. The initial draft received over 60 direct contributions from indigenous organizations, indigenous experts and institutions from six socio-cultural regions. We owe our thanks to all who contributed, and whose names can be found at the beginning of the paper.

This White/Wiphala Paper offers a constructive, evidence-based contribution to the 2021 UN Food Systems Summit. The contributors and co-authors of the paper look to the leadership of the UN Food Systems Summit to incorporate the principles and values of Indigenous Peoples' food systems in the Summit's agenda, and in the policy discussions and programmes beyond the Summit.

This paper articulates the importance of respecting the rights of Indigenous Peoples to ensure the protection and preservation of their foods systems, and the value this can add to tackle emerging global challenges. Furthermore, it advocates that lessons learned from Indigenous Peoples' approach to food will contribute to the resilience and sustainability of other food systems worldwide. In this vein, the paper provides evidence on the sustainability of Indigenous Peoples' food systems, including the ways in which they have proven resilient over time.

To date, the 2021 United Nations Food Systems Summit has not paid sufficient attention to the food and knowledge systems of Indigenous Peoples. Indigenous Peoples challenge the Summit's current conceptualisation of food systems, which is not representative of their realities, beliefs, livelihoods and food systems.

The paper also challenges some widely accepted ideas and paradigms about food, food systems, sustainability, biodiversity conservation and territorial management. This is intended. Indeed, reassessment of such paradigms is needed to fully grasp Indigenous Peoples' views and the possible contributions they can make to food systems' thinking and approaches. Whilst there has been widespread acceptance of Indigenous Peoples' capacity to preserve biodiversity, there has been only incipient understanding of the important ways that biodiversity conservation intersects with indigenous cultural diversity, language diversity, spirituality, cosmogony and food systems.

This paper highlights the risks of not taking on board the time-tested contributions that Indigenous Peoples have and continue to make for sustainability and territorial management, amongst other dimensions. It also addresses the ongoing policy contradictions and limitations in meeting the Sustainable Development Goals (SDGs), UN Climate Change Conference of Parties' (COP) debates and international agreements about sustainability. The White/Wiphala Paper authors expect Indigenous Peoples' traditional knowledge systems to be recognised, respected and valued with equal consideration and integration by the scientific and academic communities informing the Summit, and beyond.

Whilst we hope and expect that this paper will invoke greater respect for Indigenous Peoples' traditional knowledge, a number of important considerations must be taken into account.

First, we must be mindful of the ways in which this knowledge is used. There are important differences between scientific formalised knowledge and Indigenous Peoples' knowledge systems, but also points of complementarity. Researchers have often been extractive in their use of Indigenous Peoples' traditional

knowledge. We advocate for the creation of platforms upon which Indigenous Peoples and scientists can work together to co-design sustainable and resilient food systems in support of wellbeing of people and ecosystems.

Second, the multiple and different contributions from Indigenous Peoples across the world manifest a way of understanding reality and communicating that is predominantly oral. The transcription of oral thoughts and knowledge into written form is often a challenge. As much as possible, we sought to retain the diversity and richness of the contributions received, whilst acknowledging that we could not reflect many of the subtleties of the comments within the limited pages of the paper. The contributions received from Indigenous Peoples often covered an intersection of topics, including cosmogony, territorial management, food, and rights to their lands, resources and territories. The Editorial Committee has in many cases presented a selection of the concepts and ideas in minimising repetition and structuring contributions into the paper's final format.

Third, Indigenous Peoples and their perception of their food systems and their traditional knowledge is fundamentally systemic. Indigenous Peoples look at the overall, observing the total plus the relationships and interactions between the elements in the food system. When communicating, they give as much importance to the balance and harmony in the system as to elements that compose it. This systemic approach is now being actively sought by scientists to analyse other food systems. Indigenous Peoples have it intrinsically due to their understanding of food, spirituality, nature and relations.

Fourth, whilst scientists base their analysis in modelling and experimentation, Indigenous Peoples refine their knowledge systems through accumulated constant observation of the environment, adjusting their responses over time. This has enabled Indigenous Peoples not only to understand natural cycles, weather patterns and wildlife behaviour but also to develop a day-to-day practical de facto experimentation based on this observation. The accumulated knowledge created during the constant observation is passed on orally through the inter- and intra-generational transmission of knowledge. This way of analysing reality and the phenomena is already a unique contribution by Indigenous Peoples to the scientific community and the world.

To support the process leading up to the UN Food Systems Summit, the White/Wiphala Paper puts forward proposals under each of the five Action Tracks pursued by the UN Food Systems Summit. This silo-creation and piecemeal approach created by the five Action Tracks when analysing food systems is not the way in which Indigenous Peoples would have approached the analysis, opting instead for a more holistic and systemic look.

The term "white" paper is used broadly to refer to frame documents and papers that, at the global level, establish important conceptual references for discussions and debates. Because this paper was written by Indigenous Peoples with Indigenous Peoples' traditional knowledge, it was suggested it be called the White/Wiphala Paper. "Wiphala" refers to the colourful flag of Indigenous Peoples in the Andes that portrays an idea of the diversity of knowledge and views that have been included in the drafting process. Therefore, the White/Wiphala Paper on Indigenous Peoples' food systems does make reference to its characteristic as a frame paper that will inform global discussions yet maintains the diversity of knowledge and peoples that have informed its drafting process, both of which are integrated into this paper.

We invite readers to reflect on the millions of people around the world who feed their families through food systems that are different from the urban, commercial and value chain food systems with which they may be more familiar. Often these unfamiliar food systems are grouped together as "traditional" food systems. However, as this paper shows, traditional food systems are not all alike, and Indigenous Peoples' food systems present characteristics that render them unique and must be better understood.

Core principles of Indigenous Peoples' food systems

In addition to the rights specified above, we outline additional core principles that inform this paper below. Terms that relate to Indigenous Peoples are often used incorrectly and interchangeably in international policy. The terms used in this paper seek to be respectful of Indigenous Peoples' understanding and use of these terms. The UN Food Systems Summit Secretariat and scientists are kindly requested to respect the way that such terms are defined and used here and maintain their use in future outputs.

Indigenous: In other literature, the word "indigenous" as an adjective often refers to the native, traditional or ancestral nature of an entity in a geographical location, which may or may not relate to Indigenous Peoples. In this paper, whenever "indigenous" is used in adjective form, it is with explicit reference to Indigenous Peoples.

Indigenous Peoples: There is no internationally agreed definition of Indigenous Peoples. The 2007 UNDRIP recognised the right of Indigenous Peoples to self-determination, by virtue of which they freely determine their political status. Increasingly, the capitalisation and pluralisation of "Indigenous Peoples" is used to emphasise the diversity of these peoples and their rights – this form is followed within this White/Wiphala Paper. Also, within this paper, any mention of the term "local communities" denotes non-Indigenous Peoples.

According to international consensus (FAO, 2010), the following four criteria are considered for Indigenous Peoples:

- Priority in time, with respect to occupation and use of specific territory.
- The voluntary perpetuation of cultural distinctiveness, which may include aspects of language, social organization, religion and spiritual values, modes of production, laws and institutions.
- Self-identification, as well as recognition by other groups, or by State authorities, as a distinct collectivity; and
- An experience of subjugation, marginalisation, dispossession, exclusion or discrimination, whether or not these conditions persist.

Indigenous Peoples' traditional knowledge: In this paper, we take "Indigenous Peoples' traditional knowledge" to denote the cumulative body of knowledge, practices and manifestations maintained and developed by Indigenous Peoples with long histories of interaction with their natural environment. Indigenous contributors to this paper stressed the importance of their traditional knowledge, most of it oral, and how its effective inter- and intra-generational transmission keeps their food systems alive and well functioning.

Land, natural resources and territories: In this paper, we define land, territories or natural resources according to the terminology agreed at WCIP 2014 ("Land, natural resources and territories of Indigenous Peoples"). These terms encompass not only the land, but also the resources and customary rights over the management of these lands, and therefore carry a different significance.

Cosmogony, cosmogonic views and spirituality: In this paper, the term cosmogony is used to refer to the set of spiritual beliefs, rites, religious practices, and customs that inform Indigenous Peoples' views of the ecosystem, nature and the world. Cosmogony is different to cosmology and is the term used by Indigenous Peoples to refer to spiritual principles held by their societies.

Living in balance and harmony with nature and Mother Earth: In this paper, living in harmony means in recognition of the interconnectedness and balance with all other beings in nature, respectful of ecosystem-carrying capacities. Indigenous Peoples' holistic view places the interconnectedness and balance amongst all living things (including humans) as fundamental for harmonious and peaceful living. This concept was stressed repeatedly by many of the indigenous experts who contributed to this paper.

Food sovereignty: Although Indigenous Peoples understand the definitions of food security and the principle of the Right to Food, Indigenous Peoples insist on the centrality of food sovereignty. Whilst the 1996 definition of food sovereignty agreed by La Via Campesina provides important conceptual framing, Indigenous Peoples tend to emphasise food sovereignty as the right for Indigenous Peoples to choose, to cultivate, and to preserve their food practices and biocultural values.

Collective rights and communal or common resources: Indigenous Peoples' traditions of collective rights to lands and resources (through the community, region or state) contrast with dominant models of individual ownership, privatisation and development. In this paper, we define and acknowledge the collective rights of Indigenous Peoples to lands, territories and resources in accordance with the UNDRIP (Articles 3 and 26) and the International Labour Organization's Indigenous and Tribal Peoples Convention (no. 169).

Biocentrism: The principle of biocentrism is part of the cosmogony of many Indigenous Peoples' societies. From a biocentric perspective, humans are simply one component of the ecosystem, deserving respect alongside other (non-human) living entities. Biocentrism underpins Indigenous Peoples' food systems, informing practices of food generation, production and natural resource management strategies. Anthropocentrism is more commonly associated with food-producing societies.

Food generation and food production: Indigenous Peoples' food systems consist of both food generation and food production, and different Indigenous Peoples' communities may participate in food generative and productive activities to differing extents. Food is produced by Indigenous Peoples through farming, livestock rearing, aquaculture and agroforestry. Food is generated via practices such as hunting, fishing, harvesting and

gathering – practices completed with respect to and understanding of ecosystems' carrying capacity to ensure the replenishment and protection of biodiversity.

Territorial management: Indigenous Peoples' food systems cannot be understood without reference to territorial management practices. Territorial management that often includes nomadic, semi-nomadic and shifting practices like shifting cultivation, mobile fishing and hunting, transhumance, and other practices that include mobility as an essential territorial management practice. The territory is where the spiritual and material worlds manifest and the place where harmony is sought through the maintenance of balance and peace between the different elements. It is not a management of resources dedicated only to production, but a management that maintains reciprocal relationships, storytelling, cosmogony and natural resources, generates food and preserves biodiversity.

Food is more than just eating: For Indigenous Peoples, food carries nutritional, medicinal, healing, spiritual, social, cultural, relational and emotional dimensions and values. Food is an expression of the linkages between Indigenous Peoples, lands, waters, non-human relatives (species), and the spiritual world.

Sustainability and resilience: Indigenous Peoples' food systems preceded the conceptualisation of sustainability or resilience, yet these were de facto incorporated into indigenous food practices. Indigenous Peoples' food systems have remained intact for hundreds, sometimes thousands, of years, as living proof of their sustainability and resilience.

Collective reciprocity and solidarity: Many Indigenous Peoples' societies across the world are informed by principles of reciprocity and solidarity. Often food cannot be sold or stored and so is shared amongst and between communities.

Barter exchange: Although it is changing rapidly, Indigenous Peoples' food systems have been traditionally underpinned by non-market access to food, self-sufficiency and subsistence orientation, and low levels of monetisation.

List of acronyms

ABS	Access and Benefit Sharing
ADHD	Attention-deficit hyperactivity disorder
CINE	Centre for Indigenous Peoples' Nutrition and Environment
COP	Conference of Parties
ESG	Environmental, Social and Governance
FAO	Food and Agriculture Organization of the United Nations
FPIC	Free, Prior and Informed Consent
GHG	Greenhouse Gases
ILO	International Labour Organization
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
INMIP	International Network for Mountain Indigenous Peoples
IPR	Intellectual Property Rights
LCIPP	Local Communities and Indigenous Peoples' Platform
NTFP	Non-Timber Forest Product
PGRFA	Plant Genetic Resources for Food and Agriculture
SDG	Sustainable Development Goal
SSF	Small-Scale Fisheries
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNPFII	United Nations Permanent Forum on Indigenous Issues
UN-SWAP	United Nations System-wide Action Plan on Indigenous Peoples
UPOV	International Union for the Protection of New Varieties of Plants
VGGT	Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security
WCIP	World Conference on Indigenous Peoples

Executive summary

The global food system is unsustainable. Unmitigated, our current food systems will result in radically modified ecosystems, environments, coastlines, mountain tops, glaciers, water bodies and weather patterns, with consequences for human wellbeing and life on earth. More efficient, sustainable, resilient and equitable food systems are needed if we are to eliminate hunger and achieve the Sustainable Development Goals. The 2021 United Nations Food Systems Summit is a call for the review of the ways that food is produced, processed and consumed across the world – and summoning of solutions to transform current food systems to increase their sustainability, resilience and efficiency. **Indigenous Peoples' food systems are well placed to contribute to global debates around food whilst priority should remain focussed on protecting and strengthening their food systems. Indigenous Peoples must be considered key allies in efforts to achieve the United Nations Sustainable Development Goals for Zero Hunger, and develop more sustainable, resilient and equitable food systems post-2030**. This paper articulates the lessons that can be learned from Indigenous Peoples and advocates for their inclusion on the agenda of the 2021 United Nations Food Systems Summit.

What is the problem?

1. **Indigenous Peoples, their food systems, knowledge and practices, have been and continue to be marginalised in policy**. Numbering over 476 million worldwide, Indigenous Peoples live across over 90 countries and seven socio-cultural regions. They often reside in sites of rich biodiversity and possess rich biocultural diversity and knowledge that has been preserved for generations. Their participation in the drafting and implementation of food policy is crucial to the future continuation of their livelihoods.
2. **Indigenous Peoples' food systems cannot be characterised according to dominant conceptualisations of food systems that are presented as linear value chains**. Indigenous Peoples' food systems do not follow linear value chains and comprise different values, systems of governance and cultural relations to food compared to value-chain-oriented food systems. Indigenous Peoples' food systems emphasise circularity, and comprise many ways of obtaining, preparing, storing and sharing food.

What are the main characteristics of Indigenous Peoples' food systems?

3. **Indigenous Peoples' food systems are embedded in a biocentric approach that is intimately tied to nature.** Compared to specialised, input-intensive systems of conventional food production, Indigenous Peoples generate a diversity of foods with minimal intervention on the ecosystems and make use of inputs endogenous to the local system. Indigenous Peoples' food systems are efficient in resource use, with little waste and wide circulation of resources. Material inputs tend to be fully used and recycled locally.
4. **Indigenous Peoples' food systems promote the equitable distribution of resources and power and support indigenous identities and values.** Food generative practices are often localised, making use of communal resources and supported by traditional governance systems. Exchange is often barter-based or based on reciprocal agreements. Indigenous Peoples' lands, waters and resources are often used, managed or governed collectively as a common resource under community-based management. Indigenous Peoples' systems of collective ownership of resources and food sharing can thus support inter- and intra-community cooperation, the cultivation and maintenance of shared identities, and healthy, resilient and culturally appropriate food systems.

What can Indigenous Peoples' food systems bring to the debate?

5. **Indigenous Peoples' knowledge, practices and worldviews differ from western science and provide a valuable contribution to current debates on sustainable food systems.** Whilst the value of Indigenous Peoples' traditional knowledge has been recognised, Indigenous Peoples' views, cosmovisions, time-tested practices and relational values continue to be excluded in science and policy. The contribution by itself of systemic observation carried by Indigenous Peoples' traditional knowledge is a tested scientific approach. The sensitive inclusion of Indigenous Peoples' traditional knowledge in policy will support the sustainable management of natural resources and transformation of food systems for all.

6. **Indigenous Peoples occupy over a quarter of the world's land and their food systems can help to preserve global biodiversity.** There is evidence that lands and forests managed and governed by Indigenous Peoples are able to resist forest loss and experience lower rates of land conversion than forests within protected areas and undefined national forests. Indigenous Peoples' communities have persisted as custodians of the planet's food and genetic resources.

7. **Indigenous Peoples' food systems provide nourishment and healthy diets.** Indigenous Peoples' food systems make use of several hundred species of edible and nutritious flora and fauna, including traditionally cultivated crops, crop wild relatives and animal wildlife (including bushmeat, marine mammals, insects and fish). Indigenous Peoples' communities are feeling the effects of the dietary transition, with increasing consumption of highly processed foods a growing public health concern. With Indigenous Peoples already suffering higher rates of malnutrition worldwide than their non-indigenous counterparts, supporting the continuation of Indigenous Peoples' food practices is important to future nutritional health.

What is needed to protect and strengthen Indigenous Peoples' food systems?

8. **Indigenous Peoples' food systems are themselves a game-changing solution.** The speed at which Indigenous Peoples' food systems are eroding and Indigenous Peoples' traditional knowledge systems are disappearing needs urgent actions to guarantee the survival of Indigenous Peoples. Indigenous Peoples' food systems are intimately tied to the natural world and are capable of providing food and nutritional security, whilst restoring ecosystems and maintaining biodiversity. Such protection and preservation is fundamentally aligned with the human and cultural rights that guarantee the survival of Indigenous Peoples.

9. **Indigenous Peoples are essential to complement the work of the five Action Tracks of the UN Food Systems Summit.** Indigenous Peoples are subject to many social, economic and environmental drivers that can positively or negatively influence the sustainability and resilience of their food systems. As the UN Food Systems Summit aspires for transformation towards more sustainable food systems, and the 2030 deadline for meeting the SDGs beckons ever closer, these drivers cannot be ignored. We provide an assessment of the drivers affecting Indigenous Peoples' food systems and make recommendations for game-changing solutions for policy that are aligned with the five Action Tracks.

Recommendations for Action Track 1

10. *Leaving no one behind* can only be achieved by the overarching recommendation of engaging indigenous leaders in policy discussions and devising strategies to access safe and nutritious foods. At the global level, inclusion of Indigenous Peoples and recognition of their knowledge in platforms,

mechanisms and processes that affect their food systems should be promoted, such as: i) United Nations Food Systems Summit and outcomes; ii) The Local Communities and Indigenous Peoples Platform (LCIPP); iii) The Treaty on Genetic Resources for Food and Agriculture; and iv) Committee on World Food Security.

11. The *Establishment of a Zero Hunger Fund* should not be done at the expense of eliminating Indigenous Peoples. Therefore, it is recommended that this global fund include a sub-fund allocated to Indigenous Peoples to protect and preserve their food systems.

12. The proposed *Expand Coverage of Social Protection Systems* is essential for Indigenous Peoples and must resolve the lack of recognition by governments of the Indigenous Peoples' population living in their countries.

13. *Develop new standards and legal frameworks to drive private-sector change and hold companies accountable*. This is fundamental to end the situations of displacement, expansion of the agriculture frontier on ecosystems, and pollution and destruction of the environment undertaken by the private sector, often under state-run concession systems.

Recommendations for Action Track 2

14. *Education*: Interculturality should become a game changer under Action Track 2, addressing not only current formal education systems, but also policymaking and social awareness about the importance of Indigenous Peoples' food systems.

15. The *Food Systems Framework* must include recommendations that increase the security of access by Indigenous Peoples to their lands and territories. Intercultural Food Policies are needed to recognise and support the many dimensions of Indigenous Peoples' food systems to promote healthy and sustainable consumption patterns.

Recommendations for Action Track 3

16. Proposals to *Increase agrobiodiversity for improved production and resilience* are key to future nature-positive production where Indigenous Peoples can play a significant role. Not only are Indigenous Peoples' communities the custodians for a significant proportion of the world's important genetic resources, but their territories also encompass unique dynamic biocultural spaces that allow these resources to continue to evolve and adapt further to ongoing climate variability and other challenges.

17. The game-changing solution of consulting and engaging with *Indigenous Peoples' food systems to support conservation and biocentric restoration* is central to the sustainable transformation of food systems. The development of an inclusive conservation approach rooted in well-functioning Indigenous Peoples' food systems has the potential to effectively and holistically address current challenges in conservation.

18. *Scaling-out agroecological production systems* and *adopting regenerative agricultural practices for resilient landscapes at scale* has the potential to conserve and promote nature-positive production where contributions of Indigenous Peoples and farmers are multiple.

Recommendations for Action Track 4

19. The realisation of this Action Track will require the direct confrontation of social and structural norms that have long privileged some groups over others, marginalising the poor. Institutions and policies can

help to overcome these structural barriers, with the aim of achieving lasting change so that food systems can lead to equitable and sustainable livelihoods.

20. *Securing land tenure rights for resilience and sustainable food systems* must be achieved in order to reach the goals of this Action Track.

21. *The promotion of inclusive and sustainable agroecological networks for small farmers and Indigenous Peoples' communities* is crucial for advancing the equitable livelihoods of Indigenous Peoples.

Recommendations for Action Track 5

22. *Systemic approaches to risk analysis* create an opportunity to incorporate Indigenous Peoples' perspectives in preventing and monitoring shocks. It is widely acknowledged that successful responses to challenges such as climate change need to be collaborative, a co-learning approach and one that is guided by values and priorities of those impacted, as well as informed by the best available science.

23. *Universal food access: enacting food as public good*. This game changer resonates with the way Indigenous Peoples perceive food. To consider food a public good and ensure universal food access, in the case of Indigenous Peoples, relates to secure access rights over their territories, lands and natural resources as recognised in the 2004 Voluntary Guidelines on the Right to Food.

24. The game-changing solutions that relate to *Community-based decision-making mechanisms and information systems on land rights* and to *Use of international agreements previously negotiated in the Committee of World Food Security* are fundamental for Indigenous Peoples whose land tenure and sovereignty are a prerequisite to adaptive capacity in confronting climate change and addressing global sustainability.

Tô kau' si t'bêi s'yù kàu nwi kàu; káu yoo pgà si t'du s'yù pgà nwi pgà

"One hornbill dies, seven Banyan trees become lonely; one gibbon dies, seven forests become sorrowful"

Au ti k'tau ti; aû kàu k'tau kâu

"Use water, take care of water; use the forest and land, take care of the water and land"

– – Proverbs of the Karen Indigenous Peoples (Burma/Thailand)

(Center for Applied Linguistics & Cultural Orientation Resource Center, 2007)

"The story of Taro or kalo begins when Wakea (sky father) and Papa (Mother Earth) conceived a daughter, Hoʻohokukalani. Daughter and father then conceived a child together, named Hāloanakalaukapapili (long stalk trembling) but it was stillborn. After the two buried the child near their house, a kalo plant grew over the grave. The stems were slender and when the wind blew they swayed and bent as though paying homage, their heart-shaped leaves shivering gracefully as in hula. And in the centre of each leaf water gathered, like a mother's teardrop. The second child born of Wakea and Hoʻohokukalaniher named Hāloa, after his older brother. The kalo of the earth was the sustenance for the young brother and became the principal food for the generations to come. Now, as man continues to work the wetlands of this sacred crop, he remembers the ancestor that nourishes him — Haloanaka.

– Hawai'ian Creation Story

"Before there were human beings, before there was man and woman, there was the corn. The spirit of

the corn, the corn song, the corn pollen — they were always here. Take care of your family corn. It is a sacred being. It is who we are and how we are made. Listen to that song. Learn your language. The corn is praying for you to come home and be healed."

– Diné Hataalii (Traditional Medicine Man) Avery Denny, September 20, 2013, Indigenous Peoples' "Corn is Life" Gathering, Dine (Navajo) Nation, Tsaile Arizona, hosted by Black Mesa Water Coalition, Diné Policy Institute, Traditional Diné Farmers and the International Indian Treaty Council

"Our primary practice is learning by doing with a traditional approach to care for our lands and our right to govern using cultural practices and sustainable methods"

– Oneida Nation, Wisconsin, United States of America

Introduction

The global food system is the largest emitter of greenhouse gas (GHG) emissions worldwide, and contributes to significant biodiversity loss, ecosystem destruction, and pollution of airs, lands and waters (IPCC, 2019; Rockström *et al.*, 2020, FAO, 2020a). Agriculture contributes significant amounts of carbon dioxide, methane and nitrous oxide to the atmosphere (IPCC, 2019). It emits about 20 percent of all GHG emissions from all sectors, of which half come from within the farm gate and half from land use change processes such as deforestation (FAO, 2020a). When adding food processing, supply chains and consumption, the contribution of food systems can be as large as one-third of all GHG emissions by human activity (Crippa *et al.*, 2021). Unmitigated, our current food systems will result in radical modification of ecosystems, environments, coastlines, mountain tops, glaciers, water bodies and weather patterns, with consequences for human wellbeing and life on earth. More efficient, sustainable, resilient and equitable food systems are needed if we are to eliminate hunger and achieve the SDGs.

The 2021 United Nations Food Systems Summit is a call from scientists, researchers, policymakers and practitioners to world leaders to review the way in which food is produced, processed and consumed across the world. The objective is to provide solutions with the potential to transform current food systems to increase their sustainability, resilience and efficiency. The UN Food Systems Summit aims to be inclusive of multiple stakeholders, bringing in the diverse perspectives of civil society, scientists, citizens, women, private sector and Indigenous Peoples. In this respect, the UN Food Systems Summit seeks to instigate "change to achieve healthier, more sustainable and equitable food systems" (von Braun *et al.*, 2021, p.3).

Both traditional food systems and Indigenous Peoples' foods systems are well placed to contribute to global debates about food. Considered some of the oldest and most sustainable on the planet, Indigenous Peoples' food systems are intimately tied to the natural world and are capable of providing food and nutritional security whilst restoring ecosystems and maintaining genetic diversity. The COVID-19 pandemic has highlighted the adaptive capacity of Indigenous Peoples and the disparities they face. Recent evidence shows that those who have relied upon their local food systems have coped better than communities who have relied heavily on the market for their food needs or are displaced from their territories (FAO, 2020b).

Indigenous Peoples are key partners in the SDGs and must be recognised as allies in their pursuit. Hearing their voice is critical not only for their own survival but also for humanity's survival. With Indigenous Peoples often inhabiting territories that are rich in biodiversity (Rights and Resources Initiative, 2018, p. 4-5), global strategies to protect the planet must engage with community-led rights-based conservation approaches, ensuring that Indigenous Peoples' customary access, land and territorial rights are secured.

Who are Indigenous Peoples and where do they live?

The term "Indigenous Peoples" encompasses a broad diversity of beliefs, cultures, languages and livelihoods, which reveal Indigenous Peoples' deep connections with the ecosystems and their constituents within their territories and demonstrate their capacities for resilience and adaptation to social, economic, environmental and climatic changes (Ford *et al.*, 2020). In 2007, the General Assembly adopted the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). The UNDRIP marks the inflection point in terms of the recognition of Indigenous Peoples' rights. It emphasises their rights to live in dignity, to maintain and strengthen their own institutions, cultures and traditions, and to pursue

their self-determined development, in keeping with their own needs and aspirations. Furthermore, the Declaration affirms Indigenous Peoples' participation in all decisions that will affect their lives.

Indigenous Peoples are estimated at 476 million or 6.2 percent of the world population (ILO, 2019), and live in more than 90 countries across seven socio-cultural regions (UNDESA, 2009). If all Indigenous Peoples lived in a single country, it would be the third most populous in the world. Nineteen percent of the people who face extreme poverty worldwide are indigenous (ILO, 2019). This economic poverty is in sharp contrast to the cultural and ecological richness of indigenous societies. Indigenous Peoples speak 4 000 out of the 6 700 languages remaining worldwide (UNDPI, 2018). And whilst they occupy about 25 percent of the earth's surface (Garnett *et al.*, 2018; Kuhnlein, Eme and Fernández-de-Larrinoa, 2019), their territories and lands have preserved 80 percent of the remaining terrestrial biodiversity (Sobrevilla, 2008). Their dynamic knowledge systems continue to evolve, adapting over generations to overcome changing environments, climates, invasions, land encroachments and acquisitions.

Indigenous Peoples globally have endured major changes affecting their ways of life. Colonisation dramatically reduced Indigenous Peoples' access to their traditional territories and natural resources and disrupted the transmission of Indigenous Peoples' traditional knowledge through assimilative education policies, amongst other impacts. The territories and natural resources on which Indigenous Peoples' food systems are based are under continual pressure from external actors and extractive industries, such as mining, commercial agriculture, concessions and logging. Government responses to COVID-19 have further curtailed Indigenous Peoples' rights. The market has introduced monetised transactions into otherwise barter-based, self-sustaining indigenous societies based on reciprocity. Today, like other rural dwellers, Indigenous Peoples and indigenous youth are increasingly migrating to urban centres, searching for better prospects and opportunities. In some regions, 50 percent of the indigenous population is located in urban and peri-urban areas, notably in North America and Latin America. Indigenous Peoples are under major pressure from external actors and extractive industries, such as mining, commercial agriculture, concessions and logging.

In many cases, these changes have reduced Indigenous Peoples' control over their production and access to preferred foods, threatening their food sovereignty, their right to food and culture, and increasing their vulnerability to extreme poverty, disease, malnutrition, social alienation (adapted from HLPE, 2017a; Hunter, *et al.*, 2015), climate change and emerging diseases, including COVID-19 (Zavaleta-Cortijo *et al.*, 2020, Menton *et al.*, 2020, HLPE, 2017a; Huntert, *et al.*, 2015).

Yet, indigenous elders, along with concerns they manifest about the future of their societies and the fate of the world's biodiversity, also express profound pride in their cosmogony, traditional knowledge, food systems and customary governance. This pride translates to a determination to continue their ancestral livelihoods and food systems, despite the pressures and growing difficulties they face.

The White/Wiphala Paper

Academics, the United Nations and governments often label Indigenous Peoples as vulnerable, poor people who are invited to different international meetings with a mix of an historical sense of guilt and curiosity. Treated as vulnerable, they are often placed in the categories of populations needing assistance and are therefore viewed through a passive and paternalistic lens.

This is not the spirit of the White/Wiphala Paper. On the contrary, this paper is motivated by the conviction that any discussion about transforming global food systems is incomplete without placing Indigenous People at the centre and without considering them as some of the main world's experts on food system sustainability and resilience.

In this White/Wiphala Paper, we seek to demonstrate how Indigenous Peoples' vast knowledge and experience can contribute to local and global actions to mitigate food and nutrition insecurity. We highlight how Indigenous Peoples' traditional knowledge can make vital contributions to enhance global health and wellbeing with a focus on aspects of resilience and sustainability. This paper aims to contribute towards the UN Food Systems Summit's fruitful deliberations and ultimately "actions that promise *change* to achieve healthier, more sustainable and equitable food systems" (von Braun *et al.*, 2021, p.1).

The White/Wiphala Paper combines insights from Indigenous Peoples' food systems across the world, with unique contributions from indigenous women, indigenous men, indigenous youth, indigenous elders, and Indigenous Peoples with disabilities to ongoing global discussions leading up to the UN Food Systems Summit. We concentrate on Indigenous Peoples' food systems capable of generating and producing food through elaborate and rich territorial management practices that are attuned to the seasonality, weather and environment of the ecosystems where they are practised. Such a contribution is imperative if we are to transform commercial food systems into sustainable food systems. Notwithstanding the contemporary relevance of discussions of urban and peri-urban food systems (and Indigenous Peoples' food practices within these settings), this discussion goes beyond the scope of this White/Wiphala Paper. The White/Wiphala Paper will also not talk about traditional food systems or those that share some elements with Indigenous Peoples (peasants, agroecology, subsistence systems) but are conceptually and spiritually quite different.

The White/Wiphala Paper is structured as follows: (I.) Characterisation of Indigenous Peoples' food systems; (II.) What Indigenous Peoples can bring to the current debate on sustainable food systems; (III.) Drivers affecting Indigenous Peoples' food systems; (IV.) Indigenous Peoples' food systems are a game-changing solution in themselves, and (V.) Recommendations organised as per the Action Tracks and game-changing solutions.

United Nations Food Systems Summit, Indigenous Peoples and the Global-Hub

The Global-Hub on Indigenous Peoples' Food Systems[1] is a platform that brings together indigenous and non-indigenous experts, scientists and researchers in a knowledge dialogue to gather insights and evidence on the sustainability and the climate resilience of Indigenous Peoples' food systems. The process of knowledge co-creation fostered by the Global-Hub on Indigenous Peoples' Food Systems is similar to that followed by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and regards Indigenous Peoples' traditional knowledge systems and non-indigenous scientific knowledge with equal respect and consideration. This process of co-creating knowledge identifies and builds synergies between Indigenous Peoples' knowledge systems and scientific knowledge systems. This approach has been recognised as a key opportunity to move towards sustainable ecosystem governance at multiple scales (Hill *et al.*, 2020; Tengö M. *et al.*, 2017; Takeuchi, 2010; Ulicsni *et al.*, 2019).

The Global-Hub on Indigenous Peoples' Food Systems and its research network join Indigenous Peoples from the seven socio-cultural regions in thanking the UN Food Systems Summit Scientific Group for the

[1] To date, 18 research, academic and multilateral institutions working on indigenous food systems have joined the Global-Hub on Indigenous Peoples' Food Systems, including the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), the French National Research Institute for Sustainable Development (IRD), the United Nations Permanent Forum on Indigenous Issues (UNPFII), Asia Indigenous Peoples Pact (AIPP), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Organization for Education, Science and Culture (UNESCO), the Indigenous Partnership for Agrobiodiversity and Food Sovereignty (TIP), the Sámi Parliament, Gaia Amazonas, the Fund for the Development of the Indigenous Peoples of Latin America and the Caribbean (FILAC), Centre for Sustainable Development and Environment (Cenesta), INFOODS, and the Universities of Massey, Monash, Cambridge, Greenwich (through its Natural Resource Institute: NRI) and McGill (through its Centre for Indigenous Peoples' Nutrition and Environment: CINE).

opportunity to present the White/Wiphala Paper as an important input towards the food systems discussion, conceptualisation and resulting framework from the Summit. It is critical that the food systems concept and framework, which will be referenced to design future policies on food systems, is inclusive and encompasses understandings of "sustainability" representative of Indigenous Peoples' views and knowledge (Virtanen, Siragusa and Guttorm, 2020).

Important considerations and core principles

Any paper on Indigenous Peoples must recognise a series of concepts, principles and important considerations that Indigenous Peoples have been advocating for years. These considerations underpin and are prerequisites for well-functioning food systems and are outlined as follows:

Important considerations

The paper is written under the overall frame of internationally agreed conventions, declarations and documents that have been negotiated by Indigenous Peoples' representatives. Central to this paper are:

- The 1989 International Labour Organisation Convention 169
- The 2004 Voluntary Guidelines on the Right to Food
- The 2007 United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)
- The 2014 World Conference on Indigenous Peoples (WCIP) and its outcome document
- The 2015-6 UN Systems-wide Action Plan on Indigenous Peoples (UN-SWAP)

These agreements established fundamental rights and principles that must be respected when working with Indigenous Peoples:

1. The right to Free, Prior and Informed Consent (FPIC)

Free, Prior and Informed Consent is a specific right that pertains to Indigenous Peoples and is recognised in the UNDRIP. It allows Indigenous Peoples to give or withhold consent to a project that may affect them or their territories. Furthermore, FPIC enables Indigenous Peoples to negotiate the conditions under which the project will be designed, implemented, monitored and evaluated. It is not only a result of a process to obtain consent for a particular project, but also a process in itself, and one by which Indigenous Peoples are able to conduct their own independent and collective discussions and decision-making. They do so in an environment where they do not feel intimidated, and where they have sufficient time to discuss in their own language, and in a culturally appropriate way, on matters affecting their rights, lands, natural resources, territories, livelihoods, knowledge, social fabric, traditions, governance systems, and culture or heritage (tangible and intangible) (FAO, 2016). Violation of this right would affect the sustainability of any development project or strategy on Indigenous Peoples' food systems.

2. Right to food

The Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security were adopted by FAO Council in November 2004 and demanded special attention to Indigenous Peoples, their participation in decision-making, and rights to land, assets and resources that are important to their food systems. Difficulties in exercising self-determination and

tensions surrounding Indigenous Peoples' access to their lands and territories are two major issues that inform the health and future of Indigenous Peoples' food systems across the world.

3. The principle of self-determination

The UNDRIP affirms Indigenous Peoples' right to self-determination, by virtue of which they freely determine their political status and economic, social and cultural development. The right to self-determination falls under the principle of "Nothing for or about Indigenous Peoples without Indigenous Peoples" in any external entity involving Indigenous Peoples in any policy discussion that could affect their livelihoods or food systems in any way. The right to self-determination is a precondition for the full and effective exercise and realisation of other rights of Indigenous Peoples.

4. Intellectual property rights (IPRs)

This paper demonstrates how Indigenous Peoples' food systems, underpinned by rich and diverse knowledge, can contribute to debates on sustainable food systems. Whilst Indigenous Peoples' knowledge is well-placed to contribute to debates, this cannot be done via the linear transfer of knowledge, akin to historical methods of extraction, but rather via the co-creation of platforms upon which their knowledge systems can be sensitively bridged and treated as equal. To mitigate the extractive use of Indigenous Peoples' traditional knowledge, the UNDRIP enshrined the right for Indigenous Peoples to maintain, control, protect and develop their intellectual property over their traditional knowledge and practices. Furthermore, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) affirmed the right for Indigenous Peoples' communities to grant access to traditional knowledge associated with genetic resources. Contracting Parties are to take measures to ensure Indigenous Peoples' free, prior and informed consent, and fair and equitable benefit sharing, keeping in mind community laws and procedures as well as customary use and exchange.

5. Right to land, territories and resources

The UNDRIP articulates Indigenous Peoples' right to own, use, develop and control the lands, territories and resources that they have traditionally owned, occupied or otherwise used or acquired (Article 26). Other guidelines also enhance the rights of Indigenous Peoples to land, including the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT Guidelines), and the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines). To support the sustainability and resilience of Indigenous Peoples' food systems, Indigenous Peoples' rights to land, territories and resources must be fully respected and recognised, including their capacity for the management and co-management of natural resources.

I. Characterisation of Indigenous Peoples' food systems

"Indigenous Peoples' food systems are the result of harmonious relationships with Mother Earth. These are holistic relationships that integrate the identity, agricultural calendar and spirituality of a people, and have implications for both physical and spiritual wellbeing."

María Eugenia Choque Quispe, Member of the UNPFII, Plurinational State of Bolivia (IFAD, 2015a)

"Our health comes from our culture, and our culture comes from our homelands... We have to take care of Mother Earth because there are uses for just about every bit of or environment. But you have to learn how to use it and you can only do that if you're there, listening. You can't get this from a couch, sitting there watching television."

Wanaseah Larry Campbell, Swinomish Elder (Donatuto *et al.,* 2020)

Indigenous Peoples portray their food systems with a wide-angle holistic view that encompasses spirituality, life and culture, with biotic and abiotic components in the ecosystem, as well as the interconnections between them. Indigenous Peoples' food systems involve the totality of human agencies (knowledge, strategies, techniques, values, sharing) for the production, generation, utilisation, access, availability, stability and management of food that are nutritious, culturally and spiritually fulfilling, and sustainable for future generations.

There are as many Indigenous Peoples' food systems as the ecosystems in which Indigenous Peoples live across the planet. Their food systems are heterogeneous, comprising different ways of obtaining, preparing, storing and sharing food. These diverse ways of obtaining food are built on diversified means and techniques based on interactions with nature that respect the biogeochemical cycles, limits and seasons.

It is with full recognition of their diversity that, for the purposes of the White/Wiphala Paper, Indigenous Peoples' food systems will not be defined. Rather, this paper characterises Indigenous Peoples' food systems. It describes the main elements and features common to Indigenous Peoples' food systems across the world, and what distinguishes them from other types of food systems. Whilst the various elements overlap and interact in multiple ways, essential pillars of Indigenous Peoples' food systems include cosmogony, territorial management, traditional knowledge, governance, and value systems of balance and reciprocity. As shown in Figure 1, Indigenous Peoples' food systems cannot be visualised in terms of conventional linear value chains: processes of food generation and production, processing, distribution and consumption are intertwined and supported by a rich structure of material, epistemological and spiritual inputs.

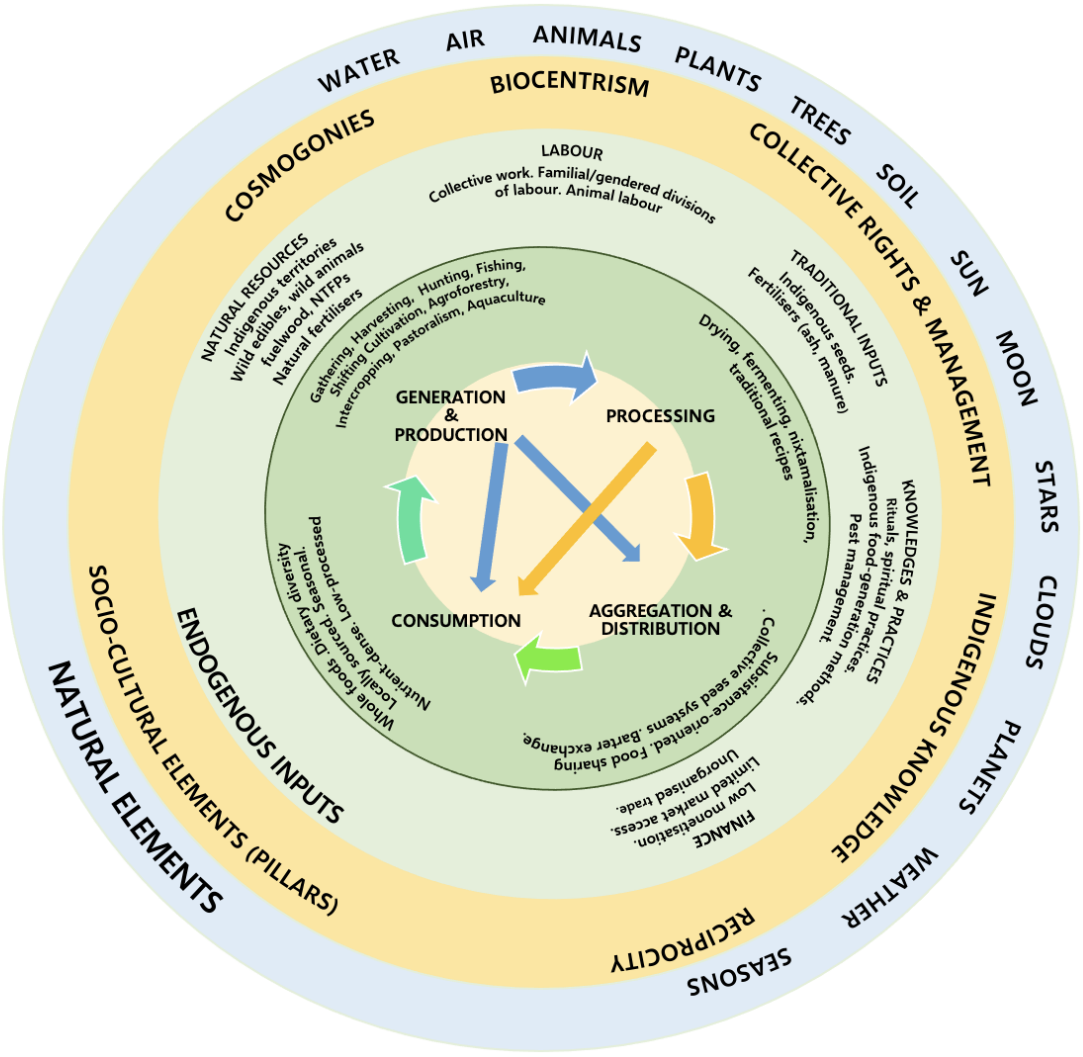

Figure 1: A food systems wheel for Indigenous Peoples' food systems.
Source: Sustainable food systems: Concept and framework, FAO 2018

Cosmogony

Indigenous Peoples' cosmogonies inform their visions of the ecosystem, nature and the world. Spirituality is an important feature of Indigenous Peoples' food systems. Numerous Indigenous Peoples' communities maintain indigenous faith and spiritual connections to ancient spirits, deities, lands and associated environments. Decisions made over the management of the ecosystems are often supported by rich cosmogonies (sets of spiritual beliefs, rites, religious practices and customs) and spiritual ideologies.[2] The territory and each epoch are part of a whole that links local ecosystems to regional, planetary, climatic, astronomical and cosmic dynamics, at material as well as energetic and spiritual levels.

[2] Rituals have a key role in maintaining these worldviews and knowledge systems, passing on practices and values and strengthening the sense of community and collective responsibility to conserve socio-ecological systems (Anacio, 2017). The production or generation of food goes through a series of ritual processes through which the reciprocal exchange with nature, the climatic cycles, and the regeneration of species is guaranteed. In addition, the ways in which foods are harvested, gathered and prepared obey traditions founded on centuries of cultural knowledge.

Biocentrism is embedded in the thinking of Indigenous Peoples when considering how to generate and produce food. The cosmogonies of Indigenous Peoples from different places in the world embody biocentrism, which is the recognition of sacredness and spirituality in all living things and their connection with the spiritual world. The mountains, deserts, rocks, rivers, lakes and forests are sacred for Indigenous Peoples. For example, in some countries, the Earth has been recognised as an entity with its own rights separated and differentiated from those of humans. Notably in Bolivia, Mother Earth (Pacha Mama) has been granted its own set of rights.

Common amongst Indigenous Peoples' cultures is their understanding that people are not separate from nature, but rather part of it. In the biocentric view of Indigenous Peoples, humans are one element in the ecosystem, deserving respect along with the rest of living entities.[3] The Inuit conceptualise the Arctic ecosystem as a puzzle in which each piece (ice, oceans, rivers, whales, animal health, feasts, languages, sharing, passing of knowledge, art and more) has its place within the greater whole (Inuit Circumpolar Council-Alaska, 2015).

Food has spiritual and cosmogonic connotations that forge the identity of Indigenous Peoples. For Indigenous Peoples, food is about more than eating. It carries nutritional, medicinal, healing, spiritual, social, cultural, relational, emotional dimensions and values. Food is an expression of the linkages between Indigenous Peoples, their ancestral lands, waters, non-human relatives and the spiritual world. Some Indigenous Peoples adopt the name of their foods, such as the Maya people who call themselves the Maize people as they believe that humankind came from maize.

Symbiotic relations between food, environment, the social system, wellness, spirituality and culture are integral to Indigenous Peoples' food systems. The environment and the ecosystems[4] in which Indigenous Peoples exist are interconnected with health, wellbeing and socioeconomic aspects (Cunningham Kain, 2017; Settee, 2020; IFAD, 2016). For example, Inuit recognise six interconnecting dimensions of food security, which include Inuit Culture, Availability, Accessibility, Health and Wellness, Stability, and Decision-Making Power and Management (Inuit Circumpolar Council-Alaska, 2015). Food security is tied to language, to learning to be within the environment, to wellbeing, and to the economy, which is tied to cultural sustainability. The health of the hunter depends on the health of the animals, just as the health of the animal depends on the health of the hunter. The concept of collective "biocultural heritage" (Swiderska, Argumedo and Pimbert, 2020) reflects the inextricable linkages and interdependencies between biodiversity, landscapes, Indigenous Peoples' traditional knowledge, and cultural and spiritual values that characterise Indigenous Peoples' food systems. This sense of interconnection with and from nature manifests in Indigenous Peoples' description of health as a composite of physical, mental, social and spiritual health – all which are significantly touched by food and food systems (Richmond *et al.*, 2007). In turn, changing conditions in the ecosystem are also a function of Indigenous Peoples' health, including climate change (Cunningham Kain, 2017; Settee, 2020; IFAD, 2016).

Harmonious living means living in balance with nature and Mother Earth is a central tenet of Indigenous Peoples' existence and their food systems. Indigenous Peoples' holistic view places the interconnectedness and balance amongst all living things (including humans) as fundamental for harmonious and peace living.

[3] One example in Tamaseq is the word *arramat*, which explains the wellbeing of the territory, the animals, the plants and the humans. Dr. Mariam Wallet Aboubakrine, President for the Association of Tinhinan Canada et member Tinhiane Sahel, former chair of the United Nations Permanent Forum on Indigenous Issues (UNPFII), explained the term *arramat* in Tamaseq to the Group of Friends of Indigenous Peoples in Rome (19 March 2021).

[4] Whose components include land/soil, water, air, animals, plants, clouds, stars, sun and wind, amongst others.

Territorial management

Indigenous Peoples' territorial management practices are as diverse as the ecosystems they inhabit across the planet. Indigenous Peoples are hunters, fishers, whalers, gatherers, herders, pastoralists, cultivators and more.

Territorial management is an essential element in Indigenous Peoples' food systems. Indigenous Peoples' food systems cannot be understood without the territorial component. The territory is where the spiritual and material worlds manifest and the place where harmony is sought through the maintenance of balance and peace between the different elements. Indigenous Peoples' territorial management often includes mobile practices like shifting cultivation, fishing, hunting and transhumance. Their territorial management practices sustain the biodiversity, natural resources and abundance of food items in land and water-based ecosystems, as well as their storytelling, traditional knowledge and cosmogonies.

Indigenous Peoples source their food through food generation and food production. Food production relates to systems managed through human intervention on the ecosystem with the intention to produce food. In anthropocentric systems, when human separation with nature is high, human intervention increases inputs of energy, nutrients, water and/or temperatures in order to favour production. In this context, food production refers to agriculture, shifting cultivation, aquaculture, pastoralism and other production systems. Food generation relates to minimal human intervention on the ecosystem, harvesting various existing food sources. This includes hunting, whaling, fishing, gathering and forestry. Indigenous Peoples' territorial management practices are geared towards sustaining the health of the land and water, which sustain the diverse plants and animals they harvest. Indigenous Peoples do not usually rely on a single activity or source for their dietary needs. It is common that Indigenous Peoples combine food generation and food production methods,[5] as well as food preparation, preservation and storage techniques.

[5] The Baka in Gribe village in Cameroon are hunter-gatherers and they practice shifting cultivation. They explain that "plantain bunches are mature when returning from the forest", which show how the Baka view agriculture in a similar sense to wild edible gathering. They prefer to feed on ripened fruits rather than investing time and efforts in increasing and stabilising crop yields (FAO and the Alliance of Bioversity International and CIAT, forthcoming-a). Indigenous Peoples in many regions, including Australia, North America and Latin America, use controlled burns of trees in winter or spring in their territorial management to prevent large wildfires, minimise insect infestations and generate new vegetative growth that sustains wild animals as well as new growth of food and medicinal plants in forest ecosystems.

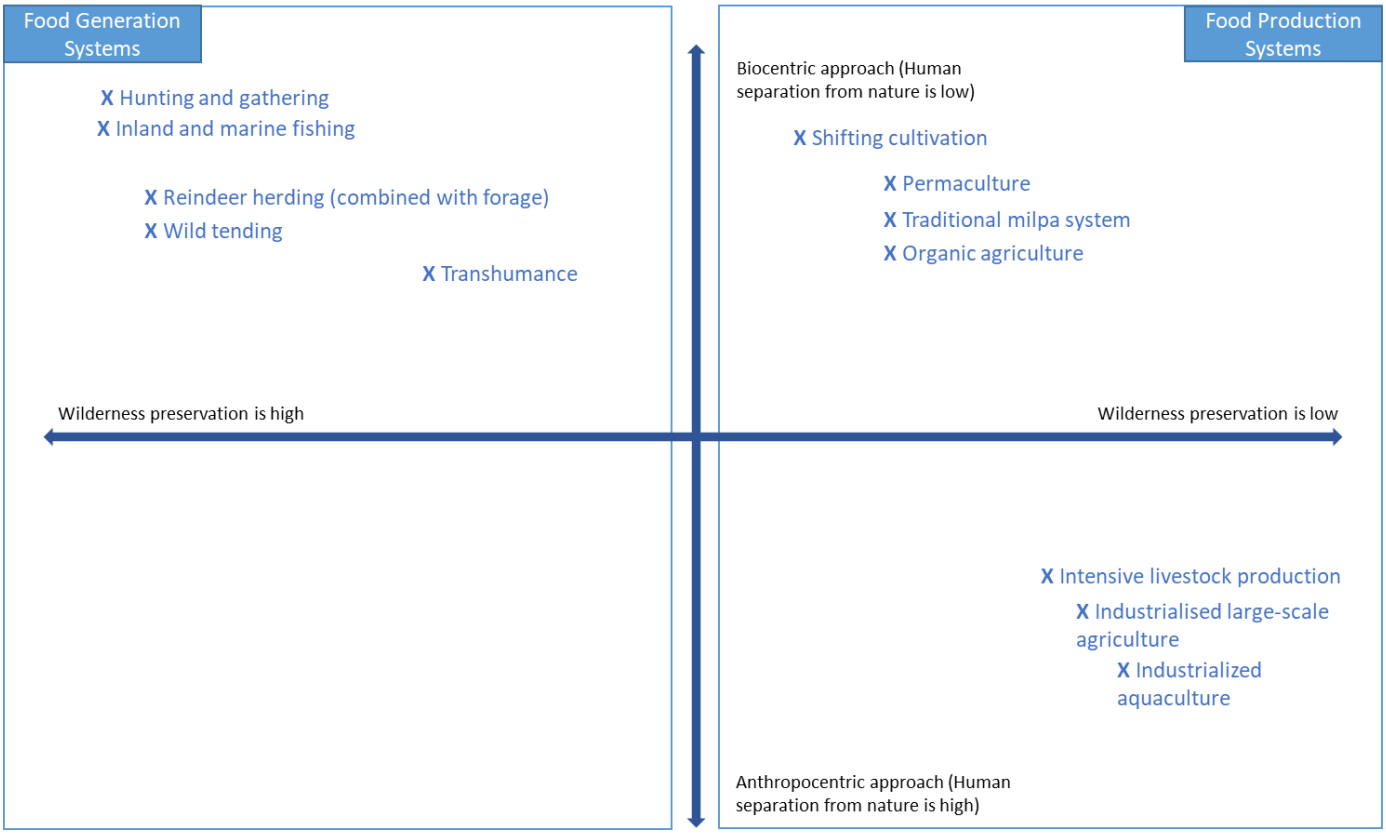

Figure 2: Example of food systems regarding the level of human intervention on the ecosystem and the approach underlying territorial management choices (anthropocentric, biocentric).

Indigenous Peoples' food systems are efficient in their use of resources, with no waste and circulation of resources. Indigenous Peoples' food systems are efficient in using food and other resources, with zero or minimal waste generated and wide circulation of resources, products and non-monetary wealth within communities, as exemplified by the rule of "take only what you need and share the excess". All the materials used tend to be fully utilised and recycled locally. In their food system, Indigenous Peoples reuse organic matter for agricultural production, which they consider as a resource more than as a waste (FAO and the Alliance of Bioversity International and CIAT, forthcoming-a). In contrast, recent studies on food loss and waste have calculated organic waste from global, conventional food systems equates to 1.3 billion tons of waste per year (FAO, 2020a). Another commonly held belief and practice amongst Indigenous Peoples is to use all parts of the plant or animal harvested, to fully honour the life given. The Inuit make walrus ivory artwork and sealskin clothing, and their crafts represent a full expression of their culture and respect for the gift of marine mammals. Their craftwork is also an important economic feature and expression of cultural identity of their subsistence hunting.

Indigenous Peoples work with nature, not against, to obtain food. In relation to the concepts of "food system boundaries" and "feedback mechanisms", Indigenous Peoples' food systems are sustained within the carrying capacities of the surrounding ecology and regulated by system linkages observed by Indigenous Peoples and their empirical methods. Each season of the annual cycle presents abundance or scarcity of certain species of flora, fauna, specific climatic characteristics, and different levels of water bodies. Indigenous Peoples closely observe and adapt to changes in the natural environment, drawing

upon and developing their traditional knowledge and practices to sustain reciprocity and balance. The Inuit follow animals and the weather with a sense of respect and gratitude as opposed to exerting control over them. Indigenous Peoples apply specialised techniques unique to their food systems that have been developed from one generation to the next. For example, soil fertility is essential for determining the ability of the soil to produce crops. In the highlands of South Wallo, Ethiopia, multiple aspects of soil fertility (organic matter, cation exchange capacity, pH and the interchangeable nutrients on the soil surface) are managed and maintained by Indigenous Peoples though their traditional knowledge (Tegene, 1998). Indigenous youth have key roles in bringing such techniques forward, to preserve and sustain their indigenous food systems into the future.

Future generations are considered when giving and taking from nature to ensure they will live in the same biological and cultural diversity and abundance. This is implemented in different Indigenous Peoples' practices practises that pay close attention to appropriate environmental and climatological conditions for harvesting, food generation and production. For example, maple is tapped during favourable environmental and climatological conditions to make sure the trees do not experience unnecessary stressors that they cannot recover from (described by Chi-Nations community in Chicago, FAO, Forthcoming).

Energy use is characterised by low use of external sources and prevalence of renewable energies. Indigenous Peoples' food systems rely on energy from the sun, water, wind, tides, firewood and human labour for most of their energy needs, in particular for processing, heating and cooking at the domestic level. Their often-remote locations create a de facto incentive for their communities to run micro hydroelectric schemes and solar panels. However, energy demand from external sources (electricity, fuel, kerosene) is increasing to meet transport, heating and cooking needs. For example, the Sámi and the Inuit now use snowmobiles for reindeer herding activities, hunting and transportation (FAO and the Alliance of Bioversity International and CIAT, forthcoming-a).

Collective seed systems comprised of domesticated and wild relatives constitute a biocultural system that enables continuous adaptation and improvement. Seed selection, saving and sharing are also common. Through their interventions in ecosystems, Indigenous Peoples often contribute to enhancement of biodiversity (IPBES, 2019). Indigenous Peoples have domesticated and improved thousands of crop varieties and livestock breeds that exhibit their ancestral knowledge and beliefs. Asian farmers, for example, have developed some 120 000 rice varieties, each adapted to specific agroecological conditions, and many of these were created as an expression of spiritual beliefs (Hamilton, 2003). In Southeast Asia, the high diversity of ethnic groups within a small region has produced extraordinary diversity in Indigenous Peoples' vegetable varieties, as different groups favour specific culinary and agronomic properties (Gill *et al.*, 2013). Indigenous Peoples continue to create new varieties through domestication of wild relatives, selection and breeding (Swiderska *et al.*, 2018), and to use resilient wild relatives to enrich domesticated crops (Swiderska and INMIP, 2017). Heirloom plant varieties create a deep, personal connectedness between communities, families and people through heirloom stories. The stories associated with food systems and seeds show the importance of seeds and food capital in Indigenous Peoples' social interaction and resilience within their food systems.

Indigenous Peoples' traditional knowledge

Indigenous Peoples' traditional knowledge is the backbone of Indigenous Peoples' food systems. Territorial and natural resource management is informed by Indigenous Peoples' knowledge systems and ways of knowing. Indigenous Peoples' traditional knowledge and practices differ from

"mainstream"/western science in many ways (Kazuhito *et al.*, 2019). Their knowledge systems are based on observations, know-how, local appropriate technologies, techniques, creation stories and ceremonial practices. Indigenous Peoples' traditional knowledge is mainly oral and taught through storytelling, skits, popular folklore, songs, poems, art, dance, objects and artefacts, and during ceremonies.

Indigenous Peoples' traditional knowledge is dynamic and holistic, encompassing governance, social, economic accounting, tenure, family institutions, languages, naming and classification systems, resource use practices, rituals, spirituality, and holistic worldviews and wellbeing concepts that promote ecological stewardship and equity (Hill *et al.*, 2020; ICSU, 2002; Swiderska Argumedo and Pimbert, 2020).[6] Indigenous Peoples' traditional knowledge systems are verified, implemented, challenged and applied within Indigenous Peoples own process of validation (Díaz *et al.*, 2015; Pearce *et al.*, 2015) and their own conceptualisations of what is "nature" and "sustainability" (Hall *et al.*, 2020). For example, oral stories about the three sisters and strawberries teach members of the Oneida Nation how and when to harvest, gather and store their foods.

Indigenous languages embody Indigenous Peoples' traditional knowledge, and their continuity enables the transmission of Indigenous Peoples' traditional knowledge and cosmogony.[7] Indigenous Peoples have developed rich vocabularies to depict the natural environment. The North Sámi language counts more than 1 000 lexemes denoting snow, ice, freezing and melting (Magga, 2006). The Inari Sámi developed specific wording to characterise whitefish and its behaviour (FAO and the Alliance of Bioversity International and CIAT, forthcoming-a). Biodiversity hotspots and high biodiversity wilderness areas often contain considerable linguistic diversity: 3 202 spoken languages, both indigenous and non-migrant, are found in the 35 biodiversity hotspots, and 2 166 of them are endemic to individual regions (Gorenflo *et al.*, 2011).

Governance

Indigenous Peoples' lands such as forests, water bodies and pastures, are used, managed or governed collectively as a common resource and under community-based governance. This governance is often based on long-standing traditions defining, distributing and regulating rights to land, individually or collectively, and is usually referred to as customary or indigenous land tenure. Collective rights are intrinsically linked with Indigenous Peoples' governance systems, traditional knowledge and territorial management practices. These nexuses are essential to ensure the effective management of common and communal resources.

Indigenous Peoples' management practices of ecosystems and landscapes are often regulated by social institutions, customary laws and cultural values rooted in their traditional knowledge (Salick and Byg, 2007), **cultural values and beliefs.** Examples include cultural values of reciprocity and reverence[8] and traditions of worshiping deities. In this context, such value systems, traditions and social institutions are

[6] The UN Declaration of the Rights of Indigenous Peoples, Article 31, recognises Indigenous Peoples "sciences" as a component of their cultural heritage.

[7] 4 000 out of the 6 700 languages in the world are indigenous languages (UNDPI, 2018).

[8] For instance, the concept of "reciprocity" between humans and other biotas arises from the creation belief of the Confederated Tribe of the Umatilla Indian Reservation (CTUIR) (Oregon, United States of America), which acknowledges a moral and practical obligation for humans and biota to care for and sustain one another, and arises from human gratitude and reverence for the contributions and sacrifices made by other biota to sustain human kind (link to Case Study 9).

central to the very identity of how Indigenous Peoples define rights, obligations and responsibilities in relation to territories, food biodiversity and cultures (WIPO, 2016)[9].

The objective of customary governance systems and laws are to serve the common good of the community, and regulate rights and obligations related to land, property ownership systems, livelihoods and food systems. Such systems of governance are integral to Indigenous Peoples' sustainable management of their lands and natural resources for their food systems and livelihoods.

There is a clear difference between collective property ownership systems and communal property ownership systems. In the collective, an individual can have superior rights and responsibility over part of the collective property. In the communal system, no individual can have any such rights. Customary rights refer to the management of collective property and communal areas and resources.

Collective work involving the family, different families and different groups is essential to maintain Indigenous Peoples' territories. This is a unique feature of Indigenous Peoples' food systems, rooted in traditional knowledge and carrying spiritual significance expressed in ceremonies and rites. The rituals of commensality and collective action in Indigenous Peoples' territories ensure the maintenance of communal areas (forests, lakes, rivers), individual spaces such as plot lands (milpas/chakras), and other food-producing/generating areas (Swiderska *et al.*, 2009 and 2018). This is important because the ancestral lands and territories encompass both individual areas as well as communal ones. This governance is exercised collectively, integrating values, such as sharing of the word for reciprocity, the minga, which enhances internal processes towards common welfare and conflict resolution. In exercising community governance, Indigenous Peoples' communities of the high Andean zone of Ecuador take care of the moorlands (main providers of water and sacred sites) and their biodiversity. They organise work through minga to build firebreaks, raise awareness and regulate the advance of the agricultural frontier. In Bolivia, the traditional governance mechanisms of their territories are of high significance, allowing both local administration of the spaces and promoting food sovereignty. For instance, collection spaces are assigned and agreed upon in the forest for each family or allocated for agricultural production. Furthermore, local conflicts are resolved by managing resources (water, soil) and ensuring harmonious output and sustainability of food systems. The Coastal-Vedda people in Sri Lanka primarily rely on culture-based fisheries for their food security. Indigenous fisherwomen's daytime subsistence fishing activities are governed by collective rules and led by the village first lady (spouse of Coastal-Vedda Chief).[10]

Indigenous women and indigenous youth play critical roles in the well functioning of these food systems. Inter- and intra-generational transmission of knowledge amongst age groups and between elders and youth are essential. In Indigenous Peoples' communities, indigenous children and youth are taught techniques and practices and they take part in the food system's activities. This is to be understood as education and integration within the community and should not be confused with labour. The Baka in Cameroon transmit knowledge about the forest between children, elders and youth. In times of intensifying climate change, globalisation and uncertainty, indigenous youth stand at the precipice of

[9] Indigenous communities in the Indian Himalaya have their own governance systems for management of natural resources i.e., Van Panchayats (forest council) for managing forest resources, where each family is given their rights but at the same time it is jointly managed by the community. They also believe in faith and conservation and regard natural resources like forest and water as sacred. They devote a certain section of the forest to their local deity and offer prayers to the local water Goddess. The entire community follows these customs to conserve and manage the natural resources.

[10] All the women should participate in the daily fishing activities based on a rotation basis that is collectively decided by village community-based fisheries institutions. Daily, about 20 women walk towards the village reservoir and fish for a couple of hours using a fishing rod. Community-based institutions determine the fishing spots and duration of the fishing, taking into consideration resource availability and community demand. All the fish are collected into one sack and distributed equally amongst households (Galappaththi *et al.*, 2020).

change that will determine if and how they will carry their indigenous ways of life and cultures into the future. Currently, many indigenous youths are confronted with the hard choice of maintaining their roots in the indigenous community or pursuing education and employment in cities far from home. However, as indigenous youth effectively navigate different cultural and knowledge systems, they hold key skills and insights of resilience and innovation. Many indigenous youth use new technological platforms to spread traditional knowledge and communicate the importance of Indigenous Peoples' food systems.[11] With their unique capacities, indigenous youth can contribute immensely to the preservation of Indigenous Peoples' food systems as well as the global agenda on food security, climate change adaptations, biodiversity preservation and Zero Hunger.

Indigenous women are daughters of mother earth and some of the world's guardians of biodiversity. It is often women who forage in the fields and forests and contribute to the territorial management. Different indigenous societies are matrifocal (either matrilineal or matriarchal) and manage territory and land in different ways. In the Khasi society, women own the land, with men playing a key role in the management. Indigenous women are knowledge holders, with unique knowledge linked to their community roles and occupations. They perform a plethora of key economic, cultural, spiritual and educational activities within their communities. Sámi women in Norway are engaged in reindeer activities and generate products that are marketed for their livelihood. Globally, indigenous women hold vast understandings and knowledge of medicinal plants, fruits, herbs, trees and shrubs. In areas where modern medical services are scarce, medicinal plants are collected and prepared by women. In Nepal, Rai and Sherpa women have a vast knowledge of the nutritional significance of plants growing in the jangal, often considered a "wild wasteland" to uninformed outsiders (Daniggelis, 2003). In Loita, Kenya, Maasai women are responsible for collecting and preparing products used by women and prepared at home. The children often assist the Maasai women, especially in the collection of vegetables.

The values system of balance, equilibrium, reciprocity and solidarity, with nature and in society

Indigenous Peoples' food systems have traditionally been underpinned by self-sufficiency and subsistence orientation with low levels of monetisation. Indigenous Peoples' food systems do produce and generate food at scale, though they are not necessarily market oriented. Often, the food items are generated, cultivated and harvested for family and community consumption, although this is changing rapidly for many Indigenous Peoples' food systems.

Indigenous Peoples' food systems promote equitable distribution of food, resources and power. This mainly comes from the fact that food generation and production by Indigenous Peoples' food systems is localised, community-based and linked to their ancestral lands. Indigenous Peoples' communal and solidarity economies promote the construction of alternative economic relations in their societal spheres. Such an approach builds productive processes, fair trade, solidarity finance and collective consumption based on associated work, self-management, collective ownership of the means of production, and cooperation. Through such indigenous-led economic systems, a diet with an identity is promoted, which helps to sustain healthy, resilient and culturally appropriate food systems. Furthermore, such indigenous economies promote short circuits of internal exchange and marketing of surpluses outside indigenous territories, through traditional or alternative fairs, Tianguis, and indigenous gastronomy (Indigenous

[11] Indigenous youth in Quechua and Yáneshas communities in Peru are sharing traditional knowledge through documentaries, other forms of audiovisual production and music (Government of Canada, 2018). In the United States of America, the indigenous-led organization Indigikitchen uses digital media to create a cooking show, using only native foods. Also in the United States of America, the United National Indian Tribal Youth (UNITY) hosts the Earth Ambassador program for indigenous youth to teach other youth in their communities the importance for the environment and value of the traditional foods offered by their culture, using digital platforms and webinars to communicate their messages (UNITY, 2020).

Peoples-cooks alliance), amongst others (FILAC and FAO, 2020). Within Indigenous Peoples' cultures and cosmogonies, the commodification of food items does not exist in the way it does within value-chain food systems.

Indigenous Peoples' food sharing has been practised as a form of security and solidarity mechanisms based on values of reciprocity.[12] By sharing, Indigenous Peoples increase access to beneficial resources for consumption and comfort (Holley, 2020). Traditionally, community members dedicated their efforts to obtain food for the subsistence of the extended family nucleus (partner, grandparents and children). The closest relatives such as parents, siblings and cousins will enjoy the excess food in a redistributive way, based on reciprocity and exchange of gifts (Mauss, M., 2009). These exchanges occur without monetary exchanges. Today, limited market access and infrastructures, unorganised trade chains and low monetisation are combined with sharing, trading and barter exchange. Food sharing and barter exchange is particularly practised during periods of food shortage as a safety net to ensure food security at the community level (FAO and the Alliance of Bioversity International and CIAT, forthcoming-a; Brimblecombe *et al.*, 2014). In Inuit communities, food sharing is a major driver of food security, which keeps the people grounded within their cultural identity and enables access to freezers, food and medicines. (ICC-Alaska, 2015). Holley (2020) describes how sharing continues to be an essential part of Alaska Indigenous Peoples' societies and economies. For a small village of Akiachak, residents share large quantities of fish, game and plant resources as part of their collective food security. Some residents who have moved into urban areas away from the village rely on the sharing of wild-harvest foods to retain cultural connection and nutritional intake of their indigenous foods. Sharing is also done between Indigenous Peoples' villages in Alaska, exchanging food sources for other resources such as timber.[13] In the Andes, barter between altitudes is vital to ensure nutrition (ANDES, 2016). In the Himalayas, seed-sharing ensures access to seeds, enhances biodiversity and enables adaptation to climate change (Swiderska *et al.*, 2009 and 2011). It is important to state that this characteristic is changing rapidly today, and some systems do not fit this description anymore.

The centrality of sharing can also be understood through the history of heirloom seeds and cultivation methods. In the example of the milpa systems (native maize intercropped with beans, pumpkins and other crops), indigenous family and community members share locally adapted, heirloom seed varieties between families and generations to ensure they are planting varieties of the milpa crops that have adapted to the specific conditions, poor soils, dry environments and windy areas (Martinez-Cruz, 2020). Camacho-Villa *et al.* (2021) show that maize cultivation is about sharing and resilience. When several families come together and help each other to cultivate the land, they share seeds, food and knowledge and reinforce their social ties.

[12] Principles of collective reciprocity that inform most Indigenous Peoples' societies across the world. The safety nets in Indigenous Peoples' societies are based on the principles of solidarity (often food cannot be sold or stored, but must be shared); reciprocity (the practices of communal work like minga, chakras and collective action are based on the benefit of the overall community based on reciprocal exchanges); and circularity.

[13] For example, sharing is an essential part of Alaska Indigenous Peoples' societies and economies and has a unique social meaning for showing both the giving and receiving parties' character. In 1998, Akiachak's per capita harvest of wild game meat averaged around 1 328 lbs. In the same year, 91.4 percent of participants in the survey reported having given or received fish, game and plant resources (Holley, 2020).

II. What Indigenous Peoples can bring to the current debate on sustainable food systems

"With regards to planting, we as Indigenous People can relate our planting knowledge back to our ancestors, and with the various methods they used, and all of those were from the earth itself. Various kinds of natural fertilisers were used, as well as various plants, to help deter the birds and bugs from eating the seeds. Even when planting, some that were grouped together helped to sustain the growth of the plants, and again to keep animals away… Awareness is key to every aspect of growing holistic healthy foods for our future generations."

Bob Brown, Traditional Chief/Knowledge Holder, Oneida Nation, United States of America

1. The role of Indigenous Peoples' view of life in sustainability transformations

The valuable role of indigenous Peoples and their knowledge and practices in informing sustainability science, resilience-building strategies and adaption to climate change is increasingly recognised (Miranda, 2011; IPCC, 2019; Ruckelshaus *et al.*, 2020). Despite this recognition, Indigenous Peoples' views, cosmovisions, time-tested practices and relational values continue to be excluded from science and policy (Mistry and Berardi, 2016; Tengö *et al.*, 2017). Western scientific knowledge remains the dominant knowledge system that sets the prevailing standards for research and policy (Lam *et al.*, 2020; Davis and Ruddle, 2010). Although the UNDRIP Article 31 recognises indigenous sciences, Indigenous Peoples' traditional knowledge – often contained within stories, songs, dances, practices and ceremonies – is only understood as scientific when it is extracted, "validated" and transcribed into scientific language. Global environmental governance would benefit from the inclusion of Indigenous Peoples' knowledge systems and enable the sustainable management of resources already observed within many Indigenous Peoples' territories (Ostrom, 2015; Ostrom, Gardner and Walker, 1994; Ostrom, Lam and Pradhan, 2011; Poteete *et al*., 2010; ICC, 2020).

Indigenous and western conceptualisations of the natural world differ in important ways. Within western frameworks, Nature and Culture are seen as distinctly separate and often opposing systems (Buscher & Fletcher, 2020). This introduces the anthropocentric perspective where humans are separate from or "doing something to" the ecosystem.[14] The terms "nature", "sustainability", "conservation", "intact forest landscapes" and "ecosystems" are commonly used within mainstream sustainability discourse, but implicate an absence of people, and thus the exclusion of local cultures, social systems, their knowledge, and practices within important spaces of biodiversity (Cronon, 1996; Maffi, 2007). This nature-culture dichotomy within western science is well-studied and runs counter to Indigenous Peoples' worldviews, which see ecosystems and their human and non-human co-inhabitants as intrinsically connected (de la Cadena, 2019; ICC-Alaska, 2015) with responsibilities to contribute to their vitality. This biocentrism is part of what makes Indigenous Peoples' food systems arguably more sustainable.[15] It is also one of the reasons

[14] For example, you would not say that a whale's food production relates to how it manages through intervention on the ecosystem (i.e. creating bubbles in the water to pull food sources) (Inuit Circumpolar Council).

[15] Consider the conventional representation of an ecosystem, which depicts a water-based or land-based food web, absent of humans. In contrast, indigenous ways of knowing recognise the interconnectedness of all living things (including humans) residing in a given ecosystem (Donatuto *et al.*, 2020). As described by Nazarea (2013), it is a perception of the world with no hierarchies, where human-nature are equal

why Indigenous Peoples' food systems do not fit in western conceptual frameworks of food systems based on linear value chains, leading to objectification of nature and its commodification (Figure 3).

Scientific knowledge operates on the notion of a single world (Ling, 2013), whilst Indigenous Peoples' traditional knowledge posits a collection of local worlds within a shared planet (Inoue & Moreira, 2016). This idea has been advanced by social scientists who define "nature" as always being a plurality of "socio-natures" or socio-ecological systems as opposed to a singular entity with overarching norms and solutions (Mansfield *et al.*, 2015). In their local contexts, Indigenous Peoples' knowledge systems are not alternatives but *the* way of being and co-creating a world amongst a human and non-human community. Indigenous worldviews or cosmovisions thus offer a different way of knowing the world, rethinking environmentally and the nature of "sustainable transformations" (Green, 2013, Yunkaporta, 2019).[16]

Acknowledging the differences between worldviews and cultures is essential to achieve productive engagement and dialogue in different policy contexts, and lead to more effective, equitable policy outcomes for food systems sustainability (Cosciemea *et al.*, 2020). The inclusion of Indigenous Peoples' voices – including their knowledge systems, values and needs – in policy, international and national legislation will support the sustainable management of natural resources and transformation of food systems for all (link to Case Study 13, Annex 1). Whilst Indigenous Peoples' traditional knowledge has much to offer to contemporary global challenges, utmost precaution and respect must be exercised so as to follow proper indigenous-led and consent-based knowledge sharing. Throughout western scientific history, Indigenous Peoples have been subject to studies constituting "extractive research". Conducting "extractive-research" studies have violated Indigenous Peoples' right to consent and intellectual property rights. Such instances of violation have caused extreme misunderstandings, mistrust, misuse and misinterpretations of their knowledge and practices. Indigenous Peoples' knowledge has been valorised in policy areas due to its "functional utility" within sustainability transformations. Whilst these new values placed on Indigenous Peoples' traditional knowledge represent a reversal of historic discourses that drove the destruction and suppression of Indigenous Peoples and their cultures, they continue to serve agendas that seek to govern and constrict indigeneity (Reid, 2019). Finally, nuance around the sustainability and resilience of Indigenous Peoples is necessary. For instance, a blanket characterisation of Indigenous Peoples as "resilient" obfuscates adequate understanding of the conditions in which they may not be resilient, as well as the complex structural drivers that enhance or diminish resilience (Reid, 2019). Indigenous Peoples and their vast systems of knowledge have the potential to substantially enrich debates around sustainable and resilient food systems, but they and their knowledge must be sensitively, respectfully integrated.

2. Indigenous Peoples' knowledge systems are complementary to scientific knowledge

Indigenous Peoples' food systems, underpinned by rich and diverse knowledge, can contribute to debates on sustainable food systems, biodiversity conservation, restoration and resilience, as well as land and

inextricably linked to nurture and protect each other. Rather than proprietary ownership, identity and resilience is built on the idea of reciprocal relationships of mutual protection, caretaking and sustenance.

[16] For example, Asian indigenous communities often ascribe cultural values to rice. Several names are prescribed to rice that denote it as being an entity or higher being (Bräunlein & Lauser, 1993), including "soul of rice", "rice mother", "rice grandmother", "rice grandfather", "rice spirit" or referring to rice as a "god" or "goddess" (Dozier, 1966; Larchrojna, 1986). For the Hanunóo-Manygan of the Philippines, the wellbeing of the entire region and every inhabitant depends on the intimate relationships between swidden farmers and the rice "people" (Conklin, 1957). The Sgaw Karen of Thailand and Myanmar practise rituals after rice harvest, calling upon the rice spirit to return the coming year to ensure a good harvest. The Tangkhul Nagas of Manipur, India, pray to the Goddess of paddy for a good harvest (Luikham, 2006). The Nagas call the earth, soil and land "*ayi*" ("mother") and their rituals support sustainable relationships with the land in order to entrust a healthy *ayi* to future generations.

resource management practices, and climate change mitigation, to name just a few. In the section that follows, we identify how scientific knowledge and Indigenous Peoples' knowledge systems can – and must – be seen as complementary despite their differences and respective intrinsic strengths and weaknesses. Further, the synergies of these knowledge systems are critical towards the needed work to co-design food systems for a world in crisis that addresses the diversity of food systems.

Acknowledging difference

Indigenous Peoples' traditional knowledge and practices have historically been seen as different from "mainstream"/western science in important ways (Kazuhito *et al.*, 2019) – substantively, methodologically and contextually (Agrawal, 1995).

Substantively, Indigenous Peoples' knowledge systems and traditional knowledge differs from scientific knowledge in subject matter and characteristics. Indigenous Peoples' knowledge systems in part emerge from the daily lives and observations of their people, and the surrounding environment in which they live. Their systems of knowledge do not centre on individualist values, rather on holistic, inclusive and interrelated ones. Their knowledge does not create a subject/object dichotomy. Indigenous Peoples' traditional knowledge is mainly oral and manifests through teachings, storytelling, skits, popular folklore, songs, poems, art, dance, objects and artefacts, and during ceremonies. Scientific knowledge positions itself as objective, exclusive and in the realm of experts. Scientists often seek replicable findings and make use of standardised units and categories. Scientific knowledge is written and can be stored and analysed (Agrawal, 1995). Methodologically, the two forms of knowledge have been seen in mainstream discourse to use different methods to examine reality. Indigenous Peoples' traditional knowledge is based on observations, know-how, local appropriate technologies, techniques and practices creation stories, and ceremonial practices. Scientific knowledge prides itself on its ability to prove and disprove hypotheses, to break down and reassemble data in intuitive ways. Finally, contextual differences between scientific and Indigenous Peoples' traditional knowledge have been identified. Indigenous Peoples' knowledge is inherently local and loses value when displaced. Scientific knowledge has historically been conceived as universal knowledge that can be transported and is applicable in multiple and diverse contexts, despite the fact that it carries its own Western cultural legacy and bias. The strength of Indigenous Peoples' knowledge in relation to sustainable food systems lies in its local situatedness – the ability to know and understand local ecosystems, territories and resources as well as their functions and capacities. This final point of difference is perhaps most important in terms of identifying effective and sensitive food policy solutions. Sustainable food systems must be tied to the local environment. Lessons can be learned from other food systems, but in application, solutions must be attentive to local context, needs and values to be effective, inclusive and sustainable.

Whilst Indigenous Peoples' knowledge is well-placed to contribute to debates, this cannot be done via the linear transfer of knowledge, akin to historical methods of extraction, but via the co-creation of platforms upon which these knowledge systems can be sensitively bridged, treated as equal and dignified in order to learn from each other. Within international science-policy arenas, there has been substantial recent progress towards engagement and collaboration across knowledge systems. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Convention on Biological Diversity (CBD), for example, now acknowledge the importance of indigenous and local knowledge in informing international biodiversity assessments and decision-making. The organizations have taken steps

to include Indigenous Peoples and their traditional knowledge to better enable the bridging of knowledge systems within agreements and written outputs (Tengö *et al.*, 2017).

In the context of food systems, there have been real-world examples of how scientific and Indigenous Peoples' knowledge have worked together, supporting the development and/or enhancement of sustainable food generation and production. This includes (but is certainly not limited to) the Dibaginjigaadeg Anishinaabe Ezhitwaad (see Case Study 13, Annex 1), a Tribal Climate Adaptation Menu developed by a diverse group of collaborators representing tribal, academic, intertribal and government entities in Minnesota, Wisconsin and Michigan. The Menu provides a framework to integrate Indigenous Peoples' traditional knowledge, culture, language and history into the climate adaptation planning process, and comprises an extensive collection of climate change adaptation actions for natural resource management. Another strong example of how systems changes and adaptations are positively influenced through complimentary knowledge systems and values are the studies demonstrating how traditional values and systems of Aloha `Āina from `Ōiwi (Indigenous Peoples of Hawai'i) complement and inform the designs of circular economies being explored in the European Union (Beamer *et al.*, 2021).

The Global Mountain Participatory Guarantee System (PGS) Network represents another valid example of knowledge-sharing processes amongst mountain peoples, including Indigenous Peoples' communities (see Case Study 7, Annex 1). Created in 2019 by 13 organizations of smallholder mountain producers from Bolivia, India, Kyrgyzstan, Mongolia, Nepal, Panama, Peru and the Philippines, the Global Mountain PGS Network is the first international network of Participatory Guarantee Systems. The network links small-scale mountain farmers around the globe, and promotes horizontal knowledge sharing amongst partners and innovative south-south cooperation. Thanks to this network, mountain farmers' experiences can be shared, communicated and scaled up, maintaining the context-specific approach typical of PGS initiatives. More detailed examples of the complementarity of Indigenous Peoples' knowledge and scientific knowledge in practice can be found in the Annex section.

This paper advocates for the co-creation of more such platforms in which mutual respect for knowledge is ensured, and which foster inclusive and effective development of sustainable food systems. This paper makes several important game-changing policy recommendations with regards to Indigenous Peoples' food systems. Underpinning all of the recommendations is the need to preserve, value and respect the richness of Indigenous Peoples' knowledge systems, and to further identify ways that bring together the synergistic strengths of scientific knowledge and Indigenous Peoples' knowledge systems.

Accepting Indigenous Peoples' knowledge as a body that gathers diverse observations by millions of peoples to the ecosystems where they live, accumulated over hundreds of years, passed on orally and embedded with a systemic approach and look into reality, is no doubt a paradigm changer in terms of accepting different bodies of knowledge that complement each other when describing reality.

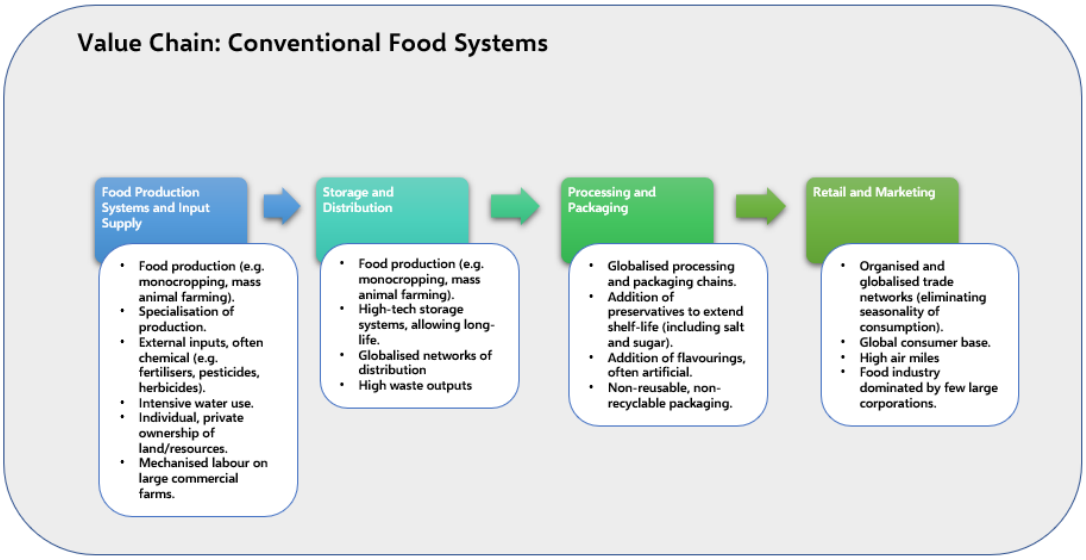

Figure 3: Conceptualised linear core value chain for value-chain food systems.

3. Indigenous Peoples' governance systems preserve global biodiversity

Indigenous Peoples occupy over a quarter of the world's land, which holds 80 percent of the world's terrestrial biodiversity (Sobrevilla, 2008; Garnett *et al.*, 2018). Indigenous Peoples often manage inland and coastal areas based on culturally specific values and worldviews, applying principles and indicators like health of the land, caring for the country, and reciprocal responsibility with the goal of promoting ecosystem health, respect and integrity (Posey, 1999; Berkes, 2012; Lyver, *et al.*, 2017). Looking deeper into natural resources management, the IPBES Global Assessment on Biodiversity and Ecosystem Services (2019) reported it is well established that "many practices of indigenous peoples […] conserve and sustainably manage wild and domesticated biodiversity" (p.9). There is evidence that Indigenous Peoples' practices can enhance biodiversity (IPBES, 2015). Indigenous Peoples' practices that enhance plant conservation amongst the Maasai in Loita, Kenya, include harvesting only what is needed, cutting only one stem from a multi-stemmed tree or clump, cutting the branches instead of the main stem, and cutting tree stems 1 ½ – 2 m above ground to allow sprouting from the stems, thus allowing continuity of life (Kariuki, 2018).

There is evidence that lands and forests managed and governed by Indigenous Peoples are able to resist forest loss (Miteva *et al.*, 2019; Schleicher, Peres, Amano, Llactayo & Leader-Williams, 2017) and experience lower rates of land conversion than forests within protected areas and undefined national forests (Baragwanath & Bayi, 2020; Blackman, Corral, Lima & Asner, 2017; Devine, Currit, Reygadas, Liller & Allen, 2020; García Latorre, 2020; Nepstad *et al.*, 2006; Nolte, Agrawal, Silvius & Soares-Filho, 2013; Wehkamp, Koch, Lübbers & Fuss, 2018). Carbon storage and sequestration capabilities of Indigenous Peoples' territories are also observed to be higher than forests in other areas (Rights and Resources Initiative, 2020; Walker *et al.*, 2020). These benefits extend beyond flora to include the species living within ecosystems, with Indigenous Peoples' territories containing greater populations of threatened terrestrial vertebrates than other areas (Corrigan *et al.*, 2018; O'Bryan *et al.*, 2020; Schuster, Germain, Bennett, Reo & Arcese, 2019). Research strongly suggests that Indigenous Peoples have contributed

towards generating the biophysical conditions that support high levels of biodiversity in the Amazon basin and Borneo (Levis *et al.*, 2017; Lombardo *et al.*, 2020; Oliveira *et al.*, 2020; Sheil *et al.*, 2012; Stephens *et al.*, 2019).

Indigenous Peoples are custodians of the majority of the planet's food and genetic resources and they are stewards of the territories and biocultural processes that shape genetic diversity (Hunter *et al.*, 2015; Garnett *et al.*, 2018; Diaz *et al.*, 2019; Hunter *et al.*, 2020). This is all too often not acknowledged and underappreciated. As the IPBES Global Assessment Report on Biodiversity (Kazuhito *et al.,* 2019) highlights, the territories and lands of Indigenous Peoples are critical areas for maintaining varieties of crops, breeds of animals, crop wild relatives and the other elements of food biodiversity that are essential for sustainable and resilient food systems (Diaz *et al.*, 2019). Many Indigenous Peoples' territories overlap with the regions identified as centres of origin of crops and crop diversity, the so-called Vavilov centres, where starting about 12 000 years ago many of our food crops were domesticated (Maxted, Hunter and Oritz, 2020). Mountains host about half of the world's biodiversity hotspots and mountain-dwelling Indigenous Peoples serve as custodians of this agrobiodiversity and traditional knowledge (Spehn *et al.*, 2010; Jarvis *et al.*, 2016).[17]

The seeds and breeds selected, crossed, shared and handed down through generations by Indigenous Peoples provide the genetic materials for crops and livestock to continue to adapt and evolve to a range of stresses including pests, diseases, increased temperatures and drought. This genetic diversity is critical for Indigenous Peoples themselves and it is also essential for future breeding programmes and for all farmers to adapt to changing climate. These genetic resources and the evolutionary processes underpinning them have been nurtured for millennia by Indigenous Peoples. Globally, Indigenous Peoples have long maintained significant on-farm portfolios of traditional varieties from multiple crops and developed diverse agroecosystems that encourage populations of crop wild relatives, the wild progenitors of food crops. Occasional gene flow between domesticated and wild species also contributes to the generation of unique genetic diversity. Indigenous Peoples are also frequently sourcing new diversity from nearby communities or further afield and exchanging materials with friends and relatives. This represents a highly dynamic biocultural system presenting unique opportunities for enhancement of genetic diversity (Maxted, Hunter and Oritz, 2020).

The biodiversity that flourishes within Indigenous Peoples' territories derives from their governance practices that are informed by their cosmogony. Indigenous communal governance systems, whereby communities collectively and equitably make decisions, are underpinned by their relationships with the surrounding environment. The Karen proverb quoted at the beginning of the document denotes these relational ontologies of an Indigenous Peoples' community with the socio-ecological system they co-inhabit. They demonstrate an awareness of the interconnectedness between species and their ecological and social roles within habitats. The nature of the proverb also imparts moral guidelines to be shared and followed amongst Karen community members. In doing so, it recognises the role of the community in ensuring the continuation of healthy relationships between all who reside in shared spaces, both humans and non-humans alike. Relational values such as these are an expression of the "diversity of life in all its manifestations", which are a product of a complex co-evolution between the biological, cultural and linguistic diversity held within adaptive socio-ecological systems (Gorenflo *et al.*, 2012; Maffi, 2007).

[17] Mountains are important centres of domestication of plants and therefore repositories of local varieties, providing a global gene pool that is critical for dietary diversity and nutritional improvement, as well as the ongoing adaptation of crops to climate variability, pest and disease outbreaks, and other future biotic and abiotic stresses.

Defending natural resources moves beyond western materialistic and capitalistic conceptualisations of what constitutes a resource, towards the very values, assumptions and definitions of "things" within Indigenous Peoples' territories (Blaser, 2013). These complex webs of relationships move beyond a language of property and ownership and are better exemplified by a language of kinship (Blaser, 2013). The success of a community relies on the wellbeing of all within it, not only of the peoples, and maintaining the collective wellbeing are built into the values of world views and the conceptual notions they express.

4. Indigenous Peoples' food systems provide nourishment and healthy diets

Indigenous Peoples' food systems make use of several hundred species of edible and nutritious flora and fauna (FAO, 2017), including traditionally cultivated crops, crop wild relatives and animal wildlife (including bushmeat, insects and fish). A compilation of case studies by the FAO Centre for Indigenous Peoples' Nutrition and Environment (CINE) demonstrated the impressive array of food species consumed by Indigenous Peoples in different ecosystems across the world, including 387 locally consumed food species for the Karen people of Thailand (Chotiboriboon *et al.*, 2009), and 381 species/varieties for the Pohnpei indigenous culture in the Federated States of Micronesia (Englberger *et al.*, 2009). The diversity of Indigenous Peoples' diets provides important sources of dietary energy, macronutrients and micronutrients all year round and/or at times of food crisis.

In many Indigenous Peoples' food systems, traditional foods are dietary staples, comprising vital sources of calories and macronutrients (Rowland *et al.*, 2017; Siren and Machoa, 2008; Broegaard *et al.*, 2017; Nasi, Taber and Van Vliet, 2011; Sarti *et al.*, 2015). Research conducted by CINE in 2009 shows that traditional foods, including local cultivars and wild edibles, can cover close to 100 percent of adults' dietary energy needs. For Igbo communities of Nigeria, traditional varieties of yam, cocoyam, cassava and maize are grown extensively and are important dietary staples. These traditional varieties also contain important micronutrients (beta-carotene, iron, iodine) and are more nutritious than their non-traditional counterparts, whilst also being better adapted to local tropical climate and soil conditions. Other Indigenous Peoples' communities derive a substantial proportion of energy and micronutrients from wild foods that are caught, hunted or gathered. In Perto Nariño, Colombia, the Tikuna, Cocama and Yagua peoples source around 80 percent of their protein from wild fishing activities (FAO and the Alliance of Bioversity International and CIAT, forthcoming-a). Recent research in Alaskan Indigenous Peoples' communities found that moose and caribou meats contribute significantly to diets, with Akiachak residents consuming around 100 kilograms of moose and caribou meat per person annually. (Holley, 2020). Traditionally harvested game, such as moose and caribou, also lack the hormones and chemicals often found in industrially produced meats.

In other Indigenous Peoples' food systems, such as those where traditional foods are being replaced by market alternatives, traditional foods are not dietary staples, but they make important contributions to dietary diversity (Powell *et al.*, 2015; Chakona *et al.*, 2018; Maseko *et al.*, 2017) and they supplement important micronutrients, such as iron, Vitamin A, sodium, zinc and calcium (Fungo *et al.*, 2016, Tata *et al.*, 2019; Golden *et al.*, 2019). For instance, in the Kivalliq region of Nunavut, harvested fish account for less than 2 percent of calorific intakes for Inuit peoples, but almost 19 percent of Vitamin D intakes. For indigenous pastoralist groups such as the Maasai, milk, blood and meat from traditionally farmed livestock comprise less than 10 percent of energy intakes but are a major source of Vitamin A (80 percent) and iron (11 percent). Amongst the Malagasy peoples in Madagascar, hunted wild meat and fish was found to contribute around 16.9 percent of protein intakes, 5.8 percent of iron, 4.7 percent of zinc, 16.2 percent of calcium, 64.7 percent of Vitamin B12 and 71.7 percent of consumed Vitamin D intakes (Golden *et al.*, 2019). In the Federated States of Micronesia, the diversity of Vitamin-A-rich species is celebrated,

including banana cultivars with some of the highest levels of beta-carotene in the world (Englberger *et al.*, 2013). Local cultivars contribute roughly three times the intake of beta-carotene (equivalents µg) compared to imported market produce for Mand adults.

Patterns of harvest, storage and preparation of traditional foods are often integral to the micronutrient status of Indigenous Peoples' foods. Studies have also shown how Indigenous Peoples' food practices support the enhanced bioavailability of nutrients. This means that taking crops from one environment to another (as it has often been promoted by mainstream policy) does not necessarily implicate healthy diets – the richness of the food lies in the environment in which it was cultivated, most notably soil, and the different ways of processing it. For example, Baker (2013) showed that maize taken from the Americas to other regions of the world during the Colonial era did not lead to the same nutritional outcomes. The nutritional richness of maize as food was linked to traditional methods of food production and preparation. The process of nixtamalisation (adding lime or hard wood ash to corn during cooking) is an Indigenous Peoples' practice that increased the bioavailability of niacin (Vitamin B3) along with the amino acid tryptophan, making over 600 corn dishes prepared by Indigenous Peoples throughout the Americas more nutrient-dense. The same can be said of many other Indigenous Peoples' food systems (See FAO, 2013; Kuhnlein, Eme and Fernández-de-Larrinoa, 2019). Even when Indigenous Peoples have apparently narrow diets of food items, they may still be diverse and rich in micronutrients because of the multiplicity of ways in which these foods are processed and prepared.

Indigenous Peoples' food systems are underpinned by rich knowledge of the seasonality of local cultivated and wild food species, supporting year-round food security. Some traditional foods may be of crucial importance during ("lean" or "hungry") seasons and/or at times of environmental and food crisis. Several studies have observed the higher consumption of wild foods during the agricultural off-season (e.g. Ntwenya *et al.*, 2017; Cruz-Garcia and Price, 2011), and as coping mechanisms at times of anticipated food shortage (Guyu and Muluneh, 2015; Hunter *et al.*, 2015; Noromiarilanto *et al.*, 2016). For example, Rakatobe *et al.* (2016) observed that the harvest of wild foods, especially wild yams, is an important way that the Madagascan Malagasy prepare for cyclone activity.

Within Indigenous Peoples' food systems, food, medicine and health are often seen as interrelated (Kuhnlein and Receveur, 1996; Johns and Sthapit, 2004) and Indigenous Peoples' communities often have sophisticated ethnobotanical knowledge. Many Indigenous Peoples' foods are locally considered to have medicinal values: consequently, communities still use herbal remedies to common ailments as a readily available and cheap alternatives to western medicine. In Jharkhand state, India, research with several tribal groups, including the Santal, Ho and Munda, has shed light on the importance of the wild Mahua flower *(Madhuca Latifolia*) in treating skin diseases, headaches, anemia and malaria. The flower is collected seasonally and used in sweets, pickles and fermented products. Food composition and chemical analyses have revealed the anti-helminthic, antibacterial, anti-cancer and antioxidant properties of the flower (Pinakin *et al.*, 2018). In east Africa, the Maasai of Sekenani Valley use local wild plant species for a variety of medicinal (and veterinary) purposes, including dental hygiene, skin diseases, gastrointestinal disorders, and joint or muscle pains (Bussman *et al.*, 2006). Scientific analyses have found many traditional medicinal foods to be rich in bioactive compounds relevant to human health, including phenolic compounds and antioxidants. These traditional food sources may protect cells against chronic diseases and obesity-induced oxidative damage, and possess antihyperglycemic, antihypertensive and microbiome-supporting benefits (Sarkar, Walker-Swaney and Shetty, 2019). Moreover, research has suggested important differences between wild and domesticated food species in terms of medicinal value (Leonti *et al.*, 2006): domesticated foods are often selected for increased yields and their more palatable tastes, and tend to contain less fiber and fewer pharmacologically active compounds than their wild progenitors.

Important dietary changes have been observed in Indigenous Peoples' populations as they experience rapid socio-economic, cultural and ecological changes associated with globalisation and modernisation. Commercial agriculture has, in many places, eroded indigenous food cultures; high-yielding crops and monoculture agriculture have replaced the important diversity of Indigenous Peoples' foods; industrial and high-input farming methods have resulted in ecosystem degradation. Traditional foods are often replaced by more convenient, and perhaps more desirable, westernised products, which are often highly processed and lower in dietary quality compared to locally cultivated fresh produce. The so-called "dietary transition" describes the increasing consumption of cheap, highly processed and energy-dense (westernised) diets in countries in Asia, Latin America, North and sub-Saharan Africa, and the Middle East (Popkin, 2001; Pingali, 2007). Alongside the transition, countries, communities and even individuals are increasingly experiencing the so-called double burden of malnutrition – that is, the co-existence of undernutrition, overweight and obesity (Popkin *et al.*, 2019; Wells *et al.*, 2020). The effects of the "dietary transition" in Indigenous Peoples' communities are of growing public health concern (Popkin, 2001). Indigenous Peoples have higher rates of infant mortality, maternal mortality, low birth weight, child stunting, malnutrition, child obesity and adult obesity, lower educational attainment, and economic status than non-Indigenous Peoples worldwide (Wong *et al.*, 2015; Anderson *et al.*, 2016). For example, Egeland *et al.* (2009) observed the replacement of traditional foods with unhealthy market foods in the Inuit Baffin communities was accompanied by a high prevalence of metabolic syndrome (including diabetes), as well as substantial food insecurity. In India, local commentators report concern with the growing reliance by undernourished Indigenous Peoples on the Public Distribution System (PDS), a nationwide system of food welfare. The PDS provisions of rice, sugar and vegetable oil replace the rich variety of local traditional foods that are often far more nutritious and diverse. The loss of traditional Indigenous Peoples' food management practices and ensuing health issues notably coincide with the indigenous community's loss of self-governance and autonomy over their ancestral lands. Thus, the importance to reinforce the need to advance in the recognition of Indigenous Peoples and the reinforcement of their governance systems and customary tenure systems to ensure the continuity in time of Indigenous Peoples' food systems.

In this context, the protection of Indigenous Peoples' food practices is essential for the sustained health of millions of Indigenous Peoples worldwide. Indigenous Peoples also have the potential to propose nutritious food from their food systems to the market to diversify global food systems. Mainstream food production policy and practice has primarily remained focussed on extending and intensifying the production of energy-dense staple crops, "trading off" biodiversity in pursuit of increased food security (Vinceti *et al.*, 2013; Perrings *et al.*, 2006; Burchi *et al.*, 2011). Fewer crops are being produced and national food supplies have become increasingly homogenised (Khoury *et al.*, 2014), with wheat, rice and maize contributing over half of global calorific intakes (Frison *et al.*, 2011; Antonelli, A. *et al.*, eds., 2020). Crop homogenisation can implicate the loss of important micronutrients from diets (Snapp and Fisher, 2014; Sibhatu, Krishna and Qaim, 2015). Stevia (*Stevia rebaudiana*), chia (*Salvia hispanica*), kañiwua (*Chenopodium pallidicaule*), kiwicha (*Amaranthus caudatus*), olluco, maca (*Lipidium meyenii*), goji berries (*Lycium barbarum*), guaraná (*Paullinia cupana*), sato palm (*Cycas revolute*), saichaichi (*Plukenetia volubilis*), azai (*Euterpe oleracea*), yarsagumbu (*Ophicordyceps sinensis*), tara (*Alpinia nigra*), mahua flowers (*Madhuca longifolia*), and quinoa (*Chenopodium quinoa*) are some examples of Indigenous Peoples' food that have broadened the world's food base (Kuhnlein, Eme and Fernández-de-Larrinoa, 2019; Cernanski, 2015; Gebru *et al.*, 2019). Commercialisation of such foods must be done sustainably, preserving the resource base with due consideration to the rights of Indigenous Peoples and to equitable benefit sharing.

5. Indigenous Peoples' food systems are resilient and can contribute to the challenges of climate change and environmental shocks

Defined as the capacity of a system to (i) to anticipate, (ii) to prevent, (iii) to absorb, (iv) to adapt to evolving risks, and (v) to transform when the current food system becomes no longer sustainable (Hertel *et al.*, 2021), resilience is often diminished within conventional food systems, as the spatial and temporal complexity of ecosystems is deliberately reduced in pursuit of maximal efficiency and yields. Despite such huge increases in production, conventional agricultural strategies have fallen short of eliminating global hunger and have failed to recognise the longer-term ecological and human health consequences of agricultural intensification and extensification. These include significant declines in biodiversity that are directly attributable to agriculture (IPBES, 2019). Growing critical attention has been paid to the unsustainability of conventional systems of food production and their lack of resilience to contemporary threats of climate change. Conventional agricultural practices have primarily focussed on enhancing the production of energy-dense staple crops, "trading off" biodiversity in pursuit of increased food security (Perrings *et al.*, 2006; Burchi *et al.*, 2011). Fewer crops are being produced and national food supplies have become increasingly homogenised (Khoury *et al.*, 2014), with wheat, rice and maize contributing to over half of global dietary energy (Frison *et al.*, 2011; Rowland *et al.*, 2017). Crop homogenisation often implicates the loss of resilience of food production systems to external environmental shocks, such as disease, pests and climate change.

In contrast with widespread monoculture agriculture, the high floral and faunal diversity of Indigenous Peoples' food systems has been linked to increased resilience against environmental shocks including pests and disease. Indigenous Peoples' food systems typically involve the generation of food from across multiple distinct areas of the landscape and from a rich diversity of species, varieties and breeds. In many cases, Indigenous Peoples' food systems entail a mix of wild and cultivated foods, and where these food systems do have some degree of market integration, often a level of use of traditional crops is retained. Making use of a diverse base of foods contributes to the flexibility and resilience of Indigenous Peoples' food systems facing environmental variability, and diminishes the comparative risks associated with relying on any single resource for food. Wild resources and traditional crops and practices also often have a heightened importance in hungry seasons and in the aftermath and recovery from climate disasters. For example, Lee and Chen (2021) describe how Tayal people responded in the recovery from typhoon Soudelor. In the aftermath of the storm, they returned to hunting, harvesting and fishing with harpoons. Indigenous Peoples' food systems have proven vital during the COVID-19 pandemic, which has exposed the vulnerability of global food chains (HLPE, 2020). Many Indigenous Peoples are now making active attempts to revive their agroecological food systems because they are more resilient to climate change and provide more nutritious diets than modern food systems (Poso, 2020).

Beyond simply the preservation of biological diversity, the vast biocultural diversity of Indigenous Peoples' food systems contributes a broad knowledge base that can inform and expand the set of possibilities and resources that humanity can draw upon in facing environmental uncertainty. Indigenous Peoples often possess rich environmental knowledge, which encompasses a breadth of topics, including climate, botany, ecology and spirituality that guide resource use and land-management practices. Deep knowledge of their

environments and their associated cycles enables Indigenous Peoples to leverage the many resources available in different areas of their territories and to detect and predict environmental change, which is essential for adaptation in the face of environmental and socio-economic shocks.

Indigenous Peoples' food systems are heterogeneous and unique combinations of factors underlie different systems and support their ability to cope, adapt and transform in the face of stress and shocks. Whilst such factors (including the aforementioned use of biodiversity, traditional governance, and rich knowledge and capacity for learning) help to enhance Indigenous Peoples' resilience when they are present, as these qualities erode, their absence contributes to the vulnerability that Indigenous Peoples face. Deforestation, marginalisation, displacement and food insecurity have all been reported as deeply affecting Indigenous Peoples' capacities to endure climatic risks (McDowell, Ford & Jones, 2016; Sherman, Ford, Llanos-Cuentas, Valdivia & Bussalleu, 2015; Zavaleta *et al.*, 2018), highlighting the relevance of considering the linkages between social and ecological systems in planning adaption responses to climate change (Ford *et al.*, 2018). Thus, whilst Indigenous Peoples´ traditional resilience mechanisms and coping strategies can help to inform global and local food systems transformations, attention must also be paid to Indigenous Peoples and their inclusion in policy decisions to avoid undermining existing systems of resilience.

The table below (Box 1) concludes Parts I and II and summarises how conception of nature, values and traditional knowledge shape Indigenous Peoples' food systems and deliver sustainability.

Box 1. Summary: How conception of nature, values and traditional knowledge shape Indigenous Peoples' food systems and deliver sustainability
Conception of nature
Biocentric: Ecosystems and their human and non-human co-inhabitants as intrinsically connected. Language of kinship to natural resources
Values sustaining the food systems
Towards nature: Harmony and balance with Mother Earth is sought. Values of reciprocity, stewardship and reverence towards nature. Actions driven by the awareness of the needs of future generations. **Towards community members:** Serving the common good of the community. Value of equilibrium, reciprocity and solidarity. Equitable distribution of food, resources and power within the community.
Knowledge system
Dynamic, adaptive and local specific. Shared, held and understood by all community members with use of rich vocabulary adapted to local environmental context and culture. Rich knowledge of the seasonality of local cultivated and wild food species.

- **Governance system that ensures equitable livelihoods, wellbeing and resilience of the community**

Governance and collective work are exercised collectively and integrate values. Self-sufficiency and low monetarisation of the food system.

- Enhances internal process towards common welfare and conflict resolution
- Limits over-exploitation of natural resources, preserves the natural resource base

- **Territorial and genetic resources management practices enhance biodiversity, resilience, nutrients' cycles and diet quality**

Food generation and food production practices respect seasonality, nature's cycles and the limits of the ecosystems.

- Diversification of food sources taking advantage of the spatial and temporal diversity of the ecosystems
- Preservation of biodiversity leading to high diet diversity and increased resilience
- Diversity of Indigenous Peoples' diets provides important sources of dietary energy, macronutrients and micronutrients all year round and/or at times of food crisis

Evolutionary genetic process for domesticated and semi-domesticated plants, animals and seeds is dynamic, community-driven and adapted to the local conditions. Genetic material is shared amongst community.

- Enhances biodiversity
- Enables adaptation to local climate
- Increases cohesion within the community and the food system
- Maintains micronutrient-rich traditional varieties that are more nutritious than their non-traditional counterparts
- Traditional food has medicinal, cultural and spiritual values

Flux of nutrients remains within the system

- Efficient in recycling organic matter
- Limits waste circulation

Low use of external sources of energy and prevalence of renewable energies

- Limits GHG emissions
- High resource use efficiency

- **Food preparation**

Multiplicity of ways in which traditional food is processed and prepared

- Diverse and micronutrient-rich diets
- Use of medicinal values of plants and animals species
- Enhance bioavailability of nutrients
- Year-round food security

III. Drivers affecting Indigenous Peoples' food systems

"Climate change constitutes the single most important threat to food security in the future."

UN Special Rapporteur on the Right to Food Olivier de Schutter report to the UN Human Rights Council, March 2009

"Fishing season get shorter each year. Ice break up faster now. Last year ice was weak … once we boat in December … so strange … ice doesn't break at right time."

An elder fisher

"Now we got more winds and it breaks ice … air is so dry … we lost our shack last year, during the fishing, wind blew it."

A Turbot fisher

"*We take care of the fish and the water and they take care of us. We will continue to have ceremonies with fish even if they are contaminated. Like we say, it's our spiritual food so it feeds our soul; so it might poison our body, but then we'd rather nourish our soul."*

Swinomish Elder (Donatuto *et al.*, 2020)

"We have to be aware of the areas of where the planting is done, and who's in these areas, 'cause the big farm industries want fast yields, and so they use whatever chem's they can to achieve this. So, those chem's leech into the ground, and the underground waterways, carries it to the unsuspecting holistic planter, only to find out, that their plants have been contaminated."

Bob Brown, Traditional Chief/Knowledge Holder, Oneida Nation, United States of America

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It is worth noting that there are two preconditions essential for Indigenous Peoples to be able to continue with their food systems: (1) the principle and right of self-determination and self-determined development; and (2) the secure rights of access to their lands, territories and natural resources. Difficulties in exercising self-determination and tensions surrounding Indigenous Peoples' access to their lands and territories are two major issues that inform the health and future of Indigenous Peoples' food systems across the world today.

Several positive and negative drivers are affecting Indigenous Peoples' access to safe and nutritious foods, consumption patterns, livelihoods, resilience food generation, and production practices. These drivers include socioeconomic and environmental factors that are both internal and external to Indigenous Peoples' territories and societies.

Out of the hundreds of interconnected drivers affecting Indigenous Peoples' food systems, this section briefly describes a total of 39 drivers that were most frequently mentioned during the contributions process to the White/Wiphala Paper. These drivers are also summarised in Annex 3. In this section, these drivers are aligned with each of the Action Tracks informing the UN Food Systems Summit and relevant policy recommendations are outlined.

Action Track 1: Ensuring Access to Safe and Nutritious Food for All

Action Track 1 of the UN Food Systems Summit is working to "end hunger and all forms of malnutrition and reduce the incidence of non-communicable disease, enabling all people to be nourished and healthy." The aims of this action track are to (1) accelerate the reduction of hunger and inequality, (2) make nutritious foods more available and affordable, and (3) make food safer. This action track is considered a precondition to enable the realisation of the remaining four action tracks.

1.1. Lack of respect of the principle and right to self-determination

There have been constant interferences in Indigenous Peoples' food systems, which threaten their collective capacities to exercise self-determination to protect aspects of quality of life such as cultural integrity, health and trusted relations for acquiring foods from other communities. In the case of Indigenous Peoples' food systems, the principle to self-determination and self-determined development are fundamental in key areas such as intellectual property rights, harvesting rights, access to plant genetic resources, territorial rights, and right to self-determination and self-governance.

1.2. Insecurity surrounding access to land, territories and natural resources

The increased insecurity surrounding Indigenous Peoples' territories is negatively affecting Indigenous Peoples' food systems and their sustainability. This is further exacerbated when the ownership of the land by Indigenous Peoples is not recognised by the State, through titling, for instance. This leads to concessions by extractive industries and logging companies. Lack of security to exercise collective rights applies directly to use of natural resources. (FAO and the Alliance of Bioversity International and CIAT, forthcoming-b). Indigenous Peoples' land tenure and sovereignty is a prerequisite to adaptive capacity in confronting climate change and addressing global sustainability.

1.3. Forced displacement and land grabs

Land grabs and occupations have forced many communities and peoples to be displaced and migrate. When Indigenous Peoples are displaced and lose access to their lands, they also lose their ability to be resilient and sovereign peoples. Furthermore, when Indigenous Peoples are displaced from their territories, it also puts at risk the biodiversity they have stewarded for millennia. In some cases, Indigenous Peoples' communities have been shifted from the protected areas to new areas that have changed their food systems, dependent on their forests, lands and waters. In the Pacific Northwest of the United States of America, historic displacement of Indigenous Peoples onto reservations, cessions of aboriginal lands, prohibition of tribal management including fire exclusion and suppression, and non-recognition of Indigenous Peoples are factors that contribute to Indigenous Peoples' disrupted relationships with their ancestral ecosystems (Long and Lake, 2018).

1.4. Educational system without interculturality

The influence of predominant cultures and school education curricula that are not rooted in Indigenous Peoples' knowledge systems have been linked to elevated rates of food insecurity in some Indigenous Peoples' communities. In Arctic North America, the legacy of government residential schools and modern-day pressures to engage in wage-based employment in Indigenous Peoples' communities have been associated with limited intergenerational ecological knowledge transfer and reduced participation in hunting (Pearce *et al.*, 2015; Wesche *et al.*, 2016). Amongst Peruvian Indigenous Shawi, a desire for youth to seek formal education has taken them away from communities, and it has been linked to lost knowledge of land and food production, and reduced exposure to traditional foods (Zavaleta *et al.*, 2018).

1.5. Continued trends of rural to urban migration

Across the world, there is a trend of net migration of populations from rural areas to urban areas, with global projections of 68 percent living in urban areas by 2050 (Van Vliet *et al.*, 2018). This migration clearly affects access to traditional cultural foods known in rural homeland areas, and impacts nutritional status, food security and health, especially when migrants live with severe disparities and poverty in urban settings (Skinner *et al.*, 2016; Richmond *et al.*, 2020).

One of the causes of migration to urban areas is climate change. Stress induced by climate change affects traditional social binding practices within Indigenous Peoples' communities. For example, amongst some Inuit communities, food-sharing networks have been documented to be under stress as traditional foods have become harder to procure, in turn reducing familial connections on which collective action is based (Beaumier *et al.*, 2015, Tejsner and Veldhuis, 2018). Over the long term, it is expected that climate change will greatly affect Indigenous Peoples' food systems, resulting in forced migration and disaster replacement amongst Indigenous Peoples.

Another cause for migration are development policies that have forced Indigenous Peoples to migrate to urban areas to seek a better life. For example, in Mexico, agricultural policy has encouraged larger farms whilst indigenous farmers have been forced to stop cultivating their lands and convert to other economic activities (Bartra, 2013) that reduce their sovereignty and resilience capacity.

1.6. Positive driver: Centrality of self-governance within the framework of self-determination

The exercise of self-government within the framework of self-determination supports Indigenous Peoples' livelihoods. There is strong evidence of the positive and central role of traditional governance practices and Indigenous Peoples' knowledge systems in maintaining and sometimes enhancing biodiversity in indigenous lands and territories, whilst supporting the generation of healthy food. In Inuit communities, research has shown that decision-making and management is a dimension of food security that adjusts stressors and disturbances and strongly impacts the other dimensions. The research reveals that a lack of decision-making power greatly influences the integrity of the connection between Inuit culture and the rest of the ecosystem (ICC -Alaska, 2015).

Action Track 2: Shifting to Sustainable Consumption Patterns

Action Track 2 of the UN Food Systems Summit is working to "build consumer demand for sustainably produced food, strengthen local value chains, improve nutrition, and promote the reuse and recycling of food resources, especially amongst the most vulnerable." The aims of this action track are to (1) dramatically increase the availability and affordability of healthy foods globally, especially whole grains, legumes and nuts, and fresh vegetables and fruits, and alternative protein sources, and particularly for vulnerable and poor population groups, sufficient quantities of healthy protein sources, including sustainably produced dairy, eggs, seafood and meat; (2) at the global level, and particularly with respect to more affluent populations, bend down the rising curve in consumption of animal-sourced foods,

especially red meat; (3) reduce the consumption of sugar-sweetened beverages and processed foods high in calories, unhealthy fats, sugars and artificial sweeteners, sodium and additives; (4) strengthen the connections between consumers and producers of food, including by fostering development of more robust local value chains wherever feasible; and (5) halve per capita food waste at retail and consumer levels by 2030 (SDG target 12.3) and transition to a circular food economy where waste becomes a thing of the past.

2.1. Changing of consumption habits of traditional foods

Some Indigenous Peoples are facing dietary changes due to decreased consumption of wild food, reduced access to traditional cultural foods in urban settings, high-yielding crops and monoculture agriculture, ecosystem degradation, migration, and imposition of non-cultural appropriate food policies without Free, Prior and Informed Consent (See Kuhnlein *et al.*, 2009; Sarkar, Walker-Swaney and ShettySarkar *et al.*, 2019). The change in many Indigenous Peoples' diets to the increased consumption of highly processed, low-nutrient foods has resulted in extensive increase of type 2 diabetes mellitus, cardiovascular disease, obesity, cancer and other chronic diseases (Johns and Sthapit 2004; Swinburn *et al.*, 2011). Those changes in diets happen more often as migration and displacement occur because Indigenous Peoples cannot rely on their lands and food richness anymore.

2.2. High prevalence of non-communicable diseases amongst Indigenous Peoples and diet transition

Indigenous Peoples' increased reliance on markets and systems of food welfare, disregarding Indigenous Peoples' traditional diets, leads to increased consumption of highly processed, low-nutrient foods with high sugar, sodium and fat content. As a result, Indigenous Peoples face a rising epidemic of non-communicable diseases, including obesity, heart disease and diabetes (Sarkar, Walker-Swaney and Shetty, 2019). For example, Egeland *et al.* (2009) observe a connection between the replacement of traditional foods with unhealthy market foods in the Inuit Baffin communities, accompanied by a high prevalence of metabolic syndrome (including diabetes) and substantial food insecurity. Similarly, the Indonesian Institute for Forest and Environment (RMI) reported that youth and elderly of the Kasepuhan Cibedug now develop non-communicable diseases, such as diabetes and toothache, favoured by the recent better road access and establishment of food stalls in the community village.

Indigenous Peoples have higher rates of infant mortality, maternal mortality, low birth weight, child malnutrition, child obesity and adult obesity, lower educational attainment, and economic status than non-Indigenous Peoples worldwide (Wong *et al.*, 2015; Anderson *et al.*, 2016). Globally, over 50 percent of Indigenous Peoples above the age of 35 suffer from diabetes, attention-deficit hyperactivity disorder (ADHD), malnutrition or cardiovascular illnesses (FAO, Forthcoming).

2.3. High prevalence of malnutrition, especially for indigenous infants and children

In Peru, chronic malnutrition affected more than double the number of indigenous children compared with non-indigenous children living in the same Amazon region (56.2 percent versus 21.9 percent) (Díaz, Arana, Vargas-Machuca and Antiporta, 2015). Similarly, in Ecuador, chronic malnutrition amongst indigenous children was found to be high (46.6 percent) (Hajri, Angamarca-Armijos and Caceres, 2020). Indigenous Peoples in higher-resource nations fare no better than those in lower-resource nations. The nutrition transition and the persistence of malnutrition in all their forms (micronutrient deficiencies, obesity, chronic malnutrition) are affecting indigenous populations in different regions in the world, and across rural and urban locations (Anderson *et al.*, 2016).

2.4. Limited scientific knowledge on food composition

Limited scientific knowledge of the food composition of many of the unique species in Indigenous Peoples' food systems hinders the ability to leverage their full potential to contribute to sustainable food systems (Borelli *et al.*, 2020; Hunter *et al.*, 2019, 2020; Bharucha and Pretty 2010; Heywood, 1999).

2.5. Loss of Indigenous Peoples' traditional knowledge and indigenous languages

Indigenous Peoples' traditional knowledge is critical in maintaining biodiversity whilst supporting the generation of healthy food. However, due to multiple factors, such as colonisation, development, globalisation, encroachment of territory, displacement and migration, Indigenous Peoples' traditional knowledge, and the practices that sustain their food systems, have been lost or abandoned. In particular, these changes have implicated the loss of knowledge of wild foods and other traditional foods, including how, when and where they can be sourced. For example, the Yukon people in Canada have experienced restricted access to traditional hunting, fishing and gathering grounds, and as a consequence their food systems have been disrupted, and they are losing and/or abandoning their traditional knowledge. For Indigenous Peoples, losing their knowledge is directly related to losing part of their culture, and it has consequences for indigenous youth. When an elder passes away, indigenous youth lose part of their culture.

Furthermore, the loss and erosion of indigenous languages have significant implications for Indigenous Peoples' food systems' resilience. Also, the loss of language is associated with the loss of a way of interpreting the world and communication between generations (ICC-Alaska, 2015). For instance, the word Imangaq in Yup'ik is translated into English as "black fish," a fish found within a particular water body. However, the word Imangaq is multidimensional. It speaks to the education that indigenous youth gain when taught how to catch this fish, as well as the types and growths of vegetation within and around the waters the fish inhabits, and the spiritual connections that are held with the environment surrounding the Imangaq (ICC-Alaska, 2015).

Action Track 3: Boosting Nature-Positive Production at Sufficient Scale

Action Track 3 of the UN Food System Summit is working to "optimize environmental resource use in food production, processing and distribution, thereby reducing biodiversity loss, pollution, water use, soil degradation and GHG emissions." To achieve nature-positive food production systems, Action Track 3 proposes to protect, sustainably manage and restore nature whilst globally meeting the fundamental human right to healthy and nutritious food for all.

3.1. Extensive degradation of ecosystems by land clearing, deforestation and extractive industries

The loss and degradation of the environments threatens Indigenous Peoples' livelihoods, territories, cultures and food systems. The loss and degradation of the environments in which traditional foods can be grown, often related to deforestation and the intensification and/or extensification of agriculture, threatens the availability of certain species of traditional foods and their frequency of consumption for some Indigenous Peoples' communities (Broegaard *et al.*, 2017; Galway *et al.*, 2018). Further threats may emerge from the loss of Indigenous Peoples' traditional knowledge of wild foods and other traditional foods, including how, when and where they can be sourced, in the face of socio-ecological change (Bussman *et al.,* 2006; Naah and Guuroh, 2017; Thakur *et al.,* 2017). Moreover, such extensive environmental destruction is driving the dramatic loss of biodiversity across the planet.

3.2. Loss of genetic and food-based diversity

Loss of genetic diversity or the reduced prevalence of the foods that Indigenous Peoples grow, hunt or gather (especially varieties and species with long cycles that are affected by thermal stress, variations in water cycles, floods or forest fires) is impacting their resilience. It has been observed that traditional varieties are being replaced by other varieties or newly engineered crops that are more robust to changing conditions. Shifts from family agriculture to monoculture agriculture is often seen as an alternative to increase household income for the purchase of food, although it can lead to the erosion of resilience due to environmental, socio-cultural and economic impacts. These shifts in cultivation practices may generate tensions regarding the vision of the land, territory and natural resources in the community (Lechón and

Chicaiza, 2019), weakening intimate long-term relationships with traditional land bases that support worldviews and cosmogonies, knowledge and social structures (Fiueroa-Helland, L., 2018). The displacement or disappearance of indigenous crops or of species or varieties that are part of Indigenous Peoples' food systems is ultimately linked to a change in or disappearance of associated Indigenous Peoples' traditional knowledge.[18]

For instance, a research project conducted by Montana State University on Flathead Indian Reservation in Montana in the United States of America interviewed low-income community members about their observance of wild food on the reservation. Community members documented seeing changes in their environments resulting in wildfire frequency and a decline in wild foods availability. The loss of wild foods on the Flathead Indian Reservation concerned 80 percent of the participants in the study (Smith *et al.*, 2019).

3.3. Expansion of industrial agriculture and monocropping systems

The spread of industrial agriculture and monocropping systems are encroaching upon Indigenous Peoples' territories, as well as adding market pressures that are causing some Indigenous Peoples to abandon their traditional production methodologies for industrial ones. Some Indigenous Peoples' food systems are shifting towards monocropping or crops that have demand in the market. Monoculture expansion is supported by perverse subsidies and incentives, urbanisation and diet transition.[19, 20] Many Indigenous Peoples have reported aggressive promotion of modern crop varieties that create dependence on costly and unsustainable external inputs, such as agrochemicals and large quantities of water. Such varieties are less resilient and not well adapted to the local context and environment. The expansion of industrial agriculture and monocropping systems undermines Indigenous Peoples' diverse production and food generation systems, as well as their sovereignty and resilience capacities, whilst causing further ecological destruction and economic binding.

3.4. Positive driver: Centrality of biodiversity-rich practices

Indigenous Peoples' food systems typically involve the generation of food from multiple distinct areas of the landscape and from a rich diversity of species, varieties and breeds, which diffuses the risk associated with any single resource. Turner, Davidson-Hunt and O'flaherty (2003) describe how Indigenous Peoples often live at ecological edges, which they are drawn to or that they actively create to benefit from the diversity of resources from different ecological zones. In many cases, a mix of wild, semi-domesticated and cultivated or raised resources are used, and if market-oriented production has been adopted, traditional foods are retained at a smaller scale (Meldrum *et al.*, 2018). Biodiversity-rich practices contribute to resilience by providing insurance against resource failures, enabling adaptation of food resources over longer time frames through evolutionary processes, encouraging positive symbiotic interactions between species and areas in the landscape that support nutrient cycling, control pests and disease, and facilitate pollination, and sheltering the food system from the impact of ecological shocks (Mijatović *et al.*, 2013). The collection and consumption of wild foods provides an important buffer at times of food shortage and food crisis (e.g. Rakotobe *et al.*, 2016; Shumsky *et al.*, 2014). Wild resources

[18] For example, in the Pasil River Valley of Kalinga Province in the Philippine Cordillera, indigenous farmers grow around 30 traditional varieties of rice, including *Chong-ak, Chaykot, Ifuwan, Waray* and *Ulikan* along the mountain slopes. These traditional heirloom rice varieties, cultivated using indigenous traditional farming practices, are at risk of disappearing due to competition with commercial varieties, and because younger generations are leaving the area in search of work, abandoning the high-elevation rice terraces.

[19] In the case of Colombia, various productive projects have been offered and implemented by the Ministry of Agriculture. Those projects promote the planting of non-native species in the fields and enforce monoculture of certain species to cover external demands. Such circumstances are leading to the gradual replacement of Indigenous Peoples' own products.

[20] The nutrition transition leads to a decrease in farm diversity due to spillover effects.

and traditional crops and practices often have a heightened importance in the aftermath and recovery from climate disasters.[21]

3.5. Positive driver: Innovative financing and investments for sustainable land management practises

Economic incentive systems such as payment for ecosystem services and carbon credits offer ways for Indigenous Peoples to continue safeguarding and managing their territories in sustainable ways for the land and their food systems, with positive side effects of sequestering carbon, maintaining carbon in ecosystems and preserving biodiversity whilst also earning an income that sustains their communities' economic needs (Case Study 11, Annex 1).

3.6. Positive driver: Global networks of custodians of agricultural biodiversity

The International Network of Mountain Indigenous Peoples (INMIP) is a network of small-scale and indigenous farmers working together as custodians of agricultural biodiversity. Such networks are an emerging opportunity for Indigenous Peoples' communities and small-scale farmers to co-organize and build capacity by learning from shared successes and challenges.

3.7. Positive driver: Protected and indigenous-managed agrobiodiversity centres

The "Parque de la Papa" (Potato Park) in Peru, a centre of diversity for a range of important Andean crops, is one example of an initiative to safeguard on-farm and *in situ* genetic diversity and the dynamic biocultural processes that underpin them (Argumedo, 2008). The park is home to a diversity of Andean crop landraces as well as crop wild relatives and many other species regularly harvested from the wild for food, medicine, cultural and spiritual reasons. The key feature of the park is the wealth of potato diversity, with around 1 300 distinct traditional varieties or landraces of potato that are named, known and managed by the local community and where a typical small farm plot may contain 250-300 varieties (WWF, 2006; Jiggins, 2017; ANDES, 2016). The park represents a community-based agrobiodiversity-focussed conservation area that aims to promote sustainable livelihoods whilst using customary laws and institutions to facilitate effective management.

Action Track 4: Advancing Equitable Livelihoods

Action Track 4 of the UN Food Systems Summit is working to "contribute to the elimination of poverty by promoting full and productive employment and decent work for all actors along the food value chain, reducing risks for the world's poorest, enabling entrepreneurship and addressing the inequitable access to resources and distribution of value." Goals identified by Action Track 4 to advance equitable livelihoods are: 1) Building agency of those people in diverse food systems who lack the space or the enabling environment in which to exercise their power and rights. 2) Changing power relations in food systems is also critical. 3) Transforming structures, including confronting social norms and practices that are embedded in structures that systematically privilege some groups over others, marginalising the poor, who often work in crop and livestock production and food value chains.

4.1. Lack of recognition of Indigenous Peoples' traditional institutions

Because Indigenous Peoples are underrepresented in democratic processes and government welfare mechanisms, more powerful actors often influence policy decisions. In nations where indigenous rights

[21] For example, in Northern Taiwan, Lee and Chen (2021) describe how Tayal people responded in the recovery from typhoon Soudelor. In the aftermath of the storm, they returned to hunting, harvesting and fishing with harpoons. This turning to foraging has also been observed with non-Indigenous Peoples in times of COVID-19.

and sovereignty are not recognised or poorly protected, indigenous institutions have been undermined and relegated in importance, undermining their food systems (Ford *et al.*, 2020).

4.2. Lack of respect of Free, Prior and Informed Consent in conservation

Indigenous Peoples have experienced negative consequences of the establishment of conservation strategies, particularly arising from the declaration of protected areas that commonly overlap Indigenous Peoples' territories. Governments have failed to ensure Indigenous Peoples' right to Free, Prior and Informed Consent when adopting such conservation initiatives. In turn, those measures often reduce Indigenous Peoples' autonomy over territories, deprive Indigenous Peoples of their territorial rights and negate access to lands and resources and management and territorial governance. The net effects may comprise the disruption of their livelihoods, displacement and food insecurity, amongst other consequences (Dudley *et al.*, 2018). Whilst indigenous forms of self-governance are important, it is also vital to include Indigenous Peoples in broader processes of policymaking that have an effect on their livelihoods, meaning that they are able to engage at other policy and government levels.

Dominant conservation policy narratives argue that unsustainable harvesting practices contribute significantly to biodiversity loss and extinction risk (Ripple *et al.*, 2016). Nevertheless, the latest report from IPBES (2020) announced substantial declines in global biodiversity directly attributable to agriculture. There are substantiated concerns for the unsustainable levels of offtake of wildlife through hunting/harvesting (e.g. Bennett *et al.,* 2006), when the community seeks full participation in the cash economy and tries to meet outside demand. At the same time, the enforcement of restrictive conservation policies negatively affects food and nutrition security for Indigenous Peoples (Golden *et al.,* 2019; Roe and Lee, 2021).

4.3. Lack of participation of Indigenous Peoples in decision-making processes

The lack of adherence to Indigenous Peoples' rights to self-determination and Free, Prior and Informed Consent in development policies and programmes are severe negative drivers of Indigenous Peoples' food systems. This is especially apparent with the lack of inclusion and consultation with indigenous women in global debates and policymaking decisions, in part due to lack of disaggregated data on indigenous women related to the persistent challenge of visibility. Indigenous Peoples have been deprived of participating in decision-making processes that directly affect them. In turn, policies that affect Indigenous Peoples have been adopted without their effective participation, disregarding Indigenous Peoples' views, cosmovision, time-tested practices and relational values. (Mistry and Berardi, 2016, Tengö *et al.*, 2017; Munamura *et al.,* 2018a; Merson *et al.*, 2019.)

4.4. Limited access to markets

There is limited access to markets for Indigenous Peoples due to absent or inadequate market linkages and infrastructure, lack of knowledge or access to economic opportunities (FAO and the Alliance of Bioversity International and CIAT, forthcoming-b; Patrinos and Skoufias, 2007; Rosado-May *et al.*, 2018). Many indigenous producers have little control over the pricing of their goods as their bargaining power is limited and they are subjected to market fluctuations and quality standards that mismatch their production systems. Indigenous Peoples' communities that want to market their goods must often operate through third parties who take significant profit (FAO and the Alliance of Bioversity International and CIAT, forthcoming-b; Lasimbang, 2008) and undervalue their goods.

4.5. Lack of protection for Indigenous Peoples' plant genetic resources

The widespread promotion and dominance of industrial agriculture is frequently compromising Indigenous Peoples' ability to protect plant genetic resources that are intrinsic to their food production and generation systems. Indigenous Peoples are keepers of vast plant genetic resources and diversity in seeds and other plant materials. However, the privatisation of ancestral seeds through intellectual

property rights, such as patents and plant variety protection, is violating Indigenous Peoples' rights over their ancestral varieties that they have domesticated and improved and goes against indigenous values of collective custodianship and the sacredness of seeds (Swiderska *et al.*, 2006, 2009 and 2011; ASFA and GRAIN, 2018).

Such intellectual property rights and seed laws requiring certification and standardisation are increasingly criminalising Indigenous Peoples' informal seed systems and small-scale farmers and restricting "seed commons" (Wattnem, 2016; Sievers-Glotzbach *et al.*, 2020; ASFA and GRAIN, 2018). Simultaneously, restrictions on the sale of harvested products and by-products limit Indigenous Peoples' realisation of benefits and sustainability in the food system, such as the adoption of European Plant Variety Protection standards of the International Union for the Protection of New Varieties of Plants (UPOV) Convention 1991 by African countries (Munyi and De Jonge, 2015).

As some Indigenous Peoples adopt these industrial crop varieties, it is resulting in the loss of traditional crop varieties and the associated Indigenous Peoples' traditional knowledge (for example, for the T'boli Indigenous People in the Philippines, Case Study 4, Annex 1) and also threatening their food sovereignty and resilience capacity as those industrial varieties require more inputs and have to be purchased cropping season by cropping season, making Indigenous Peoples dependent on the market.

4.6. Positive driver: Indigenous Peoples' worldviews and global policy for sustainable systems

Promoting indigenous worldviews through their inclusion in policy and international and national legislation is a transformation that will continue the sustainable management of resources observed in decentralised local solutions and governance systems (Ostrom, 2015; Ostrom, Gardner and Walker, 1994; Ostrom, Lam and Pradhan, 2011; Poteete *et al.*, 2010; ICC, 2020). Yet, the terms of participation could be improved by developing capacities of Indigenous Peoples so they can engage in dialogues and research-based policy as advisers, policymakers and researchers, amongst others.

4.7. Need for a gender perspective and women empowerment to avoid leaving anyone behind

Similarly to many other contexts, women suffer from systematic and structural exclusion. This exclusion goes from not paying for their work such as caring for children or sick family members to political participation. For example, in some cases, women cannot obtain the benefits of sharing communal resources as they are investing their time in caring for their family or relatives. In other instances, they cannot participate politically because they do not have land titles that recognise them as "users" or have access to credits, amongst other issues. Other factors affecting women include high levels of violence and social norms and rules that prevent them from engaging in other economic activities.

As with women, it is important to acknowledge that indigenous populations are not homogeneous and use an intersectionality lens when collaborating with them.

Action Track 5: Building Resilience to Vulnerabilities, Shocks and Stresses

Action Track 5 of the UN Food Systems Summit is working to "ensure the continued functionality of sustainable food systems in areas that are prone to conflict or natural disasters." Action Track 5 proposed a three-pronged fully integrated focus on food systems to build resilience to vulnerabilities, shocks and stress: (1) being equitable and inclusive (economic resilience); (2) producing broad-based benefits for all people (social resilience), and; (3) generating positive and regenerative impacts on the natural environment (environmental resilience). As demonstrated by the drivers in preceding action tracks, all three prongs are essential for Indigenous Peoples' resilience. Drivers relating to climate change and the COVID-19 pandemic specifically are highlighted below.

5.1. Global climate change and environmental pollution

Effects of climate change are already palpable worldwide and, amongst Indigenous Peoples' communities, causing a variety of human health impacts (Swinburn *et al.*, 2019). Indigenous Peoples are disproportionately affected by environmental changes over which they have little control. Despite contributing the least to GHG emissions, Indigenous Peoples are at higher risk of being impacted by the consequences of climate change due to their direct dependence and close relationship with land and sea, and their subsistence activities (Ford *et al.*, 2010; Lemelin *et al.*, 2010).

Rapid environmental change is a major stress to food systems, compounding underlying socio-economic trends (de Coninck *et al.*, 2018; IPCC, 2019). Climate drivers act through multiple pathways in Indigenous Peoples' food systems, impacting the availability, access, use and stability of nutritive food resources. In particular, the dependence of many Indigenous Peoples on climate-sensitive resources means that altered animal and wildlife health and distribution, access to wild food, as well as quality and safety of traditional foods (Guyot and Chan, 2006; Rosol, Powell-Hellyer and Chan, 2016) is increasingly impacted.

5.1.1 Accelerated climate change in the Arctic

In the Arctic, where climate change is more exacerbated and accelerated than in other regions, warming temperatures, uncertainty about seasons, and unexpected winds have changed the availability of fishing and hunting food species (Ford *et al.*, 2019; Galappaththi *et al.*, 2019; Pearce *et al*, 2015). Amongst the Sakha in Siberia, permafrost thaw is deteriorating pasture used for animal husbandry (Crate *et al.*, 2017), and for Sámi reindeer herders, increased unpredictability and frequency of extreme weather events are disrupting human-animal agency (Horstkotte *et al.*, 2017).

5.1.2. Climate change impacting mountain food systems

As the Andes have warmed, the cultivation zones of potatoes have shifted increasingly higher in elevation, where the land is scarcer (Sayre, Stenner and Argumedo, 2017). A Quechua farmer remarked that "You can't grow potatoes in the sky" in reflecting the challenges for maintaining the cold-adapted potato varieties and associated cultural practices that have been an integral feature of these lands for thousands of years (Sayre, Stenner and Argumedo, 2017). Amongst the most threatened peoples are the Indigenous Peoples from islands because of rising sea levels.

5.1.3. Climate change impacting weather patterns and local food resources

In the Amazon, warming temperatures, more unpredictable precipitations and more frequent "once in a century" extreme weather events (Jiménez-Muñoz *et al.*, 2016) have threatened the availability and stability of local food resources (Torres-Vitolas *et al.*, 2019). Climate change and its variability can create confusion amongst Indigenous Peoples who highly depend on their traditional seasonal calendar. The Kasepuhan Cibedug in Indonesia feel that their food system is now easily prone to crisis.[22]

5.1.4. Climate change impacting water cycles and extreme weather events

Variation of water cycles linked to climate change is leading to more significant attacks by pests and diseases, affecting not only yields but also food diversity, processing, storage aimed at self-consumption and exchange within the indigenous economy (food, seed, exchange). At the same time, extreme weather events are increasing diseases in animals, and affecting safety and traditional methods of harvesting, preservation methods and food preparation. Indigenous Peoples reported water insecurity as an increasing threat experienced by communities in coastal, arid and sub-Arctic/Arctic regions of the United States of America.

[22] Observation reported by the Indonesian Institute for Forest and Environment (RMI).

5.1.5. Environmental pollution and environmental contaminants bioaccumulating in food systems

Rapid global industrialisation over the past 70 years has resulted in pollution of the world's ecosystems. Pesticide and herbicide spraying is now more widespread, impacting ecosystems in urban and rural settings. In addition to agrochemicals, pollution also results from legal and illegal mining, and hydrocarbon industries. These operations can damage the environment and their food generation capacity, in the end threatening the future existence of Indigenous Peoples who depend on the territory and resources.[23] Some plants and animals bioaccumulate toxins and environmental poisons, concentrating their levels. Long-range transport of industrial chemicals from lower latitudes to northern regions with consequent accumulation and biomagnification of environmental contaminants in food chains presents serious challenges for indigenous populations who live off the land and for whom consumption of traditional foods are essential to their cultural identity, nutritional health and overall wellbeing (Kuhnlein and Chan, 2000; Laird *et al.*, 2013). Exposure to environmental contaminants raises a concern about the safety of traditional foods such as fish and leads to a shift away from traditional lifestyles (Fitzgerald *et al.*, 2004).

5.2. The COVID-19 pandemic and other shocks and stresses

The COVID-19 pandemic has exacerbated existing inequities in Indigenous Peoples' food systems, health and territorial rights.

5.2.1. Externally imposed lockdowns disrupted food systems and worsened food insecurity

Externally imposed lockdowns and disrupted value chains prevented many Indigenous Peoples from accessing their traditional lands, which had severe consequences for communities facing increased food insecurity (FAO, Forthcoming). In particular, Indigenous Peoples with mobile livelihoods became unable to lead their herds to pastures or to access markets (FAO, 2020b). Large numbers of tribal peoples in the Bangladesh Hill Tracts faced hunger and had to rely on food aid. In Nepal, indigenous villages were unable to harvest their fields (FAO, 2020b). COVID-19 revived historic racism and discrimination against Indigenous Peoples.[24]

5.2.2. Forced and violent displacement during the COVID-19 pandemic

Third parties took advantage of confinement measures and the state of siege, and invaded Indigenous Peoples' lands, provoking violence, forced displacement and ultimately situations of food insecurity (COICA, 2020; OHCHR; 2020; FAO, 2020b).

The COVID-19 pandemic has given impetus to existing calls (largely from conservationist groups) to evict forest users from spaces in which human-wildlife contact is more likely. The conservation community responded to the pandemic by adding the legitimacy of a public health narrative to long-standing concerns around the impacts of sustainable land use practices, wildlife harvesting and illegal wildlife trade (IPBES, 2020). In India, the Ministry of Environment and Forests instructed all states to seek to reduce human-wildlife interaction by placing restrictions on access to national parks, sanctuaries and tiger reserves. This directive applied to 3-4 million (mostly Indigenous) Peoples who live close to these areas, and who often rely on these areas for natural subsistence resources. Reports from Odisha state indicated that Indigenous Peoples were evicted from the buffer zone of the Similipal Biosphere Reserve. The compensation fees given to tribal peoples following evictions were meagre compared to the money earned from the sale of

[23] Indigenous Peoples' communities in Eastern Washington in the United States of America are exposed to radionuclides from the transport of uranium ore and mining waste. Indigenous Peoples who are gathering plants and animals can be and have been exposed to toxins through direct contact, inhalation and ingestion.

[24] In North-East India, Indigenous Peoples' communities were discriminated against based on their skin colour, leading in some cases to eviction from their house and denied access to the food market. In Myanmar, patient zero was a member of an Indigenous Peoples' community, leading to the discrimination of Indigenous Peoples in the country (FAO, 2020b).

Non-Timber Forest Products (NTFPs) sourced from the local forest (Prava, 2020). Concerns around indigenous "intrusion" into spaces of nature drew attention away from the destructive activities and consequences associated with the intensification and extensification of conventional agriculture, which may increase contact between wildlife, livestock, pathogens and people (IPBES, 2020)

5.2.3. Lack of agency and exclusion from emergency response planning and implementation

Services provided by governments are often not adapted to Indigenous Peoples' needs (FAO, Forthcoming). The exclusion and invisibility of Indigenous Peoples within their own countries have jeopardised their food security and increased their risk of being affected by COVID-19. Responses to COVID-19 at the country level included mitigation actions and economic assistance policies, which were in many cases implemented with limited participation of Indigenous Peoples' communities and leaders (CODEPISAN, Forest Peoples Program, Instituto de Defensa Legal & CAAAP, 2020; Menton *et al.*, 2021). The presence of social exclusion was reflected in the use of a "one-size-fits-all approach" to respond to COVID-19 (Power *et al.*, 2020), whilst ignoring Indigenous Peoples' traditional knowledge and the importance of biodiversity to directly assist indigenous persons who were sick with COVID-19 (Montag *et al.*, 2021).

5.2.4. Limited mobility and flexibility

Nomadic and semi-nomadic practices are essential for many Indigenous Peoples' food systems and their sustainable, nature-positive management systems. Indigenous Peoples' mobility and flexibility are increasingly constrained by forced resettlement, land dispossession, landscape fragmentation (Furberg *et al.*, 2011; Berrang-Ford *et al.*, 2012) and environmental degradation. For many indigenous pastoralists, traditional institutions for managing risk through mobility and the joint ownership of assets and resources have been replaced by the privatisation of land and enforcement of administrative boundaries, increasing vulnerability to environmental stress (Liao *et al.*, 2016). Restrictions on the movement and ability of Indigenous Peoples to draw upon local environments and wildlife for food have a detrimental effect on their food sovereignty, dietary quality (Kothari *et al.*, 2015) and physical health (Dounias and Froment, 2011).

5.2.5. Positive driver: Indigenous Peoples' access to land, territories and natural resources sustain enacting their right to self-determination

On the one hand, Indigenous Peoples are at higher risk from the consequences of climate change due to their direct dependence and close relationship with land and water, and their subsistence activities (Ford *et al.*, 2010; Lemelin *et al.*, 2010). On the other hand, their territories and resources are a primary source of resilience (Ford *et al.*, 2020). This was exemplified as multiple communities in South America self-isolated and blockaded the entrance to their communities over several months to avoid the first wave of COVID-19 (Amigo, 2020; Zavaleta-Cortijo, 2020). This protective strategy was possible only for communities with access to their territories and for those whose food sovereignty was the main strategy to survive during isolation (Menton *et al.*, 2021). Similarly, in India, the collective management of resources enabled resiliency in the face of COVID-19 where rights were recognised and the legal empowerment of communities was enjoyed (Sangam and The Community Forest Rights-Learning and Advocacy, 2020). Place is closely related to all other resilience factors (Ford *et al.*, 2020) which include food, water and social networks, amongst others.

5.2.6. Positive driver: Traditional institutions and local governance for long-term resilience

Traditional institutions that help to manage environmental stress include customary laws and common property systems that promote sustainable resource use and conservation of biodiversity, define grazing schedules in common areas, develop fire management practices, and identify taboo areas and resources

(Ford *et al.*, 2020). The leadership of chiefs, elders, village councils and assemblies enforce rules for resource use, manage conflict, and promote collective planning and stewardship (Ford *et al.*, 2020). Trosper (2002) described how indigenous governance principles contributed to the resilience of peoples in the Northwest Coast of North America prior to the disruption of these systems by colonisation. The system of property rights enabled self-organization and disturbances were buffered by systems of reciprocity, contingent proprietorship, ethics guiding the respectful use of the land, and the leadership and accountability of chiefs. The potlatch system was a central practice through which governance principles were implemented and enforced. Across 20 case studies, local governance systems based in secure rights generated benefits through minor forest produce livelihoods, food security, food sovereignty, forest restoration, community conservation initiatives, and women-led forest management (Vikalp Sangam and The Community Forest Rights-Learning and Advocacy, 2020).

5.2.7. Positive driver: Collective action initiated through culture and cosmogony

Indigenous beliefs, rituals and values in many cases underpin collective action by enabling processes that gather and reconcile different viewpoints on how to respond to environmental issues (Ford *et al.*, 2020). Recent accounts of disaster recovery in Indigenous Peoples' communities reveal how strong cooperation enabled the process of rebuilding.[25]

5.2.8. Positive driver: Cultural practices of resource sharing and community support

Food sharing is a norm in many Indigenous Peoples' communities, which helps to buffer food availability and diversity during periods of stress. Harvesting and sharing local foods have helped Indigenous Peoples' communities like the Inuit maintain food and nutrition security during the restrictions brought about by COVID-19 (Zavaleta-Cortijo *et al.*, 2020).[26] Camacho-Villa *et al.* (2021) documented a case in a Zapotec indigenous village in Oaxaca, Mexico, where a grandmother who lived alone felt safe when the community went into collective lockdown as a preventive measure for COVID-19. She felt secure because of the crops they had harvested in their fields and backyards prior to the lockdown, and from the care demonstrated by other community members.

The core value of collective wellbeing is reflected in the strong regional and international networks that Indigenous Peoples lead to support each other. These become essential for quick adaptation of the food system, especially in times of crisis and challenges, to provide tailored solutions to their communities (FAO, Forthcoming).

5.2.9 Positive driver: Indigenous youth support networking and emergency response communications

Indigenous Peoples also place important value on learning. The process involves adopting and modifying existing practices, as well as learning to abandon practices that no longer serve them. Learning is supported by intergenerational exchange between indigenous youths and elders and supports the continual adaptation of food systems in response to environmental change. Indigenous youth have a unique role in these networks, innovatively using social media and other online platforms to strengthen these networks and connect Indigenous Peoples for advocacy, positive change and to quickly establish support mechanisms to offset the negative consequences of living in often remote areas or as an ethnic minority in cities. Examples of this collective approach in the management of food systems, especially with relation to climate change, are food-sharing networks or food-sourcing projects, such as community gardens and greenhouses (FAO, Forthcoming).

[25] Amongst the iTaukei in Fiji, Currenti *et al.* (2019) describe how the custom of *kerekere* allows an individual to request a relative or neighbour for something they need with no expectation of repayment. This practice has been widely documented as helping to mitigate the impacts of cyclones and flooding on vulnerable community members (e.g. elderly) (Ford *et al.*, 2020; Nakamura and Kanemasu, 2020; Lee and Chen, 2021).

[26] Indigenous Peoples living in the Peruvian Andean communities were sending fresh food to their relatives, located and trapped in the cities because of lockdown policies (FAO, 2020b).

IV. Indigenous Peoples' food systems a game-changing solution in themselves

As described by the leadership of the UN Food Systems Summit, some criteria defining a "game- changing, systemic solution" include: have a positive effect on ensuring equity focus on youth, marginalised and disabled populations; be a true departure from existing practices; address a long-term constraint/obstacle or trend; act across more than one component of the food system; be able to be implemented at a sufficient scale to reach a large portion of the population; be feasible given existing resources, political will, and social/cultural norms and practices; be sustainable in that it can persist in the medium- to long term; have no negative impact/co-benefits/mutually reinforcing on achieving the other Action Tracks' goals; be timely and produce major impacts by 2030; and have an impact that is empirically verifiable.

Based on this criteria and attributes described thus far about Indigenous Peoples' food systems (see Box 1, in particular), the authors of the current White/Wiphala Paper advocate for considering the urgent protection and preservation of Indigenous Peoples' food systems as a game-changing solution.

The risks of inaction and ineffective actions for Indigenous Peoples, their food systems and the planet are severe.

Historic marginalisation, discrimination and violence have put Indigenous Peoples in situations of vulnerability. Today, Indigenous Peoples continue to endure these situations and violations. The Special Rapporteur on the Rights of Indigenous Peoples highlights in its 2018 report a "drastic increase in attacks and acts of violence against, criminalization of and threats aimed at indigenous peoples, particularly those arising in the context of large-scale projects involving extractive industries, agribusiness, infrastructure, hydroelectric dams and logging" (p.3). The Global Witness annual reports from 2016 to 2019 indicate 660 Indigenous Peoples' land defenders were murdered across 27 countries. In its latest annual report, the Global Witness sadly indicates 2019 as the deadliest year on record for people defending their homes, forests and rivers against climate-destructive industries, including Indigenous Peoples (Global Witness, 2019). During the COVID-19 pandemic, many Indigenous Peoples have faced increased rates of violence, killings, land grabs, forced displacement and further violations of their human rights (FAO, 2020b).

The State of Food Security and Nutrition in the World (2020) reports 688 million undernourished people across the world. Many of them are Indigenous Peoples who are experiencing a dismantling of their food systems, caused by lack of access to land, waters, territories and natural resources or loss of traditional knowledge due to migration of the youth to urban areas and passing of the elders.

The speed at which Indigenous Peoples' food systems and traditional knowledge systems are eroding and disappearing demands urgent actions to guarantee the survival of Indigenous Peoples. A human- rights-based approach is fundamental for the protection and strengthening of Indigenous Peoples' food systems and futures.

Erosion of Indigenous Peoples' food systems weakens the many symbiotic relationships that Indigenous Peoples steward between their food sources, environment, social systems, wellness, spirituality and culture. In many cases, the loss of these food systems also marks the loss of extremely specified land and resource management practices that have proven over numerous generations to not only provide for

communities but also ensure the land and resources' wellbeing. It confirms once again the need to consider that their system be further protected and strengthened as a whole. The example below aims to present how unilateral intervention programmes can fail and harm Indigenous Peoples' wellness when blind to their holistic approach and existing richness of their food systems.

Kuhnlein *et al.* (2013) report that the nutritional status of the Pohnpei community on the Federated States of Micronesia started to deteriorate during the 1970s when the traditional food system shifted towards processed and less healthy imported food, leading to high rates of overweight, obesity and diabetes along with other non-communicable diseases by the end of the 1980s (Kunhlein *et al.*, 2013; Coyne, 2000; Elymore *et al.*, 1989). In addition, during 30 years starting from the 1960s and mainly during the colonisation period, the United States Department of Agriculture (USDA) and other food-aid programmes provided non-traditional foods, such as rice and processed food, for school lunches and families, changing the tastes of indigenous youth and fostering a shift towards an unhealthy diet. In 1993, more than half of children under five years old in the community had Vitamin A deficiency (Kunhlein *et al.*, 2013; Yamamura *et al.*, 2004). By that time, the Vitamin A supplementation programme that was established for children was revealed to be unsuccessful given logistical and organisational difficulties with distributing the supplements. Research carried by Kuhnlein *et al*. (2013) stressed the need and relevance for revitalizing the traditional Indigenous Peoples' food systems, still neglected after independence of the island, to address these nutrition gaps that arose over time.

This example not only highlights the nutritional values of Indigenous Peoples' traditional foods, but also the harm exogenous food aid programmes can cause on the health and culture of Indigenous Peoples when a human rights-based and self-determination approach is omitted.

As described above (Part II.2), Indigenous Peoples' traditional knowledge systems and scientific knowledge systems must cooperate, further expanding upon examples of success (see Case Studies 5, 6, 7, 13 in Annex 1). It is important to reflect on the intention and impact of these collaborations and exchanges of knowledge. Expected outcomes must be prioritised for the self-determined, wellbeing of Indigenous Peoples and the sustainability of their food systems. As previously described, Indigenous Peoples' traditional knowledge systems are collective, practised and experienced by the people of their communities, context-specific and embodied in their values. In this context, Indigenous Peoples' traditional knowledge systems are vital to their survival, and cannot be understood separate from their roots, cultures, cosmogonies, locations and values.

Through a systematic review of 227 peer-reviewed articles published in the last 10 years, Ford and colleagues (2020) identified place, agency, institutions, collective action, Indigenous Peoples' traditional knowledge and learning as common interacting factors that contribute to the resilience of Indigenous Peoples to environmental change when they are present altogether. It further acknowledges the importance of considering Indigenous Peoples' food systems as a whole. Additional drivers that affect the resilience of Indigenous Peoples' food systems include mobility, biodiversity and health.

It is by Indigenous Peoples' ways of life and their global, unwavering, generational commitment to sustaining the systemic health of the lands, waters, plants, animals and their people that they provide immeasurable services to the entire world. Therefore, to protect and preserve Indigenous Peoples' human and cultural rights, which in turn serve to protect and preserve their food systems, the Summit can enact a game-changing solution that meets all the described criteria.

V. Recommendations organised as per the Action Tracks and game-changing solutions

Following the logic of the organization of the drivers as per the Action Tracks of the UN Food Systems Summit, the proposed recommendations are clustered using the same logic whilst also referencing the game-changing solutions proposed under each Action Track: (1) ensure access to safe and nutritious food for all through transformation of food systems; (2) shift to sustainable consumption patterns; (3) boost nature-positive production; (4) advance equitable livelihoods; and (5) build resilience to vulnerabilities, shocks and stress.

Before presenting the recommendations, it is important to highlight the overarching **right to land, territories and natural resources**, as well as the **right to self-determination and cultural rights** as preconditions for the full and effective exercise and realisation of other rights.

Indigenous Peoples' rights to land, territories and resources must be fully respected and recognised, including their capacity for the management and co-management of resources that are at the heart of their food systems.

Right to self-determination and cultural rights to the people who hold the knowledge associated with food systems supports the reliance of Indigenous Peoples on their traditional foods and food culture and supports maintaining the diversity of nutritious and healthy food.

The right to self-determination under the principle of "Nothing for or about Indigenous Peoples without Indigenous Peoples" consists in any external entity involving Indigenous Peoples in any policy discussion that could affect their livelihoods or food systems in any way.

The right to self-determination is interlinked with the right to Free Prior and Informed Consent (FPIC), which informs safeguards in the environmental and social guidelines (ESG) in programmes and projects affecting Indigenous Peoples and implemented by governments, donors, the UN or private companies.

Indigenous Peoples play a clear role in managing and conserving the unique and critical biodiversity and genetic resources essential for food systems, for both production and consumption. In this case, when Indigenous Peoples' traditional knowledge associated with genetic resources is used by any food businesses and pharma companies, Indigenous Peoples' communities should benefit from Access and Benefit Sharing (ABS) as foreseen under the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their use. It also contributes to ensuring harvesting rights,

which are critical given Indigenous Peoples' concerns about sources of wild foods, plants and animals being over-harvested by non-Indigenous Peoples.

Adhering and applying the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT Guidelines) and the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) is also crucial to enhance Indigenous Peoples' food systems. These guidelines provide a framework that States can use when developing their own strategies, policies, legislation, programmes and activities. They allow governments, civil society, the private sector and citizens to judge whether their proposed actions and the actions of others constitute acceptable practices.

Recommendations under Action Track 1:

Several of the game-changing solutions (underlined and italicised) proposed by Action Track 1 to enhance access to safe and nutritious foods in global food systems are fundamental for Indigenous Peoples and, under the spirit of leave no one behind, must be made sensitive and include interculturality to ensure that views of Indigenous Peoples are respected.

Leaving no one behind can only be achieved by the overarching recommendation of engaging indigenous leaders in policy discussion and in devising strategies about their access to safe and nutritious foods. There would not be transformation towards more sustainable food systems without increasing inclusion of Indigenous Peoples in any policy platforms operating at regional, national and local levels. Policymaking and decision-making concerning food resources must start and end with Indigenous Peoples and their management and co-management institutions and bodies and, where relevant, in collaboration and cooperation with State government bodies supporting such indigenous-driven decisions. Any and all relationships with non-Indigenous Peoples at all levels requires trust, respect, sharing and cooperation, as well as education to support Indigenous Peoples' food systems and thereby guide and protect the cultural integrity of Indigenous Peoples and their communities now and into the future. At the global level, inclusion of Indigenous Peoples and recognition of their knowledge in platforms, mechanisms and processes that affect their food systems should be promoted, such as: i) United Nations Food Systems Summit and outcomes; ii) The Local Communities and Indigenous Peoples Platform (LCIPP); iii) The Treaty on Genetic Resources for Food and Agriculture; and iv) Committee on World Food Security.

Indigenous Peoples should be involved and empowered as leaders in devising strategies for developing their food systems based on their insights and priorities for their own communities. A good example of this approach is the new Food Policy for Canada, which was formulated through extensive consultations with First Nations, Métis Nations and Inuit and affirms the unique rights and interests of the First Nations, Métis Nations and Inuit for their self-determination and their right to define their own food system. The policy includes commitment to develop food security with Inuit, Métis and First Nations peoples that is based on respect and partnerships with communities that support food systems as defined by the peoples themselves. Also in Canada, efforts for mitigating lack of food access for urban Indigenous Peoples have focussed on increasing food sovereignty through several community actions, including improving the indigenous neighbourhood food availability and family food resilience (Provincial Health Services Authority, 2011).

The *Establishment of a Zero Hunger Fund* should not be done without specific consideration for Indigenous Peoples, therefore it is recommended that this global fund include a sub-fund allocated to Indigenous Peoples to protect and preserve their Indigenous Peoples' food systems. Such a sub-fund needs to be run by indigenous elders from the seven socio-cultural regions in the world. This fund will enable them to:

document their knowledge about Indigenous Peoples' food systems; undertake food composition analysis of their own foods; reinforce the respect over their intellectual property rights about wild and semi-domesticated foods, plants and animals; and ensure that indigenous youth continue with the transmission of traditional knowledge that sustains Indigenous Peoples' food systems and that more Indigenous Peoples take an active role in policymaking that affects the welfare of their own peoples.

There is a general consensus that more research, development investment and mainstreaming of indigenous foods into programmes and policies are needed (Hunter *et al.*, 2020). The consumption of "uncultivated" (or "wild") foods (Bharucha and Pretty, 2010; Hunter *et al.*, 2015; Halpern *et al.*, 2019) has been notably absent from academic and political literature on food security, agriculture and nutrition. The relationships between Indigenous Peoples' communities' consumption of wild edibles and dietary outcomes need to be better understood to allow Indigenous Peoples' effective, context-sensitive integration into policy for food and nutritional security, and for the effective management of the habitats and landscapes in which wild edibles are found. Understanding contextual differences in Indigenous Peoples' communities' knowledge, demands and attitudes for wild edibles is important in order to incorporate them more effectively into sustainable consumption strategies.

Global databases on Indigenous Peoples' food systems are extremely valuable, and their development should be continued and expanded to include biodiversity of food and its properties, as well as cultural diversity, and related conservation efforts (Kuhnlein, Eme and Fernandez de Larrinoa, 2019). It is noted that sensitivities may exist to knowledge exploitation, such as overharvesting and commercialisation that are understood to detract from resilience and sustainability. Efforts to document Indigenous Peoples' food systems should thus be carried out in full respect of their self-determination and intellectual property rights through approaches and practices that ensure cultural security. For example, the Native Nations Institute at the University of Arizona is working actively to develop protocols on data sovereignty and research sovereignty to increase accountability and transparency in accordance to the rules and protocols of Indigenous Peoples.[27]

The proposed *Expand coverage of social protection systems* is essential for Indigenous Peoples and must resolve the lack of recognition by governments of the Indigenous Peoples' populations living in their countries. Under the principle of self-determination, recognising Indigenous Peoples ensures: the end of their invisibility in the eyes of policy; their access to basic public services (health, education); the recognition of their land, territorial and natural resources rights; and the importance of their customary and traditional governance institutions and systems.

So far, the expansion of social protection systems across the world has been blind to Indigenous Peoples' needs, interculturality, and view of the world and their food systems. Extension packages to support production were designed top-top; education curricula undermined Indigenous Peoples' values systems, culture and languages, school feeding altered the health and food preferences of indigenous youth towards processed unhealthier foods, etc.

However, it is possible to come up with expanded social protection systems that support Indigenous Peoples' food systems, their territorial rights, cultures and beliefs. In this regard, the already existing normative work, such as the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT Guidelines) and the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) provide solid foundations that are useful to build on.

27 See https://nni.arizona.edu/programs-projects/policy-analysis-research

Lastly, *Develop new standards and legal frameworks to drive private sector change and hold companies accountable* is fundamental to end the situations of displacement, expansion of the agriculture frontier on ecosystems, and pollution and destruction of the environment undertaken by the private sector often under state-run concession systems. Accountability for both the private and public sector is essential to ensure biodiversity conservation and the continuation of Indigenous Peoples' food systems.

Recommendations under Action Track 2:

The game-changing solutions in Action Track 2 to shift towards sustainable consumption to "build consumer demand for sustainably produced food, strengthen local value chains, improve nutrition, and promote the reuse and recycling of food resources, especially amongst the most vulnerable", are essential for Indigenous Peoples. This is true not only in terms of improved education on nutrition, but also in valuing local food chains and in transitioning to a circular food economy. Indigenous Peoples have robust contributions to make about circularity in food, waste and input use rooted in value systems of reciprocity and solidarity.

Identifying *Education* as a game-changing solution cannot be overemphasized in terms of its relevance for Indigenous Peoples. Indigenous Peoples are caught in the divide between realising the importance of education and being aware that the way education is currently set up means undermining their culture, language, food systems, nutrition, health, cosmogonies and values system. In addition, the identity of indigenous youth is closely related to the diet, based on their culture, even more so in the context of migration.

It is essential that education curricula, programmes and school feeding incorporate interculturality. In 2018, experts at the High-Level Expert Seminar on Indigenous Food Systems recommended to "develop intercultural education methods strengthening indigenous values, foods and traditional knowledge and include them in national educational programmes and curricula".[28]

Recommendations to encourage the education of indigenous youth and young adults, including parents of young children, on the cultural and nutritional importance of indigenous foods have been made several times by the scientific community (Beaton, 2004; Kuhnlein *et al.*, 2013). This could take shape in the form of alternative and contextual schools that train indigenous youth to preserve and share local seeds, whilst encouraging cross-generational dialogue between indigenous elders and youth about medicinal plants, local food and other food-related knowledge. Research has shown the adverse impacts of school feeding programmes on the tastes of indigenous youth when not designed in accordance with cultural preferences.

Interculturality needs to become an overarching game-changing solution approach under Action Track 2, addressing not only current formal education systems, but also policymaking and social awareness about the importance of Indigenous Peoples' food systems.

Raising awareness about the health benefits of Indigenous Peoples' traditional diets and the need to limit consumption of highly processed foods could be achieved with the support of government policies. For example, the Federated States of Micronesia have national policies to promote local indigenous foods, including the publication of national postage stamps with unique traditional and nutritious foods and restrictions to serve only traditional local foods at government-sponsored events (Englberger *et al.*, 2013). Strategies at local and international levels should explore, restore and develop effective self-

[28] See http://www.fao.org/fileadmin/user_upload/partnerships/docs/LAST_FINAL_REPORT_HLESIFS_2018_01.pdf

determination, awareness of the values of Indigenous Peoples' traditional food systems, and necessary research, processes and policies, considering the drivers of the nutrition transition that affects Indigenous Peoples everywhere (Kuhnlein *et al.*, 2004; Damman *et al.*, 2007; Council of Canadian Academies, 2014; Delormier *et al.*, 2017).

Intercultural education is related to intercultural food policies that recognise and support the role of Indigenous Peoples' food systems in providing healthy and sustainable foods whilst protecting biodiversity.

The AT2 proposed *Food systems framework* must include recommendations that increase the security of access by Indigenous Peoples to their lands and territories. This is a precondition that must be incorporated into intercultural policies about food security and nutrition to support Indigenous Peoples' traditional healthy and sustainably generated foods in line with their rights to food and cultural norms.

Efforts to help conserve the knowledge and practices of wild harvesting have attracted attention as an effective and contextually appropriate response to malnutrition, whilst ensuring prudent use of natural resources (HLPE, 2017a).

Strengthening the use and sustainable management of biodiversity in Indigenous Peoples' food systems can be important in tackling the nutrition transition. For example, the Diabetes Prevention Program of the Oneida nation strengthened support for traditional medicines, traditional foods and medicinal practices to help aid diabetes, and numbers have shown decline with these efforts. Supporting the consumption of wild edibles and indigenous resource management practices could contribute to sustainable food and nutrition security, whilst supporting ecological health and conservation efforts.

Thus, *Intercultural food policies* are needed to recognise and support the many dimensions of Indigenous Peoples' food systems in enabling healthy and sustainable consumption patterns. So far, most of the policies intervening in Indigenous Peoples' knowledge about plants, wild edibles and wildlife have been related to biodiversity conservation, passing over their potential to contribute to food and nutrition security. Intercultural food policy supporting Indigenous Peoples' food systems for food security should be accompanied by regulation mechanisms that ensure the rights of Indigenous Peoples to their lands, territories, natural resources and knowledge (via intellectual property, for instance), whilst ensuring that Indigenous Peoples are incentivised to produce or harvest relevant foods of their choice for themselves and local communities. One example of such a policy can be the establishment of community seed banks.

Intercultural food policies will lead to national-food dietary guidelines that are inclusive and sensitive to Indigenous Peoples' food systems. National food-based dietary guidelines are a potential resource to broaden awareness of ecologically appropriate, and locally known, species that can improve nutrition and health. Amongst the pioneers are the First Nation Health Authority (Canada) and Brazil (Wilson and Shukla, 2020). Gebru *et al.* (2019) suggest that "The Ethiopian Food-based Dietary Guidelines provide an unprecedented opportunity to promote the consumption of healthy diets that are rich fruits and vegetables; not only domesticated fruits and vegetables, but also semi-wild and wild fruits and vegetables that can be considered Ethiopian treasures to be widely promoted to provide a wide range of options for consumers". The Task Force on Traditional and Indigenous Food Systems of the International Union of Nutritional Sciences prepared a commentary to promote inclusion of indigenous fruits and vegetables in food-based dietary guidelines, based on the knowledge that national dietary patterns worldwide are not met for intake of micronutrient-rich fruits and vegetables (Kennedy *et al.*, forthcoming).

It is recommended that indigenous leaders from the seven socio-cultural regions be engaged in the design of the Food Systems Framework and Intercultural Food Policies as well as in the design of intercultural education that incorporates these different recommendations. It is also relevant that more investment to

describe and analyse the potential of Indigenous Peoples' food systems occurs. Thus, rather than seeking new solutions, we can reinforce local strategies whilst respecting socio-cultural norms and rules. For example, Indigenous Peoples' food systems can reduce the associated costs from taking food from the field to the table whilst providing rich and nutritious food and improving the economies of Indigenous Peoples. In general, Indigenous Peoples' food systems are regarded only as self-sufficient systems but they have the potential to satisfy beyond local demands in a healthier way. However, investment must occur, combining the best modern scientific knowledge with indigenous scientific knowledge.

Recommendations under Action Track 3

To meet the aims of Action Track 3 and boost nature-positive production, several game-changing solutions must be identified and addressed relating to Indigenous Peoples' food systems.

Proposals to *Increase agrobiodiversity for improved production and resilience* are key to future nature-positive production. Not only are Indigenous Peoples' communities the custodians for a significant proportion of the world's important genetic resources, but their territories also encompass unique dynamic biocultural spaces that allow these resources to continue to evolve and adapt further to ongoing climate variability and other challenges.

Keep in mind that the game-changing solution of increased agrobiodiversity will require much political will and action. This might entail innovative financial mechanisms that better support Indigenous Peoples' communities to continue their sustainable land management practices that safeguard and nurture critical genetic resources (for example, through payments for ecosystem service, see Case Study 11, Annex 2). The reversal of perverse subsidies that undermine nature-positive production in sites of rich agrobiodiversity may also be pertinent in some locations. More generally, the active promotion and support of Indigenous Peoples' initiatives and practices that maintain and enhance agrobiodiversity (including beekeeping practices and resilient mountain agriculture) will help to address this goal. A good example is the "Parque de la Papa" (Potato Park) in Peru, a community-based initiative focussed on boosting agrobiodiversity that uses customary laws and institutions to facilitate effective management. The Park is a centre of diversity for a range of important Andean crops, with around 1 300 distinct traditional varieties or landraces of potato that are named, known and managed by the local community.

The game-changing solution of consulting and engaging with *Indigenous Peoples' food systems to support conservation and biocentric restoration* is central to the sustainable transformation of food systems (and this White/Wiphala Paper). It has been estimated that 50 percent of protected areas worldwide have been designated on lands traditionally occupied and used by Indigenous Peoples (UNDESA, 2019). The establishment of new protected areas and management of natural resources in indigenous territories continues to be a contentious subject for governments, conservation organizations, non-governmental organizations (NGOs) and Indigenous Peoples, due to the negative consequences experienced by communities within and adjacent to the areas, in particular Indigenous Peoples.

The development of an inclusive conservation approach rooted in well-functioning Indigenous Peoples' food systems has the potential to effectively and holistically address current challenges in conservation. In 2018, the United Nations Permanent Forum on Indigenous Issues (UNPFII) acknowledged the urgent need to develop a universally recognised set of standards for engaging in conservation efforts on the lands and waters of Indigenous Peoples (Keane and Laltaika, 2018). Indigenous Peoples' groups have often expressed concerns regarding exogenous stakeholders bringing in technical advice and innovation that does not resonate with Indigenous Peoples' values and worldviews. Promoting more inclusive ways of

working with Indigenous Peoples' groups could improve conservation outcomes in several ways: 1) by supporting conservation in areas that are not suitable for protected area status (due, for example, to land tenure, cultural or capacity constraints); 2) by demonstrating new models of conservation and sustainable use (such as Indigenous Peoples' management, monitoring and restoration techniques) that in some cases could also be applied in protected areas; 3) by enabling a more holistic, landscape-level view to conservation that links Indigenous Peoples' territories, protected areas, buffer zones and conservation corridors, and; (4) because Indigenous Peoples' territories surrounding protected areas function as biodiversity buffer areas when controlled by Indigenous Peoples as part of their territorial management practices.

Finally, *Scaling-out agroecological production systems* and *adopting regenerative agricultural practices for resilient landscapes at scale* has the potential to conserve and promote nature-positive production in accordance with the objectives of Action Track 3. Indigenous Peoples' communities and farmers can make numerous contributions to this game-changing solution, given their rich knowledge, agroecological practices and access to a diversity of crop genetic resources. The International Treaty on Plant and Genetic Resources adopted by FAO in 2001 and entered into force in 2004 is the first legally binding international agreement to recognise the enormous contributions that the local and Indigenous Peoples' communities and farmers of all regions of the world have made and will continue to make for the conservation and development of plant genetic resources as the basis of food and agricultural production throughout the world. However, any attempt to scale up nature-positive agricultural practices must recognise the need to affirm Indigenous Peoples' rights, including the important protection and sensitive use of Indigenous Peoples' traditional knowledge, and ensure the equitable sharing of benefits. Legal tools and instruments may support this.

Recommendations under Action Track 4

Action Track 4 aims to contribute to the elimination of poverty, through the promotion of equitable livelihoods, distributing risks and expanding productive employment for all actors along the food value chain. The game-changing solutions proposed by Action Track 4 include several solutions that are relevant to Indigenous Peoples' food systems and must be addressed for the goal to be realised.

Securing land tenure rights for resilient and sustainable food systems must be achieved to reach the goals of Action Track 4. There has been historical – and continued – lack of recognition and marginalisation of Indigenous Peoples' traditional institutions in democratic processes and government welfare mechanisms. More powerful actors are increasingly influencing decisions around land use and food production. Indigenous Peoples have often been displaced, and their systems of governance undermined, threatening food sovereignty and the biodiversity their food systems support (Ford *et al.*, 2020). No Action Track will meet its goals without securing rights to land, natural resources and territories, and the right to self-determination of Indigenous Peoples. Legislative ambiguities over land tenure must be addressed, and the rights of Indigenous Peoples to manage resources in their territories recognised.

The Promotion of inclusive and sustainable agroecological networks for small farmers and Indigenous Peoples' communities is also crucial for advancing the equitable livelihoods of Indigenous Peoples. Indigenous Peoples have traditionally relied on sharing and barter exchange. This is at odds with the increasing and widespread promotion of industrial agriculture and market economies, often driven by a few powerful corporate actors and interests. Indigenous Peoples' communities that have marketed their goods often have to operate through third parties that decide the pricing of their goods and take a large profit (FAO and the Alliance of Bioversity International and CIAT, forthcoming-b; Lasimbang, 2008).

Towards the aim of inclusive and sustainable markets, labelling and certification schemes represent an interesting opportunity for Indigenous Peoples. Certification schemes can add value to indigenous products. A review of 12 studies of labelling and certification initiatives by FAO and the Alliance of Bioversity International and CIAT identified favourable economic conditions for the exchange of biocultural products whilst protecting and promoting Indigenous Peoples' values. Niche markets fitting with the principles of diversified and low-input agriculture were more aligned with Indigenous Peoples' values compared mainstream commodity markets. Importantly, the initiative being driven forward by Indigenous Peoples was identified as an essential enabling factor, granting Indigenous Peoples' agency to define and manage their food systems. States have an important role to play in creating inclusive agroecological networks, for example in supporting the use of products through public procurement programmes and developing infrastructures for physical access to markets. Developing short, domestic, and equitable value chains that ensure transparency and trust between producers and consumers, fair compensation for the primary producers, cultural security, and sustainable resource use is crucial for advancing the equitable livelihoods of Indigenous Peoples.

The realisation of Action Track 4 will require the direct confrontation of social and structural norms that have long privileged some groups over others, marginalising the poor. Institutions and policies can help to overcome these structural barriers, with the aim of achieving lasting change so that food systems can lead to equitable, sustainable livelihoods, rather than just temporary or seasonal increases in opportunities. Within food systems, this transformation means adjustments to regimes that regulate access to, use of and control over resources, especially those defining land distribution, labour division and decision-making power.

Recommendations under Action Track 5

Action Track 5 game-changers to build social, ecological and economic resilience to vulnerabilities, shocks and stress include several that are critical for Indigenous Peoples' food systems. Enhancing the resilience of Indigenous Peoples' food systems will involve building, strengthening and revitalising the elements that contribute to their resilience, including actions to secure their connection to place, their agency, institutions, collective action, traditional knowledge, learning, biodiversity and health status. It is highly relevant to consider the linkages between social and ecological systems in planning adaption responses to climate change (Ford *et al.*, 2018).

The Action Track 5 game-changer *Systemic approaches to risk analysis* creates an opportunity to incorporate Indigenous Peoples' perspectives in preventing and monitoring shocks. It is widely acknowledged that successful responses to challenges such as climate change need to be collaborative, a co-learning approach and one that is guided by values and priorities of those impacted, as well as informed by the best available science. Contributors pointed out the lack of integration and articulation between indigenous and non-indigenous monitoring and early warning systems whilst collaborating on this paper.

Indigenous Peoples are particularly aware and able to detect changes induced by climate change (Green and Raygorodetsky, 2010). Perceptions of changes in the climate system and coping strategies of Indigenous Peoples are intimately linked to their knowledge and worldviews (Donatuto, Campbell and Trousdale, 2020). As monitoring and understanding these changes are essential to adaptation, the role of Indigenous Peoples is increasingly being recognised. Some researchers have taken the initiative to design and offer place-based, values-driven case studies of climate change health impact assessments from an indigenous perspective. The results provide decision-makers and climate adaptation teams with the technical data and values-based evidence to design better solutions that are more responsive to

community priorities, more likely to be implemented, and more likely to be supported by the community (Donatuto *et al.*, 2019).

In many parts of the world, Indigenous Peoples are leading efforts to assess climate change impacts and plan adaptation actions. One of many reasons behind this push in the United States of America is that reservation boundaries are not mobile, so Indigenous Peoples' communities must address the changes taking place in their homelands.

The recognition of Indigenous Peoples' traditional resilience mechanisms and coping strategies in response to mitigating climate change in global and local policies is a fundamental transformation to achieve broadly sustainable food systems.

Since the beginning of the deliberations for the development of the Local Communities and Indigenous Peoples Platform (LCIPP)[29] based on Article 135 of the Paris Agreement, Indigenous Peoples' knowledge holders and traditional food producers have advocated for the implementation of a rights-based framework, protocols and safeguards for their effective and respectful engagement in this process. This includes respect for rights to Free, Prior and Informed Consent, Participation in Decision-making, Self-Determination, cultural heritage and other rights affirmed in The UN Declaration on the Rights of Indigenous Peoples, as well as a recognition of the distinct collective, intergenerational, time-tested and experiential nature of Indigenous Peoples' knowledge systems and practices as preconditions for of their participation.

Universal food access: enacting food as public good. This game-changing solution resonates with the way Indigenous Peoples perceive food as a concept that goes beyond the nutritional and physical aspects, but also something that embodies culture, cosmogony and territorial management. Everything starts in the ecosystems, in the environment, in the territory. To consider food a public good and ensure universal food access, in the case of Indigenous Peoples, relates to secure access rights over their territories, lands and natural resources as recognised in the FAO 2004 Voluntary Guidelines on the Right to Food.

Community-based decision-making mechanisms and information systems on land rights, access and control over essential food-producing resources to promote food sovereignty, equitable land and resource rights, effective and responsible governance, and sustainable livelihoods

and

Use of international agreements previously negotiated in the committee of world food security. Voluntary guidelines (governance of land, fisheries, forestry and food systems) and CFS Framework for action for food security and nutrition in protracted crises.

These local and global recommendations are fundamental game changers shared with other Action Tracks. Indigenous land tenure and sovereignty is a prerequisite to adaptive capacity in confronting climate change and addressing global sustainability.

There are other important recommendations that are not currently acknowledged as a game-changing solution under Action Track 5 but ought to be:

[29] Over several decades, Indigenous Peoples' gatherings and collective declarations have consistently emphasised the interconnected and mutually reinforcing relationships between the vitality of their traditional knowledge and food systems, the protection of their original resilient seed varieties, and their ability to adapt and respond to the climate crisis, now and in the future.

Intercultural health services or the institutionalisation of cultural security in health services: To ensure quality and equitable health care provided to Indigenous Peoples, it is important to bridge the gap they currently suffer in terms of health support or lack of health support altogether.

The COVID-19 pandemic has illuminated the fact that Indigenous Peoples are often underserved by public health services, with a historical mismatch between the delivery of services and the respect and incorporation of traditional beliefs of food as medicine. In many contexts, Indigenous Peoples experience a higher burden of disease than other majority population groups. The inequalities in disease burden are a driver within the system that food systems can help to address. There is a need to deliver health care tailored to a more holistic plan of services that are better able to elevate the health of Indigenous Peoples and which incorporate and recognise the positive attributes of local foods that can help attain better health and wellbeing. There are positive examples of intercultural health assistance programmes in Bolivia, combining traditional indigenous medicine with allopathic medicine that can be expanded to other countries.

Importance of documenting Indigenous Peoples' knowledge to inform policymaking on the potential threats to Indigenous Peoples' knowledge systems and design more inclusive policies:

Although this recommendation relates to other Action Tracks as well, it is fundamental that the documentation of Indigenous Peoples' knowledge is incorporated into policies that increase safety nets and resilience. This is particularly significant in relation to climate change and to unique territorial management practices that are disappearing with the changes in Indigenous Peoples' societies.

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Glossary

Access and benefit-sharing: Access and benefit-sharing (ABS) refers to the way in which genetic resources may be accessed, and how the benefits that result from their use are shared between the people or countries using the resources (users).

Adaptation: Adjustment in natural or human systems to a new or changing environment, whether through genetic or behavioural change (IPBES Glossary).

Adaptive capacity: The general ability of institutions, systems and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences (IPBES Glossary)

Agency: The ability of people, individually or collectively, to have a choice in responding to environmental change (Ford *et al.*, 2020).

Agricultural intensification: An increase in agricultural production per unit of inputs (which may be labour, land, time, fertilizer, seed, feed or cash (IPBES Glossary).

Agricultural extensification: The expansion of agricultural production over (greater) geographical area.

Agrobiodiversity: A broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agroecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agroecosystem, its structure and processes (CBD, 2000).

Agrochemicals: Chemical compounds used in farming including fertilisers, pesticides, hormones and other growth agents, and soil conditioners.

Agroforestry: A collective name for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in a spatial mixture or in a temporal sequence. There are normally both ecological and economic interactions between woody and non-woody components in agroforestry (IUFRO Glossary).

Ancestral land or territory: All areas generally belonging to indigenous cultural communities comprising lands, inland waters, coastal areas and natural resources therein, held under a claim of ownership occupied or possessed by indigenous Cultural Communities (modified from IFAD glossary).

Anthropocentric: An anthropocentric value is a value centred on human beings and human purposes (adapted from IPBES; see also **Value Systems**).

Antioxidants: Compounds that slow the rate of oxidation reactions (FAO Technical Glossary). In nutritional science, antioxidants prevent or slow down the damage that oxygen does to organisms or food (Cambridge English Dictionary).

Aquaculture: Farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants, involving interventions such as regular stocking, feeding or protection from predators, to enhance production. (In contrast, aquatic organisms that are exploitable by the public as a common property resource are classed as fisheries, not aquaculture; FAO and IPBES Glossaries).

Barter trade: System of exchange in which goods or services are directly exchanged for other goods or services without using a medium of exchange, such as money. The nature of the goods exchanged is

invariably premised on availability as opposed to current value. To indigenous communities, barter trading is not only an economic necessity it is also a form of social interaction, particularly if the barter centres attract other communities. It is an opportunity to share stories and exchange experience (Lasimbang, 2008).

Bio-absorption: The process whereby substances are absorbed by the tissues and organs of organisms.

Bioaccumulation: A problem that can arise when a stable chemical such as a heavy metal is introduced into a natural environment. Where there are no agents present able to biodegrade it, its concentration can increase as it passes up the food chain and higher organisms may suffer toxic effects (FAO Glossary).

Bioavailability: The proportion of a nutrient or administered drug etc. that can be taken up by an organism in a biologically effective form.

Biocentrism: An ethical approach that holds that all life deserves equal considerations and has, therefore, rights of existence and standing.

Biodiversity conservation: The practice of protecting and preserving the abundance and variety (biodiversity) of all species, regardless of classification, ecosystems and genetic diversity, on the planet (IFAD, 2015b and Convention on Biological Diversity).

Biodiversity The variability among living organisms from all sources including *inter alia*, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD, UN, UNEP, 2016). Synonyms: biological diversity or ecological diversity.

Biological resources: Genetic resources, organisms, or parts thereof, populations or any other biotic component of ecosystems with actual or potential use or value for humanity (Convention on Biological Diversity).

Biosphere: All the ecosystems of the world considered together. It includes the organisms living on the Earth, the resources they use and the space they occupy on part of the Earth's crust (the lithosphere), in the oceans (the hydrosphere) and in the atmosphere (adapted from FAO Glossary).

Breed: Either a subspecific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group for which geographical and/or cultural separation from phenotypically similar groups has led to acceptance of its separate identity (FAO Glossary).

Bushmeat: Meat for human consumption derived from wild animals (IPBES Glossary).

Carbon sequestration: The long-term storage of carbon in plants, soils, geologic formations and the ocean. Carbon sequestration occurs both naturally and as a result of anthropogenic activities and typically refers to the storage of carbon that has the immediate potential to become carbon dioxide gas (IPBES Glossary).

Certification: A process by which an authorised body, either a governmental or non-governmental organization, evaluates and recognises either an individual or an organization as meeting predetermined requirements or criteria. Although the terms accreditation and certification are often used interchangeably, accreditation usually applies only to organizations, while certification may apply to individuals, as well as to organizations. When applied to individual practitioners, certification usually implies that the individual has received additional education and training, and demonstrated competence in a specialty area beyond the minimum requirements set for licensure (WHO Glossary).

Chronic disease: see Non-Communicable Disease (NCD)

Climate change: A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (Article 1 of the UNFCCC).

Collective action: Actions that a group of two or more people take together to meet a common goal (Ford *et al.*, 2020).

Control Rights: The right to control the management of the property. It may include rights to make decisions about how the land should be used, including what crops should be planted, and to benefit financially from the sale of crops, etc. (FAOTERM).

Communal resources or "common property": Rights held by members of a community to land and other natural resources (e.g. pastures) that members can use independently of one another (FAO Glossary). Common property is characterised by the following elements: overarching ritual and cosmological relations with traditional lands; community "rights" of control over land disposal (sometimes delegated to traditional leaders); kinship or territory-based criteria for land access; community-based restrictions on dealings in land with outsiders; and principles of reversion of unused land to community control (IFAD, 2015b).

Community-based natural resource management: An approach to natural resource management that involves the full participation of Indigenous Peoples' and local communities and resource users in decision-making activities, and the incorporation of local institutions, customary practices and knowledge systems in management, regulatory and enforcement processes. Under this approach, community-based monitoring and information systems are initiatives by Indigenous Peoples and local community organizations to monitor their community's wellbeing and the state of their territories and natural resources, applying a mix of traditional knowledge and innovative tools and approaches (IPBES Glossary).

Conservation: Includes protection, maintenance, rehabilitation, restoration and enhancement of populations and ecosystems. This implies sound biosphere management within given social and economic constraints, producing goods and services without depleting natural ecosystem diversity.

Conventional agriculture: Capital-intensive, large-scale, highly mechanised agriculture with monocultures of crops and extensive use of artificial fertilisers, herbicides and pesticides, with intensive animal husbandry (Knorr and Watkins, 1984; Beus and Dunlap, 1990).

Coping strategy: Strategies to deal with risk are classified as: (1) risk reduction, i.e. ex-ante actions to raise income or reduce income variability; (2) risk mitigation, i.e. ex-ante actions to reduce income variability if and when a shock occurs; and (3) risk-coping, i.e. actions to alleviate the impacts of shocks after they occur (from FAOTERM).

Co-production: (of knowledge) The collaborative process of bringing a plurality of knowledge sources and types together to address a defined problem and build an integrated or systems-oriented understanding of that problem (Armitage *et al.*, 2011).

Cosmogonies: A vision of reality that places the highest importance or emphasis in the universe or nature, as opposed to an anthropocentric vision, which strongly focusses on humankind as the most important element of existence (IPBES Glossary).

Crop: A cultivated plant grown to be harvested, either to be used or to be sold (adapted from FAOTERM).

Cultural diversity: Uniqueness and plurality of the identities of the groups and societies making up humankind (IFAD Glossary).

Cultural heritage: Traditions or living expressions inherited from ancestors and passed on to descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts (UNESCO).

Customary law: Norms that have force within the community; when national legislation recognises that customary law has force, the rules also become part of statutory law (IFAD Glossary).

Customary tenure: Rules and norms that communities devise and uphold to regulate how their lands are acquired, owned, used and transferred. Many rules and norms are tested over generations (hence "traditions" or "customs"). IFAD Glossary

Customary use of biological resources: Uses of biological resources in accordance with traditional cultural practices that are compatible with conservation and sustainable use requirements (Convention on Biological Diversity, CBD).

Decision-making: Control over a resource, including labour or development processes (FAOTERM).

Declaration of Atitlán: Drafted at the First Indigenous Peoples' Global Consultation on the Right to Food in April 2002 in Guatemala, the Declaration stated that the denial of the right to food for Indigenous Peoples is a denial of their collective indigenous existence, not only denying their physical survival, but also their social organization, cultures, traditions, languages, spirituality, sovereignty and total identity.

Deforestation: The direct human-induced conversion of forested land to non-forested land. (FAOTERM).

Degradation: The reduction of the capacity of a landscape to provide goods and services (IUFRO Glossary).

Diet: The kinds of food that follow a particular pattern that a person or community eats.

Dietary diversity: A measure of the variety of food from different food groups consumed over a reference period (Ruel, 2003).

Discrimination: Any distinction, exclusion or restriction made on the basis of socially constructed gender roles and norms, which prevents a person from enjoying full human rights (IFAD Glossary).

Domesticated species: Domesticated or cultivated species means species in which the evolutionary process has been influenced by humans to meet their needs (Convention on Biological Diversity).

Driver: Factors that, directly or indirectly, cause changes in nature, anthropogenic assets, nature's contributions to people and a good quality of life (IPBES Glossary).

Ecological edge: Zones of transition from one ecosystem to another, areas where two different types of habitat, or successional stages, meet and intergrade. These transitional zones can be high in biodiversity since they tend to incorporate features of species composition, structure and function representative of the ecosystems they transcend. Ecological edges may have their own unique features and species as well (Turner, Davidson-Hunt and O'flaherty, 2003).

Ecology: The relationship of living things to their environment and to each other, or the scientific study of this.

Ecosystem: A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (Convention on Biological Diversity).

Ecosystem (-based) management: An approach to maintaining or restoring the composition, structure, function and delivery of services of natural and modified ecosystems for the goal of achieving sustainability. It is based on an adaptive, collaboratively developed vision of desired future conditions that integrates ecological, socioeconomic and institutional perspectives, applied within a geographic framework, and defined primarily by natural ecological boundaries (IPBES Glossary).

Ecosystem function: An intrinsic ecosystem characteristic related to the set of conditions and processes whereby an ecosystem maintains its integrity (such as primary productivity, food chain, biogeochemical cycles). Ecosystem functions include such processes as decomposition, production, nutrient cycling, and fluxes of nutrients and energy.

Ecosystem health: A metaphor used to describe the condition of an ecosystem, by analogy with human health. Note that there is no universally accepted benchmark for a healthy ecosystem. Rather, the apparent health status of an ecosystem can vary, depending upon which metrics are employed in judging it, and which societal aspirations are driving the assessment (IPBES Glossary).

Ecosystem services: The benefits people obtain from ecosystems. These include provisioning services such as food and water; pollination of crops; regulating services such as flood and disease control; cultural services such as spiritual, recreational and cultural benefits; and supporting services, such as the nutrient cycling that maintains the conditions for life on Earth (IPBES Glossary).

Efficiency: The ratio of a system's output (or production) to the inputs that it requires, as in the useful energy produced by a system compared with the energy put into that system.

Empowerment (of Indigenous Peoples): The process of increasing the opportunity of Indigenous Peoples to take control of their own lives (IFAD, 2015b).

Endemism: The ecological state of a species being unique to a defined geographic location, such as an island, nation, country or other defined zone, or habitat type; organisms that are indigenous to a place are not endemic to it if they are also found elsewhere (IPBES Glossary).

Environmental contamination: Any biological or chemical agent, foreign matter or other substance not intentionally added to feed or food that may compromise feed and food safety or suitability (FAOTERM, 2015).

Equitable benefit-sharing: Equitable distribution of benefits between stakeholders (modified from IPBES).

Ethnic identity: A multidimensional concept that includes self-categorisation or labelling, commitment or attachment to a group, certain values and beliefs that are associated with the group, and an evaluation of the group that can be positive or negative (Phinney & Ong, 2007).

Ethnobiology: The interdisciplinary study of how human cultures interact with and use their native plants and animals.

Ethnobotany: Discipline addressing how and in what ways people use nature and plants in their local environment. As a field of research and study, ethnobotany is an interdisciplinary, holistic approach that includes botany, anthropology, history and chemistry (FAOTERM).

Fertiliser: Any substance that is added to soil to increase its productivity. Fertilisers can be of biological origin (e.g. composts), or they can be synthetic (artificial fertiliser) (FAO).

First foods: A term identified by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), referring to traditionally gathered foods, including water, fish, big game, roots and berries. First foods can

be thought of as cultural keystone species – foods that nourish the body and the spirit of both the individual and the community, while providing opportunities to pass on Indigenous Peoples' traditional knowledge about connections with nonhuman beings and the environment to the next generations (Donatuto *et al.*, 2020).

Food biodiversity: The diversity of plant, animal and other sources used for food, covering the genetic resources within species and between species.

Food generation: Viewed in contrast to food production, food generation relates to consumptive activities involving minimal human intervention on the ecosystem. Food generation includes hunting, fishing and gathering activities, which traditionally rely on a deep understanding of the seasonality of ecosystems, the availability of food sources, and on knowledge that supports the recollection of food spontaneously generated by the system.

Food insecurity: An outcome of inadequate or uncertain access to an acceptable amount and quality of healthy food. It refers to the immediate inability to secure an adequate diet, as well as the risk of being unable to do so in the future.

Food production: The production of raw agricultural, livestock, fisheries and forestry products (FAOTERM). Note that within this paper, food production is viewed in contrast with food generation.

Food security: When all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Multiple dimensions of food security can be identified: food availability, economic and physical access to food, food utilization, stability over time, adequacy and agency (FAO, IFAD and WFP, 2014).

Food sovereignty: The right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations (Declaration of Nyéléni, 2007).

Food environment: The physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food (HLPE, 2017a). It includes food availability and physical access (proximity); economic access (affordability); promotion, advertising and information; convenience and time savings, and food quality and safety (Herforth & Ahmed, 2015) (A4NH Glossary).

Forced (or involuntary) resettlement: Physical displacement (relocation, loss of residential land or loss of shelter), economic displacement (loss of land, assets or access to assets, including those that lead to loss of income sources or other means of livelihood), or both, caused by project-related land acquisition or restriction on land use (modified from IFAD Glossary).

Formal property: Rights that are explicitly acknowledged by the state and which may be protected using legal means. This is in contrast with informal property (FAOTERM).

Free, Prior and Informed Consent (FPIC): Operational principle empowering local communities to give or withhold their consent to proposed investment and development programmes that may affect their rights, access to lands, territories and resources, and livelihoods. Defined by the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

Gender equality: Women and men have equal rights, freedoms, conditions and opportunities to access and control socially valued goods and resources and enjoy the same status within a society. It does not mean that the goal is that women and men become the same, but rather that they have equal life chances. This applies not only to equality of opportunity but also to equality of impact and benefits arising from economic, social, cultural and political development. (IFAD, 2012).

Genetic diversity: The genetic variability among or within a sample of individuals of a variety, population or species (Bioversity International, 2017).

Global (environmental) change: A major environmental and worldwide concern for the time being, global change combines systemic and cumulative dimensions. It is systemic where environmental change in any place directly affects the characteristics of the environment elsewhere, or even of the whole earth system. It is cumulative when change results from the accumulation of local and regional changes occurring around the world (Callan and Coleman, eds., 2018).

Globalisation: The integration of markets, trade and investments with few barriers to slow the flow of products and services between nations. Culturally, globalisation also refers to the ways that ideas and traditions are traded and assimilated (World Economic Forum).

Governance: Structures and processes that are designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity and inclusiveness, empowerment, and broad-based participation (IFAD Glossary).

Green revolution: A significant increase in agricultural productivity resulting from the introduction of high-yield varieties of grains, the use of pesticides, and improved management techniques, typically confined to the 1960s and 1970s.

Greenhouse gas (GHG): Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, by the atmosphere itself, and by clouds. This property causes the greenhouse effect (IFAD Glossary).

Habitat: The place or type of site where species and communities normally live or grow, usually characterised by relatively uniform physical features or by consistent plant forms, e.g. deserts, lakes and forest are all habitats.

Habitat degradation: A general term describing the set of processes by which habitat quality is reduced. Habitat degradation may occur through natural processes (e.g. drought, heat, cold) and through human activities (forestry, agriculture, urbanisation).

Healthy diet: A healthy diet is health-promoting and disease-preventing. It provides adequacy, without excess, of nutrients and health-promoting substances from nutritious foods and avoids the consumption of health-harming substances (Neufeld, Hendriks and Hugas, 2021).

Herbicide: A substance that is toxic to plants; the active ingredient in agrochemicals intended to kill specific unwanted plants, especially weeds (FAOTERM).

Highly processed foods: Formulations of ingredients, mostly of exclusive industrial use, that result from a series of industrial processes (Monteiro *et al.*, 2019). Consequences include proliferation of food environments in which consumers are prompted to purchase highly processed foods of low nutritional value more often and to purchase nutritious foods less.

Holism: Holistic perspectives consider a large number of variables qualitatively, while science tends to concentrate on a small number of variables quantitatively (adapted from Berkes and Berkes, 2009).

Hotspot (of biodiversity or agrobiodiversity): A generic term for an area high in such biodiversity attributes as species richness or endemism. It may also be used in assessments as a precise term applied to geographic areas defined according to two criteria: (i) containing at least 1 500 species of the world's 300 000 vascular plant species as endemics, and (ii) being under threat, in having lost 70 percent of its primary vegetation (IPBES Glossary).

Hunter-gatherers (present-day): A term used to refer to small-scale, mostly egalitarian, societies that subsist primarily from food that has been obtained directly from the environment – through hunting animals, gathering plant food, fishing or scavenging. A more general term for this is "foraging" and such peoples are also sometimes referred to as "foragers" – or often "post-foragers", given that most such societies no longer survive through these subsistence techniques alone. They constitute a tiny fraction (less than 1 percent) of the 476 million peoples referred to as indigenous (Lee R.B., Heywood Daly R. and Daly R., 1999).

Hybrid seed: Seed produced by crossing genetically dissimilar parents (FAO Technical Glossary).

***In situ* conservation:** The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties (FAOTERM).

Indigenous food: Foods from the natural environment that became included into the cultural food use patterns of a group of Indigenous Peoples (FAOTERM).

Indigenous language: Not only methods of communication but also extensive and complex systems of knowledge that have developed over millenniums. They are central to the identity of Indigenous Peoples, the preservation of their cultures, worldviews and visions and an expression of self-determination. Indigenous languages are critical markers of the cultural health of Indigenous Peoples. When indigenous languages are under threat, so too are Indigenous Peoples themselves (UN, 2008)

Indigenous Peoples: In accordance with international consensus, the four following criteria apply when considering Indigenous Peoples: priority in time, with respect to occupation and use of a specific territory; the voluntary perpetuation of cultural distinctiveness, which may include the aspects of language, social organization, religion and spiritual values, modes of production, laws and institutions; self-identification, as well as recognition by other groups, or by state authorities, as a distinct collectivity; and an experience of subjugation, marginalisation, dispossession, exclusion or discrimination, whether or not these conditions persist (FAO, 2010).

Indigenous Peoples' traditional knowledge: Cumulative body of knowledge (for example know-how), practices and manifestations maintained and developed by Indigenous Peoples with long histories of interaction with their natural environment. Indigenous Peoples' knowledge is adapted to the local culture and transmitted orally from generation to generation (adapted from FAOTERM).

Informal property: Rights that lack formal, official recognition and protection. In some cases, informal property rights are illegal, i.e. held in direct violation of the law. In other cases, informal property may be "extra-legal", i.e. not against the law, but not recognised by the law (FAOTERM).

Institution: Formal and informal norms, rules and organizations that stem from social interaction and guide behaviour to help decide which actions are required, permitted or forbidden (Ford *et al.*, 2020).

Intellectual property (IP): The legal framework, which includes patenting and plant variety protection, by which inventors control the commercial application of their work. These rights are outlined in Article 27 of the Universal Declaration of Human Rights, which provides for the right to benefit from the protection of moral and material interests resulting from authorship of any scientific, literary or artistic work (IFAD Policy on Engagement with Indigenous Peoples).

Intercropping: Growing two or more crops as a mixture in the same field at the same time. Intercropping can be one way of adding diversity to a crop system.

Invasive species: A plant, particularly a weed, with the ability to spread beyond its presently established site and become established in new locations (FAOTERM).

Knowledge system: A body of propositions that are adhered to, whether formally or informally, and are routinely used to claim truth. They are organised structures and dynamic processes (a) generating and representing content, components, classes or types of knowledge, that are (b) domain-specific or characterised by domain-relevant features as defined by the user or consumer, (c) reinforced by a set of logical relationships that connect the content of knowledge to its value (utility), (d) enhanced by a set of iterative processes that enable the evolution, revision, adaptation and advances, and (e) subject to criteria of relevance, reliability and quality (IPBES Glossary).

Land acquisition: All methods of obtaining land for project purposes, which may include outright purchase, expropriation of property and acquisition of access rights, such as easements or rights of way (IFAD Glossary).

Landrace: In plant genetic resources, an early, cultivated form of a crop species, evolved from a wild population, and generally composed of a heterogeneous mixture of genotypes (FAOTERM).

Land rights: Property rights pertaining to land. There are three principal rights linked to the spatial dimension of land: use rights, control rights and transfer rights (FAOTERM).

Land tenure: The relationship, whether legally or customarily defined, between people, as individuals or groups, with respect to land. More than one person may hold rights to a parcel of land, which gives rise to the concept of a "bundle of rights" (adapted from FAOTERM).

Land tenure security: The ability to control and manage a parcel of land, use it and dispose of its produce and engage in transactions, including transfers (FAOTERM).

Landscape: A landscape can be defined as a socioecological system made up of natural and/or human-modified ecosystems.

Learning: The capacity to generate, absorb and process new information on changing conditions, assess response options and frame or reframe problems (Ford *et al.*, 2020).

Linguistic diversity: Range of variations exhibited by human languages (IFAD Glossary).

Livelihood: A combination of the resources used, and the activities undertaken, in order to live. The resources might consist of individual skills and abilities (human capital), land, savings and equipment (natural, financial and physical capital, respectively), and formal support groups or informal networks that assist in the activities being undertaken (social capital).

Local food: Local food refers to food that is produced near its point of consumption.

Macronutrients: A major chemical element essential for normal growth and development (e.g. carbohydrate, protein).

Malnutrition: Inadequate, unbalanced or excessive consumption of macronutrients and/or micronutrients. Malnutrition includes undernutrition and overnutrition as well as micronutrient deficiencies (FAO, IFAD and WFP, 2014).

Marginalisation: The process of pushing particular groups of people – usually minorities such as Indigenous Peoples or rural women – to the edge of society by not allowing them to have an active participation, identity or place in society (FAOTERM).

Market foods: Food that enters communities often through global industrially sponsored outlets, and which must be purchased (Kuhnlein *et al.*, 2009, p.4).

Microbiome: The combined genetic material of all microorganisms living in a given ecosystem, including in the human body. Within the sphere of human health, gut dysbiosis, or the loss of microbiome diversity and shifts in the composition of the microorganisms populating the gut, can result in loss or alteration of a healthy microbiome (FAO, 2019).

Micronutrient: Vitamins, minerals and certain other substances that are required in small amounts (milligrams or micrograms) by the body for normal physiological function (FAOTERM).

Milpa: A traditional intercropping system, usually maize intercropped with the common bean (*Phaseolus vulgaris L.),* and squash (*Cucurbita spp.)*, used by many Indigenous Peoples. Crop varieties are planted together to maximise their abilities to add nutrients to the soil that enrich growing capacity for all traditional crops.

Monoculture: The agricultural practice of cultivating a single crop over a whole farm or area (FAOTERM).

Mother Earth: An expression used in a number of countries and regions to refer to the planet Earth and the entity that sustains all living things found in nature with which humans have an indivisible, interdependent physical and spiritual relationship.

Natural hazard: Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (FAOTERM).

Natural resource: Any portion of the natural environment, such as air, water, soil, botanical and zoological resources and minerals. A renewable resource can potentially last indefinitely without reducing the available supply because it is replaced through natural processes or because it recycles rapidly as water does.

Nature: The natural world, with emphasis on the diversity of living organisms and their interactions among themselves and with their environment (from Diaz, 2015).

Nature-positive production: Nature-positive food production systems produce a larger diversity of plants and animals to feed a growing population, without degrading the functional integrity of ecosystems, and meet the nutritional needs of all current and future generations. Nature-positive approaches recognise that biodiversity underpins the delivery of all ecosystem services on which humanity depends and that these are critical for the delivery of the Sustainable Development Goals, the Convention on Biological Diversity, and the Paris Agreement (UN Food Systems Summit, 2021).

Nixtamalisation: A process for the preparation of maize (or other grain), in which lime, hard wood ash or other alkaline solution is added to maize during cooking.

Non-communicable diseases (NCDs): Also known as chronic diseases, these are generally of long duration and are the result of a combination of genetic, physiological, environmental, dietary and behavioural factors. The main types of NCDs are cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes. NCDs are the leading cause of death worldwide (adapted from WHO, 2018).

Non-Timber Forest Product (NTFPs): Goods derived from forests that are tangible and physical objects of biological origin other than wood.

Nutrient: A substance used by an organism to survive, grow and reproduce.

Nutrition: The process of taking in food and using it for growth, metabolism and repair.

Nutrition security: When secure access to an appropriately nutritious diet is coupled with a sanitary environment and adequate health services and care, in order to ensure a healthy and active life for all household members. Nutrition security differs from food security in that it also considers the aspects of adequate caregiving practices, health and hygiene, in addition to dietary adequacy (FAO, IFAD and WFP, 2014).

Nutrition transition: Refers to changes in lifestyle and dietary patterns driven by urbanisation, globalisation and economic growth, and their resulting impacts on nutrition and health outcomes. The nutrition transition is often associated with an increase in the consumption of vegetable oils, sugar-sweetened beverages, meat and highly processed, fast and street foods (FAOTERM).

Oral tradition: Variety of spoken forms including proverbs, riddles, tales, nursery rhymes, legends, myths, epic songs and poems, charms, prayers, chants, songs, dramatic performances and more used to pass on knowledge, cultural and social values, and collective memory. They play a crucial part in keeping cultures alive (IFAD Glossary).

Organic matter: Plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesised by the soil population (FAOTERM).

Organic agriculture: A holistic production management system that promotes and enhances agroecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, cultural, biological and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system (FAOTERM).

Ownership: The rights to land that are, in everyday language, associated with the ability to use, control, transfer or otherwise enjoy a land parcel as long as those activities are allowed by law. In statutory tenure, it is often associated with freehold. However, land law does not tend to define explicitly what is meant by "ownership" (FAO).

Pandemic: The worldwide spread of a new disease (WHO, 2020).

Pastoralism: Wide family of livestock-based, livelihood/food production systems, which are specialised in improving the animals' diet and welfare through different forms of mobility (from short movements to nomadism), thus managing their grazing itineraries at a variety of scales in time and space (FAO, forthcoming).

Pesticide: Any substance intended for preventing, destroying, attracting, repelling or controlling any pest including unwanted species of plants or animals during the production, storage, transport, distribution and processing of food, agricultural commodities or animal feeds or which may be administered to animals for the control of ectoparasites. The term includes substances intended for use as a plant-growth regulator, defoliant, desiccant, fruit-thinning agent or sprouting inhibitor and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport. The term normally excludes fertilisers, plant and animal nutrients, food additives and animal drugs.

Pharmacologically active substance: Any chemical or substance that affects the physiology, the function of the body of a human or animal.

Phenolic compounds: Compounds with hydroxyl group(s) attached to the benzene ring, forming esters, ethers and salts. Phenolic substances produced from newly explanted tissues are liable to oxidise, and as a result, form coloured compounds visible in nutrient media (FAOTERM).

Phenotype: The visible appearance of an individual (with respect to one or more traits) that reflects the reaction of a given genotype with a given environment (FAOTERM).

Phytochemical: Molecules characteristically found in plants.

Private property: Rights held by a private party who may be an individual person, a married couple, a group of people or a corporate body such as a commercial entity or non-profit organization (FAOTERM).

Productivity (instead of resource productivity): The amount of economically significant product generated within a given period from a specified quantity of resource (FAOTERM).

Protected areas: A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (IUCN 2008).

Radionuclide: An isotope of artificial or natural origin that exhibits radioactivity.

Reciprocity: Within this report, the concept acknowledges a moral and practical obligation for humans and biota to care for and sustain one another, and arises from human gratitude and reverence for the contributions and sacrifices made by other biota to sustain humankind.

Renewable energy: Renewable energy consists of energy produced and/or derived from sources infinitely renovated (hydro, solar, wind) or generated by combustible renewables (sustainably produced biomass); usually expressed in energy units and, in the case of fuels, based on net calorific values (FAOTERM).

Resilience: Defined as the capacity of a system to (i) to anticipate, (ii) to prevent, (iii) to absorb, (iv) to adapt to evolving risks, and (v) to transform when the current food system becomes no longer sustainable (Hertel et *al.*, 2021).

Restoration: The active intervention and management of degraded biotic communities, landforms and landscapes in order to restore biological character, ecological and physical processes and their cultural and visual qualities (FAOTERM).

Rituals: Understood as a network of practices, knowledge and behaviours, rituals associated with food form a key role in maintaining indigenous world views, passing on practices and values and strengthening the sense of community and collective responsibility to conserve socio-ecological systems (Anacio, 2017).

Rotational agriculture: Refers to the growing of dissimilar crops or no crop during sequential seasons on the same piece of land.

Sacred site: A site, object, structure, area or natural feature or area, held by national governments or indigenous and local communities to be of particular importance in accordance with the custom of an indigenous or local community because of its religious and/or spiritual significance.

Safeguards: Essential tools to prevent and mitigate undue harm to people and their environment during the development process. When identifying and designing a project, safeguards should help assess the possible environmental and social risks and the impacts (positive or negative) associated with a development intervention. Synonyms: environmental or social safeguards (FAO Investment Learning Platform).

Seed system: An ensemble of individuals, networks, organizations, practices and rules that provide seeds for plant production (Bioversity International, 2017).

Self-determination: The ability or power to make decisions for oneself, especially to decide how to be governed. The UNDRIP (article 3) recognises the right of Indigenous Peoples to self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development.

Self-sufficiency: A group is considered self-sufficient by its ability to produce all the materials it consumes and to consume what it produces. Self-sufficiency refers to a closed loop from production to consumption to production. It is a model, sometimes an ideal, that is never achieved. Economic self-sufficiency is in total contrast to complete market economy in which everything produced is traded and everything consumed is secured through trade (Callan and Coleman, eds., 2018).

Shifting cultivation: A way of farming that involves the clearing of natural or largely natural vegetation, usually using fire, to plant crops for one or two years and then allowing natural vegetation to regenerate on the plot for a long period of time, referred to as fallowing, before clearing and cropping it again. Shifting cultivation is also known as “slash and burn” or “swidden cultivation” and by a variety of local names specific to each place in which it is practised (Callan and Coleman, eds., 2018).

Social-ecological system: “Social” or “socio” ecological systems are complex and evolving systems in which humans are part of nature. Social, economic, ecological, cultural, political, technological and other components are strongly linked, and the ecological component provides essential services to society such as supply of food, fibre, energy and drinking water (Berkes and Folke, eds., 1998).

Soil fertility: The ability of a soil to sustain plant growth by providing essential plant nutrients and favourable chemical, physical and biological characteristics as a habitat for plant growth.

Species diversity: A measure of the number of different species within a biological community, and relative abundance of individual in that community.

Species: An interbreeding group of organisms that is reproductively isolated from all other organisms, although there are many partial exceptions to this rule, in particular taxa. Operationally, the term species is a generally agreed fundamental taxonomic unit, based on morphological or genetic similarity, that once described and accepted is associated with a unique scientific name.

Spirituality: A fundamental belief in the sacredness of nature, Earth and the universe.

Stakeholder: Any person or group (including governmental and non-governmental institutions, traditional communities, universities, research institutions, development agencies and banks, donors, etc.) with an

interest or claim (whether stated or implied) that has the potential of being impacted by or having an impact on a given project and its objectives (FAOTERM).

Staple food: Food that is eaten commonly and regularly in a country or community and in such quantities as to constitute the dominant part of the diet and supply a major proportion of energy needs.

Stewardship (of the environment): The actions taken by individuals, groups or networks of actors, with various motivations and levels of capacity, to protect, care for or responsibly use the environment in pursuit of environmental and/or social outcomes in diverse social–ecological contexts (Bennett *et al.*, 2018).

Subsistence: Subsistence is the process whereby people supply themselves with the necessities of life, such as food and shelter. Subsistence relates primarily to self-provisioning by small productive units, often families. These groups are referred to as autarkic for being able to supply all their own needs with no dependence or interaction with others to obtain necessities (Callan and Coleman, eds., 2018).

Superfoods: A nutrient-rich food considered to be especially beneficial for health and wellbeing. Generally speaking, superfoods refer to foods — especially fruits and vegetables — whose nutrient content confers a health benefit above that of other foods. There is no official or legal definition of a superfood (FAOTERM).

Sustainability: A characteristic or state whereby the needs of the present and local population can be met without compromising the ability of future generations or populations in other locations to meet their needs.

Sustainable diet: Diets with low environmental impacts that contribute to food and nutrition security and to a healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy, while optimising natural and human resources.

Sustainable development: Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, IFAD).

Sustainable development goals: One of the main outcomes of the United Nations Conference on Sustainable Development (Rio+20), held in Rio de Janeiro in 2012, was the agreement by Member States to launch a process to develop a set of sustainable development goals (SDGs). 17 SDGs and 169 targets aim to stimulate action over the next 15 years in areas of critical importance for humanity and the planet (UN, 2015).

Sustainable food system: A food system that ensures food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition of future generations are not compromised (HLPE, FAO, 2014).

Sustainable livelihood: Cope with, and recover from, stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, whilst not undermining the natural resource base (IFAD Glossary).

Sustainable use: Use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations (Convention on Biological Diversity).

Territory: Lands and waters traditionally occupied or used by indigenous and local communities.

Traditional crops: Crops that have been grown for a long time by local communities and that are well adapted to the local agro-climatic conditions

Traditional custodian: The group, clan or community of people, or an individual, who is recognised by a group, clan or community of people as the individual in whom the custody or protection of the expressions of culture are entrusted in accordance with the customary law and practices of that group, clan or community (IFAD Glossary).

Traditional lands and territories: Lands and waters traditionally occupied or used by indigenous and local communities.

Traditional resources: Tangible or intangible assets of biological, spiritual, aesthetic, cultural and economic value used traditionally by Indigenous Peoples and local communities.

Traditional medicine: The medicinal preparations, often based on centuries-old traditions, that contain derivatives from plants or animals that have proven or reputed medicinal properties (CITES Glossary).

Tribal peoples: Peoples in independent countries whose social, cultural and economic conditions distinguish them from other sections of the national community, and whose status is regulated wholly or partially by its own customs or traditions or by special laws or regulations. (C169 – Indigenous and Tribal Peoples Convention, 1989, ILO, 2016; OFAD).

Tribe: Notional form of human social organization based on a set of smaller groups, having temporary or permanent political integration, and defined by traditions of common descent, language, culture and ideology (IFAD Glossary).

Undernutrition: The outcome of poor nutritional intake in terms of quantity and/or quality, and/ or poor absorption and/or poor biological use of nutrients consumed as a result of repeated instances of disease. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (suffering from wasting), and deficient in vitamins and minerals (micronutrient deficiency) (A4NH Glossary).

United Nations Declaration of Rights on Indigenous Peoples (UNDRIP): Adopted by the General Assembly in September 2007, the UNDRIP contains provisions on land, natural resources and subsistence activities relevant for the realisation of Indigenous Peoples' right to food and food sovereignty. It also includes the protection of traditional knowledge, biodiversity and genetic resources, and sets limits to activities of third parties on the territories of indigenous communities without their consent.

Use rights ("usufruct"): Right to use the land for growing crops, passage, grazing animals and the utilisation of natural and forest products. A holder of a use right may not have the right to sell the property, etc. (FAO TERM).

Value systems: Set of values according to which people, societies and organizations regulate their behaviour. Value systems can be identified in both individuals and social groups (IPBES Glossary).

Value chain: The set of actors (private, public and including service providers) and the sequence of value-adding activities involved in bringing a product from production to the final consumer. In agriculture they can be thought of as a "farm to fork" set of processes and flows.

Variety: A plant or group of plants selected for desirable characteristics and maintained in cultivation. It may be traditional and maintained by farmers, or modern and developed as a result of deliberate breeding programs (Bioversity International, 2017).

Vulnerability: Ability to be easily physically, emotionally or mentally hurt, influenced or attacked. Vulnerable groups define those who have insufficient access to the quantity and quality of food that would ensure a healthy life and/or are at risk of losing such access altogether (World Food Programme [WFP]).

Water security: The capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human wellbeing and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability (IPBES Glossary).

Wellbeing: A context – and situation – dependent state, comprising basic material for a good life, freedom and choice, health, good social relations and security (UN, 2008).

Western science (also called modern science): A broad term to refer to knowledge typically generated in universities, research institutions and private firms following paradigms and methods typically associated with the "scientific method" consolidated in Post-Renaissance Europe on the basis of wider and more ancient roots. It is typically transmitted through scientific journals and scholarly books. Some of its central tenets are observer independence, replicable findings, systematic scepticism and transparent research methodologies with standard units and categories.

Wild food (or "uncultivated food"): Wild plants, animals and insects that are not cultivated or reared in captivity. They are part of the minor crops and underutilised species, and include roots and tubers, vegetables and leafy vegetables, fruits, insects, amphibians, reptiles, birds, game and mammals gathered for food (Bioversity International, 2017).

Worldviews: Worldviews defined by the connections between networks of concepts and systems of knowledge, values, norms and beliefs. Individual person's worldviews are molded by the community to which the person belongs. Practices are embedded in worldviews and are intrinsically part of them (e.g. through rituals, institutional regimes, social organization, but also in environmental policies, in development choices, etc.).

Zoonotic disease (or zoonoses): A disease that is communicable from animals to humans via various routes of transmission (e.g. air – influenza; bites and saliva – rabies).

Annexes

Annex 1: Case studies

Case study 1

Declaration of the indigenous territory as a cultural heritage for agrobiodiversity

In Ecuador, as a strategy to defend collective economic, social and cultural rights of the indigenous communities of Cotacachi, and to promote agrobiodiversity conservation, along with related traditional knowledge and ancestral practices, the municipal government of Cotacachi canton initiated the declaration of the territory as a cultural heritage for agrobiodiversity. The idea of declaration started in 2010 and then following years of consultation and preparatory work with the Unión de Organizaciones Campesinas e Indígenas de Cotacachi (UNORCAC), an association of farmers' and indigenous communities, in 2014, the Cotacachi canton was declared a cultural heritage. This declaration not only recognises the biodiverse nature of the territory but, more importantly, it values the traditional knowledge of the communities as custodians of biodiversity and genetic resources, especially the women, in their role in conserving and sustaining local agrobiodiversity. The declaration is accompanied by a safeguard plan of the indigenous territory. The safeguard plan stipulates support for the indigenous communities in the restitution of local seeds; training for seed producers and seed exchange fairs; marketing of agrobiodiversity products, valorisation of traditional cuisine and gastronomic fairs; value addition to native crops; as well as awareness building and educational activities. Therefore, the recognition of the indigenous communities through the declaration enables the indigenous communities to contribute to both food security and wellbeing and conservation of the biodiversity and genetic resources. Also, it was proven that actions taken should be led by participating indigenous farming communities; there should be a clear priority on farmers' needs, especially needs of women farmers. Furthermore, the need of indigenous communities to link with research organizations is cited as essential; research should have a direct and immediate relationship with their territory needs. (FAO: Submission of national measures and practices on the realization of Indigenous Peoples' Rights by Ecuador available at http://www.fao.org/3/ca7934en/ca7934en.pdf)

Linked to: AT3

Case study 2

Alaska native youth learning their indigenous food ways: Bristol Bay 4-H Trapping Club

The Bristol Bay region of southwest Alaska is rich with natural resources. Indigenous and non-Indigenous Peoples harvest moose, caribou, salmon, plants, berries and more. They depend on their local harvests, and the Bristol Bay 4-H members are involved in cultural and traditional activities that teach how to gather and survive. School-age kids in Bristol Bay 4-H learn the biology and life cycle of wild salmon through diagrams, dissection, and visits to canneries, weirs, rivers and beaches. Youth learn and participate in cleaning and putting up smoked salmon to share with families and elders. The youth create salmon dishes such as salmon chowder and salmon spread. Kids involved in the Bristol Bay 4-H Trapping Club learn how and when to harvest animals such as otter, beaver, fox, martin, mink and rabbits. They build traps and learn responsible methods of hunting and trapping. They learn how to skin the animals they catch and how to use the fur and meat. Bristol Bay 4-H youth also gather plants and berries for eating. They learn when and how to collect plants and how to prepare them. They have collected and prepared dandelions, fiddle heads, fireweed, cranberries, black berries, cloud berries and more. Youth learn to create syrups, jams and jellies and traditional dishes, such as agutuk. Bristol Bay 4-H members learn how to identify and harvest local medicinal plants, like plantain, dandelions, stink weed, yarrow and more. They make teas, healing lotions and muscle rubs with the plants and share them with families and elders.

This is done annually during the summer. Many kids have participated for several years and are now youth leaders, teaching the less experienced members how to identify and harvest medicinal plants. Hundreds of children in communities across Bristol Bay have participated in and learned about harvesting our local resources, creating useful items and sharing them with others. These youth are able to keep our local culture, traditions and knowledge alive and pass it on to future generations (Deanna Baier, Tribal Educator, Bristol Bay 4-H Coordinator, 2021).
Linked to: AT1, AT2, AT5

Case Study 3

Advancing healthy and sustainable food environments: The Flathead Reservation case study

Work is being conducted on the Flathead Indian Reservation in Montana that is more appropriate to engage Tribal Community members and supplement the existing food-environment research models. These three models were used to evaluate the desirability of vegetables and fruits on the Flathead Reservation. The research models showed that produce in urban environments had a higher desirability score than rural environments. Researchers at Montana State University worked with the Flathead Indian Reservation to create different food intervention models to see what works the best to increase healthy foods and diet. These included Eat Fresh intervention (2016) with 20 households, which included education, culinary training, and provision of fruit and vegetables. They found that there were improvements in self-reported health characteristics amongst participants such as wellbeing, mental alertness and mood as well as increases in fruit consumption. The Eat Fresh and Local intervention (2017) with 40 households included education, culinary training, and provision of fruit and vegetables but focussed on the whole diet. The Healthy & Sustainable Diets for All intervention (2018) with 40 households included education and provision of produce and whole grains from local and sustainable agricultural systems. These interventions will help to understand ways to engage community members at the Flathead Indian Reservation in promoting healthy food choices in food deserts. Supplementing these diets with wild food systems will enhance the nutritional components of rural communities.

From these multiple interventions, lessons that emerged acknowledged that interventions have to be community-based, incremental and multi-phased with linkages to existing institutions and a thoughtful dissemination approach that includes multiple stakeholders and outlets. Funding for this work comes from the National Science Foundation and the National Institutes of Health (Ahmed *et al.*, 2019).
Linked to: AT2

Case Study 4

Agricultural intensification (or modernisation of agriculture), homogenisation of crops, farming systems and agrarian conditions in the Phillipines

During the 1960s and 1970s, the Philippines was at the epicentre of the agricultural Green Revolution. Reacting to food insecurity driven by rapid population growth, agricultural modernization and intensification primarily in rice farming was promoted extensively across the Philippines. Varietal replacement, hybridisation, monocropping and use of standardised crops effectively supplanted traditional rice-based farming systems and diminished indigenous agricultural biodiversity in many areas across the country. New rice cultivars like IR8 developed by the Philippines-based International Rice Research Institute (IRRI) produced high yields, but at the same time required industrialised agricultural approaches and intense use of fertilisers and pesticides. Government policies and subsidies geared towards maximum short-term productivity further exacerbated the dominance of unsustainable agricultural practices in the Philippines.

Many indigenous communities, such as the T'boli indigenous in Lake Sebu, have seen their traditional crop varieties and farming systems impacted both directly and indirectly by programmes aimed at modernising farming systems and agrarian conditions more generally. Access to land for T'boli people has become a chronic issue since the implementation of earlier government policies that encouraged migration to other parts of the country, as well as the rise of agribusiness in the Lake Sebu region. Major portions of T'boli ancestral lands are now in the possession of agribusiness ventures and migrant farmers, through various forms of land transfer that many T'boli have questioned. Traditional farming, which harbours local agrobiodiversity, has rapidly shrunk and been pushed upwards to the steeper slopes in the fringes of remaining forests. In Hungduan, Ifugao province, the situation is similar, as many traditional rice varieties are no longer planted by many farmers as a result of agricultural intensification, leading to the loss of Inawi, Imbayak and Kam-nga traditional rice varieties, of importance in the Indigenous Peoples' food system. (Source: Baseline assessment of the target regions for the FAO-GEF Project "Dynamic conservation and sustainable use of agrobiodiversity in traditional agroecosystems in the Philippines, https://www.thegef.org/project/dynamic-conservation-and-sustainable-use-agro-biodiversity-traditional-agro-ecosystems)

Dynamic Conservation and Sustainable Use of Agrobiodiversity in Traditional Agro-Ecosystems of the Philippines

Indigenous Peoples are widely recognised as stewards of ancestral lands and the agrobiodiversity resources therein. In Lake Sebu of South Cotabato in the southern Philippines, two indigenous groups – the T'boli and the Ubo – make up a majority of the labour force and have, for decades, relied on local agrobiodiversity for their daily needs. However, with current challenges posed by poverty and climate change, agrobiodiversity presents myriad opportunities beyond just subsistence. This is the basic premise of FAO's Dynamic Conservation and Sustainable Use of Agrobiodiversity in Traditional Agroecosystems of the Philippines project.

Through the project, the Lake Sebu Indigenous Women and Farmers Association (LASIWFA) was organised and provided with training and other inputs to improve their traditional farming practices and productivity. Members were also taught to process local crops into high-value products, which they sold in adjacent localities and at international market exhibitions. These not only boosted members' incomes but also their sense of empowerment. Seeing the success and potential of the initiative, the local government funded the construction of processing infrastructure to further assist LASIWFA, as well as an allotted budget for LASIWFA's enterprise activities. Local legislation is also being lobbied to institutionalise and sustain the project's interventions. The project has shown that multisector partnership is critical to sustain and scale its interventions and, therefore, should be maintained and enhanced. Additionally, it is essential that any initiative that involves Indigenous Peoples should respect, recognise and build upon their existing practices if they are to "own" such initiative for success and long-term sustainability.

Linked to: AT3, AT4

Case Study 5

Management of the Gwaii Haanas National Park Reserve and Haida Heritage Site by Haida nation

The establishment of the Gwaii Haanas National Park Reserve and Haida Heritage Site by the Haida nation came as a response to concerns over the damage and destruction of ancestral sites. The area made of pacific temperate rainforests is rich in cultural sites, as a consequence of humans having inhabiting the place for 12 500 years. The council of the Haida nation and Parks Canada co-manage the park in order to restore the "rich cultural and ecological heritage of the Gwaii Haanas". Decision-making and planning both rely on indigenous and western science. The protected areas were extended in 2010 with the

creation of the Gwaii Haanas National Marine Conservation Area Reserve and the Haida Heritage Site, whose management respects values and principles of living of the Haida nation. Management is based on yahguudang, a principle that conveys respect for all living things, and it aims to balance the protection of the area with Haida food, culture, economic and ceremonial needs (Stephenson *et al.*, 2014; Dasgupta, 2021).
Linked to: AT3

Case Study 6

The Story of 13 Moons: Developing an environmental health and sustainability curriculum founded on indigenous first foods and technologies

The Swinomish Indian Tribal Community developed an informal environmental health and sustainability (EHS) curriculum based on Swinomish beliefs and practices. EHS programs developed and implemented by indigenous communities are extremely scarce. The mainstream view of EHS does not do justice to how many Indigenous Peoples define EHS as reciprocal relationships between people, nonhuman beings, homelands, air and waters. The curriculum provides an alternative informal educational platform for teaching science, technology, engineering, art and mathematics (STEAM) using identification, harvest and preparation activities of first foods and medicines that are important to community members to increase awareness and understanding of local EHS issues. The curriculum objectives are to: increase awareness and understanding of local EHS issues among all ages of Swinomish community members; provide an informal (outside of school) educational platform for teaching science, technology, engineering, art and mathematics; and increase interest in healthy lifestyles and practices. The curriculum, called 13 Moons, is founded on a set of guiding principles that may be useful for other indigenous communities seeking to develop their own curricula (Donatuto *et al.*, 2020).
Linked to: AT4

Case Study 7

The Global Mountain Participatory Guarantee System (PGS) Network

The Global Mountain Participatory Guarantee System (PGS) Network represents another valid example of knowledge- sharing processes among mountain peoples, including indigenous communities. Created in 2019 by 13 organizations of small-holder mountain producers from Bolivia, India, Kyrgyzstan, Mongolia, Nepal, Panama, Peru and the Philippines, the Global Mountain PGS Network is the first international network of Participatory Guarantee Systems. The process was promoted and facilitated by the Mountain Partnership Secretariat through its Mountain Partnership Products (MPP) initiative. The Global Mountain PGS network is rooted in the Ranikhet Declaration, which represents a commitment of the MPP partners to start a transition towards a PGS that will certify their farming systems as ethical, fair and organic. PGS represent cost-effective and locally focussed quality assurance systems, alternative or complementary to third-party certification schemes. The network links small-scale mountain farmers around the globe, promotes horizontal knowledge sharing among partners and innovative south-south cooperation. Thanks to this network, mountain farmers' experiences can be shared, communicated and scaled up, maintaining the context-specific approach typical of PGS initiatives. The network is currently being expanded to new farmer groups in Guatemala, Lesotho, Papua New Guinea and Rwanda. The Mountain Partnership – the only United Nations alliance of partners dedicated to improving the lives of mountain peoples and protecting mountain environments around the world – advocates for global attention and tangible commitments from the international community to achieving sustainable mountain development. This includes the inclusion of Indigenous Peoples' traditional knowledge in responding to climate change adaptation, as stipulated by the UNFCCC COP21 Paris Agreement, and the right of Indigenous Peoples to their land, territories and resources, as stipulated by the UNDRIP. Founded in 2002, the Mountain Partnership addresses the challenges facing mountain regions by tapping the wealth and diversity of

resources, knowledge, information and expertise, from and between its members, to stimulate concrete initiatives at all levels that will ensure improved quality of life and environments in the world's mountain regions. Currently, more than 400 governments, intergovernmental organizations, major groups (e.g. civil society, NGOs and the private sector) and subnational authorities are members.
Linked to: AT4

Case Study 8

Indigenous land tenure and sovereignty as a prerequisite to adaptive capacity in confronting climate change and addressing global sustainability

Carbon sequestration in forest and rangeland ecosystems is touted as a primary means of combating climate change while increasing biodiversity and sustainable rural livelihoods (Seymour & Busch, 2017; Seymour, 2020). However, evidence demonstrates that economic and policy structures surrounding the implementation of carbon programs have led to the degradation of ecosystems and deceases in biodiversity, with little effectivity in carbon sequestration, all whilst undermining the livelihoods and autonomy of indigenous rural communities (Corbera, 2012; McDermott, 2017; Milne *et al.*, 2019; Asiyanbi & Lund, 2020; Devine & Baca, 2020; Global Forest Coalition, 2020). This incongruence between objective and outcome is due to several factors. First, the policies behind these programmes are based on financial priorities and models that are divorced from land-based, place-based community needs and realities, with indigenous communities often possessing little to no decision-making power or land rights (Corbera, 2012; Fosci, 2012; Fosci, 2013; Bustamante *et al.*, 2014; Osborne and Shapiro-Garza, 2018). Second, equitable cross-accountability is often weak or non-existent among the entities providing the financing, receiving the financing, and implementing the management decisions (Ballesteros *et al.*, 2010; Gupta *et al.*, 2012). Third, carbon markets have classically been plagued by the high cost of monitoring by technical consultants who consume a large proportion of the funds intended to reimburse carbon storage (Kerchner and Keeton, 2015; Kelly and Schmitz, 2016).

The Yurok, an indigenous people of the lower Klamath River basin in northern California, United States of America, provide a good example of how otherwise failed investments in carbon sequestration efforts are made more successful when they are guided by the place-based knowledge and practices of indigenous communities. To regain control of their ancestral territories and restore culturally significant ecosystems, the Yurok sold 100-year contracts for forest carbon offsets under the California Air Resources Board forestry protocol (Kelly and Schmitz, 2016; Schmitz and Kelly, 2016; Manning and Reed, 2019) and used the funds to purchase back 23 300 ha of their own ancestral territory. Although some have made convincing arguments that tribal land restitution is justified simply because of historical genocide and land theft (Kormann, 2018), tribes in North America are often forced to compromise their sovereignty by selling long-term offsets or leases to non-indigenous entities (Manning and Reed, 2019). As with most indigenous communities in North America, the Yurok have themselves suffered a history of genocidal land theft (Huntsinger & McCaffrey, 1995; Manning & Reed, 2019; Huntsinger and Diekmann, 2010), and continue to fear future expropriation (Whyte, 2017). This dispossession resulted in the implementation of misguided bans on indigenous prescribed fires, which decreased long-term carbon storage by encouraging destructive wildfires (Huntsinger and McCaffrey, 1995; Manning and Reed, 2019).

Despite this history, after the acquisition of their ancestral lands, the Yurok's forest carbon implementation has been demonstrated to be successful in sequestering carbon and increasing biodiversity due to several factors (Fleischman *et al.*, 2020). First, this land purchase provided the Yurok with land rights that protect them from external interference and provide them with enforceable management rights. This in turn levels the playing field in their relationships with political, legal and economic entities while providing them the liberty to implement their traditional ecological knowledge.

Their practices have led to reduced timber harvesting relative to commercially owned operations, and their implementation of traditional fire management has increased tree stand diversity while reducing the incidence of California wildfires that release a tremendous amount of carbon into the atmosphere (Halpern, 2016; Marks-Block, Lakes and Curran, 2019; Marks-Block, 2020). Second, land tenure security provides the Yurok a stable, equitable and reciprocal position of accountability with the State of California. The Yurok tribal government represents the peoples' ecological restoration priorities through a contract outlining mutual responsibilities with the California government, which is easily enforced through a low-cost court system when violations arise (Manning and Reed, 2019). Third, the major expense of monitoring that has bankrupted other forest carbon programmes has been turned into a local capacity-building and job creation mechanism for Yurok tribal members who are hired and trained to conduct the forest inventories themselves (Kormann, 2018).

This case study exemplifies several priorities for adaptive capacity development. First, foundational to successful climate mitigation strategies (including carbon storage, biodiversity, sustainable rural livelihoods, and ecosystem function and health) are policy reforms that provide tribal communities greater security in land tenure, the power to resist land intrusions, and institutional recognition of their management rights (Chhatre & Agrawal, 2008; Coleman, 2009; Tucker, 2010; Persha, Agrawal and Chhartre, 2011; Kashwan, 2017; Fleischman & Rodriguez, 2018; Osborne and Shapiro-Garza, 2018; Solorzano & Fleischman, 2018; Villamayor-Tomas and Garcia-Lopez, 2018; Waller and Reo, 2018; Reyes-Garcia *et al.*, 2019; Fa *et al.*, 2020; Right and Resources, 2020; Wordsell *et al.*, 2020). Second, negotiations and contracts between tribal governments and political, legal and economic institutions must be equitable and free from coercion and fear of dispossession, whilst encouraging democratisation (Ribot, 2008). Third, tribal land managers must possess enforceable rights and all interested parties must be held accountable to one another through an accessible judicial system. Fourth, political reforms that encourage the restitution of indigenous lands to indigenous communities reduce the need for cost-prohibitive monitoring for carbon programs and reduce the need for tribal nations to sacrifice their sovereignty in order to abide by convoluted contracts whilst gaining access to markets (Osborne, 2015; Wordsell *et al.*, 2020).
Linked to: AT5

Case Study 9

Aligning environmental management with ecosystem resilience: a "First Foods" example from the Confederated Tribes of the Umatilla Indian Reservation, Oregon, United States of America

The "First Foods" management approach of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Department of Natural Resources presents a case study that follows distinguished components: (1) the explicit acknowledgement of reciprocity between humans and the environment as reinforced by the CTUIR's creation belief and ritual serving order for culturally significant foods; (2) a departmental mission and structure organised by the First Foods approach; (3) the recognition and emphasis on the ecological ordering of First Foods; (4) the recognition of the spatial distribution of foods as modeled in the serving order; and (5) the identification of linkages between the serving order and the Walla Walla Treaty of 1855, thereby informing and enriching intergovernmental relations and collaborative opportunities. This case study offers insights into how ecosystem resilience can be incorporated into environmental management strategies in ways that are meaningful to communities, helpful for interagency collaboration, and adaptable by other natural resource management entities. They describe the cultural basis of the First Foods, the CTUIR's use of resource visions to implement the First Foods management approach, and subsequent shifts to planning and goals amongst tribal environmental staff in their first decade of managing First Foods. Through their approach of the five components, they develop and follow both a River Vision and an Upland Vision management plan – the River Vision for the First Foods of the

river systems and the Upland Vision for the deer, berries and roots harvested in the plains and mountains. Their fundamental approach is based on the order in which the First Foods promised to care for the Indian people according to the CTUIR creation belief: First Foods, fish, big game, roots and berries, water – in this order, with water served at the beginning and end in recognition that water is singularly essential for all life and all of the First Foods, people and the landscape (Quaempts *et al.*, 2018).
Linked to: AT3

Case Study 10

Building resilience to vulnerabilities, shocks and stresses

Comparing two climate-sensitive small-scale fisheries systems – an Inuit community in the Canadian Arctic and the Coastal-Vedda in Sri Lanka (Galappaththi *et al.*, 2021) – generate eight ways of building resilience in fisheries-dependent indigenous communities to respond and adapt to climate change impacts. Both Inuit and Coastal-Vedda communities are undergoing food system transformations. The Inuit food system transformed from land-based (Caribou) country food to ocean-based food system (fish, seal) in the face of Caribou out-migration to Western Canadian Arctic lands. The Sri Lankan Coastal-Vedda food system is transforming from rice farming to culture-based fisheries due to unpredictable and extreme weather patterns. From across these two case studies, this study identifies eight sources of resilience that can build adaptive capacity in indigenous fisheries systems: i) use of diverse kinds of knowledge systems for daily fishing activities; ii) practise different ways of learning opportunities to foster adaptive learning; iii) use of community-based institutions to cope with everyday challenges and fisheries management; iv) efforts to improve human agency to build adaptive capacity; v) unique worldviews that encourage living with the changing conditions and adapting; vi) specific cultural attributes such as sharing, collective action and collaboration; vii) effective social networks that lubricate specific information-sharing processes that are mandatory for fishing activities; and viii) flexibility with which fisheries systems can switch between different adaptive responses or engage in multiple responses as appropriate to adapt to changing conditions.
Linked to: AT5

Case Study 11

Universities Council on Water Resources: "Change Rippling through Our Waters and Culture"

It is well established that climate change is already causing a wide variety of human health impacts in the United States of America and globally, and that for many reasons Native Americans are particularly vulnerable. Tribal water security is particularly threatened; the ways in which climate changes are damaging community health and wellbeing through impacts on water resources have been addressed more thoroughly for Tribes in coastal, arid and sub-arctic/arctic regions of the United States of America. Crow Tribal members from the Northern Plains, Unites States of America have documented the impacts of climate and environmental change on local water resources and ecosystems, and thereby on Tribal community health and wellbeing. Formal, qualitative research methodology was employed drawing on interviews with 26 Crow Tribal Elders. Multiple determinants of health are addressed, including cultural, social, economic and environmental factors. The sense of environmental-cultural-health loss and despair at the inability to address the root causes of climate change are widespread. Yet the co-authors and many other Tribal members are actively prioritising, addressing and coping with some of the local impacts of these changes, and are carrying on Apsáalooke [Crow] lifeways and values (Martin *et al.*, 2020).

The Akiachak Tribe of Alaska, United States of America is experiencing and witnessing the effects of climate change in their surrounding environment. The permafrost is melting at increasingly fast rates, and seasonal weather patterns and temperatures are changing. The tribe has made many efforts to fit their way of life into the present demands of the 21st century, working to bring forth their strengths and

concerns, especially regarding natural resources and climate change adaptations. They have formulated the Akiachak Carbon Project that helps communicate natural resource management needs while protecting and increasing the carbon sequestration value of private and public lands. Concurrently, they are enhancing the habitat and vegetative growth for the wild game and species they depend on for their subsistence livelihoods. The markets for ecosystem services recognise the value of the intact ecosystems such as forests and wetlands as pools of carbon stored and areas of high biodiversity. Organizations such as, NativeEnergy, a leading carbon project developer and retailer, believe the carbon offsets generated by the Alaska Carbon Exchange program are attractive to "carbon buyers" who want to support Native American tribal efforts to protect their lands, food systems and cultures. The agreement of the Akiachak Project places protections on the Akiachak peoples' lands by providing a contract to not damage the environmental value/"Carbon Sequestration Value" and works to enhance the Land Management Plan carried out by the Akiachak Tribe. Some Alaska Native villages are recognising the opportunities in markets for ecosystem services and carbon offset credits as a way to earn the monetary income needed in current markets, while also preserving their lands, resources, food systems and ways of life (Holley, 2020).
Linked to: AT5

Case Study 12

Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu

Climate change has impacted and will continue to impact Indigenous Peoples, their lifeways and culture, and the natural world upon which they rely, in unpredictable and potentially devastating ways. Many climate adaptation planning tools fail to address the unique needs, values and cultures of indigenous communities. This Tribal Climate Adaptation Menu, which was developed by a diverse group of collaborators representing tribal, academic, inter-tribal and government entities in Minnesota, Wisconsin and Michigan, provides a framework to integrate indigenous and traditional knowledge, culture, language and history into the climate adaptation planning process. Developed as part of the Climate Change Response Framework, the Tribal Climate Adaptation Menu is designed to work with the Northern Institute of Applied Climate Science (NIACS) Adaptation Workbook, and as a stand-alone resource. The Menu is an extensive collection of climate change adaptation actions for natural resource management, organised into tiers of general and more specific ideas. It also includes a companion Guiding Principles document, which describes detailed considerations for working with tribal communities. While this first version of the Menu was created based on Ojibwe and Menominee perspectives, languages, concepts and values, it was intentionally designed to be adaptable to other indigenous communities, allowing for the incorporation of their language, knowledge and culture. Primarily developed for the use of indigenous communities, tribal natural resource agencies and their non-indigenous partners, this Tribal Climate Adaptation Menu may be useful in bridging communication barriers for non-tribal persons or organizations interested in indigenous approaches to climate adaptation and the needs and values of tribal communities. (Tribal Adaptation Menu Team 2019).
Linked to: AT5

Annex 2: Key elements of divergence of paradigm and worldview

(inspired and modified from Beus C.E. and Dunlap R.E, 1990)

Food system conventional production	Food system generation in Indigenous Peoples' food systems
New existence	Ancient existence
Existence of decades to centuries	Existence of millennia
Centralisation	Decentralisation
National/international production, processing and marketing	Community-level production, processing. Exchange, sharing, usually limited marketing.
Concentrated control of land, resources and capital inputs	Collective customary tenure of land and resources. Usually limited capital inputs.
Dependence	Independence
Large, capital-intensive production units and technology	Small, low-capital food systems and Indigenous Peoples' traditional knowledge from within the system
Heavy reliance on external sources of energy, inputs and credit	Collaboration and sharing, reduced reliance on external sources of energy, inputs and credit
Consumerism and dependence on the market	Community self-sufficiency and reciprocity prioritised
Primary emphasis on science, specialists and experts	Primary emphasis on Indigenous Peoples' traditional knowledge and practices at the community level
Low knowledge inputs in observation of the ecosystem	High knowledge inputs in observation of the ecosystem
Competition	Community/Collectivity
Minimal cooperation	Solidarity and support within the community, e.g. seed exchange. Food sharing during time of food scarcity.
Farm traditions and rural culture outdated	Preservation of traditional and culture valued and essential for the survival of the Indigenous Peoples' food system; knowledge, practices and

	resources are seen as collective and intergenerational, not owned individually
Farming is a business only	Food systems is primarily is a way of life
Primary emphasis on speed, quantity and profit	Primary emphasis on circular, balance and complementary of many dimensions of permanence, medicinal, healing, spiritual, sacred, social, cultural and emotional dimensions
Domination of nature	Harmony with nature
Humans are separate from and superior to nature	Humans are part of and subject to nature. Culture, language, spirituality and cosmogony strongly tied to nature.
Nature consists primarily of resources to be used	Nature is valued primarily for its own sake
Life cycle incomplete; decay (recycling wastes) accumulating in the landscape	Life cycle complete; growth and decay balanced in the landscape
Seasonality tend to be avoided	Seasonality is followed for food generation
Human-made systems imposed on nature	Natural ecosystems are imitated
Production maintained by agriculture chemicals	Food generation maintained by maintenance of healthy ecosystems
Highly processed, nutrient-fortified food	Minimally processed, naturally nutritious food
Specialisation	Diversity
Narrow genetic base	Broad genetic base of species, varieties and breeds
Most plants grown in monocultures	High plant diversity in cultivation plots
Standardised production systems	Locally adapted food systems. Practising hunting, fishing, gathering, cultivation
Highly specialised, analytical science, technology and innovation	Indigenous Peoples' traditional knowledge and holistic approach to food
Exploitation	Restraint
Short-term benefits outweigh long-term consequences	Short-term and long-term outcomes equally important

Based on heavy use of non-renewable resources	Based on renewable resources, non-renewable resources conserved

Annex 3: Drivers identified in Indigenous Peoples' food systems

	Driver	Negative effects on the food system	Positive effects on the food system and proposed solutions	Link
	(Rights, policies and programmes)			
1	**Legal recognition of Indigenous Peoples**	(-) Sovereignty of Indigenous Peoples is not recognised or poorly protected (AT4) (-) No legal recognition of Indigenous Peoples (AT5)		AT4
2	**Rights to access and manage traditionally occupied or used land, territories and resources**	(-) Inadequate rights to traditional hunting, fishing and gathering grounds (AT1) (-) Forced displacement (AT1, AT2, AT5) (-) Colonisation policies that led to loss of ancestral lands (AT2) (-) Rights to territories, land and natural resources not respected (AT3, AT4) (-) Legislative ambiguity in rights of access to resources and natural resource management (AT4) (-) Privatisation of land (AT4) (-) Invasion of lands (AT5) (-) Land dispossession (AT5) (-) Removal from reservations, cessions of aboriginal lands (AT5)	(+) Regulation mechanisms that ensure the rights of Indigenous Peoples to their lands and natural resources (AT2) (+) Strengthening Indigenous Peoples' rights to their territories (AT3) (+) Consideration of its core principle of the FAO Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (AT4)	AT1, AT2, AT3, AT4, AT5
3	**Rights to mobility and passage to access food system resources**	(-) Forced sedentarisation and limitation to a geographical area (AT2) (-) Enforcement of administrative boundaries affecting mobile livelihoods (AT4) (-) Lockdowns in response to the COVID-19 pandemic (AT5)		AT2, AT4, AT5
4	**Right to self-determination and Free, Prior and Informed Consent (FPIC)**	(-) Imposition of activities that violate Indigenous Peoples' conception of wellbeing (AT4) (-) Communities' authority to manage their territories taken over by state-led governance structures (AT3) (-) Lack of respect of Free, Prior and Informed Consent in development policies and programmes (AT4)	(+) Self-determination to protect aspects of quality of life (AT1) (+) Recognition of and respect to self-determination of Indigenous Peoples (AT3) (+) Decision-making and management (AT3) (+) Local decision-making power (AT5)	AT1, AT3, AT5
5	**Rights to intellectual property, including indigenous seed systems and seed resources**	(-) Violations of rights to own seed systems and genetic resources (AT3) (-) Privatisation of ancestral seeds through intellectual property rights (patents, plant variety protection) (AT4) (-) Seed laws requiring certification and standardisation (AT4) (-) Criminalisation of informal seed systems (AT4)	(+) Regulation mechanisms that ensure the rights of Indigenous Peoples to their knowledge, via intellectual property for instance (AT2) (+) Strengthening Indigenous Peoples' rights to their genetic resources (AT3)	AT2, AT3, AT4
6	**Recognition of traditional institutions of Indigenous Peoples**	(-) Communities' authority to manage has been largely taken over by state-led governance structures (AT3) (-) Lack of recognition of traditional institutions of Indigenous Peoples (AT4) (-) Communities' authority to manage their territories taken over by modern governance structures (AT3) (-) Undermining and relegating indigenous institutions importance (AT4)	(+) Acknowledging and applying international guidelines that protect and enable Indigenous Peoples' right to exercise their own traditional governance mechanisms (AT4)	AT3, AT4, AT5
7	**Conservation policies**	(-) Establishment of protected areas leading to land dispossession and resettlement (AT1) (-) Policies intervening on Indigenous Peoples' traditional knowledge, plants, wild edibles, wildlife and Indigenous Peoples grounded on	(+) Mainstream indigenous foods into programmes and policies (AT1) (+) Develop a universally recognised set of standards for engaging in conservation efforts on the lands and waters of Indigenous Peoples (AT3)	AT1, AT2, AT3, AT4, AT5

	Driver	Negative effects on the food system	Positive effects on the food system and proposed solutions	Link
		biodiversity conservation, overpassing their potential to contribute to food security (AT2) (-) Overlapping of indigenous territories with protected areas (AT4) (-) Restrictions on sale of harvested products and by-products (AT4) (-) Restricting access to protected areas (AT5) (-) Fire exclusion and suppression (AT5)	(+) Develop an inclusive conservation approach rooted in well-functioning Indigenous Peoples' food systems (AT3) (+) Develop policies and practices to address biodiversity conservation and ecosystem-based management in a changing environment through co-production of knowledge based in equity (AT3)	
8	**Development policies and programmes directly or indirectly affecting the food system**	(-) Promotion of perceptions of wild foods as inferior, associated with poverty and undesirable by mainstream agricultural development paradigms dating from colonisation (AT2) (-) Food security policies focused on improving yields through modernisation of agriculture, neglecting the role and specificities of Indigenous Peoples' food systems (AT2) (-) Spread of industrial agriculture and monoculture expansion supported by perverse subsidies and incentives (AT3) (-) Aggressive promotion of modern varieties that create dependence on costly and unsustainable external inputs such as agrochemicals and large quantities of water, and which are less resilient and well adapted to the local context (AT3)	(+) Mainstreaming indigenous foods, including wild foods, into programmes and policies (AT1) (+) Effective, context-sensitive integration of wild edibles into policy for food and nutrition security and for the effective management of the habitats and landscapes in which wild edibles are found (AT1) (+) Building interventions to restore and sustain local food systems using locally preferred methods (AT1) (+) Policies that recognise and support the many dimensions of Indigenous Peoples' food systems in enabling healthy and sustainable consumption patterns (AT2) (+) Intercultural policies that recognise and support the role of Indigenous Peoples' food systems for food security (AT2) (+) Incentivising indigenous farmers to cultivate, harvest or produce culturally relevant foods of their choice for themselves and local communities (AT2) (+) Establishing community seed banks (AT2) (+) Innovative financing and investments that better support indigenous communities to continue their sustainable land management practices (AT3) (+) Reversing perverse subsidies and incentives, including inappropriate public policies, which continue to undermine nature-positive food production and redirecting these to establish an enabling environment that better supports Indigenous Peoples to maintain genetic resources, food biodiversity, soil health and water quality (AT3) (+) Adhering and enforcing compliance with environmental and social safeguards and standards in programmes and projects supported by public and private (ESG) institutions addressing directly or indirectly issues related to Indigenous Peoples, including projects supported by United Nations, International financial institutions and bilateral institutions (AT4)	AT1, AT2, AT3, AT4
9	**Research programmes and scientific knowledge**	(-) Limited knowledge on food composition of unique species Indigenous Peoples' food systems (AT1)	(+) Mainstreaming indigenous foods, including wild foods, into programmes and policies (AT1) (+) Knowledge of the food species in Indigenous Peoples' food systems (AT1) (+) Recognition and documentation of local diversity (species identification, chemical analysis, cultural methods of obtaining, preparing, processing and preserving, and more) (AT1) (+) Development and expansion of global databases on Indigenous Peoples' food systems, with full respect of self-determination and intellectual property rights of Indigenous Peoples (AT1)	AT1

	Driver	Negative effects on the food system	Positive effects on the food system and proposed solutions	Link
			(+) Building knowledge on the relationship between consumption of wild edibles and dietary outcomes (AT1) (+) Building evidence on how food practices in indigenous communities are affected by broader socio-economic and ecological change, and government policies (AT1)	
10	**Inclusion of Indigenous Peoples in decision-making**	(-) Marginalisation of Indigenous Peoples in democratic processes (AT4) (-) Exclusion and invisibility of Indigenous Peoples within their own countries (AT5) (-) Implementation of programmes with limited participation of Indigenous communities and leaders (AT5) (-) One-size-fits-all approaches (AT5) (-) Exclusion of Indigenous Peoples' knowledge and skills from policies (AT5)	(+) Development of an inclusive conservation approach rooted in well-functioning Indigenous Peoples' food systems (AT3) (+) Development of policies and practices to address biodiversity conservation and ecosystem-based management in a changing environment through co-production of knowledge based on equity (AT3) (+) Promoting intercultural dialogue in the construction of public policies and normative frameworks that affect Indigenous Peoples' food systems in any possible dimension (AT4) (+) Involvement and empowerment of Indigenous Peoples as leaders in devising strategies for developing their food systems (AT1)	AT1, AT3, AT4
11	**Cultural security in health services**	(-) Services provided by governments are often not adapted to Indigenous Peoples' needs (AT5)	(+) Mainstreaming indigenous foods into programmes and policies (AT1)	AT1, AT5
12	**Cultural security in education**	(-) Westernisation and imposed education of indigenous youth in school curricula that are not rooted in Indigenous Peoples' knowledge systems (AT1) (-) Indigenous youth seeking education outside of the communities reduces exposure to traditional foods, affects transmission of traditional knowledge (AT1) (-) Disruption of Indigenous Peoples' traditional knowledge transmission through colonial assimilative education programmes (AT1)	(+) Mainstreaming indigenous foods into programmes and policies (AT1) (+) Encouraging the education of indigenous youth and young adults to the cultural and nutritional importance of their indigenous foods (AT2) (+) Develop intercultural education methods strengthening indigenous values, foods and traditional knowledge and include them in national education programmes and curricula (AT2) (+) Capacity-building for using indigenous foods, beginning with school children (AT2) (+) Food skills education for urban indigenous youth (AT2) (+) Participatory and interactive learning approaches based on the intergenerational transmission of knowledge between indigenous elders and youth (Schools of Life) (AT3)	AT1, AT2, AT3
13	**Social welfare systems**	(-) Marginalisation of Indigenous Peoples in government welfare mechanisms (AT4) (-) Services provided by governments are often not adapted to Indigenous Peoples' needs (AT5)	(+) Indigenous governance and institutions that integrate values and internal processes towards common welfare (AT4) (+) Indigenous systems of reciprocity (AT5)	AT4, AT5
	(Environment)			
14	**Climate change, variability and effects**	(-) Warming temperatures (AT5) (-) More unpredictable precipitation (AT5) (-) Extreme weather events (AT5) (-) Uncertainty about seasons (AT5) (-) Shorter seasons for food generation (AT5) (-) More winds, unexpected winds (AT5) (-) Permafrost thaw (AT5) (-) Variation of water cycles (AT5) (-) More significant attacks from pests and disease (AT5) (-) Faster ice break up, weak ice (AT5) (-) Water insecurity		AT1, AT5

	Driver	Negative effects on the food system	Positive effects on the food system and proposed solutions	Link
15	**Continuity of indigenous territorial management, governance and food system practices**	(-) Transition to sedentary livelihoods (AT2) (-) Agricultural changes at the local level (AT2) (-) Climate change impacts on methods of harvesting, preservation and food preparation (AT5) (-) Prohibition of indigenous management (AT5) (-) Fire exclusion and suppression (AT5)	(+) Supporting indigenous resource management practices for wild edibles, including for marine mammals, fish and foods sourced from forests and tree-based systems (AT2) (+) Innovative financing and investments that better support indigenous communities to continue their sustainable land management practices (AT3) (+) Customary laws and common property systems that promote sustainable resource use and conservation of biodiversity, define grazing schedules in common areas, fire management practices, and taboo areas and resources (AT5) (+) Leadership of chiefs, elders, village councils and assemblies enforces rules for resource use, manages conflict, and promotes collective planning and stewardship (AT5)	AT2, AT3, AT5
16	**Availability and diversity of wild foods**	(-) Availability of wild foods (AT1) (-) Overexploitation (AT1) (-) Climate change impacts on wildlife health and distribution (AT5) (-) Climate change impacts on availability of fishing and hunting food species (AT5)	(+) Strengthening the use and sustainable management of biodiversity in Indigenous Peoples' food systems (AT2) (+) Conserve practices of wild harvesting, as well as the knowledge that underlies these practices (AT2)	AT1, AT2, AT5
17	**Availability and diversity of traditional varieties and breeds**	(-) Adoption of modern varieties (AT3) (-) Disease in animals linked to climate change (AT5)	(+) Strengthening the use and sustainable management of biodiversity in Indigenous Peoples' food systems (AT2)	AT2, AT3, AT5
18	**Ecosystem integrity and habitat quality affecting availability of food resources**	(-) Deforestation (AT1, AT4, AT5) (-) Land-use changes, habitat alteration, environmental change (AT1, AT2) (-) Intensification and extensification of agriculture (AT1) (-) Extensive land clearing (AT4) (-) Deteriorating pasture (AT5) (-) Altitudinal shift of cultivation zones resulting from climate change decreasing area for food generation in mountains (AT5)		AT1, AT4, AT5
19	**Ecosystem health and safety for food generation**	(-) Pollution (AT1) (-) Pesticides and herbicide spraying; agrochemicals in big farm industries (AT1) (-) Toxins from mining and extractive industries (AT1) (-) Long-range transport of industrial chemicals (AT1) (-) Accumulation and magnification of environmental contaminants in food chains; bioaccumulated toxins (AT1)		AT1
	(Macro-economic context)			
20	**Industrialisation (AT1, AT2)**			
21	**Agricultural intensification and extensification**	Shifts in agricultural production (AT2) Spread of industrial agriculture and monoculture expansion (AT4)		AT2, AT4
22	**Biodiversity in global food systems**	(-) Focus on yields and food security over dietary qualities in agricultural development policies (AT1) (-) Lower competitiveness of indigenous foods in mainstream agriculture and economy (AT1)	(+) Maintaining and increasing agrobiodiversity in agricultural settings (AT3)	AT1, AT3
23	**Globalisation (AT1, AT3)**	(-) Globalisation of food production and food processing AT2)		
24	**Economic development**			AT2, AT4
25	**Urbanisation**			AT1, AT2
26	**Population increase**			AT1

	Driver	Negative effects on the food system	Positive effects on the food system and proposed solutions	Link
27	**Market demand**			AT3
28	**Land appropriation**			AT1
29	**Commercialisation**			AT1, AT4
30	**Market demand**			AT4
31	**Extractive industries and infrastructure development**	(-) Hydrocarbon industries (-) Forestry (-) Dams		
	(Economic)			
32	**Integration in the cash economy**	(-) Pressures to engage in wage-based employment (AT1) (-) Extreme poverty; low incomes (AT1) (-) Severe disparities and poverty in urban settings (AT1) (-) Dependency on items that cannot be produced within the community (AT3)		AT1, AT3
33	**Commercialisation of foods from Indigenous Peoples' food systems**	(-) Competition of indigenous crop varieties with commercial varieties (-) Shift from mixed farming towards monocropping and cash crops production to the detriment of traditional varieties and Indigenous Peoples' knowledge systems	(+) Developing short, domestic and equitable value chains that ensure transparency and trust between producers and consumers, fair compensation for the primary producers, cultural security, and sustainable resource use (AT4) (+) Labelling and certification schemes for Indigenous Peoples' foods, driven forward by Indigenous Peoples (+) Integration of Indigenous Peoples biocultural products in public procurement programmes (AT4) (+) Infrastructure to enable physical access to markets (AT4) (+) Value chains for traditional varieties	
34	**Migration**	(-) Emigration of younger people from communities in search of work (AT2) (-) Rural to urban migration (AT1)		
35	**Labour force in the Indigenous Peoples' food system**	(-) Feminisation of the labour force (AT2) (-) Aging of the labour force (AT2)		AT2
36	**Indigenous networks of trade and sharing**	(-) Degradation of indigenous networks of trade and sharing (AT5)	(+) Trusted relations for acquiring foods from other communities (AT1)	AT1, AT5
37	**Availability and access to foods in markets**	(-) High food prices (AT1) (-) Highly processed, high sugar and carbohydrate foods with low-nutrient value (AT1) (-) Highly processed market foods are high in dietary energy, contain high amounts of sugar, salt and fat, and replace more nutritious options such as fruits, vegetables, whole grains, pulses and nuts (AT2) (-) Disruption of value chains (AT5) (-) Denied access to the food market because of racism (AT5)	(+) Access to nutritious and convenient food (+) Market linkages for local food producers drive sustainable Indigenous Peoples' food system management	AT1, AT2
38	**Remoteness, isolation**			AT1
	(Social)			
39	**Indigenous Peoples' knowledge systems**	(-) Indigenous Peoples' traditional knowledge and practices to sustain their food ways have been lost or abandoned (AT1) (-) Less time to participate in traditional food system activities (AT1) (-) Loss of knowledge on poisonous plants (AT1) (-) Oral teaching not passed on to younger generations as a result of colonisation and more recent disruptions (AT1) (-) Loss of knowledge on how, when and where to source wild foods and other traditional foods (AT1)	(+) Capacity-building for using indigenous foods, beginning with school children and community leadership (AT2) (+) Food skills education for urban indigenous youth (AT2) (+) Participatory and interactive learning approaches based on the intergenerational transmission of knowledge between indigenous elders and youth (Schools of Life) (AT3)	AT1

	Driver	Negative effects on the food system	Positive effects on the food system and proposed solutions	Link
		(-) Loss of knowledge on land and food production (AT2) (-) Reduced exposure to traditional foods (AT2) (-) Adoption of modern varieties (AT3) (-) Rapid climate change affecting the application of Indigenous Peoples' traditional knowledge related to climate, food production and generation (AT5)	(+) Indigenous Peoples' traditional knowledge supports the ability to anticipate and prevent environmental shocks (AT5)	
40	**Indigenous languages**	(-) Loss of indigenous languages (-) Difficulties in transmission of indigenous languages (-) Loss of way of interpreting the world and communicating between generations (Indigenous Peoples' traditional knowledge)		
41	**Indigenous cosmogony**	(-) Traditional beliefs that support sustainable natural resources management are eroding, as monotheistic religions continue to gain ground (AT3)	(+) No separation between humans and nature is perceived (AT5)	AT5
42	**Place**		(+) Spaces that have acquired meaning for those associated with them (AT5)	AT5
43	**Agency**	(-) Disrupted human-animal agency resulting from unpredictable and extreme weather (AT5) (-) Externally imposed lockdowns preventing harvesting (AT5)		AT5
44	**Values guiding food system practices**	(-) Mainstream material culture affects the values of Indigenous Peoples, leading to overexploitation of natural resources for quick income (AT3) (-) Some Indigenous Peoples do not see the reason for continuing indigenous ways of life, unaware of their potential to mitigate and adapt to climate change and reverse ecosystem destruction	(+) Moral responsibility to protect and care for nature (AT5)	
45	**Perceptions and awareness of traditional foods**	(-) Food safety concerns resulting from exposure to environmental contaminants (AT1) (-) Shifting attitudes towards traditional food practices and their perceived social acceptability, as non-modern, inferior and associated with poverty (AT2) (-) Wild foods seen as inferior, associated with poverty and undesirable (AT2) (-) School feeding programmes, when not culturally appropriate, decrease the interest of indigenous youth in traditional foods (AT2)	(+) Capacity-building and policy formulation to raise awareness of indigenous foods (AT2) (+) National policies to promote local indigenous foods (AT2) (+) National postage stamps with unique traditional and nutritious foods (AT2) (+) Policies to serve only traditional local foods at government-sponsored events (+) National food-based dietary guidelines broadening awareness of ecologically appropriate and locally known species that can improve nutrition and health (AT2) (+) Inclusion of indigenous fruits and vegetables in food-based dietary guidelines	
46	**Health and nutrition of Indigenous Peoples**	(-) Nutrition transition, characterised as broad shifts in the structure of diet and physical activity (AT2) (-) Rising epidemic of non-communicable diseases among Indigenous Peoples (AT2) (-) Prevalence of malnutrition (AT5)		
47	**Food security**	(-) Food insecurity (AT5)		AT5
48	**Food sovereignty**			
49	**Consumption of traditional foods**	(-) Decreased frequency of wild food consumption (AT1) (-) Reduced access to traditional cultural foods in urban settings (AT1) (-) Nutrition transition, characterised as broad shifts in the structure of diet and physical activity (AT2)	(+) Supporting the consumption of wild edibles, including for marine mammals, fish and foods sourced from forests and tree-based systems (AT2)	AT1, AT2

Annex 4: Analysis of game-changing solutions proposed by the 5 Action Tracks

+ Clear opportunity for Indigenous Peoples is identified

! Opportunity for Indigenous Peoples is identified under certain conditions

* (Alternative solution particular for IPFSS)

IPFSS = Indigenous Peoples' Food Systems

Major cross-cutting themes:

1. Including Indigenous Peoples, respecting their right to self-determination
2. Respecting Indigenous Peoples' rights to lands
3. Reinforcing indigenous data governance and indigenous research to create evidence but also provide recommendations that can be solutions at local scale, e.g. providing not only food for Indigenous Peoples but for the local communities as well, using their rationale to influence healthier behaviours in other consumers.
4. Investing in IPFSS to boost their potential not only for Indigenous Peoples' self-consumption but also for local communities. Investing means valuing their potential and not displacing them by modernisation approaches.
5. Investing in women and youth so they can overcome norms and rules that limit their agency and empowerment BUT also respecting at the same time their right to self-determination.
6. Invest in capacity development to increase the potential of Indigenous Peoples to participate actively in other points of the value chains but also to become active at the policymaking and decision-making level in regards to food security, environmental protection and for their own right to self-determination.

	Goal	Game-changing solution (GCS) **AT 1 "Ensure access to safe and nutritious food for all"**		Analysis	Comment
1	Reducing hunger	Establish a Zero Hunger Fund			
2		Democratise precision agriculture technologies			
3		Expand coverage of social protection systems	!	(+) If expanded to Indigenous Peoples, means that Indigenous Peoples' right to self-determination is respected: respecting their territory and food systems, creating systems that are interculturally sensitive. (!) No Action Track will meet its goals without securing rights to land, natural resources and territories, and right to self-determination of Indigenous Peoples (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
4		Establish a catalytic SME financing facility to transform food systems	(!)	(!) If adapted correctly using an intercultural sensitive approach, it can reinforce Indigenous Peoples' Food Systems and Livelihoods. Adding value	

				to indigenous food and connecting with potential markets.	
5		Launch clean energy information and coordination platforms			
6		Scale up sustainable cold chain technology	(*)	(*) IPFSS have the potential to supply food demands throughout the year so it reduces the need to rely on storage alternatives and provides a local food source.	
7	Increasing access to nutritious food	Create partnership for investment in infrastructure for public procurement of nutritious foods	(+)	(+) Creating biodiversity conservation parks to promote the use of local/indigenous technologies that can satisfy local food demands and are culturally fitted to contexts, e.g., biocentric restoration, seed banks, centres that promote the use of underutilised foods and IPFSS.	
8		Incentivise food systems change towards equitable food marketing		(!) Promote local consumption and eating seasonal food, IPFSS have the potential to satisfy local markets if supported with the adequate investment and infrastructure.	
9		Launch a Workforce Nutrition Alliance to reach food system workers	(*)	(*) Many of the labourers in Agriculture are Indigenous Peoples forced by policies to migrate; reinforcing their own production/living strategies offers a possibility to reduce migrations and also ensures that they are not displaced, “respecting their right to self-determination”.	
10		Promote women-led entreprises to grow and sell nutritious but neglected crops	+	(!) Investing in local IPFSS to strengthen them so they can satisfy local food demands while also reducing environmental costs.	
11		Make social protection programmes more nutrition sensitive	!	(+) Opportunity if Indigenous Peoples’ right to self-determination is respected. Proposing intercultural approaches to nutrition that start by embracing traditional ways of cultivating, gathering, fishing, among other, as opposed to the external interventions such as monocropping or programmes that do not considered the preferences of IPs and the potential of their local diets. (!) No Action Track will meet its goals without securing rights to land, natural resources and territories, and right to	

				self-determination of Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
12		Implement comprehensive school food programmes in every country	!	(+) Opportunity if Indigenous Peoples' right to self-determination is respected. Those food programmes should include indigenous foods as an enactment of IPs' right to self-determination. (!) No Action Track will meet its goals without securing rights to land, natural resources and territories, and right to self-determination of Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
13		Create a global virtual nutritious food innovation hub for SMEs			
14		Foster a global conversation around coherence for food environment policies for healthier children	!	Link to recommendations: (+) Engaging Indigenous Peoples as leaders in devising strategies to enhance their access to safe and nutritious foods. (+) Engaging technical experts or the Global Hub on IPFSS to provide recommendations to create sensitve recommendations. (!) No Action Track will meet its goals without securing rights to land, natural resources and territories, and right to self-determination of Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
15		Launch a new alliance to end anemia			
16		Scale up bio-fortified crops		(*) For IP, explore first what is available within their IPFS like the superfoods and which ones can help to increase food security while creating resilience strategies.	

17	Making food safer	Develop a new global food safety index		(!) Incorporate biocultural drivers into the index that reflects values tied to IPFFS.	
18		Develop a global alliance for Safe Food for All		(!) Include Indigenous Peoples within the alliance.	
19		Assemble and launch a Food Safety Toolkit			
20	Potential cross-cutting solutions	Foster shared learning on food systems Transformation Pathways	?	(*) Limited research is linked to IPFSS, create a trust that allows the exploration of the potential of IPFSS.	
21		Develop new standards and legal frameworks to drive private-sector change and hold companies accountable		(*) Increase transparency in terms of food products taken to IP, promote the use of indigenous languages to inform consumers on what they eat and create healthier patterns.	
		AT2			
1	Food environment	Food Systems Framework	!	(!) Need to recognise and include Indigenous Peoples' traditional knowledge, biocultural drivers that are not present in the framewrok and that reflect the reality and way of understanding the world of Indigenous Peoples, e.g. holistic view. (!) No Action Track will meet its goals without securing rights to land, natural resources and territories, and right to self-determination of Indigenous Peoples.	
2		City region food strategies		(*) Recommend countries think about intercultural food policies that consider the diversity of Indigenous Peoples and contexts that first acknowledge the potential contribution of IPFSS and then how to reinforce those systems rather than imposing new/modern ones.	
3		Fiscal policy			
4		Education	!	Link to policy recommendations (!) Engage in school education programmes on healthy diets from sustainable food systems that are culturally appropriate and that recognise and respect traditional foods of Indigenous Peoples for their cultural and healthy values. (!) Raise awareness of the values of indigenous foods and capacities for their utilization. (!!) Promote IPFSS as a potential alternative not only to satisfy Indigenous Peoples food demands but	

				also the potential contribution to local/regional food demands. (iii) Engage in initiatives that bring together the consumers and farming Indigenous Peoples communities to increase awareness of the costs of food production and value of food, seeking to see a change in consumers' habits.	
5		Action hubs			
6		Civil society and youth	!	(+) Opportunity for indigenous youth, but need to be included as relevant stakeholders in the discussion. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
7	Food Demand	Food demand		(!) Raising awareness on the consumer's side on the potentials of IPFSS, e.g. superfoods, creating hub-training programmes that teach consumers the value of food. (!) Investing funds to document good practices of IPFSS and creating awareness campaigns that help shape consumers' behaviours.	
8		Power and accountability			
9		Labelling			
10		Breastfeeding			
11		Demand package		(*) Producing locally to satisfy the food demands along the year reduces the need of packaging and IPFSS have the potential for that.	
12	Food waste	Food is never wasted		(*) Sharing IPFSS practices on sacredness of food and recipes that are used by IPFSS can help shape consumers' behaviours.	
13		150x50x30			
14		Activate the activists			
15		Reduce global food loss			
16	Cross-cutting solutions	A just transition	-?	Link to policy recommendation: Support Indigenous Peoples in their demand to access traditional healthy and sustainably generated foods in line	Threats. About 75% of all emerging infectious diseases are zoonotic in nature. Increasing human demand for animal protein and unsustainable agricultural intensification are considered to

				with their rights to food and cultural norms	be the main drivers of zoonotic diseases globally. Feel this argument could be detrimental to Indigenous Peoples.
17		Food-based dietary guidelines	!	Link to policy recommendation: No Action Track will meet its goals if Indigenous Peoples are not part of the policy discussions.	
18	Cross-cutting lever	Women empowerment	+	Opportunity for indigenous women (+) Women are systematically excluded even within indigenous communities, where they can lack rights on lands or are limited by specific norms and rules on what they can or cannot do. So, finding points where they have the potential to become entrepreneurs can reinforce their local capacities and empower them, cultivating specific crops or adding value to crops to sell them and obtain extra income.	
		AT3			
1	Protect	A Just Transition to Sustainable Agriculture through Policy Reform and Public Support – Meeting the triple challenge of food and nutrition security, climate, and biodiversity		(*) A "transition" back to look at the potential of Indigenous Peoples agricultural practices, mixing the Indigenous Peoples' traditional knowledge available and that fits indigenous contexts with other modern technologies, e.g. implementing water harvesting for irrigation of traditional crop systems, participatory improvement of native seeds, among others.	
2		Transforming commodity supply chains to benefit people and to protect and restore nature	+	Link to policy recommendation: No Action Track will meet its goals if Indigenous Peoples are not part of the policy discussions. (*) Help Indigenous Peoples preserve their ancestral lands against development projects and reinforce incentives to protect nature, e.g. sustainable forest practices.	The government-to-government FACT Dialogue is supported by an accompanying Multi-Stakeholder Dialogue, led by the Tropical Forest Alliance, intended to ensure the involvement of a much broader set of actors in support of the goals of the FACT Dialogue: supply chain companies, finance sector, Indigenous Peoples' representatives, civil society organizations.
3		Strengthening Indigenous and Tribal Peoples' Rights to Management of Their Territories	+	Link to policy recommendation: No Action Track will meet its goals without securing rights to land, natural resources and territories, and right to self-determination of Indigenous Peoples (Link to all Action Tracks)	

4		Develop a "Codex Planetarius" to determine a set of minimum environmental standards to govern global food trade		(+) When including Indigenous Peoples traditional foods, ensure their intellectual property rights are respected.	
5		Global movement to protect (and restore) riparian buffers in private agricultural lands (including legal requirements to protect private lands, bioeconomy)			
6	Manage	Transforming agricultural innovation for climate, nature and people		(*) A "transition" back to look at the potential of Indigenous Peoples agricultural practices, mixing the Indigenous Peoples' traditional knowledge available and that fits indigenous contexts with other modern technologies, e.g. implementing water harvesting for irrigation of traditional crop systems, participatory improvement of native seeds, amongst others. (*) Using IPFSS as a model on how to connect nature and people.	
7		Adopting nature-positive livestock production systems		(!) Acknowledging the existence of pastoralist communities and their traditional practices.	
8		Adopting regenerative agricultural practices for resilient landscapes at scale	+	Link to recommendation: Supporting and promoting Indigenous Peoples' food systems and practices as a key strategy for scaling out agroecological, regenerative agricultural practices and/or sustainable practices globally, fully respecting the right to self-determination of each community.	
9		Scaling-out agroecological production systems	+	Link to recommendation: Supporting and promoting Indigenous Peoples' food systems and practices as a key strategy for scaling out agroecological, regenerative agricultural practices and/or sustainable practices globally, fully respecting the right to self-determination of each community. (*) Scaling out IPFSS practices helps to create resilient communities in the face of shocks such as whether these are climatic, socioeconomic or due to pandemics such as COVID-19, e.g. the value of "self-sufficient" and sovereign communities.	

10		Increasing agrobiodiversity for improved production and resilience	+	Link to recommendation: Supporting and promoting Indigenous Peoples' food systems and practices as a key strategy for scaling out agroecological, regenerative agricultural practices and/or sustainable practices globally, fully respecting the right to self-determination of each community. (+) Native seeds and native plants are better adapted to extreme conditions and have evolved hand to hand with Indigenous Peoples, thus preserving them "*in situ*" and "*ex situ*" is also supporting the resilience of indigenous communities.	
11		Sustain and expand sustainable resilient Blue Food Production Systems		(!) IPFSS are diverse and some of them can fit into the category of "Blue Food Production Systems". With climate change, islands that rely heavily on seafood are more at risk, and they must be supported and protected.	
12		Aligning policies with nature-positive production		(*) When implementing nature-positive solutions, think beyond preservation but also how the life of Indigenous Peoples evolves hand-to-hand with nature as one. Some lessons can be collated from IPSSS, e.g. avoid conservation without people.	
13		Reducing on-farm and post-harvest food loss		(!) IPFSS can contribute to this in several dimensions: 1. Providing food at local scale and reducing the need to fulfill "commercial standards" imposed by industry and reducing the gap between producer and consumer, e.g. changing the perception of consumers on food production and quality. 2. Collating some lessons of how Indigenous Peoples treat food, the sacredness values of foods. 3. Eating seasonal food.	
14		Broadening the genetic base of nature-positive production systems		(*) There are thousands of underutilised crops, created a fund to research the potential of many Indigenous Peoples food that have the potential to contribute to already existing food demands.	
15		$200M Climate Smart Food Systems Impact Investment Fund		(*) Invest in Indigenous Peoples' traditional knowledge linked to IPFSS and sustainable practices that can increase the resilience and sovereignty of communities.	

16	Restore	Addressing “invisible” underwater issues for food systems: The “Blue Food” revolution		(!) IPFSS are diverse and some of them can fit into the category of “Blue Food Production Systems”. With climate change, islands that rely heavily on seafood are more at risk, and they must be supported and protected.	
17		Delivering healthier diets and restoring degraded land through tree-based food production		(!) Supporting IPFSS and ensuring their right to self-determination and their lands. (!) If the previous point is ensured, look at Indigenous Peoples’ traditional knowledge and practices as an alternative first and then combine it with other potential technologies and knowledges.	
18		Restoring grasslands, shrublands and savannahs through extensive livestock-based food systems	+	(!) Supporting IPFSS and ensuring their right to self-determination and their lands when specifically looking at pastoral communities.	
19		Enhanced restoration monitoring and data to guide investment		(!) Ensuring indigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	
20		Shifting the way stakeholders engage with evidence to enhance food system decision-making		(!) Ensuring indigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	
21		Strengthening landscape partnerships		(!) Ensuring indigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	

22		Soils Investment Hub		(!) Ensuring indigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	
23		Building global initiative to address soil health and carbon sequestration			
24		Indigenous Peoples' food systems: conservation and biocentric restoration	+	Support and enable the role and knowledge of Indigenous Peoples in preserving and restoring ecosystems through their biocentric approach and holistic worldview (!) Ensuring indigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	
		AT4			
1	Institutionalise rights	Strengthen labour regulations by placing people's dignity and rights at the centre	!	(+) Could represent an opportunity for indigenous persons involved in off-farm activities. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	The solution is a rights-based framework for regulations that is intersectional and includes labour rights and social protections, incorporates UN human rights conventions, builds people power, and challenges any forms of neo-colonisation of Indigenous Peoples.
2		Improve governance of labour market in food systems	!	(+) Could represent an opportunity for Indigenous Peoples involved in off-farm activities, considering that farming is just one component of the livelihoods of farming IPs. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
3		Promote ratification and effective implementation of international labour standards	!	(+) Could represent an opportunity for Indigenous Peoples involved in off-farm activities. (*) Provide alternatives for Indigenous Peoples to not migrate if that is what	

				they want and support their economic activities locally. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
4		Securing land tenure rights for resilience and sustainable food systems	+	Link to recommendation: No Action Track will meet its goals without securing rights to land, natural resources and territories, and the right to self-determination of Indigenous Peoples. (*) Provide alternatives for Indigenous Peoples to not migrate if that is what they want and support their economic activities locally.	
5		Institutionalize and mainstream the anti-discrimination and labour rights of migrant (foreign) workers in agriculture and across the food chain	!	(+) Could represent an opportunity for migrant Indigeneous Peoples involved in off-farm activities. (*) Provide alternatives for Indigenous Peoples to not migrate if that is what they want and support their economic activities locally. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	Labour and other protections will be strengthened, and food security overall will be achieved taking into account the most marginalized persons in the food sector, including subsistence farmers, women, Indigenous Peoples and socially and culturally racialised persons.
6	Strengthen social dialogue	Establish or improve social dialogue mechanisms as powerful means for finding common solutions to problems, advancing decent work and social justice	!	(+) Could represent an opportunity for Indigenous Peoples involved in off-farm activities. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) Investing in education of Indigenous Peoples so they can reach positions for policymaking and decision-making on matters that affect their livelihoods, territories and peoples. (!) Ensuring indigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	The establishment of forums that bring together representatives of government, trade unions and employers' associations and may include other key stakeholders and organizations such as cooperatives and small business associations, as well as women's groups, peasants' or Indigenous Peoples' organizations that have proven to be an effective way of jointly designing and implementing common strategies to promote decent work in the agri-food sector and economic development.

7		Strengthening organization in the agri-food sector	!	(+) Could represent an opportunity for Indigenous Peoples involved in off-farm activities. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) Investing in education of Indigenous Peoples so they can participate at different points of the food value chains and reinforce the IPFSS.	
8	Building people's knowledge, practice and agency	Promote inclusive and sustainable agroecological networks for small farmers and indigenous communities linked to rural and urban consumers	+	Link to policy: Enhancing sustainable access to market while supporting Indigenous Peoples' value chains and stewardship. (!) Investing in education of Indigenous Peoples so they can reach positions for policymaking and decision-making on matters that affect their livelihoods, territories and peoples. (!) Ensuring indigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	
9	New forms of policy development	Engaging with cities and local governments for equitable livelihoods	!	(+) Could represent an opportunity for Indigenous Peoples involved in off-farm activities. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) Investing in education of Indigenous Peoples so they can reach positions for policymaking and decision-making on matters that affect their livelihoods, territories and peoples. (!) Ensuring iIndigenous data sovereignty and indigenous governance. (!!) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with	Ensure meaningful participation by people, local institutions and communities across the urban-rural continuum as well as spaces and mechanisms to engage in political dialogue and planning processes for women, Indigenous Peoples, children, youth, elders, persons with disabilities, slum dwellers, smallholders, and the forcibly displaced as well as others at risk of being left behind; protect and respect local and indigenous cultures.

				external stakeholders and support their right to self-determination.	
10	Business and technology	Bridging the digital divide and increasing access to information and services in food systems		(+) Could represent an opportunity for Indigenous Peoples (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) Investing in education of Indigenous Peoples so they can reach positions for policymaking and decision-making on matters that affect their livelihoods, territories and peoples. (*) Ensuring indigenous data sovereignty and indigenous governance. (*) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	Ensure socially equitable access to quality digital services for vulnerable communities and marginalised groups (in particular, small-scale producers and workers, informal food vendors and caterers, migrants and Indigenous People) and public and private actors interacting with them.
11		Commitment by main supermarket chains to buy locally		(!)Indigenous Peoples can support local food chains, although they might not be able to provide enough on an individual basis at the community level. Find alternatives on “bulk” selling within their community-based organization, e.g support micro-organisations.	
12		Global matching investment fund for small-scale producers’ organizations	!	(+) Could represent an opportunity for Indigenous Peoples (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!)Indigenous Peoples can support local food chains, although they might not be able to provide enough on an individual basis at the community level. Find alternatives on “bulk” selling within their community-based organization, e.g support micro-organisations.	They [Investments] have to ensure decent incomes, livelihoods and equitable development opportunities for local communities, especially for rural youth, women and Indigenous Peoples. They [investments] must respect and uphold the rights of small-scale food producers, Indigenous Peoples and local communities to access, use and have control over land, water and other natural resources. Action Track 4: Advancing Equitable Livelihoods 44: All investments must respect the rights of Indigenous Peoples to their territories and ancestral domains, cultural heritage and

					landscapes, and traditional knowledge and practices.
13	Equitable investment and uptake	Invest in the future – making food systems finance accessible for rural people	!	(+) Could represent an opportunity for Indigenous Peoples (!) Producing food locally and consuming seasonal food reduces the cost of taking it from the field to table, IPs have the potential to contribute to local food demands if supported appropriately. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
14		Public development bank initiative to catalyse green and inclusive food system investments	!	(+) Could represent an opportunity for Indigenous Peoples. (I) Investing in local IPFSS to strengthen them so they can satisfy local food demands while also reducing environmental costs. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
15		Change relationships of power in ways that ensure a fair share of resources through the MAC (Mining, Agriculture and Construction) Protocol			
16	Livelihood support and diversification	Agri-SME Business Development Platform: the first global multi-stakeholder engine for inclusive and equitable agri-value-chains		(+) Could represent an opportunity for Indigenous Peoples. (I) Investing in local IPFSS to strengthen them so they can satisfy local food demands while also reducing environmental costs.	
17		Farmer field and business schools	!	(+) Could represent an opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (I) Investing in local IPFSS to strengthen them so they can satisfy local food demands while also reducing environmental costs. (I) Investing in capacity development so the Indigenous Peoples can participate in different parts of the value chains	

				while their rights to self-determination are also respected.	
18	Extending social protection coverage to all	Promoting social protection in coherence with agri-food-systems-related sectors	!	(+) Could represent an opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
		Integrating gender transformative approaches for equity and justice in food systems		(*) Needed but they should be a sensitive approach that considers the "right to self-determination and forms of self-governance" of IPs. (!) Investing in education of Indigenous Peoples so they can play active roles in the transformation approaches while they understand the local contexts of their communities.	
19		Living incomes and wages in value chains for small-scale farmers and agricultural workers	!	(+) Could represent an opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
		AT5			
1		Food and peace facility in countries facing the risk, reality or aftermath of a conflict-related humanitarian crisis		(*) Supporting Indigenous Peoples in the enactment of their right to self-determination, their right to their lands, and to increase their resilience strategies by avoiding displacement or migration.	
2		Strategic food reserves to smooth consumption shocks		(+) Food sovereignty, IPFSS have the potentital to provide to local diets and help the resilience of communities under stress situations. Thus, enacting their right to self-determination and lands is crucial in the process.	
3		Nutrition-sensitive social protection schemes	!	(+) Recognise and respect traditional resilience mechanisms and coping strategies of Indigenous Peoples that are grounded on their right to self-determination, right to land and linked strongly to their IPFSS. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	By adopting a cash-first approach, these schemes support local markets with knock-on impacts on local economies, and empower recipients to use their resources in the best possible way to meet their current and future needs.

4		Blended financing mechanism to small projects/initiatives locally owned by women and youth	!	(+) Opportunity for indigenous women and youth. (+) Women are systematically excluded even within indigenous communities where they can lack rights on lands or are limited by specific norms and rules on what they can or cannot do. So, finding points where they can have a potential to become entrepreneurs can reinforce their local capacities and empower them, cultivating specific crops or adding value to crops to sell them and obtain extra income. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
5		Financial inclusion to small-scale producers through climate risk profiling	!	(+) Opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (I) Investing in local IPFSS to strengthen them so they can satisfy local food demands while reducing environmental costs, increasing resilience and improving the livelihoods of IPs.	
6		Community gardens utilising vertical farming tools for food security			
7		Empower women's agency and leadership in developing resilience solutions	!	(+) Opportunity for indigenous women. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (+) Women are systematically excluded even within indigenous communities where they can lack rights on lands or are limited by specific norms and rules on what they can or cannot do. So, finding points where they have the potential to become entrepreneurs can reinforce their local capacities and empower them, cultivating specific crops or adding value to crops to sell them and obtain extra income. (+) Investing in capacity development and education of indigenous women so they can take more active roles at	

				policymaking and decision-making levels.	
8		Expanded and improved food security forecasting and monitoring, based on the integrated food security phase classification (ipc) as the accepted global food security analysis standard			
9		E-commerce ecosystem solution for rural transformation (platforms to reach last-mile households)	!	(+) Opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) Promoting fair trade if IPs are connected with bigger value chains, investing in capacity development.	
10		Tools for accelerated breeding and trait mining underserved (underutilised?) crops		(*) Ensure that IPs' rights to intellectual property are respected and fairly recognised. (*) Promoting data and research sovereignty led by Indigenous Peoples.	
11		Integrated approach for sustainable soil management: the global soil partnership			
12		The Sahel resilience initiative, integrating food for assets, school feeding, nutrition, capacity strengthening and seasonality.	!	(+) Opportunity for Indigenous Peoples. (!) Desiging cultural-sensitive programmes considering IPs' right to self-determination. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	
13		Use of international agreements previously negotiated in the committee on world food security. Voluntary guidelines (governance of land, fisheries, forestry and food systems) and CFS Framework for action on food security and nutrition in protracted crises	+	Link to recommendation: (+) No Action Track will meet its goals without securing rights to land, natural resources and territories, and right to self-determination of Indigenous Peoples. (*) Ensure the participation of Indigenous Peoples. (*) Invest in capacity development so Indigenous Peoples can take leadership positions at the policymaking and decision-making levels.	
14		Harvest-tenure rights provided by mobile grain storages to			

		reduce post-harvest losses in Sub-saharan Africa			
15		Agroforestry practices in arid and semi-arid lands		(!) IPFSS are diverse and models exist that can be replicated and adapted to arid lands, e.g. desert of Arizona.	
16		Advance wide-scale adoption of agro-ecology within farms and rangelands	!	(+) Opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) Document food practices of Indigenous Peoples and scale them out. (!) Investing in a fund that allows creating data and evidence on the potential of IPFSS and provide specific scalable solutions.	
17		Local and public procurement schemes specifically targeting smallholder farmers and small and micro/small/medium-sized enterprises to purchase food with specific characteristics (i.e. locally produced, produced by women's or youth cooperatives, organic, seasonal)			
18		Universal food access: enacting food as a public good	+	(+) No Action Track will meet its goals without securing rights to land, natural resources and territories, and the right to self-determination of Indigenous Peoples. Link with AT1, AT2 (!) IPFSS have the potential to contibute to this goal not only for Indigenous Peoples but local markets if supported adequately.	Healthy and nutrient-rich diets could become accessible to all (not just through purchasing power), guaranteed by state mechanisms, with a (regulated and growing) private sector that is geared towards that goal. So far, most efforts in fragile states have been geared to increase the supply of calories. However, diets based primarily on staple cereals or tubers lack diversity, which contributes to micronutrient deficiencies. Thus, much greater effort on enabling access to healthy diets is required. Moreover, cooperatives, customary indigenous systems and contemporary alternative food networks (i.e. community-supported agriculture) would also be a fundamental part of this scheme.
19		Enriching child's food and nutritional education and situation through web-based tools, including food into the curricula, and providing school meals	+	(+) Opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension.	

				Link with AT2 (same recommendations as in AT2 on intercultural programmes).	
20		Adaptive human-centric approach to resilient and sustainable water management	+	(+) Opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) IPFSS have the potential to contribute to this goal not only for Indigenous Peoples but local markets if supported adequately.	
21		Long-term conservation of food diversity in gene banks and in the field, and sustained diversification of the food basket	+	(+) Opportunity for Indigenous Peoples. (!) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. Link with AT3 and AT1 – Creation of resaturation biocentres that ensure food everyone in an environmental way.	
22		Community-based decision-making mechanisms and information systems on land rights and access and control over essential food-producing resources to promote food sovereignty; equitable land and resource rights, effective and responsible governance, and sustainable livelihoods	+	(+) No Action Track will meet its goals without securing rights to land, natural resources and territories, and the right to self-determination of Indigenous Peoples. (+) No Action Track will meet its goals without including Indigenous Peoples into any discussion that could affect their food system in any possible dimension. (!) IPFSS have the potential to contribute to this goal not only for Indigenous Peoples but local markets if supported adequately.	
23		The global network against food crises, an innovative approach to address complex food crises with integrative approaches		(*) Innovative solutions are not necessarily new but undermined practicesexplore and document good practices of the IPFSSS to scale them up. Link to AT3	
24		Establish a global centre for risk assessment and policy response on conflict and hunger		(!) Involve IPs who are also amongst the most displaced groups due to land grabbings.	
25		Systemic approaches to risk analysis	!	(+) Opportunity for Indigenous Peoples. Link to recommendation:	

				(!) Include Indigenous Peoples' perspectives in preventing and monitoring shocks. (!) Investing in education of Indigenous Peoples so they can reach positions at the policymaking and decision-making level on matters that affect their livelihoods, territories and peoples. (*) Ensuring indigenous data sovereignty and indigenous governance. (*) Supporting research within and by indigenous communities to create their own data and have evidence that allows them to negotiate better with external stakeholders and support their right to self-determination.	

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Asociación ANDES

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