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THE INVISIBLE TRADE

WILD PLANTS AND YOU
IN THE TIMES OF COVID-19 AND THE ESSENTIAL JOURNEY TOWARDS SUSTAINABILITY

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WILD PLANTS IN TRADE : A SNAPSHOT

SPECIES, THREATS, AND WILD HARVESTING

26K plant species have well-documented use, and twice as many are estimated to be used for medicinal purposes

10% of these **(~3,000 species)** are traded internationally

11% of the 19% of species that have been assessed are threatened with extinction in the wild based on **IUCN Red List criteria**

60-90% of species are thought to be **wild-collected** by rural and marginalised communities, with many relying on plants for their income and wellbeing

ECONOMIC VALUE AND VOLUME OF TRADE

value of the global trade in medicinal and aromatic (MAP) plant species has **almost tripled in recent years** ...

the global value of this trade has increased from USD1.3 billion in 1998 to the 2018 value of **USD3.3billion**

TOP **EXPORTERS**

TOP **IMPORTERS**

global annual income from the production of non-wood forest products (NWFPs) is **USD88billion**

production of plant-based NWFPs is valued at **USD77billion**

26% of European households collect NFWPs with an average annual value of **USD26billion (EUR23.3billion)**

WILD PLANTS AND COVID-19

Official TCM formulas recommended for COVID-19 treatment in China utilise over **125** plant species

this includes liquorice root *Glycyrrhiza* spp, a protected species in parts of its Chinese range, used in 11 formulations, and several CITES Appendix II-listed species: Ginseng root *Panax* spp, *Aquilaria sinensis*, and *Cibotium barometz*. A subset of these species is likely to be sourced from the wild, in China and internationally

there have been reports around the use of herbal products as part of the COVID-19 response in **Africa, Asia, Europe, South America, USA**, and an increase in the volume of trade is likely.

across the world, it is anticipated that the **number of harvesters may increase** as an impact of the long-term economic crisis due to COVID-19, in particular in areas where wild harvesting correlates with high unemployment and poverty rates.

TRADE IN CITES-LISTED SPECIES AND ENFORCEMENT

CITES is the Convention on International Trade in Endangered Species of Wild Fauna and Flora, regulating global trade in wildlife

800 species of medicinal and aromatic plants are listed in CITES Appendix II - regulating the volume and nature of their trade

25,000tonnes of CITES-listed wild plant species were traded legally between 2006–2015 **involving 43 separate species**

23% of all **2018 seizures reported by the EU Member States** were of medicinal plant and animal products and parts/derivatives for medicinal use, including over 260,000 plant-derived medicinal items

INTRODUCTION

The future availability of plant ingredients to support human health–through medicines, food and well-being products–is dependent on prioritising the **conservation and sustainable use of their source species in the long-term**.

Much greater action is required on the part of the private sector, governments and consumers to address the visibility and long-term availability of these species.

With the current global spotlight on wild animal markets as a possible source of the COVID-19 epidemic, it is easy to forget that the biggest flows of "wildlife" in trade involve plants, not animals.

There are also important conservation and health reasons to keep a close eye on the wild plant trade sector during this global health emergency.

During the COVID-19 outbreak, the use of wild plants as herbal ingredients in Traditional Chinese Medicine formulations and other herbal products around the world is anticipated to increase dramatically.

This report summarises what is known about the trade in wild plant ingredients, the impacts of COVID-19 on the demand and trade in these resources and recommends ways forward to ensure their long-term availability to businesses, consumers and government agencies.

WHAT'S THE ISSUE?

People are utterly reliant on plants for their survival, yet few appreciate that many of the consumer products in common use—ranging from herbal remedies, food, and drink to cosmetics, health supplements, and even furniture—come from wild harvested plants.

Out of approximately 390,000 plant species distributed around the world, **60,000 plant species are estimated to be used globally for medicinal purposes**, of which about 26,000 have well-documented use. Roughly 10% of these (3,000) are traded internationally. While estimates vary across geographies and sectors, **60–90% of these species are thought to be wild-collected**, and not in commercial cultivation[i].

THE WILD IN YOUR HOME

Remember that box of **chocolate-covered Brazil nuts** you got for your birthday? The brazil nuts themselves came from wild trees in a South American rainforest. The chocolate probably contained **shea butter from nuts harvested from a West African savannah tree**, maybe in Burkina Faso, one of the world's poorest countries for whom it is a nationally important export crop. The designer hat that you treated yourself to may have been woven from **raffia collected from wild palms by a women's co-operative in northern Madagascar**, and the **rattan chair** you sat on while eating your chocolates was made from **wild palms**, probably harvested in South-East Asian rainforests.

If you had a **mushroom risotto** for supper last night, the ceps that flavoured it are likely to have been collected in **woodlands somewhere in Europe**, perhaps in Hungary, or the Dolomites, and the soothing cup of herbal tea you drank afterwards contained nettles, hawthorn and elder, all harvested from the wild. If you are of a musical disposition and play a woodwind instrument, then your clarinet, or oboe, was almost certainly made from African Blackwood, harvested from a slow-growing and increasingly scarce tree in Mozambique or Tanzania.

Your **shampoo may contain Argan oil**, which comes from nuts wild-harvested from endemic trees in Morocco, and **cosmetic products can contain Frankincense, a resin collected from wild trees**, mostly in the Horn of Africa.

All these products and more—a multitude of flavourings, foodstuffs and herbal remedies—are harvested from the wild, a fact unknown to many consumers and companies. And if we don't know where the ingredients originate, how can we tell whether the impact each of us has on the plants that provide these products, on the wider environment and on the livelihoods of the people involved, is beneficial or destructive?

HOW THREATENED ARE THEY?

The global threat to plants used for medicinal and aromatic purposes has been assessed for only about **19% of these species**, with approximately **11% of them considered threatened with extinction in the wild based on IUCN Red List criteria**[ii]. Biological resource use, including for international trade, land use changes and habitat degradation, as well as climate change are key threats. The global increase in the trade in plant resources is an important factor to consider in discussing the threats and trends to this group of species.

TRADE AND REGULATION

ECONOMIC VALUE AND ORIGIN OF TRADE

The value of the global trade in medicinal and aromatic plant species has almost tripled in recent years (from USD1.3 billion in 1998 to USD3.3 billion in 2018), based on the latest available UN Comtrade data. The world's top exporters are China, India, Germany, USA, and Hong Kong SAR, while USA, Hong Kong SAR, Germany, and Japan, are the top importers, all based on the value of traded products and using combined trade data for 1998, 2008 and 2018. This is an underestimate as the customs code from which the figure is derived (HS 1211[iii]) does not cover all relevant plants traded. Estimates of the scale of trade are dependent on customs codes, which presents challenges given the variety of species involved and how they are captured in national reporting[iv]. Notably, one species with a commodity specific HS code, African Cherry *Prunus africana* was accepted in 2020[v]. One comprehensive review suggests that in 2013 China exported over 1.3 billion kg of plant materials, with a reported customs value of over USD5 billion, to which wild-collected produce may have contributed as much as USD1.8 billion[vi].

THE ROLE OF CITES

At the international level, CITES provides an important form of trade regulation with over 800 species of medicinal and aromatic plants listed in Appendix II. In 2006–2015, 43 CITES Appendix II wild species were traded legally—some 25,000 t in total. According to importers' annual reports, the top three exporters were Mexico, Cameroon and South Africa, together representing 75% of all wild-sourced exports (kg as unit), while five countries were responsible for 77% of imports: France (26%), USA (16%), Japan (15%), Germany (11%) and Spain (7%). According to importers' data, the trade in Candelilla *Euphorbia antisyphilitica* and African Cherry *Prunus africana* accounted for 73% by volume with significant trade in aloes *Aloe* spp., orchids *Dendrobium* spp., and agarwoods *Aquilaria* spp. Jatamansi *Nardostachys jatamansi* exports from Nepal appear to be globally significant according to data reported by exporters.

ILLEGAL TRADE

There is also evidence of illicit trade as exemplified by analysis of CITES-related seizures reported by European Union (EU) Member States[vii]. During 2018, 23% of all seizures reported were of medicinal plant and animal products and parts/derivatives for medicinal use—by far the largest category of all reported seizures. This included 260,562 plant-derived medicinal items (and an additional 6,685 kg and 23 l), with many Appendix II-listed MAPs seized, including aloe *Aloe maculate*, *Gastrodia elata* and *Dendrobium nobile* orchids, and *Prunus africana*. Many of the seized products contain CITES Appendix-II listed plant species suggesting some are linked to poor compliance with rather than intentional violation of CITES regulations. The former may be linked to a lack of understanding of CITES requirements along trade chains, and/or capacities to implement the regulations in source and transit countries.

NATIONAL LEGISLATION AND ONGOING CHALLENGES

At the national level, the control of use and trade are often covered by different legislative requirements, including the establishment of access and resource use regimes, the protection of species and habitats, consumer protection, and the establishment of intellectual property regimes. The US Lacey Act requires a declaration of legal sourcing at the time of import of certain plants and plant products. In 2017 a US manufacturing company was prosecuted and fined for non-compliance with the Act[viii], while from 1st October 2020, the scheduled Phase six of the Act will also include certain essential oils[ix].

Challenges around trade in wild plant ingredients include increasing demand, complex trade chains and traceability issues. Millions of wild harvesters in poor and marginalised

regions around the world are reliant on this trade, which often operates under complex legality, with much of the trade being informal and under-reported. There are also identification issues as plants are mostly traded as parts, derivatives, and finished products, including in mixed and processed form. Conversely, market awareness of sustainability issues is growing, and best practices are available—such as the FairWild Standard, as well as some policy and legislative frameworks (notably including CITES regulations), creating opportunities for establishing the conditions for sustainable and legal trade in wild plants, benefiting livelihoods, ecosystems and other species, as well as providing healthcare opportunities and food security.

WHO IS HARVESTING AND USING **WILD PLANTS?**

WILD HARVESTER PROFILE

Wild plants are harvested for commercial purposes all over the world under a wide range of different conditions. Nevertheless, certain commonalities emerge. People engaged in the harvest are generally rural and marginalised—often children or elderly, and mostly women. Typically they have few other opportunities to earn income. In many cases they come from ethnic minorities or Indigenous Peoples and Local Community groups. Often, the art of wild-harvest is linked to traditional knowledge of what parts can be collected, when, and how much and how often. The global income from the production of non-wood forest products (NWFPs) has been conservatively estimated at USD88 billion annually, coming for the most part (USD77 billion) from the production of plant-based NWFPs[x].

In some places the income generated through this activity is of considerable importance to livelihoods. For example:

1. The harvest of **Devil's claw *Harpagophytum* spp.** (used to treat **arthritis** and rheumatoid arthritis) in Namibia, which supplies around 90% of the world's market, is believed to supply a major part of, in some cases the sole, income for some 3,000–5,000 harvesters[xi].

2. Investigation of the role of commercial medicinal plants in Nepal[xii] in lifting rural households out of poverty estimated that income from selling wild-collected medicinal plant products constituted **~58% of the total annual household income** and 78% of cash income.

3. Commercial harvesting and trade in NWFPs that supplements formal material livelihoods is a **common market activity in many of the economically stressed, forested regions of the eastern United States**[xiii].

EUROPEAN HARVESTING

It has been reported[xiv] that on average 26% of European households collect NWFPs, ranging from Latvia (68% of households), the Czech Republic (58%) and Slovenia (54%) to the Netherlands (5%) and the United Kingdom (8%). Collected NWFPs—according to the same study—represent a total economic value of approximately USD26 billion (EUR23.3 billion) per year in Europe, having the largest economic importance in Russia, followed by France, Germany, and Turkey. These values and contributions of NWFPs to the formal economy, however, remain invisible in policy and practical applications.

GLOBAL HARVESTING

Worldwide, wild plants are collected from an enormous range of different habitats. However, the places from which they are collected are not necessarily themselves at all wild: fields cultivated for other crops, hedgerows and timber plantations are all important sources of wild produce of various kinds. The legal status of the land where plants are collected and the rights, or otherwise, of those doing the collecting are similarly variable. Land may be community or privately-owned, state-owned (at various governmental levels), under some kind of common-property regime or customary tenure. Ownership may be unclear or contested. The land may be under open access or restricted access that is or is not enforced.

LEGALITY AND ACCESS TO WILD HARVESTING

Under many legal systems anything growing on private land is automatically the property of the landowner, but this is not always the case—others may have some rights to these resources (known as usufruct rights). Sometimes national legislation, for example that protecting threatened species, overrides these property rights. State-owned lands and the resources they contain may also come under a whole range of management and protection regimes, ranging from strict nature reserves with no public access to unrestricted access lands whose plants are treated essentially as common property. As well as formal legal systems, customary restrictions and regulations may apply to the exploitation of some plants.

Given all this, it is risky to generalise. However, aside from the case of landowners collecting plants on their own property, it is undoubtedly true that many people who collect wild plants, whether for subsistence or commercial use, do so under conditions of uncertain or insecure access. They may also be wittingly or unwittingly contravening laws or regulations, both formal and informal. Where people are heavily dependent on such collection for their livelihoods, this can put them in a very vulnerable position.

RELEVANCE OF PLANTS TO THE COVID-19 CRISIS

Plant products are recommended as either formal or informal COVID-19 treatments or for general well-being worldwide, many of them likely sourced from the wild. There are no considerations of how sustainable the provenance of these products is.

TRADITIONAL CHINESE MEDICINES

WILD PLANTS WITHIN TRADITIONAL MEDICINES

In China, where the first COVID-19 cases were registered, plants comprise around 80% of traditional Chinese medicine (TCM) products. An estimated 30% of TCM industrial production volume is from wild plants, accounting for 70% of the species by number. The resource base of the TCM industry is a combination of supply chains from China and from around the world. Estimating the exact levels of trade is complex, however China is one of the world's top importers of medicinal and aromatic plants and also a top exporter of botanical ingredients.

Both TCM and Western treatments are used to treat COVID-19 patients, with official treatments issued by the National Health Commission of the Republic of China. One study[xv] screened 125 Chinese herbal medicines for the potential to inhibit COVID-19 directly, and evidence of SARS and H1N1 influenza prevention has been reviewed[xvi].

The current official treatment plan[xvii] includes ten TCM prescribed formulations and 13 proprietary Chinese medicine formulations (including granules, capsules, injections), which utilise over 125 plant species. They include liquorice root *Glycyrrhiza* spp, a protected species in parts of its Chinese range, used in 11 formulations, and several CITES Appendix II-listed species: Ginseng root *Panax* spp, *Aquilaria sinensis*, and *Cibotium barometz*. *Magnolia officinalis* is grade-II listed on China's nationally important protected medicinal plant list alongside another 11 species including *Panax ginseng*. This means their harvesting and trade can only take place with the provincial authorities' permit, and under their oversight. A subset of these species is likely to be sourced from the wild, in China and internationally.

KEY SPECIES USED AS COVID-19 TREATMENTS

One of the species more regularly present in the prescribed TCM formulations is liquorice root or the TCM ingredient, "Gan Cao". The main species found in the commercial trade of liquorice are *Glycyrrhiza glabra* and *Glycyrrhiza uralensis*, which are principally sourced from Asia and the Mediterranean. There are concerns about the conservation status of liquorice species, with some threatened in parts of their range, along with many other wild collected medicinal and aromatic plants. Commercial demand can put pressure on wild plant populations, placing them in danger of overexploitation. Evidence suggests that the growing and

diversifying demand for wild liquorice, as well as the entry of non-traditional harvesters into the market, has resulted in traditional, often sustainable harvesting practices being replaced by more intensive and destructive practices. This can also threaten the livelihoods of traditional collectors, who are often drawn from the poorest social groups in rural areas. However, if properly managed, liquorice root can be harvested without lasting negative impacts on the population. Liquorice species regenerate strongly from the roots. In fact, liquorice was one of the first products for which sustainability standards were tested in practice. The FairWild Standard[xviii], which certifies sustainable wild harvest using a rigorous set of criteria to demonstrate sustainability of the wild resource and equitable trade in wild species, has been applied in liquorice production sites in Kazakhstan, Georgia, and Spain. Liquorice root extract is specifically recommended to control COVID-19 symptoms[xix].

INCREASING USE OF HERBAL INGREDIENTS

SPREAD OF TCM ACROSS ASIA AND SOUTH AMERICA

An increase in the volume of trade in herbal products in China, driven by COVID-19 prescriptions, and in TCM formulations exported to Thailand, Lao PDR, and Ecuador[xx] is known to have taken place, and is likely elsewhere. There are reports of stocks tied to TCM products attracting investors in recent months and volumes of production growing[xxi].

There are reported "rushes for traditional herbal medications" against COVID-19 in Thailand[xxii], and "immune-boosting" herbal capsules promoted in India[xxiii], government-promoted herbal medicines against coronavirus in Bolivia[xxiv], and increased traditional remedies use in Tunisia[xxv]. India's Ministry of AYUSH issued a statement on "Ayurveda's immunity boosting measures for self-care during COVID-19 crisis[xxvi]," which includes the recommendation to take Chyavanprash formula (containing a range of wild plant ingredients) daily. Other research suggests infusing nano-fibre respiratory masks with medicinal plants[xxvii].

The President of Madagascar promoted a herbal drink as a treatment[xxviii],[xxix], which precipitated a range of responses from various African countries and discussions at the World Health Organization (WHO)[xxx]. While the disclosed active ingredient of the drink is from the widely cultivated *Artemisia annua*[xxxi], no information was disclosed about "other endemic medicinal plants" that are part of the formula[xxxii]. There are reports of Cameroonians taking a herbal COVID "cure"[xxxiii].

There is also a reported rapid increase in the demand for traditional Chinese remedies for respiratory and other ailments in the US[xxxiv].

Across the world, it is anticipated that the number of harvesters may increase as an impact of the long-term economic crisis due to COVID-19, in particular in areas where wild harvesting correlates with high unemployment and poverty rates.

WHY DOES IT MATTER, WHAT SHOULD BE DONE **AND WHY NOW?**

ACADEMIC SUPPORT FOR PLANT TREATMENTS

A rapid search in the fast-expanding academic research on the subject of COVID-19 demonstrated a range of articles published on the usefulness and efficacy of plants in prevention or treatment[xxxv], including plants from Africa[xxxvi] and India[xxxvii]; with the focus on plants for food (for instance liquorice root as an important food ingredient)[xxxviii], and highlighting the role of ethnobotanic research[xxxix].

There is however a lack of attention to ensuring the sustainability of supply chains, in particular of those herbs sourced from the wild. This also applies to wild plant ingredients used in other products, such as food and cosmetics, the demand for which likewise appear to be growing.

Within China, recent efforts[xl] have provided insights into the industrial production of TCM products, identifying key gaps around the sustainability of supply chains, and provided practical solutions to address them. Solutions include the application of TCM sector corporate sustainability guidelines, together with international best practices such as the FairWild Standard[xli]. Beyond China, the Belt and Road

Initiative (BRI) includes a TCM strategy[xlii], which focuses on the rapid expansion of TCM centres around the world, providing opportunities to advance sustainable use practices. The "greening" of this strategy is key to ensuring the long-term survival of medicinal and aromatic plant species.

Harvest of wild plants can provide vital resources for poor and marginalised people and, where the resulting products are commercialised, much-needed income. It can also provide an incentive to manage the harvest of plants sustainably and to maintain their habitat to the benefit of other species and whole ecosystems. In most of cases, sustainable management of wild plant resources that are of any commercial importance needs some kind of input—either in the form of positive incentives or regulation, or a combination of the two. These interventions do not always work, but if they do the benefits can be significant.

The future availability of plant ingredients to support human health—through medicines, food and well-being products—is dependent on prioritising the conservation and sustainable use of their source species in the long-term. Much greater action is required on the part of the private sector, governments and consumers to address the long-term availability of these species.

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PRIORITY ACTIONS

1

ALL STAKEHOLDERS

to support the assessment of use, trade and threat status of key plants, contribute to the development of species and area management plans.

2

COMPANIES

proactively review what supply chains rely on wild plant ingredients, assess their ecological and social sustainability, build targets to demonstrate the commitment to moving all supply chains to verifiable sustainability, and implement third-party standards and certification (in particular the FairWild Standard and certification scheme).

3

COUNTRIES

enable effective regulation of wild-harvesting, increase the visibility of wild plants and contribution to the livelihoods, economies, and healthcare, and promote sustainable harvest practices. This would support the delivery of the CBD's Target 12 of the Global Strategy for Plant Conservation, Biodiversity and Health area of work, the implementation of CITES Decisions on Trade in medicinal and aromatic plant species[xliii], and contribute to the development of the post-2020 Global Biodiversity Framework.

4

WORLD HEALTH ORGANIZATION MEMBER COUNTRIES

join the request for formal finalisation and adoption of the WHO/WWF/IUCN/TRAFFIC Guidelines on Conservation of Medicinal Plants.

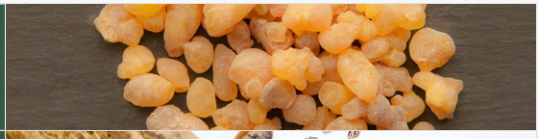
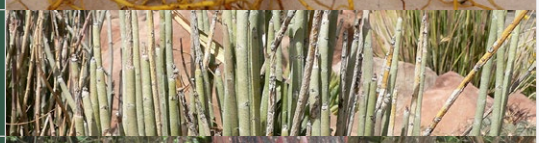
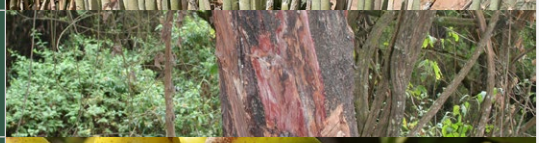
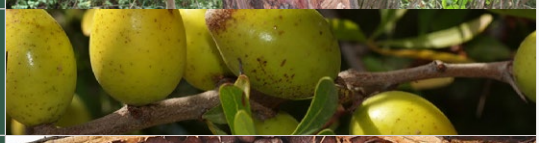
5

CONSUMERS

look out for the healthcare, food and well-being products that contain wild plant ingredients, and support best practices (such as the FairWild-certified products) and join the #ifoundwild initiative.

THERE ARE 26,000 SPECIES ...
WHERE DO I START?

You could start your journey with the "Wild Dozen"— 12 fascinating species important in trade that act as flagships of the opportunities and challenges of wild-sourcing. Some are already subject to careful management to avoid over-harvesting and ensure equitable trade, some need more attention now and others may do so in future as markets for them grow. Learn more about wild plant ingredients and be part of positive conservation action.

1	Frankincense resin and oil *Boswellia spp.*	
2	Shea butter *Vitellaria paradoxa*	
3	Jatamansi/Spikenard oil *Nardostachys jatamansi*	
4	Gum arabic resin *Acacia spp.* or E414	
5	Goldenseal root *Hydrastis canadensis*	
6	Candelilla wax *Euphorbia antisyphilitica*	
7	Pygeum bark *Prunus africana*	
8	Argan oil *Argania spinosa*	
9	Baobab fruit *Adansonia digitata*	
10	Devil's Claw root *Harpagophytum procumbens*	
11	Liquorice root *Glycyrrhiza* spp.	
12	**Juniper** (which exemplifies wild-harvest and trade in popular medicinal and aromatic plants in Europe)	

Other species in Europe to look out for, are wild garlic, thyme, sage and oregano, as well as rosehips, Leopard's Bane *Arnica montana*, elderberries, blueberries, lime flowers, and even dandelions and nettles.

FOOTNOTES

i. Jenkins, M., Timoshyna, A., & Cornthwaite, M. (2018). *Wild at Home: Exploring the global harvest, trade and use of wild plant ingredients*. TRAFFIC. Cambridge, UK.

ii. These numbers are based on updated information with the number of medicinal and aromatic plant species assessed doubled since 2018, IUCN Medicinal Plant Specialist Group.

iii. United Nations Commodity Trade Statistics Database (UN COMTRADE Database), Harmonised System (HS) code 1211: Plants, plant parts for perfumery, pharmacy, etc. Description: Plants and parts of plants (including seeds and fruits), of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes, fresh or dried, whether or not cut, crushed or powdered.

iv. Sorrenti, S. 2017. *Non-wood forest products in international statistical systems*. Non-wood Forest Products Series no. 22. Rome, FAO.

v. *Changes in agricultural and forest product codes in the Harmonized System (HS) nomenclature maintained by the World Customs Organization* (WCO), (2020), retrieved from: http://www.fao.org/forestry/45489-02a9432b8e3b130a0aa6887484a4fbfb0.pdf

vi. Brinckmann, J. A. (2016). *Sustainable Sourcing: Markets for certified Chinese medicinal and aromatic plants*. Geneva: International Trade Centre, 22.

vii. TRAFFIC (2019). *Overview of seizures of CITES-listed wildlife in the European Union*—January to December 2018. Retrieved from: https://ec.europa.eu/environment/cites/pdf/reports/EU-seizures-report-2018-FINAL%20(rev%2009-04-20).pdf

viii. https://www.justice.gov/opa/pr/essential-oils-company-sentenced-lacey-act-and-endangered-species-act-violations-pay-760000

ix. https://www.aphis.usda.gov/aphis/newsroom/stakeholder-info/sa_by_date/sa-2020/sa-03/lacey-act-phase-six

x. Food and Agriculture Organization (FAO). (2014). *State of the World's Forests: Enhancing the socioeconomic benefits from forests*. http://www.fao.org/3/a-i3710e.pdf

xi. Stewart, K. M., & Cole, D. (2005). The commercial harvest of devil's claw (Harpagophytum spp.) in southern Africa: The devil's in the details. *Journal of Ethnopharmacology*, 100(3), 225-236. https://doi.org/10.1016/j.jep.2005.07.004

xii. Timmermann, L., & Smith-Hall, C. (2020). Commercial Medicinal Plant Collection Is Transforming High-altitude Livelihoods in the Himalayas. *Mountain Research and Development*, 39(3). https://doi.org/10.1659/MRD-JOURNAL-D-18-00103.1

xiii. Kruger, S. D., Munsell, J. F., Chamberlain, J. L., Davis, J. M., & Huish, R. D. (2020). Projecting Medicinal Plant Trade Volume and Value in Deciduous Forests of the Eastern United States. *Forests*, 11(1), 74. https://doi.org/10.3390/f11010074

xiv. Lovrić, M., Da Re, R., Vidale, E., Prokofieva, I., Wong, J., Pettenella, D., ... & Mavsar, R. (2020). Non-wood forest products in Europe–A quantitative overview. *Forest Policy and Economics,* 116, 102175. https://doi.org/10.1016/j.forpol.2020.102175

xv. Zhang, D. H., Wu, K. L., Zhang, X., Deng, S. Q., & Peng, B. (2020). In silico screening of Chinese herbal medicines with the potential to directly inhibit 2019 novel coronavirus. *Journal of Integrative Medicine*, 18(2), 152-158. https://doi.org/10.1016/j.joim.2020.02.005

xvi. Luo, H., Tang, Q., Shang, Y. et al. Can Chinese Medicine Be Used for Prevention of Corona Virus Disease 2019 (COVID-19)? A Review of Historical Classics, Research Evidence and Current Prevention Programs. Chin. J. *Integr. Med.* (2020). https://doi.org/10.1007/s11655-020-3192-6

xvii. http://www.nhc.gov.cn/yzygj/s7653p/202003/46c9294a7dfe4cef80dc7f5912eb1989.shtml

xviii. FairWild Standard Version 2.0 (2010), retrieved from: https://www.fairwild.org/s/FairWild-Standard-V2.pdf

xix. Redeploying plant defences. Nat. *Plants* 6, 177 (2020). https://doi.org/10.1038/s41477-020-0628-0

xx. For example https://www.nutraingredients-asia.com/Article/2020/04/29/COVID-19-and-TCM-Thailand-and-Laos-embrace-China-approved-Lianhua-Qingwen-Capsule-product

xxi. https://asia.nikkei.com/Business/Pharmaceuticals/Traditional-Chinese-cures-battle-for-acceptance-in-COVID-19-fight

xxii. https://www.bangkokpost.com/thailand/general/1880490/covid-19-fear-fuels-rush-for-traditional-herbal-medication

xxiii. https://economictimes.indiatimes.com/magazines/panache/covid-19-boost-your-immunity-with-dalmia-groups-herbal-capsule/articleshow/74684873.cms

xxiv. https://www.nytimes.com/reuters/2020/03/21/world/americas/21reuters-health-coronavirus-bolivia-tradition.html

xxv. https://www.middleeasteye.net/video/tunisians-turn-traditional-herbal-medicines-amid-coronavirus-fears

xxvi. http://ayush.gov.in/sites/default/files/Immunity%20Boosting%20-%20%20AYUSH%20Advisory.pdf

xxvii. https://www.port.ac.uk/news-events-and-blogs/news/herbal-medicine-might-help-battle-against-covid-19

xxviii. https://www.dw.com/en/covid-19-who-cautions-against-the-use-of-traditional-herbs-in-africa/a-53341901

xxix. https://www.sciencemag.org/news/2020/05/unproven-herbal-remedy-against-covid-19-could-fuel-drug-resistant-malaria-scientists

xxx. https://www.afro.who.int/news/who-supports-scientifically-proven-traditional-medicine

xxxi. https://www.newscientist.com/article/2243669-no-evidence-madagascar-cure-for-covid-19-works-says-who/

xxxii. https://www.theafricareport.com/27203/coronavirus-madagascars-covid-organics-born-from-local-tradition/

xxxiii. https://www.voanews.com/covid-19-pandemic/hundreds-rush-popular-clerics-herbal-covid-cure-cameroon

xxxiv. https://www.reuters.com/article/us-health-coronavirus-usa-herbs/u-s-coronavirus-threat-fuels-demand-for-traditional-herbal-remedies-idUSKBN20W2GR

xxxv. Sayed, A. M., Khattab, A. R., AboulMagd, A. M., Hassan, H. M., Rateb, M. E., Zaid, H., & Abdelmohsen, U. R. (2020). Nature as a treasure trove of potential anti-SARS-CoV drug leads: a structural/mechanistic rationale. *RSC Advances*, 10(34), 19790-19802. https://doi.org/10.1039/D0RA04199H

xxxvi. Gyebi, G. A., Ogunro, O. B., Adegunloye, A. P., Ogunyemi, O. M., & Afolabi, S. O. (2020). Potential inhibitors of coronavirus 3-chymotrypsin-like protease (3CLpro): an in silico screening of alkaloids and terpenoids from African medicinal plants. *Journal of Biomolecular Structure and Dynamics*, (just-accepted), 1-19.

xxxvii. Divya, M., Vijayakumar, S., Chen, J., Vaseeharan, B., & Durán-Lara, E. F. (2020). A review of South Indian medicinal plant has the ability to combat against deadly viruses along with COVID-19?. *Microbial Pathogenesis*, 104277.

xxxviii. Fan, Y., Zhang, Y., Tariq, A., Jiang, X., Ahamd, Z., Zhihao, Z., ... & Bussmann, R. W. (2020). Food as medicine: a possible preventive measure against coronavirus disease (COVID-19). *Phytotherapy Research*.

xxxix. Franco, F. M., & Bussmann, R. W. (2020). Rising to the occasion: outlining Ethnobiologists' response to the coronavirus (COVID-19) pandemic. *Ethnobotany Research and Applications*, 20, 1-4.

xl. Engaging China's private sector in sustainable management of medicinal plants project website: https://www.traffic.org/what-we-do/projects-and-approaches/promoting-sustainable-trade/fairwild/egp-maps/

xli. FairWild Standard Version 2.0 (2010), retrieved from: https://www.fairwild.org/s/FairWild-Standard-V2.pdf

xlii. Hinsley, A., Milner-Gulland, E.J., Cooney, R. et al. Building sustainability into the Belt and Road Initiative's Traditional Chinese Medicine trade. *Nat Sustain* 3, 96–100 (2020). https://doi.org/10.1038/s41893-019-0460-6

xliii. CITES CoP18 Decisions 18.300 - 18.303 Trade in medicinal and aromatic plant species. https://www.cites.org/eng/dec/valid17/82278

xliv. Wild Dozen – key plants to look out for in your products, from Jenkins, M., Timoshyna, A., & Cornthwaite, M. (2018). *Wild at Home: Exploring the global harvest, trade and use of wild plant ingredients* https://static1.squarespace.com/static/5bec424b297114f64cb908d8/t/5d08ef5c72ef04000144f850/1560866654464/Wild+dozen.pdf

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