Medicinal Plant Conservation

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Chaired by Danna J. Leaman

Chair's Note

Danna J. Leamann

This 14th volume of Medicinal Plant Conservation inaugurates the new online format, and ends a long hiatus for readers and contributors since volume 13 was published in December 2007. We owe many thanks to former editor Uwe Schippmann, to Natalie Hofbauer, and to the German Federal Agency for Nature Conservation (BfN) for producing 13 print volumes of this newsletter since 1995. I'm delighted to welcome the new editor, Helle O. Larsen, and extend my thanks to the University of Copenhagen and to DANIDA for their support. I'm also pleased to report that the full texts of all previous volumes are now available to download from the MPSG website [www.mpsg.org], where you will also find instructions for submissions to upcoming volumes. Please be aware that all internet browsers may not support downloading the pdf files of previous volumes; Google works well.

This volume features contributions relevant to medicinal plant conservation methods, national-level management, and international policy that illustrate the wide scope of relevance of medicinal plant conservation. Alan Hamilton proposes a model and best-practice hypothesis for medicinal plant conservation highlighting the importance of personal relationships between community groups, project teams, and policy makers. Valentyna Minarchenko provides a thorough overview of the medicinal plant flora and its conservation in the Ukraine. China Williams gives us a look into the complex history and controversial negotiation of an international Protocol on Access and Benefit Sharing at the 10th Conference of the Parties to the Convention on Biological Diversity.

This volume also contains comprehensive updates of work in which MPSG has formally had a role. Wolfgang Kathe comments on the evolution of the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) into the more comprehensive FairWild Standard version 2.0 [see www.FairWild.org], which was launched in 2010. MPSG is currently well represented on the FairWild Foundation Board and on its Technical Committee. Helle Larsen provides an excerpt from our reporting on the development of an indicator of conservation trends in biological diversity used for food and medicine, undertaken with TRAFFIC as part of the Biodiversity Indicators Partnership. Uwe Schippmann reports on several proposals adopted by the 15th CITES Conference of the Parties that build on work undertaken by MPSG to revise the annotations relating to medicinal plants and to promote the application of ISSC-MAP principles in non-detriment findings.

You may note that this volume retains "Notices of publication" as a standard feature (with thanks to Uwe Schippmann and Helle Larsen for its compilation), but other elements previously included in Medicinal Plant Conservation (a listing of members, ongoing project updates, notices of upcoming events) will be found on the MPSG website.

Regional file

An evidence-based approach to conservation through medicinal plants

Alan Hamilton

1. Why conservation *through* medicinal plants?

Biological conservation should be pursued across the landscape, especially at this time of climate change, to promote survival of genetic diversity, supplies of biotic resources for local needs, and delivery of ecosystem services. Conservation at this scale requires concomitant social engagement. A challenge for the conservationist is to identify features of local societies favourable towards conservation and then, where needed, find ways to encourage them.

Medicinal plants may offer exceptional opportunities for landscape-scale conservation where many people depend on these resources. The argument is that the major benefits associated with these plants can serve as motivational foundations

to improve the management of the plants and their habitats. First, however, methods of converting people's interests in these plants into actions on the ground need to be established.

The major benefits provided to societies by locally growing medicinal plants are support for local healthcare, opportunities for income generation, and affirmation of local culture. Medicinal plants can assume particular prominence in places that are poorly provisioned with conventional (western) health services, economically disadvantaged, and with cultures distinct from those that are nationally dominant.

The whole socio-ecological system needs to be taken into consideration in efforts to achieve conservation through medicinal plants. Interventions should be appropriate to local livelihoods, workable for village institutions, and entail a socially acceptable distribution of benefits and costs. This is particularly so for medicinal plants growing in those wilder habitats, such as forests, which are typically of most value for conservation of genetic diversity (considering the national or global scale) and provision of ecosystem services (e.g. carbon sequestration, soil stabilisation and delivery of water supplies). These habitats are sometimes legally protected, but, even where this is so, in practice they are often subject to virtually 'open access' exploitation of their biological resources. Their management is hard to improve without the engagement of the whole community.

2. Evidence-based science

Conservation in the 'real world' (outside the confines of strict nature reserves or ex situ collections) is a multi-disciplinary challenge. Every place has its own peculiarities, as do all practical efforts aimed at conservation. Therefore, it can be difficult to know why any particular conservation effort has succeeded or failed. From the perspective of scientific methodology, the problem of determining best practice in conservation has a parallel with medicine, also a real world, multi-disciplinary, challenge. In some parts of the world, medicine has undergone an 'effectiveness revolution' over recent decades thanks to the adoption of an evidence-based approach (Sackett et al. 1996). The same approach has therefore been recommended for conservation (Pullin & Knight 2001, Sutherland et al. 2004).

Evidence-based research entails the formulation and presentation of formal hypotheses on best practice, based on systematic reviews of the evidence relating to the success or failure of efforts to deal with particular issues. The hypotheses are then available for wider application or further development. More weight may be given to evidence believed to be especially conclusive, for example (in medicine) the results of double blind trials compared with anecdotal reports of drug effectiveness. 'Evidence-based' does not mean 'cookbook', as some doctors (and conservationists) have feared. Rather, it means integrating the expertise of the individual practitioner, gained through self-development and practice over the years, with the best evidence available from systematic research (Sackett et al. 1996).

Here we present the results of a four-year (2005-2008) programme of Plantlife International aimed at the promotion and development of community-based conservation through medicinal plants. The programme included fourteen projects and eight countries in East Africa and the Himalayas, regions selected because of the high level of dependency of rural communities on medicinal plants. All projects provide evidence on the question 'How can community-based conservation be achieved through medicinal plants?' Ten of the projects were field projects, one (in Kenya) involving communities at three contrasting locations, so that the effective size of the field sample is twelve. The other four projects were exercises to share experiences between the countries and identify best practice. All field projects were carried out by national partners (NGOs or research institutes) following their own approaches, though sometimes influenced by interactions with Plantlife or one another. Details of the reasoning behind the hypothesis and descriptions of the case studies are available elsewhere (Hamilton 2008), as is a fuller account of one of the projects (Pei Shengji et al. 2010).

3. A best practice hypothesis on conservation through medicinal plants

The hypothesis takes the form of a model, consisting of three types of social players (community groups,

project teams, and policy makers), the relationships between them, and recommendation for action by each group (FIGURE 1, TABLES 1-3). The model refers to three geographical levels, the village, the district and the nation. The district is defined as the level of socio-political organization associated with the local headquarters of government agencies (such as forestry departments), and which is often dominated by people of a particular cultural type. In actuality, each village, district and nation has its own peculiarities in the way that society is organized and thus in the specific institutions relevant to conservation. Not all types of activity are appropriate in all contexts. It is suggested that place-specific protocols for practical action be drawn up based on this generic model, suitable for local circumstances.

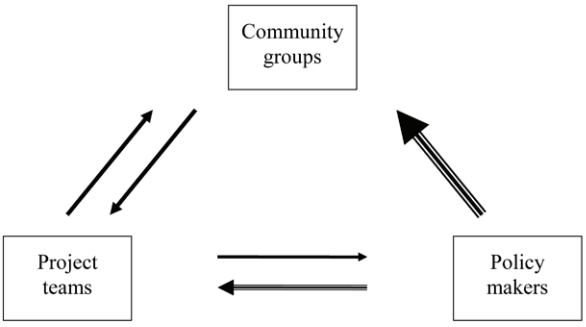

FIGURE 1. Diagram showing the elements and relationships of a model for conservation through medicinal plants. solid lines indicate that personal relationships are important, while barred lines indicate greater institutionalisation.

TABLE 1. Conservation through medicinal plants: recommendations for community groups.

A. Essential steps

- Ensure that the whole community is served by the group's activities.
- Identify local developmental concerns relating to me dicinal plants.
- Provide greater recognition and roles to primary stake holders, such as housewives using herbal remedies and commercial collectors of wild medicinal plants.

B. Choice of steps, depending on the local context

- Strengthen the conservation of wild medicinal plants:
  - o Identify priority species and sites for improved management.
  - o Develop local teams to take care of these sites (this may require an umbrella group if communities are collecting in each others' areas).
  - o Seek recognition of community rights over the medicinal resources of the sites (this may require negotiation with landowners, such as forestry departments).
  - o Establish adaptive systems of management, based on cycles of monitoring, reflection, and decision-making on management (e.g. rotational harvesting, quotas, restoration, distribution of tasks and benefits).
- Encourage the cultivation of medicinal plants identified as local priorities.
- Develop home herbal healthcare by identifying best practice within the community and seeking advice from research centres.
- Seek information on medicinal plant markets and nego tiate improved terms with traders (assured high quality materials in exchange for better prices).
- Seek technical guidance on how to add value to me dicinal plants and products (e.g. proper drying, making powders).
- Record local knowledge of medicinal plants, develop a cultural centre, and encourage educational programmes to raise appreciation of local culture.

4. The key social elements identified in the hypothesis

Three types of social groups are identified as key players to engage in efforts to achieve conservation through medicinal plants. The most fundamental is the 'community group', considered as a group within a community whose members are prepared to work within their communities to achieve conservation through medicinal plants. In Plantlife's sample, it was found that the pre-existence of suitable community groups was very useful for accelerating progress. It was also found that such groups do not need to be primarily concerned with medicinal plants, though they have to have an interest. The primary concerns of community groups in Plantlife's sample included agriculture, tree planting, forest management, healthcare and women's affairs, as well as medicinal plants more directly.

'Project teams' are groups of co-operating individuals with multi-disciplinary skills, willing to work with community groups to achieve conservation. In Plantlife's sample, it was found that it is helpful if some members of project teams are ethnobotanists, with cross-disciplinary understanding of inter-relations between people and plants. Because of the way that Plantlife's programme was structured (always channelling support for community activities through project teams), it is uncertain from this sample alone

how much progress can be made if communities act unsupported by project teams. However, it is believed that project teams will often be critical for success. They bring an outside perspective to bear on community concerns and therefore can be relatively objective, they can potentially introduce new ideas, information and technologies, they can provide useful external contacts, and they can sometimes act as channels to influence policy.

The 'policy makers' element of the model is not a coherent entity, as is a community group or project team. Rather, it includes all people involved in the development of institutional policies that influence how communities relate to medicinal plants. Some of the organizations of relevance are agencies of the state, such as those responsible for local government, indigenous affairs, national healthcare, natural resource management, the regulation of NGOs and scientific research. Also relevant are commercial companies purchasing medicinal plants from communities and certain organizations of civil society which are concerned with the same aspects of development that make medicinal plants of interest to communities (see Section 6).

5. Relationships between the social elements

Relationships between community groups and project teams are much influenced by the characters and aptitudes of those involved. These personal relationships need to mature as projects progress through the development of increased understanding, respect and trust. Each party should be able to bring its own special knowledge and skills to identify and seek answers to questions of conservation and related development (Law & Salick 2007). The relationships should be able to draw on the strengths of both scientific knowledge and methodologies, and local wisdom, knowledge and skills. This type of 'participatory action research' has been proposed in numerous conservation and development contexts, including the improved management of natural habitats, the development of new cultivation practices, the development of improved healthcare systems, pest control in agriculture, and the selection and breeding of new varieties of crops (Berlin & Berlin 2000, Uniyal 2000, Cunningham 2001, Jones & Garforth 2002, Song & Jiggins 2003).

Table 2. Conservation through medicinal plants: recommendations from project teams.

- Ensure that the project team has multi-disciplinary skills.
- Include community members with practical knowledge in the project team.
- Learn about local medicinal plants, livelihoods and stakeholders before starting community work. Identify institutions that support local ecological knowledge.
- Form a cross-disciplinary advisory group.
- Provide in-service training to team members.
- Raise awareness at community and district levels about the usefulness of medicinal plants and the need to conserve them.
- Make long-term commitment to particular communities.
- Identify community groups with a special interest in medicinal plants. If lacking, assist in their formation.
- Undertake joint research with community groups to identify key local concerns relating to medicinal plants and find practical ways to solve them.

The number of people professionally interested in medicinal plants or community-based conservation is limited in most countries, so it is not surprising that, in Plantlife's sample, some members of project teams (working for NGOs or research institutes) knew people influential in policy development in government or industry. Accordingly, they can be well placed to influence policy. In contrast, members of community groups tend to be remote from governmental and company policy. Thus, project teams can sometimes play a useful role in conveying community concerns to policy level.

Many fields of government policy influence the ways that communities relate to medicinal plants. The impact of some policies is fairly immediate, such as those underlying the regulations dealing with the harvest, trade and sale of medicinal plants. Other policies too can be influential though less directly, for instance those underlying the regulation of NGOs and the funding of science. The policies of commercial companies interested in purchasing medicinal plants from communities have become of greater conservation significance in recent years, because of the widespread liberalisation of economies and, in some countries, a slackening in government controls. Hence, the value of Organic, FairWild and other standards benchmarking levels of ethical acceptability in the commercial

acquisition of produce from plants (www.fairwild.org; www.soilassociation.org).

Government capacity for conservation is limited at many of the localities in Plantlife's sample of field projects, as shown (for example) by the commonness of illegal collection of medicinal plants in protected areas and, in a more general way, by a high frequency of social strife. About half of the field projects were mounted within districts subject to serious civil unrest during, or shortly before or after, the programme period. This demonstrates why it is so important to strengthen community institutions for conservation and why it is valuable to seek other types of organisation for conservation engagement, apart from those connected to the state (see next section).

6. Landscape-level application

The organisations involved in developing the model have been conservation NGOs and research institutes, types of organisations typically poorly placed to engage the public on a landscape scale. It is suggested that conservationists seek allies among organisations of civil society well represented at community level and which share concern for the same aspects of development that make medicinal plants of interest to communities (healthcare, income generation, and cultural affirmation). Depending on the place, these might include:

- Women's groups, because of the leading role of women in home healthcare.
- Traditional doctor associations, because of their concern for people's health, as well as for the future of their professions. Some traditional doctor associations already include conservation of medicinal plants among their objectives (e.g. Deqing County Tibetan Medicine Association in China, Himalayan Amchi Association in Nepal, Ladakh Society for Traditional Medicines in India). In Africa, the organisation *Promotion des Médecines Traditionnelles* (PROMETRA) could be well placed to promote landscape-level conservation. PROMETRA-Uganda, for instance, is connected to a network of healers from many villages, mounting self-proficiency training sessions for about two hundred of them weekly to strengthen their skills (http://www.prometra.org/representations_nationales/uganda.html). Many of the healers are well aware that some medicinal plants are in decline.
- Indigenous people's organisations, because of their interest in cultural survival and culturally appropriate development.
- Faith-based organisations, because of their concern for the fundamental aspects of people's lives. Several of the world's major faiths have close connections with traditional medicine, for instance Buddhism with Tibetan Medicine, Hinduism with Ayurveda, and Islam with Unani. Where there has been conflict between religion and traditional medicine in the past, as sometimes with Christianity in Africa, this is rarer today. Many of the world's leading faith-based organisations have signed the Assisi Declaration and are committed to conservation (www.archworld.org).

Conservation NGOs and research institutes, such as those involved in Plantlife's programme, can provide a useful service by drawing the attention of members of appropriate organisations in civil society to the developmental opportunities offered by medicinal plants. Where an interest is shown, they could follow up by helping to prepare protocols of specific actions for the use of community groups, suitable for the type of organisation and the locality, and train project teams from the organisations to work across the landscape with community groups.

7. Testing the hypothesis

The hypothesis offered here is available for testing by scientists having their own case studies. The model is a general one, intended to be relevant in many geographic contexts and useful for policy makers. It is suggested that scientists proposing improvements should avoid introducing greater complexity, since this is likely to detract from its appeal (SUTHERLAND et al. 2006). Through analogy with public health, the hypothesis is nearer to a 'five-a-day' approach aimed at improving the diet than a manual listing the detailed nutritional benefits of every type of fruit and vegetable.

Acknowledgements

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References

Berlin, B. & Berlin, E.A. (2000): Improving health care by coupling indigenous and modern medical knowledge: the scientific bases of highland Maya herbal medicine in Chiapas, Mexico. - In: Cetto, A.M. (Ed.): Science for the twenty-first century: a new commitment. UNESCO, Paris, France. pp. 338-349.

Cunningham, A.B. (2001): Applied ethno-botany: people, wild plant use and conservation. - Earthscan, London, UK. 300 pp.

Hamilton, A. (Ed.) (2008): Medicinal plants in conservation and development: case studies and lessons learnt. - Plantlife International, Salisbury, UK. 85 pp.

Jones, G.E. & Garforth, C. (2002): The history, development, and future of agricultural extension. - Food and Agricultural Organization, Rome, Italy. www.fao.org.docrep/W5830E/w5830e03.htm

Law, W. & Salick, J. (2007): Comparing conservation priorities for useful plants among botanists and Tibetan doctors. - Biodiversity and Conservation 16 (6): 1747-1759.

Pei Shengji, Hamilton, A.C. et al. (2010): Conservation and development through medicinal plants: a case study from Ludian (Northwest Yunnan, China) and presentation of a general model. - Biodiversity and Conservation 19 (9): 2619-2636.

Pullin, A.S. & Knight, T.M. (2001): Effectiveness in conservation practice: pointers from medicine and public health. - Conservation Biology 15 (1): 50-54.

Sackett, D.L., Rosenberg, W.M.C. et al. (1996): Evidence-based medicine: what it is and what it isn't. - British Medical Journal 312 (7023): 71-72.

Song, Y. & Jiggins, J. (2003): Women and maize breeding: the development of new seed systems in a marginal area of south-west China. - In: Howard, P.L. (Ed.): Women and Plants. Zed Books, London, UK. pp. 273-288.

Sutherland, W.J., Armstrong-Brown, S. et al. (2006): The identification of one hundred ecological questions of high policy relevance in the UK. - Journal of Applied Ecology 43 (4): 617-627.

Sutherland, W.J., Pullin, A.S. et al. (2004): The need for evidence-based conservation. - Trends in Ecology and Evolution 19 (6): 305-308.

Uniyal, R.C. (2000): Research for 'Medicinal plants cultivation in India - a reference book'. - Medicinal Plants Stakeholders' Meeting, New Delhi, India, TRAFFIC-India.

Alan Hamilton • 128 Busbridge Lane • Godalming • Surrey GU7 1QJ • UK • alanchamilton@btinternet.com

Medicinal plants of Ukraine: diversity, resources, legislation

Valentyna Minarchenko

Introduction

Maintenance of wild flora species and their natural habitats is a main aim of the Bern Convention on the Conservation of European Wildlife and Natural Habitats. This includes a focus on endangered and vulnerable plant species in order to limit the exploitation of these, as well as on restoration of plant communities (CCWNH 1979). The present paper presents the state and dynamics of Ukraine's wild plant resources, focusing on economically valuable species.

Wild-growing herbs and medicines produced from them have considerable impact on the preventive and effective treatment of many diseases in Ukraine, especially in the combined treatment with synthetic medicines. Herbal medicines are particularly useful for cardiovascular, gastro-enteric, and respiratory diseases and in rehabilitation after disease. At present about 20% of the drugs authorized by the Ukrainian

Ministry of Health (termed 'official medicine' and described in the State Pharmacopoeia and separate Pharmaceutical Regulations) are produced from raw materials of medicinal plants and almost 50% contain biologically active substances from plants (Minarchenko 2000).

Research has been carried out for more than 30 years in Ukraine on the distribution and state of the wild-growing plant resources and so far more than 80 scientific works have been published. Of major interest are the "Atlas of herbs of Ukraine" (Minarchenko & Tymchenko 2002) and the monograph "Vascular herbs of Ukraine: medicinal and resource value" (Minarchenko 2005). Partly in consequence of this, Ukraine has developed legislation directed at the regulation of use and protection of plant resources.

Overview of the medicinal plants of Ukraine

The vascular plant flora of Ukraine enumerates 6 086 species (including native, introduced, adventive, and some cultivated). Of these, 2 223 species contain biologically active agents and are, or can, be used for medicinal purposes (Minarchenko 2005). At the moment 202 species are considered rare and are listed by the Red Data Book of Ukraine (Didukh 2009). The following world-famous medicinal plants are listed: *Adonis vernalis* L., *Allium ursinum* L., *Asphodeline lutea* (L.) Reich., *Asplenium adiantum-nigrum* L., *Atropa belladonna* L., *Colchicum autumnale* L., *Galanthus nivalis* L., *Gentiana lutea* L., *Glycyrrhiza glabra* L., *Lycopodium annotinum* L., *Rhodiola rosea* L., and all species of the family *Orchidaceae*. A total of 102 species of medicinal plants are regionally rare, they are protected at the regional level and collecting their raw materials from the wild is banned in designated regions. Some of the species are rare in all regions, e.g. *Anemone sylvestris L.*, *Hypericum humifusum* L., *Polemonium caeruleum* L. Other species, such as *Convallaria majalis* L., *Ledum palustre* L., and *Alnus incana* (L.) Moench, are rare in some areas while in others they constitute a relatively abundant and valuable raw resource.

Altogether 1 217 species of the Ukrainian wild medicinal plants are of limited economic importance. More than 50% of them have widespread geographical distribution but grow scattered or occasionally, and though there are no destructive impacts on their habitats their populations do not supply raw material for production of, e.g. medicine. These species include: *Agrostemma githago* L., *Althaea officanalis* L., *Consolida ajacis* (L.) Schur, *Nigella arvensis* L., *Thalictrum aquilegifolium* L., *Berberis vulgaris* L., *Glaucium corniculatum* (L.) J. Rudolph, *Fumaria officinalis* L., *Gypsophila acutifolia* Fish. ex Spreng, *Melandrium album* (Mill.) Garcke, *Silene chlorantha* (Willd.) Ehrh., *Pyrola media* Sw., *Bryonia alba* L., *Thymus marshallianus* Willd. and many other medicinal plants. About 10% of the medicinal plants listed by the Flora of Ukraine are characterized as alien (introduced) and cultivated plants.

***Arnica montana* in the Ukrainian Carpathians (about 1400 meters above sea level). Photo: V. Minarchenko**

With integration into the World economy the Ukrainian medicinal plant cultivation faced a crisis and amounts harvested decreased 10-20 times compared to the 1980s, where hundred of tonnes were harvested. Today, about 10–20 species and varieties of medicinal and aromatic plants are cultivated in considerable quantities. These include: *Althaea officinalis* L., *Calendula officinalis* L., *Echinacea purpurea* (L.) Moench., *Lavandula angustifolia* Mill., *Matricaria recutita* L. , *Mentha piperita* L., *Salvia officinalis* L., and *Thymus vulgaris* L.

Approximately 20-25% of the wild medicinal plants of Ukraine provide valuable raw material. This includes species with both large distribution and some growing within a single natural zone, but

with highly productive populations. Only about 200 plant species in Ukraine are used by the official medicine; almost twice as many provide raw materials for homoeopathic preparations. The raw materials of 20-30 species are used in large amounts (more than1 tonne) as a source of biologically active agents (plants which are sources of antioxidants, tocopherols, carotenoids, flavanoids and other useful substances) (Minarchenko & Tymchenko 2002). The folk (traditional) medicine of Ukraine uses the raw material from over one thousand species of vascular plants.

Resources

The condition of the raw material resources of wild medicinal plants depend on their biological potential (intensity of reproduction, coenotic activity, raw productivity, etc.), the availability of areas suitable for their growth, and the level of human pressure on them. The harvesting of wild plant resources depends on market demand and the state of their resources. The need for medicinal plants, especially for species having radioprotective and anti-inflammation effects, is constantly rising despite continued reductions in their natural basis. This is especially true for plants with limited distribution and resources, such as *Primula veris* L., *Pulmonaria officanalis* L., and *Rhodiola rosea* L.

A substantial reduction in the availability of many useful species in the Ukrainian flora (with the exception of synanthropic medicinal plants) is caused by: (i) continuous overharvesting of many valuable medicinal plant resources, (ii) increased farming on their native habitats, (iii) large concentration of the resources within areas contaminated by the Chernobyl accident, and (iv) devastating draining of swamplands, especially in forested regions.

The medicinal plants resources in Ukraine have been monitored by the M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine since the late 1970s, including the state and trends in populations and resource availability, and reasons for these. Evaluation of the state and trends of the dynamics for medicinal plant resources used methods developed on a geobotanical basis (Minarchenko & Sereda 2005) and recommendations for rational and sustainable medicinal plant use have been developed. As part of this endeavour the wild medicinal plants of Ukraine, which are officially used as raw materials for medicine and pharmaceutical purposes, are divided into five categories based on the state of the resources (Table 1).

Table 1. State-of-resource categories for Ukrainian medicinal plants.

1. Protected. Regionally rare species and threatened populations (if exploited). Preventive measures for protection are: prohibited harvesting in natural habitats, protection of habitats (*Melittis sarmatica, Arctostaphyllos uva-ursi*).

2. Endangered. Species for which resources tend to decrease due to environmental changes in their habitats. They have limited distribution and restricted resources (*Acorus calamus, Ledum palustre, Menyanthes trifoliata, Oxycoccus palustris*). Preventive protection measures are: limiting the use, preservation of habitats by reducing human pressure.

3. Disturbed. Species for which resources are limited due to small geographical area of habitats or low productivity of populations (*Convallaria majalis, Potentilla erecta, Origanum vulgare, Vaccinium uliginosum, Valeriana officinalis)*. Preventive measures: similar to those for category 1.

4. Limited. Species that have significant resources but a limited distribution (*Crataegus spp.,Frangula alnus, Helichrysum arenarium, Hypericum perforatum, Thymus serpyllum*). Preventive measures are: regulation of the use from the natural environment, decrease of human pressure.

5. Prospective. Species that have significant distribution and resources (most species of synanthropic flora; *Sambucus nigra, Alnus glutinosa* ets.). Preventive measures of protection: adhering to the rules of gathering raw materials.

Only some medicinal plants are available in large quantities (category 5, Table 2) and do not require use of preventive measures of protection. One of the ways to increase the resource basis for medicinal plants is their cultivation. However, cultivation of many medicinal plants is economically inefficient, and therefore conservation should be focused on restrictions of their use and protection of habitats.

Some aspects of use

The use of medicinal plant raw materials in Ukraine has decreased since the 1970s and 80s, where

TABLE 2. Status of medicinal plants in Ukraine by resource and harvesting categories (MINISTRY OF ENVIRONMENT OF UKRAINE 2002-2005, unpublished data).

Species	Resource category[1]	Harvest category[2]	W/C[3]
Achillea millefolium	5	L	W+C
Acorus calamus	2	A	W
Agrimonia eupatoria	4	Mi	W
Alnus glutinosa (+A. incana)	5	A	W
Althaea officinalis	3	A	W+C
Arctium lappa (+A. tomentosum)	3	A	W+C
Arctostaphyllos uva-ursi	1	-	W
Arnica montana	1	M	W
Artemisia absinthium	5	A	W
Asarum europaeum	3	M	W
Astragalus glycyphyllos	3	M	W
Berberis vulgaris	2	M	W
Betonica officinalis	3	M	W
Bidens tripartita	4	L	W+C
Bryonia alba	2	M	W
Calluna vulgaris	5	M	W
Capsella bursa-pastoris	4	A	W
Centaurium erythraea	3	Mi	W
Chamerion angustifolium	4	Mi	W
Chelidonium majus	5	A	W
Cichorium intybus	4	M	W+C
Comarum palustre	3	M	W
Convallaria majalis	3	A	W
Cotinus coggygria	5	A	W+C
Crataegus monogyna (+ C.oxycantha+ C. sanguinea)	4	L	W
Datura stramonium	2	M	W+C
Digitalis grandiflora	2	M	W+C
Ephedra distachya	1	M	W
Equisetum arvense	5	L	W
Eryngium campestre	3	M	W
Euphrasia stricta (+E. rostkoviana)	3	M	W
Filipendula ulmaria	3	Mi	W
Fragaria vesca	4	Mi	W
Frangula alnus	4	L	W
Galega officialis	2	M	W+C
Gnaphalium uliginosum	3	Mi	W
Hedera helix	1	M	W
Helichrysum arenarium	4	L	W+C
Hepatica nobilis Mill.	2	M	W
Herniaria glabra	3	M	W
Humulus lupulus	3	A	W+C
Hypericum perforatum	4	Max	W+C
Hyoscyamus niger	2	M	W+C
Hyppophae rhamnoides	5	A	W+C
Inula helenium	1	M	W+C
Juniperus communis	3	M	W
Juniperus sibirica	3	M	W
Lamium album	4	M	W
Ledum palustre	2	M	W
Leonurus cardiaca (+L. Quinquelobatus Gilib. (L. villosus)	4	Max	W+C
Lepidoteca suaveolens (Chamomilla suaveolens)	3	M	W
Linaria vulgaris	3	M	W
Lycopodium clavatum	2	M	W
Lythrum salicaria	4	M	W
Matricaria recutita (Chamomilla recutita)	5	Max	W+C
Melilotus albus (+M. officinalis)	5	A	W+C
Melittis sarmatica	2	M	W
Mentha longifolia	4	Mi	W+C
Menyanthes trifoliata	2	M	W
Nigella arvensis	3	M	W+C
Nuphar lutea	2	M	W
Nymphaea alba	2	M	W
Ononis arvensis	3	Mi	W+C
Origanum vulgare	4	A	W+C
Oxycoccus palustris	2	A	W
Pulmonaria officinalis	3	M	W
Quercus robur	5	Max	W
Rhamnus cathartica	3	M	W
Robinia pseudoacacia	4	Mi	W
Rubus caesius (+R. nessensis)	5	L	W
Rubus idaeus	4	L	W
Saponaria officinalis	3	M	W
Sambucus nigra	5	A	W
Sanguisorba officinalis	2	M	W
Sedum acre	3	M	W
Sedum maximum	3	M	W
Solidago canadensis	5	Mi	W
Sophora japonica	4	Mi	W
Sorbus aucuparia	4	A	W+C
Symphytum officinale	3	M	W
Tanacetum vulgare	4	A	W
Taraxacum officinale	4	A	W+C
Thymus serpyllum	4	A	W
Tilia spp	4	L	W
Tussilago farfara	4	L	W
Urtica dioica	5	L	W
Urtica urens	3	M	W
Vaccinium myrtillus	4	Max	W
Vaccinium uliginosum	3	Mi	W
Vaccinium vitis-idaea	3	M	W
Veratrum album (+V. lobelianum)	2	M	W
Verbascum phlomoides(+V. thapsus)	4	M	W
Valeriana officinalis L.	3	M	W+C
Veronica officinalis	3	M	W
Viburnum opulus	3	M	W+C
Vinca minor L.	2	M	W
Viola tricolor	4	L	W+C

[1]For Resource categories refer to TABLE 1.
[2]Harvest categories: - = no harvest; M = minimum, <0,1 t per year; Mi = minor, 0,1-1 t/ year; A = average 1.1-10.0 t/ year; L = large, 10.1 – 50 t/year; Max = maximum, > 50 t/year.
[3] Wild harvested (W) and/or cultivated (C)

the medicine and pharmaceutical industry used considerable amounts of raw materials from more than 80 wild plants and hemerophytes. The decline is partly a consequence of a reduced medicinal plant resource base as many plant species were overused and the natural ecosystems transformed. In 1980 about 17 thousand tonnes of raw materials from 68 species of medicinal plants (including 15 cultivated) were used. In 1990, 10 thousand tonnes from 60 species of medicinal plants (including 17 cultivated) were used, and in 1999 this had decreased to 1 thousand tonnes from 44 species (including 17 cultivated). In the early nineties more than 85% of the medicinal plant raw material was harvested from natural plant communities - in 1999 this proportion had decreased to 60% and in this year nearly 600 tonnes of raw materials from wild medicinal plants and almost 400 tonnes from cultivated plants in specialized farms were prepared. As natural stocks are continuously decreasing the proportion of raw materials from wild sources is declining. The demand for medicinal plant raw material of the Ukrainian pharmaceutical industry remains high, and the problem of declining supply is partially solved by import or augmentation of cultivated raw materials (Minarchenko 2005).

Legislation and mechanism of regulation

Unlike in Bulgaria, Ukraine does not have a uniform law on the use and conservation of medicinal and food plants (Evstatieva et al. 2007). The use and protection of the wild flora is governed by several legal instruments: the Constitution of Ukraine (GoU 1996, N 30 art. 141), the Laws on Environmental Protection (GoU 1991, N 42 art. 546), on Plant world (GoU 1999, N 22-23 art. 198), on Nature Reserve Fund of Ukraine (GoU 1992, N 34 art. 502) in areas of natural reserve fund, and by the Law of Ukraine on the Red Data Book of Ukraine (GoU 2002a, N 30 art. 201). A number of regulations in the use and protection of plants are covered by the Forest (GoU 1994, N 17 art. 99), Water (GoU 1995, N 24 art. 189) and Land (GoU 2002b, N 3-4 art. 27) Codes. Various aspects of liability for damage inflicted upon the environment, including plant resources, are covered by the Civil and Criminal Code of Ukraine (GoU 2001, N25-26 art. 131). The existing regulations are implemented through specific mechanisms which are elements of the overall strategy and sustainable use of plant resources of Ukraine.

A significant contribution to the protection and sustainable use of plant resources is adopted in the 1999 Law of Ukraine on Plant world (GoU 1999), and a number of subordinate legislations governing use and reproduction of natural plant resources, including the medicinal plants resources. In the Law on Plant world it is noted that plant resources are divided into resources of national and local significance. The natural plant resources of national significance include:

a) The objects of flora within: inland waters, the continental shelf and exclusive (maritime) economic zone of Ukraine; surface waters (lakes, reservoirs, rivers, canals) which are located and used in more than one area (oblast); and the Natural and Biosphere reserves, National parks, botanical gardens, and dendrological parks of national significance.

b) Forest resources of national importance.

c) Rare species and those that are threatened with extinction (vascular plants, mosses, algae, lichens and fungi species which are listed in the Red Data Book of Ukraine).

d) Rare species and those endangered species and types of natural plant communities that are listed in the Green Book of Ukraine.

Resource estimation: *Thymus serpyllum*. Photo: V. Minarchenko

The harvesting of plant resources of national significance is regulated by the Ministry of Environment of Ukraine. Use of the wild resources of local value (wild vascular and other non-wood

and non-agricultural plants, mosses, algae, lichens and mushrooms which do not to belong to natural resources of national significance) is governed by local authorities. The harvesting of wild medicinal and other valuable plants is categorised as either "general" or "special" use of plant resources.

The general use of plant resources is the gathering of wild plants for personal consumption (i.e. non-profit); this includes gathering of flowers, berries, fruits, mushrooms, etc. The legislation of Ukraine guarantees citizens the right to the general use of natural plant resources in order to meet vital needs without the need for collection permits or payment of fees. The collection of species listed in the Red Book of Ukraine and species under regional protection is prohibited. The special use of natural resources includes all commercial use (extraction, gathering, etc.) from the natural environment. This use requires special permits and (or) other documents, is subject to limitations on amounts, and usually involves a fee. The purchase of unlicensed vegetable raw material is illegal.

State regulation of the natural resources of medicinal and other useful groups of plants involves setting limits on the use of these resources. The administrative authority approves the list of useful plants for exploitation as well as the permitted quantity of harvest, and issues a list of species for which use is prohibited. Both lists are revised annually. The accounting of the medicinal plant natural resource base should be updated at least once every five years to allow for updated estimates of annual allowable harvest amounts taking into account the dynamics of the resource under exploitation (Minarchenko & Sereda 2005).

In order to ensure the sustainable use and optimise the production of medicinal and other useful plants in Ukraine, the creation of the State plants Cadastre with the use of geo-information technologies was initiated. The structure of this Cadastre includes three main sections: flora, vegetation and plant resources. The information for cadastres is provided by academic institutions engaged in relevant research and the main institution conducting and coordinating such research is the M.G. Kholodny Institute of Botany of the National Academy of Sciences of Ukraine. The studies of plant resources are made based on the administrative (in the context of administrative areas) or regional (in the context of separate natural areas) principle. Maintaining the natural resource accounting includes the execution of:

- Identification of specific areas (regions), where the inventory will be conducted, processing official and literary materials that contain information about the flora, fungi, plant communities and plant resources of certain territory.
- Accounting diversity of objects, identifying their main characteristics directly in the natural environment.
- Analysis of data obtained during the field works, determination of their qualitative and quantitative characteristics, including setting allowable harvestable amounts by species, and analysis of the determining factors that threaten their existence of the natural resource in a transformed environment.
- Maintaining and updating the online database of flora, plant communities and resources, summarizing the received information, and publication of the materials of the State Cadastre.

For a detailed study of all objects of flora and their natural resources, including fungi, lichens, algae, moss, and vascular plants, a long time period, a large number of skilled professionals, and considerable expenses are required. Therefore, the State Cadastre has both primary and future tasks. The primary task is largely determined by the Law on Plant world: "Government accounting and inventory of the plant world is to take account of quantitative, qualitative and other characteristics of natural plant resources, scope, nature and mode of their use, as well as for systematic monitoring of the qualitative and quantitative changes in the plant world" (GoU 1999, Article 38). As of 2005 the main coordinating body for the establishment and maintenance of the State Cadastre of the plant world is the Ministry of Environment of Ukraine. At the time of establishment a structure of an electronic version of the Cadastre was designed in which were included the basic data and the methods for accounting of flora, vegetation and plant resources for purposes of the Cadastre. Regional investigations of the flora, vegetation and

non-wood plant resources are currently carried out on a periodical basis.

Conclusion

Recently in Ukraine increasing attention is devoted to the sustainable use of natural plant resources; therefore, the collection of wild-growing medicinal plants is strictly monitored and annual limits on use of raw materials from certain plant species are prepared at the national and local levels. These limits, according to the legislation of Ukraine, are established on the basis of species-wise estimation of the condition of the natural resources (Minarchenko & Sereda 2005).

The studies of wild medicinal, food and aromatic plants in Ukraine are carried out in the following directions:

- Identification of species diversity.
- Estimation of the resources of raw plant material.
- Studies of the dynamics of resources and populations of the species with limited distribution.
- Development of an institutional basis for governing the use and protection of the natural resources.
- Development of programs and textbooks for studying the plant resources.
- Introduction and cultivation of medicinal plants.

Except for the last two, these are developed at the M.G. Kholodny Institute of Botany.

References

CCWNH (Convention on the Conservation of European Wildlife and Natural Habitats.- Bern). (1979): http://conventions.coe.int/treaty/en/Treaties/Html/104.htm

Didukh, Y.P. (Ed.) (2009): Red Data Book of Ukraine. Flora. – Ukrainian Scientific Publishers, Kyiv, Ukraine. 900 pp.

Evstatieva, L., Hardalova, R. et al. (2007): Medicinal plants in Bulgaria: diversity, legislation, conservation and trade. *Phytologia Balcanica,* 13 (3): 415–427.

GoU (1991): Law of Ukraine "On protection of natural environment". Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (1992): Law of Ukraine " On Nature Conservation Fund of Ukraine" with amendments. Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (1994): Forest Code of Ukraine. Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (1995): Water Code of Ukraine. Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (1996): Constitution of Ukraine. Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (1999): Law of Ukraine "On the Plant World". Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (2001): Criminal Code of Ukraine. Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (2002a): Law of Ukraine "On the Red Book of Ukraine". Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

GoU (2002b): Land Code of Ukraine. Vidomosti of the Verkhovna Rada of Ukraine. Government of Ukraine, Kyiv.

Minarchenko V.M. (2000): Medicinal plant resources in Ukraine. – In: Medicinal plants in Ukraine, Baydia Books, Melbourne, Australia. pp. 3-7.

Minarchenko V.M. (2005): Medicinal vascular plants of Ukraine (medicinal and resource values). – Ukrainian Scientific Publishers, Kyiv, Ukraine. 324 pp.

Minarchenko V.M. & Sereda P.I. 2005. Evaluation of resources. Medicinal plants. – Ukrainian Scientific Publishers, Kyiv, Ukraine. 70pp.

Minarchenko V.M & Tymchenko I.A. (2002): Atlas of medicinal plants of Ukraine. – Ukrainian Scientific Publishers, Kyiv, Ukraine. 172 pp.

Valentyna Minarchenko • Head of the laboratory of plant resources • M.G. Kholodny Institute of Botany • National Academy of Sciences of Ukraine • 2 Tereshchenkivska Str. • Kyiv-1, 01601 • Ukraine • valminar@ukr.net

The new FairWild standard – a tool to ensure sustainable wild-collection of plants

Wolfgang Kathe

In August 2010, the FairWild Foundation published version 2.0 of the FairWild Standard (FairWild 2010a). This is not just a new version, but an outstanding new document: the world's most comprehensive international sustainability standard that focuses exclusively on the sustainable wild collection of plants, fungi and lichens.

To understand the scope and significance of the new standard, it is useful to go back in time for a minute. FairWild originates from an initiative started by the IUCN-SSC Medicinal Plant Specialist Group, WWF, TRAFFIC and the German Federal Agency for Nature Conservation (BfN). These four organizations decided, in 2004, to take action to address the increasing threat to medicinal plant populations world-wide. Very rough estimates show that about 70 000 plant species are used for medicinal and/or aromatic purposes, the majority of which are still collected from the wild. About 15 000 of these species have become threatened in at least parts of their natural habitats (Schippmann et al. 2006). Amongst other factors, habitat destruction through land conversion or unsustainable land management and over-collection contribute to this negative development. As a first step, the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) was developed between 2005 and 2007 (IUCN & MPSG 2007).

This standard focused on conservation aspects and ecological parameters that are influenced by wild collection and its management. Some basic social and cultural principles and criteria, such as the respect of customary rights, were included from the beginning. Certification was not the main aim of the standard, but only one of several options for implementation. Others were resource management guidance for collection managers and companies, influencing private sector good practice standards, and informing the regulatory and legislative processes of countries, states, or other political entities.

In late 2007, the Swiss Import Promotion Programme SIPPO (a mandate of the Swiss State Secretariat for Economic Affairs SECO), the Institute for Marketecology (IMO) and Forum Essenzia, which had also been part of the ISSC-MAP development process, decided to widen the scope of application by developing a fair trade standard for the wild collection of plants. Wild collected commodities had been insufficiently covered by other fair trade standards, such as those of the Fairtrade Labelling Organization (FLO) or organic standards for wild collection. The charismatic name of the new standard – and later on also the name of the foundation - combined the core aspects (fair trade and wild collection) into a single, catchy word: FairWild.

Unlike the ISSC-MAP, FairWild was designed from the beginning as an exclusive certification standard; it did not focus on medicinal plants but included all wild collected plants, lichens and fungi. The basic structural design of the ISSC-MAP was copied but the content (except for the principle on customary rights) was replaced by social and fair trade principles and criteria. The first FairWild certifications started in 2008. After the successful testing and implementation of both ISSC-MAP and FairWild the participating organizations, namely the IUCN-SSC Medicinal Plant Specialist Group, WWF, TRAFFIC, BfN, IMO, SIPPO, Forum Essenzia, the Indian Foundation for Revitalization of Local Health Traditions (FRLHT), and Traditional Medicinals® came together in 2009 to discuss potential synergies of the ISSC-MAP and FairWild. It soon became clear that both initiatives would hugely benefit from joining forces. The ultimate advantage: this would offer the chance to develop a true sustainability standard for the wild collection of medicinal plants, but also other plant, lichen and fungi species. Consequently, both initiatives merged in early 2010 under the umbrella of the Swiss FairWild Foundation. The mission

of this foundation is 'to provide a worldwide framework for implementing a sustainable, fair and value-added management and trading system for wild-collected natural ingredients and products thereof' (FairWild Foundation 2010b)

Wild collection of *Hypericum perforatum* in Macedonia. Photo: W. Kathe

The integrated FairWild Standard version 2.0 published in August 2010 combines the two original standards (ISSC-MAP and FairWild); the new standard constitutes the FairWild Foundation's main asset. The foundation offers a comprehensive portfolio of services. These range from certification according to FairWild (through accredited third party certification organizations) to providing training to companies and wild collection operators on how to best implement the standard and transform their sourcing practices into sustainable enterprises. Public information and PR as well as advocacy work influencing national and international policy makers to consider the principles of FairWild in guidelines, regulations and good practice documents are further key activities and functions of the FairWild Foundation.

Eleven principles form the framework of the new FairWild standard. These principles are further defined by criteria and performance indicators. They provide guidance and set control points on:

1) Ecologically sound collection
2) Social responsibility of the operation
3) Economically viable business practices
4) Respect of customary rights
5) Fair trade relationships, including the payment of a fair price and a FairWild Premium for social community investment

The most important challenges and prerequisites for the establishment of sustainable collection are adequate resource assessment / monitoring and appropriate resource management. Being aware that the provisions of a standard alone are often insufficient to provide useful support, additional guidance documents were developed that help resource users carry out resource assessments and develop a management plan.

Practice shows that it is not feasible to apply the same methods and level of rigour to all species for which a sustainable FairWild collection system is being established - the parameters that have to be taken into consideration are too different. Habitat specificity of species, plant parts harvested, regeneration patterns, population dynamics and abundance, harvest practices, and many other factors have an influence on the rigour that needs to be applied to resource assessment and sustainable yield calculations. For this reason, a risk categorization system has been developed. Based on the risk category requirements for resource assessment, monitoring and management can be adapted.

In the past three years, FairWild (including its predecessor standards) has been implemented in many different countries and collection situations. Between 2007 and 2010, a project called 'Saving Plants that Safe Lives and Livelihoods' (Kathe et al. 2010) (financed primarily by the German Federal Ministry for Economic Cooperation and Development BMZ, and carried out by WWF and TRAFFIC) was implemented in Southeast Europe, Cambodia, India, Nepal, Lesotho and Brazil. Hundreds of collectors in the project regions depend on the wild collection of plants. Many are organized in groups, often based on local community structures (e.g. in South Asia). Care was taken that community user groups and their members were trained in all important aspects of standard implementation and prepared to take over management responsibilities. However, for most of these projects certification was no, or at least not an obvious, option; the focus of implementation was resource assessment and management. One of the

projects even used the standard and management planning guidance as tools for the CITES non-detriment finding process - *Pelargonium sidoides* in Lesotho and South Africa (FairWild Foundation 2010c).

The FairWild Foundation and IMO are particularly active in Central Asia and the Caucasus region, where projects on FairWild training and implementation are being carried out together with the German Agency for Technical Cooperation GTZ and the private sector. Meanwhile, several projects are certified according to FairWild, mostly in East and Southeast Europe.

The lichen *Parmelia* sp. collected from the wild in Northern India. Photo: W. Kathe

While FairWild implementation has shown, within only about three years, that it is a very valuable and promising tool to make wild collection sustainable, there are a number of challenges that will have to be overcome in the future. Of course it is great to have a comprehensive sustainability standard available, but not all operators will be interested in, or have a market for, fair trade products. An operator may fulfill the social responsibility requirements but may not necessarily be able to cover above-market (fair trade) prices and premiums because clients will not pay a higher price if certification does not result in added market value. This poses a hurdle, particularly to small companies that may not have the financial means for extra investment based on ethical principles alone. Standard implementation may meet resistance if wild collection is undertaken in a region or a social environment in which a fair trade system cannot reasonably be applied because the potential beneficiaries (collectors, workers) are comparatively rich and further financial support would be perceived as unfair. In such cases, the ecological principles of the FairWild Standard can still be implemented, but certification will currently not be possible because compliance with the entire standard is required.

While the uniqueness of FairWild with its exclusive focus on wild collection is an asset highly appreciated by some operators, it can become a disadvantage for companies that manufacture products based on raw material sourced from both wild collection and cultivation (e.g. tea or spice mixtures). Usually, companies prefer to work with as few certification schemes as possible, because each new scheme requires extra capacity and investment. This can be overcome to some degree if FairWild manages to establish cooperation and mutual equivalency agreements with other organizations holding important and meaningful fair trade or ecological sustainability standards.

Despite these limitations, FairWild is an exciting and very promising initiative that is unique in its combination of care for nature and care for humans. It formalizes what we all should be more aware of: as humans we are part of nature; our lives – and survival – is so intrinsically woven into natural cycles that we must re-consider how we treat our environment. Economic principles only work in the long run if we measure them with rigorous sustainability criteria; otherwise, they tend to reflect the desire for instant profit, to which there is, inevitably, a downside and a re-payment to be made. It may not be us, but our children, who have to face this downside. And perhaps this is one of the greatest benefits of FairWild: while there is a lot of talk about sustainability and responsibility for future generations, FairWild has provided an implementable and measurable tool to transform sourcing of plants from the wild into an enterprise that does protect the plants and their habitats through using them in a responsible way. Its intention is not to prevent collection, on the contrary; if we realize and manage to demonstrate that responsible harvesting from the wild provides extra value to us, it will also give extra value to the natural habitats and support their struggle for survival against proceeding land conversion. Trustworthy

certification additionally conveys the message that wild collectors and their communities are – just like responsible farmers – conscious care-takers of their land. If we follow the FairWild principles, collectors should receive better payment and their work as well as a higher level of recognition, which in turn creates incentives for them to continue sustainable wild collection. There is hardly any better incentive than that, if we want to protect the resources and habitats for future generations. This is FairWild's most promising perspective. It will need the support of us all to succeed in a world in which volatile share value seems to prevail over long term survival.

Good luck, FairWild!

References

FairWild Foundation (2010a): FairWild Standard: Version 2.0. – FairWild Foundation, Weinfelden, Switzerland. 8 pp. http://www.fairwild.org/publication-downloads/fairwild-standard-ver-20/FairWild-Standard-V2.pdf

FairWild Foundation (2010b): About FairWild. – [Online material] FairWild Foundation, Weinfelden, Switzerland. http://www.fairwild.org/background/

FairWild Foundation (2010c): FairWild and CITES. – [Online material] FairWild Foundation, Weinfelden, Switzerland. www.fairwild.org/international-legal-agreements.

IUCN & MPSG (2007): International standard for sustainable wild collection of medicinal and aromatic plants (ISSC-MAP). Version 1.0. BfN-Skripten **195**, Bundesamt für Naturschutz, Bonn, Germany. 36 pp.

Kathe, W., Pätzold, B. et al. (2010): Wild for a cure: ground-truthing a standard for sustainable management of wild plants in the field. – TRAFFIC International, Cambridge, UK. 44 pp.

Schippmann, U., Leamann, D. et al. (2006): A comparison of cultivation and wild collection of medicinal and aromatic plants under sustainability aspects. – In: Bogers, R.J., Craker, R.E. et al. (Eds.): Medicinal and aromatic plants. Springer, Dordrecht, the Netherlands. pp. 75-95.

Wolfgang Kathe • giraglia@arctictern.de

Access and Benefit Sharing under the Convention on Biological Diversity – Update from CoP 10 in Nagoya

China Williams

Between 18th and 29th October 2010 over 7 000 participants met in Nagoya, Japan for the tenth meeting of the 193 Parties to the Convention on Biological Diversity (CoP10). One of the most significant decisions came, literally, at the midnight hour, when at 1.30 am on 30 October the CoP finally adopted a Protocol on Access and Benefit Sharing (ABS) – the Nagoya Protocol. (www.cbd.int/nagoya/outcomes/)

Brief Background to ABS in the Convention on Biological Diversity

Article 15 of the CBD

The third objective of the Convention on Biological Diversity (CBD), the fair and equitable sharing of benefits from the use of biological diversity was fiercely promoted by developing countries and inserted at the Rio Earth Summit in 1992. It recognises that countries need resources and incentives to develop sustainably, and to conserve biological resources. Most importantly it reveals the grand bargain at the heart of the CBD – the exchange, on mutually agreed terms, of access to genetic resources and associated knowledge in return for the fair and equitable sharing of benefits. The ABS provisions are laid out in more detail in Article 15 of the Convention. This Article creates a framework for Parties to develop national legislation to ensure that genetic resources are collected and used: according to national law; with the prior informed consent of the provider, and on mutually agreed terms that promote the fair and

equitable sharing of benefits arising from their use.

These provisions have always been key to the success of the Convention, and contentious too. As the CBD moved from creation to implementation it became clear that they were a major sticking point in achieving the other goals of the Convention – conservation and sustainable use. While some countries quickly developed access legislation to implement Article 15 and control access, many others were less clear as to their obligations. Lack of clarity as to procedures to follow, little legal certainty for users and a lack of a compliance mechanism to give providers security that terms of access would be followed meant that progress stalled. Underpinning this was general confusion as to what terms used in the CBD actually meant. Fair and equitable benefit sharing is never defined – what do we mean by benefits? Are they monetary or non monetary? Whom should benefits be shared with and what amounts to fair and equitable? Parties felt they needed more guidance in establishing access legislation and procedure – if only to avoid the confusion of over a hundred different procedures! In response to this the Conference of the Parties established a Working Group on access and benefit sharing, and this group went on to draft the Bonn Guidelines to give advice to countries and stakeholders on how to regulate access and ensure benefits are shared fairly.

The Bonn Guidelines

The Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilisation (www.cbd.int/abs/bonn.shtml) were adopted by the CoP in April 2002. The guidelines are not legally binding but were adopted unanimously by over 180 countries to provide authoritative guidance to assist parties, governments and stakeholders in developing their ABS strategies. They are useful and practical – for instance, they outline steps in the process of negotiating access and benefit sharing provisions, include suggested elements for use in material transfer agreements, and provide a helpful list of monetary and non monetary benefits.

However, many parties quickly became dissatisfied with the 'voluntary' nature of the Bonn Guidelines, and what they saw as the unfair emphasis on development of national laws by countries *providing* genetic resources, as well as a lack of any compliance mechanism to ensure terms of access were adhered to. These *provider* countries (usually biodiversity rich developing countries) felt there was a need for action by the *users* of genetic resources, and more specifically their governments, to ensure they are following these national laws, obtaining prior informed consent, honouring mutually agreed terms of use, and ensuring benefits are shared. Following the World Summit on Sustainable Development in 2002, the CoP asked the Working Group to negotiate a new 'international regime' on Access and Benefit Sharing (www.cbd.int/abs/ir/)

An International Regime on ABS

Negotiations on the international regime started in February 2005 and the main issues dividing participants were apparent from the start. Firstly, the 'Nature' of the new regime – should it be legally binding or voluntary? As one of the main criticisms of the Bonn Guidelines was that they were voluntary, and consequently had no 'teeth', it was expected that the new Regime would aim to be legally binding. Secondly there has been huge debate on the 'Scope' of the new regime. What material should it cover? Should it stick with the terms of Article 15 and only cover access and use and benefit sharing of genetic resources? Or should the scope be expanded to cover biological resources, derivatives, and finished products? How should traditional knowledge be dealt with under the regime, and should there be facilitated access for conservation uses and research institutions? A huge issue was compliance, and much work has gone into looking at mechanisms for extra-territorial enforcement of national ABS laws. Many developing countries felt not nearly enough was in place to combat what they considered to be 'biopiracy'. This was really at the basis of the desire to create a fairer and truly 'international' regime. The ABS Working Group met on 12 occasions, with several other ad hoc technical groups, and a deadline was set for a Protocol on ABS to be finalised at CoP10 in Nagoya.

The Nagoya Protocol

The same old sticking points continued to slow progress in the last weeks of negotiations in Nagoya.

A huge amount hung on agreeing the Protocol, as a number of developing countries were not prepared to adopt the CoP's proposals for a strategic plan and finance mechanism without an agreed ABS Protocol. At some points, CoP10 seemed doomed to all out failure.

The Protocol was adopted in the final hours after a compromise text was produced by the Japanese chair and co-chairs of the working group that managed to bridge some differences and be acceptable to the Parties (delegates that expressed concerns when the Protocol was adopted in the closing plenary included the African Group, Venezuela, Cuba, the CEE and Bolivia). The main contentious points (the inclusion of derivatives and compliance), on which lack of agreement had threatened to sink the Protocol, were dealt with by general provisions allowing flexible interpretation by Parties. Consequently, a lot of provisions have been left more fluid than many would like and down to individual country implementation. Some countries were unhappy or dissatisfied with the final result, and felt it was not the 'viable regime against biopiracy' that they had been working for, but realistically prepared to accept it as the best result possible in the circumstances – or at least better than nothing. Ultimately the next few years of implementation will be crucial. For although the Protocol is agreed, its operational details remain to be fleshed out and will need to be discussed and agreed at the first Meeting of the Parties.

Key issues in dispute… and what happened:

Temporal scope

The proposal, largely by the African group, for an expanded temporal scope, i.e. to include material acquired before the CBD came in to force, was always going to be divisive. While Africa said there were moral obligations to share benefits for new/continuing uses of material accessed pre-CBD, others argued that this was too wide a scope and not legally feasible. The compromise solution was for the wording of the Protocol to remain silent on its temporal scope (Article 3), but to call on parties to 'consider a global multilateral benefit sharing mechanism' for benefits from pre-CBD genetic resources (Article 7).

ABS Timeline

- 1992 – CBD opened for signature
- 1993 – CBD comes into force
- 2001 – ABS working group drafts Bonn Guidelines
- 2002 – CoP6 adopts Bonn Guidelines
- 2002 – World Summit on Sustainable Development – call for new international regime
- 2004 – CoP7 sets terms of reference for international regime negotiations
- 2006 – CoP8 sets deadline for end of negotiations by 2010
- 2007 – 2009 Technical expert groups meet to discuss certificates of origin, legal terms and concepts, compliance and traditional knowledge
- 2008 – CoP9 adopts a roadmap for the negotiation of the IR before the 2010 deadline
- 2009 – 2010 ABS WG meets 5 times to negotiate text
- 2010 - CoP 10 Nagoya – The Nagoya ABS Protocol agreed

Derivatives

Many developing countries were insistent that derivatives be included in the scope of the new Protocol, arguing that many cases of biopiracy relate to the use of derivatives. Other country blocks, such as the EU, were equally insistent that derivatives be excluded. The eventual text is vague, to say the least: while derivatives and utilisation are given broad definitions in Article 2, Article 3, which sets out the regimes scope, makes no direct reference to derivatives being included. So we are not left much clearer as to where derivatives stand in the Protocol.

Scope/Regulation of Publically available TK

The Asian Group, among others, had been keen to include traditional knowledge that is publically available within the Scope of the new ABS regime. Several countries have national legislation reflecting this (Brazil for example). This was dropped at the last moment.

Compliance

Stricter compliance measures were a key negotiating position of provider countries, to achieve a degree of fairness and legal certainty. Over years of negotiations there was much discussion of the different forms compliance mechanisms could take at the national and international level. Some governments and NGOs had called for a 'disclosure requirement' in patent applications (that the use of genetic resources or TK should be disclosed when a patent is applied for), and some national laws have already begun to implement this. In the end the language in the Protocol tells parties to 'take appropriate, effective and proportionate measures to address situations of non compliance' (Article 12) and to 'establish one or more effective checkpoints' (Article 13). Again, much has been left to be worked out in national implementation.

Facilitated Access

Representatives of the scientific research community were active throughout the negotiations to promote the importance of biodiversity research in meeting the objectives of the CBD. Their case stated that conservation work could be delayed by overly complex access procedures and that Parties have an obligation to support biodiversity research. This could be achieved through simplified access procedures for non-commercial research. The agreed Article 6 (a) urges Parties to create conditions to promote and encourage conservation and research related to sustainable use, particularly in developing countries, including simplified access measures for non-commercial research purposes. Such measures should take into account the need to address a change of intent for non-commercial research.

Next steps for the Nagoya Protocol – putting it in to action

The Protocol is open for signature from 2 February 2011 to 1 February 2012. Representatives of Colombia, Yemen, Brazil and Algeria signed the Nagoya Protocol during the opening ceremony. It will come in to effect 90 days after the fiftieth ratification. The Protocol is widely expected to be adopted by October 2012.

In order to prepare for the first Meeting of the Parties the CoP has established an (Open ended Ad hoc) Intergovernmental Committee (IC) to guide the Protocol in tackling its huge and challenging work plan. The first meeting of the IC will be in June 2011 and the second in April 2012.

Conclusions

Ultimately, there were some issues that were never going to be agreed, and realistically the Protocol is probably as good as it could be. However, there is a huge amount of detail to be discussed and a huge way to go to put the Protocol into action and ensure that positive progress is made on the ground. While it is difficult to predict what the implications of the Protocol will be, it seems clear that we will see big changes over the next five or ten years. For the Protocol to be effective user countries will need to be seen to work hard at implementing measures to monitor use of genetic resources within their jurisdiction, and to ensure compliance with the national laws and regulatory arrangements of countries of origin of those genetic resources.

The Medicinal Plants community, in common with the scientific research community in general, is likely to see a huge increase in the need to track, monitor and document material used for research and the benefits shared as a result. New access procedures are likely to be introduced, and, as examples become more used, available and shared, more formal agreements (access and transfer) will probably be used in national access procedures and across all sectors. The Protocol applies to traditional knowledge associated with genetic resources within the scope of the Convention, and to the benefits arising from the utilisation of such knowledge (Article 3 of Protocol). Obligations to obtain PIC/MAT and share benefits with indigenous and local communities are likely to become more extensive. We will need to build the trust of provider countries to prove that we are capable of using material according to the terms of access, supplying to others on those terms and always going back for new PIC when there is change of use. We may see the introduction of more formal certificates of compliance in use in some countries we work in. We may see a clearer distinction between commercial and non-commercial use as countries implement facilitated access procedures, but trust is crucial to this. We will need to work closely with our governments to inform and ensure

decisions are made that we can implement on the ground.

The next phase is truly make or break – a trust building exercise where countries and stakeholder commitment will be harshly tested.

(For the detailed IISD report of all decisions of CoP 10 go to: www.iisd.ca/vol09/enb09544e.html)

China Williams • CBD Education Officer • Royal Botanic Garden • Kew • C.Williams@kew.org

CITES News: 15th CITES Conference of the Parties

Uwe Schippmann

The 15th CITES Conference of the Parties was held in March 2010 in Doha, Qatar. Fishery issues were high on the agenda. Many delegations and NGOs were concerned that none of the proposals to include some shark species on Appendix II and the Bluefin Tuna in Appendix I gained the necessary 2/3 majority of votes.

Plant issues were somewhat dwarfed by these heated debates over animal issues but nevertheless had better outcome: Two new plant species with medicinal trade components were included in Appendix II of CITES: *Aniba rosaeodora* proposed by Brazil and *Bulnesia sarmientoi* proposed by Argentina. In the run-up to the conference, IUCN and TRAFFIC prepared and released detailed analyses of all proposals to amend the Appendices (IUCN & TRAFFIC 2010):

• Brazilian Rosewood ***Aniba rosaeodora*** (also known as Pau-rosa and Palo de Rosa) is a slow-growing hardwood tree. It is one of about 40 members of the neotropical genus *Aniba* and occurs in dense primary wet tropical rainforest in Brazil, Colombia, Ecuador, French Guyana, Guyana, Peru, Suriname and Venezuela. The tree has been extensively felled to harvest its wood, which is rich in linalool oil and valued as a fragrance in top-of-the-range perfumes. *A. rosaeodora* wood is rarely used for timber purposes because of the high commercial value of its essential oil.

According to the IUCN and TRAFFIC review, Brazil is apparently the only producer of *A. rosaeodora* essential oil, which is derived almost entirely from natural stands. Current extraction methods require the tree's destruction. Typically, trees over 30 cm diameter at breast height and on average 30 to 35 years old are cut down due to the higher quality aroma allegedly obtained from older trees. Now smaller trees are also being harvested because of the shortage of readily accessible older *A. rosaeodora* trees. The species was assessed by IUCN as Endangered (A1d+2d) in 1998; this assessment is regarded as in need of updating. It was listed as Endangered in Brazil in 1992.

It is estimated that 15% of the oil is used in the perfume industry in Brazil, with the remainder being exported. A comparison of the volume of logs authorized for extraction done by IUCN and TRAFFIC indicates that a large proportion of the oil exported must have come from unauthorized felling. More than five times the raw material legally harvested would be needed for the total level of export reported in the period.

In recent years the USA has been the chief international buyer of oil, followed by France, Belgium and the UK. The oil is expensive, with advertised retail prices of up to ca. US$ 2 per ml in importing countries. Cheaper, synthetic linalool oil and Ho wood and leaf oils (*Cinnamomum camphora*) are substitutes for that obtained from *A. rosaeodora* in low price and mid- range perfumes, but *A. roseaodora* oil is still much in demand for fine perfumes because of its superior aroma.

Adulteration is reported to occur. It can only be detected by chemical analysis. The Brazilian Government has many laws and general measures designed to help conserve the species, and while there has been some success, there are difficulties in enforcing the regulations.

• ***Bulnesia sarmientoi*** (Palo santo) is a large, slow growing tree, reaching 10-20 m in height. It is confined to the Gran Chaco region in Bolivia, Paraguay, Argentina and a small part of Brazil. The Gran Chaco has been subject to land-use changes for agriculture and stock-farming and is intensively logged for timber and charcoal production. It has been estimated that between 1998 and 2006 at least 20 000 km^2 (2 million ha) of 'chaqueño' forest have been deforested in Argentina (IUCN & TRAFFIC 2010).

The wood of *Bulnesia sarmientoi* is heavy, very strong, and decay-resistant because of its resin content which also gives it aromatic properties. It has a wide range of uses including furniture or flooring. The essential oil derived from *B. sarmientoi* wood, known as "Guayacol", "Guajol" or "Guayaco" is used in the perfume cosmetics industry and in mosquito repellents.

According to the IUCN and TRAFFIC review, the destination of exports from Paraguay is primarily China. The main destinations for extract are said to be France and Spain. The extent of trade in essential oil or "Guayacol" for the perfume cosmetics industry is difficult to estimate although it appears to be met by exports from Paraguay.

Bulnesia sarmientoi shares the common names "lignum-vitae" and "guaiac" with the *Guaiacum* species, which were listed in Appendix II in 2003. *Bulnesia arborea* is also referred to by these names and can be used for the same purposes. Identification of *Bulnesia* to the genus level through wood anatomy is relatively straightforward; however, *B. sarmientoi* and *B. arborea* are almost indistinguishable at the macroscopic and microscopic level.

The new listings came into force June 23, 2010. They are a considerable challenge for enforcement staff because the commodities to be controlled are not easy to identify. Also, there are look-alike species in trade which need to be further explored. The CITES Plants Committee will focus on these issues in its meetings until CoP 16.

• Wild populations of ***Euphorbia antisyphilitica***, a succulent species listed in CITES Appendix II, are the only source of candelilla wax, an ingredient used in many finished cosmetic products, including lipstick. A tube of lipstick with this ingredient contains about 0.3 mg of candelilla wax (AHPA 2009). The United States and Mexico are the species' only range states.

While annotations for some CITES Appendix II species specifically exempt finished products packaged and ready for retail trade, no such annotation was provided for *Euphorbia antisyphilitica*. Without such an annotation, all international commerce in finished products that contain any amount of candelilla wax is subject to CITES export, import, and re-export requirements. The extent of such trade was not realised by CITES Authorities until 2008, when finished product units were subject to close scrutiny by enforcement agencies and a large number of confiscations occurred in CITES Parties.

A trade survey submitted by Germany at the 18th meeting of the Plants Committee provided a review of international trade in *Euphorbia antisyphilitica*, and stated: "After the candelilla wax has been legally exported and the raw commodity processed into finished products it seems to be without any conservation effect when re-export certificates and import permits would be necessary for consumer products" (Schneider 2009).

In considering annotations relating to medicinal plants, the following guiding principles were adopted already at CoP 13: (i) Controls should concentrate on those commodities that first appear in international trade as exports from range states; and (ii) controls should include only those commodities that dominate the trade and the demand for the wild resource.

In the spirit of these considerations a new annotation was adopted at CoP 15, especially tailored for the *Euphorbia antisyphilitica* case to exempt finished products that are packaged and ready for retail trade.

• Another important element on the agenda of CoP 15 was the so-called "**Non-Detriment Finding**" (NDF), carried out by exporting countries' CITES Scientific Authorities. This is an assessment of sustainable export levels for CITES species. A definition of sustainability in the use of wild plants and animals is still controversial among scientists, conservationists, users, and policy makers. The

IUCN as a global umbrella organization for conservation has tried for many years to establish and agree on technical criteria, but has failed several times. In the animal sector, debate is complicated by issues concerning animal welfare, and these hamper progress. For plants, the debate has been significantly advanced by the development of An International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP). In place 2007, the development of ISSC-MAP was coordinated by WWF, IUCN and BfN with many actors supporting its genesis.
CITES has tried to solve these issues by setting out in Article 4.2 (a) that the country of export of a CITES species must examine whether an export is "detrimental to the survival of the species". This term circumscribes what today would be phrased as "the collection must be sustainable". The term "sustainable", however, was still not common in the mid-1970s. Therefore, CITES representatives talk about the development of a Non-Detriment Finding or NDF.

Although this is probably the key issue to make CITES a success story, only little was done in the past 30 years to provide the CITES parties and their agencies with guidance as to how to do an NDF. This has changed since CoP 14 in 2007: the Plants Committee was requested to "develop principles, criteria and indicators on the formulation of non-detriment findings for priority taxa such as tree species, *Prunus africana* and other medicinal plants". In November 2008 a unique expert workshop was organised by Mexico, where information and experience on the methods by which one can formulate an NDF was exchanged (CITES 2010a, CITES 2010b, CoP 15 documents 16.2.2 and 16.3). At CoP 15, however, it became clear that the political support by the Parties was limited. The preparation of a resolution was not supported and it was decided that the issue will be re-negotiated at CoP 16. The reason for this reluctance is the fear among many Parties that the voluntary guidance provided today will later turn into binding regulations; they insisted on the sovereignty of their decision as they carry out an NDF. Many CITES Parties fear that they will be held to too high a standard and subject to constant criticism of their work. Confidence building is required in the NDF process in addition to the provision of scientific yet practical guidance.

A number of countries have made clear that the successes of CITES can only be secured by improved NDFs in the countries of origin and they favour a partnership approach. They believe that, technically, we are already in a position today to improve the sustainability of CITES exports and NDF making. This could take place through training and collaboration with those exporting countries that want to be strengthened in their decision making and therefore training modules need to be elaborated and implemented with an aim to give a feedback to CoP 16 in 2012.

References

AHPA (2009): International commerce and annotation for finished products containing candelilla wax derived from *Euphorbia antisyphilitica*. – Information document 17 presented at 18th meeting of

CITES Plants Committee. Retrieved from http://www.cites.org/common/com/PC/18/X-PC18-Inf17.pdf, viewed: 20.07.2010.

CITES (2010a): Report of the Animal and Plant Committees. – CoP15 Doc. 16.2.2. Fifteenth meeting of the Conference of the Parties Doha (Qatar), 13-25 March 2010. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Retrieved from http://www.cites.org/eng/cop/15/doc/E15-16-02-02.pdf.

CITES (2010b): Non-detriment findings for timber, medicinal plants and agarwood. – CoP15 Doc. 16.3. Fifteenth meeting of the Conference of the Parties Doha (Qatar), 13-25 March 2010. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Retrieved from http://www.cites.org/eng/cop/15/doc/E15-16-03.pdf

IUCN & TRAFFIC (2010): Analyses of the proposals to amend the CITES Appendices at the 15th meeting of the Conference of the Parties. IUCN, Gland. Retrieved from http://www.cites.org/eng/cop/15/inf/E15i-18A.pdf, viewed: 14.07.2010.

Schneider, E. (2009): Trade survey study on succulent *Euphorbia* species protected by CITES and used as cosmetic, food and medicine, with special focus on Candelilla wax. – Inf. Doc. 6

presented to the 18th meeting of the CITES Plants Committee. 41 pp. Retrieved from http://www.cites.org/common/com/PC/18/X-PC18-Inf06.pdf, viewed: 20.07.2010.

Uwe Schippmann • Bundesamt für Naturschutz • Uwe.Schippmann@BfN.de

Accessibility of wild products. Biodiversity for Food and Medicine indicators partnership.

TRAFFIC International and the IUCN/SSC Medicinal Plant Specialist Group.

Excerpt by Helle Overgaard Larsen

The 2010 Biodiversity Indicators Partnership (BIP) has developed indicators in 7 focal areas to monitor the progress towards the 2010 biodiversity target. This target is not being met (Butchart et al. 2010), and so continued importance of BIP is emphasised by the acknowledged need to build on and continue its work post COP10 (CBD COP10 decision 2.5). Within BIP focal area 4 "Ecosystem integrity and ecosystem goods and services", indicator 4.5.2 is "Biodiversity for food and medicine". The present paper provides information on the accessibility of medicinal plants excerpted from a report on indicator 4.5.2 including material concerning both wild meat and medicinal plants. Part of the results are published in 2010 Biodiversity Indicators Partnership (2010, 146-150).

Introduction

It has been estimated that in some Asian and African countries up to 80% of the population depends on traditional medicine for primary healthcare and about 25% of modern medicines are developed from plants that were first used traditionally (WHO 2008). The World Health Organisation (WHO) estimates that one third of the world's population has no regular access to essential modern medicines, a proportion that increases to one half in some parts of Africa, Asia and Latin America; at the same time, there are often rich resources of traditional remedies, and practitioners, in these regions (Bodeker et al. 2005). The increasing human population in the least developed countries (UN 2009) and the fact that a significant proportion of people in especially Africa are still living on less than a dollar a day, are factors likely contributing to further pressure on wild species through conversion of land, increased direct harvesting pressure, and other human-induced threats.

While reliance on traditional medicines is not optional for some, Ong et al. (2005) found that traditional/herbal medicines were as popular in high-income as in low-income nations, although it is likely that in high-income countries traditional medicines are used in conjunction with modern medicines; this raises concerns that the growing popularity of these traditional forms of healthcare in high-income countries may mean that, as a result of market forces, traditional medicines become less affordable in low-income countries, particularly if resources become scarcer as a result of meeting the demands of the high-income countries.

Rationale behind approaches to the food and medicine indicator

The initially approach to producing indicators of biodiversity for food and medicine focused on the changing status of species used for these purposes, as assessed by the IUCN Red List. It was found that birds and mammals used for food and medicines were more threatened than those that were not, and that the conservation status of these species was also deteriorating at a greater rate. Threats to the species used for food and medicine include over-exploitation and different pressures, such as habitat loss, invasive species, or a combination of factors. Regardless of the causes, the diminishing availability of these resources threatens the well-being of the people depending on them directly and of those who depend on them as a source of income.

Given the nature of BIP Focal area 4 a need was felt for the indicators to also reflect whether wild resources used for food and medicine were becoming more or less accessible to people.

To complement the global assessment of this indicator based on the IUCN Red List, primary data from selected countries were collected to investigate how the accessibility of species used for food and medicine was changing over time for poorer people. In order to assess the (changing) accessibility of these resources to people within the sampled countries, prices of wild products were contrasted with (i) prices of comparable marker products (staple foods and generic or "common manufactured" medicines), and (ii) a measure of income (Gross Domestic Product (GDP) per capita for the 10% poorest of the population), over time. Although wild meat and medicines are not always consumed by the poorest, affordability of these for the poorest will best be assessed using GDP data for this sub-section of the population. Of course price information alone cannot reveal whether there is more or less of a given wild resource accessible to people; price changes may be a result of changes in demand or supply for various reasons. In order to interpret price data in terms of wild resource sustainability, species population data would also be necessary.

Methods

Table 1. Nature and origin of population and income data.

Measure	Source	Notes
GDP (local currency, current price)	International Monetary Fund (IMF)	2010 data are based on IMF estimates.
% share of GDP for 10% poorest in population	UNDP reports	Figure for the nearest year to 2000 and 2010 used.
Population	IMF	2010 data are based on IMF estimates.
Official inflation rates	IMF national consumer price inflation rates	2010 data are based on IMF estimates.
Exchange rates	IMF	Calculated using IMF GDP current prices for 2000 and 2010 in national currency and US dollars

A "basket" of medicinal plant products and animals commonly used for food and medicines (Appendix 1) was selected from Latin America, Africa, and Asia - regions chosen for their high biodiversity. Countries chosen as sample representatives included: Mexico, Peru, Cameroon, Tanzania, South Africa, India, Viet Nam and China.

Markets in each country were selected and visited by a researcher between November 2009 and June 2010. Where possible, markets were selected on the basis that they sold all the targeted wild plant and animal species. However, in some cases, markets specialized in medicinal products or foods and therefore it was necessary to visit more than one market per country. Some markets were well established and fairly permanent, whereas others were highly informal; more so when the goods in question were in trade illegally in that country. Price data were collected from vendors at the market for a standard unit of the goods (a kilogramme, an individual). Ten vendors were surveyed at each market (in some cases fewer vendors sold a given product).

In addition to current price for each product, vendors were asked to recall the prices in 2000 and in 1990, and estimate the distance to the source and the existence of (seasonal) trends in supply. Vendors' recall varied significantly and very few felt able to remember the price in 1990; it was therefore decided not to include these data. In some instances, price data for the year 2000 could not be recollected by vendors and in some cases they were not willing to discuss the trade in any detail. Prices for wild meat and domestic meat were compared by country. Similar comparisons were not possible between medicinal wild products and generic medicines as we did not have dosage information and there are numerous uses for the wild products where different parts and doses may apply.

National level data on human population and income for the selected countries were obtained from published sources (Table 1), and information on national or local populations of the species was collected where possible; however, little information was available. Inflation rates ($I = (Price_{2010} - Price_{2000})/Price_{2000})*100$) were calculated using local currency current prices for each country's medicinal plant, medicinal animal, and food

animal baskets and an average of the inflation rates for each product within the basket. Inflation rates for marker products were calculated. Using figures for GDP and GDP share for the 10% poorest in the population, the per capita GDP for this 10% was calculated.

Results

Results presented below focus on findings of relevance to medicinal plants; tables exclusively presenting data on wild meat are omitted and numbering therefore differs from the original.

Price change between 2000 and 2010

Prices of medicinal plants were found to have risen above inflation from 2000 to 2010, except in India. Although marker products had also increased above inflation in many cases, in general this trend was less conspicuous than for the wild-sourced products (FIGURE 1).

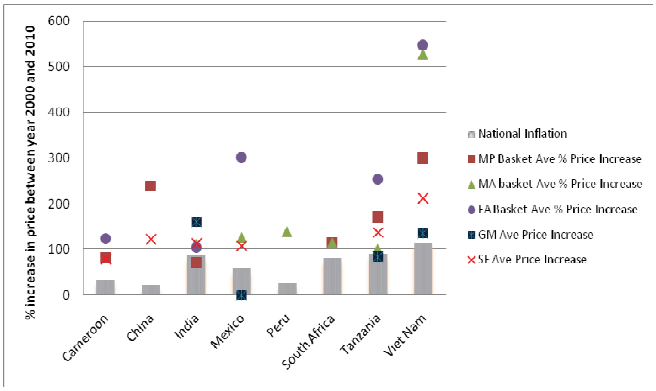

FIGURE 1. Percentage increase in price of goods, 2000—2010, and national inflation rate. GM = generic medicines, SF = staple foods, MA = medicinal animals, FA = wild food animals, MP = medicinal plants.

Viet Nam has a developing market economy and has experienced huge national inflation and large increases in prices of wild products above the national inflation rates. In Mexico, marker product medicines have increased at a lower rate than national inflation, suggesting healthcare may be becoming more accessible to the poorest people

Relative to other countries, staple medicines in Tanzania have increased in price less significantly, while in India they have increased significantly above national inflation rates between the years.

Increases in wild product prices compared with marker products

The average price of the combined wild products (i.e. including plants and animals, and both medicines and foods) increased more than the average price of the marker products, 2000-2010, for all countries apart from India, where the price of marker products increased more than the price of wild products (FIGURE 2). This may be related to India's drop in rice production, 2009-2010, related to a particularly deficient monsoon season (FAO, 2009), which inflated staple food product prices significantly.

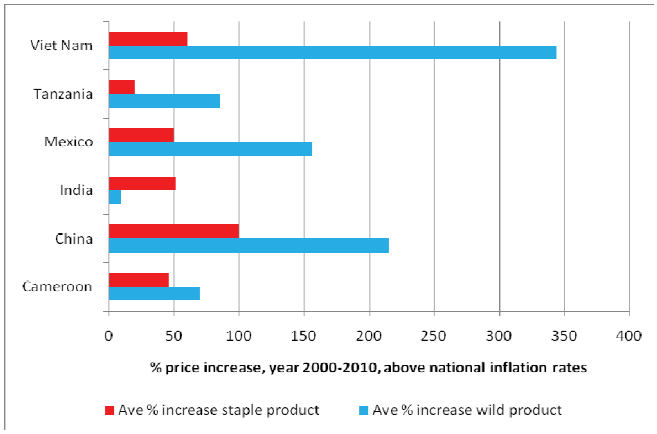

FIGURE 2. Percentage increase in price above national inflation, 2000-2010, for marker and wild-sourced products (meat, medicinal plants and medicinal animals).

Changing affordability of wild products

Where data allowed, the percentage change in the cost of each basket in relation to the percentage of per capita GDP used to buy the basket by the poorest 10% of the population was calculated, to indicate if products were becoming more or less affordable.

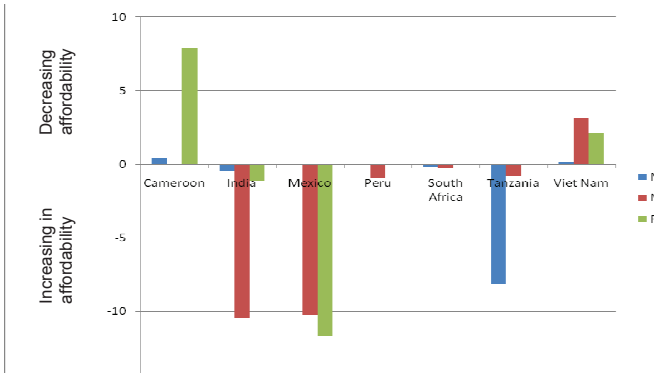

FIGURE 3. Change in percentage of GDP per capita for 10% poorest used to purchase baskets of goods (medicinal plants, medicinal animals and food animals), 2000–2010. MA = medicinal animals, FA = wild food animals, MP = medicinal plants.

In South Africa and India, medicinal plants are marginally more affordable now than in 2000, whereas in Tanzania medicinal plants were ound to be significantly more affordable in 2010 than they were in 2000 (FIGURE 3). In Viet Nam and Cameroon medicinal plants have become marginally less affordable.

Discussion

Price changes may be a result of changes in demand and/or supply; this study did not collect information on wildlife populations, harvests, or contextual factors allowing for an in-depth interpretation of the reasons for changes in prices. What the data collected by this study do reveal is whether prices are increasing or decreasing relative to inflation rates and whether foods and medicines are becoming more or less affordable, measured as a proportion of income. For example, in China prices of *Cistanche deserticola* and *Ophiocordyceps sinensis* increased by more than 300% from 2000 to 2010, indicating that international demand may negatively influence local consumption. At the same time, if prices are increasing, this may mean that rural people harvesting from the wild for trade are becoming better off.

A high demand may also seriously compromise sustainable harvest. In South Africa, high value *Warburgia salutaris*, the Pepper-bark Tree widely used in South African traditional medicine to treat for example coughs, colds, and chest complaints, has faced at least 50% decline and extinctions and very low subpopulation numbers have been documented in (WILLIAMS et al. 2009).

The data for this study must be treated with caution. Price data do not represent an average for the year and repeat measurements will have to be collected at the same time of year to be comparable. Vendors' recall was in several cases problematic, and therefore the 1990 data are not reported. GDP is probably not the best indicator for local wealth levels, partly because it omits the subsistence economy; direct comparison of the country-level GDP is also somewhat problematic as methods of data collection differ between countries. Nevertheless, this study presents an opportunity for developing national level indicators useful for the CBD and provides baseline data for an inexpensive and easily replicable ongoing indicator.

Biodiversity for food and medicine and the MDGs

Whether people are able to access wild foods and medicines is function of their price and affordability, which in turn depend on resource availability and other factors influencing supply and demand. Our results shown that for most of the countries surveyed wild products have become relatively more affordable, and therefore accessible. However, if trade in these species is unsustainable the picture may look very different in the future. For Cameroon, one of the poorest countries sampled and one where reliance on wild products is likely to be higher for the poorest, wild goods were becoming less affordable. This may indicate that biodiversity for these goods is threatened, but decreasing accessibility to these goods may have serious impacts on the health and well-being of those that rely on them.

Biodiversity's relevance to the Millennium Development Goals (MDGs) has mainly been discussed in terms of Goal 7: to "Ensure environmental sustainability". However, unsustainable harvest of wildlife for food and medicine threatens to undermine not only the achievement of Goal 7 but also to hinder progress towards other goals. These include:

- **Goal 1** on hunger and poverty reduction: Sustainable wildlife trade (of plant and animal origin) can help enhance food security both directly, by providing consumers with a valuable, affordable source of protein and indirectly, by increasing the amount of cash in the household that is available for food expenditures. The World Bank estimates that, overall, forest products provide roughly 20% of poor rural families' income, of which half is cash and half is in the form of subsistence goods (VEDELD et al. 2004). Sustainable wildlife trade can make a significant contribution to the economies of cash-poor, but biodiversity-rich, countries (ROE 2008).
- **Goals 4, 5 and 6** on health: Sustainable wildlife trade can make a major contribution to primary healthcare. An enhanced protein supply (e.g. from access to fisheries or wild meat products) is, in itself, hugely beneficial for human health, but beyond that the trade in wildlife-based

medicines (of plant and animal origin) is a major component of wildlife trade and benefits millions of poor people. Unregulated wildlife trade can, however, have unexpected negative implications for human health.

References

2010 Biodiversity Indicators Partnership (2010): Biodiversity indicators and the 2010 target: experiences and lessons learnt from the 2010 Biodiversity Indicators Partnership. Technical Series No. 53. – Secretariat of the Convention on Biological Diversity, Montréal, Canada. 196 pp.

Bodeker, G., Ong, C.K. et al. (2005): WHO Global atlas of traditional, complementary and alternative medicine. Text volume. – WHO, Centre for Health Development. Kobe, Japan. 216 pp.

Butchart, S. H.M., Wallpole, M. et al. (2010): Global biodiversity: indicators of recent declines. – Science 328 (1164) 8.

FAO (2009): 1.02 billion people hungry. One sixth of humanity undernourished - more than ever before. FAO Media release. – FAO, Rome 19 June 2009. http://www.fao.org/news/story/0/item/20568/icode/en/

Ong, C.K., Bodeker, G. et al. (2005): WHO global atlas of traditional, complementary and alternative medicine. Map volume. – World Health Organization, Kobe, Japan. 98 pp.

Roe, D. (2008): Trading nature. A report, with case studies, on the contribution of wildlife trade management to sustainable livelihoods and the Millennium Development Goals. – TRAFFIC International and WWF International, Cambridge and Gland, UK and Switzerland. 84 pp.

UN 2009. World population prospects: the 2008 revision. Volume 1: Comprehensive tables. – United Nations, New York. 801 pp.

Vedeld, P., Angelsen, A. et al. (2004): Counting on the environment: forest incomes and the rural poor. Environment Department Paper No. 98. – The World Bank, Washington DC, USA.

WHO (2008): Traditional medicine fact sheet 134. – World Health Organization, Geneva, Switzerland. http://www.who.int/mediacentre/factsheets/fs134/en/

Williams, V.L., Geldenhuys, C.J. et al. (2009): *Warburgia salutaris*. – In: Raimondo, D., von Staden, L. et al. (Eds.): Red List of South African Plants. Strelitzia 25. South African National Biodiversity Institute, Pretoria, South Africa.

APPENDIX 1: LIST OF SPECIES SAMPLED WITH AVERAGE PRICE DATA IN LOCAL CURRENCY

	Species	Av. price 2009/10	Av. recall price 2000
CAMEROON		**Franc**	
MP1	*Annickia/Enanthia chlorantha*	402.38	250.04
MP2	*Picralima nitida*	616.83	364.15
MP3	*Mammea Africana*	388.07	198.05
MP4	*Cylicodiscus gabunensis*	340.09	164.98
MP5	*Alstonia boonei*	372.10	211.50
MA1	*Atherurus africanus*	480.00	X
MA2	*Chamaeleo chamaeleo*	1700.00	X
MA3	*Lanistes lybicus*	413.33	X
MA4	*Python sebae*	697.33	X
MA5	*Bitis nasicornis*	673.33	X
FA1	*Phataginus tricuspis*	2921.67	1406.67
FA2	*Atherurus africanus*	2453.37	1113.97
FA3	*Cephalophus dorsalis*	2247.62	836.43
FA4	*Lepus microtis*	1438.33	636.94
FA5	*Thryonomys swinderianus*	1966.67	979.17
CHINA		**Yuan**	
MP1	*Cistanche deserticola*	202.75	41.25
MP2	*Cordyceps sinensis*	59240.00	13633.33
MP3	*Glycyrrhiza uralensis*	18.47	9.00
MP4	*Dendrobium candidum*	435.40	194.00
MP5	*Gastrodia elata*	365.00	X
MA1	*Hippocampus trimaculatus*	4356.97	X
MA2	*Zaocys dhumnades*	162.50	X
MA3	*Rana chensinensis*	4960.00	X
MA4	*Chinemys/Mauremys reevesi*	122.08	X
MA5	*Syngnathus acus*	130.00	X
FA1	*Pelodiscus/Trionyx sinensis*	470.00	X
FA2	*Elaphe taeniura*	132.50	X
FA3	*Ophiophagus Hannah*	135.42	X
FA4	*Ptyas korros*	115.33	X
FA5	*Ptyas mucosus*	113.33	X
INDIA		**Rupee**	
MP1	*Emblica officinalis*	58.00	27.40
MP2	*Aegle marmelos*	32.00	19.80
MP3	*Terminalia bellerica*	26.30	16.50
MP4	*Tinospora cordifolia*	36.00	22.60
MP5	*Terminalia chebula*	37.20	23.50
MA1	*Uromastyx hardwickii*	155.00	85.00
MA2	*Varanus bengalensis*	214.00	102.00
MA3	*Lissemys punctata & Nilssonia gangeticus*	2500.00	2025.00
MA4	*Python molurus*	265.00	111.25
MA5	*Moschus chrysogaster*	4166.67	1350.00
FA1	*Axis axis*	247.00	115.00

	Species	Av. price 2009/10	Av. recall price 2000
FA2	*Sus scrofa*	196.00	105.00
FA3	*Rusa unicolor*	139.00	75.00
FA4	*Python molurus*	265.00	111.25
FA5	*Perdicula asiatica*	116.67	58.33
MEXICO		**Peso**	
MP1	*Brickellia veronicifolia*	62.00	x
MP2	*Dysphania graveolens*	60.00	x
MP3	*Hintonia latiflora*	73.00	x
MP4	*Ibervillea sonorae*	85.00	x
MP5	*Larrea tridentate*	56.60	x
MA1	*Mephitis macroura*	515.00	252.00
MA2	*Canis latrans*	1550.00	675.00
MA3	*Odocoileus virginianus*	1335.00	568.00
MA4	*Dasypus novemcinctus*	259.00	124.00
MA5	*Crotalus atrox*	228.50	89.00
FA1	*Cossus redtenbachi*	1765.00	739.00
FA2	*Corisella texcocana/ mercenaria*	2248.70	1152.80
FA3	*Sphenarium purpurascens*	358.50	53.00
FA4	*Liometopum apiculatum*	835.00	261.50
FA5	*Cambarellus montezumae*	384.00	66.50
MP1	*Elaeodendron transvaalense*	16.65	7.34
SOUTH AFRICA		**Rand**	
MP1	*Elaeodendron transvaalense*	16.65	7.34
MP2	*Gunnera perpensa*	14.33	6.41
MP3	*Merwilla plumbea*	5.81	2.82
MP4	*Stangeria eriopus*	13.79	6.49
MP5	*Warburgia salutaris*	35.66	17.51
MA1	*Loxodonta Africana*	36.00	15.71
MA2	*Hystrix africaeustralis*	33.50	15.00
MA3	*Papio ursinus*	32.00	15.71
MA4	*Crocodylus niloticus*	35.00	15.71
MA5	*Python natalensis*	33.00	16.43
TANZANIA		**Tz sh.**	
MP1	*Abrus precatorius*	14333.33	5250.00
MP2	*Cadaba farinose*	14472.22	5500.00
MP3	*Acacia mellifera*	11500.00	4550.00
MP4	*Albizia anthelmintica*	14250.00	5000.00
MP5	*Sclerocarya birrea*	13513.89	4750.00
MA1	*Protoreaster lincki*	832.50	607.50
MA2	*Achatina fulica*	495.00	215.00
MA3	*Plagiocardium pseudolima*	336.95	122.00
MA4	*Sepia pharaonis*	150.00	73.50
MA5	*Numida meleagris*	205.90	126.33
FA1	*Syncerus caffer*	2500.00	716.67
FA2	*Equus quagga*	2500.00	716.67
FA3	*Aepyceros melampus*	3000.00	783.33
FA4	*Tragelaphus oryx*	2500.00	700.00
FA5	*Connochaetes taurinus*	2500.00	750.00
VIET NAM		**Dong**	
MP1	*Dipsacus asper*	37663	8050
MP2	*Smilax glabra*	13500	6556
MP3	*Crataegus pinnatifida*	9100	2320
MP4	*Uncaria rhynchophylla*	14200	3000
MP5	*Gynostemma pentaphyllum*	40200	8667
MA1	*Hippocampus*	59400	29700
MA2	*Asteric*	5560	2190
MA3	*Gecko gecko*	123250	40600
MA4	*Centropus sinensis*	161400	25900
MA5	*Ptyas korros*	275750	15650
FA1	*Rhizomys pruinosus*	275750	25300
FA2	*Sus scrofa*	294750	45000
FA3	*Hystrix brachyuran*	550250	48000
FA4	*Streptopelia chinensis*	266875	110000
FA5	*Amphiesma boulengeri*	174250	169500
PERU		**Sol**	
MP1	*Uncaria tomentosa*	2.00	x
MP2	*Croton lechieri*	4.00	x
MP3	*Copaifera paupera*	8.00	x
MP4	*Ficus insipida*	3.00	x
MP5	*Spondias mombin*	2.00	x
MA1	*Boa constrictor*	5.00	2.00
MA2	*Caiman crocodilus*	5.00	2.00
MA3	*Dasyatis* spp.	5.00	2.00
MA4	*Chelonoidis denticulate*	5.00	2.00
MA5	*Bradypus variegates*	6.00	3.00
FA1	*Pecari tajacu*	13.00	x
FA2	*Tayassu pecari*	12.00	x
FA3	*Cuniculus paca*	14.00	x
FA4	*Caiman crocodilus*	14.00	x
FA5	*Chelonoidis denticulate*	12.00	x

Notices of publication

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References 2008-2010. All links provided were functioning 20th January 2011.

ABENSPERG-TRAUN, M. (2009): CITES, sustainable use of wild species and incentive-driven conservation in developing countries, with an emphasis on Southern Africa. – Biological Conservation 142 (5): 948-963.

ADDO-FORDJOUR, P., ANNING, A.K. et al. (2008): Diversity and conservation of medicinal plants in the Bomaa community of the Brong Ahafo region, Ghana. – Journal of Medicinal Plants Research 2 (9): 226-233.

AGRA, M. DE F, Silva, K.N., Basilio, I.J.L.D. et al. (2008): Survey of medicinal plants used in the

region Northeast of Brazil. – Revista Brasileira de Farmacognosia 18 (3): 472-508. http://www.scielo.br/pdf/rbfar/v18n3/a23v18n3.pdf

ALBRECHT, M.A. & MCCARTHY, B.C. (2009): Seedling establishment shapes the distribution of shade-adapted forest herbs across a topographical moisture gradient. – Journal of Ecology 97 (5): 1037-1049.

AL-QURA'N, S. (2009): Ethnopharmacological survey of wild medicinal plants in Showbak, Jordan. – Journal of Ethnopharmacology 123 (1): 45-50.

ALTAFFER P. & WASHINGTON-SMITH G. (2008): Wild collected botanicals. Creating global standards is imperative before societies lose the plants they depend on. – Neutraceuticals World 11 (7): 34-37.

ANDEL, T. VAN & HAVINGA, R. (2008): Sustainability aspects of commercial medicinal plant harvesting in Suriname. – Forest Ecology and Management 256 (8): 1540-1545.

ANON. (2009): WHO monographs on selected medicinal plants 4. – WHO, Geneva, Switzerland. 444 pp. http://apps.who.int/medicinedocs/documents/s16713e/s16713e.pdf

ANTONOPOULOU, M., COMPTON, J. et al 2010. The trade and use of agarwood (oudh) in the United Arab Emirates. – TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia. 55 pp. www.traffic.org/species-reports/traffic_species_plants16.pdf

ARBUNE, A., NICULAE, M. et al. (2009): Conservation status, present threats and their causes, grieving the medicinal plant species of the genus Sempervivum in natural occurrence sites in the Romanian S-E Carpatians. – Planta Medica 75 (9): 937-937

ASHWELL, D. & WALSTON, N. (2008): An overview of the use and trade of plants and animals in traditional medicine systems in Cambodia. – TRAFFIC Southeast Asia, Greater Mekong Programme, Ha Noi, Viet Nam. 108 pp. www.traffic.org/medicinal-reports/traffic_pub_medicinal3.pdf

BAJRAI, A.A. (2010): Prevalence of crude drugs used in Arab folk medicine available in Makkah Al-Mukarramah Area. – International Journal of Medicine and Medical Sciences 2 (9): 256-262. www.academicjournals.org/IJMMS/PDF/pdf2010/Sept/Bajrai.pdf

BARAZANI, O., PEREVOLOTSKY, A. et al. (2008): A problem of the rich: prioritizing local plant genetic resources for ex situ conservation in Israel. – Biological Conservation 141 (2): 596-600.

BARBER-MEYER, S.M. (2010): Dealing with the clandestine nature of wildlife-trade market surveys. – Conservation Biology 24 (4): 918-923.

BARBHUIYA, A.R., SHARMA, G.D. et al. (2009): Diversity and conservation of medicinal plants in Barak valley, Northeast India. – Indian Journal of Traditional Knowledge 8 (2): 169-175.

BHATT, V.P. & VASHISHTHA, D.P. (2008): Indigenous plants in traditional healthcare system in Kedarnath valley of western Himalaya. – Indian Journal of Traditional Knowledge 7 (2): 300-310.

BHATTACHARYYA, N. & SARMA, S. (2010): Assessment of availability, ecological feature, and habitat preference of the medicinal herb Houttuynia cordata Thunb in the Brahmaputra Valley of Assam, India. – Environmental Monitoring and Assessment 160 (1-4): 277-287.

BHATTACHARYYA, R., ASOKAN, A. et al. (2009): The potential of certification for conservation and management of wild MAP resources. – Biodiversity and Conservation 18 (13): 3441-3451.

BHATTARAI, S., CHAUDHARY, R.P. 2010. The use of medicinal plants in the transhimalayan arid zone of Mustang district, Nepal. – Journal of Ethnobiology and Ethnomedicine 6: 14. http://www.ethnobiomed.com/content/6/1/14

BRANDAO, M.G.L., COSENZA, G.P. et al. (2010): Influence of Brazilian herbal regulations on the use and conservation of native medicinal plants. – Environmental Monitoring and Assessment 164 (1-4): 369-377.

BRANDÃO, M.G.L., ZANETTI, N.N.S. et al. (2008): Other medicinal plants and botanical products from the first edition of the Branzilian Official Pharmacopoeia. – Revista Brasileira de Farmacognosia 18 (1): 127-134. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-695X2008000100022&lng=en&nrm=iso

BREHM, J.M., MAXTED, N. et al. (2010): New approaches for establishing conservation priorities for socio economically important plant species. – Biodiversity and Conservation 19 (9): 2715-2740.

BURKHART, E.P. & JACOBSON, M.G. (2009): Transitioning from wild collection to forest cultivation of indigenous medicinal forest plants in eastern North America is constrained by lack of profitability 76 (2): 437-453.

BUSSMANN, R.W. & SHARON, D. (2009): Markets, healers, vendors, collectors: the sustainability of medicinal plant use in Northern Peru. – Mountain Research and Development 29 (2): 128-134.

CAMOU-GUERRERO, A., REYES-GARCIA, V. et al. (2008): Knowledge and use value of plant species in a Raramuri community: a gender perspective for conservation. – Human Ecology 36 (2): 259-272.

CAO, S. & KINGSTON, D.G.I. (2009): Biodiversity conservation and drug discovery. Can they be combined? The Suriname and Madagascar experiences. – Pharmaceutical Biology 47 (8): 809-823.

Cetinkaya, G. (2010): Conservation and sustainable wild-collection of medicinal and aromatic plants in Köprülü Kanyon National Park, Turkey. – Journal of Medicinal Plants Research 4 (12): 1108-1114. www.academicjournals.org/JMPR/PDF/pdf2010/18June/Cetinkaya.pdf

Chivian, E. & Bernstein, A. (Ed.) (2008): Sustaining life. How human health depends on biodiversity. – Oxford University Press, New York, USA. 542 pp.

Chowdhury, M.S.H. & Koike, M. (2010): Therapeutic use of plants by local communities in and around Rema-Kalenga Wildlife Sanctuary: implications for protected area management in Bangladesh. – Agroforestry Systems 80 (2): 241-257.

Chowdhury, M.S.H. & Koike, M. (2010): Towards exploration of plant-based ethno-medicinal knowledge of rural community: basis for biodiversity conservation in Bangladesh. – New Forests 40 (2): 243-260.

Cole, D. (2008): Report on the current status of cultivation and export of Devil's Claw in Namibia. – CRIAA SA-DC, Windhoek, Namibia. 17 pp.

Crepaldi, M.O.S. & Peixoto, A.L. (2010): Use and knowledge of plants by "Quilombolas" as subsidies for conservation efforts in an area of Atlantic Forest in Espirito Santo State, Brazil. – Biodiversity and Conservation 19 (1): 37-60.

Das, A.K., Dutta, B.K. et al. (2008): Medicinal plants used by different tribes of Cachar district, Assam. – Indian Journal of Traditional Knowledge 7 (3): 446-454.

de Melo, J.G., de Amorim, E.L.C. et al. (2009): Native medicinal plants commercialized in Brazil – priorities for conservation. – Environmental Monitoring and Assessment 156 (1-4): 567-580.

Dos Santos, M.R.A., de Lima, M.R. et al. (2008): Use of medicinal plants by the population of Ariquemes, in Rondonia State, Brazil. – Horticultura Brasileira 26 (2): 244-250.

Douwes, E., Crouch, N.R. et al. (2008): Regression analyses of southern African ethnomedicinal plants. Informing the targeted selection of bioprospecting and pharmacological screeening subjects. – Journal of Ethnopharmacology 119 (3): 356-364.

Dovie, D.B.K., Witkowski, E.T.F. et al. 2008. Knowledge of plant resource use based on location, gender and generation. – Applied Geography 28 (4): 311-322.

Estupinan-Gonzalez, A.C. & Jimenez-Escobar, N.D. (2010): Plants use by rural communities in the tropical zone of the Parque Nacional Natural Paramillo (Cordoba, Colombia). – Caldasia 32 (1): 21-38.

FairWild Foundation (2010): FairWild Standard. Version 2.0. – FairWild Foundation, Weinfelden, Switzerland. 8 pp. www.fairwild.org/publication-downloads/fairwild-standard-ver-20/FairWild-Standard-V2.pdf

Fandohan, B., Assogbadjo, A.E. et al. (2010): Women's traditional knowledge, use value, and the contribution of Tamarind (Tamarindus indica L.) to rural households' cash income in Benin. – Economic Botany 64 (3): 248-259.

Forycka, A. & Buchwald, W. (2008): Badania zasobów naturalnych roslin leczniczych objetych w Polsce ochrona prawna. [The research of the natural resources of medicinal plants protected in Poland; in Polish w English summary]. – Herba Polonica 54 (3): 81-112.

Gaikwad, J., Khanna, V. et al. (2008): CMKb: a web-based prototype for integrating Australian Aboriginal customary medicinal plant knowledge. - BMC Bioinformatics 9 (12).

Gaoue, O.G. & Ticktin, T. (2009): Effects of harvest of nontimber forest products and ecological differences between sites on the demography of African Mahogany. – Conservation Biology 24 (2): 605-614.

Gavin, M.C. (2009): Conservation implications of rainforest use patterns: mature forests provide more resources but secondary forests supply more medicine. – Journal of Applied Ecology 46 (6): 1275-1282.

Ghate, U. & Britto, J. (2008): Myths and preconditions of sustainable use of medicinal plants in southern India. - In: Kinhal, G.A. & Jagannatha Rao, R. (Eds.): Adaptive management of medicinal plants and non timber forest products. Strategies, implications and policy. FRLHT, Bangalore, India. pp. 77-88.

Ghimire, K. & Bastakoti, R.R. (2009): Ethnomedicinal knowledge and healthcare practices among the Tharus of Nawalparasi district in central Nepal. – Forest Ecology and Management 257 (10): 2066-2072.

Ghimire, S.K., Sapkota, I.B. et al. (2008): Non-timber forest products of Nepal Himalaya. Database of some important species found in the mountain protected areas and surrounding regions. – WWF Nepal, Kathmandu, Nepal. 186 pp.

Gonzalez-Tejero, M.R., Casares-Porcel, M. et al. (2008): Medicinal plants in the Mediterranean area: synthesis of the results of the project Rubia. – Journal of Ethnopharmacology 116 (2): 341-357.

Hahn, A. (2008): Pflanzliche Drogen im Spannungsfeld zwischen Nahrungsergänzungsmitteln und Arzneimitteln. – [Food supplements containing herbals versus herbal medicines; in German w English summary] Zeitschrift für Phytotherapie 29 (6): 262-269.

Hamilton, A. (Ed.) (2008): Medicinal plants in conservation and development. Case studies and lessons learnt. – Plant Life International, Salisbury,

UK. 85 pp.
Hawkins, B. (2008): Plants for life. Medicinal plant conservation and botanic gardens. – Botanic Gardens Conservation International, Richmond, U.K. 48 pp.
Hegazy, A.K., Hammouda, O. et al. (2008): Population dynamics of Moringa peregrina along altitudinal gradient in the northwestern sector of the Red Sea. – Journal of Arid Environments 72 (9): 1537-1551.
Huber, F.K., Ineichen, R. et al. (2010): Livelihood and conservation aspects of non-wood forest product collection in the Shaxi Valley, Southwest China (1). – Economic Botany 64 (3): 189-204.
Idu, M., Erhabor, J.O. et al. (2010): Documentation on medicinal plants sold in markets in Abeokuta, Nigeria. – Tropical Journal of Pharmaceutical Research 9 (2): 110-118.
IUCN & TRAFFIC (2010): Analyses of the proposals to amend the CITES appendices at the 15th meeting of the Conference of the Parties. – IUCN, Gland, Switzerland. 267 pp. www.cites.org/eng/cop/15/inf/E15i-18A.pdf
Jagannatha Rao, R. & Kinhal, G.A. (2008): Documentation, application and assimilation of traditional knowledge on sustainable harvesting of medicinal plants/non-timber forest products. – In: Kinhal, G.A. & Jagannatha Rao, R. (Eds.): Adaptive management of medicinal plants and non timber forest products. Strategies, implications and policy. FRLHT, Bangalore, India. pp. 91-110.
Jain, V., Verma, S.K. et al. (2009): Myths, traditions and fate of multipurpose Bombax ceiba L.: an appraisal. – Indian Journal of Traditional Knowledge 8 (4): 638-644.
Jambor, J. (2008): Stand und Perspektiven der Kräuterindustrie in Polen. [State and prospects of the botanicals industry in Poland; in German w English summary]. – Zeitschrift für Arznei- und Gewürzpflanzen 13 (2): 54-58.
Jeruto, P., Lukhoba, C. et al. (2008): An ethnobotanical study of medicinal plants used by the Nandi people in Kenya. – Journal of Ethnopharmacology 116 (2): 370-376.
Jiofack, T., Fokunang, C. et al. (2008): Ethnobotany and phytopharmacopoea of the South-West ethnoecological region of Cameroon. – Journal of Medicinal Plants Research 2 (8): 197-206.
Kala, C.P. (2008): Programmes for revitalising herbal medicine in India. – Zeitschrift fur Arznei- & Gewürzpflanzen 13 (3): 138-139.
Kathe, W., Pätzold, B. et al. (2010): Wild for a cure. Ground-truthing a standard for sustainable management of wild plants in the field. – TRAFFIC International, Cambridge, UK. 44 pp. www.traffic.org/species-reports/traffic_species_plants14.pdf
Kiehn, M. (2009): Neues zum Silphion der Antike. [New information on Silphion use in antiquity; in German w English summary]. – Zeitschrift für Phytotherapie 30 (2): 83-87.
Kinhal, G.A. & Jagannatha Rao, R. (ed.) (2008): Adaptive management of medicinal plants and non timber forest products. Strategies, implications and policy. –FRLHT, Bangalore, India. 273 pp.
Kinhal, G.A., Jagannatha rao, R. et al. (2008): Sustainable harvesting of medicinal plants/non-timber forest products. Development of methodology-concepts and practices. - In: Kinhal, G.A. & Jagannatha Rao, R. (Eds.): Adaptive management of medicinal plants and non timber forest products. Strategies, implications and policy. FRLHT, Bangalore, India. pp. 19-37.
Kozak, A. & Erdész, F. (2008): A gyógynövenyágazat helyzete [The Hungarian medicinal plant sector; in Hungarian, w English summary]. – Kertgazdaság 40 (3): 80-86.
Kumar, V.S., Jaishanker, R. et al. (2010): Ensete superbum (Roxb.) Cheesman: a rare medicinal plant in urgent need of conservation. – Current Science 98 (5): 602-603.
Kunwar, R.M. & Bussmann, R.W. 2008. Medicinal aromatic and dye plants of Baitadi and Darchula Districts, Nepal Himalaya. Status, uses and management. – In: Hartmann, M. & Weipert, J. (Hrsg.) (Eds.): Biodiversität und Naturausstattung im Himalaya III. Biodiversity and natural heritage of the Himalaya III. Verein der Freunde und Förderer des Naturkundemuseums Erfurt e.V., Erfurt, Germany pp. 43-49.
Kunwar, R.M., Shrestha, K.P. et al. (2010): Traditional herbal medicine in Far-west Nepal: a pharmacological appraisal. – Journal of Ethnobiology and Ethnomedicine 6: 35.
Larsen, H.O. (2008): Towards valid non-detrimental findings for Nardostachys grandiflora. NDF Workshop Case Studies. WG 2 - Perennials. Case Study 3. Nardostachys grandiflora. – 16 pp. www.conabio.gob.mx/institucion/cooperacion_internacional/TallerNDF/Links-Documentos/Casos%20de%20Estudio/Perennials/WG2%20CS3%20.pdf
Lee, S.W., Mao, C.J. et al. (2008): Ethnobotanical survey of medicinal plants at periodic markets of Honghe Prefecture in Yunnan Province, SW China. – Journal of Ethnopharmacology 117 (2): 362-377.
Leond, M., Casu, L. et al. (2009): A comparison of medicinal plant use in Sardinia and Sicily-De Materia Medica revisited? – Journal of Ethnopharmacology 121 (2): 55-67.
Lewu, F.B. & Afolayan, A.J. (2009): Ethnomedicine in South Africa: the role of weedy species. – African

Journal of Biotechnology 8 (6): 929-934.

Lhendup, P. (2009): Ethno-medicinal plant knowledge of a tradtional healer in Shershong, Bhutan. – Tigerpaper 36 (2): 19-23. www.fao.org/world/regional/rap/tigerpaper/Paper/TP36_2_001.pdf

Liu, H.X., Luo, Y.B. et al. (2010): Studies of mycorrhizal fungi of Chinese orchids and their role in orchid conservation in China - a review. – Botanical Review 76 (2): 241-262.

Mahato, P. & Mehta, S. (2009): Medicinal plants of Jharkhand. Crisis and extinction. – Journal of Economic and Taxonomic Botany 33 (82): 476-481.

Makunga, N.P., Philander, L.E. et al. (2008): Current perspectives on an emerging formal natural products sector in South Africa. – Journal of Ethnopharmacology 119 (3): 365-375.

Maxted, N., Ford-Lloyd, B.V. et al. (Eds.) (2008): Crop wild relative. Conservation and use. CABI, Wallingford, UK. 682 pp.

McGeoch, L., Gordon, I. et al. (2008): Impacts of land use, anthropogenic disturbance, and harvesting on an African medicinal liana. – Biological Conservation 141 (9): 2218-2229.

Meyer, J.-Y. (2008): Le 'ava ou kava. Renouveau d'une boisson traditionelle oubliée en Polynésie française. – La Garance Voyageuse. Revue du Monde Végétal 84: 6-12.

Miranda, T.M. & Iianazaki, N. (2008): Knowledge and use of coastal sand-dune plant resources by communities from Cardoso (Sao Paulo) and Santa Catarina (Santa Catarina) islands, Brazil. –Acta Botanica Brasilica 22 (1): 203-215.

Molares, S. & Ladio, A. (2009): Ethnobotanical review of the Mapuche medicinal flora: use patterns on a regional scale. – Journal of Ethnopharmacology 122: 251-260.

Monroy-Ortiz, C., Garcia-Moya, E. et al. (2009): Participative generation of local indicators for conservation in Morelos, Mexico. – International Journal of Sustainable Development and World Ecology 16 (6): 381-391.

Mugula, B.B., de Vries, B.J. et al. (2010): Mechanisms for sustainable use of biodiversity in and beyond natural ecosystems. A study on conservation and commercial production of Prunus africana in Uganda. – International Journal of Biodiversity and Conservation 2 (7): 180-185. www.academicjournals.org/IJBC/PDF/pdf%202010/Jul/Mugula%20et%20al.pdf

Mulliken, T. & Crofton, P. (2008): Review of the status, harvest, trade and management of seven Asian CITES-listed medicinal and aromatic plant species. - BfN-Skripten 227. Bundesamt für Naturschutz, Bonn, Germany. 142 pp. www.cites.org/common/com/PC/17/X-PC17-Inf-10.pdf

Murali, K.S. (2008): Impact of extraction on Decalepis hamiltonii Wight & Arn. An experiment from BR hills, Karnataka. - In: Kinhal, G.A. & Jagannatha Rao, R. (Eds.): Adaptive management of medicinal plants and non timber forest products. Strategies, implications and policy. FRLHT, Bangalore, India. pp. 49-61.

Nguyen Dao Ngoc Van & Nguyen Tap (Eds.) (2008): An overview of the use of plants and animals in traditional medicine systems in Viet Nam. – TRAFFIC Southeast Asia, Greater Mekong Programme, Ha Noi, Viet Nam. 92 pp. www.traffic.org/medicinal-reports/traffic_pub_medicinal4.pdf

Ocampo, R. & Balick, M.J. (2009): Plants of semillas sagradas. An ethnomedicinal garden in Costa Rica. – Finca Luna Nueva Extractos de Costa Rica, S.A., Costa Rica. 109 pp. http://fincalunanuevalodge.com/sacred-seeds/semillas-sagradas.pdf

Okello, S.V., Nyunja, R.O. (2010): Ethnobotanical study of medicinal plants used by Sabaots of Mt. Elgon Kenya. – African Journal of Traditional Complementary and Alternative Medicines 7 (1): 1-10.

Okigbo, R.N., Anuagasi, C.L. et al. (2009): Advances in selected medicinal and aromatic plants indigenous to Africa. – Journal of Medicinal Plants Research 3 (2): 86-95. www.academicjournals.org/JMPR/PDF/pdf2009/Feb/Okigbo%20et%20al.pdf

Okigbo, R.N., Eme, U.E. et al. (2008): Biodiversity and conservation of medicinal and aromatic plants in Africa. – Biotechnology and Molecular Biology Reviews 3 (6): 127-134. www.academicjournals.org/bmbr/PDF/pdf2008/Dec/Okigbo%20et%20al%20Pdf.pdf

Olupot, W., Barigyira, R. et al. (2009): Edge-related variation in medicinal and other "useful" wild plants of Bwindi Impenetrable National Park, Uganda. – Conservation Biology 23 (5): 1138-1145.

Oryema, C., Ziraba, R.B. et al. (2010): Medicinal plants of Erute county, Lira district, Uganda with particular reference to their conservation. – African Journal of Ecology 48 (2): 285-298.

Osemeobo, G.J. (2009): Economic assessment of medicinal plant trade in the rainforest of Nigeria. – Zeitschrift für Arznei- und Gewürzpflanzen 14 (4): 171-176.

Pant, S. & Samant, S.S. (2008): Population ecology of the endangered Himalayan Yew in Khokhan Wildlife Sanctuary of North Western Himalaya for conservation management. – Journal of Mountain Science 5 (3): 257-264.

Parkash, V. & Aggarwal, A. (2010): Traditional uses of ethnomedicinal plants of lower foot-hills of

Hmachal Pradesh-I. – Indian Journal of Traditional Knowledge 9 (3): 519-521.

Patil, S.V. & Depommier, D. (2008): Medicinal plants diversity in different agroforestry systems in south India. - In: Kinhal, G.A. & Jagannatha Rao, R. (Eds.): Adaptive management of medicinal plants and non timber forest products. Strategies, implications and policy. FRLHT, Bangalore, India. pp. 111-122.

Pei Shengji, Hamilton, A. et al. (2010): Conservation and development through medicinal plants. A case study from Ludian (Northwest Yunnan, China) and presentation of a general model. – Biodiversity and Conservation 19 (9): 2619-2636.

Pesek, T., Abramiuk, M. et al. (2009): Sustaining plants and people: traditional Q'eqchi' Maya botanical knowledge and interactive spatial modeling in prioritizing conservation of medicinal plants for culturally relative holistic health promotion. – Ecohealth 6 (1): 79-90.

Pesek, T., Abramiuk, M., et al. (2010): Q'eqchi' Maya healers' traditional knowledge in prioritizing conservation of medicinal plants. Culturally relative conservation in sustaining traditional holistic health promotion. – Biodiversity and Conservation 19 (1): 1-20.

Poonam, K. & Singh, G.S. (2009): Ethnobotanical study of medicinal plants used by the Taungya community in Terai Arc Landscape, India. – Journal of Ethnopharmacology 123 (1): 167-176.

Radusiene, J. & Labokas, J. (2008): Population performance of Arnica montana L. in different habitats. – In: Maxted, N., Ford-Lloyd, B.V. et al. (Eds.): Crop wild relative. Conservation and use. CABI, Wallingford, UK. pp. 380-388.

Rai, P.K. & Lalramnghinglova, H. (2010): Lesser known ethnomedicinal plants of Mizoram, North East India: an Indo-Burma hotspot region. – Journal of Medicinal Plants Research 4 (13): 1301-1307.

Rath, S. (2008): Sustainable harvesting. A paradigm for conservation of medicinal plants. - In: Kinhal, G.A. & Jagannatha Rao, R. (Eds.): Adaptive management of medicinal plants and non timber forest products. Strategies, implications and policy. FRLHT, Bangalore, India. pp. 63-76.

Ratnayake, R.S.S. & Karyawasam, C.S. (2008): Conservation and use of wild-harvested medicinal plants in Sri Lanka. - In: Maxted, N., Ford-Lloyd, B.V. et al. (Eds.): Crop wild relative. Conservation and use. CABI, Wallingford, UK. pp. 625-631.

Rawat, N. (2008): An approach towards sustainable harvesting for medicinal and aromatic plants. – MFP News 18 (2): 6-10.

Recasens, J., Ninot, P. et al. (2009): Sustainable wild harvesting of Arctostaphylos uva-ursi in the Pyrenees as a conservation practice. – Journal of Herbs, Spices and Medicinal Plants 14 (1-2): 1-12.

Reddy, C.S., Reddy, K.N. et al. (2009): Traditional medicinal plants in Seshachalam hills, Andhra Pradesh, India. - Journal of Medicinal Plants Research 3 (5): 408-412. http://www.academicjournals.org/JMPR/PDF/pdf2009/May/Reddy%20et%20al.

Rokaya, M.B., Munzbergova, Z. et al. (2010): Ethnobotanical study of medicinal plants from the Humla district of western Nepal. – Journal of Ethnopharmacology 130 (3): 485-504.

Samuel, J.K. & Andrews, B. (2010): Traditional medicinal plant wealth of Pachalur and Periyur hamlets Dindigul district, Tamil Nadu. – Indian Journal of Traditional Knowledge 9 (2): 264-270.

Sanz-Biset, J., Campos-De-La-Cruz, J. et al. (2009): A first survey on the medicinal plants of the Chazuta valley (Peruvian Amazon). – Journal of Ethnopharmacology 122 (2): 333-362.

Schmelzer, G.H. & Gurib-Fakim, A. (Eds.) (2008): Medicinal plants 1. PROTA Foundation/Backhuys Pubishers/CTA, Wageningen, the Netherlands. 789 pp.

Schneider, E. (2009): Trade survey study on succulent Euphorbia species protected by CITES and used as cosmetic, food and medicine, with special focus on Candelilla wax. – Inf. Doc. 6 presented to the Eighteenth Meeting of the Plants Committee. 41 pp. www.cites.org/common/com/PC/18/X-PC18-Inf06.pdf

Schülke, A., Uebelhör, K. et al. (2008): Biodiversity in German development cooperation. 7th edition. – GTZ, Eschborn, Germany. 125 pp.

Secretariat of the Convention on Biological Diversity (2010): Global biodiversity outlook 3. – Montreal. 94 pp. http://gbo3.cbd.int/

Semwal, D.P., Saradhi, P.P. et al. (2010): Medicinal plants used by local Vaidyas in Ukhimath block, Uttarakhand. – Indian Journal of Traditional Knowledge 9 (3): 480-485.

Sharma, J., Painuli, R.M. et al. (2010): Plants used by the rural communities of district Shahjahanpur, Uttar Pradesh. – Indian Journal of Traditional Knowledge 9 (4): 798-803.

Sher, H., Al-Yemeni, M.N et al. (2010): Ethnomedicinal and ethnoecological evaluation of Salvadora persica L.: a threatened medicinal plant in Arabian Peninsula. – Journal of Medicinal Plants Research 4 (12): 1209-1215.

Sher, H., Alyemeni, M.N. et al. (2010): Ethnopharmaceutically important medicinal plants and its utilization in traditional system of medicine, observation from the northern parts of Pakistan. – Journal of Medicinal Plants Research 4 (18): 1853-

1864.

Shrestha, B.B. & Jha, P.K. (2010): Life history and population status of the endemic Himalayan Aconitum naviculare. - Mountain Research and Development 30 (4): 353-364.

Shrestha, B.B., Jha, P.K. et al. (2011): Reproductive ecology and conservation prospects of a threatened medicinal plant Curculigo orchioides Gaertn. in Nepal. – Tropical Ecology 52 (1): 91-101.

Singh, K.N., Gopichand Kumar, A. et al. (2008): Species diversity and population status of threatened plants in different landscape elements of the Rohtang Pass, western Himalaya. – Journal of Mountain Science 5 (1): 73-83.

Srivastava, R.C., Singh, R.K. et al. (2010): Bioculturally important rare new plant species of Heteropanax Seems (Araliaceae) from Eastern Himalaya, Arunachal Pradesh. – Indian Journal of Traditional Knowledge 9 (2): 242-244.

Syampungani, S., Chirwa, P.W. et al. (2009): The miombo woodlands at the cross roads: potential threats, sustainable livelihoods, policy gaps and challenges. - Natural Resources Forum 33 (2): 150-159.

Tareen, R.B., Bibi, T. et al. (2010): Indigenous knowledge of folk medicine by the women of Kalat and Khuzdar regions of Balochistan, Pakistan. Pakistan Journal of Botany. 42 (3): 1465-1485.

Tibe, O., Modise, D.M. et al. (2008): Potential for domestication and commercialization of Hoodia and Opuntia species in Botswana. – African Journal of Biotechnology 7 (9): 1199-1203. http://ajol.info/index.php/ajb/article/viewFile/58648/46979

Toksoy, D., Bayramoglu, M. et al. (2010): Usage and the economic potential of the medicinal plants in Eastern Black Sea Region of Turkey. – Journal of Environmental Biology 31 (5): 623-628.

Trujillo-C, W. & Correa-Munera, M. (2010): Plants used by a Coreguaje indigenous community in the Colombian Amazon. – Caldasia 32 (1): 1-20.

Tushar Basak, s. & Sarma, G.C. (2010). Ethnomedical uses of Zingiberaceous plants of Northeast India. – Journal of Ethnopharmacology 132 (1): 286-296.

Ugulu, I. & Baslar, S. (2010): The determination and fidelity level of medicinal plants used to make traditional Turkish salves. – Journal of Alternative and Complementary Medicine 16 (3): 313-322.

van Andel, T. & Havinga, R. (2008): Sustainability aspects of commercial medicinal plant harvesting in Suriname. –Forest Ecology and Management 256 (8): 1540-1545.

Van Hoang, S., Baas, P. et al. (2008): Uses and conservation of plant species in a national park-a case study of Ben En, Vietnam. – Economic Botany 62 (4): 574-593.

Van Sam, H., Baas, P. et al. (2008): Traditional medicinal plants in Ben En National Park, Vietnam. – Blumea 53 (3): 569-601.

Ved, D.K. & Goraya, G.S. (2008): Demand and supply of medicinal plants in India. – FRLHT, Bangalore, India. 216 pp. http://nmpb.nic.in/WriteReadData/links/9517830850Contents.pdf

Vodouhê, F.G., Coulibaly, O. et al. (2008): Medicinal plant commercialization in Benin. An analysis of profit distribution equity across supply chain actors and its effect on the sustainable use of harvested species. – Journal of Medicinal Plants Research 2 (11): 331-340. www.academicjournals.org/JMPR/PDF/pdf2008/November/Vodouhe%20et%20al.pdf

Walters, M., Steenkamp, Y. et al. (2008): Conservation of medicinal plant species: the role of reserves. – South African Journal of Botany 74 (2): 392-392.

Wang, J., Tang, Y. et al. (2009): Autecology and conservation status of Magnolia sargentiana Rehder & Wilson (Magnoliaceae) in the Dafengding region, southern Sichuan Province, China. – Journal of Systematics and Evolution 47 (6): 525-534.

Weckerle, C.S., Ineichen, R. et al. (2009): Mao's heritage: medicinal plant knowledge among the Bai in Shaxi, China, at a crossroads between distinct local and common widespread practice. – Journal of Ethnopharmacology 123 (2): 213-228.

Wehi, P.M. & Wehi, W.L. (2010): Traditional plant harvesting in contemporary fragmented and urban Landscapes. – Conservation Biology 24 (2): 594-604.

Wyn, L.T. & Anak, N.A. (2010): Wood for the trees: a review of the agarwood (gharu) trade in Malaysia. –TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia. 116 pp. www.traffic.org/species-reports/traffic_species_plants15.pdf

Yineger, H., Kelbessa, E. et al. (2008): Plants used in traditional management of human ailments at Bale Mountains National Park, Southeastern Ethiopia. – Journal of Medicinal Plants Research 2 (6): 132-153.

Zhang, J.T. & Ru, W.M. (2010): Population characteristics of endangered species Taxus chinensis var. mairei and its conservation strategy in Shanxi, China. – Population Ecology 52 (3): 407-416.

The Medicinal Plant Specialist Group is chaired by Danna J. Leamann • 98 Russel Avenue • Ottawa, Ontario K1N 7X1 • Canada • Tel. +1/61/235-7213 • Fax +1/61/235-9622 • E-mail: djl@green-world.org.

Contributions for the next issue of *Medicinal Plant Conservation* are very welcome, please refer to format requirements on the Medicinal Plant Specialist Group homepage http://www.iucn.org/about/work/programmes/species/about_ssc/specialist_groups/directory_specialist_groups/directory_sg_plants/ssc_medicinalplant_home/ssc_medicinalplant_newsletter/

Medicinal Plant Conservation is edited by Helle O. Larsen • University of Copenhagen • Rolighedsvej 23 • 1958 Frederiksberg C • Denmark • email: hol@life.ku.dk