



ENVIRONMENTAL AND FOOD SAFETY FOR HUMAN WELFARE



CERTIFICATE OF APPRECIATION

This is to certify that :

Prof. Dr. Ernawati Sinaga, MS., Apt.

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K. Muangnil

Kanit Muangnil, M. Sc., MBA
Kyusei Nature Farming Center,
Thailand

Akio Ito

Akio Ito
International Nature Farming
Research Center, Japan

Prof. Dr. Takashi Hayase

Prof. Dr. Takashi Hayase
Nagasaki University,
Japan

Dr. El Amry Bermawi Putera, MA

Dr. El Amry Bermawi Putera, MA
Universitas Nasional,
Indonesia

Sustainable Use of Medicinal Plants for Human Welfare

Ernawati Sinaga

Summary

Herbal medicines have gained increasing popularity in the last decade. It ranges from traditional medicines of every country to the use of standardized extract and clinically trialed herbal medicines. Herbal medicines are a part of traditional medicine or complementary medicine. Herbal medicines are classified as herbs, herbal supplements, herbal preparations, and finished herbal products that contain parts of herbal plants or other herbal plant materials as key ingredients.

According to the World Health Organization (WHO), today as many as 80% of the world's people depend on herbal medicine for their primary health care needs, and it is on the increase. In several countries like China, India, Japan and Indonesia, herbal medicines and medicinal plants are very popular and become an important part of primary health care. However, it is not just in eastern countries that medicinal plants are important. In the USA, for example, 25% of all prescriptions from community pharmacies contained materials from higher plants, and of the top 150 prescription drugs, at least 118 are based on natural sources, and 74 percent of these come from plants. In 2013, herbal market in USA reaches \$6 billions or 11% of global market. According to Global Industry Analysis, it is estimated that global herbal market will reaches to \$107 billion by the end of 2017. And surprisingly, the largest herbal market is Europe (40%), and Germany shares highest percentage of herbal medicines market (28%).

The increasing popularity and need of herbal medicines means the increasing demand of medicinal plants as main source of herbal medicines. Unfortunately, although some plant species used in large quantities in herbal medicines are cultivated, the great majority are still collected from the wild. In Europe, from some 1300 medicinal plants used commercially, up to 90 percent collected from the wild. In Indonesia, from almost 2000 plant species used as medicinal plants and over 300 species used extensively in herbal industry, only 100 species are cultivated. Worldwide, some two-thirds of all medicinal plants are harvested from the wild. Some of these are common and fast-growing and there is no conservation concern. However, others are more vulnerable with their populations becoming diminished. Rapidly growing demand for medicinal plants, compounded by habitat degradation, is putting pressure on many species. Moreover, medicinal plants can have other uses than as sources of herbal medicines that increase their demand. They can also used as spices, food, cosmetic raw material, etc. Overharvesting of known medicinal plants from the wild and bioprospecting for new sources has also placed many medicinal species at risk of extinction. The dangers are genetic erosion of populations and local extinction.

According to the International Union for the Conservation of Nature (IUCN), about 15,000 medicinal plant species may be threatened with extinction worldwide. Experts estimate that the earth is losing at least one potential major medicinal plant every two years. European Red List of Medicinal Plants stated that 2.4% of the medicinal plant species were assigned a threatened category and 31% were found to have a declining population trend. Progressive loss of medicinal plants is not only losing present benefits from current use, but is being deprived of the option of future availability known as option value. Medicinal plants provide meaningful inputs for medicines and health care. Their loss through extinction could lead to considerable risk to human welfare.

For all of these reasons, the conservation and sustainable use of medicinal plants has become increasingly urgent. Many types of action can be taken in favour of conservation and sustainable use of medicinal plants. Some of these are urging the cultivation of medicinal plants, especially which use commercially or in large quantity, study and recommend sustainable harvesting techniques, especially from the wild, study and implement the local wisdom, especially related to conservation of wild plants, study and implement advanced biotechnological methods of culturing plant cells and tissues, and to support government and authorities to develop and force regulation to protect medicinal plant species from extinction and to ensure that any collecting from the wild is sustainable.

2nd International Conference on Environmental and Food Safety for Human Welfare

Utilization of Biodiversity
through Natural Farming
to Achieve Sustainable
Human Welfare



Sustainable Use of Medicinal Plants for Human Welfare

Ernawati Sinaga

Herbal
Medicines



More popular

Herbal Medicine



Traditional
Medicines
(Jamu)

Standardize
Herbal
Medicines

Clinically-trialed
Herbal Medicines
(Phytopharmaca)



Interesting Facts

- 80% of the world's people depend on herbal medicine for their primary health care needs, and it is on the increase (WHO)
- In several countries like China, India, Japan and Indonesia, herbal medicines and medicinal plants are very popular and become an important part of primary health care

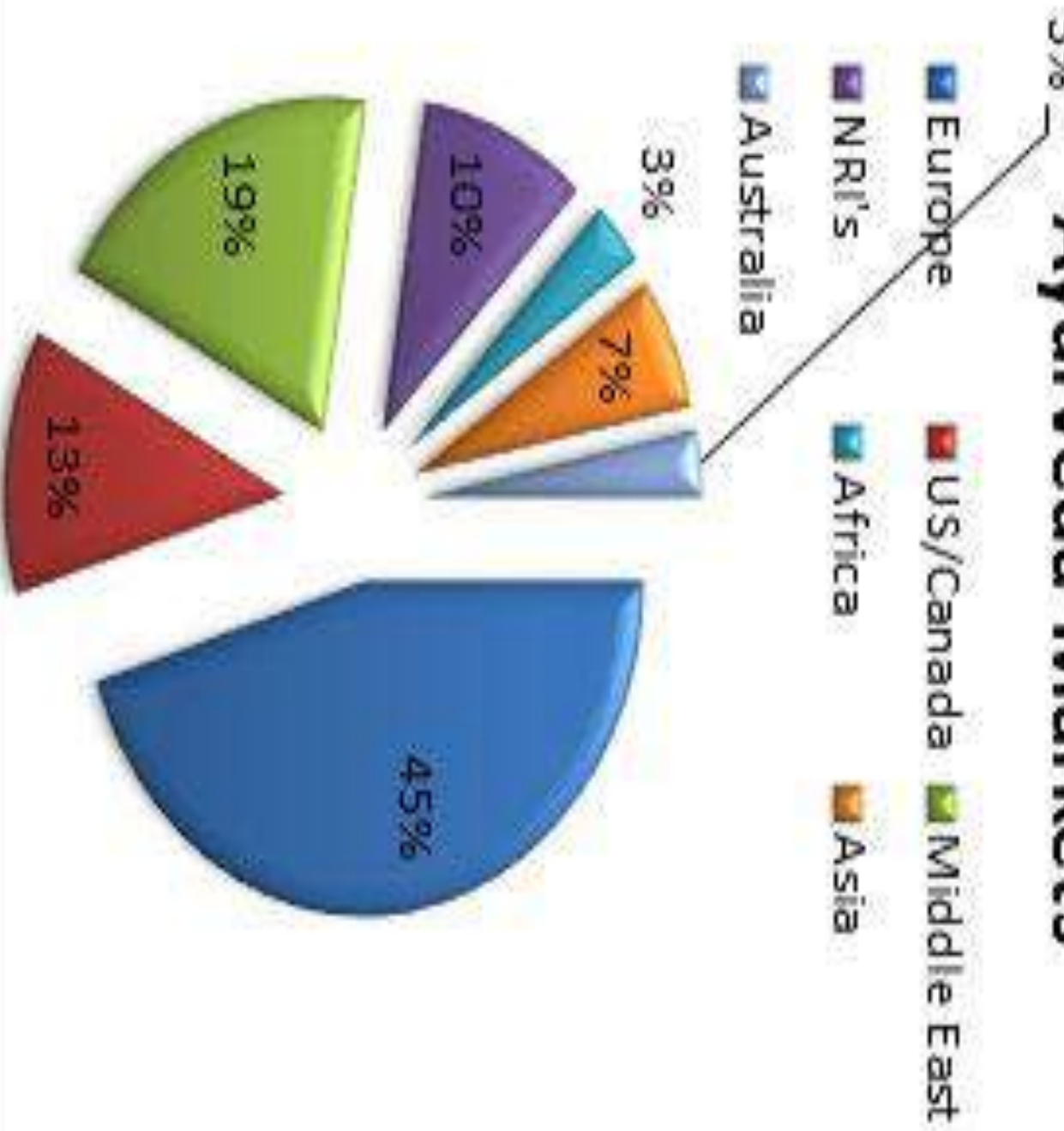
Interesting Facts

- However, it is not just in eastern countries that medicinal plants are important
- USA: 25% of all prescriptions from community pharmacies contained materials from higher plants
- USA: The top 150 prescription drugs, at least 118 (79%) are based on natural sources, and 74 percent of these come from plants

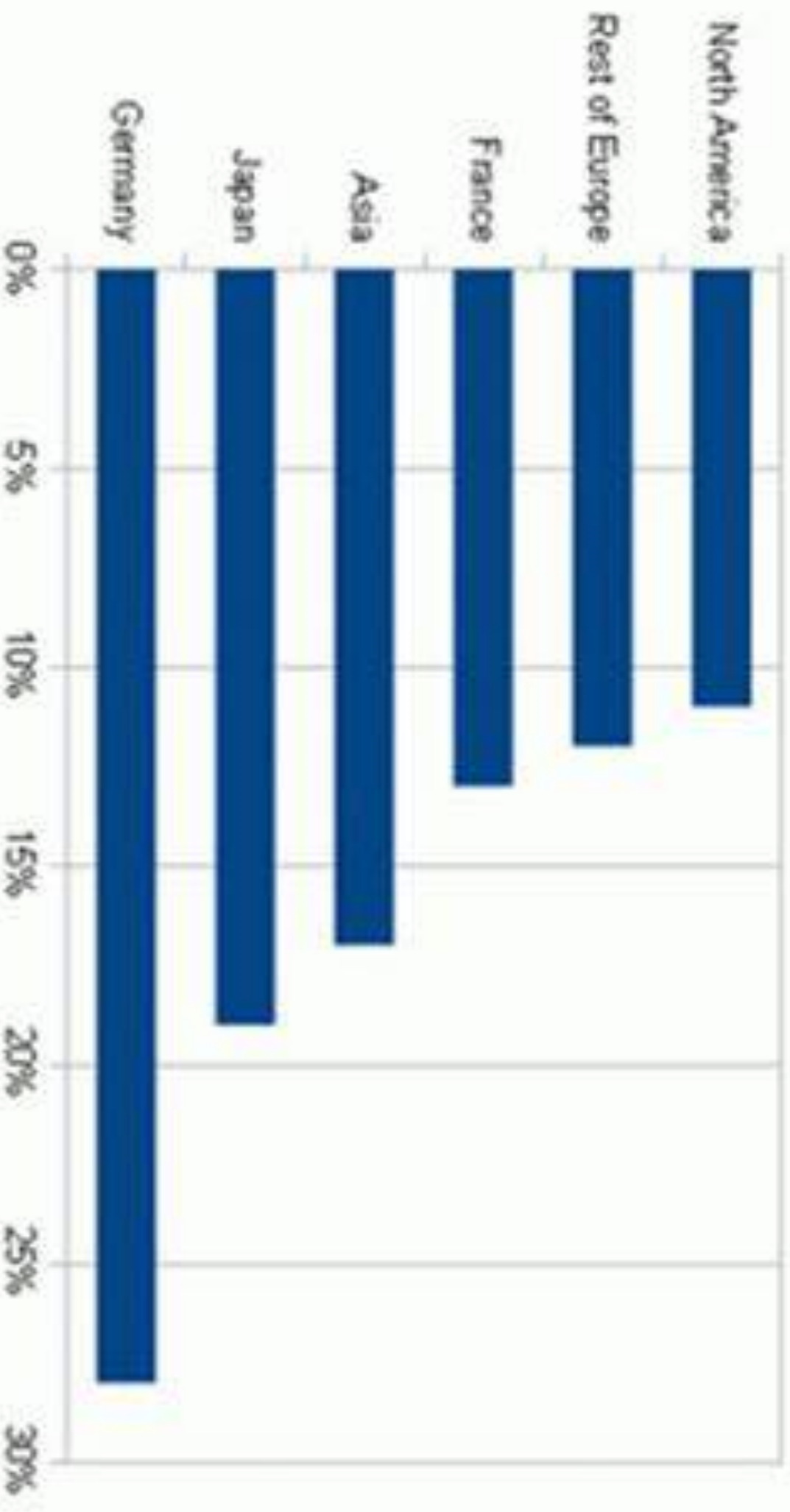
Interesting Facts

- Herbal market in USA (2013) reaches \$6 billions or 11 % of global market
- Herbal market in Europe ca 40% of global market
- Germany shares the largest global market of herbal medicines → ca 50% of all Europe and ca 28% of global market

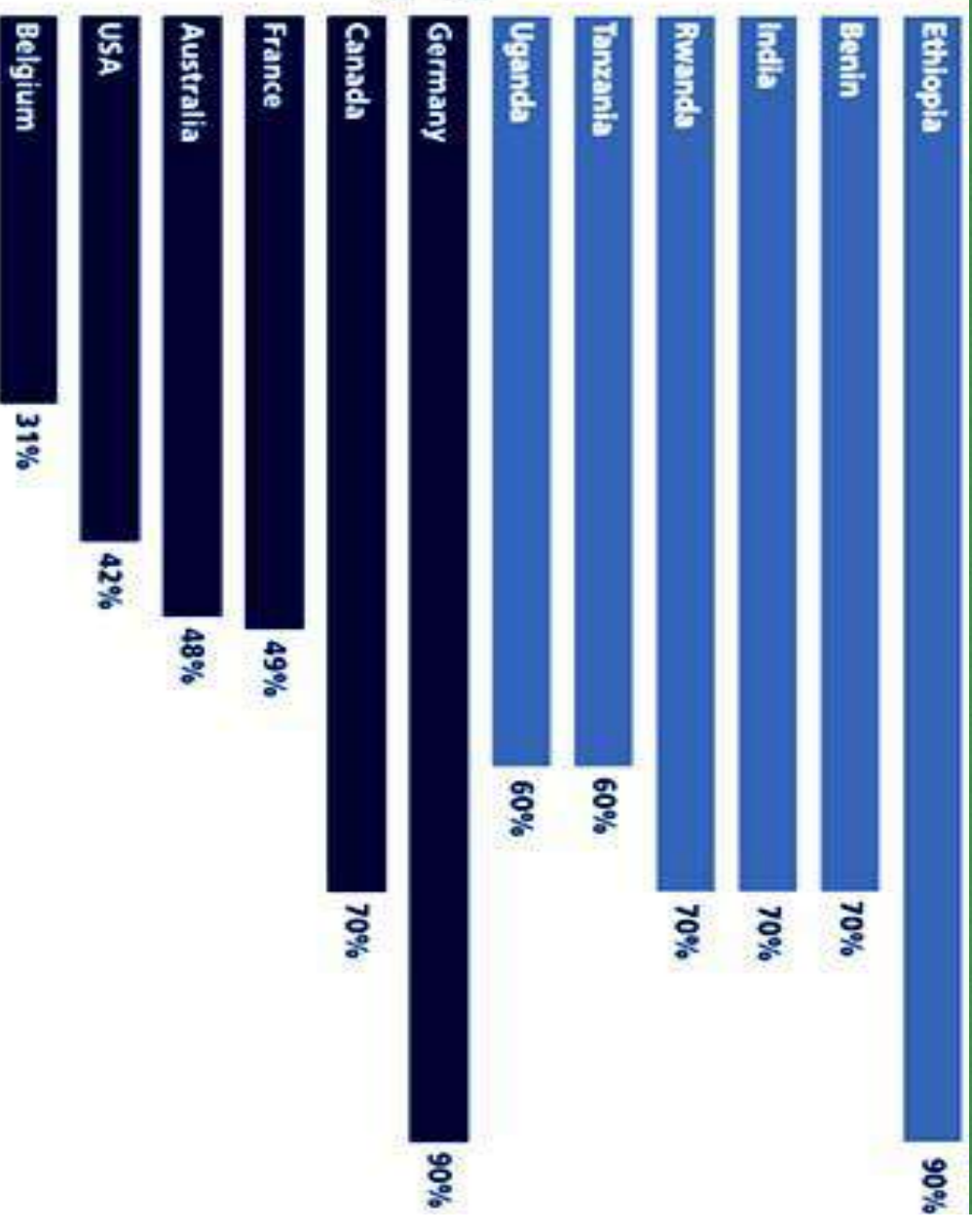
Ayurveda-Markets



Global Herbal Medicines Market



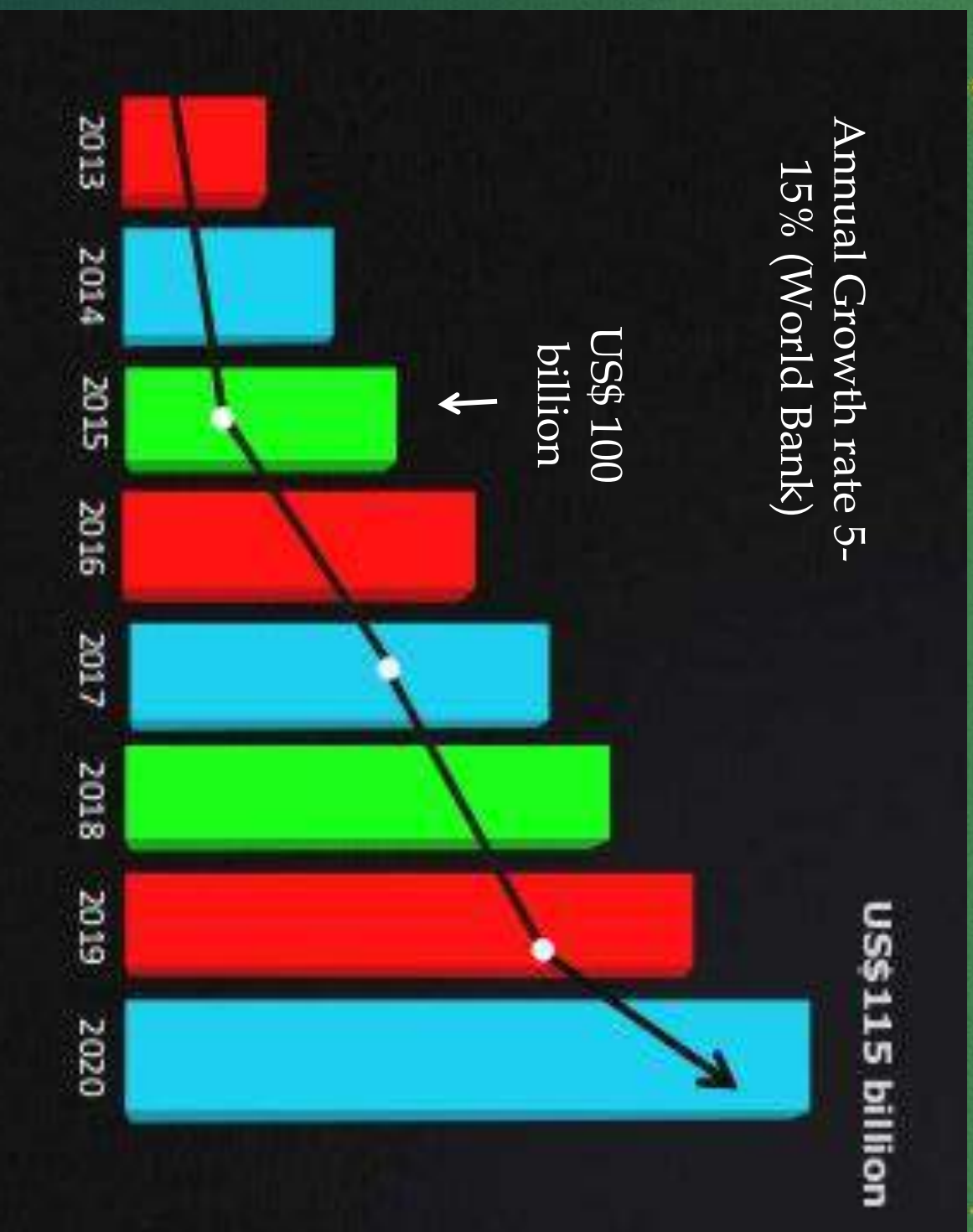
Populations using traditional medicine for primary health care



Populations in developed countries who have used complementary and alternative medicine at least once

WHO Medicines Strategy, 2004-2007
(2004)

Increasing Global Market of Herbal Medicines & Supplements



Reason of Using Herbal Medicine

- Easily available
- More affordable price
- More closely corresponds to the patient's ideology
- Satisfies a desire for more personalized health care
- Allows greater public access to health information

Reason of Using Herbal Medicine

- Allays concerns about the adverse effects of chemical (synthetic) medicines
- Traditional medicines are widely perceived as natural products that are safe: non-toxic, less side effects

Herbal Medicine

More popular



More scientific
evidence for
their safety and
efficacy

Improvements
in formulation,
analysis and
quality control

Herbal Medicine

**Increasing
interest in herbal
medicines**



**Increasing
demand of
medicinal plants**

Medicinal Plants

Traditional
Medicines

Other Herbal
Medicines

Raw Material of
Conventional
Medicines

Other Purpose:
Food, Spices,
Cosmetics,
Parfumes, etc

Plant Based Drugs and Medicines

Drug/Chemical	Clinical Use	Plant Source
Taxol, Paclitaxel	Anticancer	<i>Taxus brevifolia</i>
Camptothecin	Anticancer	<i>Camptotheca acuminata</i>
Vincristine, Vinblastine	Anticancer	<i>Vinca rosea</i>
Digitalin, Digitoxin	Cardiotonic	<i>Digitalis purpurea</i>
Acetyldigoxin	Cardiotonic	<i>Digitalis lanata</i>
Atropine	Anticholinergic	<i>Atropa belladonna</i>
Ephedrine	Sympathomimetic, antihistamine	<i>Ephedra sinica</i>
Caffeine	CNS stimulant	<i>Camellia sinensis</i>
Cocaine	Local anaesthetic	<i>Erythroxylum coca</i>
Codeine	Analgesic, antitussive	<i>Papaver somniferum</i>
Galanthamine	Alzheimer, dementia	<i>Lycoris squamigera</i>



Increasing
demand for
medicinal plants

World's Biodiversity of Medicinal Plants

- Ca 422,000 species of flowering plants
- 50,000 - 70,000 medicinal plants are estimated to be used world-wide
- Some 3,000 Medicinal Plants species are traded internationally

Biodiversity of Medicinal Plants in Indonesia

- > 30.000 species Angiospermae (flowering plants)
- > 2000 species used as traditional/folk medicines
- ± 300 used in Herbal Medicine Industry in Indonesia (BPOM)
- ± 100 cultivated (BPOM)



Biodiversity of Medicinal Plants in India

- > 47.000 species Angiospermae (flowering plants)
- > 7500 species cited as medicinal plants
- \pm 800 claimed to be used as medicinal plants
- \pm 120 used in large scale in Herbal Medicine Industry





Most of Medicinal Plants
are collected from the wild

Most of Medicinal Plants are collected from the wild

- In India, of more than 400 plant species used for production of medicine by the herbal industry, less than 20 species (5%) are currently under cultivation (Uniyal et al., 2000)
- In China, about 5000 medicinal plants have been identified and about 1000 are commonly used, only 100–250 species (2-5%/10-25%) are cultivated (Xiao Pei-Gen, 1991, He Shan-An and Ning Sheng, 1997).
- In Indonesia, 2000 species of medicinal plants use as traditional medicines, 300 species use in industry, only 100 species (5%/30%) cultivated (BPOM Indonesia)

Most of Medicinal Plants are collected from the wild

- In Germany, from 1543 species traded in Germany, only 50–100 species (3-6%) are exclusively sourced from cultivation (Lange and Schippmann, 1997)
- In Hungary, a country with a long tradition of MAP cultivation, only 40 species are cultivated for commercial production (Bernáth, 1999; Palevitch, 1991).
- In Europe as a whole, only 130–140 species (ca 10%) are cultivated from ca 1300 species traded (Pank, 1998; Verlet and Leclercq, 1999).

Source of Herbal Medicine

- Ca 900 species (from ca 3000) →
< 30% are commercially cultivated
- Most are from wild collection
 - 70-90% in terms of species numbers
 - 60-70% in term of quantity



Medicinal Plants are
at Risk of Extinction

- 50,000 – 70,000 medicinal are estimated to be used world-wide
- Some 3,000 species are traded internationally



Resource under pressure:

About 15,000 (20-30%) medicinal plant species may be threatened to some degree world-wide (IUCN/Int'l Union for Conservation of Nature)

European Red List of Medicinal Plants

- Assessment of ecological status of 400 species of medicinal plants (vascular plants from 90 families)
 - 9 species (2,4%) → threatened
 - 25 species (5,1%) → data deficient
 - 125 species (31%) → declining population
 - 164 species (41%) → stable population
 - 10 species (2,5%) → increasing population
 - 101 species (25%) → unknown trend

IUCN Red List Category 2015: Critically Endangered

1. *Aconitum chasmanthum*
2. *Chlorophytum borivilianum*
3. *Gentiana kurroo*
4. *Gymnocladus assamica*
5. *Lilium polyphyllum*
6. *Nardostachys jatamansi*
7. *Saussurea costus*
8. *Tribulus rajasthanensis*
9. *Valeriana leschenaultia*

IUCN Red List Category 2015: Endangered

1. *Cinnamomum wightii*
2. *Coptis teeta*
3. *Decalepis hamiltonii*
4. *Dysoxylum malabaricum*
5. *Gymnema khandalense*
6. *Humboldtia vahliana*
7. *Illicium griffithii*
8. *Iphigenia stellata*

Some endangered medicinal plants species in India

A review on endangered medicinal plants of India and their conservation (Sharma and Thokchom, 2014)

1. *Saussurea lappa*
2. *Picorrhiza kurroa*
3. *Ginkgo biloba*
4. *Suertia chirata*
5. *Gymnema sylvestre*
6. *Tinospora cordifolia*
7. *Salaca oblonga*
8. *Holostemma*
9. *Celastrus paniculata*
10. *Oroxylum indicum*
11. *Glycyrrhiza glabra*
12. *Tylophora indica*
13. *Bacopa monnieri*
14. *Rauwolfia serpentina*

4 important species are at risk of extinction

- Yew tree - Cancer drug paclitaxel is derived from the bark, but it takes six trees to create a single dose so growers are struggling to keep up
- Hoodia - Plant has sparked interest for its ability to suppress appetite, but vast quantities have already been "ripped from the wild" as the search for the miracle weight drug continues

4 important species are at risk of extinction

- **Magnolia** - Has been used in traditional Chinese medicine for 5,000 years as it is believed to help fight cancer, dementia and heart disease. Half the world's species threatened, mostly due to deforestation
- **Autumn crocus** - Romans and Greeks used it as poison, but now one of the most effective treatments for gout. Under threat from horticulture trade

Some endangered medicinal plants species in Indonesia

Some Ethnophytomedical Aspects and Conservation Strategy of Several Medicinal Plants in Java, Indonesia (Sangat and Larashati, 2002)

1. *Alyxia reinwardtii* Bl.
2. *Cassia tora* L.
3. *Cinnamomum sintoc* Bl.
4. *Curcuma mangga* Val. & Zijp
5. *Cryptocarya massoy* (Oken) Kosterm.
6. *Elaeocarpus sphaericus* (Gaert.) K. Schum.
7. *Paraneria laevigata* (Juss.) Moldenke
8. *Pimpinella alpina* Koord.
9. *Stelechocarpus burahol* Hook.f. & Th.

Some action should be taken

- Cultivation of medicinal plants, especially which use commercially or in large quantity
- Advanced technology to grow medicinal plants → cell/tissue culture for mass propagation and conservation of germplasms, new techniques of cultivation, etc
- Sustainable harvesting techniques

Some action should be taken

- Advanced biotechnological methods for the production of bioactive substances
- Local wisdom related to conservation of wild plants
- Develop and force regulation to protect medicinal plant species from extinction and to ensure that any collecting from the wild is sustainable

Local wisdom → Medicinal

Plant Conservation in Tanzania

1. Domestication
2. Beliefs in sacredness of trees
3. Beliefs in sacred forests
4. Respect of cultural forests
5. Protection of plants at the burial sites
6. Selective harvesting
7. Secrecy
8. Collection of deadwood for firewood
9. Energy-saving traditional stoves

Local Wisdom in Indonesia

- Hutan larangan (Forbidden forest or Sacred Forest)
- Lubuk larangan (Forbidden or Sacred ponds/river)
- Time-schedule to harvest certain kind of medicinal plant
- etc



Thank you very much
for your kind attention