International Journal of Pharmaceutical research and Applications
Volume 8, Issue 5, Sep.-Oct. 2023, pp: 1729-1738 www.ijprajournal.com ISSN: 2456-4494

A brief review on Commercial cultivation and collection aspect of Medicinal and Aromatic plants.

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Date of Submission: 27-10-2023 Date of Acceptance: 08-11-2023

Abstract:-
Given the growing awareness that many wild medicinal and aromatic plant (MAP) species are being overexploited, many authorities are recommending the introduction of wild species into farming systems.
Others argue that sustainable harvesting is the most important conservation strategy for the most commonly exploited wild species, given their contribution to the local economy and their greater long-term value to collectors.
In addition to poverty and the failure of traditional controls, the greatest challenges to the sustainable exploitation of wildlife include a lack of knowledge about sustainable exploitation rates and practices, unregulated land use rights as defined in , and a lack of legislative and policy guidance. Identifying the conservation benefits and costs of different MAP production systems should guide policy on whether conservation should occur in the wild, in nurseries, or both.

Keywords:-
domestication; plant propagation; source of income; health care; plant trade; reduce poverty; income generators

I. INTRODUCTION:-

Humans have always collected plant and animal resources for their own use. Examples include edible nuts, mushrooms, fruits, herbs, spices, chewing gum, game, animal feed, fiber used in the construction of shelters and houses, clothing or equipment, and plant or animal products for medicinal, cosmetic, or cultural purposes. Even today, hundreds of millions of people, especially in developing countries, derive a significant portion of their livelihoods and income from the collection of plant and animal products (Iqbal 1993; Walter 2001). A collection of high quality products such as mushrooms (morels, matsutake, truffles), medicinal plants (ginseng, black cohosh, sweet and sour).

RJ Bogers und Craker in D. (1999).Lange (ed.), Medicinal and aromatic plants, 75-95. © 2006 Springer. Printed in the Netherland

- **U. SCHIPPMANN ET AL:-**

continues to exist in developed countries for cultural and economic reasons (Jones et al. 2002). Among these uses, medicinal plants play a key role, not only as traditional medicines used in many cultures, but also as commercial goods that meet the needs of often distant markets

.In this article, the term “medicinal and aromatic plants” (MAP) refers to all plants that are used not only in medicine in the narrower sense, but also in the adjacent and often overlapping areas of spices and food. and cosmetics. Demand for a variety of wildlife species is increasing as human needs, numbers and trade increase. Given the growing awareness that some wild species are being overfished, many authorities are recommending the introduction of wild species into farming systems (BAH 2004; Lambert et al. 1997; WHO 1993). However, cultivation can also have an impact on the environment and needs to be better understood .

For example, the production of medicinal plants through cultivation may reduce the extent of harvesting of wild populations, but may also lead to environmental degradation and loss of genetic diversity, as well as loss of incentives for the conservation of wild populations (Assessing the Conservation Impacts of Commercial Captive Breeding and Artificial Breeding of Wild Species, IUCN/SSC Workshop , December 7-9, 2001, Jacksonville (Project Workshop Report 2002) The relationship between the conservation of species in situ and ex situ is an interesting topic with local implications Communities, owners and managers of

International Journal of Pharmaceutical research and Applications
Volume 8, Issue 5, Sep.-Oct. 2023, pp: 1729-1738 www.ijprajournal.com ISSN: 2456-4494

public and private lands, entire industries and, of course, wildlife.Identifying the conservation benefits and costs of different MAP production systems should guide policy on whether conservation should occur in the wild, in nurseries, or both (Bodeker et al. 1997; Schippmann et al. 2002; Schippmann et al.). . 2005).

- **CONCEPT OF SUSTAINABILITY:-**

As a basic element of the ecosystem approach, it must be taken into account that people with their cultural diversity represent an integral part of ecosystems. Conceptually, the essence of sustainable development is expressed in the long-term relationship between populations and the surrounding ecosystem. This means that ultimately one is completely dependent on the other. The well-being of humans and the ecosystem must be assessed together. When the human condition and ecosystem are satisfactory or improving, society is considered sustainable. The system only improves as the ecosystem and human condition improve (Prescott-Allen and Prescott-Allen 1996). Sustainability is most often viewed from an ecological perspective in the context of plant and animal populations. A sustainable MAP harvesting system is one in which fruits, seeds or other plant parts can be harvested indefinitely from a fixed area , without negative effects on the population structure and dynamics of the harvested plants (Peters 1994; Cunningham 2001). However, what is needed is a balanced - sentence approach that takes into account four interrelated scales

- COMPARISON OF CULTIVATION:-

(1)landscape level;
(2) at community and ecosystem levels;
(3) plant population level; and
(4) the genetic level (Noss 1990).

Destructive processes can directly impact sustainable crops through their impact on plant populations. When it comes to medicinal plants, there are positive relationships between plant diversity and disruptive factors. An example is Arnica montana, which occurs in traditional grasslands of Europe, where annual mowing and seasonal livestock grazing without the use of artificial fertilizers allows the development of diverse populations and often rare species (Ellenberger 1999; Myklestad and Saeters in 2004).

- SOME FIGURES TO START WITH…

How many MAPs are in use worldwide? The number of plant species used from time to time and even the number of plant species currently used for medicinal purposes in some cultures can only be determined

Table 1. How many plants are used medicinally worldwide?

Country	Plant species	Medicinal plant species	%
Bulgaria	3,567	750	21.0
China	32,200	4,941	15.3
France	4,630	900	19.4
Hungary	2,214	270	12.2
India	18,664	3,000	16.1
Jordan	2,100	363	17.3
Korea, Rep. of	2,898	1,000	34.5
Malaysia	15,500	1,200	7.7
Nepal	6,973	900	12.9
Pakistan	4,950	1,500	30.3
Philippines	8,931	850	9.5
Sri Lanka	3,314	550	16.6
Thailand	11,625	1,800	15.5
USA	21,641	2,564	11.8
Vietnam	10,500	1,800	17.1
Average			17.1
World	422,000	72,000	

Sources: WHO (1998); Duke and Ayensu (1985); Govaerts (2001); Groombridge (1994); Groombridge and Jenkins (2002); Hardalova et al. (1998); Jain and DeFillipps (1991); Lange (1998); Manandhar and Manandhar (2002); Moerman (1996); Oran and Ali-Eisawi (1998); De Padua et al. (1999); Zahoor Ahmad (1997).

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estimated. The WHO calculation from the late 1970s listed 21,000, types of medicine (Penso 1980). However, in China alone, 4,941 of the 32,200, native plant species are used medicinally in traditional Chinese medicine (Groombridge 1994), a staggering 15.3% of . If this proportion is calculated for other known medicinal plant species, then it is relative to the total Out of 422,000 flowering plant species worldwide (Bramwell 2002; Govaerts 2001), the number of plant species used for medicinal purposes can be estimated at over 70,000 (Table 1).

How many MAP species are traded?

It is difficult to estimate how much MAP is marketed both nationally and internationally. The majority of plant material is exported from developing countries, while the main markets are in developed countries. Analysis of UNCTAD trade data for the period 1981-1998 reflects this near-universal feature of MAP trade (Table 2). The addition of quantities for the five European countries to this list (94,300 tonnes) indicates the dominance of Europe as an importing region. Germany ranks fourth and third in terms of imports and exports, reflecting the country's leading role as a producer of medicinal plant raw materials in the world.

Table 2. The 12 leading countries of import and export of medicinal and aromatic plant material, 1991–1998 (Lange 2002)

Country of import	Volume [tonnes]	Value [1000 US$]	Country of export	Volume [tonnes]	Value [1000 US$]
Hong Kong	73,650	314,000	China	139,750	298,650
Japan	56,750	146,650	India	36,750	57,400
USA	56,000	133,350	Germany	15,050	72,400
Germany	45,850	113,900	USA	11,950	114,450
Rep. Korea	31,400	52,550	Chile	11,850	29,100
France	20,800	50,400	Egypt	11,350	13,700
China	12,400	41,750	Singapore	11,250	59,850
Italy	11,450	42,250	Maxico	10,600	10 050
Pakistan	11,350	11,850	Bulgaria	10,150	14,850
Spain	8,600	27,450	Pakistan	8,100	5,300
UK	7,600	25,550	Albania	7,350	14,050
Singapore	6,550	55,500	Morocco	7,250	13,200
Total	342,550	1,015,200	Total	281,550	643,200

Figures based on commodity group pharmaceutical plants (SITC.3: 292.4 = HS 1211). Source: UNCTAD COMTRADE database, United Nations Statistics Division, New York.

Iqbal (1993) estimates that about "4,000 to 6,000 plants are of commercial importance ", another source states that between 5,000 and 6,000 "plants enter the global market" (SCBD 2001). An extensive study of the German medicinal plant trade revealed a total of 1,543 MAPs that were traded or offered on the German market (Lange and Schippmann 1997). An extension of this study across Europe found that species accounted for 2000 species traded for medicinal purposes (Lange 1998). Given Europe's role as a reservoir for AMPs traded from all regions of the world, it can be assumed that the total number of AMPs in international trade worldwide is approximately ,3000 species.

How many MAP are threatened worldwide?

To meet the needs of regional and international markets, plants used to expand local, regional, and international markets are harvested in increasing quantities and come primarily from wild populations (Kuipers 1997; Lange 1998). Overall, the supply of wild plants is becoming increasingly limited due to deforestation and land conversion to plantations, pastures and agriculture (Ahmad 1998; Cunningham 1993). In many cases, the impacts of

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Volume 8, Issue 5, Sep.-Oct. 2023, pp: 1729-1738 www.ijprajournal.com ISSN: 2456-4494

direct harvesting are accompanied by declines due to land use changes. Species favored by extensive agriculture, such as Arnica montana in Central Europe, are in decline as agricultural practices shift toward increasing nutrient inputs to grasslands.

This requires habitat management as a key factor in managing species populations (Ellenberger 1999). One of the goals of the IUCN Medicinal Plant Specialist Group is to identify species threatened by unsustainable harvests and other factors. The following estimate shows how enormous this task is: According to Walter and Gillett (1998), 34,000 of the 49,000 species examined worldwide were considered threatened with extinction. A more recent assessment by Bramwell (2003) estimates that 21% of the world's flora is threatened. If we apply this last number to our previous projection that 72,000 plant species are used medicinally, this leads us to estimate that about 15,000 MAP species are at least about threatened (Table 3).

Table 3. How many medicinal plant species are threatened?

Number of flowering plant species (Govaerts 2001)	422,000 plant species
17.1% of them are used medicinally (see table 1)	72,000 plant species
21% are threatened (Bramwell 2003)	15,000 medicinal species

How many MAP are under cultivation?

Many medicinal plants, especially aromatic herbs, are grown in home gardens , some are grown in open fields, both as salt crops and in intercropping systems and rarely as plantation plants (De Padova et al. 1999).

In a survey conducted for the Rainforest Alliance, companies involved in the trade and production of medicinal plants and other botanical products were asked whether % of their material came from cultivated sources and what percentage came from wild sources. On average, companies reported that 60-90% of the material was cultivated, while the remaining were collected from the wild.

However, if one asks about the number of species rather than the volume of matter, the numbers are usually reversed (Laird and Pierce 2002). Lange and Schippmann (1997) report that of the 1,543 species marketed in Germany, only 50 to 100 species (3 to 6%) are cultivated exclusively. Of the over 400 plant species used by the Indian herbal industry to produce medicines, currently less than 20 species are cultivated in different regions of the country (Uniyal et al. 2000). In China, about 5,000 medicinal plants have been identified, of which about 1,000 are commonly used, but only 100 to 250, species are cultivated (Xiao 1991; He and Ning 1997). In Hungary, a country with a long tradition of MAP cultivation, only 40 species are grown commercially (Bernáth 1999; Palevitch 1991).Only 130–140, MAP species are cultivated across Europe (Pank 1998; Verlet and Leclercq 1999).

Based on these figures, we estimate that the number of MAP species currently formally cultivated for commercial production does not exceed several hundred worldwide, representing less than 1% of the total number of medicinal plants used. On the other hand, we know that many other MAP species are grown on a small scale in home gardens, either as home remedies or by herbalists. The cultivation carried out by the residents can also take the form of enrichment plantations. TRAFFIC International is currently conducting a global study on the scope of MAP cash crops in terms of type, volume and value.

WILD OR CULTIVATED: WHAT DOES THE MARKET WANT?

Given the need for a continuous and regular supply of medicinal plants and the continuous depletion of forest resources, increasing the number of cultivated medicinal plant species appears to be an important strategy to meet the growing demand (Uniyal et al. 2000).). But why are so few species cultivated? Why are some species cultivated and many others not? An explanation can be found in the observation that cultivated plants are sometimes considered to be of lower quality than specimens collected in nature .For example, wild ginseng roots are five to ten times more valuable than artificially propagated roots (Robbins 1998). The reason is primarily cultural, because the Chinese community, which is the largest consumer group of wild ginseng , believes that the similarity of the appearance of the gnarled wild roots to the human body symbolizes the vitality and strength of the root. Cultivated roots do not have the characteristic shape of wild roots and are therefore not as desirable.

- **COMPARISON OF CULTIVATION:-**

Consumers (Robbins 1998). In Botswana, traditional practitioners have stated that cultivated material is unacceptable because cultivated plants do

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Volume 8, Issue 5, Sep.-Oct. 2023, pp: 1729-1738 www.ijprajournal.com ISSN: 2456-4494

not have the potency of wild-harvested material (Cunningham 1994). Scientific studies partially confirm this. The medicinal properties of plants are mainly due to the presence of secondary metabolites that plants require in their natural environment under certain stress and competition conditions and which might not be evident under monoculture conditions. Levels of API may be much lower in fast-growing plant materials, while wild populations of may be older and have higher levels of API due to slow growth rates. Although it can be assumed that the properties of cultivated plants differ slightly from those in their natural habitat, it is also clear that some plant values can be specifically improved under controlled growth conditions (Palevitch 1991; Uniyal et al. 2000). Overall, the trend in all countries is to increase the proportion of plant material. Most companies—bulk pharmaceutical companies, over-the-counter companies, and large medicinal plant companies—prefer plant material, particularly because the plant material can be certified "biodynamic" or "organic" (Laird and Pierce 2002). From a commercial perspective, domestication and cultivation offer a number of advantages over wild collection for the production of medicinal plants:

(i)Although wild collection often yields material contaminated with other undesirable, sometimes harmful plant species, cultivation provides reliable botanical identification.

(ii) The extent of wildlife harvest depends on many factors that cannot be controlled and irregular supply is a common feature. The cultivation guarantees a constant supply of raw materials.

(iii) Wholesalers and pharmaceutical companies can agree on quantities and prices with the manufacturer over time.

(iv) Selection and development of genotypes with commercially desirable traits from wild or managed populations may create opportunities for the economic development of medicinal plant species as crops.

(v) Cultivation allows controlled post-harvest handling and, therefore,

(vi) quality controls can be assured, and

(vii) product standards can be adjusted to regulations and consumer preferences. (viii) Cultivated material can be easily certified ‘organic’ or ‘biodynamic’ although certifiers and other agencies are also presently developing wildcrafting standards (Honnef et al. 2005; Leaman 2004; Pierce et al. 2002). However, domestication of the resource through farming is not always technically possible.Many species are difficult to breed due to certain biological characteristics or ecological requirements (e.g. slow growth rates, special soil requirements, interactions with pollinators and other species, low germination, sensitivity to pests). Farmers are also often concerned about the lack of long-term security of ownership of high-value, long-lived species. These social and biological factors in turn influence the economic viability of medicinal plant cultivation. Economic feasibility is the main reason for the decision to introduce a species into cultivation, but it also represents an important limitation as long as it is still possible to obtain sufficient quantities of material from wild cultivation at a lower price . Cultivated material will compete with wild material supplied to the market by commercial collectors who have not incurred cultivation costs.

Low prices, both for local use and in the international pharmaceutical trade, mean that only a few species can be sold at a price high enough to make their cultivation profitable (Cunningham 1994). Domestication of species previously collected from the wild not only requires a significant capital investment (up to US$200,000; Plescher in litt.), but also requires several years of research (e.g. 12 years in the case of Alchemilla alpina ; Schneider et al.1999).

WILD OR CULTIVATED: WHAT DO PEOPLE NEED?

- Health-care needs:-

There is a worldwide trend of increasing demand for many popular and effective species in Europe, North America and Asia, with an increase of 8-15% per year (Grünwald and Büttel 1996). Rapid urbanization and the importance of medicinal plants in African health systems have stimulated the growth of internal and regional trade in Africa (Cunningham 1993). A similar situation exists in Latin America, where large quantities of medicinal plants are sold in urban markets (Shanley and Luz 2003). The demand for medicinal plants also reflects different cultural preferences. For example, in the United States in , only 3% of respondents had used medicinal plants that year (Eisenberg et al.1993), while in Germany, with a strong tradition in the use of medicinal plants, in 2001 31% of the products available over the counter in pharmacies were phytopharmaceutical preparations (BAH 2004). The level of use of medicinal plants is much higher in most developing countries. Although most traditional medicinal plants are derived from nature, these health systems are not static and introduced species are widely adopted into the plant repertoire used by herbalists in Africa or South America. In many cases, herbal medicines can also be cheaper than Western medicines, particularly

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where access to traditional healers is easier. The need for traditional medicine persists in urban environments even when Western biomedicine is available (Assessing the conservation implications of commercial captive breeding and artificial propagation), IUCN/SSC Workshop, 7-9.12/2001, Jacksonville. Draft Laboratory Report of 2002; Manderaetal . 1996).

- **Income generation:-**

Wild harvesting of medicinal plants offers poor people an opportunity to earn at least $ in cash. In particular, people who do not have access to agricultural land rely on the MAP harvest to earn at least some money. However, local people usually receive a low price for unprocessed plant material. Although revenue from the sale of Prunus Africana bark represents an important source of income for villagers in Madagascar, in some cases generating more than 30% of village income, the price paid to harvesters is comparatively low compared to Malagasy middlemen (Walter and Rakotonirina 1995).). In Mexico, Hersch-Martinez (1995) found that out of medicinal plants, collectors received, on average, only 6.17% of the consumer price for medicinal plants.

Whether fruits, roots, bark, or whole plants, the potential yield of wild stands of many species is often overestimated, especially when the effects of stochastic events are taken into account (Nantel et al. 1996). As a result, commercial resource extraction ventures based on wild populations can be characterized by a boom-and-bust situation, in which an initial harvest is followed by a decline in resource availability .

- **Small-scale cultivation and home gardens:-**

Small-scale cultivation, requiring few economic inputs, can respond to declining local supplies, generate income and supply regional markets. This could provide a more secure income than the notoriously inconsistent wild collection. For farmers integrating PAM into agroforestry systems or small-scale farming, these species can provide a varied and additional source of family income . Home gardens are increasingly focusing on the propagation of medicinal plants and introductory programs designed to promote the use of traditional remedies for common diseases by increasing the availability of plant sources (Agelet et al. 2000).

- **Large-scale cultivation:-**

As Leakey and Izac (1996) point out, large-scale cultivation has numerous socioeconomic impacts on rural residents: “Commercialization is necessary and potentially harmful to farmers. This is necessary because without them the product market is limited and the rural population has no opportunity to earn income. A certain degree of domestication of the product is therefore desirable. On the other hand, commercialization is potentially harmful to rural populations if it expands to the point where foreigners come with investment capital to establish large-scale monoculture plantations for export markets. Rural residents can benefit from the plantations thanks to the jobs available and therefore non-agricultural income However, plantations can also distort market forces to their advantage, for example by imposing low wages that limit the social and economic development of local people. The main beneficiaries of large-scale exports are likely to be the country's elite and perhaps the national economy." Furthermore, socially disadvantaged groups whose survival and income actually depend on MAP collection may not have access to agricultural land and are therefore unable to , to compete with large-scale MAP production by farmers. well established ((Vantomme in Conservation Impact of Commercial Captive Reproductive Workshop , December 7-9, 2001, White Oak Foundation, Jacksonville, Florida, United States. Selected Briefing Notes, 2002.) Other limitations of the domestication approach include a A period of boom and bust and volatile markets that disappointed farmers as consumers turned their attention elsewhere (Laird and Pierce 2002).

WILD OR CULTIVATED: WHAT DO THE SPECIES AND ECOSYSTEMS REQUIRE?

The cultivation of medicinal plants is generally viewed not only as a means of meeting current and future demand for mass production of medicinal plants and herbal remedies, but also as a means of reducing harvest pressure on wild populations (FAO 1995). ; Lambert et al., 1997; Palevich 1991; DeSilva 1997; WHO 1993). In this chapter we want to evaluate the benefits and risks associated with these recommendations. Dynamic markets with rapidly growing demand often have a devastating impact on wildlife. A closer look shows that harvest pressure does not affect all species equally.The seven forms of rarity described by Rabinowitz (1981) clearly show that a species that (i) has a narrow geographical distribution, (ii) is habitat specific, and (iii) has small populations everywhere

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is more easily overfished by species with one other formula (Table 4).

Table 4. Seven forms of rarity (after Rabinowitz 1981)

Geographic distribution	Habitat specificity	Local population size	
Wide	broad	Somewhere large	Least concern
	restricted	Everywhere small	
		Somewhere large	
		Everywhere small	
narrow	Broad	Somewhere large	
		Everywhere small	
	Restricted	Somewhere large	
		Everywhere small	Highly susceptible

Second, sensitivity or resistance to crop pressure varies among species due to biological characteristics such as different growth rates (slow growth versus fast growth) and reproductive systems (vegetative or generative reproduction; germination rate ; dormancy; apomixis). and life forms (annual, perennial, woody). By looking at their life forms and harvested plant parts together, species can be easily distinguished in terms of their susceptibility to overexploitation (Table 5). Harvesting the fruit of a long-lived tree poses a much lower risk to the long-term survival of the species than harvesting the seeds of an annual plant. In the latter case, when the seed disappears, the plant disappears.In some cases, the effects of harvesting are more complex, such as slow-growing trees that reproduce from seed but produce only a few large fruits (example: Araucaria araucana, the monkey tree). This increases their susceptibility to overuse from low to medium or even high.

A detailed summary of factors predicting resistance or susceptibility to capture in wild populations was provided by Cunningham (2001).

Table 5. Susceptibility of species to over collection as a function of life form and plant parts used

	Wood	Bark	Root	Leaf	Flower	Fruit / Seed
Annual	----------	----------	high	medium	medium	high
Biannual	----------	----------	high	medium	medium	high
Perennial	----------	medium	high	low	low	low
Shrub	medium	Medium?	Medium?	low	low	low
Tree	medium	Medium?	Medium?	low	low	low

In summary, the species most likely to be affected by overexploitation are habitat-specific, slow-growing and destructive species whose bark, roots or the entire plant are harvested. These species are the most affected by the harvest and many have been severely depleted, such as Prunus Africana in West Africa, Warburgia salutelis in South Africa and Saussurea costus in the Himalayas. Cultivation is a

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conservation option for endangered medicinal plant species because the permanent removal of material from their populations is far greater than the sustainable annual yield. If the demand for these species could be met from cultivated sources, pressure on wild populations would be reduced. In these cases, the need for strict protection of remaining populations, greater security of ex situ genetic material and investment in breeding and breeding programs is extremely urgent, as for example with the Jaborandi (Pilocarpus jaborandi) in Brazil (Pinheiro 1997). . . . However, of the species that can be sold at a price high enough to make their cultivation profitable, few fall into the highest risk category. Examples of threatened but cultivated species include Garcinia afzelii, Panax quinquefolius, Saussurea costus and Warburgia salutes (Cunningham 1994). Many critically endangered MAPs cannot be grown for reasons of economic sustainability. This group of plants is only cultivated as part of public domestication programs . For all other collected MAP species, sustainable collection from wild populations is the primary conservation option for various reasons. Imagine that a valuable medicinal plant is exploited by local collectors. The pharmaceutical company domesticates this plant and begins growing it commercially. When a company no longer needs wild-harvested material, local collectors must stop collecting, and any incentive that local collectors might have to protect wild populations disappears. Domestication of MAP species has environmental implications by reducing the economic incentives for forest-dependent populations to protect ecosystems in which MAP species occur (Leaman et al. 1997; Vantomme in: Conservation Impacts of Captive Breeding Workshop, 7-9 December 2001, White Oak Foundation , Jacksonville, Florida, USA. Selected Information Notes 2002). If collectors and foraging communities can be involved in the development of breeding and management methods, it is likely that they will have an interest in protecting wild populations from over-exploitation, particularly when they act as a "bank of genetic resources" for domestic populations to be viewed as . Species. Company. Another aspect to consider is the genetic diversity of the species studied. Long before unsustainable harvesting practices result in the extinction of entire species, the genetic diversity of wild populations is compromised through selection of preferred growth forms and concentration in specific harvesting areas where particular ecotypes may occur.The same applies to domestication: requirements for industrial standardization encourage the use of a limited range of genetic material in crops. Domestication does not preserve genetic diversity because a small group of high-yielding individuals are selected for planting. As a summary of the previous sections, Table 6 in the appendix shows the advantages and disadvantages of three different aspects: "species/ecosystems", "market" and "people".

CHALLENGES OF HARVESTING SUSTAINABLY FROM THE WILD

Sustainable collecting is increasingly seen as a key conservation strategy for most wildlife species and their habitats, as they currently and potentially contribute to local economies and have greater long-term value to collectors. The basic idea is that non-destructive use and local benefits maintain the diversity of populations, species and ecosystems. In addition to poverty and the decline of traditional controls, key challenges to sustainable wildlife exploitation include: lack of knowledge about sustainable harvest rates and practices, undefined land use rights and the absence of legal and policy guidelines.

Lack of information on the wild resource

"The most important prerequisite for a truly sustainable form of resource use is information" (Peters 1994). In fact, resource managers still lack sufficient information about the plants used, their distribution, the genetic diversity of wild populations and related species, and, most importantly, sustainable annual crops that can be harvested without harming the environment. inhabitants (Iqbal 1993). Research into the conservation and sustainable use of medicinal plants and their habitats lags far behind the demand for this globally important resource . Each species has unique ecological, socioeconomic, health and cultural contexts that must be considered. Pattern search approaches are feasible, but solutions with " universal dimensions" are not.Sustainable solutions must be adapted to local conditions.

Problems of open access

In many cases, access to a resource is open to all and there is no restricted access or private ownership. To make a living, commercial collectors of medicinal plants "dig" these resources rather than manage them (Cunningham 1994). Open access programs for cultivable plant stocks prevent the rational and prudent use of plants and make it difficult to comply no quotas and blocking periods.
Lack of legislative and policy support for wild-harvesting schemes

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Volume 8, Issue 5, Sep.-Oct. 2023, pp: 1729-1738 www.ijprajournal.com ISSN: 2456-4494

WFP trade information is scarce and data is rarely collected or published at the national level. A large part of production and consumption is maintained at the subsistence level and therefore the economic importance of these activities is largely underestimated in government decision-making processes regarding rural development, rural planning, natural resource management and state budget allocations (Vantomme). Conservation Impacts Commercial Captive Breeding Workshop, July 7-9 December 2001, White Oak Foundation, Jacksonville, Florida, USA (Selected Briefing Notes 2002). Therefore, national laws and policies generally do not provide a framework for the rational and sustainable use of The ability of governments to develop laws to control and monitor the collection and trade of medicinal plant species and the conservation and sustainable use of medicinal plants when establishing protected areas Prioritization has been significantly strengthened by two changes in international law: the inclusion of medicinal plant species in the Convention on International Trade in Endangered Species (CITES) and the entry into force of the CBD.

FUTURE TRENDS AND SOLUTIONS

How will market demand change in the future? People in developing countries are already and are increasingly relying on medicinal plants as a source of primary health care . An often-cited estimate from the World Health Organization (Bannerman 1982) is that more than 80% of the world's population uses medicinal plants exclusively largely through traditional health practices. Even in the northern part of the world, the use of medicinal plants in both allopathic and herbal medicine is expected to increase worldwide (WHO 2002). This upward trend is due not only to the population explosion, but also to the growing popularity of natural and organic products.

Most MAP species will continue to be harvested from the wild

The limitations of cultivation as an alternative to wild collection were discussed by Sheldon et al. in . examined. (1996) in several case studies. We agree with their conclusion that despite the great interest in cultivation as a means of increasing production and in some cases as an attempt to help conserve the resource, the majority of MAP species persist in some cases to be collected. of the wild area. It is therefore necessary to recognize and strengthen the role of the local population

Forest inventory processes, monitoring and impact assessment, and integration of the use of non-timber products into forest management.

Need for implementation of management plans

To reduce yields to sustainable levels, an effective management system and sound scientific information are required. The management system should include annual harvest quotas, take into account seasonal or geographical constraints, and limit harvest to specific plant parts or size classes. In addition, an explanation of the rights to access and use the resources provided by the WFP is part of the basic information . Continuous monitoring and evaluation of success is required to adapt the management strategy (FAO 1995; Leaman et al. 1997; Prescott-Allen and Prescott-Allen 1996; Schippmann 1997; WHO 1993). In many cases, harvesting techniques need to be improved, as removal of the roots or bark often has a negative impact on the recovery of the species and can even kill it. Harvesting methods are often primitive and inexpensive, resulting in loss of quality and reduced prices (Iqbal 1993; Vantomme in Conservation Impacts of Commercial Captive Reproductive Workshop, December 7-9, 2001, White Oak Foundation, Jacksonville, Florida, United States).). (Selected briefing notes 2002). Field methods have already been developed to assess sustainable harvest and monitor non-timber forest products, leading to the publication of research guidelines and predictive models (Cunningham 2001; FAO 1995; Nantel et al. 1996; Peters 1994).

II. Conclusion:-

The review of the commercial cultivation and collection aspect of medicinal and aromatic plants led to following

Conclusions:-

Given that sustainable harvesting from the wild is difficult to achieve, certification standards can play a role to assure that a product meets certain standards of sustainability. Certification programmes related to natural-resource use have mainly been developed for timber and agricultural products, but they are presently being adapted for wild-harvest of non-timber plants. Various schemes focus on different areas along the supply chain: production, processing, trade, manufacturing and marketing. Four categories of certification schemes have been identified to be of relevance for MAP products (Walter 2002): (i) forest management certification (e.g., Forest Management Council (FSC); (ii) social certification (e.g. Fair Trade Federation FTF); (iii)

International Journal of Pharmaceutical research and Applications
Volume 8, Issue 5, Sep.-Oct. 2023, pp: 1729-1738 www.ijprajournal.com ISSN: 2456-4494

organic certification (e.g. International Federation of Organic Agriculture IFOAM); and (iv) certification of product quality.These include parameters such as product identity, purity, safety and effectiveness. The basic requirement is the correct identification of the medicinal plants collected. Good plant identification practices have been developed in Canada (Brigham et al. 2004) and for traditional Chinese medicines sold in the United Kingdom (Leon et al. 2002).

REFERENCES :-

[1]. Agelet, A., Bonet, M.À. and Vallés, J., 2000. Homegardens and their role as a main source of medicinal plants in mountain regions of Catalonia (Iberian Peninsula). Economic Botany, pp.295-309.
[2]. Bodeker, G.C., Bhat, K.K.S., Burley, J. and Vantomme, P., 2003. Medicinal plants for forest conservation and health care
[3]. Carruthers, J., 2017. National Park Science: a century of research in South Africa. Cambridge University Press.
[4]. Cheminal, A., Kokkoris, I.P., Strid, A. and Dimopoulos, P., 2020. Medicinal and aromatic Lamiaceae plants in Greece: Linking diversity and distribution patterns with ecosystem services. Forests, 11(6), p.661.
[5]. Cunningham, A.B., 2014. Applied ethnobotany: people, wild plant use and conservation. Routledge.
[6]. De Silva, T., 1997. Industrial utilization of medicinal plants in developing countries. Medicinal plants for forest conservation and health care. FAO, Rome, pp.34-44.
[7]. Ellenberger, A., 1998, June. Assuming responsibility for a protected plant: WELEDA's endeavour to secure the firm's supply of Arnica montana. In Medicinal plant trade in Europe: conservation and supply: proceedings of the first international symposium on the conservation of medicinal plants in trade in Europe (pp. 22-23).
[8]. Gerique, A., 2006. An introduction to ethnoecology and ethnobotany, theory and methods. Integrative assessment and planning methods for sustainable agroforestry in humid and semiarid regions. Advanced Scientific Training (ed.), 20p. Loja, Ecuador.
[9]. Groombridge, B. and Jenkins, M., 2002. World atlas of biodiversity: earth's living resources in the 21st century. Univ of California Press.
[10]. Gruenwald, J.O.R.G. and Büttel, K., 1996. The European Phytotherapeutics market/figures, trends analyses. Drugs made in Germany, 39, pp.6-11.
[11]. Hardalova, R., Evstatieva, L. and Gussev, C., 1998. Wild medicinal plant resources in Bulgaria and recommendations for their long-term development. Bulgarias's biological diversity: conservation status and needs assessment, 1, pp.527-561.
[12]. Lambert, J., Srivastava, J. and Vietmeyer, N., 1997. Medicinal plants: rescuing a global heritage (Vol. 355). World Bank Publications.
[13]. Leakey, R.R.B., Temu, A.B., Melnyk, M. and Vantomme, P., 1996. Domestication and commercialization of non-timber forest products. Non-Wood Forest Products Series, 9.
[14]. Leaman, D.J., Schippmann, U. and Glowka, L., 1997, June. Environmental protection concerns of prospecting and producing plant-based drugs. In International symposium on herbal medicine. A holistic approach. Documents, proceedings and recommendations (Vol. 1, No. 4).
[15]. Myklestad, Åse, and Magne Sætersdal. "The importance of traditional meadow management techniques for conservation of vascular plant species richness in Norway." Biological conservation 118, no. 2 (2004): 133-139.
[16]. Robbins, C.S., 1998. American ginseng: the root of North America's medicinal herb trade. TRAFFIC North America.
[17]. (17)Schippmann, U., Leaman, D.J. and Cunningham, A.B., 2002. Impact of cultivation and gathering of medicinal plants on biodiversity: global trends and issues. Biodiversity and the ecosystem approach in agriculture, forestry and fisheries.
[18]. Synge, H., 1981. The biological aspects of rare plant conservation.
[19]. Walter, K.S. and Gillett, H.J. eds., 1998. 1997 IUCN red list of threatened plants. IUCN.
[20]. Van der Laan, J.W., Minor, P., Mahoney, R., Arntzen, C., Shin, J. and Wood, D., 2006. WHO informal consultation on scientific basis for regulatory evaluation of candidate human vaccines from plants, Geneva, Switzerland, 24–25 January 2005. Vaccine, 24(20), pp.4271-4278.