Demand and Supply of Medicinal Plants in India – an Assessment

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The Assessment -1

The assessment is based on:

A. Sample survey of consumption of botanicals by 188 herbal manufacturing units stratified into four size-classes.
B. Estimation of non-commercial consumption of medicinal plants by rural households based on survey of 1223 households in 5 states.
C. Sample survey of 3 Large mandis, 4 Regional mandis and 13 intermediate mandis across the country.

The Assessment -2

D. Assessment of Production and Supply of the medicinal plants from Wild and Cultivated sources.
E. Review of published literature on domestic trade, consumption, imports & exports (including DGCIS data).

Limitations:

(i) The short study time (6 months), that had influence on the design and size of sampling;
(ii) Reluctance of various stakeholder groups in participation in the survey;
(iii) Inadequacy in record maintenance.

Comprehensive listing of 960 plant species in Trade

- Includes correlation of trade names with the updated botanical nomenclature.
- 1289 botanical raw drugs recorded in trade and correlated to 960 species.
- 41% of these 960 species are herbs, 26% are trees, 18% are shrubs and the remaining 15% are climbers.
- More than 50% of the plant raw drugs in trade involve collection of whole plants, roots, wood or bark.

Estimation of Annual Demand of Botanical Raw Drugs

Key findings

S. No.	Categories of users	Estimated Annual Demand (MT)	Basis of Estimates	Remarks
1	Herbal Industry	**1,77,000**	Analysis of consumption of botanicals by 188 sampled manufacturing units stratified into four size classes	The demand estimate pertains to botanical entities that are primarily traded as 'herbal raw drugs' and excludes the popular spices, fruits, vegetables and cereals used in very high quantities for other purposes.
2	Rural Households	**86,000**	Analysis of medicinal plants consumption of 1223 sampled rural households (5 states)	
3	Exports*	**56,500**	Analysis of DGCIS data relating to exports of commodities during 2004-05	
	Total:	**3,19,500**		

*** Data pertains to the year 2004-05.**

Estimation of Annual Trade Value of Botanical Raw Drugs

Key findings

Consumer Categories	Quantity Consumed (MT)	Trade Value (Rs. in crores)	Remarks
Herbal Industry	177000	627.90	i) The aggregated procurement costs reported by four major manufacturing units (Dabur, Charak, Sami and Zandu) have been utilized for estimating the procurement value of 177000 MT of raw drugs.
Exports*	56,500	354.80	
Rural Households	86,000	86.0	
Total:	**3,19,500**	**1068.70**	ii) Trade value of material consumed by the rural households has been estimated using a notional rate of Rs.10 per kg.

* Data pertains to the year 2004-05.

The turnover of India's herbal manufacturing units has been estimated at **Rs. 8800** crores during 2005-06.

Analysis of Exports and Imports of Botanical Raw Drugs

Key findings

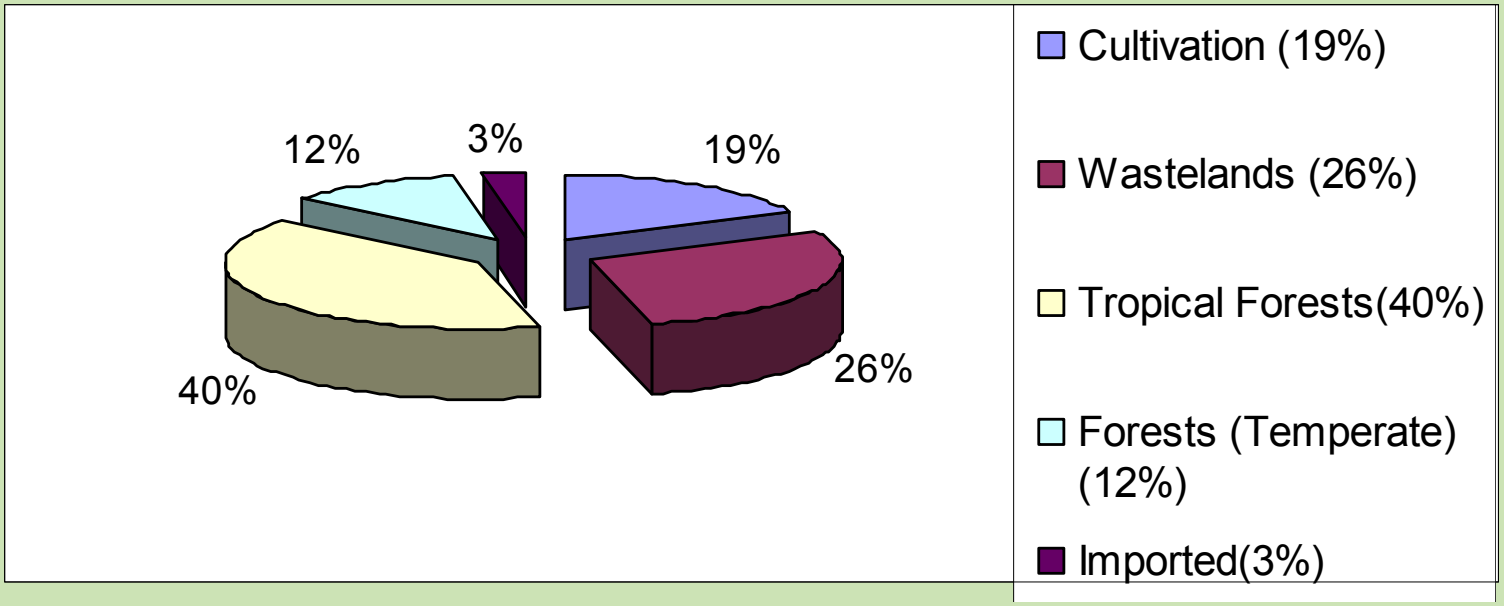
- Analysis of the latest available data (2004-05) shows the exports of 56,500 MT of botanical raw drugs valued at Rs. **354.80 crores** compared to the imports of 37,483 MT valued at **Rs. 173 Crores** during the same year. These figures relate only to ‘plant raw drugs’ and exclude ‘plant extracts’.
- It is not possible to draw-up a comprehensive list of plant species, linked to the range of botanical raw drugs that are in foreign trade, as much of the foreign trade data is assigned to miscellaneous/ others categories.
- With no guidelines or consensus on use of data from specific heads for working out export and import of botanical raw drugs, different researchers use different data to arrive at the quantum of foreign trade in botanicals, making it difficult to have comparable figures.

Exports turnover of India's Herbal sector

- As per the analysis of DGCIS data, the annual exports of India's herbal sector added upto **Rupees 807 Crores** in 2004-05.
- Out of this **Rs.291 Crores** relate to exports of medicants of Ayurvedic, Unani, Siddha and Homoeopathic system i.e. finished products, **Rs.355 Crores** relate to exports of plant raw drugs and **Rs.161 Crores** relate to plant extracts.
- Thus during 2004-05 the finished herbal products constituted nearly 36% of the total exports(by value) of India's herbal sector and the balance 64% was on account of exports of plant raw drugs and extracts.
- As compared to the total herbal exports turnover of Rs.622 Crores, for the year 2003-04 there has been a noticeable **increase of Rs.185 Crores** (nearly 30%) during 2004-05 and this has been, almost entirely, on account of higher exports of finished herbal products.

Identification of 176 Species traded in High volumes (>100 MT/yr.)

- The 176 species in high trade(> 100MT/Yr.) have been enlisted based on data of industrial consumption as well as data of production, supply and trade recorded during the study.An analysis of supply sources is given below:



91 wild species, in high trade, needing focused management interventions

- 21 of these are obtained from temperate forests (Himalaya) and 70 from tropical forests.

21 Species obtained from Temperate Forests(Himalayan region):
Abies spectabilis (Brahmi talis), *Aconitum ferox* (Bachnag), *Aconitum heterophyllum* (Atis), *Berberis aristata* (Daruhaldi), *Berginia ciliata* (Pashanbheda), *Cedrus deodara* (Devdar), *Cinnamomum tamala* (Tejpatra), *Ephedra gerardiana* (Somlata), *Juniperus communis* (Hauber), *Jurinea macrocephala* (Dhoop), *Nardostachys grandiflora* (Jatamansi), *Onosma hispidum* (Ratanjot), *Parmelia perlata*(Chadila) , *Picrorhiza kurroa* (Kutki), *Pistacia integerrima* (Kakarsingi), *Rheum australe* (Revandchini), *Rhododendron anthopogon* (Talis patra), *Swertia chirayita* (Chirata), *Taxus wallichiana* (Talis), *Valeriana jatamansi* (Mushkbala), *Viola pilosa* (Banafsha).

70 Species, in High Trade, obtained from Tropical Forests of India

Acacia catechu, Acacia nilotica, Acacia sinuata, ***Aegle marmelos****, Albizzia amara, Alstonia scholaris, Anogeissus latifolia,* ***Asparagus racemosus****, Baliospermum montanum, Bombax ceiba, Boswellia serrata, Buchnania lanzan,* ***Butea monosperma****, Careya arborea,* ***Cassia fistula****, Celastrus paniculatus, Chlorophytum tuberosum, Cinnamomum sulphuratum, Clerodendrum phlomides, Coscinium fenestratum, Cyclea peltata, Decalepis hamiltonii,* ***Desmodium gangeticum****,* ***Embelia tsjerium-cottam****,* ***Emblica officinalis****,* ***Garcinia indica****, Gardenia resinifera,* ***Gmelina arborea****,* ***Gymnema sylvestre****, Helictrus isora,* ***Holarrhena pubescens****, Holoptelia integrifolia, Holostemma ada-kodien,* ***Ipomoea mauritiana****, Ixora coccinea, Lannea coromandelica, Litsea glutinosa, Lobelia nicotianaefolia, Madhuca indica, Messua ferrea, Mimusops elengi, Morinda pubescens, Mucuna pruriens, Nilgirianthus ciliatus, Operculina turpethum,* ***Oroxylum indicum****,* ***Premna integrifolia****,* ***Pterocarpus marsupium****, Pterocarpus santalinus, Rauvolfia serpentina,* ***Rubia cordifolia****, Santalum album, Sapindus mukorossi,* ***Saraca asoca****, Schrebera swietenioides, Semecarpus anacardium, Shorea robusta, Smilax glabra, Soymida febrifuga, Sterculia urens,* ***Stereospermum chelonoides****,* ***Strychnous nux-vomica****, Strychnos potatorum,* ***Symplocos racemosus****,* ***Terminalia arjuna****,* ***Terminalia bellirica****,* ***Terminalia chebula****, Vateria indica, Wrightia tinctoria, Zizyphus xylocarpus.*

46 Species, in High Trade, largely/ entirely obtained from wastelands/ roadsides

Abrus precatorius , Achyranthes aspera , Aerva lanata , Andrographis paniculata, Bacopa monnieri , Boerhavia diffusa , Cardiospermum halicacabum , Cassia absus , Cassia tora , Centella asiatica , Centratherum anthelminticum , Citrullus colocynthis , Convolvulus microphyllus , Curculigo orchioides , Cynodon dactylon , Cyperus esculentus , Cyperus rotundus , Datura metel , Eclipta prostrata , Fumaria indica , Hedyotis corymbosa , Hemidesmus indicus , Hygrophylla schulli , Ipomoea nil , Merremia tridentata , Ocimum americanum , Peganum harmala , Phyllanthus amarus , Pluchea lanceolata , Plambago zeylanica , Pseudarthia viscida , Psoralea corylifolia , Sida rhombifolia , Sisymbrium irio , Solanum anguivi , Solanum nigrum , Solanum virginianum , Sphaeranthus indicus , Tephrosia purpurea , Tinospora cordifolia , Tragia involucrata , Tribulus terrestris , Trichosanthes cucumerina , Vetiveria zizanioides , Withania coagulens , Woodfordia fruticosa .

Some of these need to be cultivated for meeting the specific quality requirements relating to the plant raw drugs.

34 Species, in high trade, largely/ entirely obtained from cultivation / plantations

Abelmoschus moschatus, Acorus calamus, Adhatoda zeylanica, Aloe barbadensis, Alpinia calcarata, Azadirachta indica, Caesalpinia sappan, Cassia angustifolia, Catharanthus roseus, Cichorium intybus, Croton tiglium, Curcuma angustifolia, Curcuma zerumbet, Ficus benghalensis, Ficus religiosa, Gloriosa superba, Indigofera tinctoria, Inula racemosa, Jatropha curcas , Kaempferia galanga , Lawsonia inermis , Lepidium sativum, Ocimum basilicum, Ocimum tenuiflorum, Piper longum, Plantago ovata, Plectranthus barbatus, Pongamia pinnata, Prunus armeniaca, Saussurea costus, Trachyspermum ammi, Vitex negundo, Withania somnifera, Zizyphus jujuba.

Some of these may need development of improved varieties / Cultivars

5 Species, in high demand, largely/ entirely obtained through imports

- **2** of these, namely *Aquilaria agallocha* (Agar) growing in N.E India and *Commiphora wightii* (Guggul) growing in western India, need augmentation of their wild populations and sustainable harvest practices.

- The remaining **3** species namely *Glycyrrhiza glabra* (Mulethi), *Piper chaba* (Gajpippal) and *Quercus infectoria* (Majuphal) are exotics and may have to be considered for cultivation in suitable areas for meeting the domestic demand.
- Note: A few high value imported species, like *Anacyclus pyrethrum,* may also be considered for such cultivation.

Need for improving and periodically updating the list of species in high trade

This is needed on two accounts:

Firstly, some species in high trade might have been missed out in this study due to limitations of the available time frame for carrying out the exercise.

Secondly, in many cases more than one species are in trade to meet the commercial demand for a specific plant raw drug and these plant species need to be properly identified through more detailed data collection and analysis.

Summary of Recommendations

S. No	Recommendation	Action Points	Time Line under the 11th 5-year plan
1	Assess status of Wild Populations of threatened Medicinal Plant Taxa in high trade like ***Coscinium fenestratum, Oroxylum indicum, Premna integrifolia*** etc. which are a sub-set of the 91 forest species	**Identify a nodal agency to co-ordinate Rapid Threat Assessments of prioritized species.** **Support state level and regional level assessments and analysis of results for prioritization of actions.** **Initiate species specific field assessments of wild populations of highly threatened medicinal plant species.**	**By Mar 2008** **2008 to 2011 (3 years)** **2008 to 2012 (continuous)**

Summary of Recommendations

S. No.	Recommendation	Action Points	Time Line under the 11th 5-year plan
2	Improve Harmonised System(HS) of Classification for the botanicals in Foreign Trade.	**Support a study to assess the prevailing HS codes and their linkages with specific plant species and initiate development of an improved HS classification with unambiguous linkages of the codes and the specific plant entities.**	**2008 to 2009 (1 year)**

Summary of Recommendations

S. No.	Recommendation	Action Points	Time Line under the 11th 5-year plan
3	Implement a system for backward Linkage of Traded Botanicals and the related forest species(91 in high trade listed in the study) which are largely/entirely sourced from forests.	**Develop protocols for establishment of proper backward linkages of traded botanical raw drugs to their species-specific and region-specific sources of supply.** **Support training programmes in the SFD's for appropriate documentation and monitoring of harvesting of prioritized forest species.**	**2008-2010 (2 years)** **2010-2012 (2 years)**

Summary of Recommendations

S. No.	Recommendation	Action Points	Time Line under the 11th 5-year plan
4	Promote effective management systems for wild (forest) populations of medicinal species in high consumption.	**Develop & Support strategic schemes of SFD's for augmentation of wild populations of medicinal trees/ shrubs.** **Support pilot programmes for introduction of such forest tree species under agro-forestry.**	2007-2012 (5 years) 2008-2012 (4 years)

Summary of Recommendations

S. No.	Recommendation	Action Points	Time Line under the 11th 5-year plan
5	Support development of Repositories of plant raw drugs in trade including proper identification of their plant sources.	**Identification of one central and 4-5 regional agencies to house such repositories.** **Support the establishment/ strengthening of these repositories.**	2007-2008 2007-2012 (5 years)

Summary of Recommendations…

S. No.	Recommendation	Action Points	Time Line under the 11th 5-year plan
6	Support studies for reviewing the plant sources of Controversial Raw Drug entities / groups like Talispatra, Daruharidra, Vaividang, Shankhapushpi, Pashanbheda, Dashamoola etc..	**Support studies relating to the controversial raw drug groups, identified by ISM experts, for establishing the botanical identities of their plant sources.**	2007-2012 (5 years)

Summary of Recommendations…

S. No.	Recommendation	Action Points	Time Line under the 11th 5-year plan
7	Support R&D for developing improved varieties of selected species among the medicinal crops under commercial cultivation(34 species identified in the study).	**Identify and support suitable institutions for research relating to development of improved varieties/ cultivars of selected species for which cultivation has already stabilized and included in the local agricultural practices.**	2008-2012 (4 years)

Summary of Recommendations…

S. No.	Recommendation	Action Points	Time Line under the 11th 5-year plan
8	Support periodic assessments of National level Demand and Supply of medicinal plants once in every two or three years.	**Identify one nodal agency and 4 or 5 regional agencies to carry out periodic assessments.** **Support the regional agencies for data gathering and nodal agency for coordination, collation & analysis of data for preparation of updated assessments.**	**By Mar 2008** **2008-2012 (4 years)**

Thank You

Consumption by India's Herbal Industry

Category-wise Coverage of Herbal Manufacturing Units in the Survey

Category	Annual Turnover (in Rs.)	Total Units	Sampled Units	Sampling Percentage
A	> 50 Crore	14	6	43
B	> 5 Crore but <50 Crore	36	17	47
C	> 1 Crore but <5 Crore	1443	48	3.3
D	< 1 Crore	8000	117	1.4
	Total	**9493**	**188**	

Consumption by India's Herbal Industry

Limitations:

- Data gathered from the herbal industries has a limitation that it entirely relies on the information provided by them with no mechanism to cross check the data.
- It is possible that some botanicals, even though consumed in large quantities by a few/ selected herbal manufacturing units,have not been captured in the sample survey.

Consumption by India's Herbal Industry

Species-wise Annual Consumption Estimates of Medicinal Plants(>100 MT)

S. No.	Botanical Name	Estimated Consumption (MT)	Source (Wild/ Cult)	Category-wise Estimated Consumption (%)			
				Cat A	Cat B	Cat C	Cat D
1	*Emblica officinalis*	16820	W/C	53	5	10	33
2	*Terminalia chebula*	8158	W	18	5	22	55
3	*Sida rhombifolia**	5505	W	15	10	37	38
4	*Withania somnifera*	4575	C/W	18	6	22	54
5	*Tinospora cordifolia**	3845	W	28	10	27	35
6	*Ocimum tenuiflorum*	3533	C	19	7	9	64
7	*Terminalia bellirica*	3424	W/C	23	8	34	35
8	*Eclipta prostrata*	3351	W	11	7	31	50
9	*Andrographis paniculata*	3279	W/C	48	3	25	24
10	*Asparagus racemosus**	3180	W/C	24	12	20	44

Consumption by India's Herbal Industry

Species-wise Consumption Estimates of Botanicals (117) with Estimated Annual Consumption >100 MT

S. No.	Botanical Name	Estimated Consumption (MT)	Source (Wild/ Cult)	Category-wise Estimated Consumption (%)			
				Cat A	Cat B	Cat C	Cat D
115	*Baliospermum montanum*	104	W	1	3	29	67
116	*Cassia absus*	102	W	0	1	53	46
117	*Helicteres isora*	100	W	0	1	16	84
Total Consumption (117 species)		**1,41,337**		**28**	**07**	**23**	**42**

Consumption by India's Herbal Industry

Correlation between Raw Material Consumption and Annual Turnover

Size Category	Annual Turnover(in Rs.)	Estimated Annual Consumption of botanicals (MT/ year)
A	> 50 Crore	> 1000
B	> 5 Crore but <50 Crore	100 to <1000
C	> 1 Crore but <5 Crore	20 to < 100
D	< 1 Crore	Up to 20

Consumption of Botanicals by Rural Households

State-wise number of sampled rural households vs. total rural households

States (Districts)	**No. of Rural Households(2001 census)**	**No. of Sampled Households (Rural)**
Karnataka (8)	67,25,882	342
Kerala (3)	50,10,259	300
Tamil Nadu (2)	82,84,383	200
Orissa (2)	66,18,547	125
Andhra Pradesh (4)	1,26,07,167	256
Total	**3,92,46,238**	**1,223**

Consumption of Botanicals by Rural Households

Reported use of 354 medicinal plant species by 1223 sampled rural households across five states

State	No. of Sampled Rural Households	Number of medicinal plant species being consumed by HHs.
Karnataka	342	179
Kerala	300	98
Tamil Nadu	200	104
Orissa	125	130
Andhra Pradesh	256	170

Consumption of Botanicals by Rural Households

Analysis of these 354 medicinal plant species recorded in rural household use reveals that 257 (72.5%) are common with the List of 960 traded medicinal plants of India.

This implies that there are competing uses of these species by the commercial sector as well as the rural households.

Any indiscriminate harvesting of this resource for commercial trade may deprive the rural households of their major means of primary health care.

Consumption of Botanicals by Rural Households

Quantitative estimates of total consumption of botanicals by all rural households across five surveyed states

Average annual consumption/ rural household (in gms)	Total number of Rural households in five states	Estimated total annual consumption(in MT)
890 gms(dry weight)	3.92 crores	24405(dry wt.)

As per 2001 census data there are13.77 crore rural households in the country. Assuming that the consumption pattern of botanicals for health care needs by the rural households in other states is by and large similar to the one obtained for five states, the total annual consumption of botanicals in the country by rural households would come to 85,754 MT. Even though this estimation is based on a small sample size, yet it is indicative enough to highlight the issue.

Production and Supply of Medicinal Plants

State-wise Annual production and Supply of medicinal plants (based on records of Forest Departments)

S. No	Botanical Name	AP (2005-2006)	CG (2005-2006)	HP (2002-2003)	KTK (2001-2002)	KER (2004-2005)	MP (2005-2006)	OR (2003-2004)	UTT (2005-2006)	Total (8 States)
1	*Madhuca indica/ M. longifolia*	1989	30200				572			32761
2	*Shorea robusta*						5	9205		9210
3	*Emblica officinalis*		3100		469	54	4970		6	8599
4	*Buchanania lanzan*		6670				581			7251
5	*Cassia tora*		5000				1601			6601
6	*Bauhinia vahlii*	887	5260				305	47		6499
7	*Terminalia chebula*	595			905	23	4200			5723
8	*Terminalia bellirica*		2970				381			3351
9	*Schleichera oleosa*		2700				9			2709
10	*Pongamia pinnata*		2650				16			2666

Production and Supply of Medicinal Plants

State-wise Annual production and Supply of medicinal plants (based on records of Forest Departments/ corporations)

S. No	Botanical Name	AP (2005-2006)	CG (2005-2006)	HP (2002-2003)	KTK (2001-2002)	KER (2004-2005)	MP (2005-2006)	OR (2003 - 2004)	UTT (2005 - 2006)	Total (8 States)
71	*Zizyphus xylopyrus*		100							100
72	*Berberis aristata*			524						524
	Total									**119778**

AP-Andhra Pradesh; CG-Chhattisgarh; HP-Himachal Pradesh; KTK-Karnataka; KER-Kerala; MP-Madhya Pradesh; OR-Orissa; UTT-Uttarakhand

Production and Supply of Medicinal Plants

From Cultivations/Plantations

S.No	Trade Entity	Plant Species	Estimated area under Cultivation & Production		Region/States
			Area(in ha)	Annual Production (in MT)	
1	Isabgul	***Plantago ovata***	60,000	60000	Gujarat, Rajasthan & MP
2	Senna	***Cassia angustifolia***	12,000	15000	Rajasthan & TN
3	Henna	***Lawsonia inermis***	40000	40000	Rajasthan (Sojat)
4	Jojoba	***Simmondsia chinensis***	400	900	Rajasthan & Gujarat
5	Aswagandha	***Withania somnifera***	5000	5000	M.P. & Rajasthan and to lesser extent in other states of peninsular India
6	Milk Thistle	***Silybum marianum***	400	500	Rajasthan
	Sub Total		**117800**	**121400**	

Production and Supply of Medicinal Plants

From Cultivations/Plantations

S. No.	Entity	Species	Industrial consumption(MT /year)
7	Tulasi	*Ocimum tenuiflorum*	3500
8	Aloe	*Aloe barbadensis*	1600
9	Coleus	*Coleus forskohlii*	1470
10	Long Pepper	*Piper longum*	1730
11	Ajwain	*Trachyspermum ammi*	1150
12	Chicory	*Cichorium intybus*	770
13	Indigo	*Indigofera tinctoria*	165
14	Bach	*Acorus calamus*	680
15	Galangal	*Alpinia calcarata*	200
16	Pokharmul	*Inula racemosa*	370

Production and Supply of Medicinal Plants

From Cultivations/Plantations

S. No.	Entity	Species	Industrial consumption(MT /year)
17	Kacholam	*Kaempferia galanga*	109
18	Bael	*Aegle marmelos*	2900
19	Neem	*Azadirachta indica*	2250
20	Chitrak	*Pumbago zeylanica*	1300
21	Kachur	*Curcuma zedoaria*	183
22	Pathimukham	*Caesalpinia sappan*	420
23	Karanj	*Pongamia pinnata*	280
24	Arali	*Ficus religiosa*	290
		Total agricultural production	**1,40,767**