

Consumption by Domestic Herbal Industry

India's domestic herbal industry consists of 8610 licensed herbal units engaged in making herbal health care formulations under different streams of Indian Systems of Medicine. The herbal units are categorised into large, medium, small and very small categories depending upon the stated annual turnover of the units. Under this study, this annual turnover-based categorisation has been correlated to herbal raw drug consumption based categorisation to arrive at the category of the industry in the absence of its annual turnover data. In accordance with a stratified sampling design, 692 domestic herbal units have been sampled under the current study to work out the domestic herbal industry's annual consumption of herbal raw drugs. The data reveals that the India's domestic herbal industry is consuming herbal raw drugs correlating to a total of 907 plant species. Based on the sampling of 692 units, the total annual consumption of herbal raw drugs by the domestic herbal industry in the country has been estimated at 1,95,000 MT, of which more than two thirds is consumed by the large and the medium units. The data also reveals that nearly 85% of the medicinal plant species used in making classical formulations under Indian codified medical streams continue to be sourced from the wild. Total annual turnover of the domestic herbal industry for the year 2014-15 has been estimated at ₹ 20,000 crore.

3.1. INTRODUCTION

India's domestic herbal industry is represented by 8610 licensed herbal units spread across different States in the country (Table 3.1). Uttar Pradesh, with 2247 licensed herbal units, has the highest concentration of such units in any State. Kerala with 905 licensed herbal units comes second. The north-eastern states of Manipur, Mizoram, Nagaland, Tripura and Arunachal Pradesh do not have any licensed herbal units. 87% of the licensed herbal units in the country have been registered under Ayurveda stream of ISM, whereas 4.9% herbal units are registered for making Unani formulations, 3.8% for making Siddha formulations, and 4.3% for making Homoeopathy formulations. At present no licensed herbal unit under Swa-rigpa (Tibetan) stream of ISM is there in the country.



Domestic Herbal Industry : Formulations under Preparation

It is interesting to note that out of the 328 herbal units registered under Siddha stream of ISM, 324 units are located in Tamil Nadu, the state with very strong Siddha traditions. Similarly, of the 421 herbal units registered under the Unani stream of ISM, 237 units are located in Uttar Pradesh and 106 units are located in Andhra Pradesh, the states where there is a lot of reliance upon Unani Tibb. Uttar Pradesh also accounts for more than one fourth of the total herbal units registered under Ayurveda stream of ISM. Kerala, with 12% of the country's Ayurvedic herbal units, is another state with strong Ayurvedic herbal industry.

Table 3.1: State-wise Data of Licensed Herbal Units

State	Number of Licenced Herbal Units					
	Ayurveda	Unani	Siddha	Tibetan	Homeopathic	Total
Andaman & Nicobar	-	-	-	-	-	-
Andhra Pradesh	473	106	-	-	31	610
Arunachal Pradesh	-	-	-	-	-	-
Assam	52	-	-	-	1	53
Bihar	214	27	-	-	40	281
Chandigarh	1	-	-	-	-	1
Chhattisgarh	31	-	-	-	-	31
Dadra & Nagar Haveli	5	-	-	-	-	5
Daman & Diu	10	-	-	-	-	10
Delhi	43	12	-	-	8	63
Goa	7	-	-	-	-	7
Gujarat	480	-	-	-	15	495
Haryana	274	3	-	-	23	300
Himachal Pradesh	135	-	-	-	3	138
Jammu & Kashmir	11	2	-	-	2	15
Jharkhand	-	-	-	-	-	-
Karnataka	166	1	-	-	10	177
Kerala	880	1	4	-	20	905
Lakshdeep	-	-	-	-	-	-
Madhya Pradesh	625	-	-	-	8	633
Maharashtra	660	6	-	-	39	705
Manipur	-	-	-	-	-	-
Meghalaya	1	-	-	-	-	1
Mizoram	-	-	-	-	-	-
Nagaland	-	-	-	-	34	34
Odisha	148	-	-	-	12	160
Puducherry	25	10	-	-	6	41
Punjab	284	-	-	-	-	284
Rajasthan	265	3	-	-	-	268
Sikkim	1	-	-	-	-	1
Tamil Nadu	323	10	324	-	5	662
Tripura	-	-	-	-	-	-
Uttarakhand	237	3	-	-	-	240
Uttar Pradesh	1974	237	-	-	36	2247
West Bengal	169	3	-	-	105	277
Total	7494	421	328	-	367	8610

Source: AYUSH (2011). Website 'indianmedicine.nic.in' giving State-wise Statistics of licensed herbal units

The Department of AYUSH, in the year 2002, used four category classes on the basis of annual turnover i.e. Large (annual turnover > ₹ 50 crore), Medium (annual turnover between ₹ 5-50 crore), Small (annual turnover between ₹ 1-5 crore), and Very Small (annual turnover < ₹ 1 crore) while categorizing the 7000 herbal units (Anon., 2002). The same broad categorization has been followed in stratifying the 8610 licensed herbal units into four size-wise classes (Table 3.2). Since the annual turnover for all licensed herbal units could not be obtained under this study, another realistic equation to correlate the annual turnover of the herbal units with their annual consumption of herbal raw drugs including spices was developed and used to classify herbal units in four size-wise categories. This equation to correlate the size-wise categories of herbal units with their annual consumption of herbal raw drugs including spices has been based on the percentage of the cost of herbal raw drugs including spices incurred by the sampled herbal units vis-a-vis the annual turnover of these units. The sample analysis of such data in respect of herbal units reveals that the cost of herbal raw drugs including spices makes approximately one tenth of the total turnover of the herbal units. The average cost of the herbal raw drugs including spices consumed by the herbal industry in India for the year 2014-15 has been worked out to be a shade above ₹ 100 per kg. However, the rate has been rounded off to ₹ 100 per kg for the ease of calculations. Based on these calculations, a herbal unit with annual turnover of ₹ 1 crore consumes herbal raw drugs including spices worth ₹ 10 lakh, which at a rate of ₹ 100 per kg works out to 10000 kg or 10 MT. Similarly, the herbal industry with a annual turnover of ₹ 50 crore spends ₹ 5 crore on procurement of herbal raw dugs including spices, correlating to a quantity of 500 MT at ₹ 100 per kg. Size-wise classification of 8,610 licensed herbal units in the country based on both the annual turnover and the annual raw drug consumption is given in Table 3.2.

Table 3.2. Categories of Domestic Herbal Units based on Annual Turnover and Annual Consumption of Herbal Raw Drugs including Spices

Unit Size	Based on Annual Turnover		Based on Annual Consumption of Herbal Raw Drugs	
	Annual turnover (₹ in Crore)	Apprx. number of units	Annual Consumption of Herbal Raw Drugs (MT)	Apprx. number of units
Large	> 50	20	>500	50
Medium	5-50	50	50-500	200
Small	1-5	2000	10-50	2000
Very Small	< 1	6540	<10	6360
Total		8610		8610

The categorisation of domestic herbal industry based on there annual consumption of herbal raw drugs by volume has been used to work out the sampling design, carrying out survey of the domestic herbal industry and analysis.

Data on consumption of herbal raw drugs by the domestic herbal industry was obtained (a) from the data formats submitted by the licensed herbal units under Section 157 (A) of the Drug and Cosmetics Act, 1945 to the State Drug Controllers and the NMPB, and (b) by directly visiting the herbal units and interacting with unit managers and other staff. During the study it was noticed that many domestic herbal units had started maintaining annual raw drug consumption record in accordance with the formats prescribed vide amendment dated 09.07.2008 to the Drug and Cosmetics Rules, 1945, where under the new section (157A) mandates each licensed manufacturing unit of Ayurveda or Siddha or Unani drugs to keep record of raw material used by them in the proforma given in Schedule to the Act in respect of all raw materials utilized in the

manufacture of Ayurveda or Siddha or Unani drugs in the preceding financial year. It is also pertinent to mention that many of the domestic herbal units willingly shared this data.

As against the proposed sample size of 396 units, consumption data in respect of more than 700 domestic herbal units was collected. This data was thereafter subjected to detailed scrutiny to identify any inconsistency. Consequent to this scrutiny, data in respect of 692 domestic herbal units was found fit for further collation and analysis. Details of the sample size planned and that achieved are given in the table 3.3.

Table 3.3. Category-wise detail of the Domestic Herbal Units Sampled

Unit Size	Aprx. number of units	Planned sample size	No. of units planned to be sampled	No. of units sampled	Sample size covered
Large	50	50%	25	36	72%
Medium	200	40%	80	118	59%
Small	2000	5%	100	147	7%
V. Small	6360	3%	191	391	6%
Total	8610	-	396	692	-

Data from 692 domestic herbal units, in addition to adding to the quality of data through a larger sample size, also helped in comprehensive coverage of the herbal industry in respect of geographical coverage, and type and size of the industry. Visits to the herbal units helped in understanding the raw drug procurement procedures, storage and use processes. These visits also helped in discussing the issues pertaining to the status of availability of herbal raw drug and to their nomenclature correlation with the experienced personnel in the pharmacies. These interactions were of immense use in fine-tuning the consolidated inventory of herbal raw drugs in commercial demand in the country.



Visits to Herbal Raw Drug Storage Facilities at Herbal Units and Interactions with their Staff



Cleaning and processing of herbal raw drugs

3.2. ESTIMATED CONSUMPTION OF HERBAL RAW DRUGS BY DOMESTIC HERBAL INDUSTRY IN INDIA FOR THE YEAR 2014-15

Computation of the herbal raw drug consumption data of 692 domestic herbal units in the country for the year 2014-15 has resulted in documentation of herbal material pertaining to 907 medicinal plant species to be in active use by the Indian herbal industry. The herbal entities commonly used as cereals, vegetables, and fruits have not been included. Extrapolation of consumption data of 692 sampled domestic herbal units category-wise over the 8610 registered domestic herbal units brings out that India's herbal industry consumed a total of 1,95,000 MT of herbal raw drugs during the year 2014-15.

Analysis of the data reveals that herbal raw drugs pertaining to 198 plant species are used in annual quantities of more than 100 MT and these 198 species accounted for about 95% of the total herbal raw drugs consumed by India's herbal industry during 2014-15. Documentation of 198 species in high annual consumption by the domestic herbal industry is an improvement over the

Total consumption of Herbal Raw Drugs by India's Herbal Industry for 2014-15 has been estimated at 1,95,000 MT

documentation of 117 species in high consumption documented by Ved and Goraya (2008) in a previous study. Species-wise detail of the medicinal plant species consumed by India's herbal industry in large quantities is given in table 3.4. Analysis of the data in table 3.4 from the perspective of use by different categories of the licensed herbal industry reveals that the large and the medium herbal industries (Category 'A' & 'B'), forming

less than 3% of the total licensed herbal units in the country, consume more than two thirds of the total herbal raw drugs consumed annually by the entire licensed herbal industry in the country with the 97% of small and very small (Category 'C' & 'D') herbal units consuming only the remaining 1/3rd of the herbal raw drugs. Ved and Goraya (2008) had estimated that the annual consumption by the large and the medium herbal units was about 35% of the total annual consumption by the entire herbal industry in the year 2005-06.

Table 3.4: Estimated Annual Consumption of Herbal Raw Drugs by Domestic Herbal Industry (with species-wise detail of entities in high trade i.e. >100 MT/year)

S. No.	Botanical Name	Estimated Consumption (Dry Weight) (MT)	Category-wise Estimated Consumption (%)		Source (Wild/Cultivation/Import)
			A & B Category %	C & D Category %	
1	<i>Aloe vera</i>	15677.08	84.56	15.44	C
2	<i>Phyllanthus emblica</i>	14178.23	83.20	16.80	W/C
3	<i>Plantago ovata</i>	13712.50	99.06	0.94	C
4	<i>Mentha arvensis</i>	6289.33	84.20	15.80	C
5	<i>Terminalia chebula</i>	6068.16	68.36	31.64	W
6	<i>Withania somnifera</i>	4198.26	59.60	40.40	C
7	<i>Mentha piperita</i>	3859.18	91.57	8.43	C
8	<i>Tinospora cordifolia</i>	3782.67	63.05	36.95	W
9	<i>Gaultheria procumbens</i>	3130.85	99.33	0.67	I
10	<i>Cinnamomum camphora</i>	2953.11	65.05	34.95	C
11	<i>Glycyrrhiza glabra</i>	2832.10	51.71	48.29	I
12	<i>Asparagus racemosus</i>	2723.00	57.62	42.38	W/C
13	<i>Terminalia bellirica</i>	2696.47	60.54	39.46	W/C
14	<i>Gaultheria fragrantissima</i>	2606.34	92.32	7.68	I
15	<i>Piper longum</i>	2553.05	77.20	22.80	C/W
16	<i>Lawsonia inermis</i>	2488.13	58.62	41.38	C
17	<i>Azadirachta indica</i>	2310.85	58.46	41.54	C/W
18	<i>Aegle marmelos</i>	2298.67	77.56	22.44	C/W
19	<i>Eucalyptus globulus</i>	2156.44	77.84	22.16	C
20	<i>Zingiber officinale</i>	2028.57	43.04	56.96	C
21	<i>Justicia adhatoda</i>	2017.85	49.37	50.63	W/C
22	<i>Terminalia arjuna</i>	1988.20	66.75	33.25	W/C
23	<i>Tribulus terrestris</i>	1973.58	58.40	41.60	W
24	<i>Eclipta prostrata</i>	1932.20	52.87	47.13	W
25	<i>Andrographis paniculata</i>	1828.35	82.23	17.77	W/C
26	<i>Saraca asoca</i>	1770.85	71.84	28.15	W
27	<i>Boerhavia diffusa</i>	1722.53	66.18	33.82	W
28	<i>Bambusa arundinacea</i>	1564.11	87.73	12.27	W/I
29	<i>Ocimum tenuiflorum</i>	1362.81	57.88	42.12	C
30	<i>Sida rhombifolia</i>	1345.42	90.38	9.62	W
31	<i>Commiphora wightii</i>	1343.96	63.23	36.77	I/W
32	<i>Acacia nilotica subsp. indica</i>	1334.13	81.70	18.30	W/C
33	<i>Curcuma longa</i>	1316.51	65.65	34.35	C
34	<i>Pinus roxburghii</i>	1310.31	77.97	22.03	W
35	<i>Solanum nigrum</i>	1290.75	87.71	12.29	W/C
36	<i>Senna alexandrina</i>	1284.35	31.47	68.53	C
37	<i>Woodfordia fruticosa</i>	1268.48	84.39	15.61	W
38	<i>Tamarindus indica</i>	1253.78	84.49	15.51	C/W
39	<i>Ricinus communis</i>	1188.81	54.99	45.01	C/W
40	<i>Trachyspermum ammi</i>	1178.10	44.60	55.40	C
41	<i>Phyllanthus amarus</i>	1166.95	70.50	29.50	C/W
42	<i>Piper nigrum</i>	1141.86	58.17	41.83	C
43	<i>Bacopa monnieri</i>	1134.86	57.50	42.50	W/C

S. No.	Botanical Name	Estimated Consumption (Dry Weight) (MT)	Category-wise Estimated Consumption (%)		Source (Wild/ Cultivation/ Import)
			A & B Category %	C & D Category %	
44	<i>Berberis aristata</i>	1046.66	65.86	34.14	W
45	<i>Cedrus deodara</i>	1035.14	66.23	33.76	W
46	<i>Rubia cordifolia</i>	974.92	76.41	23.59	W
47	<i>Holarrhena pubescens</i>	934.41	66.52	33.48	W
48	<i>Mentha spicata</i>	920.91	97.38	2.62	C
49	<i>Acacia catechu</i>	903.45	78.83	21.17	W
50	<i>Mucuna pruriens</i>	887.69	29.58	70.42	W/C
51	<i>Cyperus rotundus</i>	886.69	62.07	37.93	W
52	<i>Sida cordifolia</i>	862.90	68.09	31.91	W
53	<i>Cichorium intybus</i>	840.50	71.77	28.23	C/W
54	<i>Oroxylum indicum</i>	794.98	92.11	7.88	W
55	<i>Centella asiatica</i>	781.02	49.90	50.10	C/W
56	<i>Embelia ribes</i>	772.98	64.31	35.69	W
57	<i>Solanum virginianum</i>	763.43	63.71	36.29	W
58	<i>Pueraria tuberosa</i>	705.34	71.22	28.78	W
59	<i>Syzygium cumini</i>	702.64	64.73	35.27	W/C
60	<i>Morinda citrifolia</i>	693.6	65.33	34.67	W
61	<i>Vitex negundo</i>	690.61	43.26	56.74	W
62	<i>Symplocos racemosa</i>	666.95	56.88	43.12	W
63	<i>Operculina turpethum</i>	666.01	61.61	38.39	W
64	<i>Boswellia serrata</i>	655.47	25.10	74.90	W
65	<i>Plumbago zeylanica</i>	636.70	61.20	38.80	W
66	<i>Foeniculum vulgare</i>	622.07	51.23	48.77	C
67	<i>Pongamia pinnata</i>	610.82	30.20	69.80	C/W
68	<i>Hibiscus rosa-sinensis</i>	609.06	87.03	12.97	C
69	<i>Solanum anguivi</i>	599.24	84.29	15.71	W
70	<i>Gmelina arborea</i>	591.54	80.60	19.40	W/C
71	<i>Acorus calamus</i>	590.10	66.31	33.68	C/W
72	<i>Bergenia ciliata</i>	584.31	87.29	12.71	W
73	<i>Gymnema sylvestre</i>	582.01	55.62	44.38	W
74	<i>Hemidesmus indicus</i>	580.33	48.96	51.04	W
75	<i>Desmodium gangeticum</i>	571.66	87.90	12.10	W
76	<i>Picrorhiza kurroa</i>	568.61	51.72	48.27	W
77	<i>Punica granatum</i>	564.66	70.50	29.50	C/W
78	<i>Nardostachys jatamansi</i>	528.11	52.39	47.61	W
79	<i>Convolvulus prostratus</i>	522.32	67.54	32.46	W
80	<i>Capparis spinosa</i>	518.41	95.43	4.57	W
81	<i>Cinnamomum verum</i>	492.10	59.09	40.91	C
82	<i>Atropa belladonna</i>	472.31	1.55	98.46	I
83	<i>Stereospermum chelonoides</i>	469.92	60.11	39.89	W
84	<i>Amorphophallus paeoniifolius</i>	463.40	9.30	90.70	C/W
85	<i>Tephrosia purpurea</i>	443.29	52.92	47.08	W
86	<i>Wrightia tinctoria</i>	440.30	96.61	3.39	C/W
87	<i>Datura metel</i>	438.09	92.13	7.87	W
88	<i>Leptadenia reticulata</i>	422.19	88.63	11.37	W
89	<i>Chrysopogon zizanioides</i>	418.93	45.25	54.75	W/C

S. No.	Botanical Name	Estimated Consumption (Dry Weight) (MT)	Category-wise Estimated Consumption (%)		Source (Wild/ Cultivation/ Import)
			A & B Category %	C & D Category %	
90	<i>Swertia chirayita</i>	404.70	56.04	43.96	W/C
91	<i>Santalum album</i>	398.66	58.01	41.98	W
92	<i>Mesua ferrea</i>	392.36	75.46	24.54	W
93	<i>Strobilanthes ciliata</i>	388.12	92.23	7.76	W
94	<i>Alpinia galanga</i>	383.39	64.21	35.79	C/W
95	<i>Clerodendrum phlomidis</i>	369.23	86.92	13.08	W
96	<i>Cassia fistula</i>	367.31	58.77	41.24	W
97	<i>Elettaria cardamomum</i>	357.83	49.53	50.47	C
98	<i>Curcuma zerumbet</i>	354.38	77.34	22.66	C/W
99	<i>Senna occidentalis</i>	345.34	91.84	8.16	W/C
100	<i>Moringa oleifera</i>	344.19	54.81	45.19	W
101	<i>Phyllanthus maderaspatensis</i>	342.66	99.91	0.09	W
102	<i>Achyranthes aspera</i>	325.30	73.17	26.83	W
103	<i>Hygrophila schulli</i>	322.72	64.36	35.64	W
104	<i>Inula racemosa</i>	316.44	85.48	14.52	C
105	<i>Pterocarpus marsupium</i>	308.75	73.27	26.73	W
106	<i>Piper chaba</i>	308.20	82.30	17.70	I
107	<i>Garcinia gummi-gutta</i>	301.04	64.63	35.37	C/W
108	<i>Cinnamomum tamala</i>	297.80	65.36	34.64	W/C
109	<i>Pterocarpus santalinus</i>	297.48	59.86	40.14	W
110	<i>Crateva religiosa</i>	296.80	60.97	39.03	W/C
111	<i>Salix caprea</i>	290.01	99.32	0.68	I
112	<i>Celastrus paniculatus</i>	290.00	77.95	22.05	W
113	<i>Madhuca indica</i>	286.40	92.08	7.92	W
114	<i>Pluchea lanceolata</i>	284.05	57.24	42.76	W
115	<i>Myristica fragrans</i>	278.22	42.61	57.38	C
116	<i>Asparagus adscendens</i>	277.63	63.64	36.36	W
117	<i>Rauvolfia serpentina</i>	275.34	72.50	27.50	W
118	<i>Anethum graveolens</i>	269.11	67.04	32.96	C
119	<i>Anacyclus pyrethrum</i>	261.14	67.66	32.34	I
120	<i>Sphaeranthus indicus</i>	259.12	30.39	69.61	W
121	<i>Cullen corylifolium</i>	258.71	50.90	49.10	W
122	<i>Stereospermum tetragonum</i>	257.42	89.17	10.83	W
123	<i>Cissus quadrangularis</i>	256.13	71.78	28.22	W
124	<i>Dioscorea bulbifera</i>	254.47	58.78	41.22	C/W
125	<i>Pistacia integerrima</i>	254.23	68.01	31.99	W
126	<i>Cyperus scariosus</i>	248.81	63.12	36.88	W
127	<i>Pseudarthria viscida</i>	246.34	89.35	10.65	W
128	<i>Ziziphus mauritiana</i>	242.27	77.67	22.32	C/W
129	<i>Zanthoxylum armatum</i>	237.78	85.99	14.01	W
130	<i>Strychnos nux-vomica</i>	236.33	41.40	58.60	W
131	<i>Ipomoea mauritiana</i>	231.42	84.39	15.61	W
132	<i>Chlorophytum tuberosum</i>	230.73	4.86	95.14	W/C
133	<i>Butea monosperma</i>	227.60	78.59	21.41	W
134	<i>Apium graveolens</i>	225.52	47.97	52.03	C/W
135	<i>Onosma bracteata</i>	225.19	95.34	4.66	I/W

S. No.	Botanical Name	Estimated Consumption (Dry Weight) (MT)	Category-wise Estimated Consumption (%)		Source (Wild/Cultivation/Import)
			A & B Category %	C & D Category %	
136	<i>Madhuca longifolia</i>	221.03	99.23	0.76	C/W
137	<i>Tragia involucrata</i>	218.28	86.21	13.79	W
138	<i>Hedychium spicatum</i>	217.67	40.12	59.88	W
139	<i>Uraria picta</i>	209.93	82.53	17.47	W
140	<i>Valeriana jatamansi</i>	207.53	71.82	28.19	W
141	<i>Mimusops elengi</i>	196.23	74.11	25.89	W/C
142	<i>Indigofera tinctoria</i>	195.62	52.14	47.86	C
143	<i>Citrullus colocynthis</i>	194.20	87.63	12.37	W
144	<i>Nigella sativa</i>	189.44	30.67	69.33	C
145	<i>Acacia sinuata</i>	188.21	40.04	59.97	W
146	<i>Vigna trilobata</i>	187.79	93.64	6.36	C
147	<i>Clerodendrum serratum</i>	186.32	37.50	62.50	W
148	<i>Plumbago indica</i>	184.19	72.75	27.25	C/W
149	<i>Fumaria indica</i>	184.18	74.24	25.76	W
150	<i>Justicia beddomei</i>	183.46	88.50	11.50	W
151	<i>Cymbopogon flexuosus</i>	178.08	0.00	100.00	W
152	<i>Premna serratifolia</i>	167.38	81.92	18.07	W
153	<i>Saussurea costus</i>	164.65	68.12	31.88	C/W
154	<i>Paederia foetida</i>	164.33	73.08	26.93	W
155	<i>Cynodon dactylon</i>	160.51	65.60	34.40	C/W
156	<i>Rheum australe</i>	158.27	76.68	23.33	W
157	<i>Cardiospermum halicacabum</i>	157.28	84.53	15.47	W
158	<i>Maranta arundinacea</i>	156.35	90.06	9.95	C
159	<i>Barleria prionitis</i>	154.30	87.58	12.42	C/W
160	<i>Nelumbo nucifera</i>	153.53	61.51	38.49	W/C
161	<i>Curculigo orchoides</i>	153.05	70.26	29.75	W
162	<i>Aerva lanata</i>	147.79	96.48	3.53	W
163	<i>Pedaliium murex</i>	142.93	33.53	66.47	W
164	<i>Ficus religiosa</i>	141.53	21.89	78.12	C/W
165	<i>Melia azedarach</i>	139.85	42.10	57.90	W/C
166	<i>Martynia annua</i>	138.57	98.97	1.03	W
167	<i>Teramnus labialis</i>	138.31	84.78	15.22	W
168	<i>Tamarix gallica</i>	135.72	89.78	10.22	I
169	<i>Holoptelea integrifolia</i>	133.55	77.24	22.76	W
170	<i>Tecomella undulata</i>	131.15	10.61	89.39	W
171	<i>Didymocarpus pedicellatus</i>	127.84	100.00	0.00	W
172	<i>Aconitum heterophyllum</i>	127.65	58.87	41.13	W
173	<i>Quercus infectoria</i>	127.25	70.97	29.03	I
174	<i>Premna corymbosa</i>	125.82	95.08	4.92	W
175	<i>Spermacoce hispida</i>	124.88	65.25	34.75	W
176	<i>Salacia reticulata</i>	123.04	78.64	21.36	W
177	<i>Kaempferia galanga</i>	122.80	68.72	31.28	C
178	<i>Ficus benghalensis</i>	121.91	50.87	49.13	W/C
179	<i>Tamarix indica</i>	121.31	99.22	0.79	C/W
180	<i>Argyreia elliptica</i>	120.46	100.00	0.00	W
181	<i>Smilax china</i>	120.34	45.92	54.08	I

S. No.	Botanical Name	Estimated Consumption (Dry Weight) (MT)	Category-wise Estimated Consumption (%)		Source (Wild/Cultivation/Import)
			A & B Category %	C & D Category %	
182	<i>Shorea robusta</i>	118.56	49.52	50.47	W
183	<i>Trichosanthes dioica</i>	117.68	54.55	45.46	W
184	<i>Baliospermum montanum</i>	117.12	86.07	13.93	W
185	<i>Melaleuca leucadendra</i>	116.80	44.33	55.68	I
186	<i>Semecarpus anacardium</i>	115.83	28.64	71.36	W
187	<i>Prunus cerasoides</i>	114.59	67.03	32.98	C/W
188	<i>Trachyspermum roxburghianum</i>	111.64	94.18	5.82	W
189	<i>Rhododendron arboreum</i>	109.14	0.00	100.00	W
190	<i>Bauhinia variegata</i>	108.51	70.44	29.55	C/W
191	<i>Alhagi pseudalhagi</i>	105.98	97.85	2.16	W
192	<i>Amomum subulatum</i>	104.66	75.87	24.12	C/W
193	<i>Erythrina variegata</i>	103.87	60.17	39.83	C/W
194	<i>Bombax ceiba</i>	103.82	61.16	38.84	W
195	<i>Cymbopogon citratus</i>	102.82	53.74	46.26	C/W
196	<i>Albizia amara</i>	102.07	100.00	0.00	W
197	<i>Baccharoides anthelmintica</i>	101.02	78.22	21.77	W
198	<i>Scindapsus officinalis</i>	100.06	92.25	7.75	W
199	Others (709 Species)	9132.70	52.57	47.43	-
Total		194749.57	67.55%	32.45%	-
or say 195000.00					

The shift in the consumption pattern of herbal raw drugs by the large and medium industries estimated under this study and the one estimated by the Ved and Goraya (2008) is mainly due to the entry of new large herbal units viz. Patanjai Ayurved Ltd. in the sector, up gradation of processing capacity by the existing large and medium herbal units, and moving up of many herbal units into the upper two categories as is evident from the estimated number of herbal units in categories 'A' & 'B' increasing from just 50 in 2005-06 to 250 in 2014-15.

Consumption pattern of herbal raw drugs by different categories of herbal units reveals apparent preference of some herbal raw drugs by large and medium herbal industry and of some others by the small and very small herbal units. For example, more than 80% quantity of the entities like Aloe, Amla, Mint oil, and Gaultheria oil in trade were being consumed by the large and the medium industries. All these commodities have major use in wellness products and the large and medium herbal units were in a better position to effectively market such products. On the other hand, small and very small herbal units seem to have preference for using those entities that have been traditionally used locally for health care, to ensure their easy marketing. The use of raw drugs obtained from species like *Tecomella undulata*, *Pedaliium murex*, *Chlorophytum tuberosum*, *Mucuna pruriens*, *Amorphophallus paeoniifolius*, etc. in very large quantities by the small and very small herbal units is indicative of this preference. This consumption pattern also matches with the trend observed during the study about the increasing inclination of the large and medium herbal units in making proprietary wellness products.

The data pertaining to annual consumption by sampled domestic herbal units was subjected to statistical analysis and category-wise Standard Error of Mean and Mean Values at 90% Confidence

Table 3.5. Estimated Mean of Consumption by Domestic Herbal Industry

Category	Apprx. No. of licensed domestic herbal units (Population)	Sampled Units	Mean Value of Annual Consumption (MT/Unit/Yr)	S.E. of Mean (MT)	Coefficient of Variation	90% Confidence Interval of Estimated Mean	
A (Large)	50	36	2203.45	265.83	12.06	1766.16	2640.74
B (Medium)	200	118	127.37	6.61	5.19	116.49	138.24
C (Small)	2000	147	18.49	0.86	4.65	17.07	19.90
D (V. Small)	6360	391	2.03	0.10	4.93	1.86	2.19

Intervals worked out (Table 3.5). The analysis in table 3.5 brings out the average herbal raw drug consumption per unit for the year 2014-15 by the four different categories of herbal units. The threshold annual consumption of herbal raw drugs consumed by the herbal units categorised as 'very small' is <10MT. The study reveals that the very small herbal units consume a mean quantity of only 2.03 MT of herbal raw drugs per year. Assuming that all the very small herbal units are in operation, the data reflects a very low level of operation of these units. As against very low annual consumption of herbal raw drugs by more than six thousand 'very small' herbal units, the annual consumption of herbal raw drugs at 2203.45 MT by the herbal units categories as 'large' is much above the threshold consumption level of 500 MT for this category of herbal industries. This clearly reflects the large level of operations for these units.

Analysis of the coefficient of variation as worked out in the table 3.5 reveals a fair uniformity in the diversity of herbal raw drugs consumed by the 'small; and 'very small' herbal units, whereas the consumption pattern of herbal raw drugs by 'large' herbal units shows a fairly large variation. It seems to be due to the product specificity of many large herbal units, especially those engaged in preparing large quantities of patent and proprietary wellness formulations with each such formulation based on smaller number of constituent herbal raw drugs.

At an industry-gate average price of ₹ 100 per kg of all herbal raw drugs, including spices, the total estimated price for 1,95,000 MT of the herbal raw drugs for the year 2014-15 works out to ₹ 1950 crore, and the total turnover of the India's herbal industry works out to ₹ 19,500 or say ₹ 20,000 crore.

3.3. SIGNIFICANT TRENDS RELATED TO THE CONSUMPTION OF HERBAL RAW DRUGS BY THE DOMESTIC HERBAL INDUSTRY

The growth of the herbal industry in the country has triggered various shifts in the traditional herbal trade dynamics. Analysis of the data gathered under the study coupled with visits to herbal units in various parts of the country and interactions with experts reveals that many of such shifts in trade dynamics are now reflected in the form of trends, of which some prominent ones are highlighted below:

3.3.1: Growth of the Domestic Herbal Industry

The estimated herbal raw drug consumption by India's herbal industry for the year 2014-15 reflects an increase of about 10% over the estimated consumption worked out for the year 2005-06 by Ved and Goraya (2008). Even as this increase in consumption of herbal raw drugs is apparently not very significant, there has been a very significant growth in the estimated turnover

of the domestic herbal industry over the same period. The total turnover of India's herbal industry, estimated at ₹ 8,800 crore for the year 2005-06 by Ved and Goraya (2008) has grown to ₹ 20,000 crore in 2014-15, registering an annual growth of about 10%.

The data presented in table 3.4 brings out that the 250 large and medium herbal industries (Category 'A' & 'B'), forming less than 3% of the total licensed herbal units in the country, consume more than two thirds of the total herbal raw drugs consumed annually by the entire herbal industry in the country. This segment of domestic herbal industry was reported to be consuming only about 35% of the total annual consumption by the entire herbal industry in the year 2005-06 (Ved and Goraya, 2008). It is apparent that the major growth in the herbal sector has been largely driven by the 'large' and the 'medium' industries, with a very large contingent of the small and the medium herbal industries seemingly left far behind in the growth graph. This trend is also apparent from the mean values of consumption worked out in table 3.5. As the trend reveals, the 'large' herbal industries will continue to consolidate their position and be the major consumers of the herbal raw drugs. Some of the 'medium' herbal industries with annual consumption of herbal raw drugs around the upper consumption threshold of 500 MT per annum are likely to consolidate their position and move up to the category of 'large' herbal industries.

Whereas Dabur India Ltd. remains a major force amongst the domestic herbal industry in the country, Patanjali Ayurved group, a new entrant in the sector during the last 10 years, has emerged

Total turnover of India's Herbal Industry for 2014-15 has been estimated at ₹ 20,000 crore

as the single major group in as far as consumption of herbal raw drugs for its diversified fast moving consumer and wellness products is concerned.

The study also reveals a growing trend towards manufacture of a variety of patent and proprietary wellness formulations alongside preparation of classical formulations by many of the domestic herbal units. Most of these patent and proprietary recipes, aimed to help cure lifestyle conditions like diabetes, joint pains, gastric disorders and obesity; to help cure kidney stones, and sexual disorders; and promising skin and hair care, etc., carry suggestive brand names and are widely publicised. These patent and proprietary items are usually sold over the counter and have significantly contributed to the growth of the sector.

3.3.2: Medicinal Plants Species in High Trade

Herbal raw drugs pertaining to 198 plant species have been recorded in high annual consumption (>100 MT) by the domestic herbal industry. Collective consumption of these 198 species accounts for about 95% of the total herbal raw drugs consumed by the entire domestic herbal industry during 2014-15. Ved and Goraya (2008) had documented 117 species in high consumption by the domestic herbal industry and the collective consumption of these 117 medicinal plants species formed 80% of the total consumption by the entire domestic herbal industry in the country.

'Amla' (*Phyllanthus emblica*), recorded as the top traded herbal raw drug entity during 2005-06 by Ved and Goraya (2008), has been replaced by 'ghritkumari' (*Aloe vera*) as the top traded herbal raw drug entity in the present study. Total estimated trade of 'ghritkumari' during 2005-06 was just 1,621 MT, and the same has grown to 15,677 MT in 2014-15. The major reason for this almost ten time increase in consumption of 'ghritkumari' is its successful positioning as a health, food and other wellness products.

The small decline in the estimated annual consumption of 'amla' and 'harar' (*Terminalia chebula*) in 2014-15 from the one reported by Ved and Goraya (2008), is perhaps due to a shift by the herbal industry towards procurement and use of deseeded material and extracts.

3.3.3: Increasing Use of 'Extracts'

During the compilation of data, an emerging trend towards the use of 'extracts' in place of 'herbal raw drugs' has been noticed. More prevalent with the herbal units engaged in making cosmeceuticals and nutraceuticals, the practice of using 'extracts' has also been adopted by the traditional herbal industry. Data from the current study brings out that 'extracts' obtained from more than 500 medicinal plant species are in extensive use by India's herbal industry. 'Mentha' extract (*Mentha arvensis* / *Mentha piperita*) is used in very large quantities with more than 6000 MT of this extract (oil) finding use in cosmeceutical and nutraceutical preparations alone. About 650 MT of 'amla' extract is now being annually used by the herbal industry in India. Enquiries revealed that there was a general perception that the use of 'extracts' provided more assurance about the authenticity of the material. Moreover, the herbal units, by using 'extracts', were making significant savings on account of transport and storage of the otherwise bulky material. With herbal sector in the country projected to grow further, a corresponding increase in the consumption of 'extracts' is also expected.

It is interesting to note that 'rice' (*Oryza sativa*) extract, with estimated consumption of more than 27,000 MT during 2014-15, mainly by the Indian herbal industry engaged in making cosmeceutical products has emerged as the highest consumed herbal entity by the Indian herbal industry. Similarly, the domestic herbal industry also uses 'extracts' of many other cereals, pulses, vegetables and fruits in fairly large quantities. Since the scope of this study was limited to estimation of demand and supply of only the medicinal plants, the cereals, pulses, vegetable, and fruits used by the herbal industry have not been included in the list of herbal entities consumed by the herbal industry. The herbal commodities usually traded as 'spices', forming integral part of the classical formulations, have however been included in the list.

3.3.4: Makeover of the Domestic Herbal Industry

The domestic herbal industry, usually seen as opaque and old style, seems to be in the process of transformation. Whereas there is a general endeavour to modernise the manufacturing facilities, many of the large and the medium herbal units have undergone complete makeover. Even the very traditional herbal units have switched over to electric or gas based appliances. Use of wood and charcoal in most of the herbal units is now limited to some specific purposes like preparation of 'bhasmas', or to run boilers to generate steam. Resultantly, the unit operations are now much cleaner. Many of the units have set up separate quality control laboratories and quarantined manufacturing and packaging facilities.

The domestic herbal industry also seems to have started following good manufacturing practices. The herbal units now present a fairly clean image, with the workers usually seen wearing aprons and head scarves. The raw drug storage is fairly good with herbal raw drug bags duly labelled and systematically stacked in the stores. Many of the units have well defined protocols of closely inspecting the raw drugs and subjecting these to final round of cleaning before use. Many of the herbal units seem to have already started following the data maintenance protocols required under section 157A of the Drug and Cosmetic Rules, 1945. With likely increase in the number of herbal units complying with the rules and maintaining data about annual consumption of herbal raw drugs, the assessment of demand of the medicinal plants, in future, will become easier.



Preparation of Health Care Formulations by Herbal Units

3.4. INFERENCES ABOUT CORRELATION OF HERBAL RAW DRUGS TO THEIR BOTANICAL IDENTITIES

The trade of herbal raw drugs continues to be under the local/trade names that vary from region to region. Similarly, the herbal units prefer referring to the material procured under their trade names by their API/ Sanskrit names. This practice of using varied names for the same entity by traders and by the herbal industry gives rise to problems of correlating herbal raw drugs to their exact botanical identities. The following examples will clarify the issue further:

Herbal raw drug popularly traded under the name 'Jatamansi' has been recorded in high consumption. The herbal industry usually correlates this entity to *Nardostachys jatamansi*, a Himalayan medicinal herb. This species, with highly fragmented wild populations, has been assessed as 'threatened'. With its cultivation on large scale not known, it is very unlikely that its wild populations can act as supply source of 500 MT of its roots per year. It seems that the material used by the herbal industry as 'jatamansi' could be pertaining to *Valeriana jatamansi*, another Himalayan herb that is also sometimes known by the same name. A high consumption of 127.84 MT of another Himalayan herb *Didymocarpus pedicellatus*, locally known as 'pathar-phori', 'shila-pushpi', 'kalpasi', 'pathar-laung', and sometime 'pashan bhedi' has been reported by some domestic herbal units. This species is very site specific and has highly fragmented patches of small populations. Thus, it is highly unlikely that the sparse wild populations of this species are able to support this high level of annual demand. The leaves of *Didymocarpus pedicellatus* have some resemblance with the leaves of *Bergenia ciliata*, other medicinal plant with extensive wild populations found alongside *Didymocarpus pedicellatus*, which is traded and used as 'pashan bhedi'. The material reportedly being used as 'pashan bhedi' and botanically correlated by the industry to *Didymocarpus pedicellatus* is very likely pertains to *Bergenia ciliata*. As samples of the material could not be accessed, its botanical identity remains to be confirmed.

Similarly, the issues pertaining to correlation of herbal raw drugs of 'shankhapushpi', 'bala', 'vidari', 'jivanti', 'daruharidra', etc. group of plants in use by the herbal industry remains to be addressed. The traders at Tanakpur herbal mandi were correlating 'jivanti' in trade to *Holostemma ada-kodien*, a climber found in peninsular India. However, closer examination of the specimen revealed that the material actually belonged to *Flickingeria macraei*, an epiphytic orchid! In addition, a very high consumption of material used as 'gandhapatra taila' (*Gaultheria procumbens* & *Gaultheria fragrantissima*), 'kapur' (*Cinnamomum camphora*), and 'banslochan' (*Bambusa arundinacea*) has been recorded in the data collected from the domestic herbal industry under this study. However, the supply of the large volumes of the material in respective of the above mentioned three entities could not be traced back to the known plants sources of these entities. It is believed that the material traded and consumed as 'gandhapatra taila', 'kapur', and 'banslochan' might not be plant product at all. The issue needs further investigation.

3.5. COTTAGE SCALE MANUFACTURERS OF HERBAL FORMULATIONS

The herbal sector in the country includes, in addition to the licensed 8610 herbal units, a very large body of petty cottage scale entrepreneurs engaged in manufacture of herbal formulations for health care and wellness. This cottage scale sector includes thousands of local vaidyas, many of whom have set up small facilities for making herbal formulations for dispensing to their patients. There also are small entrepreneurs who prepare herbal formulations, mainly 'churnas', to alleviate wellness related conditions like obesity, rheumatic pains, gastric ailments, skin problems, diabetes, etc. and sell these along road sides, weekly haats, or at places frequented by visitors like

markets, religious places, and melas. Some of the smarter entrepreneurs have put up grinders powered by diesel engines on their pick-up vans and prepare and pack the powdered formulations from the whole raw drugs in front of the buyers. Whereas the local vaidyas get patients at their places, the small entrepreneurs move from place to place and sell their products by attracting potential buyers and convincing them about the useful properties of natural products used by them and promising sure relief from various conditions.



Petty entrepreneurs selling herbal formulations in melas, and outside religious places

Then there is a large community of nomadic vaidyas selling herbal remedies from their tented 'pharmacies' put up along the roads for short periods in almost all towns in the country. These dispensers of herbal medicines claim to be specialising in curing chronic illness, sexual disorders, and in enhancing sexual vigour with 'Himalayan herbs', 'animal parts, and 'metals and minerals'. None of these categories of manufacturers and dispensers of herbal medicines is registered for making herbal medicines.



Tented 'pharmacies' of nomadic vaidyas - a common sight in many towns

Self Help Groups (SHGs), promoted by different government agencies to enhance rural livelihoods, is yet another category of consumers of herbal raw drugs for making finished/ semi-finished products for sale through counters of the concerned departments or through tie ups with other agencies. Most of such SHGs have been promoted by the State Forest Departments and the State Tribal Development Departments. Some of such initiative have also been promoted by the National Medicinal Plants Board. Irrespective of the type of cottage scale initiative, these petty entrepreneurs consume large quantities of herbal raw drugs. Thriving on secrecy of their herbal



Medicinal Plants Processing by Forest Self Help Groups

recipes, most of these petty manufacturers bluntly refuse to share their herbal recipes and the diversity and quantity of herbal raw drugs used by them. The consumption of herbal raw drugs by this sector is believed to be fairly significant. However, in the absence of any data about their numbers and the size of their operation, estimation of their total collective consumption per year was not found feasible. This issue needs further investigation to bring consumption of botanicals by this large body of consumers into national estimations of demand of herbal raw drugs.

3.6. LIMITATIONS

India has a very large number of domestic herbal units spread over the various regions of the country making formulations under different streams of the Indian System of Medicine. Whereas all possible effort has been made to stratify these herbal units to adequately represent all segments, the ultimate analysis is based on the sampling of 692 herbal units. The data and analysis therefore is constrained with the following limitations:

- All efforts have been made to gather data in respect of the different segments and strata of the domestic herbal industry. However, this stratification was based on interactions with experts and *a priori* knowledge on the subject. It is possible that some niche herbal units using specific herbal raw drugs could have been missed during the survey. For example, *Artemisia annua*, used exclusively by Ipca Laboratories, a licensed pharmaceutical company, for extraction of 'artemisinin' used in making anti-malarial medicines, could not be documented under the survey of domestic herbal industry. It was only during field visits that cultivation of this species came to notice and efforts at forward trade linkages of the cultivated produce revealed its use by Ipca Laboratories.
- The annual quantum of consumption of herbal raw drugs as given by the responding herbal units has been taken as true and used for extrapolation over the entire sector and for drawing various inferences from the consolidated data.
- The listing of species is based upon the botanical correlations established and shared by the sampled domestic herbal units, and not upon 100% verification of such nomenclature correlation with the samples of herbal raw drugs used by these units. Whereas many of the herbal units allowed the field teams to their raw drug godowns, there was a general reluctance to provide samples of the herbal raw drugs used by them.
- Field visits to survey wild harvests and the herbal mandis reveal the trade of a number of species as 'equivalents' to many officially recognised herbal raw drug entities. However, the data made available by the herbal units reflects the consumption of only the officially recognised herbal raw drugs. Whereas we have enlisted only those medicinal plant species that have been recorded by the herbal industry, we have, however, included the commonly used 'substitutes', 'equivalents', and 'adulterants' in the 'Consolidated Inventory of the Medicinal Plants in Commercial Demand' given as Annexure-I to this report.