

Result of Sample Tree Enumeration of Sawantwadi Forest Division

Sawantwadi forest division is the one of the forest divisions of Kolhapur circle and is within Sindhudurg civil district. The headquarter is at Sawantwadi. The entire forest area of Sawantwadi division lies between 15°-36'-21" to 16°-40'-6" North Latitude and 73°-18'-37" to 74°-12'-38" East Longitude.

The tract is bounded as follows:-

North :- Ratnagari tahsil of Ratnagiri District .
East :- Kolhapur District and Belgaum District.
Sout :- Goa State, and
West :- Arabian Sea

Topography :- The plateau region of Sawantwadi Forest Division is wedged in between Belgaum and Kolhapur district borders. The tract thus lies within the narrow physical limits between Sahyandri heights reaching 974 mtr. at Amboli hills above M.S.L. and sea coast. The average width of tract is 50 km. and max North South stretch is 115 km. The whole tract is entirely rugged and hilly with precipitous drops at places.

The whole tract is criss-crossed with seasonal and a few perennial nallas and rivers. The main drainage is from East to West. The main drainage is through Gad, Karlee, Talvade, Kalna, Terekhol and Tilari rivers which flow towards the Arabian sea. The Hiranyakeshi river originates in the plateau region of Amboli and drains East towards Kolhapur and Belgaum District. In lower reaches the rivers are tidal.

Geology, Rock and Soil:- Geologically, two rock formations are met with viz. 'Volcanic' rocks that are the Southern end of the Deccan trap system and the rocks of 'Plutonic' origin of the Archian system that form the core of the land mass which the trap rocks appear either to overlap or about against in the mountainous regions. In the Ghats therefore, rock boulders both blast and granite stick out along the steep inclines, and downward, granite or granitoid gneiss prevails. Towards North of the region mica schists come across.

The soil from these are of course gravelly texture in the hills and the hill tops themselves being capped with laterites. This is the “Secondary” laterite as different from the “Primary” type found in the lower elevation below ghat where granite predominates, the soils are mostly sandy and of loose grains, liable for dislodging easily by rains.

The principal soils of the tract are gravelly either in mixture of lateritic lumps and quartz grains or are purely clayey or sandy with intermediate loamy state chiefly met within valleys which provide greater fertility. Below ghat the soils assume considerable depth and on the plateau, there is only a thin layer which subsists under the forest growth.

Climate:- The climate is generally warm and humid. Minimum and maximum temperature varies between 18⁰C to 35⁰C. The annual rainfall in various parts of the tract is heavy and varies from 3000 mm to 6250 mm. It is heaviest along the top ridgeline of the Sahyadries separating the eastern plateau portion from the ghat and below ghat areas on the West. The incidence of rain fall decreases as the elevation drops.

The Forests:-According to the “Revised Survey of Forest Types of India” by Champion and Seth the forests belongs to the types,

- 1) 2A/C2, Southern tropical Semi-evergreen forests, West Coast Semi-evergreen (Montane, dwarf, semi-evergreen forest) and
- 2) 3B/C2, Southern moist mixed deciduous forests.

Forest Area:-According to Management & Legal Status, the following are the forest area figure as on dated 31/3/2012.

Table No-1
Classification of Forest area according to Management & Legal status
(Area in Sq. km.)

Sr. No.	Controlling Agency	Reserved forest	Protected forest	Un-classed forest	Total
1.	Area in charge of Forest Department	20.05	---	391.69	411.74
2.	Area in charge of F.D.C.M.	---	---	---	---

3.	Private Forest brought under possession of Forest Department	143.92	---	---	143.92
4	Area in charge of Revenue department	---	---	---	---
	Total	163.97	---	391.69	555.66
	% to total forest area	29.51	---	70.49	100

The Sawantwadi forest division consist of six ranges namely 1) Aamboli 2) Dodamarg 3) Kadawal 4) Kankavali 5) Kudal 6) Sawantwadi

The area under Scientific Management as recorded in Working Plan (2003-04 to 2012-13) by Shri V.G. Takalkar, Dy. Conservator of Forests, Working Plan Division, Kolhapur is as under.

Table No.2

Sr. No	Name of Working Circle	Total area in (ha)
1.	All ranges	44554.26

The Dy. Conservator of Forest, Sawantwadi Division has proposed following working circlewise forest area, for sample tree enumeration.

Table No.3

Working Circle wise Area proposed for tree enumeration

Sr. No.	Name of working circle	Population area in ha
1	Selection -Cum -Improvement Working Circle	17422.160
2	Protection Working Circle	26958.98
3	Teak Plantation Working Circle	8.16
4	Coastal Area & Mangrove Working Circle	141.31
5	Miscellaneous Working Circle	1.94
	Total	44532.55

Sampling plan of Tree Enumeration

Actually the tree enumeration work was done by Dy. Conservator of Forests, Sawantwadi Division from Feb. 2011 to Dec 2012. The entire forest division's area was considered for sampling enumeration plan. The trees are enumerated in girth classes started from 15-30 cms to Above 150 cms. The girth is measured at breast height (g.b.h.).

The statistical sampling method namely "Systematic Line Plot Sampling with Random Start" was used for tree enumeration. The plot size 60 meters x 60 meters, was found to be suitable with the least standard error. The complete enumeration of trees, seeding, coppices, Grass and Medicinal species were carried out in these plots. Similarly qualitative measurements were also carried out.

Scrutiny of data and preparation of results i.e. (1) Stock per hectare was calculated and the result are being reported in the form of following statements.

- Statement I : Estimated growing stock- No. of Sound trees.
 - Statement II : Estimated growing stock- No. of Sound trees per ha.
 - Statement III : Percentage distribution of total stock of species over all girth classes.
 - Statement IV : Percentage of stock of species in a girth class to the total stock in that particular girth class.
 - Statement V : Estimated growing stock - volume in cubic mt./ha
- Some noteworthy result on current enumeration is described in following Table.

Table No. 4 (a)

Statement showing estimated No. of trees per ha. for Past and Current tree enumeration (Feb 2011 to Dec 2012)

Sr. No	Name of Working Circle	Past enumeration 1997-98	Sr. No.	Name of Working Circle	Current enumeration No. of trees per ha.
1	Forest Area acquired under soil conservation scheme.	493	1	Selection Cum Improvement Working Circle	414.913
2	Main Teak Timber Working Circle	---	2	Protection Working Circle	205.054

			3	Teak Plantation Working Circle	373.285
			4	Coastal Area & Mangrove Working Circle	18.724
			5	Miscellaneous Working Circle	0
Weighted Average		493	Weighted Average		286.586

It is observed that the total estimated number of trees per hectare in current enumeration (Feb 2011 to Dec 2012) is 286.586. It comes to know that the No. of trees decreases as compared to the previous enumeration (1997-98) i.e 493/ha.

Table 4 (b)

Estimated percentage of trees in 15 U 30 and 31 U 45 girth class.

Working Circle	Girth class-wise estimated percentage of number of trees (%)			
	15U30	31U45	Remaining Girth Classes	Total estimated No. of trees
Selection - Cum - Improvement W. C.	25.977	27.915	46.11	100
Protection W. C.	26.284	28.992	44.72	100
Teak Plantation W. C.	55.745	37.557	6.698	100
Coastal Area & Mangrove W. C.	0	11.905	88.095	100
Miscellaneous W. C.	0	0	0	0
Weighted Average	26.084	28.516	45.393	100

Working circlewise estimated, number of sound trees per hectare are as follows.

Table No.5
Working Circlewise No. of sound trees per ha

Sr. No.	Name of Working Circle	Total	General utility species	Special utility species	Minor forest produce species	Other species
1	2	3	4	5	6	7
1	Selection Cum Improvement Working Circle	414.913	127.865	15.240	34.827	236.981
	% of stock to total stock	100.00	30.82	3.67	8.39	57.12
2	Protection Working Circle	205.054	36.396	13.459	24.593	130.606
	% of stock to total stock	100.00	17.75	6.56	11.99	63.69
3	Teak Plantation Working Circle	373.285	334.681	1.348	4.167	33.089
	% of stock to total stock	100.00	89.66	0.36	1.12	8.86
4	Coastal Area & Mangrove W. C.	18.724	0	0	0.184	18.540
	% of stock to total stock	100.00	0	0	0.98	99.02
5	Miscellaneous W. C.	0	0	0	0	0
	% of stock to total stock	0	0	0	0	0
Total weighted average		286.586	72.118	14.110	28.511	171.843
% of stock to total stock		100.00	25.16	4.92	9.95	59.96

Highlights from the results of tree enumeration as given in table No.5, are summarised below:

1) Selection Cum Improvement Working Circle:-

It is observed that Ain, Shisham, and Teak of General utility was found in this area which is 30.82% to the total growing stock. The species of special utility viz, Arjun, Dhawada, Hed, Kalamb, Khair, Salai, Sawar and Shivan are 3.67% to the total growing stock. The species of minor forest produce viz., Amba, Apta, Awala , Badam, Bhedas/Jambhul, Biba, Bor, Char, Hirda, Kadipatta, Kaju, Karwand, Kavati, Kawati, Narkya, Neem, Nilgiri, Palas and Shiras are 8.39% to the total growing stock and rest of the species are 57.12% to the total growing stock.

2) Protection Working Circle:-

It is observed that Ain, Shisham, and Teak of General utility was found in this area which is 17.75% to the total growing stock. The species of special utility viz, Arjun, Dhawada, Hed, Kalamb, Khair, Salai, Sawar and Shivan are 6.56% to the total growing stock. The species of minor forest produce viz., Amba, Apta, Awala , Jambhul, Biba, Bor, Char, Hirda, Kadipatta, Kaju, Karwand, Neem, Nilgiri, Palas and Shiras are 11.99% to the total growing stock and rest of the species are 63.69% to the total growing stock.

3) Teak Plantation Working Circle:-

It is observed that the specie ,Teak of General utility was found in this area which is 89.66% to the total growing stock. The specie of special utility viz, Sawar are 0.36% to the total growing stock. The species of minor forest produce viz., Amba, Jambhul, are 1.12% to the total growing stock and rest of the species are 8.86% to the total growing stock

4) Coastal Area & Mangrove Working Circle:-

It is observed that no species of General utility and Special are found in was found in this area The specie of minor forest produce viz. Chinch is found which is 0.98% to the total growing stock and rest of the species are 99.02% to the total growing stock.

5) Miscellaneous Working Circle:-

It is observed that no species are found in this Working Circle.

Table No.6
Availability of Teak (Enumeration period of 1997-98)
As per previous Working Plan.

Sr. No	Name Working Circle	Total growing Stock	Teak/Ha	% of stock of trees to the total stock
1	2	3	4	5
1	Forest Area acquired under soil conservation scheme.	493	47.01	9.53
	Weighted Average	493	47.01	9.53

Table No.6(A)

Availability of Teak (Enumeration period of Feb. 2011 to Dec. 2012) in Current enumeration.

Sr. No	Name Working Circle	Total growing Stock	Teak/Ha	% of stock of Teak trees to the total stock
1	2	3	4	5
1	Selection Cum Improvement W.C.	414.913	63.922	15.410
2	Protection W.C.	205.054	8.975	4.380
3	Teak Plantation W.C.	373.285	334.681	89.660
4	Coastal Area & Mangrove W.C	18.724	0	0
5	Miscellaneous	0	0	0
Total (Weighted Average)		286.586	30.500	10.640

Estimated growing stock of Medicinal plant, Natural regeneration and grass per Ha.

Table No. 7

A) Medicinal plant, per ha (Sample plot size 5 Mtr.X 5 Mtr.)

Sr. No.	Working Circle	Population area (Ha.)	No. of sample plots	Sample area (Ha.)	No. of Plants in sample area	No. of Plants per Ha.
1	2	3	4	5	6	7
1	S.C.I.W.C.	17422.160	445	1.11	1804	1622
2	P. W.C.	26958.98	756	1.89	3065	
3	T.P.W.C	8.16	2	0.005	8	
4	C.A & M.W.C	141.31	15	0.0375	61	
5	Misc. W.C.	1.94	3	0.0075	12	
	Total	44532.55	1221	3.0525	4950	

B) Natural Regeneration plant, per ha (Sample plot size 5 Mtr.X 5 Mtr.)

Sr. No.	Working Circle	Population area (Ha.)	No. of sample plots	Sample area (Ha.)	No. of Plants in sample area	No. of Plants per Ha.
1	2	3	4	5	6	7
1	S.C.I.W.C.	17422.160	445	1.11	2773	2493
2	P. W.C.	26958.98	756	1.89	4711	
3	T.P.W.C	8.16	2	0.005	12	
4	C.A & M.W.C	141.31	15	0.0375	93	
5	Misc. W.C.	1.94	3	0.0075	19	
	Total	44532.55	1221	3.0525	7608	

G) Grass Species, per ha (Sample plot size 1 Mtr.X 1 Mtr.)

Sr. No.	Working Circle	Population area (Ha.)	No. of sample plots	Sample area (Ha.)	No. of Plants in sample area	No. of Grass roots per Ha.
1	2	3	4	5	6	7
1	S.C.I.W.C.	17422.160	445	0.0445	1849	41548
2	P. W.C.	26958.98	756	0.0756	3141	
3	T.P.W.C	8.16	2	0.0002	8	
4	C.A & M.W.C	141.31	15	0.0015	62	
5	Misc. W.C.	1.94	3	0.0003	12	
	Total	44532.55	1221	0.1221	5072	

Statistical Analysis: -

The Statistical personnel of the office of the Chief Forest Statistician, Maharashtra State, Nagpur, have carried out the statistical analysis of the data. In Miscellaneous Working Circle no trees are reported hence the Intensity of sampling goes to higher side. The calculated estimates lead to certain error and percentage of Standard error is around 5%, for Selection Cum Improvement Working Circle and Protection Working Circle. In Teak Plantation Working Circle, and Coastal Area & Mangrove Working Circle the standard error bound to be high, which itself signifies that standard error will not be a reliable measure for accurate statistical analysis for Teak Plantation Working Circle. The percentage standard error is calculated for each Working Circle is given in the following table No. 8

Table No.8
Working Circle-wise % of Standard error.

Sr. No.	Name of working circle	Population area in ha	Sample area in ha	Intensity of sampling %	% Standard Error
1	Selection Cum Improvement W.C.	17422.160	160.20	0.010	4.34
2	Protection W.C.	26958.98	272.16	1.010	5.75
3	Teak Plantation W.C.	8.16	0.72	8.824	95.46
4	Coastal Area & Mangrove W.C	141.31	5.40	3.821	98.14
5	Miscellaneous	1.94	1.08	55.670	----
	Total	44532.55	439.56	0.010	----

**Chief Forest Statistician,
Maharashtra State, Nagpur.**

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बाबतचा सुधारीत विश्लेषणात्मक अहवाल सादर
करणेबाबत.

क्रमांक कक्ष.15 / वसंसयो / / 2013.14
नागपूर दिनांक / 03 / 2014.

प्रति,

वनसंरक्षक
कार्य आयोजना विभाग,
कोल्हापूर.

संदर्भ—1. आपलेकडील ई मेल दिनांक 29.11.2013 व पत्र क्रमांक ब/कक्ष-1/ल. ले./742
दिनांक 30.11.2013.

2. या कार्यालयाचे पत्र क्रमांक कक्ष-15/वसंसयो/997, दिनांक 24.12.2013.

3. आपले पत्र क्रमांक ब/कक्ष-वक्षेपा/1030, दिनांक 11.03.2014.

आपले वरील संदर्भिय पत्र क्रमांक 1 अन्वये सावंतवाडी वनविभागाचा नमुना वृक्ष मोजनीबाबतच्या माहितीचे प्रपत्र 1A व 1B या कार्यालयास प्राप्त झाले. त्यामध्ये आपण सुचविल्यानुसार एकूण सहा वर्किंग सर्कल नमुद होते. त्यात Selection Working Circle व Improvement Working Circle असे दोन्ही वर्किंग सर्कल वेगवेगळे समाविष्ट होते. त्याआधारे एकूण सहा वर्किंग सर्कलच्या माहितीचे पृथक्करण व सांख्यिकीय विश्लेषणात्मक अहवाल तयार करून या कार्यालयाचे संदर्भिय पत्र क्र. 2 अन्वये आपणास सादर करण्यात आलेला होता.

तथापी आपले कार्यालयाचे संदर्भिय पत्र क्र. 3 मध्ये दिलेल्या सुचनेच्या अनुषंगाने Selection Working Circle व Improvement Working Circle या दोन Working Circle चे एकत्रीकरण Selection - Cum - Improvement Working Circle असे करून सुधारीत प्रपत्र IA ते V मध्ये माहिती व सांख्यिकीय विश्लेषणात्मक अहवाल यासोबत सादर करण्यात येत आहे.

सहपत्र – वरीलप्रमाणे.

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