

**EVALUATION OF PHYSICAL FERTILITY AND
ERODIBILITY OF SOILS IN RELATION TO POPLAR
(*Populus deltoides*) BASED AGRO-FORESTRY
SYSTEM**



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AGRO-FORESTRY

- **Growing of multipurpose trees along with agricultural crops.**
- **Practiced for better economics.**
- **Soil conservation practice.**
- **Increases or at least maintain the organic matter level of soils mainly through litterfall.**
- **Soil is physically fertile when its infiltration rate and water retention are sufficient, soil aeration is adequate with ready exchange of gases between soil and atmosphere, resistance to root penetration is minimum and resistance to soil erosion is maximum.**



OBJECTIVE

- **To observe the effect of poplar tree age on soil physical properties and erodibility.**



STUDY SITE

Location : Central Punjab, India

Latitude : 30° 54' N

Longitude : 75° 40' E

Rainfall : 700 mm

Soil : Loamy sand



TREATMENTS

Tree age: Three

- **One year**
- **Three year**
- **Six year**

Replications: Three

Statistical Design: RBD factorial



Soil physical fertility of surface soil (0-15 cm) in relation to poplar age

Soil parameter	Land use	1	3	6	Mean
Organic matter (%)	AF	0.95	1.13	1.34	1.14 ^a
	C	0.75	0.74	0.74	0.74 ^b
	Mean	0.85 ^a	0.93 ^b	1.04 ^c	
MWD (mm)	AF	0.080	0.190	0.360	0.210 ^a
	C	0.025	0.026	0.027	0.026 ^b
	Mean	0.052 ^a	0.108 ^b	0.193 ^c	
Aggregates >0.25 mm	AF	3.60	11.43	19.93	11.6 ^a
	C	0.25	0.35	0.31	0.30 ^b
	Mean	1.92 ^a	5.89 ^b	10.12 ^c	
Total porosity (%)	AF	49.3	50.8	52.3	50.8 ^a
	C	45.7	48.7	47.1	47.1 ^b
	Mean	47.5 ^a	49.7 ^b	49.7 ^c	
WHC (%)	AF	34.0	36.0	43.0	38.0 ^a
	C	32.0	34.0	36.0	34.0 ^b
	Mean	33.0 ^a	35.0 ^b	39.5 ^c	



Soil physical fertility of subsurface soil (15-30 cm) in relation to poplar age

Soil parameter	Land use	1	3	6	Mean
Organic matter (%)	AF	0.84	0.88	1.03	0.92 ^a
	C	0.62	0.64	0.63	0.63 ^b
	Mean	0.73 ^a	0.76 ^b	0.83 ^c	
MWD (mm)	AF	0.050	0.130	0.220	0.130 ^a
	C	0.024	0.026	0.025	0.025 ^b
	Mean	0.037 ^a	0.078 ^b	0.122 ^c	
Aggregates >0.25 mm	AF	2.40	6.93	12.3	7.21 ^a
	C	0.17	0.33	0.16	0.22 ^b
	Mean	1.28 ^a	3.63 ^b	6.23 ^c	
Total porosity (%)	AF	48.7	49.5	52.5	50.2 ^a
	C	44.7	45.7	46.7	45.7 ^b
	Mean	46.7 ^a	47.6 ^b	49.6 ^c	
WHC (%)	AF	32.0	35.0	41.0	36.0 ^a
	C	30.0	33.0	35.0	33.0 ^b
	Mean	31.0 ^a	34.0 ^b	38.0 ^c	



Soil erodibility indices in relation to poplar age

Soil erodibility indices	Land use	1	3	6	Mean
0-15 cm soil layer					
Dispersion ratio (%)	AF	6.46	3.37	1.07	3.63 ^a
	C	15.45	15.44	15.42	15.44 ^b
	Mean	10.95 ^a	9.40 ^b	8.24 ^c	
WSA >0.5 mm	AF	5.59	10.28	20.33	12.06 ^a
	C	0.53	0.69	0.61	0.61 ^b
	Mean	3.06 ^a	5.48 ^b	10.47 ^c	
15-30 cm soil layer					
Dispersion ratio (%)	AF	12.61	10.78	8.16	10.52 ^a
	C	15.08	14.77	15.58	15.14 ^b
	Mean	13.84 ^a	12.77 ^b	11.87 ^c	
WSA >0.5 mm	AF	2.80	7.29	12.68	7.59 ^a
	C	0.43	0.65	0.44	0.51 ^b
	Mean	1.61 ^a	3.97 ^b	6.56 ^c	



CONCLUSIONS

- **Agro-forestry is an important soil conserving practice in IndoGangetic Plains of India. The poplar based agro-forestry improves soil physical environment and decreases its erodibility.**
- **The organic matter content increased with agro-forestry both in surface and subsurface layers, the difference being more pronounced in surface layer. The organic matter content increases with increases in tree age.**
- **Total porosity and WHC also improved with agro-forestry and the effect became pronounced with tree age.**
- **The increased organic matter under agro-forestry improved soil aggregation status, more so in older plantation.**
- **Soil erodibility indices showed marked decrease in erodibility under agro-forestry, the decrease being highest under six year plantation.**