

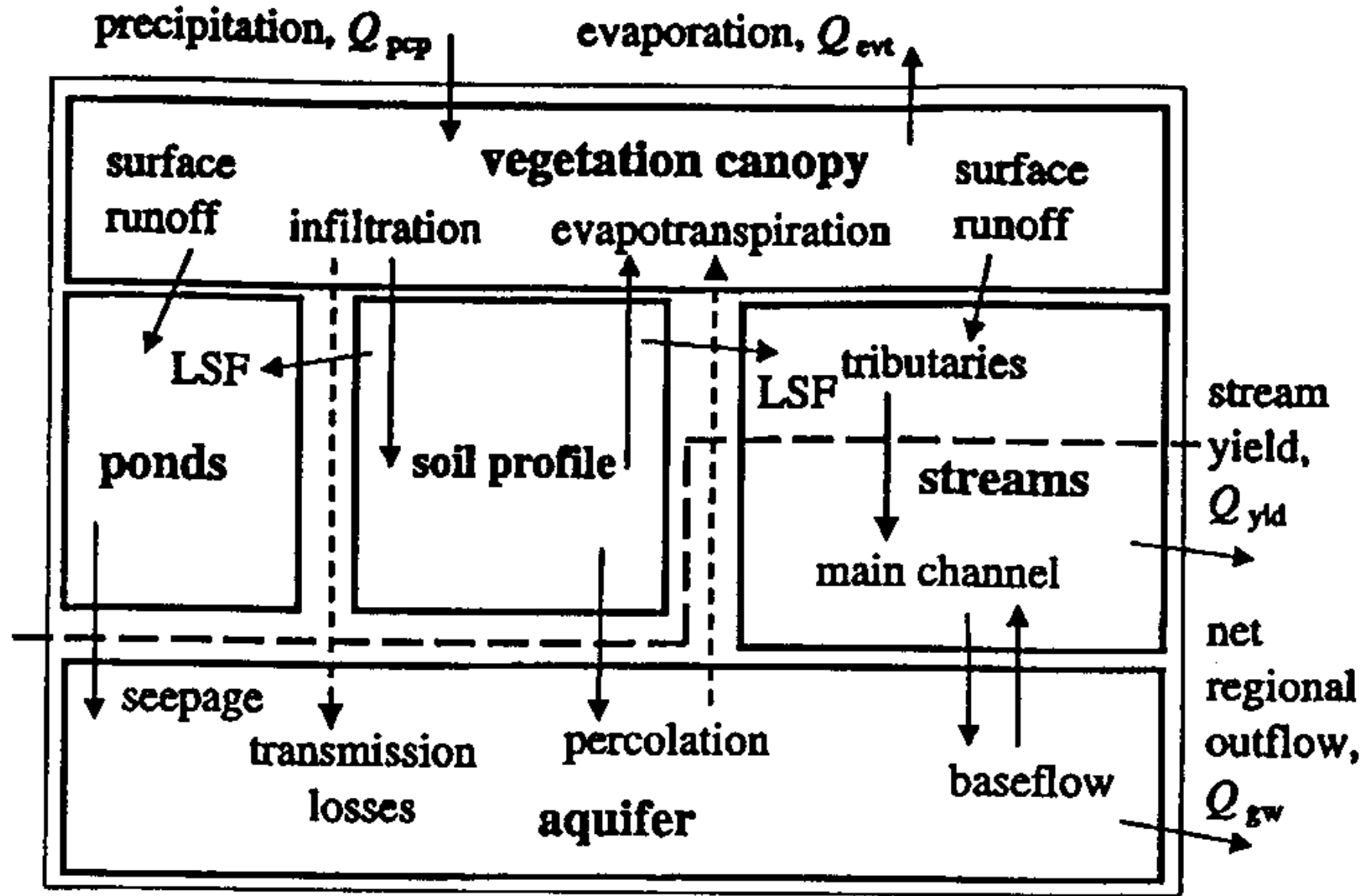
Surface Rainfall - Run off Assessment & Models

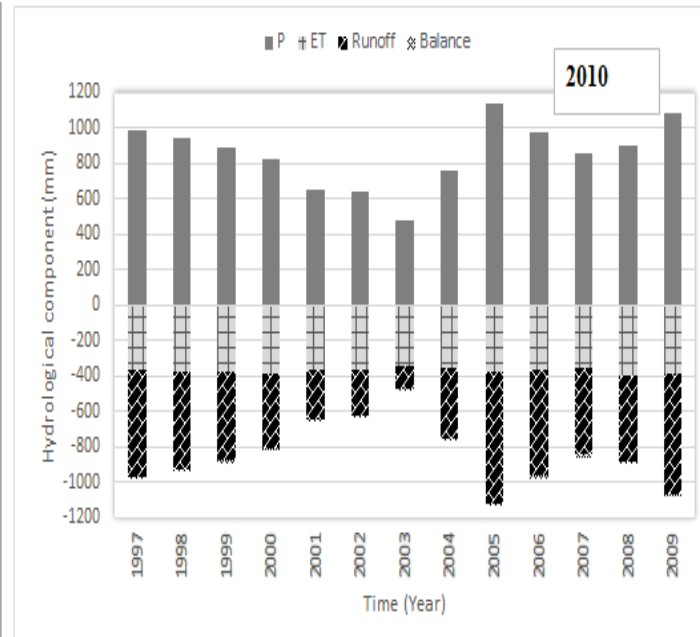
Global hydrologic cycle - Transfers of water between the land, ocean and atmosphere

Land based hydrologic cycle - The movement of water on and under the land surface, physical and chemical interactions with earth materials accompanying that movement, and the biological processes that conduct or affect that movement.

Hydrologic processes encompass space and time scales; thunderstorms that occur over the course of minutes to hours and space scales of a few kilometres; development of major river basins taking place over millions to tens of millions of years and space scales of 1000-10,000 km.

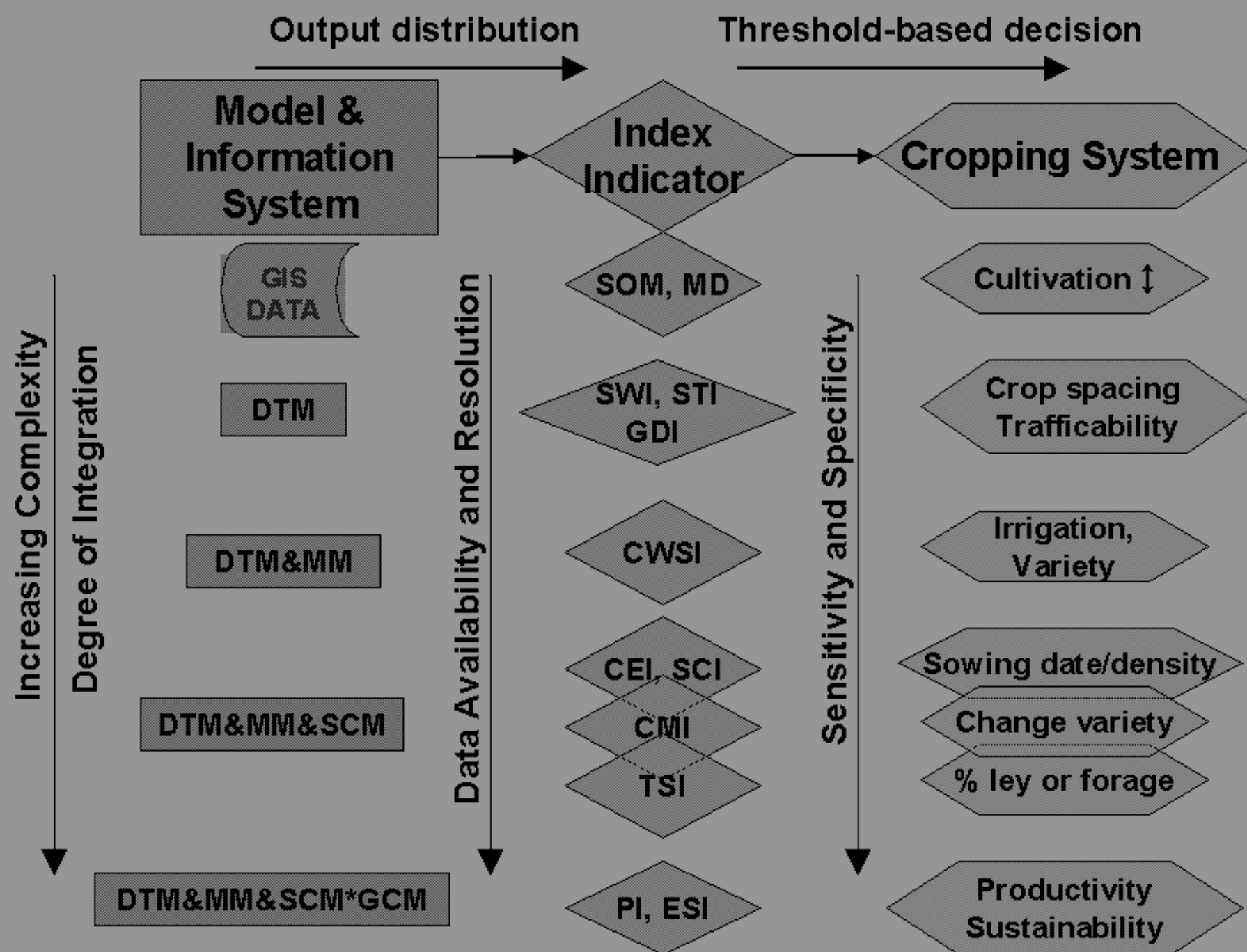
Hydrological processes



$$P=Q+ET+\Delta S/\Delta t$$


Runoff > ET (2010)

		2001			2010		
Year	P	ET	Runoff	Balance	ET	Runoff	Balance
1997	983.66	432.05	443.00	108.61	367.73	599.80	16.14
1998	942.33	470.73	343.00	128.6	380.11	544.15	18.07
1999	892.89	452.86	362.14	77.89	372.04	501.92	18.93
2000	818.49	463.38	290.35	64.76	389.87	415.64	12.98
2001	654.44	416.40	225.68	12.36	362.86	280.19	11.39
2002	635.27	435.61	201.64	1.98	370.29	256.59	8.39
2003	478.59	375.59	140.16	37.16	343.38	127.70	7.51
2004	761.76	425.05	270.51	66.2	356.89	394.16	10.72
2005	1136.0	452.61	512.03	171.38	380.49	737.68	17.85
2006	979.81	446.64	415.09	118.08	371.21	586.92	21.68
2007	860.35	431.62	375.24	53.49	356.02	489.21	15.12
2008	895.02	473.40	349.64	71.98	394.06	488.98	11.99
2009	1080.6	466.76	475.22	138.62	383.11	683.97	13.52
Note - P: Rainfall, ET : Evapotranspiration, Balance : Storage							



Agro-ecological indicators estimated at different degrees of integration

Surface runoff occurs when the rainfall input exceeds losses such as interception, infiltration, evaporation and surface storage. Individual catchments have a unique runoff response to different rainfall events. Many models try to simulate runoff from rainfall.) Simulating the real-world relationships using these Rainfall-Runoff models is far from satisfactory.

An ***empirical model*** is based on a mathematical linkage between an input and output series (rainfall and runoff data) considering the catchment as a lumped unit, with no physical characteristics of the basin – Auto Regressive Moving Average (ARMA) model.

Conceptual models describe relevant components of hydrological behaviour through simplified conceptualizations of the physical transportation processes associated with the hydrological cycle.

Available models

Soil Conservation Service (SCS) developed by USDA (1972), NAM (Nielsen and Hansen, 1973), TANK (Sugawara, 1974), HEC-HMS (Hydrologic Engineering Center (HEC), 2000), SWAT (Neitsch et al., 2005), TOPMODEL (Beven and Kirkby, 1979; Beven et al., 1984) and IHACRES (Croke et al., 2004).

Thank you