

# **Sustainable ecosystem at mid-Himalayan region**

Arijit Das

Center for Economic Studies and  
Planning  
Jawaharlal Nehru University

# Motivation

- A large number of case studies on collective action in Common property resources.
- Absence of universal model to identify stimulating factor.
- Identify why human cooperate.

# Literature

- Hardin (1968) found these open access resources are under great risk of overuse.
- Three important works are done by Wade (1988), Ostrom (1990), Baland and Platteau (1996).
- Wade's (1988) important work on commonly managed irrigation systems in South India. He found that villagers developed and financed joint institutions for irrigation management.
- Similar to work of Wade, Ostrom (1990) designed eight principals in her seminal research after analysing 14 cases.
- Balannd and Platteau (1996) gone through analyzing a number of case studies.

# Model

- The model is based on Sethi and Somnathan (2006).
- Given the conditions player  $i$  can choose to contribute ( $x_i=1$ ) or not ( $x_i=0$ ).
- the cost of punishing is proportional to the number of defectors ( $d$ ) and inversely proportional to the number of enforcers ( $e$ ), with the parameter  $\gamma$  affecting the size of the cost. The material payoff to player  $i$  is therefore given by

- $\Pi_i =$

$$\begin{aligned} & \alpha K - x_i \quad \text{if } e = 0 \\ & \alpha K - x - (1-x)p - \frac{\gamma Y_i d}{e} \quad \text{if } e > 0 \end{aligned}$$

# Model

- It is found from the above discussion that complete successful or partial success crucially depends on the values of  $\alpha$ ,  $b$ ,  $\Upsilon$ ,  $p$ . So, to build up an econometric model we need to find out the variables which are influencing these parameters.
- Agarwal (2003) summarized the seminal works of Ostrom, Wade, Baland and Platteau to cluster out four major areas that influence successful collective action. These major areas are:
  - Resource Characteristics
  - Group Characteristics
  - Relation between Resource and Users
  - Institutional organization and external environment

# Model

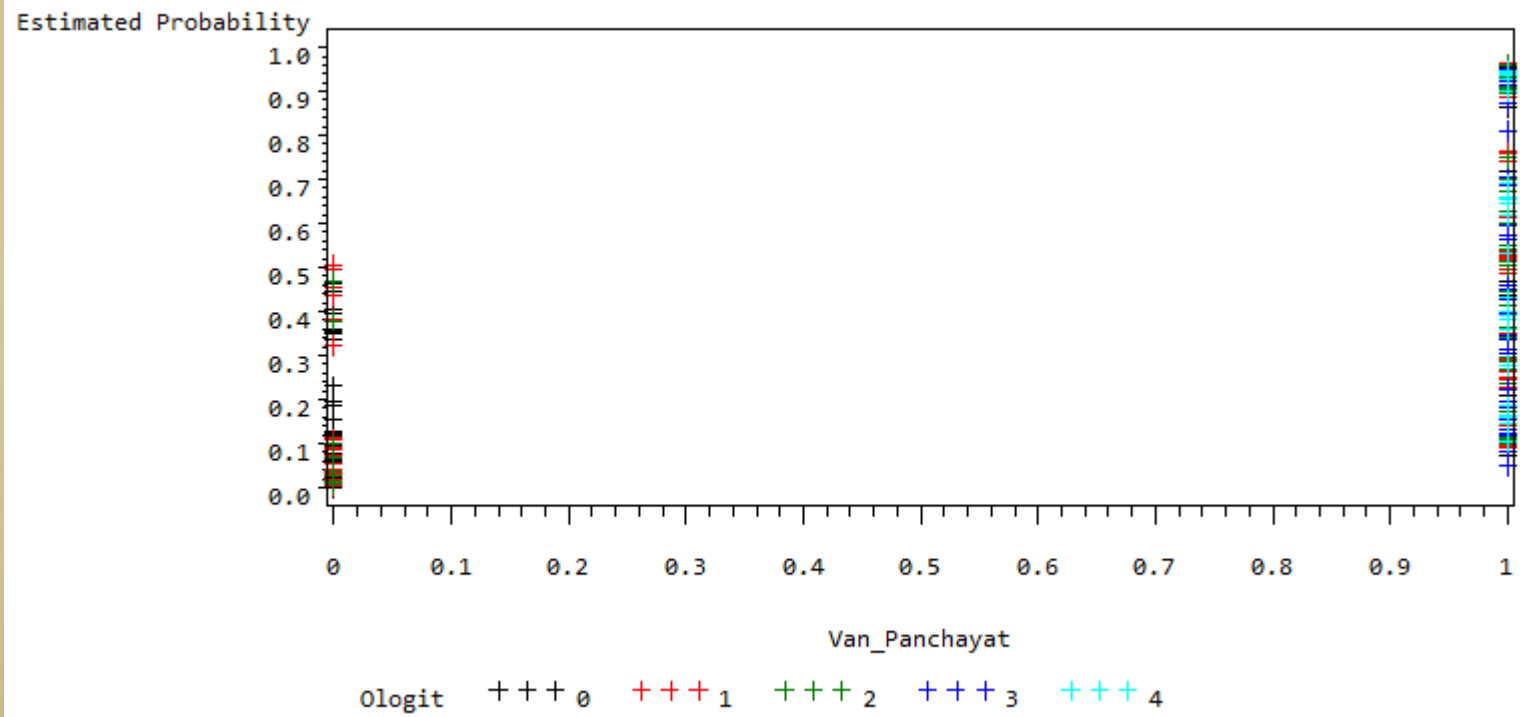
- We identified several factors under these four major heads. In the paragraph below we described how those variables influencing those four parameters ( $\alpha$ ,  $b$ ,  $\Upsilon$ ,  $p$ ).
- Based on the identification the econometric model  
*Collective activity = f (rule of use, population, heterogeneity of the population, migration, dependency on the resource, governance)*

# Result

- After ordered logit regression.

Analysis of Maximum Likelihood Estimates (Pseudo R2= .2157), no of observations= 83					
Parameter		Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	4	-6.1909	1.611	14.7673	0.0001
Intercept	3	-4.9862	1.5593	10.2253	0.0014
Intercept	2	-3.9139	1.5198	6.6321	0.01
Intercept	1	-1.8223	1.4474	1.5852	0.208
Total Population		0.00001	0.000929	0.0001	0.9911
Migration		-5.4671	4.1444	1.7402	0.1871
Distance Town		-0.00642	0.0109	0.3485	0.555
Van Panchayat		3.3007	0.6381	26.7565	<.0001
History		0.3294	0.5277	0.3896	0.5325
Homogeneity index		1.5838	1.257	1.5876	0.2077

# Result





# Result

## Marginal effect after ordered logit

	Coefficient	Std. Err.	Z	P>z	[95% Confidence Interval]	
<b>0</b>						
Migration	0.1149484	0.619102	0.19	0.853	-1.09847	1.328365
Van panchayat	-0.6363273	0.087957	7.23	0	-0.80872	-0.46394
History	-0.0840963	0.108178	0.78	0.437	-0.29612	0.127928
Distance Town	0.0014894	0.002266	0.66	0.511	-0.00295	0.00593
Total Population	0.0000314	0.000178	0.18	0.86	-0.00032	0.000381
Heterogeneity Index	-0.3379024	0.252474	1.34	0.181	-0.83274	0.156938

# Result

1

Migration	-0.0043388	0.035732	0.12	0.903	-0.07437	0.065695
Van panchayat	0.0664385	0.082477	0.81	0.421	-0.09521	0.228091
History	0.008974	0.025864	0.35	0.729	-0.04172	0.059667
Distance Town	-0.0000562	0.000366	0.15	0.878	-0.00077	0.000661
Total Population	-1.19E-06	9.66E-06	0.12	0.902	-2E-05	1.78E-05
Heterogeneity Index	0.0127543	0.078783	0.16	0.871	-0.14166	0.167166

# Result

2

Migration	-0.0567126	0.305407	0.19	0.853	-0.6553	0.541875
Van panchayat	0.2333848	0.063527	3.67	0	0.108875	0.357894
History	0.0392252	0.048254	0.81	0.416	-0.05535	0.133802
Distance Town	-0.0007349	0.001108	0.66	0.507	-0.00291	0.001437
Total Population	-0.0000155	0.000088	0.18	0.86	-0.00019	0.000157
Heterogeneity Index	0.1667123	0.130552	1.28	0.202	-0.08917	0.42259

# Result

3

Migration	-0.0354725	0.191139	0.19	0.853	-0.4101	0.339154
Van panchayat	0.2030891	0.063388	3.2	0.001	0.078851	0.327328
History	0.0237286	0.029188	0.81	0.416	-0.03348	0.080937
Distance Town	-0.0004596	0.000697	0.66	0.509	-0.00183	0.000906
Total Population	-9.69E-06	5.53E-05	0.18	0.861	-0.00012	9.87E-05
Heterogeneity Index	0.104275	0.083333	1.25	0.211	-0.05905	0.267604

# Result

4

Migration	-0.0184245	0.099488	0.19	0.853	-0.21342	0.176568
Van panchayat	0.1334148	0.053092	2.51	0.012	0.029356	0.237473
History	0.0121685	0.015199	0.8	0.423	-0.01762	0.041957
Distance Town	-0.0002387	0.000367	0.65	0.516	-0.00096	0.000481
Total Population	-5.03E-06	2.87E-05	0.18	0.861	-6.1E-05	5.12E-05
Heterogeneity Index	0.0541608	0.044877	1.21	0.227	-0.0338	0.142118

# Household collective activity

- What are effecting the household collective action?
- The reduced form equation would be then  
*Collective work = f (income, no of family members, migration, dependency on forest, social norms)*

# Result

**Table 7: Result of Robust regression, number of observations=3291, F(5,3285)= 167.09 and Pr>F =.000**

Dependent variable Collective activity	Coefficient	Standard Error	t value	P>t	(95% Confidence Interval)	
Household size	-0.45889	0.107201	-4.28	0	-0.66908	-0.2487
State dummy	-5.28598	0.459197	-11.51	0	-6.18632	-4.38564
Firewood use	0.067404	0.002497	26.99	0	0.062508	0.0723
Migration	-0.51042	0.903025	-0.57	0.572	-2.28097	1.260132
Evidence of permanent income	2.14885	0.624595	3.44	0.001	0.924215	3.373484
Constant	4.177536	0.682331	6.12	0	2.8397	5.515373

# Conclusion

- Institutions is found to be most significant faction for successful collective action.
- Income found to be second important.