

AARES 55th Annual Conference

Ecological Afforestation in China: A Market-based Approach

*Jintao Xu, Haipeng Zhang, Jeff Bennett,
Xuehong Wang and Mark Eigenraam*

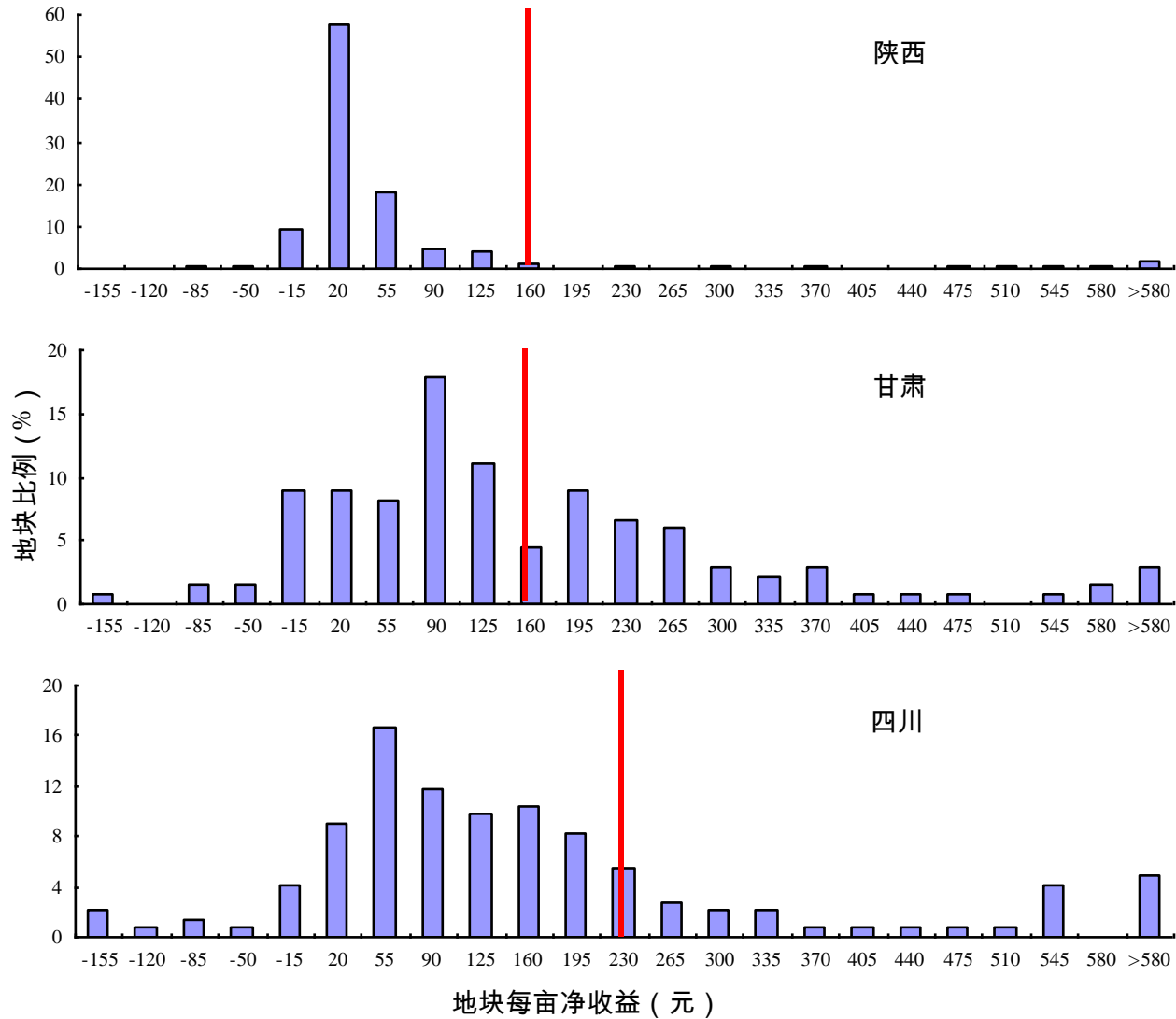
February 9, 2011, Crown Conference Center, Melbourne

China's Ecological Restoration Campaign since 1998

- Flood and Drought recurring threats to China
- Since 1998, 50 billion yuans per year on eco-restoration (SLCP, NFPP, etc.)
- Top-down approach, implemented by farmers and enterprises with compensation
- Usual question: are farmers' opportunity cost adequately compensated?

Cost Effectiveness of CCFGP

- Annual compensation per unit of land
- Uniformed compensation
- 1.5 and 2.6 times higher than US CRP (Uchida etal, 2003)
- There are still farmers enduring significant loss
- Threat to sustainability (returning to cropping)
 - In our 2003/2005 survey, near 40% claimed inclination of re-cropping, backed by recent FEDRC



Xu, Tao and Xu, 2004, "Sloping Land Conversion Program : Cost-effectiveness, Structural Effect and Economic Sustainability", China Economic Quarterly, Vol 4 (1)

Questions

- If we could be more cost effective by
 - Using less money to achieve the same level of restoration, or
 - Achieving greater target with same amount of money
- If the program could be real voluntary, so that no one was forced into the program and suffer
- Market approach would probably solve the issues (auction, bidding, of projects)

ACIAR funded trial project in Sichuan

- “Tender Scheme” for barren land restoration to forests
- Government had restoration target and funding
- Inviting farmers to submit tender for funded restoration projects
- The tender includes afforestation technology choice, management plan and estimated cost
- 10 steps in the trial (advertisement, training, meetings, etc.)

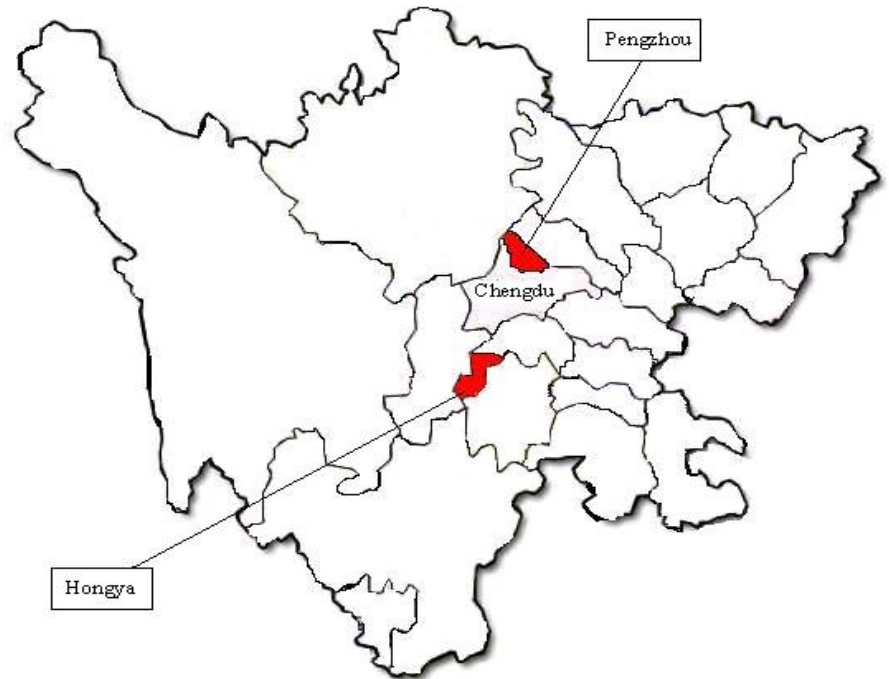
Project Implementation

- Two potential selection criteria
 - Lowest unit cost
 - Highest net environmental benefit
- After selection, signing of contract
- Three year project, 2-3 installments

Potential Problems

- Will farmers have the capacity to participate in the tender program
 - Farmer comprehension of the program
 - Sensible bid reflecting true opportunity cost
 - Independence, voluntariness, etc.
- How high is the transaction cost
- What is the risk of farmer disputes, in the ground of equity, etc.
- Potential social instability

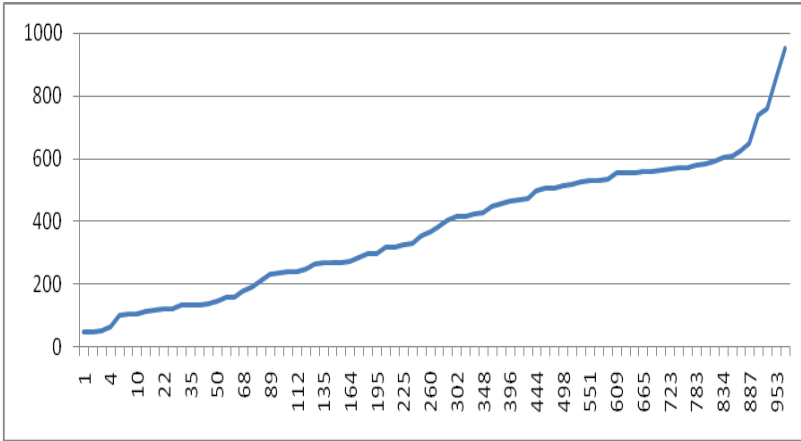
Trial Project Area



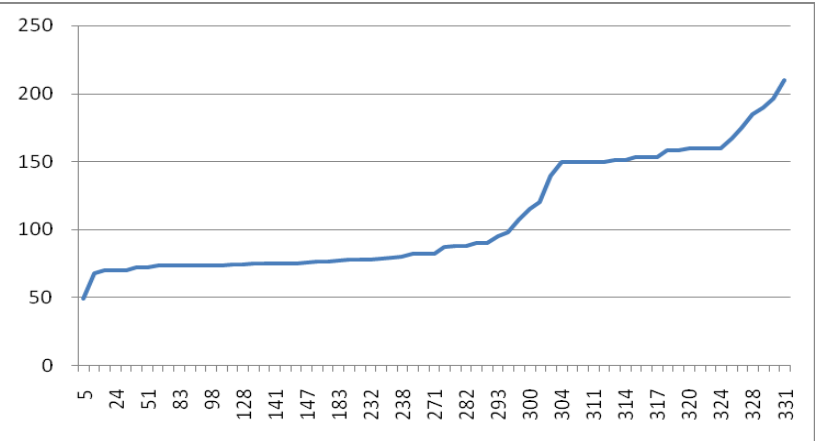
Biding Results

	Wenshan	Shunhe	Dishui	Zhongba
Number of bidder	79	66	90	68
Number of nominated sites	80	67	93	124
Bid area (Mu)	985	330.7	3226.5	663.2
Minimum area (mu)	1	0.5	0.5	1
Maximum area (mu)	35	30	280	50
Total bid price (10,000 yuan)	15	2.8	72.76	14.97
Average bid price (yuan/mu)	152.4	84.5	228.6	225.7
Minimum bid price (yuan/mu)	47	49	24	20
Maximum bid price (yuan/mu)	952	210	324	1500

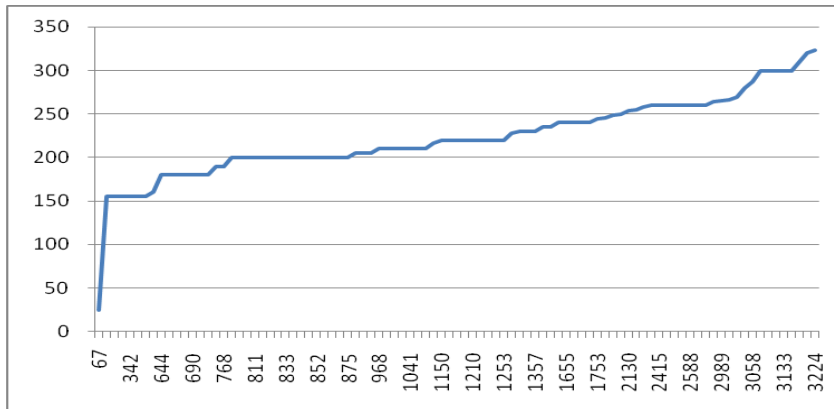
Marginal Cost Curve



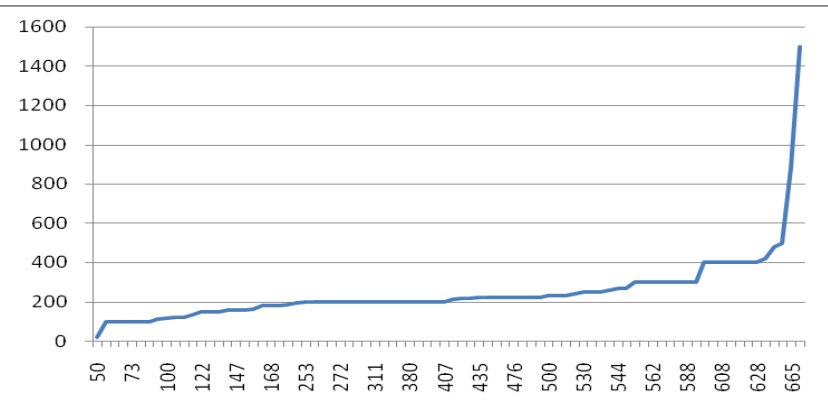
Wensha



Shunhe



Dishui



Zhongba

Cost Saving: Zhongba Village

- In Zhongba, with 400 mu and 240y/mu as baseline information
- Bidding results will save 36K RMB, 1/3 of total initial budget for same 400 mu, or
- Expand plantation area by ~200 mu for the same total budget
- (Using net benefit approach, total savings amounted to 110 K RMB in 4 villages)

Other Interesting Things

- Farmer owned several plots, and proposed different unit costs for different plots
 - A unflattened supply curve of land plots for a single household
- Farmer households proposed joint bids
 - Forming large land block based on
 - Land adjacency
 - Factor complementarities

Conclusions

- There is capacity in rural China to adopt market based approach in ecological restoration
- It can improve cost effectiveness, and voluntariness of farmers
 - Potentially, a Pareto improvement
- Caveats
 - Implementing agency cost of adjustment
 - Initial period, potential social disputes

	VARIABLES	unitprice	unitprice	unitprice	unitprice
年龄	age	0.725	0.840	0.815	0.813
性别	male	50.28*	51.02*	51.86*	52.57**
教育水平	edu	25.68*	27.58**	27.87**	26.96**
人均收入	pcinc	6.639*	6.609*	6.730*	7.143*
人均非农收入	pcnfinc	-8.803***	-7.999***	-8.047***	-7.856***
海拔高 (m)	high_m	0.0271	0.0215		
坡位	loc_umd	4.689	3.980		
坡度	gradient	0.543	0.476		
地块条件指数	ldcond			1.810	1.659
离水源距离	toriver	-0.0139	-0.0124	-0.0124	-0.0130*
单位种植密度	unitdensity	9.337**	8.833**	8.792**	8.540**
整地规格	hole_m3	-214.5	-160.3	-150.8	-165.8
是否施化肥	fertorn	34.95**	28.40*	27.28*	27.39*
第二年抚育次数	fostern2				-9.641
第三年抚育次数	fostern3				11.31
第二年 and 第三年抚育总次数	fostern	2.618	1.321	1.196	
1=荒山荒地	plotype1	-37.93**	-42.21**	-43.06**	-44.22**
3=采伐迹地	plotype2	-31.42	-29.63	-31.03	-34.88*
4=陡坡地	plotype3	-23.61	-34.21	-35.13	-38.14
常数项	Constant	-25.32	46.12	82.32	89.86
地区虚变量	_lvid_2	有	有	有	有
坡向虚变量		有	无	无	无
树种虚变量	_ldirection_2	有	无	无	无
	Observations	210	210	210	210
	R-squared	0.192	0.165	0.162	0.171
	***	p<0.01,	**	p<0.05,	*<0.01

Social characteristics of the selected villages (2008)

		Hongya		Pengzhou	
		Wenshan	Shunhe	Dishui	Zhongba
Households		565	640	214	305
Population		1905	2195	842	1035
The amount of labor		1040	1560	460	662
Level of education	Primary and below (%)	20	30	13	30
	Junior school (%)	60	60	74	60
	High school and above (%)	20	10	13	10
Off-farm employment	Population	240	329	40	23
	Percentage	25.1	15	8.7	2.2
Per capita income (Yuan/Year)		6155	5658	3400	3860
Arable land (per capita)		0.03	0.23	0.82	0.1
area (per capita)		16.12	2.1	9.14	6