Appendix 1

D-efficiency - In the design of experiments, optimal designs are a class of experimental designs that are optimal with respect to some statistical criterion (often related to the variance-covariance matrix). Optimal designs allow parameters to be estimated without bias and with minimum variance. A non-optimal design, in contrast, requires a greater number of experimental runs to estimate the parameters with the same precision as an optimal design. A D-optimal design is a computer generated design and consists of the best subset of experiments selected from the full candidate set. For a given model, $Y = X\beta + \varepsilon$, with a D-optimal design, the selected runs maximize the determinant of the information matrix X'X, resulting in higher precision in the parameter estimates (Atkinson and Donev 1992).

Atkinson, A. C., and A. N. Donev. 1992. Optimum experimental designs. Oxford University Press, Oxford.

Derivation of the reservation payment:

Respondent *i* has baseline indirect utility U_{i0} from their *status quo* activities (i.e. current farming practices), which is as a function of current household wealth (for example, livestock, cash, and other storables) and current period income:

$$U_{i0} = \gamma \cdot E_i + \varepsilon_{i0}$$

where the baseline utility for respondent *i* is U_{i0}, E_i is the households's status quo wealth and money income, ε_{i0} is a random error, and γ is a parameter to be estimated. If respondent *i* elects to enroll in agroforestry program *j* then their indirect utility function is:

$$U_{ij} = V_{ij} + \varepsilon_{ij} = \mathbf{X'_{ij}\beta} + \gamma \cdot \left(E_i + \text{Payment}_{ij}\right) + \varepsilon_{ij}$$

where the utility derived from enrolling in agroforestry program *j* is U_{ij}, $\mathbf{X_{ij}}$ is a vector of the non-monetary attributes of the program (e.g. land to be enrolled, duration of the program), Payment_{ij} is the annual payment per acre for enrollment in program *j*, ε_{ij} is a random error, and $\boldsymbol{\beta}$ is a vector of parameters to be estimated. Respondent *i*'s characteristics enter the model as shifters on the $\boldsymbol{\beta}$ parameters.

The probability that respondent *i* chooses to enroll in agroforestry program *j* (i.e. they respond that *Yes* they would prefer to enroll in that program) is:

$$Pr(Yes) = Pr\left(U_{ij} > U_{i0}\right) = Pr\left(\Delta\varepsilon_{ij} < \Delta V_{ij}\right)$$

where $\Delta\varepsilon_{ij} = \varepsilon_{i0} - \varepsilon_{ij}$ is the difference in errors and

$$\Delta V_{ij} = V_{ij} - V_{i0} = \mathbf{X'_{ij}\beta} + \gamma \cdot \left(E_i + \text{Payment}_{ij}\right) - \gamma \cdot E_i = \mathbf{X'_{ij}\beta} + \gamma \cdot \text{Payment}_{ij}$$

is the utility difference between enrolling in agroforestry program *j* and not enrolling in the program (i.e., remaining at *status quo*). The reservation price at which respondent *i* will choose to enroll in agroforestry program *j* is the minimum payment ($Payment_{ij}$) that respondent *i* will accept for enrollment in the program, and is defined implicitly by the utility difference being zero:

$$\mathbf{X'_{ij}\beta} + \gamma \cdot \text{Payment}_{ij} = 0$$

The reservation price can thus be solved for as:

$$\text{reservation price} = -\frac{\mathbf{X'_{ij}\beta}}{\gamma}$$

Figure A1.1: Photographs used to illustrate the (a) current and (b) the envisioned state of the land. These photographs were shown along with a detailed explanation of the kind of agroforestry practices that the landowner could potentially undertake. Photographs are for representation purpose only.

Photo credits:

Image (a) - https://www.flickr.com/photos/mckaysavage/2230560278

Image (b) – C Watson (https://blog.worldagroforestry.org/index.php/2016/05/23/in-nicaragua-a-staggering-diversity-and-density-of-trees-on-farms/)

Table A1.1: Description of demographic, economic and socio-psychological variables and the parameters they interacted with in the two RPL models.

Variable type	Abbreviation	Description	Parameter of Interaction
Demographic	PDIS	Distance from Protected Area boundary	LAND, YEARS
Demographic	FCOV	Percentage forest cover in 1-km of landholding	LAND, YEARS
Demographic	CONF	Dummy variable takes a value of 1 if respondent has experienced conflict with herbivore	LAND, YEARS
Demographic	AGE	Dummy variable takes a value of 1 if respondent more than 44 years (average age)	LAND, YEARS
Demographic	EDU	Categorical variable for respondent's education	LAND, YEARS
Demographic	HHS	Household size	LAND, YEARS
Demographic	HIST	History/number of years living in the village	LAND, YEARS
Demographic	CAST	Caste of the respondent	LAND, YEARS
Economic	SIZE	Size of respondent's landholding	LAND, YEARS
Economic	AGIN	Income from agriculture	LAND, YEARS
Economic	OTIN	Income from other (non-agriculture) sources	LAND, YEARS
Economic	CROP	Number of crops grown	LAND, YEARS
Economic	SOUR	Number of income sources	LAND, YEARS

Socio-psychological	LINP	Component generated using PCA combining Likert statements relating to additional requirements of effort and financial expenditure	ASC
Socio-psychological	LBNF	Component generated using PCA combining Likert statements relating to provision of fodder, firewood, and additional income	ASC
Socio-psychological	LHWC	Likert statements relating to increase in conflict with animals	ASC
Socio-psychological	LSIZ	Likert response related to self-efficacy/worry about land size	ASC
Socio-psychological	LKNW	Likert response related to self-efficacy/worry about technical knowledge/training	ASC
Socio-psychological	LLBR	Likert response related to self-efficacy/worry about labor availability	ASC
Socio-psychological	LIRR	Likert response related to self-efficacy/worry about access to irrigation	ASC
Socio-psychological	LNBR	Likert response related to self-efficacy/worry about problems with neighbors	ASC
Socio-psychological	LSUC	Likert response related to self-efficacy/worry about trees not growing or fruiting	ASC
Socio-psychological	LFAM	Likert response related to social norms/ agreement with family members	ASC

Table A1.2: Demographic and socio-economic characteristics of respondents (N = 602)

Characteristics	**Sub-characteristics**	**Details**	
Villages sampled		90	
Number of people in HH[1] (Average/HH)		5	
		Respondent	Household
Gender	Male	98%	43%
	Female	2%	57%
Age	< 18	NA	30%
	18-40	44%	46%
	41-65	51%	19%
	> 65	5%	5%
Education	illiterate	13%	19%
	< 10th grade	53%	50%
	10th grade	12%	10%
	12th grade	10%	6%
	Graduate and above	12%	14%
Caste	Scheduled Tribe	56%	
	Scheduled Caste	6%	
	Other Backward Class	31%	
	General	7%	
History of living in village	0-5 years	0	
	6-19 years	1%	
	20-49 years	11%	
	> 50 years	88%	
Livestock ownership - Average/HH (min-max)	Cows	4.79 (0-34)	
	Buffaloes	1.27 (0-32)	
	Goat	1.55 (0-27)	
	Total	7.61 (0-66)	
Landholding size	< 3 acres	4%	
	3-5 acres	38%	
	6-10 acres	30%	
	> 10 acres	28%	

Number of crops grown - Average/HH (min-max)		3 (1-5)
Annual Agricultural Revenue[2] - Median/HH (min-max)		Rs. 1,50,000 (~USD 2142) (Rs. 10,000 – Rs. 30,00,000)
Non-agricultural Income Sources	Daily wage labor	44%
	Dairy	9%
	NTFP	56%
	Non-service jobs[3]	3%
	Service jobs[4]	26%
	Business[5]	21%
	Pension	11%
Number of non-agricultural income sources - Average/HH (min-max)		2 (0-5)
Annual Non-agricultural Income - Median/HH		Rs. 51,200 (~USD 730)
Carnivore interaction (7 species[6])	LP+HI+HD (personal loss)	12%
	LP+HI+HD (in village)	70%
Herbivore interaction (crop raiding) - number of species named in top 3 problem animals	3 species	32%
	2 species	32%
	1 species	29%
	None	7%

[1] HH – household

[2] Rs. – Indian Rupees (1 USD = Rs. 70)

[3] Non-service jobs including employment in factory or as truck driver

[4] Service jobs including employment as teacher, in tourism sector or government

[5] Business including own shop, contractor, mill

[6] Carnivores including tiger, leopard, bear, wolf, wild dog, jackal, fox; LP = Livestock predation, HI – human injury, HD – human death

Table A1.3: Descriptive statistics for local context regarding rainfall trends, emigration, forest dependence, and perceptions about living adjacent to forest, based on questionnaire surveys (n = 602) in the buffer areas of Pench Tiger reserve, Madhya Pradesh, India.

Questions regarding local context	**Categories**	**Percentage**
Have you experienced changes in rainfall pattern over the last 3 years	No change	3.32
	Decreased	74.92
	Increased	0.50
	Erratic	18.44
Has the change in rainfall patterns resulted in increase or decrease in your agricultural income	No change	4.10
	Decreased	95.56
	Increased	0.34
What would you like for the future of your family/children	Stay here and continue farming	22.84
	Stay here but not farm	4.40
	Move to city or town for job	60.41
	They can decide for themselves	12.69
What resources do you obtain from the forest	Firewood	62.46
	Fodder	2.99
	NTFP	49.17
	Livestock grazing	49.38
	Other	0.33
Do you like living near a forest	No	5.81
	Yes	69.93
	Neutral	24.25
Reasons for liking living near forest	Ancestral ties, affiliation to land and community support	82.01
	Resource availability	36.86
	Ecological and aesthetic value of forests	84.30
	Job in tourism sector	5.64
	Job in forest dept	0.88
	Other reasons	7.94
Reasons for disliking living near forest	Crop raiding by herbivores	87.36
	Livestock loss to carnivores	23.08
	Low standards of education	30.22
	Poor healthcare	35.71
	Limited job opportunities	20.33
	Overcrowding due to tourism	1.10
	Other reasons	21.43

Table A1.4: Estimated beta coefficients from multinomial logit (MNL) model incorporating landowner characteristics of respondents from choice experiment surveys conducted in the buffer area of Pench Tiger Reserve, India in 2018-19. Estimates are from the best-fit model based on AIC.

Attribute	**MNL**	
	Coefficient	**SE**
ASC[†]	1.18***	0.07
Land	-0.04***	0.002
Year	-0.002	0.01
Payment	0.02***	0.002
BFCOV	0.11*	0.06
BCONF	0.14**	0.06
Model Properties		
AIC/N	1.126	
Log-Likelihood	-3035.44	

BFCOV – binary variable with 1 = more than 25% forest cover in the 1-km buffer of landholding

BCONF – binary variable with 1 = conflict (crop loss) with two or more herbivores

[†]ASC is an alternative specific constant taking the value 1 if one of the agroforestry programs (Program A or Program B) is chosen and zero otherwise (Program C)

*** $p < 0.01$; ** $p < 0.05$; * $0.05 < p < 0.1$