

Appendix B

Due to the counting approach is limited to the evaluation of choice frequencies.

Multinomial logit (MNL) and mixed logit (random parameter model) yield propensity scores, representing the probability of a factor being present in a given combination. The mixed logit model offers details on the distribution of parameters, including the heterogeneity of the respondent (Glenk et al., 2014).

1. Multinomial logit (MNL)

Assuming the error terms ε_{nit} and $\varepsilon_{ni't}$ in equation (1) and (3) are independent and identically distributed (i.i.d.) type I, the extreme value with constant variance of $\pi^2/6$, the probability in multinomial logit (MNL) form Louviere et al. (2015), wherefrom farmer n selects the i as the best and i' as the worst can be expressed as follows:

$$P_n(ii'|t) = \frac{\exp[\tau_{ni} - \tau_{ni'}]}{\sum_{\substack{j, j' \in M \\ j \neq j'}} \exp[\tau_{nj} - \tau_{nj'}]} \quad (\text{a1})$$

where t represents the choice set; M is the vector of practices; j and j' are the remaining pairs of the best and the worst attributes not chosen. The probability of the sequence of choosing i as the best and i' as the worst items by farmer n over the T_n BWS questions ($T_n = 6$ in this study) can be given in the following formula:

$$P_{nii'} = \prod_t^{T_n} \frac{\exp[\tau_{nit} - \tau_{ni't}]}{\sum_{\substack{j,j' \in M \\ j \neq j'}} \exp[\tau_{njt} - \tau_{nj't}]} \quad (\text{a2})$$

According to equation (2), τ_{nit} equals to $\beta_{it}x_{nit}$, and it is vice versa for the worst items. The above probability with the estimated parameter can be expressed as follows:

$$P_{nii'} = \prod_t^{T_n} \frac{\exp[\beta_{it}x_{nit} - \beta_{i't}x_{ni't}]}{\sum_{\substack{j,j' \in M \\ j \neq j'}} \exp[\beta_{jt}x_{njt} - \beta_{j't}x_{nj't}]} \quad (\text{a3})$$

where the coefficients $\beta_i, \beta_{i'}, \beta_j, \beta_{j'}$ associated with the best and the worst items are fixed among farmers.

2. Mixed-Logit

The MNL described in equation (a3) assumes that all farmers have the same coefficient for each attribute, so that for instance, there is no n subscript on β_i .

Mixed Logit (MXL) is applied in this application to provide random taste variation on an individual level. The unconditional probability over the T_n BWS questions of farmer n selecting i as the best and i' as the worst is given in the following equation:

$$P_{nii'} = \int \prod_t^{T_n} \frac{\exp[\beta_{nit}x_{nit} - \beta_{ni't}x_{ni't}]}{\sum_{\substack{j,j' \in M \\ j \neq j'}} \exp[\beta_{njt}x_{njt} - \beta_{nj't}x_{nj't}]} f(\beta_n) d\beta_n \quad (\text{a4})$$

where $f(\beta_n)$ is the density of the coefficient β_n .

3. The importance of the arable land conservation practices

Table A1 presents the estimations from the MNL and MXL models. The coefficients reflect the importance of each of the 9 arable land conservation practices. The results show variations in individuals' perceptions indicating preferences for improving irrigation facilities and substituting CF with OF. These are commonly selected as the two most effective practices. Other practices such as crop rotation and interplanting with GMCCs are the next most important policies. However, the coefficients of preferences for crop rotation and interplanting with GMCCs are quite distant to the most preferred practice (improving irrigation facilities). The results from the estimation of the MXL also indicate that the most effective practices selected by farmers are the same as in the MNL model. As expected, the McFadden's R-square of the MXL (0.4783) indicates that it is better fit than that of the MNL model (0.4073).

Table A1: MNL Model and MXL model

	MNL model		MXL model	
	Coef. (Std. Err)	Share of preference	Coef. (Std. Err)	Share of Preferences
improving irrigation facilities	1.284 *** (0.073)	0.209	1.911 *** (0.088)	0.269
substituting CF with OF	1.233 *** (0.073)	0.199	1.612 *** (0.088)	0.199
crop rotation with GMCCs	0.764 *** (0.073)	0.124	1.208 *** (0.087)	0.133

interplanting with GMCCs	0.601 *** (0.073)	0.106	0.889 *** (0.087)	0.097
biochar	0.360 *** (0.072)	0.083	0.757 *** (0.087)	0.085
halving CF and PS input	0.320 *** (0.072)	0.080	0.546 *** (0.081)	0.069
growing GMCCs in fallow land	0.261 *** (0.071)	0.075	0.435 *** (0.080)	0.061
returning crop residues to the field	0.136 * (0.071)	0.066	0.184 ** (0.084)	0.048
Leaving land fallow for a whole year	Baseline	0.058		0.040
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Model Fit				
Log likelihood	-5,316		-4,679	
McFadden's R-square	0.4073		0.4783	
Number of observations (N)	1,656		1,656	

Notes: * p<0.1, ** p<0.05, *** p<0.01
GMCCs= green manure / cover crops
CF=chemical fertilizer
OF=organic fertilizer

A summary of the methods employed and the results is presented in Table A2. The counting approach, the multinomial model and the mixed logit model indicate that crop rotation and intercropping with GMCCs are the third and fourth most preferred conservation farming practices among farmers, but they are distant from the most preferred one. The mixed logit model suggests that the preferences for conservation practices differ among farmers. The Tobit model shows that farm location, training course participation and their current practices play a role on their preferences for green manure planting. Latent

class analysis presents the heterogeneity of farmers.

Table A2: Summary of the methods employed and the results

Models applied	Results	Policy implication
Counting approach	<ul style="list-style-type: none"> - Irrigation facilities improvement and substituting CF with OF are the most preferred - Crop rotation and interplanting with GMCCs are 3rd/4th preferred 	<ul style="list-style-type: none"> - Irrigation facilities need to be improved in arid and semi-arid regions - Training program on crop rotation and interplanting with GMCCs needs to be extended
Multinomial model-Mixed logit model	<ul style="list-style-type: none"> - Show the relative importance of each conservation practices - Irrigation facilities improvement are far more preferred than crop rotation and interplanting with GMCCs 	<ul style="list-style-type: none"> - Irrigation facilities need to be improved - Training program on GMCCs planting need to be extended
Tobit model	<ul style="list-style-type: none"> - Farm location, training course participation and current practices significantly affect their preferences 	<ul style="list-style-type: none"> - Improve irrigation facilities in arid and semi-arid areas. - Increase number of training courses on GMCCs planting
Latent class model	<ul style="list-style-type: none"> - High off-farm income farmers, arable farms, only attending training courses on agricultural production technology 	<ul style="list-style-type: none"> - Increase number of training courses on GMCCs planting