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COMMITTEE ON COMMODITY PROBLEMS

INTERGOVERNMENTAL GROUP ON TEA

NINETEENTH SESSION

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SUSTAINABILITY OF SMALLHOLDER TEA PRODUCTION IN THE UNITED REPUBLIC OF TANZANIA - APPENDICES

APPENDICES:

Table 1: Correlation matrix for variables associated with the greenleaf yield

		Age of the household head	Number of household members	Total labour ($MDha^{-1}$)	Total household land (ha)	Tea farm size (ha)	Fertiliser application rate per hectare	Estimated annual yield (Kgs GL)	How long yo've been growing tea	Total value of the credit	Distance to the nearest estate	Soil type
Age of the household head	Pearson Correlation	1	-.052	-.027	-.165(**)	-.185(**)	-.143(*)	-.165(**)	.682(**)	-.160(*)	.113	-.165(**)
	Sig. (2-tailed)		.373	.640	.004	.001	.013	.004	.000	.011	.051	.004
	N	301	301	301	301	301	301	301	299	253	301	301
Number of household members	Pearson Correlation	-.052	1	.384(**)	.322(**)	.345(**)	.137(*)	.097	-.061	.273(**)	.048	.126(*)
	Sig. (2-tailed)	.373		.000	.000	.000	.017	.093	.290	.000	.408	.029
	N	301	301	301	301	301	301	301	299	253	301	301
Total labour ($MDha^{-1}$)	Pearson Correlation	-.027	.384(**)	1	.397(**)	.424(**)	.391(**)	.470(**)	-.138(*)	.259(**)	-.130(*)	.146(*)
	Sig. (2-tailed)	.640	.000		.000	.000	.000	.000	.017	.000	.024	.011
	N	301	301	301	301	301	301	301	299	253	301	301
Total household land (ha)	Pearson Correlation	-.165(**)	.322(**)	.397(**)	1	.939(**)	.480(**)	.481(**)	-.218(**)	.351(**)	-.171(**)	.235(**)
	Sig. (2-tailed)	.004	.000	.000		.000	.000	.000	.000	.000	.003	.000
	N	301	301	301	301	301	301	301	299	253	301	301
Tea farm size (ha)	Pearson Correlation	-.185(**)	.345(**)	.424(**)	.939(**)	1	.513(**)	.528(**)	-.265(**)	.487(**)	-.216(**)	.263(**)
	Sig. (2-tailed)	.001	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	301	301	301	301	301	301	301	299	253	301	301
Fertiliser application rate per hectare	Pearson Correlation	-.143(*)	.137(*)	.391(**)	.480(**)	.513(**)	1	.549(**)	-.139(*)	.306(**)	-.284(**)	.051
	Sig. (2-tailed)	.013	.017	.000	.000	.000		.000	.016	.000	.000	.374
	N	301	301	301	301	301	301	301	299	253	301	301
Estimated annual yield (Kgs GL)	Pearson Correlation	-.165(**)	.097	.470(**)	.481(**)	.528(**)	.549(**)	1	-.314(**)	.304(**)	-.318(**)	.302(**)
	Sig. (2-tailed)	.004	.093	.000	.000	.000	.000		.000	.000	.000	.000
	N	301	301	301	301	301	301	301	299	253	301	301
How long yo've been growing tea	Pearson Correlation	.682(**)	-.061	-.138(*)	-.218(**)	-.265(**)	-.139(*)	-.314(**)	1	-.159(*)	.153(**)	-.315(**)
	Sig. (2-tailed)	.000	.290	.017	.000	.000	.016	.000		.011	.008	.000
	N	299	299	299	299	299	299	299	299	251	299	299
Total value of the credit	Pearson Correlation	-.160(*)	.273(**)	.259(**)	.351(**)	.487(**)	.306(**)	.304(**)	-.159(*)	1	-.103	.179(**)
	Sig. (2-tailed)	.011	.000	.000	.000	.000	.000	.000	.011		.102	.004
	N	253	253	253	253	253	253	253	251	253	253	253
Distance to the nearest estate	Pearson Correlation	.113	.048	-.130(*)	-.171(**)	-.216(**)	-.284(**)	-.318(**)	.153(**)	-.103	1	.068
	Sig. (2-tailed)	.051	.408	.024	.003	.000	.000	.000	.008	.102		.240
	N	301	301	301	301	301	301	301	299	253	301	301
Soil type	Pearson Correlation	-.165(**)	.126(*)	.146(*)	.235(**)	.263(**)	.051	.302(**)	-.315(**)	.179(**)	.068	1
	Sig. (2-tailed)	.004	.029	.011	.000	.000	.374	.000	.000	.004	.240	
	N	301	301	301	301	301	301	301	299	253	301	301

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 2: Comparison of mean greenleaf yield and fertilizer use according to farmers' attendance to formal training

Performance variable	Attended formal tea training	Statistics	Case study area		
			Smallholders Mufindi (n=77)	Smallholders Rungwe (n=200)	Medium scale growers (n=23)
Estimated annual yield (Kg GL ha-1)	Yes	Mean	8,442	4,657	10,681
		SE. mean	491	245	427
	No	Mean	7,600	4,292	10,211
		SE. mean	447	250	1,127
	Total	Mean	8,070	4,476	10,599
		SE. mean Mean	339	175	394
Fertilizer application (kg N ha-1)	Yes		71	58	126
		SE. mean	4	3	4
	No	Mean	61	49	121
		SE. mean	6	3	5
	Total	Mean	66	53	125
		SE. mean	4	2	4

Table 3: Summary of selected indicators for household assets for the three case study areas

Type of assets/ capitals	Assets and related flow indicators	Case study areas							
		Smallholders (Mufindi) n=77		Smallholders (Rungwe) n=201		Medium growers (Mufindi) n=25		Smallholders (Non-tea) n=80	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Natural Capital	Total household land (ha)	2	(0.23)	2.9	(0.10)	32.9	(4.69)	1.2	(0.09)
	Size of the tea field (ha)	1.24	(0.09)	0.54	(0.25)	16.3	(1.41)	na	-
	Proportion of tea area (percent)	46	(2.03)	31	(1.49)	56	(2.87)	na	-
Human Capital	Age of household head (Yrs)	44	(1.43)	53	(1.06)	41	(1.49)	39	(1.073)
	Members per household (N)	5.9	(0.29)	6.4	(0.23)	11.5	(0.69)	4.9	(0.264)
	Members working in the tea farm (N)	2.6	(014)	2.78	(0.08)	2.5	(0.24)	na	-
	Total farm labour (MD/ha)	227	(10.92)	189	(5.32)	314	(13.64)	140	(2.45)
	Experience in tea (years)	11	(0.53)	24	(0.84)	8	(0.5)	na	-
	Proportion formally trained (percent)	55.8	na	50.5	na	82.6	na	-	-
Physical Capital	Bought assets using tea income (percent)	53.2	na	49.8	na	100	na	na	na
	Proportion owning means of transport	46.8	na	36.8	na	95.7	na	-	-
Social Capital	Members of farmers association (percent)	81.8	na	100	na	79.1	na	na	-
	Living within 5 km of the tea estate (percent)	75.4	na	27.4	na	65.2	na	na	-
Financial Capital	Total revenue (000' TZS/ha)	541.49	(49.21)	355.71	(37.54)	931.56	(32.82)	na	-
	Total average cost (000' TZS/ha)	392.03	(26.38)	221.06	(19.37)	442.89	(13.66)	na	-
	Credit value/household (000' TZS)	81.02	(11.72)	88.85	(17.21)	746.59	(165.52)	na	-
	Greenleaf price (TZS/kg GL)	100	(0.00)	96	(0.00)	125	(0.00)	na	-

Table 4: Regression coefficient predictors for the annual greenleaf yield for all case study areas (N=301)

Model	Coefficients	Unstandardized Coefficients	Standardized Coefficients			
		B	SE	Beta	t	R^2
1	(Constant)	2252.55	380.73		5.92**	
	Fertilizer (kgNha-1)	58.76	5.41	0.57	10.86**	0.32
2	(Constant)	2973.68	373.42		7.96**	
	Fertilizer (kgNha-1)	38.79	5.98	0.37	6.49**	
	Tea farm size (ha)	249.98	40.26	0.36	6.21**	0.41
3	(Constant)	1437.02	493.29		2.91**	
	Fertilizer (kgNha-1)	32.61	5.92	0.32	5.51**	
	Tea farm size (ha)	196.13	40.52	0.28	4.84**	
	Total labour (MDha-1)	9.70	2.13	0.25	4.55**	0.46
4	(Constant)	2375.31	572.12		4.15**	
	Fertilizer (kgNha-1)	33.20	5.82	0.32	5.71**	
	Tea farm size (ha)	167.00	40.93	0.24	4.08**	
	Total labour (MDha-1)	9.34	2.10	0.24	4.45**	
	Years as tea grower	(42.24)	13.66	(0.15)	(3.09)**	0.48
5	(Constant)	3578.17	744.41		4.81**	
	Fertilizer (kgNha-1)	30.07	5.89	0.29	5.10**	
	Tea farm size (ha)	160.39	40.59	0.24	3.95**	
	Total labour (MDha-1)	9.44	2.08	0.24	4.54**	
	Years as tea grower	(39.50)	13.57	(0.14)	(2.91)**	
	Distance to nearest estate	(402.18)	161.60	(0.12)	(2.49)**	0.49

Note: R^2 = 0.49 *p<0.05; **p<0.001, Independent variables that were not significant at p<0.001 were not included in this model (see paragraph 6).

Mean Age of Household Head is: 46

Table 5: Regression coefficient predictors for the annual greenleaf yield for the typical smallholder's case study areas (Mufindi and Rungwe)

Model	Coefficients	Unstandardized Coefficients		Standardized Coefficients	t	R^2
		B	SE	Beta		
1.	(Constant)	3,111.07	401.15		7.76**	
	Fertilizer (kgNha-1)	39.29	6.25	.385	6.29**	0.14
2	(Constant)	1,522.35	528.24		2.88**	
	Fertilizer (kgNha-1)	32.9	6.19	0.322	5.32**	
	Total labour (MDha-1)	9.83	2.23	0.267	4.40**	0.22
3.	(Constant)	2,509.95	611.54		4.10**	
	Fertilizer (kgNha-1)	33.21	6.08	.325	5.47**	
	Total labour (MDha-1)	9.39	2.20	.255	4.27**	
	Years as tea grower	(43.72)	14.33	(.177)	(3.05)**	0.25
4	(Constant)	4,045.68	811.95		4.98**	
	Fertilizer (kgNha-1)	28.73	6.19	.282	4.64**	
	Total labour (MDha-1)	9.38	2.16	.255	4.34**	
	Years as tea grower	(40.09)	14.17	(.162)	(2.83)**	
	Distance to nearest estate	(498.10)	176.60	(.167)	(2.82)**	0.27

Note: R^2 = 0.27, *p<0.05; **p<0.001; Independent variables that were not significant at p<0.001 were not included in this model (see paragraph 6).

Mean Age of Household Head is: 48.5

Table 6: Regression coefficient predictors for the annual greenleaf yield for the medium-scale growers Mufindi.

Model	Coefficients	Unstandardized Coefficients		Standardized Coefficients	t	R^2
		B	SE	Beta		
1	(Constant)	1373.27	810.46		1.69	
	Fertilizer (kgNha-1)	89.81	6.94	0.95	12.95**	0.89
2	(Constant)	2045.66	794.36		2.58**	
	Fertilizer (kgNha-1)	69.92	10.79	0.74	6.48**	
	Tea farm size (ha)	96.74	42.55	0.26	2.27**	0.92

R^2 = 0.92 *p<0.05; **p<0.001; Independent variables that were not significant at p<0.001 were not included in this model (see paragraph 6).

Mean Age of Household Head is: 41

Table 7. Sustainability Standards – Perceived Costs and Benefits to Producers

Standard	Est. in Tea	Sustainability Criteria	Cert. Costs	Illustrative Compliance Investments	Benefits	Challenges
Ethical Tea Partnership	1997	Good social and environmental conditions that improve the lives of tea workers	N/A	Field toilets & hand washing Facilities Provide Health & Safety Training Protective Gear	No perceived benefits	No market benefit Audits have been difficult in the past
Fairtrade	1997	Provide a sustainable livelihood to smallholder farmers. A sustainable livelihood is one that not only meets day-to-day needs for economic, social and environmental well-being but that also enables improved conditions in the future. No Genetically Modified Organisms	$4,000 (Tsh 5 mil)	Someone who is capable of creating budgets, policies, management plans, environmental plans, & meetings minutes Conduct trainings on Environmental plan, FT general awareness Undertake risk assessment of soil erosion, health & safety	US$1.40/kg MT floor price Fairtrade Premium (US$0.50/kg MT) Community Infrastructural Investments Direct sales Market demand for smallholder produced tea	Low overall market demand Constraints on use of funds from the Premium Use of the Auction system Paper trails
Organic	1994	Holistic notion of agriculture based on the values of fairness, ecology, hope and care Low reliance on agro-chemicals No Genetically Modified Organisms	$5,000	Separation of organic and conventional tea on farm, in transport, in factory Purchase of composting materials Additional labour needed for manual weeding	Strong policy level support Organic price premium Direct sales	Low overall market demand Paper trails High input costs (labour & composting) Lack of research on organic tea

Rainforest Alliance	2008	Economy = improved efficiency, more competitive production, premium prices, access to credit based on RA guarantee Ecology = less soil erosion, less water used, wildlife habitats protected, efficient farm management, waste management, controlled use of agro-chemicals, Improved profitability and competitiveness for farmers Ethics = improved conditions for farm workers, health and human safety, collaboration between farmers & conservationists No Genetically Modified Organisms	$5,000	Soil Analysis Water Analysis Tree barriers between fields Waste Management strategy Convert non-tea crops on smallholder farms to Rainforest Alliance compliant crops	Access to Lipton, Tetley, Twinings, Betty & Taylors of Harrogate markets US$0.10/kg MT premium from Lipton Environmental benefits	Support needed to prepare smallholders for certification Price premium is temporary (will be phased out in 2010)