SHELL FOUNDATION HEH PROJECT CONTROLLED COOKING TEST

DATA AND CALCULATION FORM

Shaded cells require user input; unshaded cells automatically display outputs

Qualitative data

Name(s) of Tester(s)		Type of stove: Stove 1	
		Type of stove: Stove 2	
Test Number		Location	
Date		Wood species	Average Hardwood

Quantitative testing conditions	data	units	variable
Avg dimensions of wood (length x width x height)		cm	--
Wood moisture content (% - wet basis)		%	m
Local boiling point of water	100	ºC	T_b
(default value is 100 ºC - correct if local value differs)			

	data	units	variable
Empty weight of Pot # 1		g	P1
Empty weight of Pot # 2		g	P2
Empty weight of Pot # 3		g	P3
Empty weight of Pot # 4		g	P4
Weight of container for char		g	k

Other comments on test conditions

The Standardized Cooking Task

Use this space to describe the standardized cooking process that forms the basis of this test. Describe each step with enough detail so that an experienced cook from the area where the test is performed could follow them easily. If more space is needed, extend the description below the space provided.

Ingredient	Name	Amount (g)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Step	Directions
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

CCT-1 for the _____ Wind conditions no wind

Shaded cells require user input; unshaded cells automatically display outputs Air temperature _____ ºC

To be filled in after cooking task is complete (as defined by the directions on the "Description" worksheet)

MEASUREMENTS	Units	Initial measurements data	Initial measurements label	Final measurements data	Final measurements label	Comments about cooking process (smokiness, ease of use, etc)
Weight of wood used for cooking	g		f_i		f_f	
Weight of charcoal+container	g				c_c	
Weight of Pot # 1 with cooked food	g				$P1_f$	
Weight of Pot # 2 with cooked food	g				$P2_f$	
Weight of Pot # 3 with cooked food	g				$P3_f$	
Weight of Pot # 4 with cooked food	g				$P4_f$	
Time	min		t_i		t_f	

CALCULATIONS			Formula	CALCULATIONS			Formula
Total weight of food cooked	g	_____	$W_f = \sum_{j=1}^{4} (Pj_f - Pj)$	Specific fuel consumption	g/kg	_____	$SC = \frac{f_d}{W_f} * 1000$
Weight of char remaining	g	_____	$\Delta c_c = k - c_c$	Total cooking time	min	_____	$\Delta t = t_f - t_i$
Equivalent dry wood consumed	g	_____	$f_d = (f_f - f_i) * (1 - (1.12 * m)) - 1.5 * \Delta c_c$				

Description of stove (indicate the construction material of the stove, the way that the pot(s) fits in the stove, and the presence of insulation, chimney, workspace, etc):

CCT-2 for the _____ Wind conditions (select from list) ▼

Shaded cells require user input; unshaded cells automatically display outputs Air temperature _____ °C

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Weight of wood used for cooking	g		f_i		f_f	
Weight of charcoal+container	g				c_c	
Weight of Pot # 1 with cooked food	g				$P1_f$	
Weight of Pot # 2 with cooked food	g				$P2_f$	
Weight of Pot # 3 with cooked food	g				$P3_f$	
Weight of Pot # 4 with cooked food	g				$P4_f$	
Time	min		t_i		t_f	

CALCULATIONS			Formula	CALCULATIONS			Formula
Total weight of food cooked	g	_____	$W_f = \sum_{j=1}^{4} (Pj_f - Pj)$	Specific fuel consumption	g/kg	_____	$SC = \frac{f_d}{W_f} * 1000$
Weight of char remaining	g	_____	$\Delta c_c = k - c_c$	Total cooking time	min	_____	$\Delta t = t_f - t_i$
Equivalent dry wood consumed	g	_____	$f_d = (f_f - f_i) * (1 - (1.12 * m)) - 1.5 * \Delta c_c$				

Description of stove (indicate the construction material of the stove, the way that the pot(s) fits in the stove, and the presence of insulation, chimney, workspace, etc):

CCT-3 for the _____ Wind conditions (select from list) ▼

Shaded cells require user input; unshaded cells automatically display outputs Air temperature _____ °C

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Weight of wood used for cooking	g		f_i		f_f	
Weight of charcoal+container	g				c_c	
Weight of Pot # 1 with cooked food	g				$P1_f$	
Weight of Pot # 2 with cooked food	g				$P2_f$	
Weight of Pot # 3 with cooked food	g				$P3_f$	
Weight of Pot # 4 with cooked food	g				$P4_f$	
Time	min		t_i		t_f	

CALCULATIONS			Formula	CALCULATIONS			Formula
Total weight of food cooked	g	_____	$W_f = \sum_{j=1}^{4} (Pj_f - Pj)$	Specific fuel consumption	g/kg	_____	$SC = \frac{f_d}{W_f} * 1000$
Weight of char remaining	g	_____	$\Delta c_c = k - c_c$	Total cooking time	min	_____	$\Delta t = t_f - t_i$
Equivalent dry wood consumed	g	_____	$f_d = (f_f - f_i) * (1 - (1.12 * m)) - 1.5 * \Delta c_c$				

Description of stove (indicate the construction material of the stove, the way that the pot(s) fits in the stove, and the presence of insulation, chimney, workspace, etc):

CCT-1 for the _____ Wind conditions (select from list) ▼

Shaded cells require user input; unshaded cells automatically display outputs Air temperature _____ °C

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Weight of Pot # 2 with cooked food	g				$P2_f$	
Weight of Pot # 3 with cooked food	g				$P3_f$	
Weight of Pot # 4 with cooked food	g				$P4_f$	
Time	min		t_i		t_f	

CALCULATIONS			Formula	CALCULATIONS			Formula
Total weight of food cooked	g	_____	$W_f = \sum_{j=1}^{4} (Pj_f - Pj)$	Specific fuel consumption	g/kg	_____	$SC = \frac{f_d}{W_f} * 1000$
Weight of char remaining	g	_____	$\Delta c_c = k - c_c$	Total cooking time	min	_____	$\Delta t = t_f - t_i$
Equivalent dry wood consumed	g	_____	$f_d = (f_f - f_i) * (1 - (1.12 * m)) - 1.5 * \Delta c_c$				

Description of stove (indicate the construction material of the stove, the way that the pot(s) fits in the stove, and the presence of insulation, chimney, workspace, etc):

CCT-2 for the _____ Wind conditions (select from list) ▾

Shaded cells require user input; unshaded cells automatically display outputs Air temperature _____ ºC

To be filled in after cooking task is complete (as defined by the directions on the "Description" worksheet)

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Weight of charcoal+container	g				c_c	
Weight of Pot # 1 with cooked food	g				$P1_f$	
Weight of Pot # 2 with cooked food	g				$P2_f$	
Weight of Pot # 3 with cooked food	g				$P3_f$	
Weight of Pot # 4 with cooked food	g				$P4_f$	
Time	min		t_i		t_f	

CALCULATIONS			Formula	CALCULATIONS			Formula
Total weight of food cooked	g	_____	$W_f = \sum_{j=1}^{4} (Pj_f - Pj)$	Specific fuel consumption	g/kg	_____	$SC = \frac{f_d}{W_f} * 1000$
Weight of char remaining	g	_____	$\Delta c_c = k - c_c$	Total cooking time	min	_____	$\Delta t = t_f - t_i$
Equivalent dry wood consumed	g	_____	$f_d = (f_f - f_i) * (1 - (1.12 * m)) - 1.5 * \Delta c_c$				

Description of stove (indicate the construction material of the stove, the way that the pot(s) fits in the stove, and the presence of insulation, chimney, workspace, etc):

CCT-3 for the _____ Wind conditions (select from list) ▾

Shaded cells require user input; unshaded cells automatically display outputs Air temperature _____ °C

To be filled in after cooking task is complete (as defined by the directions on the "Description" worksheet)

MEASUREMENTS	Units	Initial measurements data	Initial measurements label	Final measurements data	Final measurements label	Comments about cooking process (smokiness, ease of use, etc)
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Weight of charcoal+container	g				c_c	
Weight of Pot # 1 with cooked food	g				$P1_f$	
Weight of Pot # 2 with cooked food	g				$P2_f$	
Weight of Pot # 3 with cooked food	g				$P3_f$	
Weight of Pot # 4 with cooked food	g				$P4_f$	
Time	min		t_i		t_f	

CALCULATIONS			Formula	CALCULATIONS			Formula
Total weight of food cooked	g	_____	$W_f = \sum_{j=1}^{4} (Pj_f - Pj)$	Specific fuel consumption	g/kg	_____	$SC = \frac{f_d}{W_f} * 1000$
Weight of char remaining	g	_____	$\Delta c_c = k - c_c$	Total cooking time	min	_____	$\Delta t = t_f - t_i$
Equivalent dry wood consumed	g	_____	$f_d = (f_f - f_i) * (1 - (1.12 * m)) - 1.5 * \Delta c_c$				

Description of stove (indicate the construction material of the stove, the way that the pot(s) fits in the stove, and the presence of insulation, chimney, workspace, etc):

Results of CCT comparing two stoves

Stove type/model: Stove 1	**0**
Stove type/model: Stove 2	**0**
Location	**0**
Wood species	**Average Hardwood**

1. CCT results: Stove 1	**units**	**Test 1**	**Test 2**	**Test 3**	**Mean**	**St Dev**
Total weight of food cooked	g					
Weight of char remaining	g					
Equivalent dry wood consumed	g					
Specific fuel consumption	g/kg					
Total cooking time	min					

2. CCT results: Stove 2	**units**	**Test 1**	**Test 2**	**Test 3**	**Mean**	**St Dev**
Total weight of food cooked	g					
Weight of char remaining	g					
Equivalent dry wood consumed	g					
Specific fuel consumption	g/kg					
Total cooking time	min					

Comparison of Stove 1 and Stove 2		**% difference**	**T-test**	**Sig @ 95% ?**
Specific fuel consumption	g/kg			
Total cooking time	min			

Summary of comments on stove 1

Summary of comments on stove 2

	Tree species	kJ/kg	Source
1	(Select from list or choose average hardwood or softwood)		--
2	Average Hardwood	19,734	3
3	Average Softwood (Conifer)	20,817	3
4	Abies Balsamea (Balsam Fir)	18,916	2
5	Acacia Auriculiformis (Ear-Leaf Acacia, Ear-Pod Wattle)	20,370	1
6	Acacia Decurrens (King Wattle, Green Wattle, Sydney Black Wattle)	18,700	4
7	Acacia Farnesiana (Sweet Acacia, Sweet Wattle)	19,200	4
8	Acacia Leucophloea (Kikar, Kuteeera Gum)	21,800	4
9	Acacia Mearnsi (Black Wattle)	19,530	1
10	Acacia Nilotica (Egyptian Thorn, Babul (India), Babar (Pakistan))	20,475	1
11	Acacia Tortilis (Umbrella Thorn)	18,480	1
12	Acer Rubrum (Red Maple)	18,545	2
13	Albizia Falcataria (Batai, Malucca Albizia, ,Placata)	18,100	4
14	Albizia Lebbek (Lebbek, East Indian Walnut Tree)	21,840	1
15	Albizia Procera (Albicia, Silver Bark Rain Tree)	19,700	4
16	Alnus Nepalensis (Nepal Alder)	17,150	4
17	Alnus Rubra (Red Alder)	19,320	1
18	Alnus Rubra (Red Alder)	18,545	2
19	Alstonia Macrophylla (Devil Tree)	19,200	4
20	Anogeissus Latifolia (Axle-Wood Tree, Dhausa (Hindi))	20,580	1
21	Anthocephalus Cadamba (Labula (Indonesia))	19,350	4
22	Antidesma Ghaessimbilla	19,100	4
23	Avicennia Officinalis (Mangrove, Api-Api Sudu (Philippines))	18,500	4
24	Balanites Aegyptiaca (Desert Date, Thorn Tree, Soapberry Tree)	19,320	1
25	Bruguiera Gymnorrhiza (Black Mangrove, Large-Leafed Mangrove)	20,400	4
26	Bruguiera Parviflora (Thua Shale, Slender-Fruited Orange Mangrove)	18,700	4
27	Bruguiera Sexangula (Orange Mangrove)	19,400	4
28	Calliandra Calothyrsus (Calliandra)	19,425	1
29	Carya Spp (Hickory)	18,684	2
30	Cassia Fistula (Cassia Stick Tree, Guayaba Cimarrona, Canafistula, Golden Shower, Indian Laburnum, Baton Casse, Chacara, Nanban-Saikati, Kachang Kayu (Woody Bean), Kallober, Keyok, Klober)	18,400	4
31	Cassia Siamea (Siamese Cassia)	18,800	4
32	Casuarina Equistofolia (Casuarina, She-Oak, Whistling Pine)	20,790	1
33	Ceriops Tagal (Tagal Mangrove, Kandal)	19,600	4
34	Cocus Nucifera (Coconut Palm)	19,000	4
35	Cordia Dichotoma (Anunang (Philippines), Bird Lime Tree)	18,400	4
36	Dalbergia Latifolia (East Indian Rosewood, Malabar Rosewood, Sitsal, Beete, Shisham)	19,800	4
37	Dalbergia Sissoo (Sissoo, Shisham, Karra, Shewa)	21,210	1
38	Derris Indica (India: Pongam, Ponga, Kona, Kanji, Karanja, Karanda; English: Indian Beech)	19,320	1
39	Diospyros Philippinensis (Kamagong (Philippines))	18,600	4
40	Diospyros Philosanthera (Bolong-Eta (Philippines))	18,100	4
41	Emblica Ofiicinalis (Madre De Cacao, Kakauati (Philippines), Mexican Lilac, Madera Negra)	21,840	1
42	Eucalyptus Camaldulensis (Red River Gum, Red Gum)	20,160	1
43	Eucalyptus Deglupta (Rainbow Gum Tree)	18,700	4
44	Eucalyptus Globulus (Southern Blue Gum, Fever Tree)	20,160	1
45	Eucalyptus Grandis (Rose Gum, Grand Eucalyptus)	19,750	4

46	Fagus Spp (Beech)	18,916	2
47	Gigantochloa Apus (Pring Tali, Tabasheer Bamboo)	18,400	4
48	Gliricidia Sepium	20,580	1
49	Gmelina Arborea (Gmelina, Gumhar (India))	20,160	1
50	Lagerstroemia Speciosa (Queen's Crape Myrtle, Giant Crape Myrtle)	19,300	4
51	Leucaena Leucocephala (Leucaena, Ipil-Ipil (Philippines), Uaxin (Latin America), Lamtora (Indonesia), Lead Tree)	18,480	1
52	Melia Azedarach (China Berry, Persian Lilac, Bead Tree, Cape Lilac)	21,460	1
53	Pinus Elliotii (Southern Pine)	19,961	2
54	Pinus Ponderosa (Ponderosa Pine)	18,684	2
55	Pithecellobium Dulce (Quamachil, Guamuchil (Mexico), Manila Tamarind)	22,680	1
56	Platanus Occidentalis (Sycamore)	18,545	2
57	Populus Euphratica (Euphrates Poplar, Saf-Saf, Indian Poplar)	21,057	1
58	Populus Trichocarpa (Black Cottonwood)	20,425	2
59	Prosopis Cineraria (Jand, Khejri (India))	21,000	1
60	Prosopis Pallida (Kiawe)	19,750	4
61	Pseudotsuga Menziesii (Douglas Fir)	20,634	2
62	Psidium Guajava (Guava, Guayaba)	20,126	1
63	Quercus Bicolor (White Oak)	18,916	2
64	Quercus Rubra (Red Oak)	18,684	2
65	Rhizophera Spp (Mangrove Spp (Also *Avicennia Spp*))	17,430	1
66	Sapium Sebiferum (Chinese Tallow Tree, Soap Tree, Tarchabi (Pahari) Shishum (India))	17,663	1
67	Schima Noronhae	20,000	4
68	Schleichera Oleosa (Kosambi (Indonesia), Lac Tree)	18,700	4
69	Sesbania Grandiflora (Scarlet Wisteria Tree, Agati, Corkwood Tree, West Indian Pea)	19,300	4
70	Swietenia Macrophylla (Brazilian Mahogany, Caoba, Honduras Mahogany, Big Leaf Mahogany)	20,700	4
71	Syzygium Cumini (Jambolan, Java Plum)	20,160	1
72	Thuja Plicata (Western Red Cedar)	22,514	2
73	Trema Spp	18,900	1
74	Tsuga Canadensis (Eastern Hemlock)	19,520	2
75	Tsuga Heterophylla (Western Hemlock)	19,520	2
76	Ulmus Spp (Elm)	18,963	2
77	Xylocarpus Granatum (Cannonball Mangrove, Cedar Mangrove)	16,300	4
78	Xylocarpus Moluccensis (Cedar Mangrove)	15,400	4
79	Zizyphus Mauritania (Indian Jujube, Indian Plum)	20,580	1
80	Zizyphus Talanai	18,300	4

Statistical Summary

Minimum	15,400
Maximum	22,680
standard Deviation	1,278
Average	19,450
Percentiles: 25th	18,684
50th	19,320
75th	20,160

1 NAS (1980). Firewood Crops. Washington DC, National Academy of Sciences.

2 Cheremisinoff, N. (1980). Properties of Wood. Wood for Energy Production. Ann Arbor, MI, Ann Arbor Science: 31-43.
3 Harker, A. P., A. Sandels, et al. (1982). Calorific values for wood and bark and a bibliography for fuelwood. London, Tropical Products Institute: 20.
4 FAO (1993). Energy and Environment Basics. Bangkok, Regional Wood Energy Development Program (RWEDP): 85.