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Irish Aid Learning Platform on Climate Change and Development

Mchinji Longitudinal Survey Report

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Executive Summary

Irish Aid and Concern Universal in Malawi are piloting an innovative model for delivering sustainable energy technologies to the poorest households – through Social Cash Transfer (SCT). Phase 1 distributes improved cookstoves to SCT recipient households that have been largely reliant on firewood for cooking and heating. Phase 2 provides SCT recipients with Sunny Pico solar powered lighting units for use within the household (as yet to be be distributed in Mchiniji).

International Institute for Environment and Development (IIED) and Irish Aid are developing evidence around the utility of this sustainable energy business model. This report documents findings from the longitudinal surveys conducted in Mchinji districts between 2016 and 2017 in relation to coverage of energy products, biomass usage of users/non-users, and the characteristics of households that partially and fully adopt the sustainable energy technologies.

This report provides details of findings from the analysis of data collected in Mchinji district in April 2017. In addition, where relevant the assessment compares the baseline scenario (collected in April 2016) with the data collected in 2017 to indicate change in performance over time. Following a similar format to the previous survey report (late 2016), the document records changes in coverage over time in Mchinji, establishing the performance of using SCT mechanism to facilitate pro-poor access, documenting reductions in biomass usage from using improved cookstoves, and showing changes in the willingness-to-pay for improved cookstoves.

In terms of coverage, the findings show an increase in improved cookstove ownership in Mchinji. The proportion of the district in possession of an improved cookstove jumped from 4.3% to 19.6% over the 12 month period to April 2017. In terms of targeting poor households, the previously reported tendency of wealthier households to have improved cookstoves has been reduced. An owner of an improved cookstove has almost the same median income as the average households without such technology, and income variation across the 2 groups is converging. However, as the number of SCT recipients households in the sample has fallen by approximately 50% (from 41 to 20), it is questionable if the improvement in pro-poor coverage is due to the use of the SCT mechanism to distribute improved cookstoves.

Biomass usage is another area of positive findings. This is especially the case for households using a Chitetzo Mbaula (model of improved cookstove), and further still, those exclusively using the stove for cooking and heating. However, performance in terms of biomass usage varies considerably once household size and make-up are taken into account. This set of findings builds upon the positive findings for biomass usage found by users of Chitetzo Mbaula in Balaka.

Findings from this survey on willingness to pay for improved cookstoves contradicts studies[1] suggesting that, as awareness of the benefits increases, so does the price people are willing

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[1] Morrison, L. (2014). Fueling Demand: The Effect of Rebates on Household Purchase of Improved Cookstoves in Rural India; Meyer, S., Kato, E., Nkonya, E., & Smith, V. H. (2015). Stated Preference of Smallholder Farmers for Improved Cookstoves in Malawi and Mozambique.

to pay. In Mchinji, the baseline willingness to pay collected in 2016 is higher relative to that calculated in 2017. There are competing explanations for this outcome, either: a) increasing awareness of the lower subsidised price itself decreased the amounts respondents were willing to part with for the technology; or b) the willingness to pay prices in the 2017 survey often came from the subsidised price people actually paid to local retailers selling the Chitetzo Mbaula (i.e. rather than through using contingent valuation methods). Either way, it appears likely the low subsidised price had some role.

Finally, accounts vary as to why the traditional 3-stone fires are being used by households at the same time as improved cookstoves. Some respondents state that size matters, meaning the Chitetzo Mbaula can be too small for some pots. Others simply needed multiple cooking implements to be running at the same time, and so to stop using the 3-stone fire altogether would require having 2 or more improved cookstoves. Finally, a common complaint was the durability of the new batch of Chitetzo Mbaula, with many respondents stating that though they possesses an improved cookstove, it is currently damaged or cracked.

Overall, the findings are broadly positive around the performance of the work on improved cookstoves in Mchinji. Indicators of coverage, pro-poor access and biomass usage all show improvements in just 12 months. A more in-depth analysis will follow after the Balaka survey in October 2017, at which point 2 surveys would have been completed in Mchinji and Balaka. This will enable time-series comparisons within Balaka, in addition to a comparison across Balaka and Mchinji. This enable a more thorough assessment of performance in terms of coverage, pro-poor coverage, adoption and uptake of improved cookstoves (including solar lights in Balaka). In addition, focus group discussions will be used to contextualise the findings, and develop a locally informed theoretical basis for patterns in the data.

The offer is always there to investigate new areas of the data on request, and as the need arises.

1. Introduction

Irish Aid and Concern Universal in Malawi are providing sustainable energy solutions to the rural poor by delivering energy technologies through Social Cash Transfer (SCT) programmes. The model links the distribution of energy efficient improved cookstoves and solar lighting, with the Government of Malawi SCT programme, and thereby seeks to provide a multi-facted energy-delivery package for the poorest households (Embassy of Ireland, 2015). Phase 1 aims to improve uptake of improved cookstove technologies that reduce bio-mass usage for the poorest households most reliant on firewood to meet basic energy needs. In Balaka district, Irish Aid currently reach 8,381 households with such products using the SCT, and have fortified the supply network to increase coverage to the district by establishing cookstove production groups. Phase 2 (2016) provides the same SCT recipients with Sunny Pico solar powered lighting units for use within the household. In Balaka district, 10,000 units have been purchased with 8,500 distributed free of charge to SCT recipients and 1,500 sold through local market-based promoters. The same model has now been applied in Mchinji district since April 2016.

International Institute for Environment and Development (IIED) is working in partnership within Irish Aid to develop evidence around the utility of the sustainable energy solution business model. The objective of the study presented here is to document the findings so far from a longitudinal survey conducted in Mchinji district in 2016 and 2017. The report covers multiple impact areas, including the coverage of energy products, especially to the poorest households, biomass usage, the willingness to pay for Chitetzo Mbaula, and finally, some qualitative discussion around the reasons people use the Chitetzo Mbaula and 3-stone simultaneously. The research questions are as follows:

1. Does using SCT to deliver energy solutions increase coverage to the rural poor?

2. Does using a Chitetzo Mbaula decrease the amount of biomass used in practice?

3. How much are households in Mchinji willing-to-pay for Chitetzo Mbaula?

4. Why do households use Chitetzo Mbaula and the 3-stone fire at the same time?

Mchinji district is a new territory for Irish Aid and Concern Universal. Roll-out of cookstoves to SCT recipients didn't happen in Mchinji until after the first survey was conducted 2016, and this assessment documents progress make between April 2016 and 2017. Therefore, Mchinji households in 2016 represent a counterfactual, and re-visiting the same households in 2017 shows the performance of the intervention. The comparison of data in the following analysis happens over a 12-month period.

2. Data Collection Methodology / Analytical Methods

Data Collection

The data collection included stratified and random sampling techniques, engaging approximately 300 households in Mchinji (600 entries in total for 2016 and 2017). Developing a representative sample from approximately 85,000 households (Mchinji has a population of 324,000), with a confidence level of 95% (1-in-20 chance of the sample not representing the population) and confidence interval of between 5-6% (margin of error), the survey requires data from around 250-300 households. A first necessary step towards gaining a representative sample of households is to first stratify according to the traditional authorities in Mchinji district. By visiting all Traditional Authorities, stratification provides the survey with geographical spread to reduce the likelihood of spatial bias. The second step is to access a list of village names within each traditional authority, and select every nth village. For instance, select the first village on each list with 'K' as the first letter of the village name. The third step is to visit the selected village with teams of enumerators, take a prominent landmark (e.g. school, church, main square), and walk in opposite directions in a straight line, visiting every nth household, such as every 2nd, 5th, 7th, 9th and so on (see figure 1).

Figure 1: Example of Household Random Selection
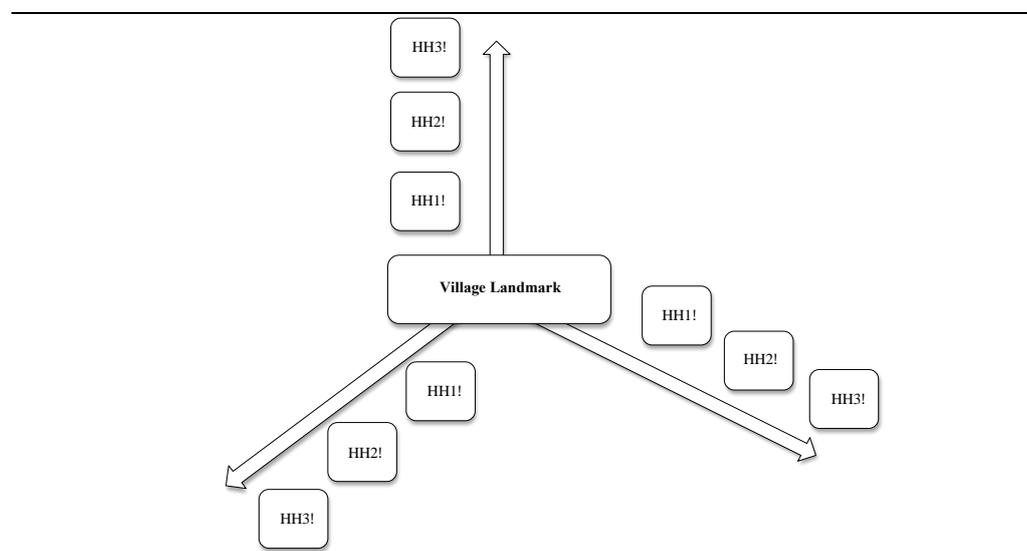
In practice, villages were often smaller than the 20+ houses required in a straight line to the methodology of selecting every other, or every 3rd house. In such instances, permission was sought from the Traditional Authority chiefs to move out of one village into neighbouring villages to complete the 8-9 household surveys needed from each group each day. Traditional leaders were typically obliging unless the next village was outside their area of authority, and ventured into another Traditional Authority.

In relation to the survey, the first section is on household demography, and asks about those residing in the property, their ages, and levels of education; the second details the energy products used in the household over the past 12 months, accounting for 3-stone fires, candles, paraffin lamps, torches, improved cookstoves and solar lighting units; the third is an income accounting exercise for all those present within the household for 6 of the past 12 months, including income from farming and livestock, wages labour, business enterprises, external payments from various groups, institutions and family, and finally, income from the renting of assets, such as land, machinery, livestock or property; the fourth section provides an overview of on-farm and livestock assets, access to credit and other non-monetary schemes; the final section details firewood sources and purchases, average daily firewood usage, plus the general benefits from improved cookstoves and solar lighting units if owning.

Data Analysis

The analysis of survey data used the following methods:

Comparison of Means (Section 4 on Coverage): This part of the analysis isolates sub-components of the sample in Mchinji, and compares mean values depending on whether households are SCT recipients/non-SCT and their current usage of different energy technologies.

Boxplots (Section 4 on Pro-Poor Coverage): Boxpots illustrate the distribution of income data depending on different sub-categories. The centre line is the median income level within the sample of households (i.e. the middle value, with 50% above and 50% below), and the box represents the interquartile range (capturing the middle 50% of variation, or 25% of the variation above and below the median).   The extended lines – top and bottom – represent the income levels that fall into the 'expected range'. Focusing on the highest points (the inverse is true for the lowest), this is calculated by taking the highest income level that is less than or equal to the edge of the box (upper section of the interquartile range) plus 1.5 times the spread of the interquartile range (i.e. the middle 50% of household income levels). All income levels higher than this value are shown as outliers shown as dots.

Tabulating Data Distribution (Section 4 on Role of SCT in Achieving Pro-Poor Coverage): This part of the analysis isolates sub-components of the sample in Mchinji, and compares mean income values depending on whether households are SCT recipients/non-SCT.   The calculation of mean values enables the identification of where in the table of income distribution is the average SCT and non-SCT household.

Graphing Demand: The analysis of the willingness-to-pay (Section 5) graphically shows the relationship between the price of Chitetzo Mbaula and the quantity demanded. This data was fused using both hard and soft sources: the hard data shows how much people actually paid in markets for Chitetzo Mbaula; in instances where there was no such purchase, the soft data was gathered through a simple contingent valuation exercise, whereby respondents were ask of they were willing to pay (yes or no) a price for the Chitetzo Mbaula that was randomly selected by the interviewer.

3. Coverage: SCT/Non-SCT Recipients in Mchinji

This section sets out the findings in terms of the coverage of energy products. Table 1 was presented on the previous survey report, but has now been updated with the findings from the

Mchiniji 2nd survey. The table now enables both inter-district comparison across Balaka and Mchinji, as well as time-series comparisons in Mchnji across 2016 and 2017. The 2016 survey in Mchinji represents a baseline scenario, because no comparable improved cookstove interventions were in operation at that time, and so indicates progress made over a 12-month period.

Table 1: Coverage of Energy Products in Balaka and Mchinji (2016 and 2017)

|	*Balaka*				*Mchinji 2016*			*Mchinji 2017*	
	All	**SCT**	*Non-SCT*	*All*	**SCT**	*Non-SCT*	*All*	**SCT**	*Non-SCT*
Improved	53.2%	**89%**	50.7%	4.3%	**7.3%**	3.5%	19.6%	**75%**	15%
Solar Lighting	18.3%	**73.6%**	14.4%	8%	**7.3%**	8.2%	10%	**0%**	10%
Other Products									
Grid Access	1.6%	**0%**	1.8%	0.3%	**0%**	0.3%	1.1%	**0%**	1.2%
3-Stone Fire	77%	**78.9%**	77%	98.3%	**100%**	98.4%	94.5%	**90%**	94.9%
Charc. Stove	28%	**15.7%**	28.9%	14%	**9.7%**	14.4%	10.8%	**10%**	10.8%
Candles	16.9%	**5.2%**	17.7%	17.7%	**29.2%**	16%	8.8%	**10%**	8.7%
Paraffin	2%	**0%**	2.1%	2.3%	**0%**	2.7%	0.7%	**0%**	0.7%
Batt. Torch	89.1%	**73.6%**	90.5%	91.3%	**82.9%**	92.9%	94.5%	**95%**	94.9%
N	295	**19**	276	299	**41**	258	259	**20**	239

In terms of improved cookstoves, overall coverage has increased from 4.3% to 19.6%, and naturally, with the greatest improvement for SCT recipients (from 7.3% to 75%). Raising the number of improved cookstoves in circulation has also had impact on the level of 3-stone fire usage, declining 3.8% for all households (from 98.3% to 94.5%), and 10% for SCT recipients more specifically (from 100% to 90%), along with approximately a 4% reduction in the use of charcoal stoves. In relation to solar lights, the data failed to detect increasing numbers in the households in Mchinji, especially for SCT recipients. However there are reductions in the usage of candles (from 17.7% to 8.8%) and paraffin (from 2.3% to 0.7%), but these have to due to more battery torches being used in households (from 91.3% to 94.5%).

Pro-Poor Coverage

An important objective around attaching the distribution of energy products to SCT is the ability to reach the poorest households. Figure 2 shows the income of Mchinji households possessing an improved cookstoves between 2016 and 2017. Income levels are converging for those possessing improved cookstoves and those without, representing an improvement in pro-poor access across the district. For example, in 2016 the median income rises 62% - from 140,000 Mk to 227,000 Mk – for those without and with improved cookstoves respectively; while in 2017, the rise in the median income is just 23%, from 149,500 Mk to 184,500 Mk. In addition, in 2017 variation in income is much narrower on the upper bound and deeper on the

lower bound compared to 2016 for those possessing improved cookstoves, which again suggests that greater numbers of poorer households are able to access the technology. The lower and upper bound of the interquartile range (capturing the middle 50% of the household income) for those possessing improved cookstoves in 2016 was 180,400 Mk and 357,000 Mk; the equivalent figure in 2017 was 146,000 Mk and 269,000 Mk.

Figure 2: Income Distribution (<600k) of Households without/with Improved Cookstoves
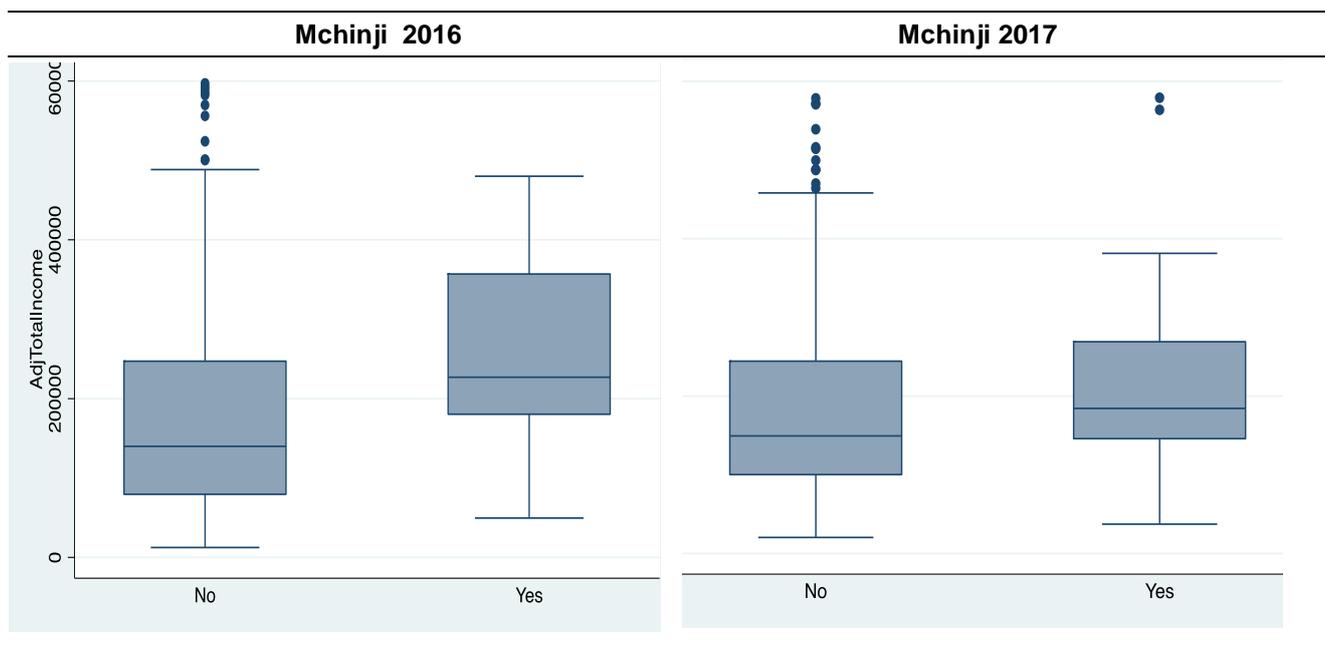
The 2016 and 2017 survey results are a relatively robust baseline and ex-post evaluation, albeit for only 12 months of project implementation. This is particularly so since 34 of 50 households in possession of an improved cookstove explicitly state Concern Universal as the supplier, and with many of the remaining 16 providing ambiguous responses, many of which could indicate supply via Concern Universal. Therefore, confidence around the contribution of the project is much higher than in other districts (e.g. Balaka) where other initiatives are currently operating.

Role of SCT in Achieving Pro-Poor Coverage

Intuition suggests that attaching the distribution of energy products to SCT programmes will achieve better pro-poor access for energy products. Table 2 shows the mean incomes of SCT recipients and non-SCT in Mchinji across 2016 and 2017. It displays total income values (past 12 months) associated with not receiving (top row) and receiving SCT (second row), and finally, shows total income for SCT recipients once amounts of SCT received have been subtracted (bottom row). Households not in receipt of SCT have a mean total income of 297,100 Mk in 2016 and 349,000 Mk in 2017; whilst those in receipt of SCT received on average 208,413 Mk in 2016 and 185,647 Mk in 2017. When funds received from SCT are excluded, recipients of SCT had a total income of 162,000 Mk in 2016 and 117,438 Mk in 2017.

Table 2: Mean Total Income (Mk) of SCT Recipients / Non-Recipients in Balaka

	Mchinji 2016	Mchinji 2017
No SCT	297,100 (259)	349,807 (239)
SCT	208,413 (41)	185,647 (20)
SCT adj	**162,862 (41)**	**117,438 (20)**

adj = Total Income Minus SCT received

Due to the data showing the relatively high incomes of SCT recipients in 2016, these initial findings raised questions around the contribution of using the SCT mechanism as a distribution mechanism to increase pro-poor coverage of improved cookstoves. In the past 12 months, the average income of a SCT recipient has fallen significantly, particularly once the figures are adjusted and the amount of SCT deducted. This means that the average SCT recipient household (earning around 117,000 Mk) is situated on the 26th percentile of the income distribution (see right column, Table 3). As a consequence, it is much more likely that the project to distribute improved cookstoves to SCT recipient households is likely to be a contributing factor in the improvement of pro-poor coverage in Mchinji.

Table 3: Total Income Distribution (Mk) in Balaka and Mchinji

Sample Portion	Mchinji 2016	Mchinji 2017
10%	52,600	78,600
20%	71,500	100,800
30%	100,000	125,000
40%	126,000	149,500
50%	168,900	176,400
60%	208,000	225,000
70%	281,200	285,000
80%	378,100	427,000
90%	624,000	646,000
100%	2,778,000	6,225,000

SCT over Time in Mchinji

Time-series data suggests the SCT system is inconsistent over time in terms of delivery to the same households. First, the number of recipients appears to vary considerably over time. The 41 SCT recipient households in 2016 falls to just 20 within 12 months. This findings of a

lower number of SCT recipients undermines the strength of the previous claims that attaching SCT to energy product distribution will contribute to pro-poor coverage.

Further investigation reveals the level of inconsistency in the SCT system. 25 SCT recipient households in 2016 (61%) did not receive any SCT payments in 2017, which rises to 32 (78%) if we include the 7 SCT households where it wasn't possible to interview (for background of individual households, please see footnote[2]). The flip side is that 11 households that didn't receive any SCT in 2016 started to receive payments in 2017. The implication being that only 9 households of the original 41 that received SCT in 2016 (21%), went on to receive SCT in 2017 (see Table 4). Of those 2 households didn't receive an improved cookstove from Concern Universal, meaning that just 17% of the original SCT recipient households received both SCT the following year and an improved cookstove.

Table 4: Households Receiving SCT between 2016 and 2017

Entry No.	Year	Trad. Authority	Village	Improved Cookstove (1=Yes)	SCT	SCT Amount (Mk)
77	2016	Nyoka	Kangwere	0	Yes	62400
77.1	2017	Nyoka	Kangwere	1	Yes	31200
104	2016	Simphasi	Kolonalio	0	Yes	43200
104.1	2017	Simphasi	Kachaje	0	Yes	38000
119	2016	Simphasi	Kachaje	0	Yes	48000
119.1	2017	Simphasi	Kachaje	0	Yes	43000
202	2016	Kapondo	Kunila	0	Yes	36600
202.1	2017	Kapondo	Kunila	1	Yes	74400
206	2016	Kapondo	Chikalamu	0	Yes	40000
206.1	2017	Kapondo	Chikalamu	1	Yes	123600
227	2016	Dambe	Chiphesi	0	Yes	60000
227.1	2017	Dambe	Chiphesi	1	Yes	134400
260	2016	Simphasi	Gaisi	0	Yes	60000
260.1	2017	Simphasi	Gaisi	1	Yes	42300
268	2016	Simphasi	Gelesomu	0	Yes	36000
268.1	2017	Simphasi	Gelesomu	1	Yes	48000
293	2016	Mduwa	Penyera	0	Yes	48000
293.1	2017	Mduwa	Penyera	1	Yes	84400

To ensure the same households were surveyed, the data was screened for similarities in terms of demographics (aside from GPS, arguably the most reliable statistic over time). There appears to be sufficient correspondence between 2016 and 2017 to have confidence that the same households were indeed surveyed in 2017.

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[2] Of the 7 SCT households that were recorded in 2016, but not recorded in 2017, 2 houses were permanently vacant (No. 53 & 234), 2 houses collapsed and the residents moved (No. 152), in 2 houses the respondent was not available after several attempts (No. 173 & 251), in another the family changed (no. 229).

4. Biomass Usage

The 2nd survey in Mchinji collected responses on the extent of firewood usage in households, which enables analysis now that sufficient improved cookstoves are in circulation. The individual responsible for collecting firewood and cooking within the household was asked to physically select the amount of firewood used each day within the homestead. The selected wood was then weighed using digital scales.

Table 5 outlines the average firewood usage of the key sub-groups within Mchinji households. Comparing firewood usage depending on whether the household has an improved cookstove – this includes Chitetzo Mbaula, portable clay stoves, fixed mud and rocket stoves, Kenyan Jica stoves, and imported firewood stoves together – shows moderate effect, but still reduces wood usage by 0.55kg per day (see row one, Table 5). The proportion saved (gap between users / non-users) improves slightly when dividing by the number of adults, but then lessens when divided by the household population.

Table 5: Average Wood Usage (Kg) in Households Possessing Improved Cookstoves or Not in Mchinji (2017)

		Wooduse Per HH	Divided by Adults	Divided by HH Pop	N
General	**Yes**	**5.45**	**2.25**	**1.09**	**208**
(Incl. all improved stoves)	No	6.01	2.86	1.21	50
Chit. Mbaula	**Yes**	**5.59**	**2.30**	**1.11**	**215**
	No	5.96	2.83	1.20	43
Chit. Mbaula 100% Use	**Yes**	**4.41**	**2.35**	**1.16**	**248**
	No	5.96	2.75	1.18	10

Wooduse Per HH = Figures taken at household level without considering demographics
Divided by Adults = Divides the value by the number of adults
Divided by HH Pop = Divides the value by number of adults and children

When breaking the sample down further to focus on just households with a Chitetzo Mbaula, reductions in biomass usage underperform in relation to other forms of improved cookstoves, contradicting the more positive findings in Balaka (see row 2 and 3, Table 5). This narrowing in mean reductions of biomass for Chitetzo Mbaula also holds when controlling for household population, but improves when controlling for the number of adults in the household. Finally, the largest reduction in biomass usage was observed in households using a Chitetzo Mbaula 100% of the time (a daily firewood saving of 1.5kg), but this narrows significantly when adjusting for the number of adults and children in the household. Stated plainly, households using Chitetzo Mbaula 100% of the time are clearly smaller, without as many adults and children to prepare meals for, and so this may account for some of the reductions at the aggregate household level.

All these findings are shown graphically in the three rows of boxplots in Figure 5. The first row of boxplots illustrates the comparison of all biomass usage for all improved cookstoves versus

households with just a 3-stone fire. The second row of boxplots displays the comparison of biomass usage between households in possession of a Chitetzo Mbaula improved cookstove and all other households. The third row of boxplots shows the same comparison for just those 10 households using a Chitetzo Mbaula improved cookstove 100% of the time.

Figure 5: Distribution of Biomass Usage (Kg) in Households According to a) Aggregate Values (blue); b) Adjusting for No. of Adults (pink); c) Adjusting for Household Population (Green)
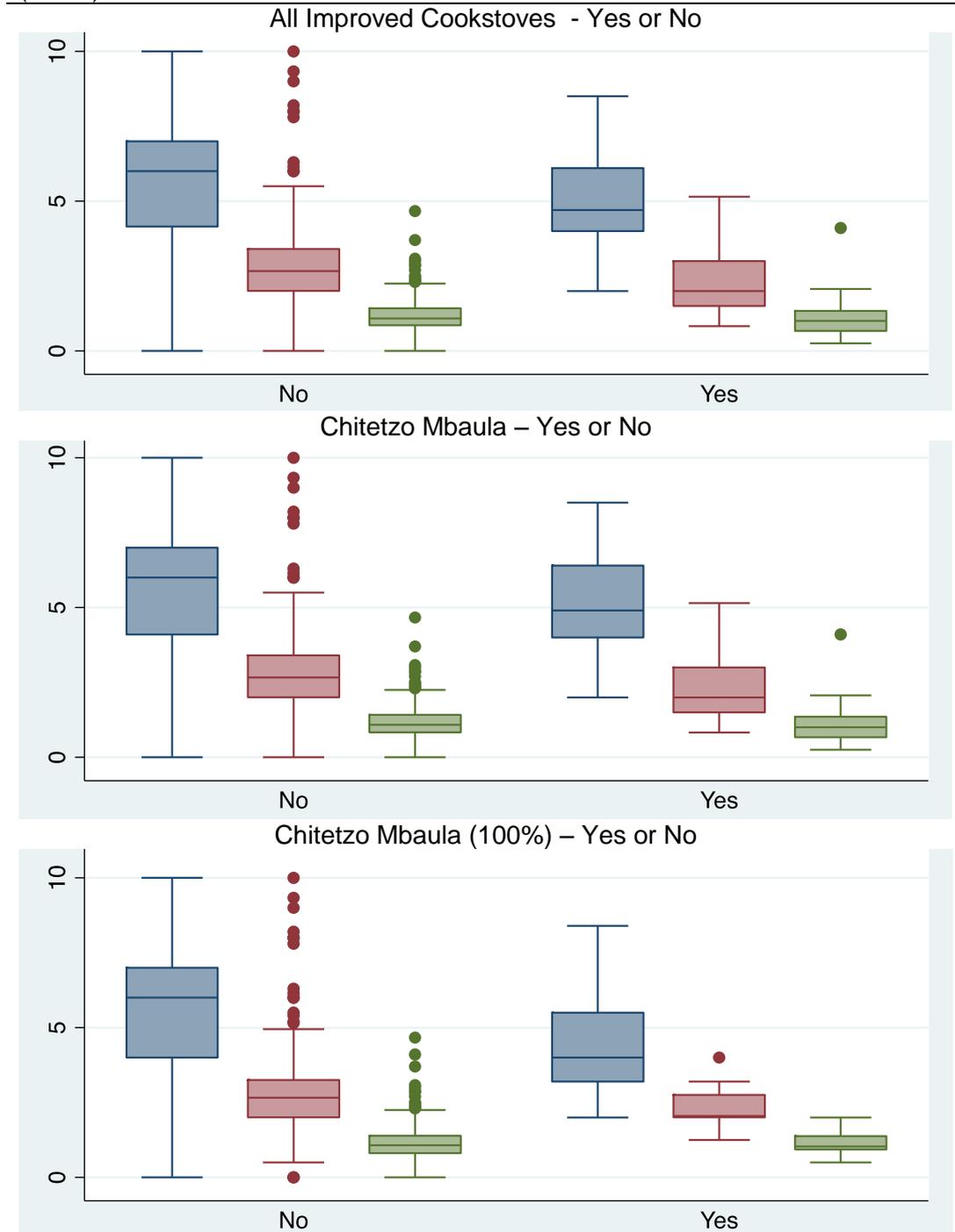
5. Demand and Supply Price

This section explores the demand for Chitetzo Mbaula between 2016 and 2017, and compares each to assumptions around supply price. Figure 5 illustrates the demand for Chitetzo Mbuala improved cookstoves in Mchinji district in 2017. This demand for Chitetzo Mbaula improved cookstoves is compared to both the subsidised (600Mk) and unsubsidised supply price (1045Mk), with the latter taken from the costs of establishing and maintaining production and distribution networks in Balaka. Please note that these costs are assumed to be similar across the two districts.

The demand for the Chitetzo Mbuala in 2017 begins at 1600Mk ($2.21), but falls rapidly to 1,000Mk ($1.38), meaning that only 6.5% of households within the sample demand the stove at a price near that required for the market to operate with support from subsidies. 6.5% of the population is willing to pay the unsubsidised prices, which represents a 1.5% increase on the same statistic in Balaka. Then a further reduction in price from 1000Mk to 600Mk ($0.83) means that 17% of the sample (45 of 259) are willing to pay above subsided price of 600 Mk. Again, the amount of households willing to pay above the subsidised price is an improvement of 5% relative to Balaka (12%). At the subsidised price, coverage within the sample is about 29% (76 of 259), which is about 9% higher than the actual coverage with Mchinji. This finding may indicate the presence of a hypothetical bias within the willingness-to-pay exercise (i.e. people are willing to pay more when not having to part with cash), or else information about how and where to access Chitetzo Mbuala is far from universally known (e.g. 49% of households stated they were unaware of where to find improved cookstoves).

Figure 5: Demand and Supply Price – Chitetzo Mbuala
(bottom graph in %)
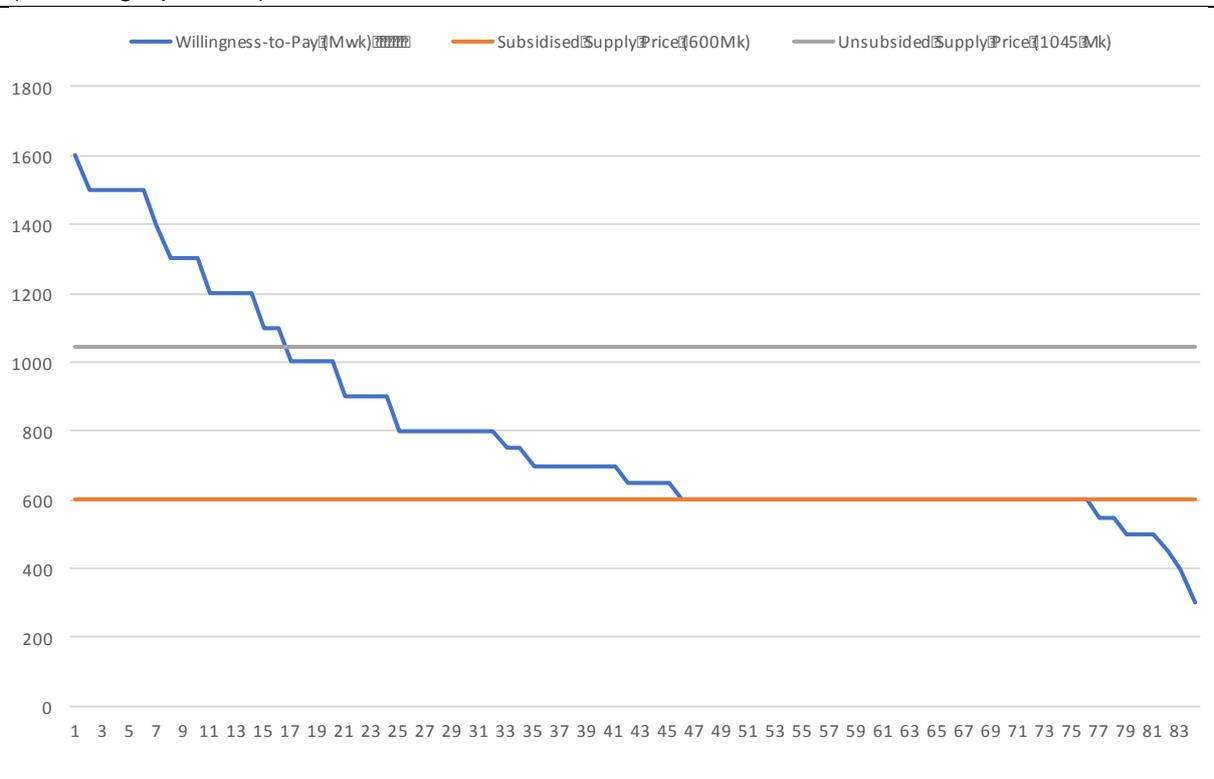
To explore further the comparison between the willingness to pay exercises in Mchinji and Balaka, there is some improvement in Mchinji, especially at the higher levels associated with the unsubsidised or market price. Much of this increase may be explained by rising incomes (see Table 6), and further, income levels are typically put forward as a primary barrier to access. The data collected facilitates informed discussion around two key factors: 1) the role of income (better in Mchinji); and 2) that of raising awareness via the project implementation (better in Balaka).

Table 6 illustrates the significantly higher incomes in Mchinji (2017) relative to Balaka (2016). Mchinji incomes are as much as 70% or 80% higher than those in Balaka, depending on the decile. This suggests that if the other 50% of the population in Mchinji became aware of Chitetzo Mbaula, coverage could maybe reach 40% (i.e. doubling based on current trajectories) at the subsidised prices, and around 10% at the unsubsidised price. This would make the coverage of subsidised Chitetzo Mbaula around 5% higher in Mchinji than Balaka. Conversely, while the market in Balaka is suffering from low incomes, and thus lower quantity demanded at every price, coverage is still around 35% for Chitetzo Mbuala, and around 50% if you include all other improved cookstoves. This is largely the result of consistent and intensive engagement over the years from Concern Universal and others. Therefore, if Balaka incomes rose to levels comparable to those in Mchinji (representing a high income, high awareness scenario), this could increase coverage significantly, perhaps approaching near full access.

Table 6: Total Income Distribution (Mk) in Balaka and Mchinji

Sample Portion	Income Balaka (2016)	Income Mchinji (2017)
10%	41,000	78,600
20%	58,950	100,800
30%	75,000	125,000
40%	90,200	149,500
50%	110,000	176,400
60%	148,000	225,000
70%	193,000	285,000
80%	258,000	427,000
90%	630,000	646,000
100%	8,340,000	6,225,000

The coverage of 5% and 6.5% for unsubsidised Chitetzo Mbaula in Balaka and Mchinji respectively remains a significant challenge to market sustainability. Even if awareness improved considerably in Mchinji, and incomes remained high, the data suggests that coverage in an unsubsidised market would not increase much above 10%-12%. To improve this level of coverage, much depends on the benefits of improved cookstoves becoming more widely acknowledged amongst the population. Aside from an increase in demand, the sustainability of the market may involve some regulation of supply, and careful targeting of the right consumers during retail.

Comparing Willingness-to-Pay for Chitetzo Mbaula Over Time – Mchinji 2016 versus 2017

The data collected facilitates the comparison of willingness to pay in Mchinji between 2016 and 2017. The demand for the Chitetzo Mbuala starts and remains much lower in 2017 compared to the baseline figures developed in 2016 (see Figure 7). In 2016, survey respondents started to accept prices of 3000Mk for Chitetzo Mbaula, and the fall thereafter in the prices accepted is much more gradual than in 2017. 73 of 300 households (24%) were willing to pay equal to or greater than the subsidised price of 1045Mk (compared to 6.5% in 2017). A further reduction in price from 1000Mk to 600Mk (subsidised price) results in 155 of 300 households willing to pay for a Chitetzo Mbaula, meaning that 51% of the sample are willing to pay the subsided price or above in 2016. This compares with just 29% (76 of 259) in 2017, which represents a significant reduction in the willingness to pay over a 12-month period.

Figure 7: Comparing 2016 and 2017 Demand and Supply Price – Chitetzo Mbuala
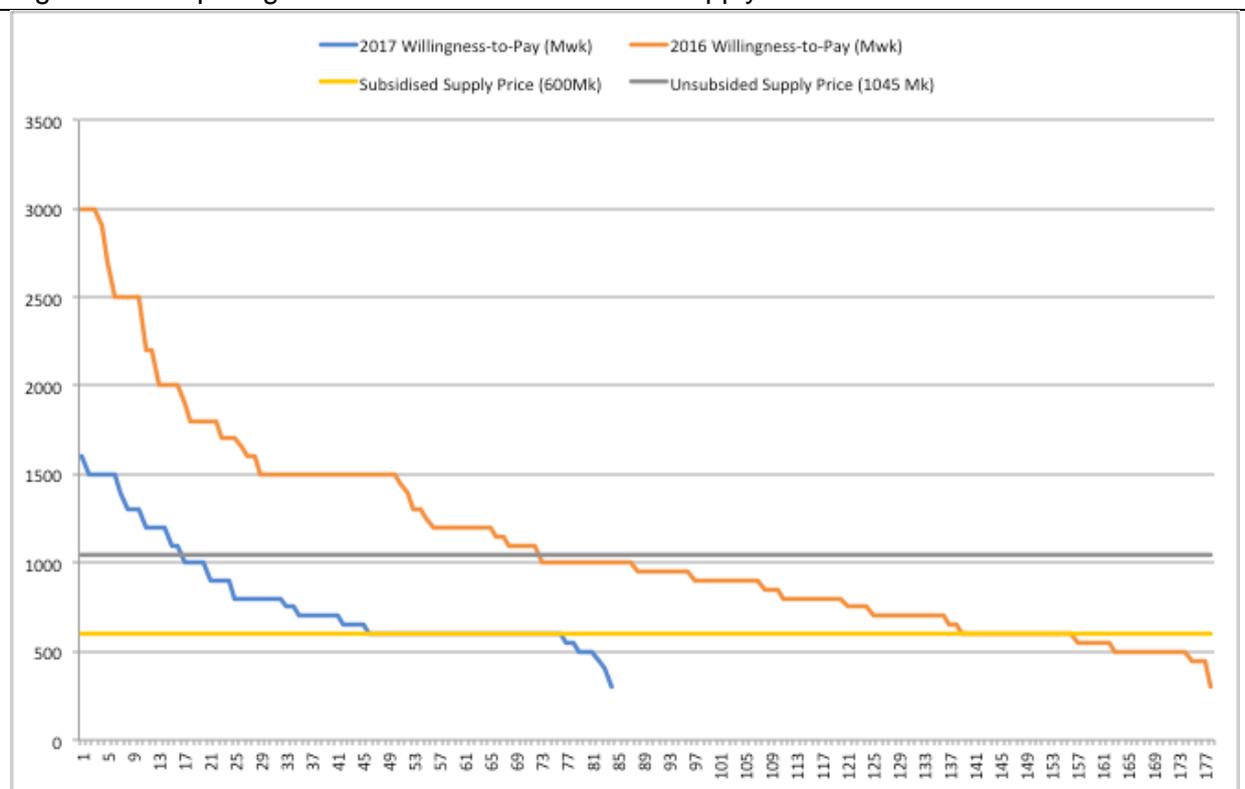
This finding that the demand was less in 2017 compared to 2016 needs to be contextualised. First, it is possible that the widespread introduction of Chitetzo Mbaula at a subsidised price – typically 600 Mk – has lowered the willingness to pay. However, confounding factors include a more widespread hypothetical bias within the willingness-to-pay exercise in 2016 (i.e. people are willing to pay more when not having to part with cash). The majority of the responses in 2016 came through a willingness to pay a randomly selected price, rather than transferring the actual price paid at the market for an improved cookstove (very often 600 Mk). Though there is circularity in this argument, because this act of seeing the Chitetzo Mbaula at the subsidised price itself reduces the value relative to a scenario where there is no prior information.

6. Using Chitetzo Mbaula

Why do households still use a 3-stone fire when they have the Chitetezo Mbaula?   What would it take to cease using 3-stone open fire?

The enumerators asked respondents what it would take for them to stop using a 3-stone fire when they already have a Chitetzo Mbaula. The responses suggest that first and foremost, durability is significant inhibiting factor in some cases. Many respondents stated that the Chitetzo Mbaula they received is of poor quality and liable to crack and split during cooking. One respondent suggested that the Chitetzo Mbuala would endure better if it was made of metal rather than clay.

Several households indicated that they needed to cook using two pots and so the only way they would stop using a 3-stone fire is if they purchased or was given a second Chitetzo Mbuala, or charcoal stove. Further again, the need to use larger pots also encourages the use of the 3-stone fire, as these can cook larger pots relative to the Chitetzo Mbaula. Due to the constant specifications of the Chitetzo Mbuala, changing the size of the cooking area is a challenge.

Others suggested that few people understood the benefits, and so perhaps greater education would improve usage. Related to education, others simply stated that they are used to cooking with the 3-stone fire, and so they will continue to use it. Conversely, related to burning performance, households also claimed that the Chitetzo Mbuala was slower to heat up than a 3-stone fire, and the wood used had to be very dry in order to burn.

Why is the coverage of Chitetzo Mbuala not 100% amongst SCT recipients?

The questionnaire was extended to ask SCT recipients to provide reasons if they were not in possession of an improved cookstove. This appears to be the case in around 25% of cases, or 5 of the 20 SCT recipients. Unfortunately, none of the enumerators completed this part of the questionnaire. An email has been sent to Martina to enquire as to why, and ask for a solution to be proposed.   It will be proposed that these 5 households can be re-visited by Concern's representatives operating within Mchinji. My apologies for this shortcoming.

8. Discussion

In terms of coverage, the findings are broadly positive for Irish Aid's 1st year of work in Mchinji. The proportion of the district in possession of an improved cookstove jumped from 4.3% to 19.6%. As a consequence, households are relying less on other technologies, particularly the 3-stone fire.   Due to Concern Universal being the only large-scale provider of such technologies, it is possible to state that the majority of this improvement in coverage can be attributable to the intervention.

In terms of pro-poor coverage, the findings were mixed. On one hand, the tendency of wealthier households to possess improved cookstoves has been reduced between 2016 and 2017. The average owner of an improved cookstove has almost the same income as the average households without such technology. Though how much pro-poor coverage has improved because of free distribution via SCT was brought into question by the fact that such households fell from 41 to 20, and of those, only 15 possessed an improved cookstove in 2017.

The findings on biomass usage were another broadly positive area for work on improved cookstoves. This is especially so for owners of Chitetzo Mbaula, and of those, particularly households using only the new technology for cooking and heating. Though performance in biomass usage did vary considerably once household demographics were taken into account.

The findings around the willingness to pay for improved cookstoves contradicts theory. Typically, as households become aware of improved cookstoves, and households realise and discuss the various benefits, the willingness to pay should rise over time. In Mchinji, the baseline willingness to pay is significantly higher relative to that calculated later in 2017. There are multiple explanations for this outcome, the most likely being either that: a) increasing awareness of the subsidised price lowered the amounts respondents were willing to part with for the technology; or b) the willingness to pay prices in the 2017 survey often came from the subsidised price people actually paid to local retailers selling the Chitetzo Mbaula.

Finally, respondents gave widely varying accounts of why they use the 3-stone fire as well as an improved cookstove. The size of the improved cookstove seemed to inhibit use in some instances. Others stated that they needed multiple stoves, and so to stop using the 3-stone fire altogether would require having 2 improved cookstoves. Finally, a common complaint was poor durability, with many respondents stating that their improved cookstove was damaged or cracked.

9. Next Steps

This update report has summarised findings on data collected in April 2016 and 2017 in Mchinji. The next data collection in Balaka (October 2017) will enable time-series comparisons within Balaka, in addition to a comparison across Balaka and Mchinji. This will continue to enable assessment of performance of times in terms of coverage, pro-poor coverage, adoption and uptake of improved cookstoves (including solar lights in Balaka). In addition, focus group discussions will be used to contextualise the findings, and develop a locally informed theoretical basis for patterns in the data.

We always leave the offer open to investigate new areas of the data on request, and as the need arises.