1.   **Household Survey in feedstock production sites**

1.1   **Sampling design**

We undertook a structured household survey to collect data that can help assess the local impact of biofuel feedstock production on livelihoods, ecosystem services, food security and poverty alleviation. This survey was undertaken in the vicinity of four feedstock production projects in southern Africa:

- a hybrid sugarcane project that contains a large sugarcane plantation surrounded by sugarcane smallholders (both rainfed and irrigated) in Dwangwa, Malawi;

- a site that contains a large-scale sugarcane plantation and several smaller community-owned plantations in Tshaneni, Swaziland;

- a smallholder-based jatropha project in Mangochi, Malawi;

- a large jatropha plantation in Buzi, Mozambique.

It targeted households with different types of involvement in feedstock production such as plantation workers and feedstock smallholders (intervention groups) and households not involved in feedstock production (control groups). For more information on the study sites refer to Romeu-Dalmau et al., (2016), and Mudombi et al. (2016).

In each site we sampled different intervention and control groups to represent the unique characteristic of each area and feedstock production mode (Table 1). In study sites that contain large plantations (i.e. Dwangwa-Malawi, Buzi-Mozambique, Tshaneni-Swaziland) we sampled two control groups, (a) a control group in the vicinity of the plantation and (b) a control group in areas further away that shared similar characteristics. This sampling approach was used to collect data that could be used to establish whether living in the proximity of plantations has any positive or negative spillover effects, such as benefits from infrastructure (e.g. roads, clinics, secondary job creation) or disadvantages from the loss of

agricultural land and natural areas. In total we sampled 1544 households across all feedstock

production sites. Below we offer more details about the sampling strategy in each study site.

Table 1: Household surveys for each study group and site

	Dwangwa, Malawi (sugarcane)	Tshaneni, Swaziland (sugarcane)	Mangochi, Malawi (jatropha)	Buzi, Mozambique (jatropha)
Biofuel crop farmers (irrigated)	104 (Group 2)	93 (Group 9)	NA	NA
Biofuel crop farmers (rainfed)	107 (Group 3)	NA	101 (Group 6)	NA
Workers in large estates	104 (Group 1)	103 (Group 8)	NA	98 (Group 12)
Workers in community plantations	NA	113 (Group 15)	NA	NA
Not involved, nearby control group	104 (Group 4)	101 (Group 10)	101 (Group 7)	104 (Group 13)
Not involved, far away control group	99 (Group 5)	104 (Group 11)	NA	108 (Group 14)
TOTAL	*518*	*514*	*202*	*310*

Note: The group number corresponds to question (Respondent_Type, Column L) NA means
that due to the unique project characteristics this group was not present in the particular site.

In Dwangwa (Malawi) we sampled three intervention groups and two control groups (Table

1). The intervention groups consisted of (a) formal plantation workers (Illovo), (b) irrigated

sugarcane smallholders, and (c) rainfed sugarcane smallholders from all relevant associations.

We also sampled two control groups, one consisting of subsistence farmers living in the

vicinity of sugarcane-growing areas and one consisting of subsistence farmers living

approximately 50 Km from the sugarcane belt. The distance of 50 km is often considered a

point after which it become uneconomical to supply sugarcane to a mill, as sugarcane is a

highly perishable crop.

We sampled permanent plantation workers using a list of employees provided by the office of

human resources of Illovo. We randomly selected workers below mid-level management for

in person interviews. Similarly we obtained lists of irrigated and rainfed smallholders from all

the different irrigated and rainfed farmers' associations operating in Dwangwa. Based on the

overall number of farmers belonging to each farmer association, we randomly selected

respondents. We used weights proportionate to sample size to avoid oversampling

respondents from any specific association. We surveyed 104 irrigated sugarcane smallholders

from 4 associations and 107 rainfed sugarcane smallholders from 7 associations (see also variable H6_specify).

In Tshaneni (Swaziland) we sampled three intervention groups (i.e. formal workers in the large RSSC plantation, workers in the community plantations, irrigated sugarcane smallholders) and two control groups (Table 1). Plantation workers were sampled through a list of employees obtained from the office of human resources of RSSC, and we randomly selected respondents below mid-level management. Sugarcane smallholders were selected in a 2-stage process. First we randomly selected 14 study associations from the list of the 27 smallholder associations. Then we visited each association and obtained a list of all smallholders belonging to the association. We then randomly selected respondent households using weights proportionate to sample size with the overall membership of each association to avoid oversampling. This 2-stage sampling process was adopted in order to achieve a good spread within the sugarcane production landscape, without diluting sample sizes by surveying all of the 27 associations. In total we surveyed 93 irrigated sugarcane smallholders from 14 associations (see also variable H6_specify).

In Mangochi (Malawi) we sampled one intervention group (i.e. jatropha smallholders) and one control group (Table 1). As there was no large jatropha plantation in this site that could have had positive or negative spill-over effects, we did not sample a faraway control group. Jatropha farmers were selected based on information provided by lead farmers in order to identify farmers that still sell jatropha as several jatropha farmers had stopped producing jatropha seeds. Lead farmers in the area were identified through information provided to the research team by BERL. We completed surveys only with those households that had already sold jatropha to BERL for 2-3 times.

In Buzi, Mozambique we sampled one intervention group (i.e. formal Niqel workers) and two control groups (Table 1). Due to the smaller size of the Niqel jatropha plantation compared to

the Illovo and RSSC sugarcane plantations (both in terms of area and personnel), workers were randomly selected from sites of congregation such as the garage, nurseries and picking points. Interviews were conducted in the working areas during breaks or after the end of the shifts. Control groups adjacent to the jatropha plantation were randomly selected through transect walks in randomly selected points around the plantation. Faraway control sites were identified following the procedure described above. Respondent households in these faraway control sites were, to the extent possible, identified randomly through transect walks. Considering the very low population density and the high forest density in the area (Romeu-Dalmau et al., 2016; von Maltitz et al., 2016), and to allow for some level of randomization we interviewed every second household encountered in the transect walks. It is worth mentioning that most of the control households were located in close vicinity to the road network in (and around) the Niqel plantation and the faraway control site. In some areas clusters emerged due to relatively higher population densities. We identify these clusters in column "Other Comments" of the provided dataset as clusters C1-C8 for the close control (Group 13), and F1-F4 for the faraway control (Group 14).

1.2 Household survey structure

The household survey consisted of 12 sections:

A.   Household demographics and socioeconomic profiles (All respondent groups)

B.   Income and livelihood sources (All respondent groups)

C.   Multi-dimensional Poverty (All respondent groups)

D.   Energy access and use (All respondent groups)

E.   Perceived provision of ecosystem services (All respondent groups)

F.   Agro-economic practices (All respondent groups)

G.   Food security (All respondent groups)

H.   Experience/impacts of sugarcane farming (Only for relevant intervention groups in Dwanwa and Tshaneni respectively, see Table 1)

I.   Employment benefits of sugarcane/jatropha (Only for relevant intervention groups in Dwangwa, Tshaneni and Buzi respectively, see Table 1)

J.   Communal impacts of sugarcane plantations (Only for relevant control groups in Dwangwa, and Tshaneni respectively, see Table 1)

K.   Experience/impacts of jatropha farming (Only for relevant intervention groups in Dwanwa, Mangochi and Tshaneni respectively, see Table 1)

L.   Perceptions of jatropha growing (Only for control group in Mangochi, see Table 1)

M.   Communal impacts of jatropha plantations (Only for relevant control groups in Buzi, see Table 1)

N.   Subjective wellbeing (All respondent groups)

O.   General comments (All respondent groups)

The household survey included both close-ended and open-ended questions. It contained generic questions related to household demographics, livelihood options, agro-economic practices, reliance on ecosystem services and energy access/use patterns. The survey also contained questions that can be used to calculate indices such as the multi-dimensional poverty index (MPI), which is a composite measure of poverty (Mudombi et al., 2016).

Questions from Sections A-G, N and O were asked to all groups. Questions in these sections were mainly closed-ended that employed were appropriately coded fixed ranges. Questions in Sections H-M varied between groups and focused on the differentiated experiences/impacts of involvement or non-involvement in feedstock production. Most of the open-ended questions of the household survey were part of these sections (and also of Section O). Apart from the questions and the answer options, the questionnaires provided clear instructions to enumerators on how to capture each answer.

2.   Household survey with stove users

2.1   Sampling design

We undertook a structured household survey to identify the factors that influence the adoption and sustained use of ethanol stoves in Maputo city (and the associated user perspectives). The survey targeted users, quitters and non-users of ethanol stoves. In total 341 households were surveyed from 6 neighborhoods. Of these, 58 households (17%) had adopted and sustained ethanol stove use, 42 households (12%) had adopted but discontinued ethanol stoves, and 241 households (71%) never adopted ethanol stoves. We defined as sustained users those households that had an ethanol stove and continued to use it as the primary or the secondary cooking option (Mudombi et al., 2018). Quitters were those households that have/had an ethanol stove but ceased its use, and non-adopters those households that never possessed an ethanol stove (Mudombi et al., 2018).

2.2   Household survey structure

The vast majority of the questions in this household survey were closed-ended, with appropriately coded answers. We targeted areas of Maputo city that experienced substantial promotion and adoption of ethanol stoves, and targeted both households that used ethanol and charcoal as the main cooking option. The household survey consisted of 5 sections:

A.   Household demographics and socioeconomic profiles (All respondent groups)

B.   Household energy use patterns (All respondent groups)

C.   Ethanol stove use patterns (Only for ethanol stove users)

D.   Charcoal stove use patterns (Only for charcoal stove users)

E.   Poverty indicators and income (All respondent groups)

The specific study areas within Maputo were selected as they had experienced an extensive adoption of ethanol stoves, as identified through expert interviews with management of NDziLO Company that spearheaded the promotion campaigns (Mudombi et al., 2018).

Through this purposeful sampling the household survey aimed to capture data about the factors that influence the adoption and sustained use of ethanol stoves (e.g. cost, use characteristics) through the perceptions of respondents when considering the other available cooking options, rather than provide a baseline of cooking fuel preferences across the city. The household survey focused mainly on user perceptions to elicit the factors that influence stove adoption and use. However further to the perceptions, key demographic and socioeconomic data were collected to study adoption dynamics. Stove adopters in these areas were randomly sampled through sales records of NDziLO and non-adopters were selected as the neighbours of adopters.

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