

Impact of Cash-based programmes on poor agro-pastoral households in the Bay region of Somalia: A structural path analysis

Introduction

Somalia is one of the poorest and most food insecure countries in the world. Large groups of the population depend on the humanitarian community for support. Conflicts, lack of effective governance, recurrent droughts and floods are major factors that have affected this situation since 1991 (Farhat et al., 2014). The humanitarian crisis in the country is one of the harshest and longest running in the world (Jackson and Aynte, 2013). In this context, emergency cash programmes are the largest type of humanitarian assistance that is being used, particularly in the southern and central part of Somalia – the area the most hit by recurrent crises within a protracted conflict. Cash-based programmes have developed since the early 2000s to address food insecurity in the most vulnerable households and improve their livelihood. The evidence shows that they can be implemented effectively despite the complex nature of circumstances in the country (Hedlund et al., 2013; Dunn, 2010). The most important elements that make the Somali environment particularly conducive to cash programming are the ability of markets to operate in an extremely insecure context, the presence of hawalas—an extensive network of money transfer agents operating in the country independently from the risk—who have substantial experience in international money transfer accumulated from managing a considerable amount of remittances from the Diaspora, and the informal credit culture deeply ingrained in the population. In addition, food insecurity is rarely the result of a failure of the market system; it is the result of livelihood failure, especially loss of income, as a result of drought (Dunn et al., 2013).

Today, after some years of recovery following the famine of 2011-2012, the political and humanitarian situation in the country continues to deteriorate (Maxwell and Majid, 2014). The situation is particularly severe in south-central Somalia as a result of poor rains, ongoing conflict, increased food prices, and reduced in humanitarian funding (ECHO, 2014; USAID, 2014).

Consequently, continued humanitarian interventions are indispensable (FSNAU, 2014a), although the complex environment in which they are delivered (Dun et al., 2013) creates problems.

This critical context makes the quality of humanitarian interventions' programming phase hugely important for their success. Understanding the potential impact of cash-based programmes, the most important transmission channels for their influence, and possible bottlenecks in the manifestation of expected benefits are critically relevant information to enhance the quality of intervention design or response analysis (Maxwell et al., 2013). In particular, they help in anticipating and avoiding possible unintended, undesirable consequences.

To this end, the structural path analysis is an interesting empirical technique. In fact, it allows us to understand in a distinctive and separate way the response mechanisms of economic influence within a structure (Defourny and Thorbecke, 1984). Lantner (1974) was the first to propose this technique, applying it to an input-output table. Subsequently, the structural path analysis was applied to a social accounting matrix following the seminal work by Defourny and Thorbecke (1984). However, this technique has never been related to the economic structure of a single household, the target of a cash-based intervention. This paper overcomes this limitation. Focusing on the normal economy of a representative poor household in the Bay Agro-pastoral High Potential Livelihood Zone, it simulates the impact of an exogenous injection of income on household consumption, production and the exchange structure by applying a structural path analysis. To this end, a household economy matrix was designed as an accounting framework that describes the typical economic structure of a representative poor household in the Livelihood Zone that is under consideration. Afterwards, a structural path analysis was applied to this household economy matrix to analyse the most important channels along which a given injection transmits itself to different aspects of the household economy and the extent to which it is amplified by adjacent circuits.

The poor households in the Bay Agro-pastoral High Potential Livelihood Zone comprise approximately 30 percent of its population and represent an interesting case study to investigate the effects of cash-based interventions. Bay is one of the targeted central-southern regions for cash-

based programmes used to support vulnerable households to improve their food security and livelihoods. The implemented interventions include unconditional cash grants, food vouchers, business grants and cash for work programmes. The sedentary, agro-pastoralist population of the sorghum belt in the Bay region are the primary target of these interventions. This group of the population was one of the most affected by the 1992 and 2011 famines (Maxwell and Majid, 2014) and remains in critical condition. Official sources in the Bay region have registered severe acute malnutrition levels and recorded the fifth lowest main harvest season in the past decade in 2014. Low rainfall, ongoing conflict and low availability of agricultural inputs are several of the primary drivers of the situation (FEWSNET, 2014; FSNAU, 2014b).

As emphasised by Defourny and Thorbecke (1984), this analysis contributes significantly to the quality of policy decisions. In our particular case, it allows us to understand in a distinctive and separate way the response mechanisms of different household economy aspects within a household's composite network of structural relations.

This paper consists of five sections. The first is devoted to presenting the household economy matrix as a basis for the structural path analysis whose elements are illustrated in Section 3. The results of the empirical investigation are in Section 4, and Section 5 is dedicated to a brief summary and conclusions.

Household economy matrix

The first step in our investigation involves using a circular flow diagram to represent the normal economy of a representative poor household in the Bay Agro-pastoral High Potential Livelihood Zone. On its basis, we designed the household economy matrix.

We made reference to qualitative and quantitative information provided by the FSNAU for the baseline analysis in Somalia. This information reflects the principles of the household economy and the sustainable livelihood approaches (Seam et al., 2000; Holzmann et al., 2008). It includes an estimate on how the household obtains food and other income, its expenditure on food and non-food

items, its savings and assets, the opportunities opened to the household and the constraints it faces, and the coping mechanisms that the household can adopt in times of crisis (Bourdeau, 2007).

Figure 1 illustrates the circular flow diagram of the normal economy of a representative poor household in the Bay Agro-pastoral High Potential Livelihood Zone (from now on, “poor household” or simply “household”). It is a household that cultivates as well as owning livestock (FSANU and FAO, 2002). The upper side of figure 1 presents the household as production and consumption unit. The lower side its exchanges with three other institutions, i.e., the Social network, the Clan, and the Rest of the economy. This latter account includes other households and actors with which or whom the investigated poor household exchanges goods and services for something in return.

[Figure 1 here]

As production unit, a poor household employs the factors it owns and the intermediate inputs, purchased from the *Rest of the economy*, to produce a set of commodities. These commodities are partly self-consumed and partly sold to the *Rest of the economy*. It also takes part in extra-household activities in exchange for factor income. Factor income from household activities and social support are used by the poor household for cash needs, i.e., goods and services purchased from the *Rest of the economy*. The *Social Network* provides the social support represented by a share of non-reciprocal gifts and relief given by other households and actors of the economy as part of the social network.

Finally, a poor household pays a clan tax to the *Clan* as an insurance tax in line with the customary law.

Each box in the flow chart represents a group of accounts in the household economy. The numbers in the cells indicate the amount and the direction of the flow of funds; the latter is represented by the arc connecting two boxes in the circular flow diagram. Table 1 shows the macro-structure of the household economy matrix designed for the normal economy of a representative poor household in Bay Agro-pastoral High Potential Livelihood Zone that is used for this study. It makes reference to

the 2006-07 accounting period and is a square, closed and ex-post accounting data framework with total receipts (represented in the rows) equal to total payments (represented in the columns).

[Table 1 here]

In our matrix, we refer to data collected by FSNAU-Somalia for preparation of the 2006 Baseline Report, which covers the situation from April 2006 to March 2007 (for the data collection procedure see FSNAU, 2009a). In terms of conflict, migration flows, climatic events and other features, the situation was judged as normal. In addition, according to FSNAU the dataset can be still considered representative of the status of the poor households in the livelihood zone that is analysed.

The macro-structure of the household economy matrix adopted in this analysis is the aggregation of a more detailed micro-framework, which includes five activities, 18 commodities (two are intermediate inputs), two factors and four institutions. Table 2 lists the detailed accounts.

[Table 2 here]

Household activities and sources of income

The activities carried out by a poor household reflect the economic structure of the Bay Agro-pastoral High Potential Livelihood Zone. This area represents the “Sorghum Basket” of Somalia as the largest cereals producing zone in the country, and it is also suitable for livestock grazing (FSNAU, 2009a). A poor household owns on average three hectares of land cultivated under a rain-fed system. From this land, it grows cereals for two main purposes: own consumption and income generation. A significant share of this income is used to repay debts accumulated in the period before harvest. For this reason poor households very rarely can maintain cereals as stock, which is the dominant form of investment in the livelihood zone. On average, a poor household also owns three cattle, five sheep and seven goats (FSNAU, 2009a). Livestock breeding provides livestock

products (milk and ghee) for own consumption and income. In addition, it provides animals to generate income, especially in difficult circumstances.

In rural areas, poor households also contribute to the agricultural activity of Middle and Better-off households by performing planting, weeding and harvesting activities. In addition, labour migration is frequent to urban centres due to the importance of sorghum trade and to the Shabelle region, where the banana industry absorbs a significant proportion of this labour force. Collection and sale of bush products, especially firewood, represent the last critical activities performed by poor households.

The available data shows that production from extra-household activities represents the most significant share (33.87 percent) of total output of the poor household. The next most significant are the crops sector (29.29 percent), livestock products (20.18 percent) and livestock (11.57 percent) activities. Total production from household non-agricultural activities only accounts for 5.08 percent of total household production. However, selling bush products is a typical coping mechanism adopted by poor households during times of shocks.

Factor income from labour is the most relevant source of earnings (55.73 percent of total income), followed by capital income (42.61 percent) and transfers from the Social network (1.66 percent).

The most remarkable share of factor income is derived from performing extra-household activities (35.19 percent) and crops activities (29.95 percent). The last source of revenue is the collection and sale of bush products (5.27 percent).

Household expenditures and exchanges

Total demand by a poor household as consumption unit includes own consumption of food products and its market demand for essential and basic food and non-food items (figure 2).

[Figure 2 here]

Almost 70 percent of a poor household's total demand is for staple food. Own consumption of cereals and livestock products makes up 33 percent, followed by expenditures on vegetable oil and

sugar (31 percent), cereals (6 percent) and survival goods (2 percent). These latter are basic food items purchased on credit and periodically repaid when income flows. Food demand also includes the non-staple food represented by tea and coffee and salt (7 percent). Other expenditures, such as clothing, kerosene, utensils and clan tax, account for the remaining 10 percent. The unbalanced structure of poor households' consumption towards staple food is justified by its critical nutrition situation.

Considering the household as the production unit, the expenditure on seeds represents a considerable share of cereals production (11.44 percent) costs given that seeds are somewhat expensive. The expenditure on animal drugs is only 1.28 percent of total livestock and livestock products output due to their low availability (FSNAU, 2009b).

The abovementioned observations underscore the fact that the investigated poor household economy has a strong cash-based nature. In fact, 64 percent of its total demand is provided by other institutions—with vegetable oil and sugar the dominant items— and 28 percent of its total production is sold in the local market.

Structural path analysis

A structural path analysis has been applied to the previously designed household economy matrix. This technique allows us to determine the paths along which external injection affects a particular endogenous account and which of these paths are better than others in transmitting influences (Shantong et al., 2004). Following the literature (i.e., Saudolet and de Janvry, 2003) and empirical realism, we assume the Social network and the Clan as exogenous, considering all the other accounts to be endogenous. We also assume that the simulated exogenous injection of income to a poor household does not crowd out pre-existing formal and informal social safety nets provided by the clan and social network.

The restructured household economy matrix consists of the following:

- matrix of endogenous accounts, E , with e_{hk} as the account in the h^{th} row and k^{th} column;
- vector of the aggregated exogenous accounts, X , with the generic element x_{hk} ;
- leakages matrix, L , showing the payments that are received by exogenous accounts from endogenous accounts that do not contribute to the multiplicative process;
- vector of the row total of endogenous accounts R , such as

$$R_h = \sum_k e_{hk} + x_h. \quad (1)$$

An expenditure coefficient matrix (A) is computed by dividing each element e_{hk} of the endogenous accounts matrix, E , by the corresponding column total C_k , where $C_k=R_h$, when $k=h$. Each of the resulting values expresses the average expenditure propensity of the endogenous accounts.

Assuming the exogenous accounts to balance the equilibrium condition of the endogenous accounts, and then

$$R = (I - A)^{-1}X = MX \quad (2)$$

the vector R of the total receipts of any endogenous account is given by the matrix X of exogenous accounts by means of the multiplier matrix M , which contains the expenditure propensities for any account in the matrix. It shows the way in which the effects of an exogenous expenditure are transmitted to the household economy system. This effect is the so-called global effect (I^G) in the structural path analysis. However, the mechanism of interactions along the lines represented by figure 1 remains a black box. The direct influence and the total influence describe these mechanisms.

To describe these two typologies of influence, we characterise the elements of the household economy matrix in terms of the topology language. Referring to every endogenous account of this matrix as a pole, the link between any two poles represents an arc, as illustrated in a stylised way in figure 3. Considering the two poles i and j , the arc is denoted by (i, j) and the element a_{ji} is the average expenditure propensity provided by matrix A defined in equation 2. This element denotes the intensity of the arc (i, j) and reflects the magnitude of influence transmitted from pole i to pole j .

[Figure 3 here]

A path that does not pass more than one time through the same pole is called an elementary path (with single or multiple arcs). A path whose pole of origin coincides with its pole of destination is referred to as a circuit. In figure 3, $i \rightarrow j$ is an elementary path with a single arc, $i \rightarrow x \rightarrow y \rightarrow j$ is an elementary path with multiple arcs, and $x \rightarrow y \rightarrow z \rightarrow x$ and $x \rightarrow y \rightarrow x$ are circuits. The direct and the total influence are defined on the basis of these concepts.

Following Defourny and Thorbecke (1984), the direct influence is the change in revenue of account j —the destination account—induced by a unitary change in account i transmitted through an elementary path, assuming constant all the other poles. With reference to figure 3, the direct influence (I^D) can be measured along the elementary path with the single arc ($i \rightarrow j$) or the elementary path with multiple arcs ($i \rightarrow x \rightarrow y \rightarrow j$).

In the former case, the intensity of the influence is

$$I_{(i \rightarrow j)}^D = a_{ij} \quad (3)$$

where a_{ij} is the average expenditure propensity of the $(i, j)^{th}$ account in the household economy matrix, i.e., the $(i, j)^{th}$ element of the expenditure coefficient matrix A of equation 2. In the topology language, this matrix is referred to as direct influence matrix.

The direct influence transmitted along an elementary path (p) containing multiple arcs is equal to the product of the intensity of the arcs forming the path. In our example referred to figure 2, the direct influence along the multiple arcs ($i \rightarrow x \rightarrow y \rightarrow j$) is

$$I_{(i \rightarrow j)_p}^D = a_{xi} * a_{yi} * a_{jy} \quad (4)$$

The total influence (I^T) adds to the direct influence along an elementary path, the feedback effect of the adjacent circuits; those within the structure are imputable to that path. In our figure 2, the total influence resulting from the elementary path ($i \rightarrow x \rightarrow y \rightarrow j$) is

$$\begin{aligned} I_{(i \rightarrow j)_p}^T &= a_{xi} * a_{yi} * a_{jy} * [1 - a_{yx} * (a_{xy} + a_{zy} * a_{xz})]^{-1} = \\ &= I_{(i \rightarrow j)_p}^D * [1 - a_{yx} * (a_{xy} + a_{zy} * a_{xz})]^{-1} = I_{(i \rightarrow j)_p}^D * M_p \end{aligned} \quad (5)$$

The second term of the right side of equation 5 is the path multiplier, M_p , which captures the extent to which the direct influence along the elementary path is amplified by the effect of adjacent connecting circuits.

In summary, the direct influence is a concept related to an elementary path isolated from the rest of the structure; the total influence adds up the indirect effects of circuits adjacent to the elementary path; and the global influence cumulates all total influences produced by the exogenous injection in the household economy that is analysed. All of these influences are in real terms. In fact, the structural path analysis is based on the assumption that the simulated exogenous injection has little impact on price changes, at least in the short term. In our investigated case, this assumption is supported by the evidence provided by the recent evaluation reports of the cash-based programmes implemented during the 2011-12 famine and earlier studies on Somalia. In retrospect, they found that these programmes had no impact on commodity prices (see, for example, Farhat et al., 2014; Hedlund et al., 2013; Majid et al., 2007; Mattinen and Ogden, 2006; Dunn et al., 2013).

Based on the global, total and direct influence, Parra and Wodon (2010) introduced the concept of concentration, strength and speed of the transmission channels. Several paths exist between two poles. In our example between the account j —disturbed by an exogenous injection—and j —the destination account—there are two elementary paths, one of which has two circuits. However, a household economic system is more complicated as characterised by the multitude of elementary paths among poles. The share of the total impact of a shock that travels along the most influential path in the household economy matrix can be considered as a measure of concentration of the transmission channels, hereinafter concentration index (CI). In addition, the contribution of a path and its adjacent circuits to global impulse provides information on its strength. The inverse of the path multiplier, M_p in equation 5, i.e., the direct over the total impulse, provides additional useful information. The greater the proportion of direct influence, the more rapidly the transmission of an external injection will be. A household economy matrix is a comparative static exercise, and the structural path analysis abstracts from time. However, it is reasonable that the more poles pass

through an elementary path and its adjacent circuits, the more time is needed for influence caused by external injection to transmit to a destination.

The selection of the pole of origin of the external impulse, i.e., the account of the household economy matrix on which the exogenous injection is simulated, can be in any of the endogenous accounts. However, the particular interrelationship of the endogenous structure of the household economy matrix requires that an elementary path must always travel counter clockwise in figure 1. We simulate the effect of an exogenous injection of one Somali Shilling on household income, i.e., its increase by 0.01 percent. The money injection from cash-based programmes is considered a regular source of revenue. The evidence provided by the evaluation report of the FAO cash for the work programme in Somalia supports this assumption. This humanitarian intervention was perceived as an essential source of income by beneficiaries and its use reproduced the characteristic spending pattern of poor, food-insecure rural households (Farhat, 2014, p.35). This latter aspect justifies the linear model adopted with the structural path analysis.

Following Parra and Wodon (2010), the size of the shock we simulated is arbitrary and selected to make the results of our empirical investigation easier to interpret. As our model is linear, the results achieved with a larger or smaller injection of income to the analysed household would be proportionately identical. For example, during the humanitarian crisis in August-October 2011, each of the beneficiaries of the Cash-for-work programme implemented in Somalia by the FAO received USD 72 per month, equivalent to the minimum basic food basket (FAO, 2012). At the 2011 exchange rate, the cash received was 116,293 Somali Shillings. To evaluate the possible impact of an intervention of this size, the results provided by our analysis must be multiplied by 116,293.

Results

Table 3 illustrates the global influence of the simulated exogenous injection of one Somali Shilling to the analysed poor household income on the aggregate endogenous accounts in comparison with the baseline data presented in the household economy matrix in table 1. An increase in household

income by 0.01 percent yields an increase of approximately 0.71 percent in all the aggregate accounts included the Rest of the economy.

[Table 3 here]

Table 4 shows the global influence of the detailed endogenous accounts of the household economy matrix, which represent the destination accounts in our simulation. It also presents the respective concentration index and number of elementary paths transporting the global influence. This latter information is reported as a measure of dispersion of the global influence and because in discussing the results of the structural path analysis we only focus on the most important paths for each destination account, those explaining more than 4 percent of the global influence.

[Table 4 here]

In absolute terms, the most remarkable effect of an exogenous injection of income to a poor household is on the Rest of the economy followed by the primary factors, i.e., Labour and Capital. One additional Somali Shilling of household income pushes receipts in the Rest of the economy by 22.13 Somali Shillings, household labour demand by 19.09 Somali Shillings and capital demand by 14.72 Somali Shillings. An additional significant stimulus is provided to the output of Extra-household and Crops activities, which increases by 11.81 and 10.38 Somali Shillings, respectively. Regarding household consumption, the undertaken structural path analysis indicates that food purchases take priority over other items. The strongest increase is in the household demand for food items, primarily sugar and vegetable oil obtained from the Rest of the economy. This demand is more than five times the initial impulse. Following an exogenous injection of money to household income, its creditworthiness also improves, as underscored by the greater demand for survival goods, i.e., the amount of goods purchased on credit. In the analysed livelihood zone, the extent of poor households' access to short-term credit depends on two conditions: their ability to repay the accumulated debt and the level of crop production (FSNAU, 2009b). According to our investigation, both aspects may be potentially positively affected by a cash-based intervention. Improved access to informal credit reduces household vulnerability to future shocks. It also reduces

the need for risk-coping responses, such as depletion of livestock that represents an important productive asset in the analysed livelihood zone (Farhat et al., 2014).

The greater expenditure on school fees and health services should also be emphasised for its contribution to capital formation and household resilience improvement. The stimulus provided to these accounts is one of the lower in absolute terms among the household consumption items. However, the percentage change with respect to the baseline is 0.719 percent for Medicine and 0.721 percent for Education, values that are slightly greater than the average raise in the total demand for the aggregate commodity items.

Focusing on the concentration index (CI), the structural path analysis undertaken in this study indicates that the additional consumption of commodities demanded by the household as a consumption unit but not produced as a production unit is determined by only one elementary path. Table 5 shows that each of these elementary paths links the origin and the destination account without any intermediate pole.

The most remarkable impulse of an exogenous injection of income to the household is on Vegetable oil and Sugar consumption in terms of both global and direct influence (cases 1 and 2 in table 5). However, in both cases the direct influence only explains approximately 35 percent of the global influence; the rest is determined by adjacent circuits that reduce the efficiency of the direct impulse.

[Table 5 here]

Concerning cereals, the other commodity demanded by the poor household, the developed structural path analysis shows a more complex transmission mechanism (table 6). The most important elementary path connects household income and demand for cereals with one arc and, thus, without using other intermediate accounts (case 13.1 in table 6). This elementary path carries 53.3 percent of the global effect. It shows an increase by 2.04 Somali Shillings in total household demand for this staple food item as a consequence of the exogenous transfer to household income of one Somali Shilling.

[Table 6 here]

The remaining impulse of Household on Cereals derives from the demand of the Rest of the economy for cereals produced by the analysed poor household. Greater demand by the Rest of the economy is in turn stimulated by an increase in its revenue determined by additional household demand for staple and non-staple food. In particular, the paths “Household / CVegetable oil / Rest of Economy / CCereals” (case 13.2 in table 6) and “Household / CSugar / Rest of Economy / CCereals” (case 13.3 in table 6) transmit 11.64 percent and 11.24 percent of the global influence, respectively.

As the efficiency of all the elementary paths with Cereals as the destination account is almost the same, we can expect a more rapid transmission of the impulse provided by the simulated exogenous injection of income on cereals demanded by the analysed household rather than by the Rest of the economy.

Activities

When household activities are the destination accounts, the undertaken structural path analysis allows us to understand what influence is caused by the simulated exogenous increase in household income on the five household activities (crops, livestock products, livestock, non-agricultural, and extra-household activities), and the differences between the particular paths in transmitting this influence. These aspects are important because a poor household in the analysed livelihood zone typically uses multiple sources of livelihood to smooth consumption, especially during critical periods.

According to table 4, the concentration index of the transmission channel is the highest for Livestock products activities (CI=69.51) followed by Crops activities (CI=64.13).

In both cases, the most significant share of the global influence is exercised without any intermediate pole (case 14.1 and case 15.1 in table 7). These elementary paths show that the exogenous transfer of income is to a household that, as a consequence, increases its own consumption of crops (6.65 Somali Shillings) and livestock products (4.96 Somali Shillings). We

expected this result because it reflects the broad engagement of poor households in the Bay region in subsistence farming. The inverse of the path multiplier suggests that the adjacent circuits significantly amplify the transmission speed of the elementary paths in both of the abovementioned simulations.

[Table 7 here]

Turning to the influence of Household on Crops activities, the developed structural path analysis suggests that another 20 percent of the global impact is channelled through household market demand for cereals as an intermediate pole (case 14.2 in table 7). In contrast, an additional 15 percent of the global impulse of Household on Livestock products activities is transmitted along two elementary paths with three intermediate poles. They are CVegetable oil, Rest of the economy, and CLivestock products (case 15.2 table 7) and CSugar, Rest of the economy, and CLivestock products (case 15.3 in table 7). In other words, following the exogenous injection of income, the household increases its demand for Vegetable oil and Sugar from the Rest of the economy. The Rest of the economy, in turn, uses the additional revenue to buy livestock products produced by the household, stimulating the related household activity and its output.

The two intermediate poles mentioned above transmit approximately 50 percent of the global influence of Household income on Livestock and Household non-agricultural activities (cases 16.1, 16.2, 17.1, and 17.2 in table 7). In these simulations, the remaining most relevant elementary paths send the impulse along the increased household's demand for commodity items (tea/coffee, kerosene, education, clothing, and other commodities) to the Rest of the economy. The Rest of the economy spends the consequent greater revenues to buy additional commodities produced by the household, stimulating an increase in gross output. Figure 4 graphically represents the structure of these elementary paths, also including the Extra-household activities as a destination account, i.e., case 18 in table 7. In fact, in this latter case only the third arc changes because the household economy matrix does not include the commodities demanded by the Rest of the economy and not produced by the household.

[Figure 4 here]

The flows in figure 4 represent the channels through which income moves between the household, its demand for cash, the Rest of the economy, and this latter institutional demand for commodities produced by the household to reach the household activities. The thicker the line, the greater the share of global influence passing through the path will be.

As the structure of the elementary paths is the same in these three simulations, their contribution in percentage terms to the global influence is identical. In addition, the inverse of the path multiplier shows the important influence of the adjacent circuits on the global impact, which is approximately 65 percent in all the sub-cases.

Factors of production

Table 8 shows the results of the undertaken structural path analysis with the factors of production as destination accounts, namely, the primary factors and the intermediate inputs.

[Table 8 here]

The investigation of the transmission path from Household to primary factors is of specific importance because, as previously noted, the household acquires a substantial part of its income through labour and capital factors. In this case, the structural path analysis allows us to understand the sector in which additional labour and capital employment will occur following an increase in household income of 1 Somali Shelling.

Table 4 indicates that the concentration index for household labour as a destination account is the lowest among those estimated (CI=15.47); 20 paths explain the related global influence.

Case 19 in table 8 shows that following the simulated increase in household income, additional household labour mainly derives from the Extra-household activities demand. This new demand is stimulated by the increase in the household expenditure capacity for cash items, particularly Vegetable oil and Sugar (case 19.1 and 19.2 in table 8).

Only approximately 18 percent of the global influence is explained by the increased demand for household labour by the household activities, namely crops and livestock products activities (case 19.3, 19.4 and 19.10 in table 8). However, these elementary paths have only two arcs instead of the four characterising the elementary paths in which the Extra-household activities absorb the additional labour. For this reason, in these cases we may expect a more rapid transmission of the impulse exerted by the simulated external injection of money.

The elementary paths that send out the influence of Household on Capital, described by case 20 in table 8, have different characteristics. In fact, almost 53 percent of the additional employed capital is in the household activities for own consumption of crops and livestock products (case 20.1 and 20.2 in table 8).

Passing to the intermediate inputs as destination accounts, the developed structural path analysis shows that the global impact of Household on Animal drugs, illustrated by case 21 in table 8, is primarily related to the increase in household production of livestock products for own consumption. This explains 38.58 percent of the global influence and is the shortest channel (case 21.1 table 8). Also in this simulation, additional household expenditure on Vegetable oil and Sugar, following its increased income, represents a significant transmitter of impulse to its demand for Animal drugs. This effect is sent through the greater demand for Livestock and Livestock products by the Rest of the economy, which stimulates related activities performed by the household (cases 21.2 and 21.5 in table 8).

The concentration of the transmission channels of Household on Seeds is significantly greater than that of household on animal drugs. The concentration index is 64.12, as opposed to 38.58 in the former case. In addition, the number of elementary paths explaining the global influence, 7, is the lowest among those estimated for the other destination accounts (table 4). Case 22.1 in table 8 shows the overwhelming importance of the impact channel running from the Household to Seeds through the production of crops for own consumption as an intermediate pole. It is followed by the elementary path “Household / CCereals / ACrops / CSeeds”, which contributes to almost 20 percent

of the global influence (case 22.2 in table 8). The remaining most relevant impulse is exerted along longer paths that connect additional household income to its demand for cash items, particularly Vegetable oil and Sugar, produced by the Rest of the economy. The resulting increased revenue of the Rest of the economy yields a greater demand for Cereals produced by the household, requiring additional employment of Seeds.

The importance of the adjacent circuits in the amplification of the direct impact is significantly high in all the described elementary paths.

Rest of the economy

The understanding of the impact of Household on the Rest of the economy is of specific importance in the cash-based programme design. In fact, these interventions are appropriate only if the demanded goods and services are available on the local market (Dunn, 2010). The analysis of the baseline and global influence provided by table 3 has underscored the remarkable spill-over effect of the simulated increase in household income on the Rest of the economy. This result confirms the evidence from the evaluation reports of the recently introduced cash-based interventions. According to them, the cash based programmes were observed by the reference communities as a significant injection of money in the local economy (Hedlund et al., 2013; Farhat et al., 2014).

The structural path analysis allows us to understand which major sectors of the local economy are activated by the performed simulation and in which measure they are activated. As illustrated by cases 23.1 and 23.2 in table 9, almost 50 percent of the global influence of Household on the Rest of the economy is explained by the household demand for Vegetable oil (24.99 percent) and Sugar (24.13 percent).

[Table 9 here]

The remaining relevant impulse is sent out along the increased household demand for tea and coffee (8.26 percent), kerosene (6.61 percent), education (6.28 percent), clothing (5.29 percent) and other commodities (4.96 percent).

Conclusions

The developed empirical investigation indicates that cash-based programmes can achieve their primary intended effects on low-income households in the Bay Agro-pastoral High Potential Livelihood Zone, stimulating their consumption, activities and exchanges with the rest of the economy. The undertaken structural path analysis, applied to a suitably design household economy matrix, has allowed us to identify the channels through which the effects of a cash-based programme are transmitted in the economy of a poor household, as well as their concentration, strength and speed.

The results reported in this paper show that the fastest reaction of a poor household to additional income is the purchase of food and non-food items and the increase in its production of cereals and livestock products for own consumption. These transmission channels are found along the shortest elementary paths, all with one arc.

Thus, a cash-based programme has the potential capacity to support the targeted poor household's ability to obtain food through trade-based entitlement and from own production. This effect is the positively intended objective of the cash-based interventions in the investigated area where food insecurity is primarily related to food access. The recent food crises have indicated that while food was available in the market, poor households could not afford it due to their position of weakened livelihood (Dunn et al., 2013). However, it is not only food access that may be a problem for a poor household's food security. In fact, our analysis suggests that its access to capital and intermediate inputs can also be limited, negatively affecting the production of cereals and livestock products for own consumption. This aspect is even more important if we consider the fact that household food security relies primarily on these sources of food.

The results provided by the structural path analysis show that a cash-based intervention has the potential capacity to affect the household's creditworthiness and human capital, contributing to building the poor household's resilience to future shocks. However, lack of human health services

and education for children are among the major constraints in this livelihood zone (FSNAU, 2009a).

Thus, we may expect that these poles do not transmit influence well.

The empirical investigation has also underscored the important role of the interaction between a poor household and the rest of the economy for the household and general development. Additional demand by the poor household activates production by the local economy (i.e., Extra-household activities) with consequent benefits in terms of new labour opportunities and factor income. On the other hand, the resulting increased expenditure capacity of the rest of the economy stimulates the poor household crops, livestock and livestock products activities.

This aspect is under-evaluated in the response analyses that despite the number of tools available tend to be decision-specific or sector-specific (Maxwell et al., 2013). Our results show that the relationship between recovery, poverty and food insecurity depends not only on the characteristics of a local economy but also on the households' structural features, which define the size and the nature of economic linkages between its production, consumption and exchange activities.

The poor household's demand for vegetable oil and sugar is the most responsible for activating the mechanisms mentioned above. Thus, household access to these staple food items should be carefully evaluated during the cash-based programming phase.

Another aspect that deserves special attention in this stage is represented by the job opportunities available in Extra-household activities or, more generally, the possible agricultural development in the local economy stimulated by the greater expenditure capacity of the poor household. In fact, this sector potentially absorbs the larger share of additional household labour stimulated by the investigated typology of intervention.

This paper also contributes to the considerable ongoing debate in the literature on food aid effectiveness toward achieving the goal and, within this debate, on the adverse unintended effects (for a review see, for example, Barret, 2006). In fact, our analysis suggests that the unintended consequences of cash-based interventions may depend not only on unwitting behaviour by households that creates disincentives to undertake the intended actions but also on poles that do not

relay influence well. In this respect, the suggested analytical approach helps to identify and anticipate the potential negative consequences of these bottlenecks in some aspects of the household and local economy.

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Figure 1 - Flow-chart of the normal economy of a poor household in Bay Agro-pastoral Livelihood Zone

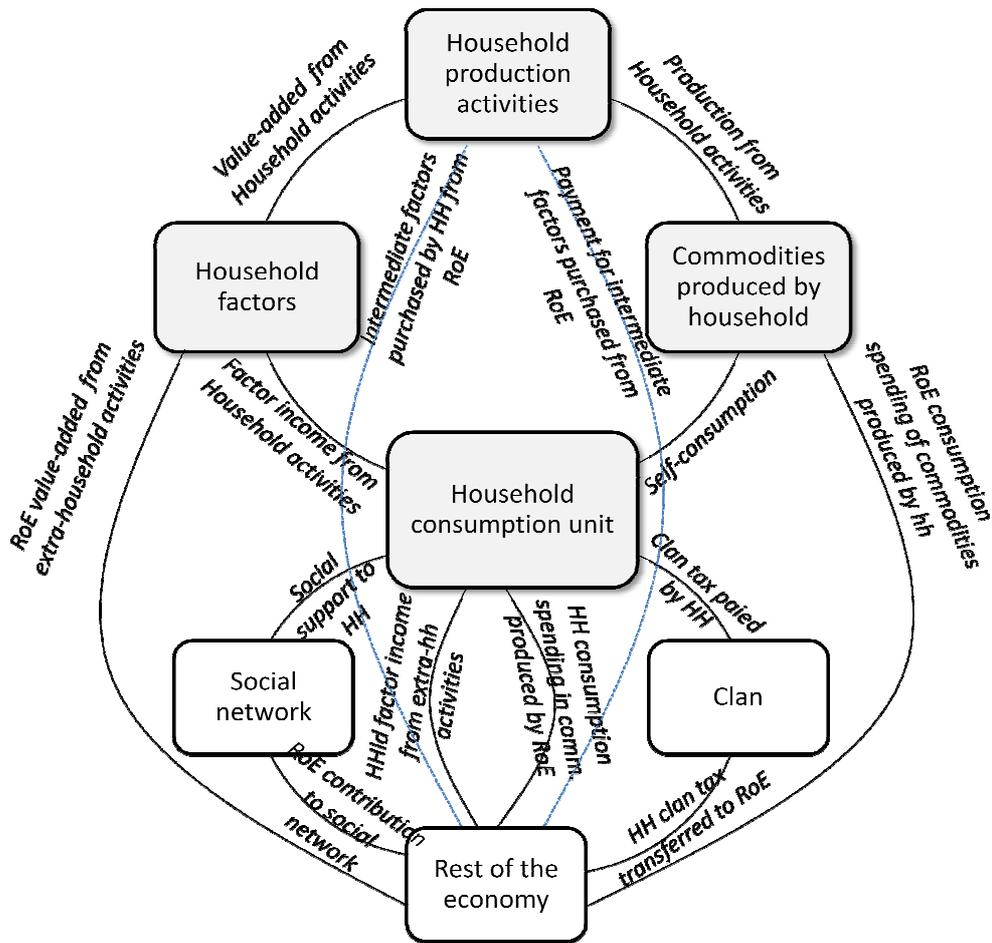


Figure 2 - Total demand composition of a poor household

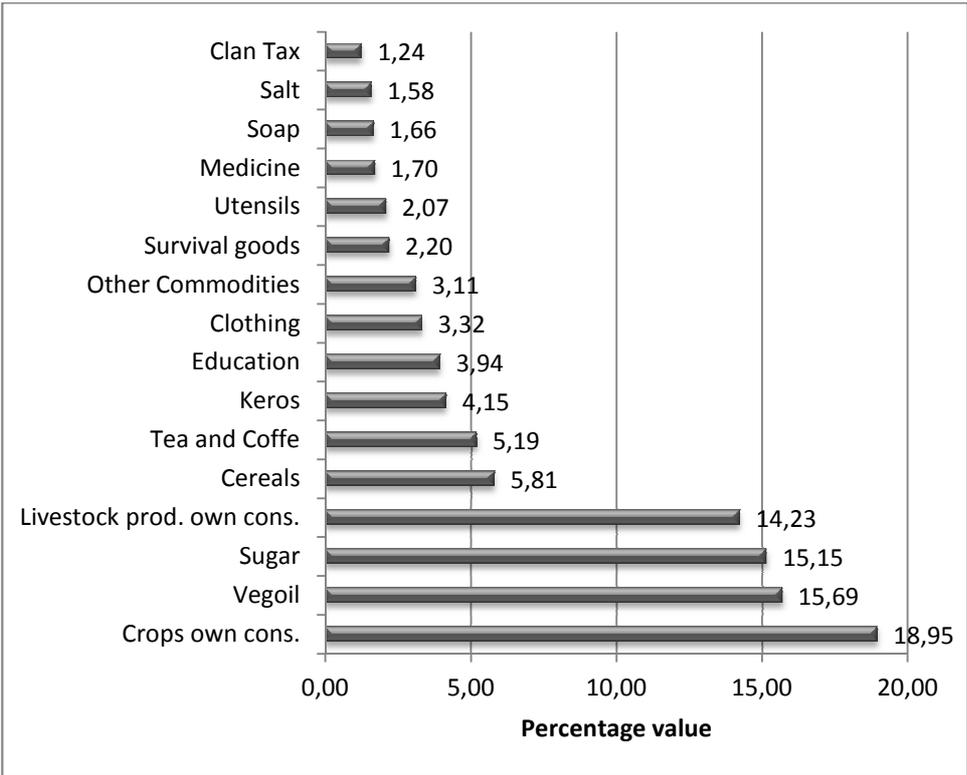


Figure 3 - Elementary paths and circuits

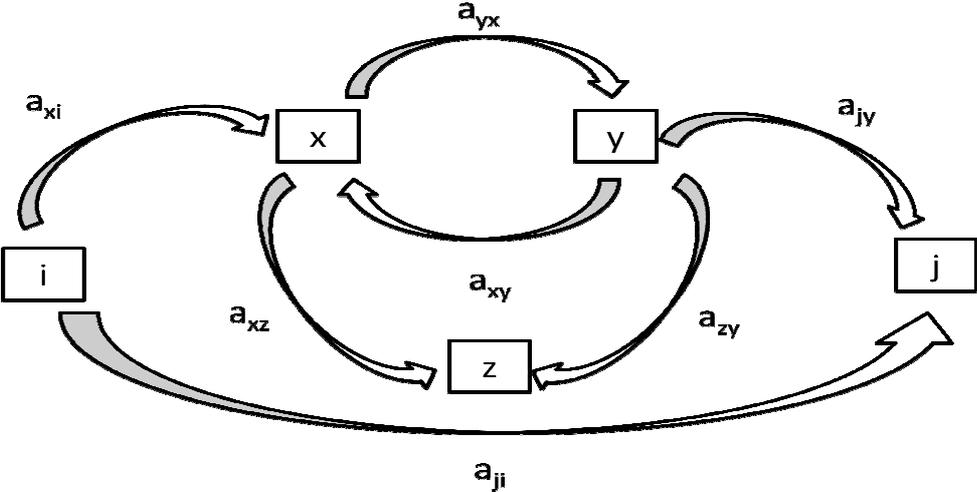


Figure 4 – Summary of the elementary paths with household non-agricultural activity, livestock activity and extra-household activities as destination accounts.

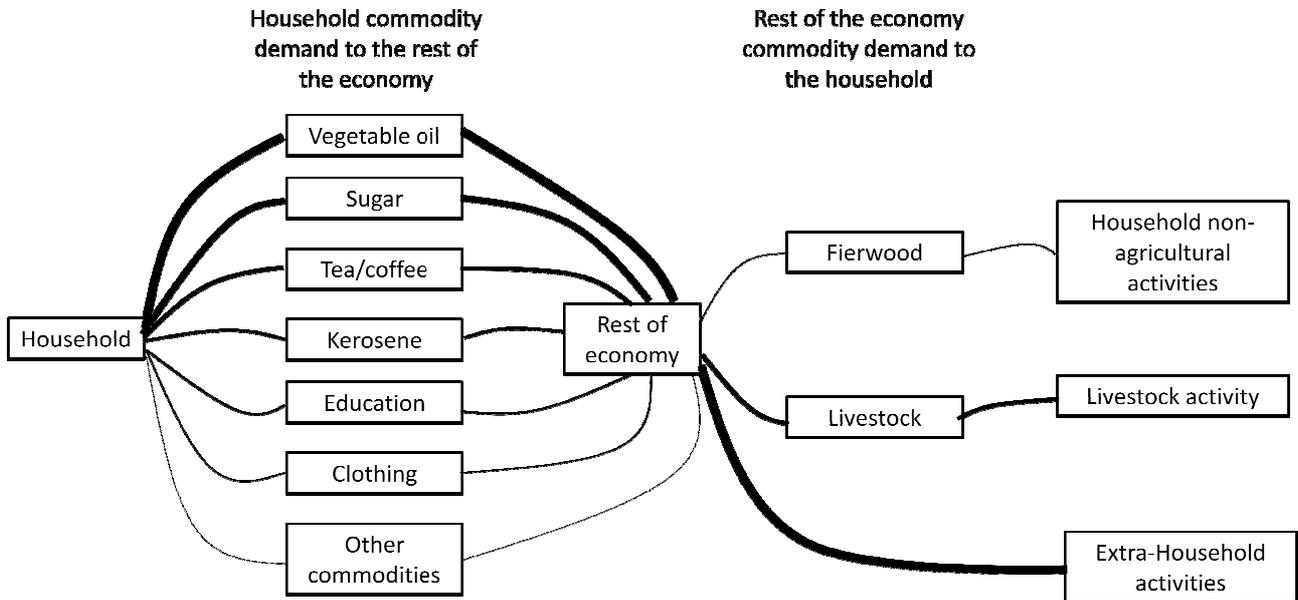


Table 1 - Macro-structure of the Household Economy Matrix (Somali Shillings)

	Activities	Commodities	Factors of production	Household	Rest of the economy	Clan	Social network	Total
Activities	0	1,657 (Marketed HH output)	0	1,599.5 (Home consumed output)	1,668 (Marketed RoE output)	0	0	4,924.5 (Total income)
Commodities	185 (Intermediate inputs)	0	0	3,160 (HH consumption)	1,377 (HH primary market sales)	0	0	4,722 (Total demand)
Factors of production	4,739.5 (Value added)	0	0	0	0	0	0	4,739.5 (Tot. receipts from factor income)
Household	0	0	4,739.5 (HH factor income)	0	0	0	80 (Transfers to HH)	4,819.5 (Tot. HH income)
Rest of the economy	0	3,065 (HH market purchasing)	0	0	0	60 (Transfer to the RoE)	0	3,125 (Tot. RoE receipts from HH)
Clan	0	0	0	60 (Clan tax)	0	0	0	60 (Tot. SN receipts from HH)
Social network	0	0	0	0	80 (Transfers to SN)	0	0	80 (SN receipts)
Total	4,924.5 (HH gross output)	4,722 (Tot. HH activities supply)	4,739.5 (Tot. factor spending)	4,819.5 (Tot. HH spending)	3,125 (Tot. RoE spending)	60 (Clan transfers)	80 (SN transfers)	

Note: HH=Household; SN=Social network; RoE=Rest of the economy

Table 2 – Aggregated and detailed accounts of the Household economy matrix

Aggregated account	Detailed accounts	Aggregated account	Detailed accounts
Activities	Crops	Commodities	Firewood
	Livestock products		Livestock
	Livestock		Clothing
	Household non-agricultural activities		Education
	Extra-household activities		Medicine
Commodities	Cereal	Factors of production	Other commodities
	Food livestock products		Animal drugs
	Sugar		Seeds
	Vegetable oil	Institutions	Household labour
	Survival goods		Capital
	Tea/coffee	Household	Household
	Salt for Humans		Rest of the economy
	Soap		Clan
	Kerosene		Social network
	Utensils		

Table 3 – Base line and global influence

	Global influence		
	Baseline (A)	Somali Shelling (B)	Percentage change (B*100/A)
Activities	4,924.5	35.14	0.7136
Commodities	4,722.0	33.85	0.7169
Factors	4,739.5	33.88	0.7148
Rest of the economy	3,125.0	22.13	0.7082

Table 4 – Global influence (I^G), concentration index (CI), and number of elementary paths (N. $(i \rightarrow j)_p$) by destination account

Destination account	$I^G_{(i \rightarrow j)_p}$	CI	N. $(i \rightarrow j)_p$	Destination account	$I^G_{(i \rightarrow j)_p}$	CI	N. $(i \rightarrow j)_p$
Activities				Utensils	0.72	100.00	1
Crops	10.38	64.13	7	Firewood	1.77	25.00	14
Livestock products	7.14	69.51	11	Livestock	4.04	25.00	14
Livestock	4.04	25.00	14	Clothing	1.16	100.00	1
Household non agricultural activities	1.77	25.00	14	Education	1.37	100.00	1
Extra-household activities	11.81	25.00	14	Medicine	0.59	100.00	1
Commodities				Other commodities	1.08	100.00	1
Cereals	3.79	53.91	14	Intermediate inputs commodities			
Livestock products	2.18	25.00	14	Animal drugs	0.14	38.58	19
Sugar	5.27	100.00	1	Seeds	1.19	64.13	7
Vegetal oil	5.46	100.00	1	Factors			
Survival goods	0.77	100.00	1	Labour	19.09	15.47	20
Tea and coffee	1.81	100.00	1	Capital	14.72	29.06	13
Salt	0.55	100.00	1	Rest of the economy			
Soap	0.58	100.00	1	Rest of economy	22.13	25.00	14
Kerosene	1.44	100.00	1				

Table 5 – Direct influence and multiplier path – Origin account: Household; Destination account: Commodities with CI=100

Case n.	Elementary Paths*	$I_{(i \rightarrow j)_p}^D$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^T} = \frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^G}$
1	Household / CVegetable oil	0.1569	34.804
2	Household / CSugar	0.1515	34.805
3	Household / CTeacoffee	0.0519	34.794
4	Household / CKerosene	0.0415	34.810
5	Household / CEducation	0.0394	34.832
6	Household / CClothing	0.0332	34.810
7	Household / COtherC	0.0311	34.839
8	Household / CSurvival goods	0.0220	34.805
9	Household / CUtensils	0.0207	34.894
10	Household / CMedicine	0.0170	34.841
11	Household / CSoap	0.0166	34.813
12	Household / CSalt for Humans	0.0158	34.747

* The prefix C abbreviates commodities, i.e. the aggregate account of reference

Table 6 – Structural path analysis: Household as origin account and cereals as destination account

Case n. and destination account	Elementary Paths*	$I_{(i \rightarrow j)_p}^D$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^T}$	$I_{(i \rightarrow j)_p}^T$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^G}$
13. CCereals	1. Household / CCereals	0.0581	35.133	2.0412	53.91
	2. Household / CVegetable oil / Rest of Economy / CCereals	0.0125	35.272	0.4409	11.64
	3. Household / CSugar / Rest of Economy / CCereals	0.0121	35.182	0.4257	11.24
	4. Household / Cteacoffee / Rest of Economy / CCereals	0.0041	35.561	0.1458	3.85

* The prefix C abbreviates commodities, i.e. the aggregate account of reference

Table 7 – Structural path analysis: Household as origin account and activities as destination accounts

Case n. and destination account	Elementary Path*	$I_{(i \rightarrow j)_p}^D$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^T}$	$I_{(i \rightarrow j)_p}^T$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^G}$
14. ACrops	1. Household / ACrops	0.1895	35.141	6.6593	64.13
	2. Household / CCereals / ACrops	0.0581	35.133	2.0412	19.66
15. ALivestock products	1. Household / ALivestock products	0.1423	34.860	4.9606	69.51
	2. Household / CVegetable oil / Rest of Economy / CLivestock products / ALivestock products	0.0155	35.181	0.5453	7.64
	3. Household / CSugar / Rest of Economy / CLivestock products / ALivestock products	0.0149	35.342	0.5266	7.38
16. ALivestock	1. Household / CVegetable oil / Rest of Economy / CLivestock / ALivestock	0.0286	35.287	1.0092	25.00
	2. Household / CSugar / Rest of Economy / CLivestock / ALivestock	0.0276	35.308	0.9745	24.14
	3. Household / Cteacoffee / Rest of Economy / CLivestock / ALivestock	0.0095	35.126	0.3337	8.27
	4. Household / CKerosene / Rest of Economy / CLivestock / ALivestock	0.0076	35.132	0.2670	6.61
	5. Household / CEducation / Rest of Economy / CLivestock / ALivestock	0.0072	35.222	0.2536	6.28
	6. Household / CClothing / Rest of Economy / CLivestock / ALivestock	0.0061	35.016	0.2136	5.29
	7. Household / COtherC / Rest of Economy / CLivestock / ALivestock	0.0057	35.123	0.2002	4.96
17. AHHnon-agriculturalA	1. Household / CVegetable oil / Rest of Economy / CFirewood / AHHnon-agriculturalA	0.0125	35.408	0.4426	25.00
	2. Household / CSugar / Rest of Economy / CFirewood / AHHnon-agriculturalA	0.0121	35.322	0.4274	24.14
	3. Household / CTeacoffee / Rest of Economy / CFirewood / AHHnon-agriculturalA	0.0041	35.707	0.1464	8.27
	4. Household / CKerosene / Rest of Economy / CFirewood / AHHnon-agriculturalA	0.0033	35.485	0.1171	6.61
	5. Household / CEducation / Rest of Economy / CFirewood / AHHnon-agriculturalA	0.0032	34.750	0.1112	6.28
	6. Household / CClothing / Rest of Economy / CFirewood / AHHnon-agriculturalA	0.0027	34.704	0.0937	5.29
	7. Household / COtherC / Rest of Economy / CFirewood / AHHnon-agriculturalA	0.0025	35.120	0.0878	4.96
18. AExtraHHA	1. Household / CVegetable oil / Rest of Economy / AExtraHHA	0.0837	35.286	2.9534	25.00
	2. Household / CSugar / Rest of Economy / AExtraHHA	0.0808	35.295	2.8518	24.14
	3. Household / Cteacof / Rest of Economy / AExtraHHA	0.0277	35.256	0.9766	8.27
	4. Household / CKerosene / Rest of Economy / AExtraHHA	0.0222	35.194	0.7813	6.61
	5. Household / CEducation / Rest of Economy / AExtraHHA	0.0210	35.343	0.7422	6.28
	6. Household / CClothing / Rest of Economy / AExtraHHA	0.0177	35.311	0.6250	5.29
	7. Household / COtherC / Rest of Economy / AExtraHHA	0.0166	35.301	0.5860	4.96

* The prefix C abbreviates commodities, i.e. the aggregate account of reference, A abbreviates the aggregate account Activities while HH stands for household

Table 8 - Structural path analysis: Household as the origin account and primary factors and intermediate inputs as destination accounts

Case n. and destination account	Elementary Path	$I_{(i \rightarrow j)_p}^D$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^T}$	$I_{(i \rightarrow j)_p}^T$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^G}$
Primary factors					
19. HHLabor	1. Household / CVegetable oil / Rest of Economy / AExtraHHA / HHLabor	0.0837	35.286	2.9534	15.47
	2. Household / CSugar / Rest of Economy / AExtraHHA / HHLabor	0.0808	35.295	2.8518	14.94
	3. Household / ACrops / HHLabor	0.0461	35.150	1.6204	8.49
	4. Household / ALivestock products / HHLabor	0.0400	34.810	1.3924	7.29
	5. Household / CTeacoffee / Rest of Economy / AExtraHHA / HHLabor	0.0277	35.256	0.9766	5.12
	6. Household / CKerosene / Rest of Economy / AExtraHHA / HHLabor	0.0222	35.194	0.7813	4.09
20. Capital	1. Household / ACrops / Capital	0.1217	35.145	4.2772	29.06
	2. Household / ALivestock products / Capital	0.1008	34.854	3.5133	23.87
	3. Household / CCereals / ACrops / Capital	0.0373	35.147	1.3110	8.91
	4. Household / CVegetable oil / Rest of Economy / CLivestock / ALivestock / Capital	0.0170	35.206	0.5985	4.07
Intermediate inputs					
21. CAnimal drugs	1. Household / ALivestock products / CAnimal drugs	0.0016	34.438	0.0551	38.58
	2. Household / CVegetable oil / Rest of Economy / CLivestock / ALivestock / CAnimal drugs	0.0005	31.800	0.0159	11.17
	3. Household / CSugar / Rest of Economy / CLivestock / ALivestock / CAnimal drugs	0.0004	38.500	0.0154	10.78
	4. Household / CVegetable oil / Rest of Economy / CLivestock products / ALivestock products / CAnimal drugs	0.0002	30.000	0.006	4.23
	5. Household / CSugar / Rest of Economy / CLivestock products / ALivestock products / CAnimal drugs	0.0002	29.000	0.0058	4.08
22. CSeeds	1. Household / ACrops / CSeeds	0.0217	35.101	0.7617	64.13
	2. Household / CCereals / ACrops / CSeeds	0.0066	35.379	0.2335	19.66
	3. Household / CVegetable oil / Rest of Economy / CCereals / ACrops / CSeeds	0.0014	36.000	0.0504	4.25
	4. Household / CSugar / Rest of Economy / CCereals / ACrops / CSeeds	0.0014	34.786	0.0487	4.10

* The prefix C abbreviates commodities, i.e. the aggregate account of reference, A abbreviates the aggregate account Activities while HH stands for household

Table 9 - Structural path analysis: Household as origin account and primary factors and Rest of the economy as destination accounts

Case n. and destination account	Elementary Path	$I_{(i \rightarrow j)_p}^D$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^T}$	$I_{(i \rightarrow j)_p}^T$	$\frac{I_{(i \rightarrow j)_p}^D}{I_{(i \rightarrow j)_p}^G}$
23. Rest of Economy	1. Household / CVegetable oil / Rest of Economy	0.1569	35.26	5.5331	24.99
	2. Household / CSugar / Rest of Economy	0.1515	35.26	5.3428	24.13
	3. Household / CTeacoffee / Rest of Economy	0.0519	35.25	1.8297	8.26
	4. Household / CKerosene / Rest of Economy	0.0415	35.27	1.4638	6.61
	5. Household / CEducation / Rest of Economy	0.0394	35.29	1.3906	6.28
	6. Household / CClothing / Rest of Economy	0.0332	35.27	1.1710	5.29
	7. Household / COtherC / Rest of Economy	0.0311	35.29	1.0978	4.96

* The prefix C abbreviates commodities, i.e. the aggregate account of reference,