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Farm viability of (semi)subsistence smallholders in Sierra Leone

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Abstract

This paper explores how different theoretical viewpoints on market integration and socio-institutional settings alter farm viability assessments based on (semi)subsistence farm income measurements. The measurement of net farm income (NFI) is presented under two approaches: one based on Neoclassical Economics, and another from a Neo-Institutional perspective. Using data from Sierra Leone it is demonstrated that the assumptions about (output and input) market integration/participation, labour usage accounting and other institutional arrangements of (semi)subsistence farming affect NFI calculations. As a consequence, different farm viability readings emerge, directly influencing the outcome of policy decisions.

Key words: net farm income measurement; (semi)subsistence farming; viability assessment; Sierra Leone

1. Introduction

The condition of being viable (or not) is commonly considered crucial for evaluating sector performance, discussing economic conditions or designing effective technical assistance packages. In the context of agrarian economies characterised by (semi)subsistence farming, net farm income (NFI) becomes a fundamental (yet complex to measure) indicator in farm viability assessment. The objective of this paper is to illustrate how different assumptions around NFI calculations can lead to substantially different viability assessments of (semi)subsistence farmers. Evidence is drawn from the experiences of farm households in the Republic of Sierra Leone.

The paper is structured as follows: Section 2 introduces the agrarian context, describes the sample and the agronomic and socio-economic practices of the surveyed smallholders in Sierra Leone. Section 3 addresses the theoretical framework and method used to assess farm viability. It also explains the different assumptions that can be adopted to capture the circumstances of (semi)subsistence farmers, which often diverge from the theoretical conditions of perfect competition. Section 4 discusses the results, while Section 5 concludes with recommendations for measuring NFI and analysing the farm viability of smallholders in low-income countries.

2. Agrarian context and survey of Sierra Leone

The present case study of smallholders in Sierra Leone is based on primary data (collected through face-to-face surveys¹) and enriched with available secondary data from statistics and technical literature review. In the survey, a farm household was defined as a social unit in which members share the same abode or hearth and pool resources for farming activities (Ellis 2000). In the case of Sierra Leone, a farm household is a subset of an extensive family. A total of 600 smallholders (i.e. farm household heads) located in the Northern and Eastern Regions of the country were surveyed. The sample represents the two main agricultural areas in the country: food crop cultivation (largely rice growers concentrated in the Northern Region and accounting for two thirds of the sample) and cash tree cropping (i.e. coffee and cocoa in the Eastern Region)².

Crop orientation is largely determined by the existing agro-ecologies. The lowlands in the Northern Region are highly suitable for flooded rice production, while the uplands (rainforest) in the Eastern Region are appropriate for coffee and cocoa cultivation. Staple crops are also grown in the Eastern Region. Besides the differences in terms of crop orientation and crop mix, plots in the Northern Region are on average smaller than plots in the Eastern Region (0.8 acre per household working unit (HWU)³ in the Northern Region versus 2.5 in the Eastern Region). There also are differences in terms of yields, since Northern rice growers obtain around four bushels per acre, while this goes up to eight bushels of rice per acre in the Eastern Region. The latter is due partially to the higher percentage of output losses registered in the Northern Region (30%) in comparison to the Eastern Region (8%). In both regions, only between 20 and 30% of staple crop output is marketed, while coffee and cocoa outputs are always destined for the market. Farms thus are defined as (semi)subsistence farming because a large percentage of staple crop output is destined for self-consumption (around 70 to 80%).

Despite the outlined dissimilarities between the two surveyed regions, smallholders in Sierra Leone generally practise the 'shifting cultivation' system for most of their food cropping. This system is heavily threatened by decreasing fallow periods. According to the Government of Sierra Leone (NSADP 2009), a key feature explaining low yields relates to the marked decline of idle periods, which are needed for forest regeneration and renewal of fertility. Currently, these idle periods vary between four and seven years instead of the required length of 25 to 30 years (NSADP 2009). This situation has a negative impact on soil fertility. Another widespread condition is that only the most basic agricultural tools (e.g. hand hoes) are available and transport infrastructure is considered largely inadequate. Storage and processing facilities are also deemed highly insufficient.

In Sierra Leone it is common for (semi)subsistence farmers to organise labour groups within their immediate community in order to look after the different plots. These labour groups are usually composed of (male) workers belonging to different farm households, in many cases living in the same village. Smallholders maintain strong social ties, which allow them to secure access to other inputs such as seeds. In fact, up to one fourth of their seeds are said to be supplied under a form of barter (SLIHS 2007). The exchange of the abovementioned inputs can be seen as a representation of

¹ The survey data was obtained from the assessment of the European Union STABEX-funded projects in Sierra Leone, which had the aim of reducing poverty and food insecurity of (semi)subsistence producers in rural areas of the country. (Gomez y Paloma *et al.* 2012).

² Sub-sample sizes of the two regions were based on existing population densities for these areas in Sierra Leone.

³ HWU is obtained by adding the total reported numbers of hours devoted by each household member to farm activities and dividing them by the full-time working manpower per year (equal to 1 950 hours as estimated by the ILO (1996) for agricultural sectors). HWU represents all full-time equivalent household labourers per year on a given farm. The working hours of men, women and children were aggregated directly, as activities are usually gender and age specific. For example, children are usually assigned the task of pig or bird watching in order to protect harvests from animal damage. Women are usually in charge of weeding and harvesting, while men tend to focus on plot clearing (i.e. cutting trees, slashing and/or burning).

the existing social capital (Scoones 1998), which is based on the notion of reciprocity. As explained by Ellis (2000), “reciprocity may involve social norms of sharing and redistribution which are designed to ensure that all members of the community survive irrespective of the year to year productive performance of individual households”. Other authors have named this behaviour “the economy of affection” (Hyden 1980) or “the moral economy” (Scott 1976).

Land market transactions (renting, selling or buying) are always supervised by a paramount chief⁴ and are regulated by traditional village rules. For instance, the notion that the enlarged farm household family (including the dead and the unborn) has to agree in land transactions represents a crucial bottleneck (Unruh & Turray 2006). At the same time, yearly land rotation between farm households means that there is not sufficient motivation to put in extra effort or invest in one specific plot.

Another constraint is related to agricultural credit. Access to credit at the farm level is uncommon in Sierra Leone, and costs related to interest on capital are not reported by smallholders in the survey. There are several practical limitations to credit besides supply issues. First, the use of land as collateral would require the written permission of the extended family and therefore is an infrequent event. Second, all potential benefits would also have to be redistributed among relatives, leaving the individual farmer with reduced return for risk taking. Third, the short (one to two years) time horizon of renting agreements inhibits renters’ investments in facilities (such as irrigation, drainage, processing constructions, etc.) and in permanent crops (trees)⁵. All of these issues restrain the growth of land and labour productivity.

In a context where land is not considered to belong to individuals, but rather to the community and extended families, it is not surprising that land markets are largely underdeveloped in Sierra Leone. Labour, the most important production factor, is also perceived to be common and shared. In fact, most assets are perceived to have a common value and are thus frequently shared beyond strict household boundaries (this includes seeds, tools, etc.). These aspects have an impact in terms of assigning a value to labour opportunity cost (including entrepreneurial remuneration) or inputs acquired through barter.

3. Theoretical framework and analytical method to assess farm viability

3.1 Key concepts

NFI measurement, NFI-based indicators and the concept of reproduction threshold are the main tools to conduct farm viability assessments. NFI measurement can be a rather straightforward procedure in the case of well-functioning output and input markets; in other words, when it is possible to establish a clear distinction between consumption and production and when all inputs can be assigned a market value. However, these conditions may not always apply to (semi)subsistence farming.

In the present analysis, NFI is determined on a micro-scale using technical and economic parameters such as yield, off-farm prices of the produce, production costs and depreciation. Policy

⁴ The chiefdoms of Sierra Leone (149) are the third-level units of administration in the country (after the regions/provinces and districts). Rural lands in Sierra Leone are owned by different families organised under a chieftaincy structure and an internal hierarchy, often with section chiefs at different administrative levels. However, the most important role in relation to land matters, settlement issues and political representation is held by the paramount chief (Fanthorpe 1998; Unruh & Turray 2006).

⁵ As in most of Africa, only land owners may plant trees. Land renters can only engage in the cultivation of short-term seasonal crops (Unruh & Turray 2006).

parameters (taxation⁶, subsidies, credits and market policies) are not included in the calculation. This method was adapted from FAO (1999), Segrè (1999), Mazoyer and Roudart (2006) and Gomez y Paloma *et al.* (2006), where NFI is obtained by subtracting all input costs (IC), including variable costs (VC) and fixed costs (FC), from gross production value (GPV) for each individual farm household based on the survey results. The steps to calculate NFI are summarised in Appendix 1, along with a brief description of data availability issues for the Sierra Leone survey. For instance, there is an absence of information on interest on capital (borrowed or owned), partly due to the inexistence of formal credit markets in the targeted areas. Similarly, there were no records of reported entrepreneurial or household labour remuneration among the surveyed smallholders. This is related not only to the context in which (semi)subsistence farmers operate (with thin and incomplete labour markets), but also to the non-separability of the production and consumption decisions of the farm household (De Janvry *et al.* 1991; Key *et al.* 2000). However, there is a calculation for depreciation of key assets (such as tools).

For comparison purposes among smallholders, it is useful to present NFI using unitary area coefficients as well as HWU per farm household. This representation results in a linear relationship between NFI per HWU and the area (*A*, measured in acres) worked per HWU (FAO 1999):

$$\frac{NFI}{HWU} = \left(\frac{GPV}{A} - \frac{VC}{A} \right) * \left(\frac{A}{HWU} - \frac{FC}{HWU} \right) \quad (1)$$

Equation (1) provides visual information on the relative viability of smallholders, since a reproduction threshold (RT) may be introduced (Figure 1). In the NFI/HWU-*A*/HWU graph, the reproduction threshold (RT) is a horizontal line corresponding to the minimum NFI, below which farmers are not able to pay for all inputs adequately and to completely restore capital productivity in order to begin the new production cycle in the same way they previously did (FAO 1999; Segrè 1999). The concept of reproduction threshold refers to Marx's definition of social reproduction, which may be of two kinds – simple reproduction and expanded reproduction. In the case of an agrarian community, simple reproduction refers to keeping aside enough of the previous season's crop for sowing in the next season, and securing a proportion of labour time for repairing and maintaining the existing means of production. Expanded reproduction refers to the "extra" production utilised to raise output still further over time. In other words, it requires the investment of this extra output in new means of production (Ellis 1996).

⁶ Smallholders in the survey are not subject to agricultural taxation (Jalloh 2006).

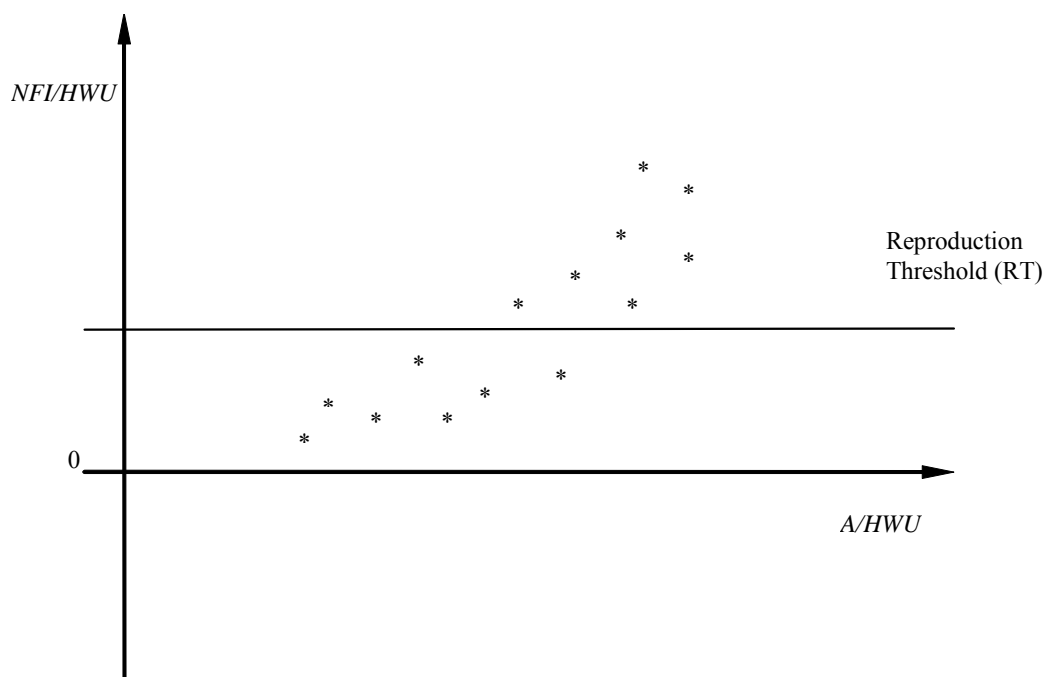


Figure 1: NFI per HWU and area per HWU

3.2 Two theoretical approaches to NFI measurement

There are challenges related to NFI measurement that are accentuated in low-income areas. First, it is difficult to assign value to the self-consumption of farm output. Second, there is the question of how to calculate opportunity cost in the absence of functioning markets, particularly when it comes to household labour use. The latter is even more cumbersome when imputing any remuneration to entrepreneurial endeavours. Third, there are problems accounting in monetary terms for community labour-sharing or exchange schemes that may entail socialising as well as working to an uncertain degree.

Often farmer groups report very large amounts of labour to complete a given task, especially when the task was carried out by a gang or collective group. It may be that in these cases the task in question was completed in less than a full working day, or it may be that the pace of work in some groups is relaxed with the work treated as much as an opportunity to socialise as to get the job done, or simply that farmers just over-estimate and over-report the time taken (SLIHS 2007).

In other words, capturing in quantitative terms the nature of reciprocal economy is complex because transactions at the community level are usually non-monetary in nature.

In order to capture and analyse the relative importance of the abovementioned challenges, two approaches or sets of assumptions were developed for estimating smallholders' NFI and conducting farm viability analyses. In the first set of assumptions, the denominated neoclassical approach (NC), market values are used to assign GPV and costs of all inputs employed at the farm level (i.e. labour, seeds, livestock purchases and tools are quantified by taking into consideration observed market wages and prices as reported in the survey). The NC approach embraces the principles of neoclassical economics theory, which assume that farms pursue profit maximisation as any enterprise would, and operate under competitive market conditions (i.e. output/input price takers, high number of suppliers, zero information and transaction costs, markets not influenced by producers/consumers, no entry or exit barriers, etc.).

A second set of assumptions was developed under the peasant farming approach (PF) in order to explicitly consider that farm households in Sierra Leone are embedded in an institutional setting that allows them to reduce the direct and indirect transaction costs associated with hiring labour or obtaining inputs such as seeds. The PF approach takes into account key assumptions introduced by Chayanov (1966) concerning (semi)subsistence smallholders, where it is argued that the goal of a farm household is its own reproduction, via risk minimisation, and utility maximisation rather than profit maximisation. In other words, the PF approach embraces the new institutional economics and rural livelihood perspectives in the sense that social relations and institutions at the community level have an effect on productive activities. As stated by Ellis (2000), these approaches regard the asset status (involving all assets around natural, physical, human, financial and social capital) as fundamental to understanding the strategies poor individuals or households adopt for survival, and their vulnerability to adverse trends and events. At the same time, it is recognised that institutions (as defined by North, 1990) directly shape the ability of individuals to exploit these assets, manage costs and interact in markets.

Next, each NFI component is analysed under the NC and PF measurement approaches. On the side of GPV under both approaches, sales are valued at the observed market price. In the NC approach, consumption and stocks are also valued at the prevailing market price. Under the PF approach, these two components of the output are assumed to be valued at a level 10% higher than the market prices. This 10% was based on the assumption that farm households that need to purchase output have to pay the retail price rather than the market (selling) price. Thus retail price is used as reference price for valuing farm output destined for self-consumption. The price difference of the local and imported rice was taken as a base for the calculations⁷. Several studies deal with the valuation of self-subsistence production (Chibnik 1978; Ellis 1996). The GPV of the staple food frequently was valued near retail price, which is higher than the market price (up to 20 to 40% higher in some cases) (Chibnik 1978). This comes from the fact that farm households prefer to secure a minimum food intake and avoid the risks and uncertainties of future unpredictable market price variations.

In neoclassical theory, all units of time, whether in housework, wage work or leisure, are valued at their opportunity cost in terms of the market wage (Boadway 2006). This means that the marginal valuation of labour is equal to the market wage. However, a highly constrained or non-existent labour market means that household labour cannot be valued effectively at market opportunity wage, thus, in the PF approach, it is assumed to be close to zero. This follows earlier approaches already applied to similar cases and circumstances (Dasgupta *et al.* 1972; Little & Mirrlees 1974; Friedman 1980; Ellis 1996). When there is no labour market, the marginal valuation of labour is equal to zero until the value of output reaches the minimum subsistence level, and leisure cannot be valued at any price (Colman & Young 1989). On commercial farms, increases in labour input without concomitant income gains can lead to losses, because profit equals GPV minus outlay on materials, minus wages, minus other payments (e.g. debt interest, land rent, etc.). However, in the case of (semi)subsistence farmers, increases in (family) labour inputs without corresponding increases in income do not necessarily lead to monetary losses because of the absence of wages.

⁷ In rural markets, imported rice would not be traded at all were domestic rice production high enough (Ministry of Finance, Government of Sierra Leone, 2007). The higher price of imported rice in the countryside reflects both transport costs and potentially the stress price paid by rural households whenever their consumption of local rice has been hampered due to local harvest loss or reduced yields.

Price of local vs. imported rice in the rural areas of Sierra Leone per 50 kg bag

	Up-country (rural) price average
Local rice	SLL 66 000
Imported rice	SLL 72 000

Source: Ministry of Finance, Government of Sierra Leone (2007). Data was extracted from fieldwork and interviews carried out in November 2006.

Thus, valuing family labour as equal to the wages of hired workers is nonsensical when considering (semi)subsistence smallholders (Chayanov 1920; on Chayanov's theory, cf. Chibnik 1978). The latter can be further justified by reviewing Ellis's argument that peasant farmers are only "partially integrated into incomplete markets" (Ellis 1996). In fact, there is not only a practically non-existent or extremely constrained labour market, but also a complex institutional setting on which farm households rely for securing other forms of intangible goods and services (i.e. tacit safety nets) in a context of strong social cohesion.

Given the nature of the labour-sharing schemes in Sierra Leone, where a farmer may hire labour one day and on another day go to work on other plots as hired labour, it can be assumed that labour exchanges in the community level out and balance on a yearly basis. By following this practice, hired labour may also be assumed at zero wages in income calculations under the PF approach when it comes to food cropping. In the case of cash tree cropping, it is common to pay in monetary terms rather than through exchanges, mainly because labour shortages occur during peak collection periods (Sesay *et al.* 2004). Thus, a wage is allocated under the two NFI measurement approaches for hired labour under cash tree crop cultivation⁸. Seeds are taken into account for their entire value (independent of whether or not cash was involved in the transaction) under both income calculation approaches⁹. Fixed costs were calculated in the same way for both NFI measurement approaches. Table 1 summarises key assumptions under the NC and PF approaches.

Table 1: Comparative summary of assumptions of two NFI measurement approaches

	NC approach	PF approach
Objective	Profit maximisation	Reproduction of farm activity; risk minimisation; utility maximisation
Market assumption	Competitive markets	Competitive output/product market and no labour market
Gross production value		
Sales	Market price	Market price
Consumption & stocks	Market price	10% higher than market price
Input costs		
Household labour	Wage (Opportunity cost)	No cost (Opportunity cost = 0)
Hired labour	Wage	No cost – Food cropping Wage – Cash tree cropping
Seeds	Market price	Market price
Livestock purchase	Market price and depreciation cost	Market price and depreciation cost
Tools	Market price and depreciation cost	Market price and depreciation cost
Land rent	Market price equivalent of bushels of rice paid	Market price equivalent of bushels of rice paid

4. Results

4.1 Overview of NFI calculations

Table 2 presents the NFI structure as percentages of total output and total cost respectively for an average smallholder at regional level under both approaches. It portrays only the NFI components for which data was available in the Sierra Leone Survey (see Appendix 1). The analysis of NFI components in percentages of GPV shows that the PF assumption of setting a 10% higher than market price level for self-consumption and stocks does not generate a substantial difference between the two approaches. On the side of input costs, the assumptions on how to account for

⁸ Average rural wage per day in Sierra Leone (including meals) is equal to SLL 7 000.

⁹ However, in the case that a cash income calculation at farm level was undertaken, it should take into account that approximately ¼ of the seeds were acquired without entering into monetary exchange (SLIHS 2007).

household and hired labour represent the crucial difference between the NC and PF approaches. In the case of the NC approach, variable costs account for over 90% of total costs in both regions, with labour representing the largest cost. Under the PF approach, variable and fixed costs are more evenly distributed. While costs for seeds represent the main components in the Northern Region, in the Eastern Region hired labour for tree cropping is the most important cost. The differences between the NC and PF approaches highlight the great importance of household and hired labour (win or outside labour exchange regimes) in the accounting of farm costs.

Table 2: Gross production values and input costs disaggregation for an average smallholder per region under the NC approach and the PF approach (in %)

	Northern region	Eastern region		Northern region	Eastern region
Gross production value (NC)	100.00	100.00	Input costs (NC)	100.00	100.00
Gross production value (PF)	100.00	100.00	Input costs (PF)	100.00	100.00
Value of sales (NC)	32.61	65.05	Variable costs (NC)	90.76	94.30
Food crop	23.40	4.18	Seeds food	8.32	4.46
Tree crop	6.94	60.22	Seeds tree	0.16	9.35
Livestock	2.27	0.65	Hired labour food	33.58	13.74
Value of consumption (NC)	28.31	17.13	Hired labour tree	8.84	14.16
Food crop	24.05	7.14	Household labour †	39.85	52.60
Tree crop	2.47	9.83	Fixed costs (NC)	9.24	5.70
Livestock	1.79	0.16	Land rent	0.01	0.01
Value of stocks (NC)	39.07	17.82	Tools*	3.28	3.21
Food crop	37.27	6.59	Livestock purchases*	5.94	2.48
Tree crop	1.81	11.23	Variable costs (PF)	47.87	83.07
Value of sales (PF)	30.55	62.85	Seeds tree	0.91	27.76
Food crop	21.93	4.04	Seeds food	46.96	13.26
Tree crop	6.50	58.18	Hired labour tree	0.00	42.05
Livestock	2.13	0.63	Fixed costs (PF)	52.13	16.93
Value of consumption (PF)	29.18	18.21	Land rent	0.08	0.02
Food crop	24.79	7.59	Tools*	18.51	9.55
Tree crop	2.54	10.45	Livestock purchases*	33.53	7.36
Livestock	1.85	0.17			
Value of stocks (PF)	40.27	18.94			
Food crop	38.41	7.00			
Tree crop	1.86	11.94			

* Annual depreciation has been accounted for. Refer to Appendix 1 for details.

† Includes livestock maintenance costs. Refer to Appendix 1 for details.

Figures 2, 3 and 4 show annual NFI per average farm, per acre and per HWU in leones (SLL) and aggregated by region under the NC and PF approaches. Under the NC approach, the Northern Region always appears to have a large negative annual NFI, while this is not the case under the PF approach. Interestingly, both approaches tend to converge when it comes to farmers in the Eastern Region, who are the ones less dependent on labour-sharing schemes and far more integrated into the output markets of coffee and cocoa.

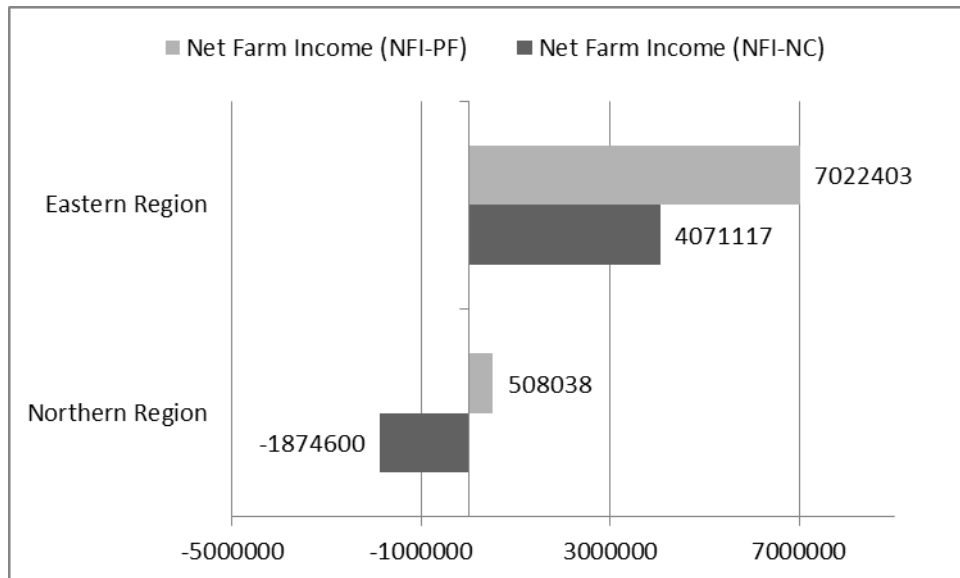


Figure 2: Annual average NFI per farm under the NC approach and the PF approach by region (in SLL)

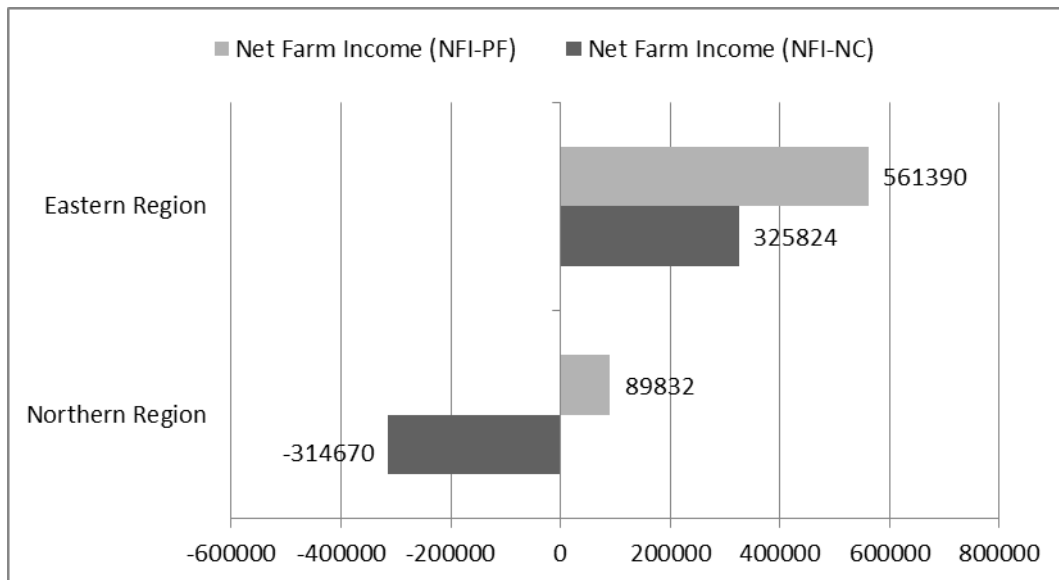


Figure 3: Annual average NFI per acre under the NC approach and the PF approach by region (in SLL)

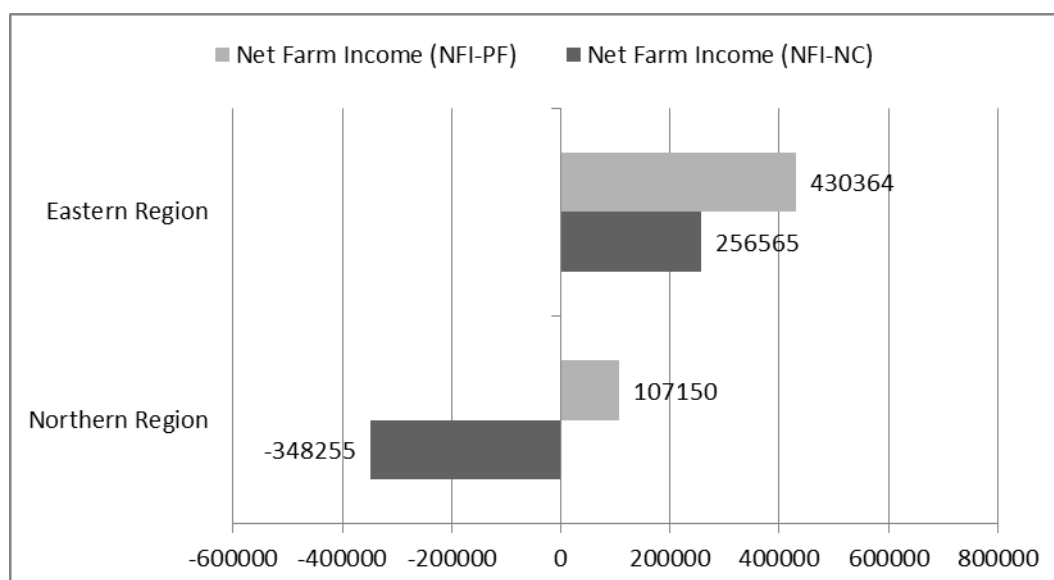


Figure 4: Annual average NFI per HWU under the NC approach and the PF approach by region (in SLL)

4.2 Farm viability assessments and policy implications

The concept of reproduction threshold (RT) is employed for assessing the viability of different farming or production systems (FAO 1999). As mentioned, the RT is the minimum NFI per HWU that would allow a farmer to pay for all inputs, restore capital productivity and begin a new production cycle. The RT refers to the reproduction of family manpower and the means of production. A negative difference between RT and the NFI per HWU implies that the farming system in question is not economically viable and risks going out of business. In such situations, and without any additional off-farm income, farms can survive only in the short run (few agricultural cycles) by underpaying labour and/or by not replacing the capital depreciation. In the medium to long run, however, these survival strategies will inevitably exclude some farms from the market and imply their collapse.

RTs differ by region within the same country, particularly if such regions are characterised by different crop portfolios, market integration, input usage, infrastructure, on/off-farm job opportunities and technology access. These components influence the way in which production and opportunity costs are calculated. For the two regions of the Sierra Leone survey, two different RTs were identified and farm viability assessments were undertaken separately. For the Northern Region, where farmers have hardly any opportunity to secure an agricultural wage (outside community labour sharing/exchange schemes), it was assumed that the RT (North) is equal to zero. In other words, as long as farmers manage to cover farm input costs, the farm activity will be deemed viable since no other labour engagement is readily available to serve as a replacement or alternative. For the Eastern Region, where some agricultural work outside the own farm can be found during the collection periods of cash tree crops, RT (East) was set at the average annual agricultural wage locally attainable, equal to SLL 700 000¹⁰.

A positive difference between NFI and RT (North or East) indicates that the farm provides (i) a minimum satisfactory livelihood for the farmer and (ii) a basic coverage of farm costs in the Northern Region or a surplus of capital accumulation in the Eastern Region. A negative difference

¹⁰ The approximate days of the agricultural working opportunity in the Eastern Region correspond to 80 to 100 working days per year (the average collection period for coffee cherries and cocoa pods), which is then multiplied by the average rural wage per day in Sierra Leone (including meals) = SLL 7 000 (SLIHS 2007).

means that the farm does not provide an investment opportunity or an acceptable living standard that could supply a minimum level of self-consumption. Hence, the farm is not viable.

Under highly constrained scenarios (i.e. no labour opportunities, high food insecurity and price volatility, no market access), farmers will not have any other choice but to adopt unviable farming systems and undertake complementary off-farm activities when available or possible (FAO 1999). In such circumstances, the farmer is said to depend on alternative sources of income in order to maintain farm activities that secure a minimum self-consumption level. In this sense, the comparison of NC or PF-NFI calculations against a contextualised reproduction threshold can shed light on the type of livelihood strategy implemented by the farm household, given their socio-economic regional context.

Figures 5, 6, 7 and 8 illustrate farm viability under the PF and NC NFI calculation approaches for the Northern and Eastern regions respectively. The results illustrate that, depending on the degree of market integration and crop portfolio, farm viability assessments under the two NFI approaches can be either contradictory or similar.

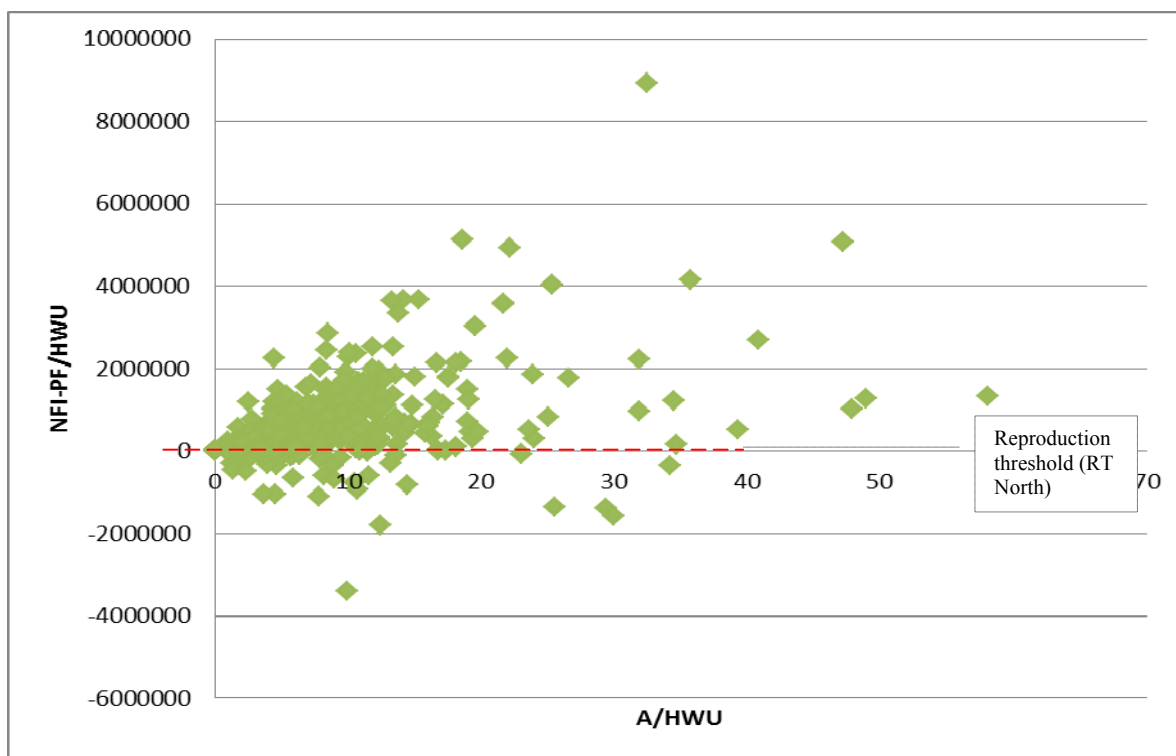


Figure 5: Farm viability of smallholders in the Northern Region – PF approach



Figure 6: Farm viability of smallholders in the Northern Region – NC approach

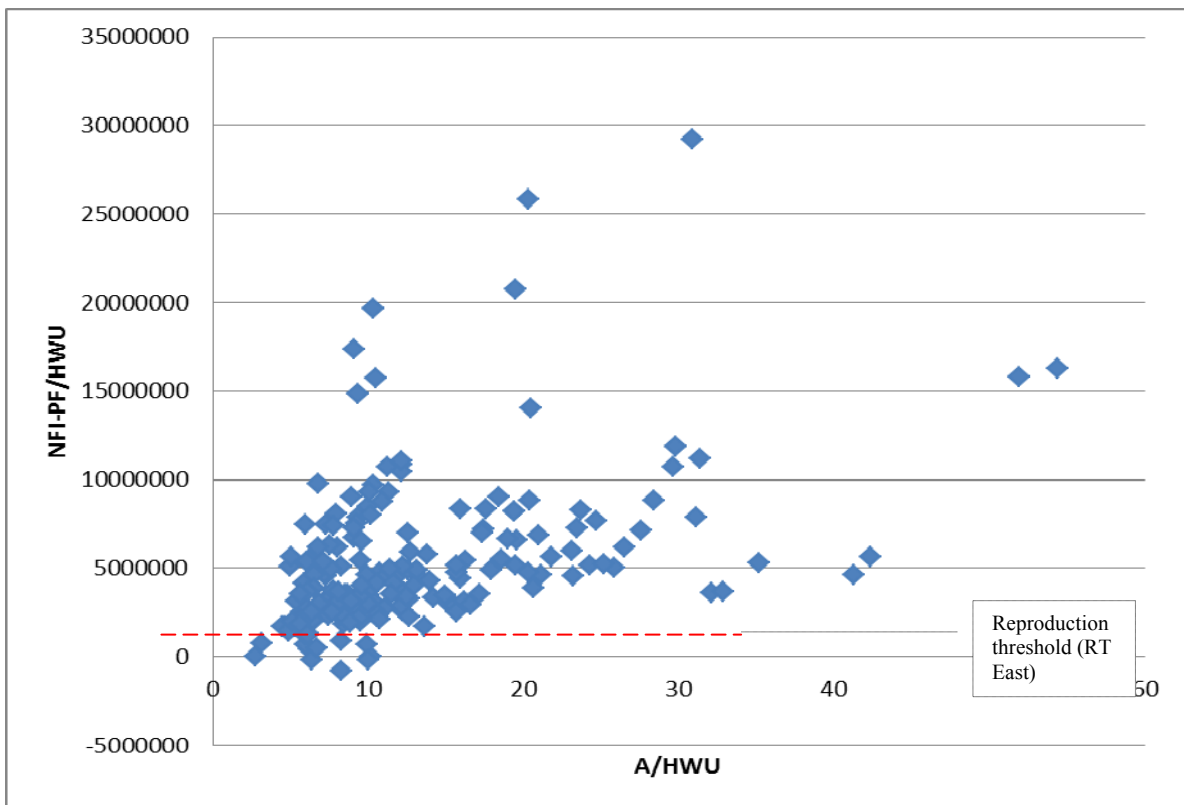


Figure 7: Farm viability of smallholders in the Eastern Region – PF approach

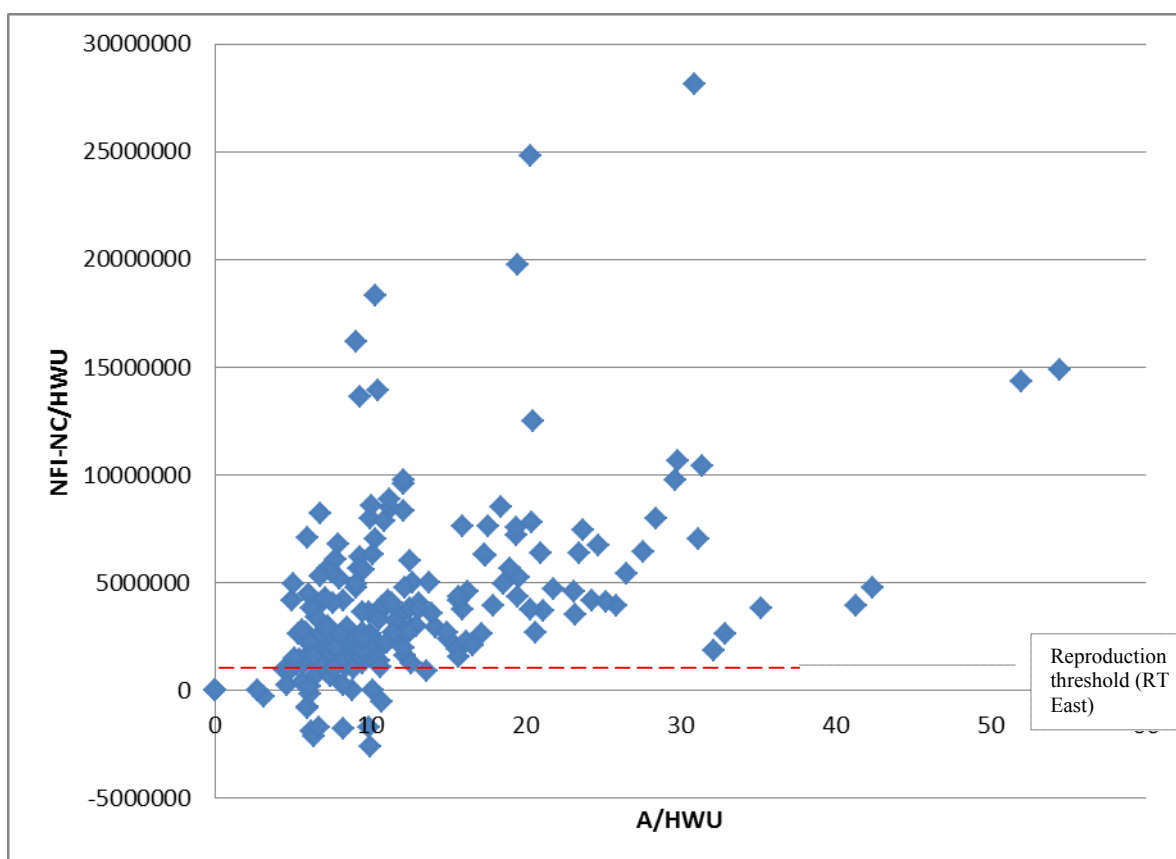


Figure 8: Farm viability of smallholders in the Eastern Region – NC approach

The major differences between the two approaches in terms of viability assessments are found in the Northern Region. It is in this region that the majority of staple farmers (only marginally integrated to markets) are located. Under the PF approach, 86% of the farms in the Northern Region are found to be above the RT, meaning that they are viable, and only 14% fall below this threshold. On the other hand, the NC income calculations show that only 5% of the farm households are above and 95% fall below the RT North. The results obtained from the NC approach suggest that almost all surveyed farms (around 400) in the Northern Region are unviable and likely to collapse in the short run. This result is misleading because it does not reflect the reality of these areas, where smallholders have been engaged in farming annually and producing steadily since the end of the civil conflict in 2002. The PF approach provides an alternative explanation: smallholders in the Northern Region (who are mainly producing staple crops: rice, cassava, vegetables and tubers) are highly dependent on agricultural arrangements established within their communities in order to sustain their farming activities. Their production system is highly dependent on labour as the primary input, and the obtained output is largely aimed at fulfilling self-consumption needs. They are not sufficiently integrated into the market economy (for either input or output) and thus the calculation of NFI under the NC approach does not capture their survival strategies and institutional arrangements, which are pivotal to maintaining agricultural production.

If the assumption of zero opportunity cost for household and hired labour of the PF approach is relaxed in the case of farmers in the Northern Region, the percentage of viable farms may be reduced considerably. For example, if the opportunity cost is changed from 0 to half the average rural wage per day (equal to SLL 7 000 per day), only 20% of the farms would be deemed viable (Figure 9). In other words, the reliance on labour-sharing schemes constitutes a key factor in undertaking smallholder activities in the Northern Region. It thus is the social institutional setting that allows (semi)subsistence smallholders in the Northern Region to maintain farming activities.

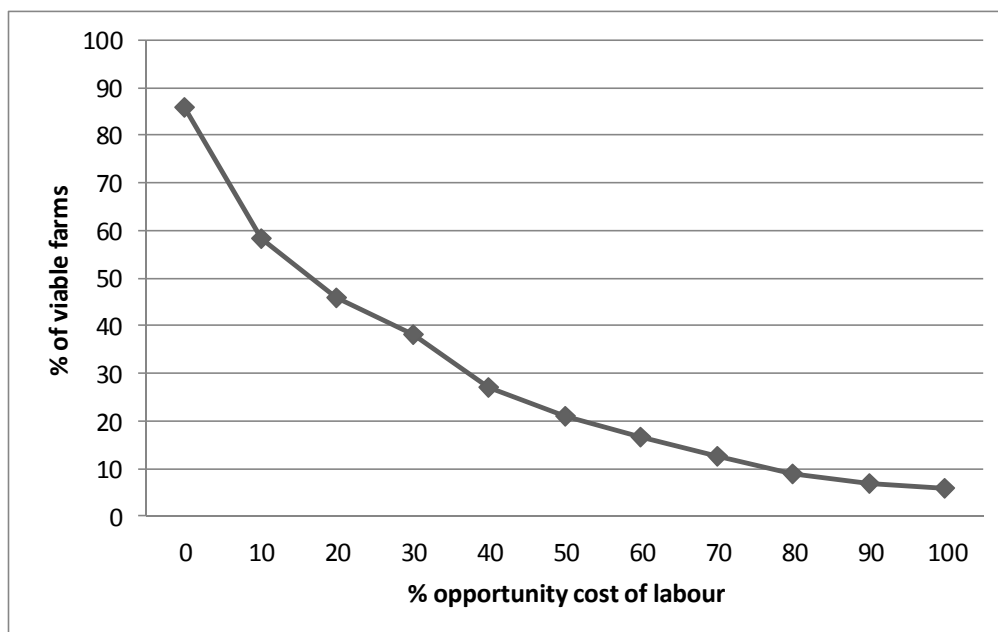


Figure 9: Sensitivity analysis of the opportunity cost of labour in the Northern Region

The policy implications of using a PF or NC approach in viability assessments are important in the case of the Northern Region. Under the NC approach, policymakers would be inclined to reduce overall support to an agricultural system deemed largely unviable and inefficient in the use of resources. Extension services, market access or similar initiatives could be classified as ineffective or unnecessary. The unviability of these smallholders could also justify the introduction of (highly mechanised) large-scale investments in order to boost overall production. One obvious social consequence would be the re-absorption of displaced farm households into a much stagnated rural economy, because it is the lack of opportunities in other activities that has kept farming as a food security mechanism. In contrast, policymakers analysing smallholder viability under the PF approach would be more likely to recommend programmes that support increasing the overall productivity of smallholders and their further integration into input and output markets within and outside agriculture. The latter would also be seen as a useful mechanism to improve consumption levels at farm-household level while expanding livelihood opportunities for smallholders. Under the PF approach, the role of social capital or village interaction to secure labour could also shed light on the advantage of promoting village-level support and not only services in the individual farm-household sphere.

The viability assessment of smallholders is rather crucial in the contemporary context. As argued by Cotula (2012), there is evidence that large-scale land transactions are not taking place in marginal or un-used land, but rather in areas accessed and used by smallholders under the *shifting cultivation* system. Investors are focusing on land where the potential gap in productivity increase is the largest. For the present case study, the results of the farm viability assessment under the NC approach would imply that policymakers could find numerical evidence that supports more leasing projects in the Northern Region than in the Eastern Region. In fact, it is in the Northern Region where large-scale land transactions have been registered, along with protests from displaced smallholders (refer to Mousseau and Sosnoff (2011) for an overview of land deals in Sierra Leone).

Conversely, in the Eastern Region, where farmers are mainly cultivating cash crops (coffee and cocoa) and manage to sell most of their farm output, viability assessments between the NC and PF approaches are highly convergent, showing that smallholders are viable. Under the PF approach, 97% of the smallholders in the Eastern Region are above and 3% fall below the RT East. With the NC approach, similar percentages are obtained: 93% are above and 7% below. Interestingly, the

percentage of smallholders deemed “unviable” in the Eastern Region (under the NC and PF approaches) refers to farm households whose main economic activity is not farming, but rather petty trade or small-scale manufacturing (i.e. basket making). This finding reinforces the idea that their farming activities are subsidised by other, complementary tasks.

In the Eastern Region, where farmers are more integrated into a market economy, both approaches reveal that the majority of the farms may be deemed viable. The difference between the two approaches is smaller in the case of the Eastern Region, because these cash tree crop farmers are far more integrated into the market economy than farmers in the Northern Region. In the Eastern Region, farms may be considered as self-standing units of production, which are far less dependent on social interactions to access output and input markets. Although Eastern Region farms are still reliant on social networks to secure additional wage labour during peak collection periods, cash payments are required to ensure adequate labour provision. Thus, policymakers using either the NC or PF approach would reach similar conclusions regarding farm viability in the Eastern Region. The resulting farm viability assessments would justify providing public support to expand the production frontier of farmers. Possible measures are training to improve output quality, or infrastructure for drying or processing coffee or cocoa. The argument to promote large plantations to substitute for small growers would also lose strength in this context.

5. Conclusions

Evidence from Sierra Leone has shown that, if standard Neoclassical Economics principles are not adapted to the socio-institutional environment of (semi)subsistence farmers, inaccurate and underestimated assessments of farm viability are obtained. This is the case for smallholders who are partially integrated into markets and who are dependent on community arrangements to maintain their farming activities. Only when smallholders are active participants in the market economy do results under both NFI approaches become highly convergent. Consequently, by explicitly focusing on the institutional setting it has been possible to:

- (i) adapt data analysis techniques to account for a series of non-monetary transactions; and
- (ii) define a theoretical approach to measure NFI that reflects the socio-economic and cultural circumstances in which (semi)subsistence farmers operate.

The paper also calls for an improvement in farm household surveys in low-income countries so that the nature of the reciprocal economy is further appreciated. In this respect, the characteristics of labour exchanges are a crucial aspect. It is necessary to be flexible in terms of the assumptions made to analyse farms that are neither fully integrated into markets nor completely isolated from their effects. Efforts directed towards this end may support policymakers in their tasks to define effective poverty-reducing measures. Similarly, given the recent wave of large-scale land transactions, host countries need to accurately compare and evaluate the advantages and disadvantages of large-scale agricultural projects that attempt to replace smallholder activities. Special attention is needed in the case of (semi)subsistence farmers who lack alternative income sources or employment opportunities within or outside the rural economy.

Appendix 1: NFI basic measurement and adaptation to the Sierra Leone dataset

NFI is measured using technical and economic parameters such as yield, prices of the produce, production costs and depreciation. Information concerning interest rates, government subsidies and taxes are not recorded in the Sierra Leone dataset. The latter reflect the partial isolation of farm households in the surveyed areas concerning credit market and other forms of government support.

NFI is calculated as follows:

$$NFI = GPV - IC \quad [A.1]$$

$$GPV = \sum_i (C_i * p_i) + \sum_j (L_j * p_j) \quad [A.2]$$

C_i is crop i production, L_j is livestock j production, p_i and p_j are the prevalent market prices of crops and animals respectively.

$$IC = VC + FC \quad [A.3]$$

$$VC = \sum_{i,j} (Lab_{i,j} * p_w + Seeds_i * p_i + L_j * p_{jm}) \quad [A.4]$$

$Lab_{i,j}$ is the labour used for crop and livestock production, p_w is the wage of labour, $Seeds_i$ is the costs of seeds per crop type, L_j is the number of livestock and p_{jm} is the variable cost of livestock maintenance. These costs include mainly household labour costs, since veterinary services are not recorded. Animals are also pasture fed in communal areas. Livestock production was negligible among the surveyed smallholders, largely due to the threat that tsetse flies still impose on cattle. Poultry and small trypano-tolerant animals (such as the West African dwarf goat) are more frequently found, but were not widespread in the sample.

$$FC = LRent + \sum_t Tools_t * d_t + \sum_j L_j * d_j \quad [A.5]$$

Fixed costs (FC) include the value of fixed assets such as land, tools, machinery, buildings and livestock purchase. Since the results in the Sierra Leone survey do not show machinery and building assets for production in the possession of surveyed smallholders, these two components are not included in equation [A.5]. Likewise, information on tree crops was not available in the survey. Therefore, it is not possible to estimate their sunk cost value. $LRent$ is the amount paid per year for land rent, $Tools_t$ is the quantity of tools per tool type, d_t is the annual depreciation value of purchased tools, L_j is the number of purchased livestock and d_j is the annual depreciation of the purchased livestock. To account for the annual depreciation of fixed equipment and livestock, a calculation on the basis of a linear depreciation was introduced:

$$d = \frac{(Iv - Fv)}{n} \quad [A.6]$$

d is the annual depreciation, Iv is the initial value, Fv is the final or residual value and n is the economic life expressed in years. Initial value (Iv) corresponds to the observed market value of the fixed equipment or livestock. In the case of the Sierra Leone survey, smallholders only reported to have small hand tools as fixed equipment, and to purchase livestock for multi-annual use. These tools are practically always used until the end of their life time. Therefore Final value (Fv) for such type of fixed equipment is valued at 0.

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