Rural Poverty and Livelihood Profiles in Post-genocide Rwanda

An **Ansoms**

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INSTITUTE OF DEVELOPMENT
POLICY AND MANAGEMENT

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TABLE OF CONTENTS

ABSTRACT

The paper aims to identify the different livelihood profiles that prevail in post-conflict rural Rwanda. By means of exploratory tools such as principal component and cluster analysis, it combines variables that capture natural, physical, human, financial and social resources in combination with environmental factors to identify household groups with different asset portfolios and varying livelihoods. The paper also explores how household groups differ with regards to the intra-cluster incidence of poverty. Finally, for a subsample, it looks in detail at how the identified household clusters perceive changes in their living conditions between 2001 and 2004. The paper concludes that "fighting poverty" can take very different forms for groups with different livelihood profiles.

Résumé

Une analyse quantitative des profils de moyens de subsistance dans la campagne au Rwanda.

Cet article vise à identifier les différents profils de moyens de subsistance qui prévalent à la campagne au Rwanda après le conflit. Au moyen d'instruments d'exploration des principales composantes et de l'analyse des groupes, il combine des variables qui comprennent les ressources naturelles, physiques, humaines, financières et sociales en association avec des facteurs environnementaux. Il identifie des groupes de ménages avec différents portefeuilles de biens et diverses combinaisons de stratégies de revenus pour gérer des moyens de subsistance. Cet article examine aussi comment les groupes de ménages diffèrent quant à l'incidence de la pauvreté à l'intérieur du groupe. Comme sous-échantillon, il examine finalement en détail comment les profils des moyens de subsistance des groupes de ménages ont changé dans la péride de 2001 à 2004. L'article conclut que "combattre la pauvreté" peut revêtir différentes formes pour des groupes aux différents profils de moyens de subsistance.

1. Introduction

The overall image of Rwanda's post-war economic recovery is quite positive. After a spectacular post-war boom, national income has continued to rise steadily with an average growth rate of over 10 % between 1996 and 2002. On the other hand, the actual translation of growth into poverty reduction has been disappointing (Ansoms, 2005 and 2007) which diminishes the Government's hopes of a purely growth-led strategy for poverty reduction. However, the Rwandan government aims for a pro-poor effect by, "looking for growth in the sector where the poor are located" (GoR, 2002). The first PRSP (Poverty Reduction Strategy Paper) document recognized the rural sector to be of crucial importance for Rwanda's economic future by presenting the agriculture and livestock sector as "the primary engines of growth" (GoR, 2002:30). This ambition reappears in the new EDPRS (PRSP-2) policy which aims for equitable growth, sustainable development, and poverty reduction with rural development as an important priorities (GoR, 2007).

This hardly seems surprising given that the primary sector employs almost 90% of Rwanda's active population and represents about 45% of its GDP. Moreover, rural poverty is more prominent and severe in comparison with urban conditions. Based on a poverty line of 250 Rwf (Rwandan francs) per adult equivalent per day (1,22$ PPP, current 2006 exchange rate), 56,8% of the rural population are labelled poor, of whom 36,8% are considered extremely poor (i.e. living below the food poverty line of less than 175 Rwf per adult equivalent per day, GoR, 2007).

However, Rwandan 'poor' are not a uniform group, nor is the problem of rural poverty a homogeneous problem that can be solved with a uniform package of policy measures that enhance agricultural growth. The contribution of this paper lies in the identification of different livelihood profiles for rural households in Rwanda. An understanding of the variations in the characteristics of different livelihood profiles, and the institutional constraints they face, is a prerequisite for effective rural policy making and is the aim of this paper.

2. In Search of a Quantitative Methodology to Identify Diverse Livelihood Profiles

The livelihood approach finds its main roots in a paper by Chambers and Conway (1991). They define sustainable rural livelihoods as, "the capabilities, assets (stores, resources, claims and access) and activities required for a means of living" (Chambers and Conway, 1991: 6). The approach has been taken up by many scholars as a framework for poverty and/or vulnerability analysis (Ellis et al., 2003; Bird and Shepherd, 2003; Bebbington, 1999; Moser, 1998 and Chambers, 1995). In addition, it has been transformed into a more practical tool by and for development practitioners like UNDP, Oxfam, Care and DFID (Hoon et al., 1997; DFID, 2001 and Solesbury, 2003).

The livelihood approach has been innovative in several ways. First, the focus of analysis has shifted away from aggregate variables concentrating on approximations of overall well-being, often scaled down to income or consumption measures (De Haan and Zoomers, 2005). The framework also breaks with the tradition in rural development research to focus on natural resources as the crucial element in living conditions (Bebbington, 1999). Instead, the livelihood approach aims to capture the multiple interactions between people's resources and strategies which are dependent upon the social and institutional environment (see Figure 1). In this paper, the combination of a household's resources and livelihood strategies will be referred to as the household's 'livelihood profile.'

Second, the livelihood approach accentuates the ability of social actors to make strategic choices, exploit opportunities and thus play an active role in shaping their livelihoods. It breaks with the rather pessimistic view of previous micro-level (household) studies which often nurtured an image of 'the poor' as passive marginalized victims (De Haan and Zoomers, 2005). Bebbington sees people's assets, "not simply [as] resources that people use in building livelihoods; [they] give them the capability to be and to act" (Bebbington, 1999:2022). According to Moser (1998), "the poor are managers of complex asset portfolios". And social actors have different management styles and thus diverse strategies in dealing with their assets, even when departing from comparable starting positions (De Haan and Zoomers, 2005).

In contrast to the basic needs approach, the livelihood profile framework considers people to be the subjects of their own development and able to shape their own destinies. Although the more deprived and constrained they are in their options and strategies, they nonetheless remain active players who have different choices and are capable of making their own decisions. This idea approximates Sen's notion of agency, which he esteems as central in valuing human life. Sen introduced the concept of "agency freedom," defined as "what the person is free to do and achieve in pursuit of whatever goals or values he or she regards as important" (Sen, 1985).[1] The notion of agency is relevant in all social experiences, even in case of extreme coercion. Agency determines and is determined by the person's access to strategic resources; it is embodied in social relations, closely linked with power relations and shaped through institutional structures (Long, 2001).

Both characteristics of the approach bring us to a third attribute: the livelihood approach inserts a dynamic dimension into the analysis of well-being and poverty. Indeed, the mul-

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[1] This stands next to a narrower concept of "well-being freedom" which refers to a person's capability to attain certain well-being achievements.

tiple links and interactions between resources and strategies occur within a timeframe in which livelihood profiles may evolve. The livelihood profiles box (Figure 1) is therefore nothing more than a snapshot at a certain point of time (in this case when the survey was done) that feeds back into the interaction between a household's resources and livelihood strategies. De Haan and Zoomers (2005) have developed the idea of 'livelihood pathways' that situate patterns of livelihood assets and activities in the negotiation process between social actors. These pathways change over time in a non-uniform, non-predefined way, but their course is embedded within an institutional and social context. The available institutional arrangements shape the interactions between social actors with diverse power bases and different livelihood pathways. However, this bargaining process determines how institutional arrangements evolve over time. Niehof refers to the idea of a livelihood system, defined as, "an open system, interfacing with other systems and using various resources and assets to produce livelihood, with the household as the locus of livelihood generation" (Niehof 2004: 321). She points to the importance of a temporal perspective in livelihoods research.

Figure 1: A schematic overview of livelihood dynamics

INSTITUTIONAL PROCESSES	ACCESS BARRIERS TO RESOURCES
	ACCESS BARRIERS TO STRATEGIC OPPORTUNITIES
	ACCESS BARRIERS TO MECHANISMS OF COLLECTIVE ACTION
	ROUTINES: PERCEPTIONS / VALUES / PURPOSES

ASSETS / RESOURCES
· Natural resources
· Physical resources
· Human resources
· Financial resources

COLLECTIVE ACTION
· Trust in community
· Solidarity networks
· Access to associations
· Collective action

Multiple links and inter-actions

STRATEGIES
· On-Farm strategies:
crop choice, diversification, specialization

· Off-Farm strategies:
Trade / Off-Farm formal or informal employment / daily wage labour

· Migration

ENTITLEMENT PORTFOLIOS FOR DIFFERENT POPULATION GROUPS

CHANGE OVER TIME: SHOCKS - TRENDS - SEASONALITY

These conceptual inputs clearly imply that 'the poor' cannot be defined as a homogeneous or fixed group; they are heterogeneous; both in terms of material well-being and in terms of their agency that defines their living conditions. Bastiaensen et al. refer to the poor as, "those human beings who, for one reason or another, almost systematically end up at the losing end of the multiple bargains that are struck around available resources and opportunities" (Bastiaensen et al., 2005:981). But at the same time, there are different degrees in winning or losing that may account for different degrees of poverty. Certainly in populations where over half are classified as 'poor' according to aggregate well-being measures, it becomes crucial to look at the diversity hidden behind aggregate poverty figures and to link this with the diversity in livelihood profiles. Furthermore, one should analyse how particular forms of poverty predetermine people's livelihood pathways.

Such analyses imply a high degree of complexity which is more traditional for in-depth qualitative research than research based upon quantitative data analysis. Traditionally, quantitative research on living conditions uses the tool of regression analysis in which a dependent variable (e.g. often income or consumption as proxies for overall well-being) is estimated, based on the value of one or more independent variables (i.e. different types of assets and strategies). Such a methodology has the advantage of establishing the relationship between variables. On the other hand, it gives little insight in the heterogeneity of livelihood profiles among a large population – even when dummy variables for specific sub-groups are used. In addition, aggregate income and consumption variables are highly variable from year to year and - when used as the sole dependent variable in the regression - do not reliably represent households' long run livelihood strategies.

Other empirical quantitative research endeavours attempt to account for livelihood diversity by comparing different settings. Bouahom et al. (2004), for example, compare how nine different villages in Laos respond differently to the transition from subsistence farming towards more diversified livelihood strategies. Moser (1998) even enlarges her geographical scope to four urban settings spread over different continents, comparing the changes in asset portfolios (i.e. defined by labour, human capital, productive assets, household relations and social capital) over a longer time period characterised by deteriorating macroeconomic circumstances. This case-study approach allows one to make interesting comparisons between particular settings. On the other hand, the external validity of the research findings is limited.

Alternatively, one may look at livelihood heterogeneity at the household level. The external validity of research findings may be assured by departing from a regionally or nationally representative survey to identify and compare the profiles of different household groups. A crucial question is, however, which variable(s) is (are) used to differentiate those groups.

Several research papers on livelihoods analyses use income as the discriminating variable. Highly acknowledged is Ellis' methodology which has been applied to several countries (e.g. Malawi, Tanzania, Uganda and Kenya). Land and livestock are placed in a pentagram next to household size, tools and education to illustrate the differences between income groups. Various papers look further at the diversity in income-generating portfolios for different groups (Ellis et al., 2003; Ellis & Mdoe, 2003; Ellis & Bahiigwa, 2003 and Freeman et al., 2004). Bird & Shepherd (2003) link income groups to the likeliness of pursuing certain livelihood strategies (e.g. income from farming, off-farm activities, enterprises, etc). Applied to the Zimbabwean case, they conclude that, "no particular livelihood strategies were intrinsically any better than any others" given that "there was a considerable range of incomes derivable from most livelihood portfolios." Some strategies are, however, more likely to be successful than others (Bird & Shepherd, 2003: 602). McKay and Loveridge (2005), although not explicitly referring to the livelihood literature, have done a similar exercise for the Rwandan case. They compare the income strategies and nutritional status of different income groups between the early 1990s and 2000. Overall, the methodology used in these studies has the disadvantage that the differentiation between groups is still based upon one aggregate proxy for overall well-being. Groups are defined based upon income categories, after which the combination of assets and strategies, relevant for a person's livelihood profile, is inserted into the analysis.

An alternative approach combines survey data with insights from participatory poverty assessments (PPA) to identify the relevant criteria for differentiation between households with

different livelihood profiles. Carter and May (1999), for example, divide the rural South-African population into eight livelihood strategy classes, based upon the diversity in their income-generating and survival strategies. It is not, however, straightforward to assign all households included in a quantitative survey to one specific qualitatively-defined PPA category, and certainly not when the household in question combines several livelihood strategies. This is illustrated in a paper by Howe and McKay who, referring to the Rwandan case, recognize that, "distinctions between the groups [identified by a PPA exercise] are not always clear at the margin, given some similarity in certain characteristics across groups" (Howe & McKay, 2007: 203). They link survey material to the combined characteristics of the three poorest PPA categories (out of six) to identify the chronically-poor households' livelihood profiles.

A third possibility to identify household groups with heterogeneous livelihood profiles – one that takes into account a wide variety of variables relevant to livelihood analysis - is to use the tool of cluster analysis. Orr and Jere (1999) identify five types of smallholder livelihood strategies in southern Malawi. Their cluster analysis includes several variables related to crop cultivation, food security and household characteristics. For a subsample of each of these clusters, Orr and Mwale (2001) analyse in detail the changes in livelihood strategies over time. This fits with the idea of inserting a temporal dimension into livelihood research. Jansen et al. (2006A; 2006B) identify groups with diverse livelihood profiles in Honduras and depart – in comparison to the previous authors - from a larger set of variables, all related to the use of labour and land, to be inserted into a factor and cluster analysis. Petrovici and Gorton (2005) finally use an even broader range of variables as a starting-point for a factor and cluster analysis. They identify sub-groups in the Romanian population based upon proxies accounting for different asset types,[2] in addition to regional variables and income and expenditure-related measures. The meaningfulness of the clusters is validated by referring to the differences in food consumption patterns and poverty incidence figures among them (Petrovici and Gorton, 2005).

This paper adopts a similar factor and cluster methodology to identify different livelihood profiles in rural Rwanda. The identification of the sub-groups (clusters) in the population is based upon proxies for the different asset types identified by the livelihoods framework, next to proxies for the regional context and aggregate well-being. Further validation of the clusters is provided by illustrating how the identified clusters differ with regards to their income-generating livelihood strategies and in terms of objective and subjective poverty incidence. A dynamic dimension is added by exploring, for a subsample, how the identified subgroups perceive changes in their living conditions over the period 2001-2004.

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[2]   Petrovici and Gorton do not depart fully from the livelihoods framework but base themselves instead upon an alternative asset-based framework identified by De Janvry and Sadoulet (2000). The latter refers to natural assets (e.g. land, water, soil fertility, etc.), human assets (e.g. number of working adults, education, etc.), institutional assets (e.g. access to credit, information, government programs, etc.) and social assets (e.g. social capital, membership in corporate communities, etc.). In addition, they add the regional context (i.e. location) as an asset type. They conclude, "Household endowments in these assets have a strong explanatory power on household income" while highlighting the potential substitution effects between different asset types (De Janvry and Sadoulet, 2000:395).

3. The Data

This paper combines data from complementary sources. The Household Living Conditions Survey (EICV) was done between July 2000 and June 2001 in a nationally-representative sample of 5.280 rural households. The survey includes data on various themes such as: education; health; time use; migration; housing; agricultural production; incomes; expenses; non-agricultural activities; money transfers; and credit facilities. The results were used to compose a descriptive national poverty profile which served as a research background to Rwanda's first PRSP (GoR, 2002).

The Food Security Research Project (FSRP)[3] gathered agricultural production and land use data over 3 years (between 2000 and 2002), each time for both seasons (A: September – February, B: March – August). The survey was executed in a subsample of the EICV survey covering 1584 households. Compared to the EICV data regarding land and livestock ownership, the FSRP data is more reliable given the effort put into exact measurement and follow-up by the surveyors involved.

For the principal component and cluster analyses done in this paper, we consider the overlapping sample of EICV 2001 and FSRP 2001A, counting a total of 1433 cases. We use weights that reflect the probability of being sampled. Multivariate outliers are identified based on the Mahalanobis distance.[4] Outliers can profoundly distort the principal component analysis through their influence on correlations between variables. In addition, the presence of outliers can lead to cluster outcomes that fail to uncover the true structure in the data. Hair et al. (1998) advise excluding, "aberrant outliers" but they plead for cautiousness in case of "truthful outliers" which reveal the presence of an important group, underrepresented in the total sample. It is difficult to assess the difference between both. To avoid deletion of too many outliers of which many might be truthful, we opted for a very low p-value (critical value of 37,697; p≤0,001) in determining the critical Mahalanobis value. Based upon this criterion, a total of 55 identified outliers are excluded. Further, the remaining sample contains 158 cases for which no complete information is available. They are also excluded leaving 1200 cases in the analysis.

The combined EICV-FSRP sample is assumed to be representative for the rural inhabitants of Rwanda. However, two important remarks have to be made with regards the external validity of the research findings. First, the sampling procedure was based upon a random selection from the administrative listings of households within the "cellules". Although most households have some kind of shelter (however poor the quality, and regardless of whether it is their own property or not), the sample still excludes the category of the extremely poor/homeless. Second, the sample does not include all the actors 'present' in the rural setting. For example, it does not include those urban entrepreneurs who own large plots of land in the countryside but do not occupy them. The average land surface available to the households included in the sample is around 0,73 hectares; the maximum 10 hectares. Although the latter farms are large in comparison to the average, they represent little when compared with the cattle farms of Umutara which measure between 30 and 100 hectares, or with private investors' farms which may occupy several thou-

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[3]   A joint initiative of Michigan State University, the Ministry of Agriculture and USAID.

[4]   The Mahalanobis distance was calculated based upon all variables included in the factor and cluster analysis. For an overview of these variables, see further.

sands of hectares[5]. The owners of such large-scale professional farms typically do not live in the country, but manage their properties from the cities (GoR, 2003). This may give a false image of the poor in comparison to the better-off, given that the richest 'rural' actors are not included in the reference base.

The relevant variables for this analysis are related to the five asset types identified within the livelihood framework, in addition to variables accounting for regional differences and aggregate incomes and expenditures. We are aware that some of these variables are endogenous to the livelihood process; some can be considered inputs, others as outputs, others as both inputs and outputs. This is not problematic as we do not look for causal links between variables. Instead, we aim to identify clusters of characteristics that fit into particular livelihood profiles.

Natural capital: A first variable, accounting for natural assets, is the land surface cultivated by the household (FSRP 2001, season A). A second proxy for this dimension, the livestock variable, accounts for all livestock and small husbandry the household owns (i.e. either kept at their own farm or lent out to other farmers) and borrows, measured in tropical livestock units (TLU) (FSRP 2001, season A).[6]

Physical capital: Proxies for physical assets should account for affordable transport, secure shelter and buildings, adequate water supply and sanitation, clean affordable energy, and availability of information (DFID, 2001). In this analysis, an aggregate physical asset index was calculated as the sum of the household's scores (i.e. 0 = insufficient, 1 = OK, 2 = Good) on six variables: availability of transport, availability of rooms per adult equivalent, quality of outside walls, quality of roof, quality of sanitation and of energy for lighting (EICV 2001).[7] The range of the asset index lies between 0 and 12 and is normally distributed. Variables accounting for access to an adequate water supply and access to information were not included as no satisfactory proxies could be identified.

Human capital: Proxies for human assets[8] are the age of the household head, the gender of the household head,[9] the number of adults aged between 14 and 60, and the maximum number of years of education of the most instructed household member (EICV 2001).[10]

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[5]   Kabuye Sugar Works was the first company to be privatised in post-conflict Rwanda. At the time of its sale in 1997, the Rwandan government granted the company a lease on 2735 hectares for 50 years (Cherif, 2004). Thereafter, another 1500 hectares of land were promised to the company.

[6]   For the land and livestock variables, both FSRP and EICV survey data were available. We consider the FSRP data to be more reliable for agricultural assets, given that e.g. the land variable was measured by FSRP surveyors, while EICV data was based on estimates made by the household head him/herself.

[7]   Availability of transport: 0 = no transport expenses or owning means, 1 = transport expenses, 2 = owning means of transport. Availability of rooms per adult equivalent: 0 = less than 0.5 rooms per adult equivalent, 1 = 0.5 – 1 room per adult equivalent, 2 = over 1 room per adult equivalent. Quality of outside walls: 0 = walls of non- cemented laterite mud or stone, 1 = walls of cemented laterite mud, 2 = walls of bricks (any type) or boards. Quality of roof: 0 = roof of thatch or straw, 1 = roof of tile, 2 = roof of corrugated iron / concrete. Quality of sanitation: 0 = no toilet, 1 = open pit latrine, 2 = closed pit latrine / flushed toilet. Quality of energy for cooking: 0 = firewood, 1 = wick lantern/ candle, 2= oil or gas lamp/electricity.

[8]   A potential proxy for "health", measured by a variable as to whether a member of the household had been sick between February 2001 and March 2002, was not included. This period does not correspond well with the data from the EICV and FSRP 2001A. Moreover, the interpretation of "being sick" may differ widely for each respondent.

[9]   The dummy variable "gender of household head" was corrected for the presence of male adults in the family. The analysis will highlight the specificities of living conditions of female-headed households in relation to gender-related institutional constraints. Female-headed households with male adults were reclassified into the male- headed household group as we expect these households to be less constrained by certain gender-induced mechanisms of exclusion (0=male household head or female household head with adult males in household, 1=female household head with no adult males in household).

[10]   The "maximum level variable" as a measure of a household's level of education has proved to be optimal for estimating total household income (Jolliffe, 2002) This paper does not focus uniquely on clarifying income but both the education and income variables are included the analysis.

Social capital: Social asset proxies include a variable for the number of household members participating in tontines (rotating savings and credit associations, EICV 2001)[11] and in diverse economic associations of other kinds (FSRP 2000, season A).[12]

Financial capital: Turning to financial assets, there are two variables that could serve as proxies: having savings and having access to credit. The "participation in tontines" variable is an imperfect proxy for both. Other variables, accounting for the household's savings or loans, were not included in the analysis as they are highly dependent upon the timing of the interview. Moreover, the rationale behind having debts might differ: some households may use these loans to invest in a productive activity whereas others may need credit mainly to survive.

Regional context: In addition to the asset variables, four variables are included as proxies accounting for the regional context. "Remoteness" is measured at cellule level and is defined as the approximate physical distance to the nearest registered road (either a district road or a national sand or asphalted road). "Public service proximity" is also measured at the cellule level, calculated as the sum of the Z scores of 3 variables accounting for the physical distances to the nearest market, school and health centre. Further, the analysis includes the average provincial cost of living index, based on prices from July 2000 until June 2001,[13] and an index accounting for average soil quality at the cellule level.

Aggregate variables: Like Petrovici and Gorton (2005), we too include both income and expenditure variables on a per capita basis.[14] Incomes are generally lower than expenditures, meaning that a lot of the 'true' income is not captured with the survey material. This phenomenon is not uncommon in survey data (Deaton, 1997).

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[11]   This variable can also serve as a proxy for access to credit.

[12]   This variable generally captures membership in another type of association(s) than tontines. Associations are either cooperatives, syndicates or other types of economic associations of which over 85% of the members are engaged in agricultural or livestock-breeding activities.

[13]   Taking provincial boundaries as a basis for the determination of living costs is a huge oversimplification of the complexity of local price levels and evolutions. Nonetheless, without more detailed data, the considerable differences in price levels between provinces calculated in this fashion are useful.

[14]   The expenditure variable was calculated by the statistics department providing the EICV data. Income is defined as the value of consumption of self-produced food plus gross revenue from sales of agricultural products minus total expenditure on agricultural inputs plus revenue from net sales of livestock and livestock product, agricultural wage income, non-agricultural unskilled wage income, non-agricultural skilled wage income, non-farm enterprise income, income from rents, net income from remittances plus total miscellaneous income. Both income and expenditure variables are deflated by the cost of living to control for variations in the timing and location of the interview. McKay and Loveridge (2005) highlight the importance of excluding the most extreme income outliers (e.g. mainly the consequence of the short recall period for consumption of self-production in the EICV survey resulting in over- or underestimation). Consequentially, extremely large or small (even negative) income values have to be excluded from the analysis. Prior to analysis, negative income values were excluded. Other cases were excluded based on extreme values for the multivariate Mahalanobis distance.

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4. IDENTIFYING LIVELIHOOD CLUSTERS BASED UPON ASSET PORTFOLIOS

The tool of principal component analysis allows one to create a new set of variables (i.e. principal component scores) capturing the character of the original variables in a simplified way and reducing the number of variables (as the original variables can be replaced by component scores). The method of substitution also solves the problem of high correlations between the original variables (Hair et al., 1998) which may distort further analysis.

Our sample size (1200 cases) is sufficiently large in terms of cases-per-variable ratio: the availability of over 80 cases per variable largely exceeds the most stringent margin of a 20-to-1 cases-per-variable ratio (Hair et al., 1998). Principal component analysis further assumes the presence of a certain degree of interrelatedness between the variables considered. Bartlett's test of sphericity identifies the correlation matrix as significantly different from the identity matrix (696741,5; df = 105; p<0,001). Further, the Kaiser-Meyer-Olkin measure of sampling adequacy (0,649) confirms the appropriateness of principal component analysis.

Using the latent root criterion that rejects all components with a value less than 1, we consider a 6-component solution. This solution accounts for 61.2% of the variance in the data set, acceptable for the social sciences (Hair et al., 1998). Moreover, for the 6-component solution, the communalities of all but one variable surpass the 0,5 level. Therefore, a large part of the variation in the variables is explained: from 48% for the associational index up to 80% for the expenditure variable.

An orthogonal VARIMAX rotation is applied to this solution in order to simplify the interpretation of the component matrix. To identify the significant dimensions of each component, all variables with loadings of at least 0,30 are taken into consideration (Hair et al., 1998). Two variables load on multiple principal components, but this does not complicate the interpretation of the 6-component solution (see Table 1).

Table 1: **Rotated component matrix**

Variable:	Com.	1	2	3	4	5	6
Cultivated land	0.51	0.17	0,09	**0,66**	0,14	0,11	0,07
Livestock owned or borrowed	0.50	0.23	0,21	**0,57**	0,12	0,09	0,24
Age of household head	0.61	-0,13	-0,21	**0,71**	-0,08	-0,12	-0,14
Gender of household head	0.60	0,03	**0,77**	-0,06	-0,04	-0,02	0,05
Adult work force (14-60 yrs,)	0.66	-0,26	**0,64**	0,40	0,01	-0,11	0,12
Maximum years of education	0.64	**0,32**	**0,73**	-0,03	0,06	-0,03	0,03
Participation in tontines?	0.71	0,05	0,02	0,06	-0,20	0,01	**0,81**
Participation in associations?	0.48	0,02	0,11	0,01	0,26	-0,09	**0,63**
Public service proximity	0.60	-0,03	0,03	0,00	0,03	**0,76**	-0,15
Remoteness index	0.62	-0,09	-0,11	0,05	-0,03	**0,77**	0,08
Regional living cost index	0.67	-0,06	0,07	0,23	**0,76**	0,08	-0,13
Soil quality in cellule	0.61	-0,04	0,05	0,06	**-0,76**	0,07	-0,14
Physical capital index	0.50	**0,65**	0,13	0,14	0,08	-0,18	-0,05
Income per adult equiv,	0.70	**0,82**	0,01	0,07	-0,03	0,04	0,09
Expenses per adult equiv,	0.80	**0,89**	0,03	-0,04	-0,06	-0,02	0,06

Source: Based on own calculations.

The first component can be regarded as the "household's aggregate resources", reporting high positive loadings for both the income and expense variables, together with the physical capital index. This principal component is also moderately influenced by the education variable (loading positively). The second component is largely influenced by variables that measure the dimensions of "human capital", with significant high positive loadings for the number of adults and the maximum education of the most educated household member. Further, this component's scores are positively influenced if the household head is male. The third component accounts for "natural resources". Households with high scores on this principal component have a relatively large area of cultivated land and considerable livestock holdings by Rwandan standards (not taking into account the large cattle farms of Umutara). The component is also positively associated with the age of the household head and is further moderately influenced by the adult working force variable. The fourth component accounts for "quality of location". The regional living cost index (high value = high living cost index) loads positively and the soil quality index (high value = high soil quality) loads negatively on this component. The fifth component measures the "centrality of location" with high loadings for the remoteness index (high value = very remote) and the public service proximity index (high value = very remote). The final component may be called the "associational component" as it has high loadings for both "participation in tontines" and "participation in associations".

The principal component scores accounting for various asset dimensions can be used as input variables in the cluster analysis. This offers the advantage of including fewer variables that are, moreover, mutually independent (guaranteed by the orthogonal varimax rotation). As such, the problem of multicollinearity that could distort the cluster analysis is avoided (Hair et al., 1998). Moreover, this procedure reduces the problem of arbitrary scale effects by avoiding that directly-measured variables are inserted in the cluster analysis (Jansen et al., 2006A).

Cluster analysis allows identifying different household groups, characterized by maximal within-group homogeneity and between-group heterogeneity. We use the methodology advocated by Punj and Steward (1983) for marketing research, applied by Petrovici and Gorton (2005) and by Jansen et al. (2006A, 2006B) for quantitative livelihood research. In a first step, Ward's (hierarchical) clustering method, based on squared Euclidean distances, is used. This agglomerative method works stepwise to combine pairs of individual observations or clusters while minimizing the within-cluster variance (Aldenderfer and Balshfield, 1984).[15] The dendrogram[16] derived from this algorithm allows for visual inspection to determine the optimal number of clusters. For our analysis, the seven cluster solution provides the optimal balance between parsimony and homogeneity. In a second step, the data are clustered through a K-means iterative partitioning analysis. While hierarchical clustering methods have the disadvantage of building upon previous steps without the possibility to revise previous decisions, the K-means algorithm reassigns cases to clusters through an iterative procedure. It allocates data points to the cluster with the nearest centroid, then computes the new cluster centroids, and alternates these steps until no

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[15] This method tends to detect spherical clusters (no huge size differences) in contrast to other hierarchical methods. In comparison with other hierarchical methods, Ward's method seems most appropriate. It performs less well when outliers are present, but the most aberrant outliers were excluded prior to analysis. It performs well in comparison to other methodologies when the true cluster structure is masked by 'noise', which is a true risk in the large Rwandan dataset with many variables (Everitt et al., 2001).

[16] The dendrogram is a cluster tree of which the first column of nodes represents each individual case. Cases are then joined by branches to form clusters and clusters are further joined to form larger clusters until finally all are joined into one big cluster. The branch that links cases/clusters to larger clusters represents the distance between the cases or clusters to be joined. The dendrogram should best be cut where there is a large distance between clusters to be joined in a next stage. In this study, this is the case when seven clusters are joined into six clusters. See Annex 1 at the end of the paper for a graphic representation.

data points change cluster. The statistical criterion it uses is to minimize the sum of the squared Euclidean distances between individuals and their group mean. The number of clusters and the initial cluster centroids are derived from Ward's (hierarchical) algorithm of step 1 (Aldenderfer and Balshfield, 1984; Everitt et al., 2001). In the final result, a cross-tabulation between the results of the hierarchical and the iterative clustering methods indicates that 24% of all cases (294 out of 1220 cases) have been reassigned to another cluster with the K-means procedure. The final six-cluster solution is presented in Table 2.

Households (HHs) in **Cluster 1** are **"rural entrepreneurs"** who are doing very well in terms of income and consumption. Mean expenses lie far above the 2001 poverty line of 64.000 Rwf per adult equivalent per year (2001 prices). Households in this category are generally small in size and headed by a younger male household head. They have at least one very educated member (almost 6 years of education on average). Further, the land availability of this cluster lies close to the overall sample mean. Given the small household size, these households are quite well equipped with natural resources in adult equivalent (ae) terms (both in terms of land and livestock). In addition, rural entrepreneurs score extremely well in terms of physical capital (i.e. quality of housing and sanitation, availability of transport and energy). Access to this type of capital may be an important underlying condition to engage in on-farm and off-farm remunerative livelihood strategies besides subsistence farming. Rural entrepreneurs generally live in areas with average living costs and soil fertility. They reside in less remote areas which may be an advantage in their entrepreneurial undertakings.

Households of clusters 2 and 3 are found in the middle range according to aggregate income and consumption measures. **Cluster 2** is the **"associational type"** as all households in this cluster must have at least one member who participates in a tontine or an association (31% participate in both). Further, cluster 2 households are, on average, headed by a younger person. The cluster average of land available for cultivation is lower than the total sample average; but on the other hand, the households of this cluster do manage to raise considerable livestock by Rwandan standards. With average expenditures still above the overall poverty line of 64.000 Rwf per adult equivalent, the investment in social capital by associating with others seems to be correlated with somewhat better living standards. From the analysis, however, we cannot deduce the direction of the causality between the two variables.

Cluster 3 can be described as relatively **"resource-rich"**. Households of this cluster cultivate larger plots of land than the average (although one should take into account the high standard deviation for this variable). Nonetheless, these are still small to medium-scale farmers. As highlighted before, an average farm size of 1,62 hectares is a lot in comparison to the sample mean, but not that extraordinary when compared with the landholdings of large cattle farms or private rural entrepreneurs who are not included in this sample. Further, households of this cluster, generally headed by an older adult male include, on average, 4,17 adults. This suggests that these are either nuclear households that consist of several sub-units; either young adults who will soon leave the household to start their own (which potentially involves a division of land). When considering available land in adult equivalent terms, households in this cluster are relatively well accommodated. The larger surface of cultivated land allows them to raise more livestock in comparison with other clusters (also in adult equivalent terms). In addition, households of this cluster are, on average, well equipped in terms of physical capital (e.g. quality of housing and sanitation, availability of transport and energy, etc.), and they often have at least one member with a high level

of education. Over one-third participate in either a tontine or an association. In terms of income and/or consumption, these households are still among the better-off in comparison with the next four clusters, although average expenses fall below the poverty line of 64.000 Rwf.

The characteristics of the resource-rich cluster (#3) contrast strongly with those of the next two clusters. **Cluster 4**, the largest in the overall sample, can be typified as households that are **"resource-poor in fertile regions"**. Mean soil fertility is the highest of all clusters. In addition, these households are, on average, located somewhat closer to public services and reside in provinces with low average living costs compared to other clusters. On the other hand, cluster 4 households are extremely resource-poor in terms of landholdings and have, on average, very limited livestock holdings. The average availability of natural resources, in per capita terms, is lowest of all clusters. Also interesting is that households of this cluster are nearly always male-headed and least inclined to participate in any form of group or association. The lower average income and expenditures indicate that these households are confronted with difficult living conditions.

Cluster 5 is referred to as the **"resource-poor / centrally-located"**. In line with the previous cluster, the average land and livestock holdings of these households are extremely limited. But in contrast to cluster 4, average soil quality is lowest of all clusters. This suggests that the "centrally-located" often depend upon other activities for income generation (see Section 4). Over 30% of this cluster also participates in an association or tontine. Engagement in off-farm activities may be facilitated by the fact that these households live most frequently in less remote areas and closer to public services than households of other clusters. On the other hand, their central location does not seem to pay off in terms of overall living conditions as aggregate income and expenditures of this cluster are poor.

The resource constraint is not the most problematic aspect to deal with for **cluster 6** households. In terms of land, livestock (per adult equivalent), and soil fertility, the cluster average is comparable to the overall sample average. However, households of this cluster live in **"isolated"** regions: very remote areas, far from the nearest road (nearly twice as far as the average household included in the sample) and extremely far from public services. Their relative isolation clearly is an important institutional constraint: average expenditures are considerably below the poverty line of 64.000 Rwf. In addition, "isolated" households are the least equipped in terms of physical capital (low mean physical capital index). They are also quite deprived in terms of educated human capital (i.e. maximum years of education is the second lowest of all clusters).

Cluster 7 finally is the group **"female-headed"**, in most cases headed by older women. The average physical labour force (number of adults) present in the household and the maximum education of the household members is the lowest of all clusters. The cluster average of land available for cultivation is lower than the total sample average; but certainly in terms of livestock female-headed households are seriously deprived. The gender aspect, specific for this cluster, seems to be an important institutional constraint in creating favourable living conditions. It is beyond the scope of our analysis to identify which particular gender-induced constraints female-headed households are confronted with. But such constraints relate to limitations in access to land (no customary land rights), access to large livestock (traditionally a man's affairs), access to markets (too much time spent on subsistence food production and on managing the household, often no other adults available to divide tasks), access to physical labour force (households generally have few adult members), access to remunerative jobs on the labour market, etc. (see Newbury

and Baldwin, 2000). The mean income and expenditures of the average household in this cluster are among the lowest of all clusters; however, standard deviations are high.

Table 2: Cluster solution

CLUSTER:	1	2	3	4	5	6	7	Total
Number of cases	96	152	130	263	198	189	192	1220
	8.0%	12.6%	10.1%	23.0%	16.8%	13.8%	15.7%	100.0%
Cultivated land (ha) (median)	0,58	0,47	**1,62**	**0,41**	**0,43**	0,52	0,52	0,52
Mean	0,72	0,62	**1,81**	**0,55**	**0,51**	0,70	0,66	0,73
St Dev	0,51	0,50	1,06	0,46	0,34	0,57	0,54	0,68
	(2,3,4,5,7)	(all)	(all)	(all)	(all)	(2,3,4,5,7)	(all)	
Cultivated land per ae (ha)	0,19	0,10	**0,23**	**0,09**	0,10	0,13	0,14	0,12
Mean	0,25	0,14	**0,34**	**0,12**	0,13	0,19	0,19	0,18
St Dev	0,20	0,13	0,30	0,11	0,11	0,18	0,17	0,18
	(all)	(all)	(all)	(all)	(all)	(1,2,3,4,5)	(1,2,3,4,5)	
Livestock (TLU) (median)	0,24	0,30	**1,28**	**0,10**	0,20	0,10	0,10	0,20
Mean	0,53	0,53	**1,49**	**0,26**	0,30	0,34	0,28	0,46
St Dev	0,80	0,74	1,,36	0,39	0,38	0,53	0,48	0,76
	(3,4,5,6,7)	(3,4,5,6,7)	(all)	(all)	(all)	(all)	(all)	
Livestock per ae (TLU)	0,08	0,06	**0,20**	**0,02**	0,03	0,03	0,02	0,04
Mean	0,16	0,10	**0,25**	**0,05**	0,07	0,09	0,08	0,10
St Dev	0,26	0,13	0,25	0,09	0,09	0,14	0,14	0,16
	(all)	(all)	(all)	(all)	(all)	(all)	(all)	
Age of HH head (median)	**35,0**	38,0	**55,0**	44,0	38,0	38,0	50,0	42,0
Mean	**38,8**	38,9	**55,5**	43,8	39,8	39,0	52,7	44,0
St Dev	15,2	10,8	12,7	12,8	11,7	13,8	15,9	14,6
	(3,4,5,7)	(3,4,5,7)	(all)	(all)	(all)	(3,4,5,7)	(all)	
% female-headed HH	12,2%	14,7%	10,1%	2,7%	7,5%	17,4%	85,6%	21,6%
Adult working force (median)	2,00	2,00	**4,00**	3,00	2,00	2,00	**2,00**	2,00
Mean	2,10	2,78	**4,17**	2,97	2,81	2,35	**1,57**	2,67
St Dev	0,83	1,14	1,62	1,23	1,16	1,02	0,92	1,,35
	(all)	(all)	(all)	(all)	(all)	(all)	(all)	
Max education (years)	**6,00**	5,00	**6,00**	5,00	5,00	5,00	**0,00**	5,00
Mean	**5,97**	4,49	**5,71**	4,77	4,70	4,05	**1,28**	4,26
St Dev	2,78	2,54	2,72	2,42	2,19	2,,58	1,,90	2,79
	(all)	(all)	(all)	(all)	(all)	(all)	(all)	
% in tontine	11,7%	**88,7%**	15,1%	3,4%	3,6%	2,4%	4,3%	16,1%
% in association	9,5%	**42,3%**	33,3%	6,7%	28,4%	17,0%	12,1%	20,0%
% in tontine or association	19,9%	**100,0%**	38,6%	10,1%	30,5%	18,5%	15,7%	30,6%
Public service proxy (index)	-0,85	-0,63	-0,67	-0,91	**-1,11**	**3,39**	-0,65	-0,65
Mean	0,21	-0,51	-0,28	-0,60	**-1,10**	**2,92**	-0,30	-0,04
St Dev	2,47	1,49	1,81	1,55	1,25	2,58	1,68	2,19
	(all)	(all)	(1,2,4,5,6)	(all)	(all)	(all)	(1,2,4,5,6)	
Remoteness index [28–6730]	736	991	1.077	973	**634**	**2.253**	991	991
Mean	1.067	1.320	1.239	1.059	**743**	**2.449**	1.282	1.284
St Dev	848	976	803	669	538	1,429	831	1,018
	(2.3.5,6,7)	(all)	(all)	(2,3,5,6,7)	(all)	(all)	(all)	
Regional living cost [74–121]	95,2	94,4	101,5	93,4	**101,8**	**100,2**	96,7	95,2
Mean	96,0	94,0	99,3	93,3	**99,8**	**97,8**	96,7	96,4
St Dev	4,5	4,2	3,5	3,7	3,8	4,0	4,7	4,7
	(all)	(all)	(all)	(all)	(all)	(all)	(all)	
Soil quality in cellule [0–1]	0,37	0,36	0,34	**0,45**	**0,25**	0,32	0,36	0,36
Mean	0,37	0,37	0,33	**0,45**	**0,28**	0,36	0,37	0,37
St Dev	0,11	0,09	0,10	0,11	0,07	0,09	0,09	0,11
	(3,4,5,6,7)	(3,4,5,6,7)	(all)	(all)	(all)	(all)	(all)	
Physical capital index [0–12]	**8,00**	5,00	7,00	6,00	6,00	**5,00**	6,00	6,00
Mean	**7,61**	5,51	6,52	5,38	5,68	**4,89**	5,53	5,70
St Dev	1,73	1,72	1,61	1,74	1,59	1,78	1,82	1,85
	(all)	(1,3,4,5,6)	(all)	(all)	(all)	(all)	(1,3,4,5,6)	
Income per ae (Rwf.)	**97.722**	33.868	33.908	25.846	22.945	23.456	24.796	29.130
Mean	**117.444**	40.557	41.470	29.514	27.488	30.872	29.268	38.975
St Dev	71.199	27.061	33.248	20.768	19.529	24.259	24.605	38.876
	(all)	(1,4,5,6,7)	(1,4,5,6,7)	(1,2,3,5,6)	(all)	(all)	(1,2,3,5,6)	
Expenses per ae (Rwf.)	**144.579**	57.930	56.618	50.146	46.651	45.167	41.297	52.497
Mean	**157.895**	65.321	62.344	51.788	52.162	50.980	50.259	62.783
St Dev	54.568	33.934	31.755	24.140	29.537	27.876	36.515	43.590
	(all)	(all)	(all)	(1,2,3,6,7)	(1,2,3,6,7)	(1,2,3,4,5)	(1,2,3,4,5)	

Notes: (1) Means and standard deviations are adjusted for sampling weights. (2) Statistically-significant differences at 0.001 level between mean of clusters x,y and the column cluster, established by Games-Howell test, suitable for pairwise multiple comparisons between groups in case of unequal or unknown variances between groups and unequal size of groups (recommended by Cardinal & Aitken, 2005; Field 2005).[17]
Source: Based on own calculations.

[17] Methodological note: Levene's statistic (i.e. test for homogeneity of variances) is significant for all variables included in the cluster analysis. This means that there is a significant difference between the variances of the different clusters. The F-test of ANOVA could still be robust if the clusters would have approximately the same size, but as this is not the case, we are obliged to use tests that do not assume equal variances between groups. There are four tests available in SPSS: Tamhane's T2 test, Dunnett's T3 and C test and the Games-Howell test. We opt for the last one as it is recommended by the sources cited above.

5. Identifying Livelihood Profiles by Linking Asset Portfolios to Livelihood Strategies

To examine the predictive validity of the cluster-solution, we look at cluster differences with regards to additional variables not included in the previous analysis. We opt for variables capturing households' access to particular livelihood strategies. Livelihood strategies are the activities / actions to which households have access to in shaping their livelihoods. Whether or not a household has access to (or is locked within) certain strategies is dependent upon a combination of livelihood assets shaped by the institutional environment. In other words, "rural households design livelihood strategies to suit their asset endowments and account for the constraints imposed by market failures, state failures, social norms, and exposure to uninsured risk" (World Bank 2007: 72). In turn, livelihood strategies determine the HHs capability of acquiring certain assets.

The World Development Report 2008 cites three complementary (but not necessarily successful) options for rural populations to gain a livelihood: through farming, through the labour market, and through migration (World Bank, 2007). At the same time, the report points to the heterogeneity within each of these activities. It highlights the importance of the dualism between market-oriented smallholder entrepreneurs versus subsistence smallholder farmers; between agricultural and non-agricultural high-skilled and low-skilled jobs on the labour market; and between emigrations with high and low returns.

Table 3 illustrates that all clusters depend to a great extent upon their agricultural production. It is interesting to compare the monetary value of rural entrepreneurs' agricultural production with the resource-rich cluster. Although resource-rich peasants on average possess more than twice as much land, they do not generate more agricultural production than rural entrepreneurs.

When considering the market-orientation of households in their on-farm activities, we find that nearly all households in the sample rely to a considerable extent upon subsistence food production, regardless of which cluster they fall into. Notwithstanding the fact that at least two-thirds of all clusters engage in agricultural trade, the relative importance of this trade is at most one-third of the monetary value of total agricultural production (based upon means). In addition, there is a large difference between median and mean monetary income from agricultural sales which indicates a large within-cluster variation (cfr. large standard deviation).

The cluster of rural entrepreneurs is most active in agricultural production for sales (over 90% of all households) and also generates the highest incomes in comparison to other clusters. Equally interestingly but rather obvious is that the "resource-rich" (cluster 1) seem to be less dependent upon subsistence food production than the "resource-poor" households of clusters 4 and 5. Cluster 3 households are able to generate production surpluses on their considerable plots of land and therefore engage more often in agricultural trade. They also generate higher revenues from this activity. Further, remoteness does not seem to hold the "isolated cluster" households back in trading part of their production; over 70% are involved in this activity. On the other hand, remoteness seems to affect the bargaining capacity of these households in price negotiations: the monetary income value of agricultural trade is limited. "Female-headed" households, finally, seem most constrained in trading their agricultural production. Although almost two-thirds occasionally engage in trade, the income this generates is among the lowest of all clusters.

Table 3: **Livelihood strategies for different clusters**

CLUSTER:	1	2	3	4	5	6	7	Total
% HH with positive income from:								
Own farming activities:	**100,0**	**99,2**	**100,0**	**99,8**	**99,5**	**99,3**	**99,2**	**99,6**
Subsistence production	98,4	99,2	100,0	99,3	97,6	98,3	97,4	98,6
Agricultural sales	91,4	68,8	78,5	71,8	69,2	70,4	65,8	72,1
Livestock (net - only if positive)	36,9	30,1	50,4	18,9	27,8	23,7	16,9	26,8
% of HH with some livestock	65,7	80,4	93,0	58,3	69,6	58,5	58,4	67,1
Off-farm activities:	**47,1**	**37,3**	**25,2**	**29,6**	**33,3**	**26,8**	**18,1**	**30,0**
Own off-farm enterprise	22,1	19,7	12,7	13,6	10,3	8,5	5,2	12,4
Non-agricultural skilled	11,1	4,9	9,3	3,4	3,6	1,7	1,5	4,3
Non-agricultural unskilled	12,0	3,4	6,4	5,3	11,2	5,8	0,6	6,0
Agricultural	6,6	14,4	4,7	12,8	13,8	14,1	11,5	11,8
Remittances (net - only if positive)	**39,1**	**28,3**	**30,4**	**39,0**	**35,9**	**37,1**	**43,5**	**36,7**

Monetary value (thousands Rwf) of income from: 1	1	2	3	4	5	6	7	Total
Subsistence production (median)	137,4	113,7	145,6	83,2	74,0	83,4	65,7	89,8
Mean	176,9	136,4	162,6	93,9	90,3	91,4	75,0	109,1
St Dev	142,6	109,0	105,5	63,9	70,8	61,8	65,1	91,3
Agricultural sales (median)	**35,6**	11,4	**30,0**	8,7	6,5	**6,1**	**5,4**	10,1
Mean	**89,0**	34,3	**59,8**	25,8	24,6	**21,7**	**21,8**	35,2
St Dev	132,9	61,6	104,4	45,3	49,8	45,8	40,6	71,6
Own off-farm enterprise (median)	**201,3**	66,0	60,0	38,5	20,0	62,6	4,5	50,9
Mean	**248,4**	82,4	204,4	70,4	35,5	103,6	28,9	107,7
St Dev	192,7	62,5	392,1	96,1	39,5	135,0	60,6	178,8
Wage labour -all kinds (median)	**144,0**	**39,6**	**46,8**	24,6	38,4	**12,0**	21,6	28,8
Mean	**188,8**	**85,1**	**89,1**	50,3	46,5	**24,4**	26,7	66,7
St Dev	176,0	96,3	91,1	73,0	42,6	31,6	23,2	96,9

Pay per hour (Rwf 2001 prices)	1	2	3	4	5	6	7	Total
All jobs (median)	**94,5**	54,5	**65,4**	30,7	**46,0**	31,3	30,7	46,0
Mean	**177,1**	67,5	**107,5**	71,0	**141,7**	50,9	64,9	97,5
St Dev	275,6	64,5	118,4	107,8	294,7	61,5	98,1	184,9
Own off-farm enterprise (median)	98,6	76,7	115,1	34,5	55,2	**80,5**	38,4	72,0
Mean	256,6	104,3	159,5	101,7	173,5	**113,3**	130,4	145,9
St Dev	395,9	86,6	166,8	117,2	257,6	136,3	149,6	215,2
Non-agricultural job (median)	111,1	50,1	102,3	53,9	**56,8**	46,6	10,2	56,8
Mean	148,3	49,9	102,4	86,5	**193,0**	51,7	8,2	113,5
St Dev	160,2	29,3	83,7	141,0	402,3	36,9	4,6	223,0
Agricultural job (median)	55,2	30,7	50,0	**23,0**	**38,4**	**30,7**	30,7	30,7
Mean	49,0	38,1	63,2	**30,5**	**47,5**	**33,9**	37,3	39,0
St Dev	14,6	25,3	77,5	24,5	29,7	17,8	20,1	30,7

Note: Only households with positive income from this source are taken into account when calculating median, means and standard deviation.
Source: Based on own calculations.

Overall, the data indicate that nearly all households in the sample retain their subsistence orientation (which represents an important share of overall income) rather than engaging in market-oriented production, regardless of which cluster they fall into. This is not a matter of a

preference for subsistence agriculture, but rather the result of the constraints they would face in agricultural production solely for trade. This finding is confirmed by qualitative field work undertaken by the author in 2007. She found that only very few households had a market-oriented production pattern. In most cases, engagement in market agriculture was based upon two different rationales: (1) either households with a cash constraint were obliged to sell a limited part of their production; or (2) households - in most cases the better-off of the local setting - sold the surplus that they generated on top of their subsistence food production/needs. Aside from these patterns, there are also some better-off entrepreneurs who deliberately produced cash crops for the market when able to rely upon other on/or off-farm income sources (Ansoms, 2008).

Turning to another aspect of agricultural trade, net income from livestock breeding is limited and even negative for a considerable group of households. This may seem surprising given that the percentage of households that keep some livestock (at least half of the households in all clusters) is much larger. Livestock is kept not so much to be intensively traded as an income-generating activity, but rather to serve as a buffer for self-insurance and as a source of manure to fertilise the land. The percentage of households extracting a positive income from their livestock is highest for the "resource-rich" (50,4%), the "rural entrepreneurs" (36,9%) and the "associational" clusters (30,6%).

Looking at off-farm activities, the data allows us to differentiate self-employment, non-agricultural skilled and unskilled jobs, and agricultural wage labour. Indeed, these categories are still quite broad: non-agricultural skilled labour may, for example, include jobs in the formal sector with high salaries, but also refers to the work of skilled plumbers and carpenters. Agricultural employment may include both fixed employment for NGOs but also very low-paid occasional employment on other peasants' land. All this cannot be captured with the data from the aggregate categories available here. Nonetheless, Table 3 illustrates that there are clear differences between aggregate employment categories.

The "rural entrepreneurs" (cluster 1) are most active in off-farm activities: nearly half are involved in generating revenue outside of their own farms. Entrepreneurs mostly undertake activities in the non-agricultural sector (22,6% generate a non-agricultural revenue) or set up their own enterprises (22,1% of this cluster 1). They are much less active as agricultural wage labour force than most other clusters. Also, the associational cluster has almost 38% of all households involved in off-farm activities. Most of them either work in their own off-farm enterprises (almost one-fifth of all associational households are self-employed) or they work as agricultural labourers (14,4% are engaged in this type of job).

Two other clusters with a relatively large proportion active in off-farm activities are the resource-poor clusters, 33,3% for the centrally-located (cluster 5) and 30% for those in fertile regions (cluster 4). In the same way as the associational cluster, households of these clusters are mostly active as an agricultural labour force and/or they have their own off-farm enterprises. But centrally-located households also engage quite regularly in unskilled off-farm activities. Indeed, these households have the advantage of their central location which brings a lot of off-farm income-generating opportunities within reach.

For all other clusters, far less than 30% engage in activities outside their own farm. Only one-quarter of the "resource-rich" cluster engage in off-farm activities. It seems strange that

the relatively large adult labour force of these households does not allow for more intra-household labour specialisation and differentiation beyond agricultural activities. On the other hand, the relatively abundant availability of land allows these households to concentrate on agricultural production for subsistence purposes and for trade on local markets. If active outside their own farm, household members of cluster 3 mostly engage in off-farm self-employment.

The two remaining clusters - 6 ("isolated") and 7 ("female-headed") - if active at all outside of their own farms, most often turn to the off-farm unskilled labour market, particularly to agricultural jobs. For the "isolated" households, income from wage labour is the lowest of all clusters. Indeed, remoteness seems to be an important institutional constraint for these households on the wage labour market. Engagement in off-farm self-employment is a more remunerative income-generating opportunity for this cluster. The mean monetary income value generated through this activity is considerable for the 8,5% of self-employed persons in the isolated cluster. Households of the "female-headed" cluster are the least active outside of their own farms. Less than one in five is involved in off-farm activities, and the revenue generated only counts for a small percentage of overall income.

Overall, the percentage of households that report earning an agricultural wage (11,8% of the total sample) is surprisingly low when put against qualitative information on social categories in the rural setting. The PPA report (GoR, 2001) mentions 'working on other people's land' as one of the main characteristics of the 'vulnerable' (umutindi). A later report by the Organisation for Social Science Research in Eastern and Southern Africa (2006), presenting the data from a survey in 10 districts in different parts of Rwanda, reports that 20,4% of the population was in this category. On top of this, the PPA report mentions that an even larger category of 'poor' (umukene nyakujya and umukene) often complement their on-farm incomes with wage earnings from temporary agricultural jobs. Therefore, the percentage of households with off-farm agricultural earnings reported in the EICV is most surely an underestimation of the real number of households involved in this type of mostly temporary employment. Quite often, poor households work on a very irregular basis as daily wage labourers for money and/or for food, most often in times of distress. Certainly when paid in food, it is likely that households forget to report these limited earnings that enter the household on an irregular basis. Another explanation may be that they are reluctant to admit to working for other peasants to earn a living (meaning that they are really so poor).

Furthermore, the differences between wage rates for different types of jobs are considerable. In general, the mean and median non-agricultural wage rate is significantly higher than the wages from agricultural jobs (except for cluster 7 with "female-headed" households; but the percentage of households involved in non-agricultural jobs is extremely small). Next to earnings on the agricultural or non-agricultural labour markets, the EICV data further allows calculating the earnings per hour for rural households involved in their own off-farm enterprise. For the total sample, both the mean and median of the non-agricultural wage is somewhat below 80% of the pay per hour in an own off-farm enterprise. The agricultural wage rate is only a fraction of what can be earned as an independent off-farm entrepreneur or a non-agricultural labour force member.

Next to wage rate differences for different job types, the between-cluster wage differences are also interesting to compare, even though the means and medians may differ quite a lot and the standard deviations are high. Between-cluster differences are the highest for off-farm self-employment and non-agricultural jobs. However, within-cluster variation is high for these types of

activities: the pay-per-hour profiles of the "rural entrepreneurs" (cluster 1) and the "resource-poor / centrally-located" (cluster 5). They are characterised by high standard deviations and wide differences between medians and means. Wages differences between clusters for agricultural jobs – certainly when considering the median wages – are less impressing.

The average pay per hour is highest for the "rural entrepreneurs" (cluster 1). It is also considerable for the "resource-rich" (cluster 3) and the "resource-poor / centrally-located" (cluster 5). Indeed, the centrally-located households are better able to capitalise on their central location to negotiate a higher pay rate for all types of activities than can households of other (poorer) clusters. The "resource-poor in fertile regions" (cluster 4) earn considerably less per hour. Their limited capacity to generate an income on their own farm apparently constrains them in negotiating reasonable wages when desperately looking for off-farm jobs, especially as labourers in the agricultural sector. The "isolated" cluster (cluster 6) is also confronted with a bargaining constraint related to their remoteness and more limited mobility, which results in low wage rates on the wage labour market. However, those active in off-farm employment do earn well. Agricultural wage rates of "female-headed" lie close to the sample average; however, they get the lowest pay per hour in non-agricultural jobs. Indeed, very few households of cluster 7 engage in this activity as it is typically done by adult males.

6. Linking Livelihood Profiles to Poverty Incidence

In economic literature, poverty is traditionally conceptualised by comparing income or consumption to a standard poverty line. In general, consumption measures perform better in comparison to income measures to approximate a household's living standard; moreover, consumption is also easier to measure and the results more accurate (Deaton, 1997). The poor are then identified as those falling below the poverty line, which offers advantages to comparisons in time and space.

The input of other social sciences (e.g. sociology, anthropology), however, has led to a focus on the multidimensionality of poverty, and the importance of conceptualising and contextualising the poverty phenomenon within its own setting. This resulted in an interest in subjective poverty assessments, including, for example, the poor as agents in their own poverty assessments. It also accepted more nuance and subjectivity than traditional unidimensional 'objective' measures. The World Bank, for example, undertook an elaborate study to capture the "Voices of the poor" and used this as an input for the World Development Report 2000/2001 ("Attacking poverty", World Bank, 2001; Narayan et al., 2000). Both objective and subjective poverty measures have their advantages and disadvantages; this paper serves to illustrate their complementarity.

From within the group of objective measures, Coudouel et al. (2002) differentiate absolute and relative poverty lines. Absolute poverty lines are often based upon minimal basic needs. For Rwanda, two consumption poverty lines have been defined to measure absolute poverty in 2001. A food poverty line of 45.000 Rwf per adult equivalent per year represents the cost of a basket of food securing the minimal necessary caloric intake (2500 kcal per adult equivalent per day). A second absolute line of 64.000 Rwf represents the minimal requirements of food and non-food consumption (GoR 2002).

Relative poverty lines, on the other hand, are defined as a fraction of a central tendency in society, for example the median or mean of the society's income/consumption distribution (Muller, 2006). An often used cut-off line is 50 percent of the country's mean or median consumption (Zheng, 2001). Petrovici and Gorton in their study take two cut-offs, one at 30% and one at 50% of average per capita expenditure (Petrovici and Gorton, 2005). Applying these 'marks' to the Rwandan context gives a set of relative poverty lines based upon overall mean consumption (25.301 and 42.169 Rwf); and an alternative set of relative poverty lines based upon rural mean consumption (19.849 and 33.082 Rwf)[18], see Table 4.

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[18] The calculation of these poverty lines is based upon the entire EICV sample, including 6420 households living in both rural and urban environments.

Table 4: **Poverty status based on absolute and relative poverty lines for different clusters**

CLUSTER:	1	2	3	4	5	6	7	Total
% of HH	8,0%	12,6%	10,1%	23,0%	16,8%	13,8%	15,7%	100,0%
Poverty incidence based on absolute poverty lines (Chi-square p = 0,000)								
Extreme poor < 45.000 Rwf	0,0	31,1	35,1	43,6	47,8	50,0	56,7	41,3
Poor 45.000 – 64.000 Rwf	2,5	25,3	25,8	26,5	27,2	23,4	18,7	22,8
Non-poor > 64.000 Rwf	97,5	43,6	39,2	29,9	25,0	26,6	24,6	35,9
Poverty incidence based on relative poverty line (30% and 50% of **overall** mean consumption) (Chi-square p = 0,000)								
Extreme poor < 30%	0,0	5,4	8,4	13,2	13,4	14,1	24,8	12,7
Poor 30% - 50%	0,0	23,6	20,1	25,6	30,7	30,9	27,5	24,6
Non-poor > 50%	100,0	71,0	71,5	61,1	55,9	55,0	47,7	62,7
Poverty incidence based on relative poverty line (30% and 50% of **rural** mean consumption) (Chi-square p = 0,000)								
Extreme poor < 30%	0,0	2,0	2,8	6,7	6,8	8,2	15,6	6,8
Poor 30% - 50%	0,0	13,8	12,8	19,9	19,6	23,1	22,5	17,6
Non-poor > 50%	100,0	84,2	84,4	73,5	73,7	68,7	62,0	75,6

Source: Based on own calculations.

For all absolute and relative poverty lines, the Chi-square tests confirm that the difference between the clusters in terms of poverty incidence is significant. The poverty problem is least prominent among the "rural entrepreneurs" (cluster 1) as nearly all fall in the non-poor population group. The two other relatively better-off clusters, the "associational" (cluster 2) and "resource-rich" (cluster 3) households, have significant numbers of extreme poor (over 30%) and poor (over 25%) when considering the absolute poverty line. On the other hand, when turning to the relative poverty line (taking mean consumption as a standard), over 70% of these households fall in the non-poor category. For the remaining clusters, more than 70% have living standards below the absolute poverty line. Most problematic is the situation for the "female-headed" cluster, of which over half live below the food poverty line and can be categorised as the 'extreme poor.'

A similar picture appears when comparing clusters in terms of material wealth, assessed through ownership or lack of ownership of seven different objects (see Table 5). "Rural entrepreneurs" (cluster 1) have the highest chance of owning each of these objects. Households in the relatively better-off "associational" and "resource-rich" categories also figure among the better-off clusters. Interestingly, cluster 3 households (resource-rich) have a higher chance of owning these objects than those of cluster 2 (associational). Among the poor clusters, the "resource-poor / centrally-located" (cluster 5) are still relatively well equipped (e.g. look at the relatively high percentage owning a radio). In comparison with this cluster, the seven assets are much less owned by the "resource-poor in fertile regions" (cluster 4) and by "isolated" households (cluster 6). The situation is, however, most problematic for the "female-headed" (cluster 7) households who own very few assets in this list.

Table 5: **Assets owned by households of different clusters**

CLUSTER:	1	2	3	4	5	6	7	Total
% of HH owning a:								
Chair	67.9	54.9	65.9	47.6	46.1	30.2	29.4	46.5
Bed	80.2	43.2	58.7	36.5	43.6	31.6	21.0	41.2
Radio	58.8	38.9	52.3	25.0	37.6	24.5	7.5	31.5
Bicycle	17.6	6.9	13.7	3.5	3.7	2.7	0.7	5.6
Cupboard	14.8	5.1	7.2	4.3	3.1	2.6	2.6	4.8
Lounge suite	7.7	2.1	4.8	1.5	1.0	0.0	0.0	1.9
Sewing machine	1.9	1.8	4.9	2.0	0.6	0.7	0.8	1.7

Source: Based on own calculations.

It is equally interesting is to see whether clusters differ substantially with respect to subjective measures of well-being. Subjective self-assessments should be approached with caution and by no means replace objective measures. On the other hand, they can reveal how households experience and perceive their own situations. In addition to the nationally representative EICV and FSRP surveys, the author of this paper conducted a follow-up survey in September 2004 on a subsample of the combined EICV – FSRP sample. The study was restricted to households in two provinces, Gitarama and Gikongoro.[19] It gathered information on the evolution of households' living conditions over the 2001-2004 period (i.e. changes in livelihood assets and strategies), the household heads' perception on the overall well-being of his/her household, and the households' social networks within their social environment.

The data from this subsample can be used to complement on our cluster analysis. The distribution of the households over the six clusters (see Table 6) is somewhat different for the Gikongoro - Gitarama subsample. There are much more "resource-poor / centrally-located" households, and somewhat more households falling in the "isolated" and "resource-rich" clusters. On the other hand, the "resource-poor in fertile regions" are few in number in the Gikongoro – Gitarama subsample. This subsample also contains somewhat fewer households of the "entrepreneurial", "associational" and the "female-headed" types.

Table 6: **Cluster membership of households included in the Gikongoro – Gitarama subsample**

Number and % of HH	1	2	3	4	5	6	7	Total
Cluster membership for total sample	96	152	130	263	198	189	192	1220
	8.0%	12.6%	10.1%	23.0%	16.8%	13.8%	15.7%	100.0%
Cluster membership for subsample	13	15	48	8	68	47	25	224[1]
	6.8%	6.9%	21.0%	4.2%	32.8%	16.6%	11.7%	100.0%

Note: (1) 58 households in the subsample (counting 282 respondents) do not overlap with the EICV-FSRP sample used for the cluster analysis.
Source: Based on own calculations.

[19]   Before the recent administrative reform (2006), Rwanda was divided into 11 provinces. After the reform, there are 4 provinces. The previous provinces Gitarama and Gikongoro, where the research is undertaken, now fall largely within the boundaries of the Southern Province.

The 282 households originally included in the Gikongoro – Gitarama subsample were shown a nine-step societal scale, subdivided into three parts (poor, medium, rich). The respondent (family head) was first asked to enumerate the characteristics of 'the poorer' (steps 1-2-3), 'the medium' (steps 4-5-6), and 'the richer' (steps 7-8-9) on the social scale. Table 7, with the result of this exercise, illustrates a large degree of consistency in the characteristics that the respondents spontaneously attributed to these categories.

Table 7: *Characteristics of three societal categories* [1]

'Richer'	Having a lot of livestock, mostly referring to cattle (77%), having sufficient or a lot of land (39%), having sufficient agricultural production or more - at least sufficient for self-subsistence (36%), having (a lot of) money (28%), having a nice house (23%), having their own business or being a trader (16%), having a permanent job (15%), having a vehicle (10%), having a banana grove (8%), having nice cloths and/or shoes (5%), having a husband or wife and enough children (5%).
'Medium'	Having livestock, mostly referring to small husbandry (50%), having agricultural production at least sufficient for self-subsistence (45%), having sufficient land, with 'sufficient' probably referring to the fact that it suffices for self-subsistence (27%), having a decent house (16%), having some land but not referring to the fact that it is 'sufficient' (12%), having (some) money (9%), having cloths and/or shoes (7%), having insufficient agricultural production, not being self-subsistent (6%).
'Poorer'	Working (temporarily) / cultivating for others (for money or food) to feed themselves (36%), having no / a lack of land (34%), having no livestock (33%), having no or limited agricultural production far from sufficient for self-subsistence (26%), having no house or a house of low quality (16%), having no cloths and/or shoes (11%), having nothing (11%), living from or needing help from others (9%), having no money (9%), being physically handicapped / incapable to work (7%), being a beggar (6%).

Note: (1) The percentage mentioned behind each element is the percentage of the 282 respondents who spontaneously mentioned this as a characteristic in open-type questions.
Source: Based on own calculations for the full Gikongoro-Gitarama subsample of 282 households.

In a next stage, the respondents categorised their own household on the 9-step social scale (based on their living conditions in 2004 – the time of the interview). They were then asked to indicate where they were three years before (in 2001, the time of the EICV-FSRP survey). The distribution of households across the nine categories in 2001 is very unequal (see Table 8). This is in line with other research on subjective well-being measures (e.g. Kingdon and Knight, 2006). About 45% estimate their household's position within the 'poorer' steps of the societal scale, while over half of the respondents (51,9%) place their household in the 'medium' categories. Category 3 and 4 are the most populated, each hosting more than 20% of the households, whereas only 2,9% of all household heads place their household in the 'richer' categories. In line with Kingdon and Knight (2006), the overlap between objective consumption-based categories and subjective well-being categories is far from perfect.

We are, however, most interested in the subjective well-being assessment for the particular clusters identified above. Referring to their living conditions in 2001, over three-quarters of the "rural entrepreneurs" and the "resource-rich" put themselves in the medium categories. It is surprising that almost one-quarter of the rural entrepreneurs consider themselves among the 'poorer,' whereas none of them has consumption levels below the poverty line. What is even more interesting is that resource-rich households seem more optimistic about their living conditions in 2001 than the rural entrepreneurs. It may be that the households' heads of resource-rich households refer rather to their own situation than that of the entire family which, in most cases, includes other adult male offspring whose living conditions in the long run will be less favourable than those of their fathers. A large majority (almost two- thirds) of households in the relatively well-off "associational" cluster consider themselves among 'the poorer.' This is the highest of all

clusters and a surprising result given that this cluster has the second lowest poverty incidence according to objective poverty measures.

For the four poorer clusters, subjective assessments are somewhat comparable. Over 50% categorise themselves among the 'poorer'. Note that this is less than the 63% of the associational cluster considering themselves to figure among the 'poorer. Equally intriguing is that the "isolated" and "female-headed" clusters have the highest percentage of households categorising themselves among the 'richer' in 2001; 4,0% and 5,8% respectively.

Table 8: **Poverty status in 2001 based on subjective assessment of well-being for different clusters**

CLUSTER:	1	2	3	4	5	6	7	Total
% of HH								
Poverty incidence in 2001 based on subjective well-being measure								
'Poorer'	24,9	62,7	18,2	50,7	54,6	54,9	52,6	45,1
'Medium'	75,1	37,3	78,7	49,3	42,6	41,2	41,6	51,9
'Richer'	0,0	0,0	3,2	0,0	2,8	4,0	5,8	2,9
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Source: Based on own calculations for the Gikongoro-Gitarama subsample of 227 households that overlap with the EICV-FSRP sample used for the cluster analysis above.

7. PERCEPTIONS UPON LIVELIHOOD PATHWAYS: OPTIMISTS VERSUS PESSIMISTS

Some of the results in the previous section may be surprising; however, when analysing the data one should take account that the data in Table 8 are based upon recall questions. This would be highly problematic if the purpose of our analysis was to determine objectively whether households' situations actually improved or deteriorated over the 2001-2004 period. We are, however, interested in the optimism or pessimism of objectively-determined livelihood profiles (based upon 2001 data) with regards to the evolution in their living conditions. This 'subjective' feeling may differ from 'objective' reality. In fact, there are two effects that play out here: the optimism or pessimism of the respondent in his/her assessment of the household's situation at a particular point in time, and the optimism or pessimism of the respondent with regards to 2001-2004.

To capture this dynamic aspect, it is interesting to analyse how the identified household groups perceive changes in their living conditions between 2001 and 2004. Important to mention is that we look at the perception of household heads on the mobility of their household, not upon the mobility of their livelihood profile as a whole. Over one-quarter of all households in this subsample report a change, placing their household in a higher or lower aggregate well-being category (immobility ratio 1 of 74,6%). About 11,7% report a shift from 'poorer' to 'medium' categories and about 2,2% from 'medium' to 'richer'. On the other hand, 9,6% have shifted from 'medium' to 'poorer' and 1,9% from 'richer' to 'medium'. However, a comparison between Tables 8 and 9 hides the true mobility that households report over the 2001 – 2004 period. The well-being categories 'poorer', 'medium' and 'richer' are aggregated categories, each subdivided into three subcategories. The immobility ratio (2), based upon the fraction of households that remain in the same subcategory, is much lower.

Table 9:   ***Poverty status in 2004 based on subjective assessment of well-being for different clusters***

CLUSTER:	1	2	3	4	5	6	7	Total
% of HH								
Poverty incidence in 2004 based on subjective well-being measure								
'Poorer'	26,9	42,4	20,5	50,7	53,9	46,3	56,0	43,1
'Medium'	73,1	57,6	68,6	49,3	43,4	53,7	44,0	53,7
'Richer'	0,0	0,0	10,9	0,0	2,7	0,0	0,0	3,2
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Immobility ratio 1 [1]	83,3	70,0	72,1	100,0	76,4	70,7	67,8	74,6
'Optimists'	37,1	**43,2**	26,8	**50,7**	29,8	**43,0**	16,3	32,1
'Pessimists'	40,5	33,8	**44,3**	13,3	**44,3**	**42,6**	**33,8**	40,5
Immobility ratio 2 [1]	22,4	23,0	28,9	36,0	25,8	14,4	49,9	27,4

Note: (1) Immobility rate 1 represents the percentage of households that remain in the same aggregate subjective well-being category 'poorer', 'medium' or 'richer'. Percentages for 'optimists' and 'pessimists' are based upon the respondent ranking the situation of his/her household in 2004 higher or lower on the 9-scale ladder than in 2001. Immobility rate 2 represents the percentage of households that remain in the same subjective well-being subcategory.
Source: Based on own calculations for the Gikongoro-Gitarama subsample.

Furthermore, the shift in the subjective assessment of well-being is very different for the different clusters. The "rural entrepreneurs" (cluster 1) are somewhat pessimistic about their overall living conditions in 2004 in comparison with 2001. Somewhat less than three-quarters consider their household to figure among the 'medium' categories; and still none of these 'objectively' well-off households consider themselves among the 'richer.' The "resource-rich" households (cluster 3) report a shift in their living conditions in two diverging directions. Whereas the group of 'medium' households is smaller in 2004, the size of the group of 'poorer' and more pronouncedly the group of 'richer' increases. Nonetheless, when considering the dynamics on the 9-scale ladder of subcategories, this cluster contains the most pessimistic households.

This is very different for the cluster of "associational" households (cluster 2): they are, in general, much more optimistic with regards to their relative wealth ranking in 2004 than 2001. In fact, the seemingly pessimistic nature of the households in assessing their living conditions in 2001 (with the highest percentage of all clusters considering themselves 'poorer') might be, in fact, the deceiving consequence that these households are rather content about the improvement in their living conditions between 2001 and 2004. On the other hand, we should also acknowledge the considerable percentage of 'pessimists' (33,8%) who report a slip on the 9-scale ladder, although they rarely classify their household into a lower aggregate well-being category. Overall, the percentage of households that consider themselves 'poorer' remains considerable. This may have to do with a wish of association households to appear poor to the research team in the hopes of attracting support.[20]

Turning to the "isolated cluster", Petrovici and Gorton (2005) found for the Romanian sample that poorer households living in the most rural remote areas tend to understate their poverty, while more centrally-located households (urban in their study) have higher expectations of overall well-being and tend to underestimate their own living status due to their ability to compare with richer households in the neighbourhood. This effect is not applicable to the Rwandan case when considering the 2001 data from Table 8. However, the 2004 data in Table 9 (where the recall effect is not present) confirm Petrovici and Gorton's findings for the Rwanda: "isolated" households report considerably less often to be among 'the poorer' than those of other objectively-poorer clusters.

When considering the 2001-2004 evolution for this "isolated" cluster, we observe a convergence trend. The group of "poorer" and "richer" has become smaller whereas an additional 12,5% of the households assess their situation as "medium" in 2004. On the other hand, when taking a look at the 9-scale ladder with subcategories, we find that the percentage of optimists is counterbalanced by an almost equally high percentage of pessimists. This indicates how working with aggregate subjective well-being measures hides part of the ongoing dynamics in subjective poverty assessment.

"Female-headed" households are very rarely optimistic. Overall, households shift from 'richer' to 'medium' and to 'poorer' categories. Interesting for this cluster is that the immobility rate, based upon aggregate categories, is the lowest of all clusters (67,8%), whereas the immobility rate based upon shifts in the nine subcategories, is the highest (49,9%). This indicates that these households – if moving at all – report shifts that immediately take them to another aggregate well-being category.

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[20]   This hope was frequently expressed during the survey conducted by the author and her research team.

Finally, the distribution of both resource-poor clusters over the aggregate subjective well-being categories remains more or less stable when comparing 2001 and 2004. The immobility rate, certainly for the aggregate categories (immobility rate 1) is high, even 100% for the "resource-poor in fertile regions" of cluster 4 (but this cluster contains few cases in the subsample). When looking at the disaggregate level, we see that a majority of cluster 4 households are optimists, although they rarely take their household upwards to a higher aggregate well-being category. "Resource-poor / centrally-located" households of cluster 5, however, are more often pessimists than optimists (although their pessimism, in most cases, does not take them towards a lower aggregate subjective well-being category). Indeed, the aggregate figures once again mask the dynamics beneath.

8. POLICY IMPLICATIONS AND CONCLUSIONS

The main aim of this paper has been to identify different livelihood profiles prevailing in the Rwandan rural context by means of principal component and cluster analysis. Next to contextual factors, the principal component analysis identified six relevant dimensions related to asset categories in livelihoods analysis (i.e. aggregate wealth, human resources, natural resources, quality of location, and centrality of location and association networks). These components were used as an input for a cluster analysis which identified seven groups of households. These clusters were validated by examining differences in livelihood strategies and poverty profiles. To add a dynamic perspective, a subsample was studied regarding how the identified household groups perceive changes in their living conditions over the years 2001-2004. An overview summarising the key elements of each cluster's profile is presented in Table 10. From this analysis, we can now identify relevant policies for poverty alleviation in the rural setting that are attuned to households' different livelihood profiles and pathways.

The cluster of "rural entrepreneurs" **(cluster 1)** is doing well in terms of income and consumption measures. This cluster illustrates that it is possible to live well in the country without sizable (cultivable) landholdings. Average cluster landholdings (0,72 hectares) are almost equal to the sample mean (although we should note that these households do better than the sample average in adult equivalent terms). However, there is another crucial factor to explain the success of these clusters: access to off-farm employment, particularly in the non-agricultural setting, and engagement in one's own off-farm enterprises. In addition, households in this cluster earn the highest hourly wages of all clusters. This is most likely linked to their educational stock. Policy makers could draw lessens from the relative comfortable situation of this cluster by investing in education and by investing in strategies that enhance demand for off-farm employment.

We can also draw policy lessons from the livelihood profile of the "associational" **cluster 2**. Association links provide households with modest access to credit and risk insurance. This seems to pay off somewhat in terms of overall income and consumption which are the second highest of all clusters. On the other hand, they categorise their households quite often in the poorer category. At the same time though, the associational cluster is the most optimistic with regards to the subjective improvement in their well-being over the 2001-2004 period. Having access to a financial safety net apparently is important. In spite of these more positive elements, the analysis also highlighted that the average consumption of cluster 2 still lies below the poverty line of 64.000 Rwf. Therefore, there are important challenges for policy makers. The livelihoods of cluster 2 associational households could improve further with policy measures that provide a lever to the initiatives taken by the associations themselves: policies that could, for example, give assistance to associations to engage in off-farm entrepreneurial activities and/or on-farm agricultural production techniques with high returns.

Policies targeting the relatively "resource-rich" **cluster 3** should focus on increasing the incentives for these households to produce for the market. This should not be done by coercion; on the contrary, it is crucial for policy makers to analyse in detail why these relatively land-abundant households do not engage more in market-oriented production. Enhancing their market-oriented entrepreneurial spirit can be done by improving their bargaining position in price negotiations. This may be achieved by encouraging them to organise into cooperatives within

which they are active agents and not passive price-takers. Further, as market-oriented production often entails higher risks (in comparison to diversified subsistence-oriented production), resource-rich households might be more inclined to produce for the market if they would have increased access to risk-insuring mechanisms and to credit facilities that allow them to invest and/or overcome financial setbacks.

The "resource-poor in fertile regions" of **cluster 4** are highly deprived in terms of land and livestock. Given the limited natural resource base of rural Rwanda, it seems unrealistic for policy makers to improve access to land. However, policies could focus on improving access to off-farm employment; and, particularly for this cluster, explore the potential of off-farm small-scale enterprises, possibly through collective action. These households have potential, given their considerable educational stock. However, only 10% of this cluster participates in some form of association; even though such associations may help them to access credit to start-up activities and engage in networks that might ensure them an outlet for their products and services. Policies could enhance incentives to engage in such associations and help them to increase the opportunities of such resource-poor households to engage in alternative types of employment outside of the agricultural sector.

Cluster 5 households, the "resource-poor / centrally located" are also characterised by very limited access to natural resources (land and livestock). Therefore, the same types of policies are relevant for this cluster: enhance incentives to start their own enterprises or engage in off-farm employment. In fact, these households are bound to find income-generating opportunities outside of the agricultural sector as they are confronted with extremely low soil fertility and other resource constraints. Their central location could aid these households to engage in an entrepreneurial network(s) and find nearby outlets for their products and services.

Isolation is the most important institutional constraint of **cluster 6** households. Improved rural road infrastructures could improve household access to agricultural markets, both for inputs and outputs; and could result in a more market-oriented production mode. In addition, a better position in the overall infrastructural network could facilitate the search by isolated households for off-farm jobs. Improved availability of public services (such as schools and health centres) could be an important additional element in improving overall living conditions.

Finally, policies targeting "female-headed" households **(cluster 7)** should focus – next to the other relevant aspects raised above - upon specific gender-related institutional constraints. These households have a limited adult labour force and an extremely low educational stock. Moreover, traditional roles constrain female-headed households in taking up remunerative off-farm activities. Their bargaining position (in the local community, on agricultural markets and in the off-farm sector) may be enhanced through mechanisms of collective action.

For **the totality of all clusters**, we may conclude that the main challenge for rural policies will be to reduce the extremely high dependence of rural households upon subsistence food production. Given the severe constraints imposed by the shortage of natural resources, several development paths should be concurrently pursued. One path may be to concentrate on enhancing incentives for households to adopt specific agricultural production techniques with high(er) returns. But first of all, policy makers should not depart from firm presuppositions, e.g. that land concentration and monocropping policies are, per definition, more productive than scattered sub-

sistence production. In addition, policies should not be imposed; on the contrary, additional access to credit and risk-insuring mechanisms could convince households much more effectively. Policies that strive for agricultural growth should also strive for an equitable distribution of this growth to benefit all social groups.

Another path should concentrate on enhancing the potential of the off-farm labour market and small-scale entrepreneurial business to absorb the labour surplus. On the demand side, this may be achieved either in the public sector (through labour-intensive works) or in the local-level private sector. If a considerable mass of peasants can profit from a broad-based growth strategy within the agricultural sector (path 1), then their increased earnings may be spent or invested in other sectors. As such, agricultural growth may produce a trickle-down effect reaching wage labourers working in off-farm activities. On the supply side, investment in training and education could upgrade the potential and skills of wage labourers. Self-employment may be stimulated by providing access to credit and risk-insurance mechanisms at the lowest level. Credit initiatives should not only reach those who possess collateral, but also those less 'promising' rural actors who may have unexplored potential. The potential risk of investing in such facilities makes public sector involvement indispensable.

Overall, we conclude that policy makers should first invest in identifying the institutional access gates or barriers for divergent impoverished groups and for the rural population as a whole. They should then analyse how specific policies are or will impact such access gates and barriers. Rural policies should aim for a maximum pro-poor effect which, as this paper illustrates, means fighting poverty with distinct and appropriate interventions for diverse groups of impoverished peasants.

Table 10: Summary profile of clusters

Livelihood asset profile	Livelihood strategies profile	Optimists versus pessimists *	Policies for poverty alleviation
Rural entrepreneurs: Most well-off house-holds, headed by young male, containing well-educated household member; moderate landholdings.	Highest mean income from agricultural sales and highest % engaged in this activity; highest % active in non-farm activities (47%), mostly in own enterprise and in non-agricultural wage labour; highest pay per hour.	Somewhat more pes-simists than optimists about shift in well-be-ing between years 2001-2004.	Lessons for other clusters: extensive landholdings are not a condi-tion sine qua non for good standards of living; however, success depends upon other crucial factors such as access to off-farm employment and to self-employ-ment; also education is important.
Associational: Associational links, often headed by younger male; landholdings below sample average while livestock holdings above sample average; mean expenses just above poverty line.	High percentage (37%) active in off-farm activities, mostly in own enterprise or agri-cultural jobs; also very high percentage with livestock holdings although percentage with positive income from this activity is limited -> underex-plored potential.	Largest % of subjec-tive poor in 2001 but very optimistic about 2001-2004 change.	Lesson for other clusters: associational links provide risk-insurance and access to credit which apparently are important for subjective assessment of progress in well-being; policy makers could provide assistance to associations to engage in new agricultural production techniques and in off-farm entrepreneurial activities.
Resource-rich: Lot of land and livestock, headed by older male, lots of adult working force; mean expenses just below poverty line.	High revenue from agricul-tural production of which relatively high % is traded; 36% active in off-farm activi-ties with highest wages of all clusters.	Divergence in terms of subjective poverty -more 'poorer' and 'richer' in 2004; high % of pessimists.	Enhance market-oriented agricultural production by improving bargaining position in price negotiations and by reducing risks related to market-oriented production (e.g. access to risk-insurance, credit, etc.).
Resource-poor in fertile regions: Very poor in terms of natural resources (land – livestock) despite high soil fertility, headed by older male.	Income very dependent upon own subsistence production; if active in off-farm sector - then lowest median pay per hour in self-employment and in agricultural jobs (lower than female-headed cluster).	Highest % of optimists about shift in well-be-ing 2001-2004; but nearly no change in aggregate well-being categories.	Improve access to off-farm employment opportunities; improve bargaining posi-tions in wage negotiations (by investing in training and education). Explore potential for off-farm small-scale entrepreneurship (enhance incen-tives to engage in associations).
Resource-poor / cen-trally-located: Live close to nearest road and public services, poor in terms of land and livestock, headed by somewhat younger male.	Quite active in off-farm sector (one third of all households), and able to negotiate reason-able wages, both in agricul-tural and non-agricultural sectors.	Highest % of pes-simists about shift in well-being in 2001-2004 but nearly no change in aggregate well-being categories.	Improve access to off-farm employment. Explore potential to involve them in off-farm small-scale entrepreneurship.
Isolated: Living in remote areas, somewhat higher avail-ability of land per ae, headed by younger male; limited stock of physical capital.	75% active in agricultural trade but income from this activity is low; lowest median income from wage labour and low pay per hour in wage labour activities; decent pay per hour if active in self-em-ployment.	Convergence (more ranked in 'medium' cat.), relatively low % of subjective poor in 2004.	Enhance access to markets by improving rural road infrastructure. Improve availability of public services (e.g. markets, schools, health centres).
Female-headed: Headed by older female, limited human capital (low adult working force and education).	Highly dependent upon subsistence production; least active in agricultural trade and in off-farm sector of all clusters.	More pessimists than optimists about shift in well-being 2001-2004; highest % of 'richer' households in 2001 but none left in 2004.	Remove gender-related constraints that prevent these households from engag-ing in agricultural trade and off-farm activities. Enhancing bargaining position through collective action.
All Severely constrained in terms of availability of land and livestock.	Highly dependent upon subsistence production; 72% are active in agricultural trade, but earnings from this activ-ity are limited; also limited engagement in off-farm sector (only 30% of all households).	More pessimists than optimists about shift in well-being 2001-2004.	Improve integration and bargaining positions on agricultural markets; improve access to risk-insurance / credit to stimulate entrepreneurial activities in off-farm sector; stimulate demand for labour force though labour intensive works and by investing in broad-based agricultural growth.

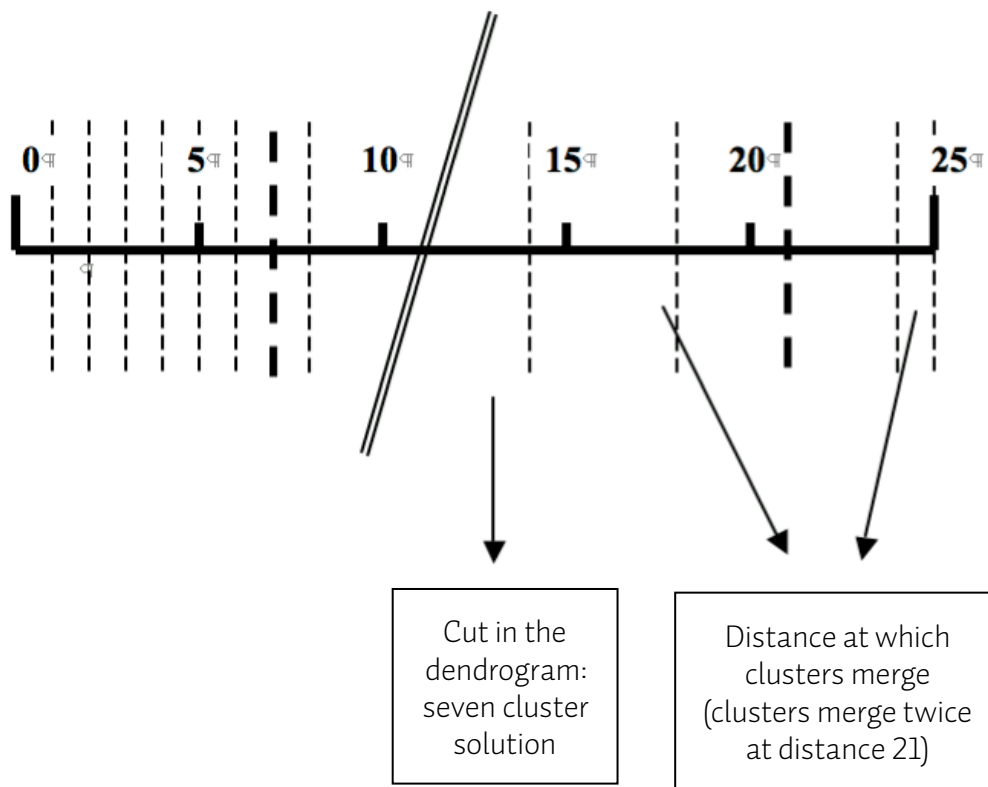* Data for this column are based upon the Gikongoro – Gitarama subsample.

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ANNEX I: SEARCHING FOR A CUT IN THE DENDROGRAM (SEE SECTION 4)

Cut in the dendrogram: seven cluster solution

Distance at which clusters merge (clusters merge twice at distance 21)