

• Kenya – Housing – Micro-credit – Self-help

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Improvement of Housing Conditions and the Performance of an Aided Housing Scheme in Selected Rural Areas of Kenya

Verbesserung von Wohnbedingungen und Leistungsfähigkeit eines unterstützten Hausbauprogramms in ausgewählten ländlichen Regionen Kenias

With 3 Figures and 5 Tables

While housing issues in urban agglomerations of sub-Saharan Africa have attracted considerable scholarly attention, comparatively little is known about housing problems in rural areas. Taking issue with this shortcoming in our contribution, we first replicate a survey of housing conditions in a rural district of Western Kenya dating back to 1980. Although we observe a significant improvement of housing structures over the past 25 years, we can also establish that deficient housing conditions fall disproportionately on the poor. Departing from this result, we secondly analyze an aided self-help housing scheme which aims to facilitate the improvement of housing conditions for the poor in rural areas of Kenya. Based on data gathered from 263 face-to-face interviews we examine the financial sustainability of the underlying mortgage system and aim to identify the main drivers of mortgage default through multivariate logit analysis. Our statistical results indicate that it is mainly endogenous variables like the size and the age of the program which drive mortgage default. At the same time, typical poverty variables are not significantly correlated with mal-performance in mortgage repayment and therefore increased targeting of poorer population groups is unlikely to result in declining repayment rates.

1. Introduction: Housing Situation and Policy in Kenya

As *Sterkenburg* noted in 1990, it is especially the rural areas of sub-Saharan Africa which suffer from a striking lack of data on housing conditions. In the case of Kenya, field surveys conducted in the early 1980s indicate that most houses are constructed with

low-grade building materials such as unprocessed clay, wattle and grass which oftentimes do not provide sufficient shelter from rain, wind or disease-bearing insects and require a high amount of maintenance work. These dwellings lack basic sanitation facilities and sufficient living space for the size of the families they have to accommodate (cf. *Sterkenburg* et al. 1982, 1984, 1986).

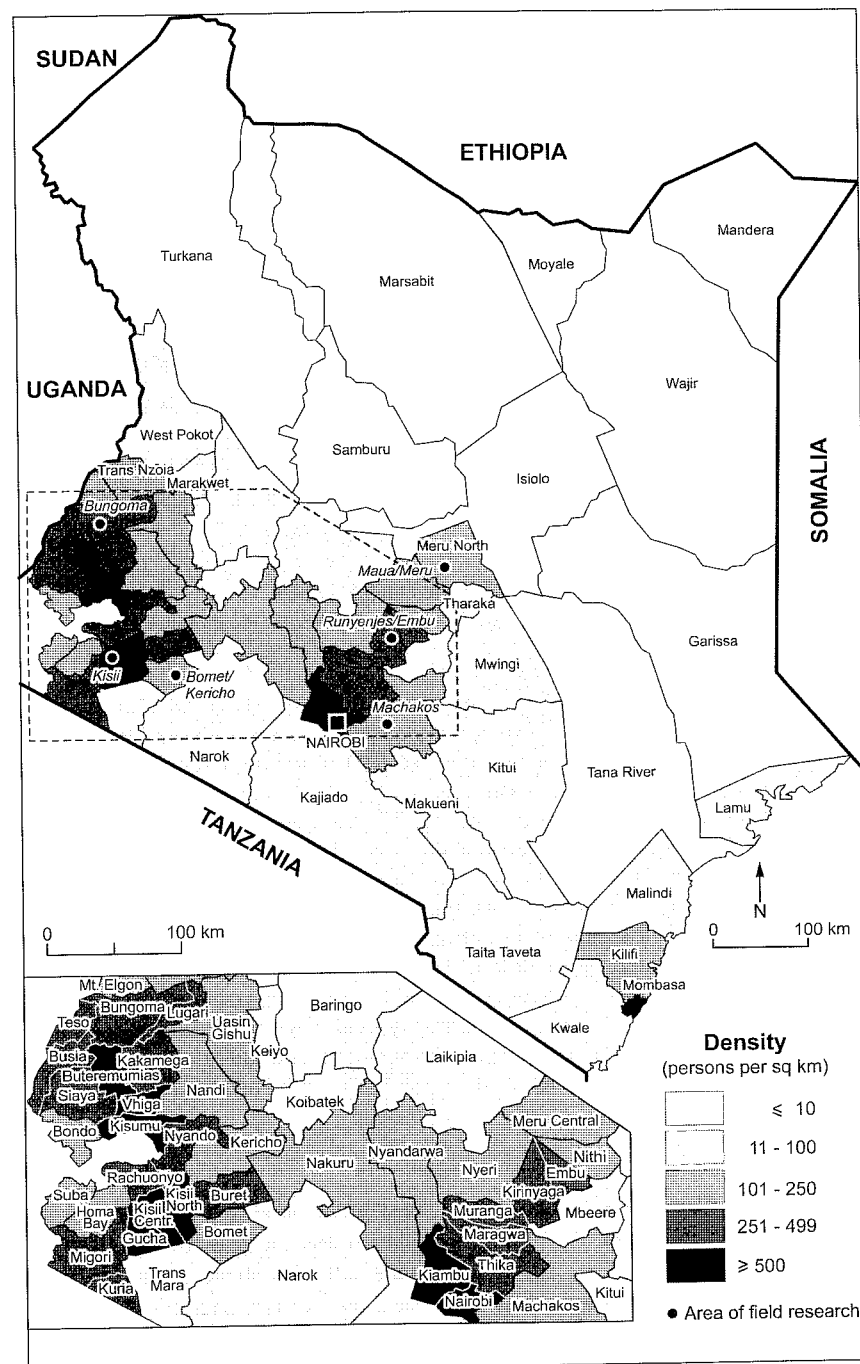


Fig. 1 Population density in Kenya by administrative units (districts); source: Kenya, Population and Housing Census 2001 / Bevölkerungsdichte Kenias nach Verwaltungseinheiten (Distrikte); Quelle: Kenya, Population and Housing Census 2001

At an annual population growth rate of 3.35 % (UNDP 2004) paired with low income – 56 % of the country's population live on less than one dollar a day (Kenya 2003a: 4) –, housing demand in Kenya by far outstrips the supply of adequate housing. Based on the results of the 1999 population and housing census, there are about 750,000 households in urban areas and about double that figure in rural areas that are in urgent need of proper housing (Kenya 2003b: 6). For several decades we have witnessed the sprawl of informal settlements with poor quality of basic services in urban areas of Kenya (Vorlauffer 1984, 1989, 1992), an urbanization problem that nowadays is ubiquitous in most countries of sub-Saharan Africa (Job and Bläser 2006). In the same vein, especially the fertile rural areas of the Lake Victoria Basin in the west of Kenya, the former White Highlands around Mount Kenya north of Nairobi and the southern reaches of the Coastal Strip (cf. Fig. 1) struggle with a mounting population density which pushes some regions to the brink of their carrying capacity (Hecklau 1989: 181ff.).

With the new National Housing Development Plan (NHDP) Kenya aims at spending EUR 2.1 billion over a period of five years from 2003 to 2007 in order to mitigate housing shortfall and deficiencies in rural areas (which ironically include large peri-urban areas) as opposed to EUR 4.4 billion for urban housing (Kenya 2003a: iii). Although still financially ill-equipped compared to the funding for urban housing this NHDP is the first to explicitly address and allocate money to the 61.8 % of the total population living outside the cities and major towns (UNDP 2004).

In Kenya housing provision outside the big agglomerations commonly relies on aided self-help (Harris 1998). Aided self-help housing is a mode of production to deliver low-cost housing for low-income households through self-help contribution on the basis of underutilized labor, cheap material costs through use of locally available building material and the curtailment of the bu-

reaucratic overhead of government-implemented housing programs (Keivani and Werna 2001). In rural areas, these aided self-help housing programs are often administered by NGOs, which take on the role of the architectural, administrative and financial facilitator. They develop housing plans in cooperation with the local population, help organize the building process and, similar to micro-credit schemes, provide beneficiaries with mortgages. In order to guarantee the long-term viability and financial sustainability of such a program, the timely repayment of mortgages is a crucial pillar on which rests a considerable part of the program's success (Turner 1976).

While aided self-help is generally geared towards the poor, various authors (Amin et al. 2003; Navajas et al. 2000; Sebstad and Cohen 1999) have found that the ability of self-help housing programs to exclude the non-poor and reach the poorest is generally very limited. Owing to the mandatory monthly repayment of a mortgage, which requires a certain minimum level of regular income, and the initial down-payment, which calls for saving efforts, it can be surmised that poorer target groups are excluded from participation in the scheme on the grounds of financial incapacity. The Grameen Bank, for example, realized that in its rural housing scheme it was not able to benefit the poorest fraction of the rural population whose income generating activities did not suffice to repay a housing loan that was several times their annual income (Ahmed 1998).

Addressing the aforementioned issues, this paper pursues a two-fold purpose: Firstly, it endeavors to augment the data basis on housing conditions in rural Kenya through a longitudinal survey which is modeled on a study by Sterkenburg et al. from 1980. This is to provide the wider picture within which the central, second part on aided self-help housing is situated. On the basis of face-to-face interviews we analyze the performance of an aided self-help housing scheme in rural Kenya which provides interest-free loans and

Tab. 1 Collinearity between independent variables (field survey 2004; Pearson correlation coefficients, ** = 0,05 and *** = 0,01 indicate significance levels) / Kollinearität zwischen unabhängigen Variablen (Feldforschung 2004; Pearson-Korrelationskoeffizienten, ** = 0,05 und *** = 0,01 bezeichnen das Signifikanzniveau)

	Age of affiliate	Number of active mortgages	Active mortgage time	Sex	Legal status	Education	Age cohort	Total dependents	Dependents in school	Monthly installment	Income group
Endogenous variables											
Age of affiliate	1	0.113	0.664 ***	0.031	0.025	-0.051	0.171 ***	-0.054	0.042	-0.020	-0.041
Number of active mortgages	0.113	1	0.223 ***	-0.128 **	-0.071	-0.145 **	-0.062	-0.004	0.021	-0.247 ***	-0.110
Active mortgage time	0.664 ***	0.223 ***	1	-0.041	-0.015	-0.290 ***	0.172 ***	0.025	0.094	-0.247 ***	-0.110
Exogenous variables											
Sex	0.031	-0.128 **	-0.041	1	0.735 ***	-0.052	0.113	-0.232 ***	-0.074	-0.053	0.021
Legal status	0.025	-0.071	-0.015	0.735 ***	1	-0.074	0.174 ***	-0.324 ***	-0.091	-0.060	-0.054
Education	-0.051	-0.145 **	-0.290 ***	-0.052	-0.074	1	-0.326 ***	-0.042	-0.036	0.183 ***	0.115
Age cohort	0.171 ***	-0.062	0.172 ***	0.113	0.174 ***	-0.326 ***	1	0.082	0.128 **	-0.080	0.020
Total dependents	-0.054	-0.004	0.025	-0.232 ***	-0.324 ***	-0.042	0.082	1	0.481 ***	0.144 **	-0.010
Dependents in school	0.042	0.021	0.094	-0.074	-0.091	-0.036	0.128 **	0.481 ***	1	0.147 **	0.080
Monthly installment	-0.020	-0.247 ***	-0.247 ***	-0.053	-0.060	0.183 ***	-0.080	0.144 **	0.147 **	1	-0.015
Income group	-0.041	-0.110	-0.110	0.021	-0.054	0.115	0.020	-0.010	0.080	-0.015	1

support in the construction process of the house. By way of a multivariate logit analysis we build regression models which isolate the main factors for financial sustainability and on the basis of our results we suggest a range of economic and institutional measures to improve repayment performance. Additionally, in view of a policy of ‘downward drift’, which has recently been implemented to include the poorest fractions of the population in the scheme, we examine to what extent poverty is connected with repayment performance. The last section discusses our findings and puts them into a comparative framework together with similar programs in other countries.

2. Research Design and Methodology

This section introduces the research methodology for the two ensuing empirical sections, which employ two different samples. The first empirical section looks at the change in housing conditions in Kisii District over a period of 24 years and for this purpose draws on data from a timeline sample group (*timeline survey*), whereas the second empirical section evaluates the performance of an aided self-help housing scheme in tackling rural poverty (*scheme survey*). In total, 360 interviews of rural households were conducted in the years 2001, 2002 and 2004. 263 interviewees were homeowners in the aided self-help housing scheme and constituted the *scheme survey*, whereas 97 interviewees were residents which had no relationship with the scheme and served as the sample group for the *timeline survey*. Roughly equal numbers of homeowners were surveyed in three project regions in rural Kenya (Kisii Central, Maua, Runyenjes) which differed in size and age but ranked in comparable socio-ecological categories regarding indicators like soil quality, elevation, annual rainfall and population density. The *timeline survey* was only carried out in Kisii Central District (cf. Fig. 1).

In the *scheme survey*, communities in each of the three regions were picked randomly in order to fore-

close elite interference and appropriation of the project at the local level for the propagation of private interests which we had observed in previous research in similar constellations. Moreover, human labor constraints did not allow taking samples in all communities, with difficult accessibility in terms of physical infrastructure further complicating the field research. The mode of travel was exclusively by foot and the necessity to return to a home base every day restricted the possibility of surveying a vast territory. For this reason a full coverage of all beneficiaries of the program in the selected communities was attempted as a means to reduce the physical distances which needed to be covered for getting an interview, while still maximizing the number of cases. Concomitantly, we a priori excluded communities which had less than a critical mass of 15 active mortgages at the time.

Interviewees for the *timeline group* were picked *en route* to the participants of the *scheme survey* by selecting every twentieth house. An interview typically lasted 20 to 30 minutes and was conducted in the home of the interviewee, mostly employing an interpreter as the researchers were not able to speak the respective vernacular languages. The non-response rate varied between 5.1 % at the lowest and 19.2 % at the highest across communities and regions. As reasons for non-response we typically encountered the absence of the homeowner at the time of the visit, illness or occasionally the refusal to participate in the interview.

The variables covered in the survey have been grouped into two classes as indicated in the left-hand column in Table 1: *endogenous* variables are subject to direct control by the housing scheme and are not related to the individual homeowners; *exogenous* variables on the other hand are mostly socio-economic characteristics of the interviewees which cannot be directly influenced by the housing scheme, but only be manipulated by applying appropriate selection criteria for participation. Table 1 shows multi-collinearity for all independent variables used in our statistical analysis.

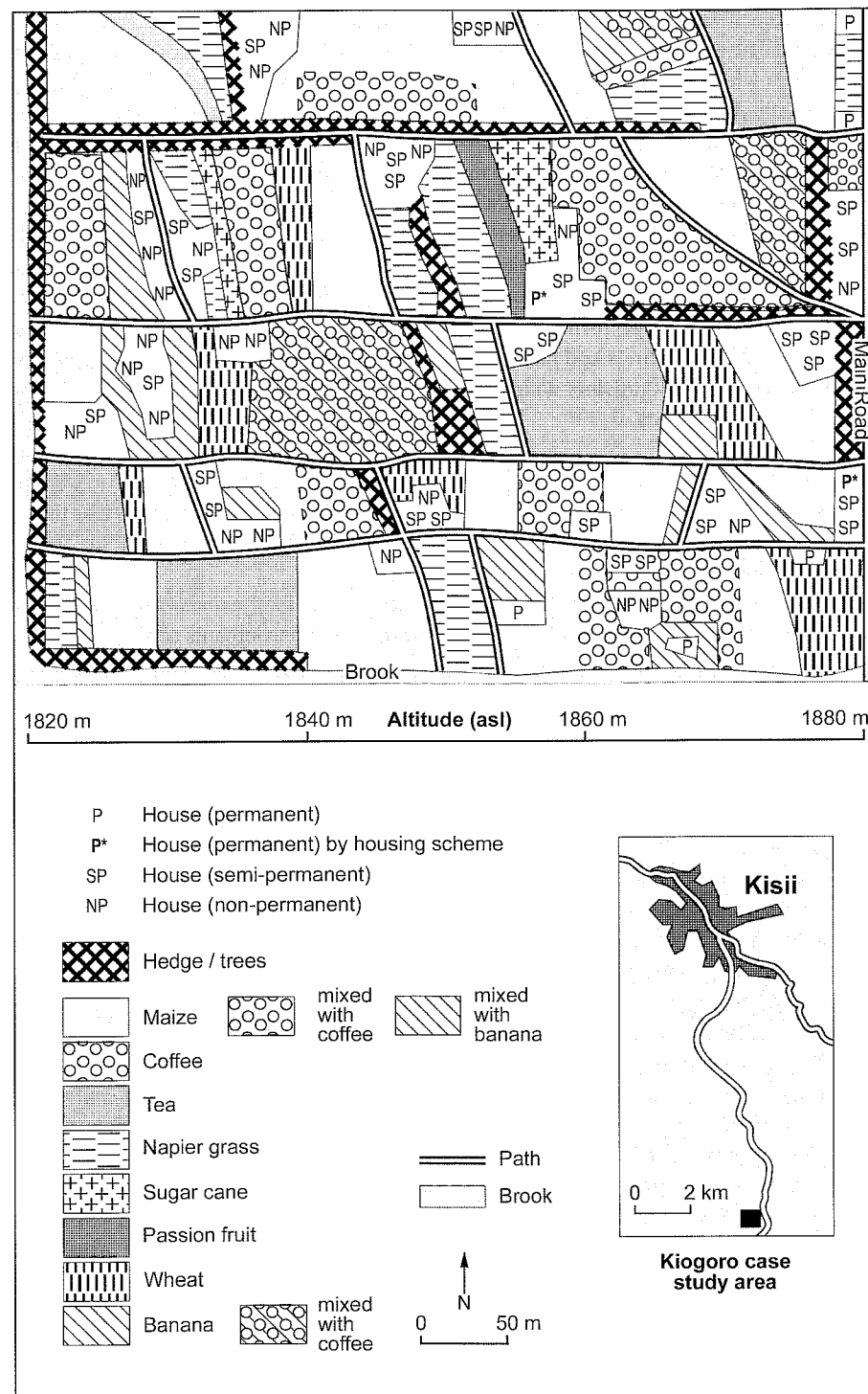


Fig. 2 Sample land use and housing stock in the Kisii Highlands (field survey 2004)
Landnutzung und Wohnungsbestand im Kisii-Hochland (Feldstudie 2004)

All mortgage-related information could be retrieved from a central database of the scheme and all indicators which do not explicitly refer to the individual homeowner have been calculated for households as units of observation. Like numerous other household surveys in developing countries (for a systematic survey cf. Braukmeier 1992) we encountered, amongst others, difficulties asking for household income, since the concept of cash flows and budgeting turned out to be foreign to the majority of the mostly farming-based households. Asking for savings ('How much is left at the end of the month?') produced better results but in order to adjust for seasonal variability, repeat visits would have been necessary to arrive at reliable averages. Employing holding size as a proxy for farm income proved to be equally unsuitable, as most interviewees were uncertain when asked to specify the size of their *shamba*, the Kiswahili term commonly used for the farming area which is not immediately adjacent to the homestead, in quantitative parameters. Savings and holding size were therefore only used as, rather unreliable, income proxies in the survey in Kisii District but abandoned in the other survey areas. To partially circumvent the pitfalls associated with income-related questions we used the occupation which provides the main source of income as the best available proxy for income and classified occupations on a subjective ordinary scale for the purpose of calculating correlations.

3. Timeline Survey: Housing Conditions

3.1 Change in rural housing conditions in Kisii Central District from 1980 to 2004

In the absence of any longitudinal data on rural housing conditions in Kenya, we decided to first

replicate one part of a study by Sterkenburg et al. (1981) to survey the change of housing conditions over a period from 1980 to 2004. As a study area we chose Kisii Central District, one of the most densely populated districts in rural Kenya (see Fig. 1) and home of the Gusii people. With its high population density, small landholdings and agricultural base Kisii qualifies as what has recently become known as a ruralopolis (Qadeer 2000): It faces high pressure on land and an aggravation of needs for community services and facilities. It is only due to the excellent ecological conditions that the land can sustain the people living on it (Job 1998).

The whole of the district lies between 1,600 and 2,200 m a.s.l., annual rainfall amounts to an average of 2,000 mm and temperatures range from 14 to 28°C throughout the year. Together with its well-drained, deep mollic Nitosols Kisii offers favorable conditions for the cultivation of tea, coffee and pyrethrum, the three main cash crops of the district (Jätzold 1986). Over time farm sizes have dropped considerably from an average of 3.3 hectares (ha) in 1967 to 2.1 ha in 1980 and only 0.4 ha in 1999, while population density has increased (Kenya 2002; Sterkenburg et al. 1981). Figure 2 schematically sketches the land use and housing stock in the Kisii Highlands: The topography is characterized by steep inclines which are intensively used for agricultural purposes. Coffee and tea dominate as cash crops whereas maize is the common staple food. The map shows an area of approximately 20 ha which illustrates the population pressure and the small-scale nature of land use associated with it. With 60 houses on the whole area, farmland is less than 0.33 ha per dwelling and population density between 900 and 1,200 persons per square kilometer if we assume three to four people per dwelling which is a common average in the Kisii region and differs from other regions due to specific cultural influences.

Tab. 2 Indicators for housing conditions in Kisii Central District in 1980 and 2004 (Sterkenburg et al. 1981; field survey 2004; N = 97; standard deviation in parentheses)
Indikatoren für die Qualität der Wohnbebauung in Kisii Central District, 1980 und 2004 (Sterkenburg et al. 1981; Feldstudie 2004; N=97; Standardabweichung in Klammern)

	1980	2004 (N=97)
Main house size (mean; m ²)	29.6	32.4 (13.72)
Roofing Material		
Grass	76%	22%
Corrugated Iron Sheets	24%	78% (0.48)
Wall Material		
Mud and Wattle	99%	91%
Brick	1%	9% (0.29)
Structure of House		
Non-permanent	76%	22%
Semi-permanent	23%	69%
Permanent	1%	9% (0.61)

Housing conditions are generally determined by the structure of the house, i.e. the materials used. It is accepted to distinguish three types which show the following characteristics in Kenya: *non-permanent* houses with mud walls and grass-thatched roofs, *semi-permanent* houses with mud and wattle walls and corrugated iron roofs, and *permanent* houses with concrete foundation, brick walls and corrugated iron roofs. This typology dates back to surveys in colonial times. Despite its provenance from a colonial mindset we employ it in this paper in order to facilitate comparisons to earlier studies and official documents, which use these categories frequently. More elaborate assessments of housing quality grade the state of repair and develop a multi-dimensional roster to classify housing quality (Ogu 1994). Moreover, housing conditions are marked by the availability of facilities, particularly piped water and electricity, both of which are not found in the rural areas of Kisii Central District.

Our *timeline* sample suggests that there has been palpable improvement in the housing conditions

in Kisii Central District within the past quarter of a century, in particular as far as roof and wall structures are concerned. *Table 2* shows a significant reduction of non-permanent houses in favor of semi-permanent houses; the more durable and expensive corrugated iron sheets have replaced grass as the dominant roofing material (also refer to *Fig. 2* for wall and roof structures of houses in the Kisii Highlands.). This is in spite of an average decrease in farm size of more than 80 % and the general absence of policies to address and tackle sub-standard housing in rural Kenya (Sterkenburg 1990).

3.2 The link between poverty and sub-standard housing

The aforementioned developments would convey the impression that housing conditions in Kisii Central District improve at a good pace even without much intervention. It is important to stress, however, that the figures reflect the situation as prevailing at two distinct points of time and do not

necessarily indicate a continuous, steady process or trend. Moreover, whilst the overall quality of housing has been improving, it is likely that the ability to obtain a share of this improvement varies considerably between income groups. As the study by Sterkenburg (1990) confirms, the quality of housing is strongly correlated to household income. Even more so, poor households tend to spend proportionately less on housing than richer households (cf. Hendriks and Lyne 2003).

Our dataset suggests similar conclusions. The type of occupation shows a significant correlation with the type of housing. None of the casually employed or subsistence farmers in the sample owns a permanent house, but 6 out of 13 full-time employed. 10 out of 16 casually employed individuals live in non-permanent houses and 5 out of 11 subsistence farmers. A oneway Kruskal-Wallis test confirms differences in the type of house owned depending on the type of occupation at a highly significant level: individuals living on subsistence agriculture rank lowest in terms of housing quality and full-time employed individuals highest. The Bravais-Pearson correlation coefficient between the area of farmland, the other, rather unreliable income proxy variable, and the type of house strengthens this conjecture: it shows a significant positive correlation between the acreage and the quality of the house.

This indicates that it is now mainly the rural poor who live under deficient housing conditions. Earlier findings by Collier and Lal (1980, 1986: 77ff.) and Livingstone (1986: 310ff.) lend support to this conclusion at a larger scale. Between 1961 and 1974 the poorest four deciles of the rural population in Nyanza Province (of which Kisii Central is one district) suffered a reduction of their proportionate share in total land holdings by 17.3 %. Concomitantly, their proportionate share of consumption dropped by 8.6 % between 1970 and 1974. Thus, while deficient housing conditions are related to poverty, at the same time the already fragile livelihood basis of the poorest fractions

of the population keeps getting squeezed even more. In the light of this evidence it seems quite unlikely that the owners of the remaining 22 % of non-permanent houses in our sample (cf. *Tab. 2*) are simply reluctant to upgrade, but we must rather surmise that they do not possess the means to afford better housing conditions. This situation provides the backdrop against which the performance of the aided self-help housing scheme in the next section shall be discussed.

4. Scheme Survey: Selection Bias and Mortgage Repayment

4.1 Details of the scheme

To assist the poor in lifting themselves out of substandard housing is the mission of the aided self-help housing scheme, the performance of which we will assess in this section. The project can be conceptualized as a micro-credit scheme in which the loan sum is channeled exclusively into the construction of a house within the self-help housing scheme of the organization. Thus the loan and the house are bundled and come as an inseparable package. Moreover, it differs from traditional micro-credit schemes in that the loan is not taken out for the purpose of primarily income enhancing or creating activities; speaking in economic terms, the money is funneled into reproduction instead of production. Contrary to most other micro-credit loans for housing, the scheme charges no interest on its loans.

In Kenya, the scope of operation of the program has grown significantly, from 281 active mortgages in March 1999 to 1,218 in March 2004. As depicted in *Figure 3*, it currently covers six regions in Central and Western Kenya, among them Kisii Central District. The scheme operates only in the rural areas of Kenya, concentrating on regions with high population density (cf. *Fig. 1*). The spatial expansion of the program to new administrative areas hinges on local initiatives who apply for

membership and are approved for affiliation if they comply with a number of conditions set out by the scheme's charter. Once part of the scheme the organizational and financial framework is provided by the national headquarters, yet it is left up to the different regions and their affiliates, the subordinate level, to decide on the pace to move forward.

Individual applicants for a housing loan are required to meet a set of criteria in order to become eligible for the scheme. They are not supposed to live in permanent structures already, the monthly household income needs to be between KES 2,500 and 12,000 (April 2004: Kenyan Shillings (KES) 100 = USD 1,28) and they need to be in possession of legal title to the plot they want to build on. The given bandwidth of household income is questionable and hardly enforceable in light of the problems mentioned when estimating household income in rural areas of developing countries. The last requirement rules out one of the major problems of aided self-help housing schemes in urban areas which frequently lack legal security due to non-availability of land titles.

Upon approval of an applicant a down-payment of 5 % of the total estimated house cost is due. With an average house cost of about KES 70,000 per unit this initial payment amounts to approx. KES 3,500. The remaining mortgage is paid back in monthly installments over a period of about ten years, depending on the exact house cost. The applicants' self-help contribution to their houses comprises preparing the plot, gathering the building materials, digging the pit latrine, and carrying out the building process to the extent possible for them. Moreover, every applicant is required to devote 40 hours of mutual help to assisting other future homeowners in building their houses. This contribution of 'sweat equity' is meant to serve as a community-building component which binds homeowners closer together. The construction plan of houses allows for adaptation to local requirements and conditions: floor plans and sizes of the houses, and the methods and materials used

for construction are adapted to the local environment and culture. Houses in the Kisii region, for instance, are built of brick and, following a local belief, have two doors whereas houses in the Maua region are made of wood or stone using locally available building materials.

4.2 Socio-economic characteristics of homeowners

In our *scheme survey* we first asked for socio-economic details of the program beneficiaries. The average participant has finished primary school (eight years), 7.3 % have university education, and 9.5 % have never been to school. By Kenyan standards, the mean age shows a remarkably high average of 46.7, in a country where life expectancy at birth was 45.2 years in 2002 (UNDP 2004). Only a minority (25.1 %) of the homeowners of our sample are female.

In terms of income-generating activity, 6.5 % of the interviewed homeowners engage in food crop farming only, whereas for 59.8 % of people interviewed cash crop farming constitutes the main source of income with tea dominating over coffee and miraa (khat). Miraa (*Catha edulis*) is a shrub that grows in the hills east of Mount Kenya and whose shoots contain an alkaloid with narcotic effects for which it is also exported to neighboring countries, especially to Somalia and the Yemen. Due to the quasi-monopoly of miraa in the Meru region in Kenya it is also the cash crop with the highest revenues: one acre of miraa yields about KES 8,000 worth of shoots per month, whereas an average acre of tea in small-scale farming produces 200 kg of tea leaves worth KES 1,800 at the time of writing. Coffee prices are subject to considerable fluctuations but even at their peaks coffee nowadays seldom pays as well as tea for small-scale farmers. While about two-thirds engage in farming, for about one-third of the interviewees off-farm employment generates the main part of household income: approximate-

ly 17.4 % are full-time employed, 4.3 % casually employed and 12.0 % self-employed.

Similar to other programs of the same design, our scheme is plagued by mis-targeting of participants. For the part of the sample located in Kisii District we have plotted the socio-economic characteristics of interviewees in the *timeline survey* as a baseline against the *scheme survey*. The results confirm at a statistically significant level that homeowners show higher achievements in education and tend to have better-paying jobs than their counterparts from the *timeline survey*. This selection effect has been recognized by the central management of the scheme and as a consequence a policy of 'downward drift' has been put in place which endeavors to explicitly address the disadvantaged groups in the communities.

However, concerns have been voiced that the increased targeting of poorer people might prove counterproductive regarding repayment performance of loans. Like all loans, the financial sustainability and therefore replicability of the scheme relies crucially on the timely repayment of loans. Debtor default is one of the key reasons why numerous micro-credit schemes fail in the long run and factors that drive default therefore deserve closer attention (Morduch 1999; Zeller 1998). For this reason, in the remainder of this section we explore mortgage default statistically and try to isolate variables which influence mortgage repayment in order to show how repayment performance might be affected by increased targeting of poorer groups of the society.

4.3 Indicators of mortgage repayment performance

Predicting mortgage default in micro-credit schemes is a key prerequisite for ensuring long-term financial sustainability of the scheme through timely repayment. Figure 3 depicts the mortgage repayment situation for the whole program in Ken-

ya suggesting two central notions: firstly, for those locations which have functioned since at least 1999, repayment performance declines with increasing maturity of a region. Secondly, repayment performance declines with increasing size of operations in a particular region. Overall, repayment performance hovers at remarkably low levels, falling from 36 % to 27 % at the national level from 1999 to 2004. In this section we start to explore issues of repayment performance statistically.

In our analysis, we employ three mortgage performance indicators which reflect different aspects of mortgage repayment. The lag indicator *LAG* mirrors the ability to keep up with mortgage repayment over the duration of the mortgage and is calculated averaging the total amount of payments a homeowner is behind or ahead of her repayment schedule over the twelve months preceding the date of the interview. We allow for a 30-day respite to adjust for short-term liquidity variability and irregular repayment collection. The second indicator, denoted *IRREGULARITY*, measures the continuity of payments during the preceding twelve months regardless of the fact whether the homeowner is ahead or behind with her payments. *IRREGULARITY* has been introduced to distinguish between mortgages which are still continuously serviced despite possible arrears, as indicated by *LAG*. Only mortgages with arrears of more than six months and irregular repayment, i.e. with a negative *IRREGULARITY* indicator, have been classified as defaults using *DEFAULT*. This allows for income variability, for example due to adverse weather conditions or unexpected household expenditure in the event of illness or death of a family member, which affects mortgage repayment and might cause a homeowner to fall into arrears (cf. Lipton and Ravallion 1995: 2597ff.). If *IRREGULARITY* is positive, a negative *LAG* value does not necessarily indicate default since the debtor is paying regularly, i.e. not accumulating further arrears.

The corresponding formulas for *LAG*, *IRREGULARITY* and *DEFAULT* express the same relation

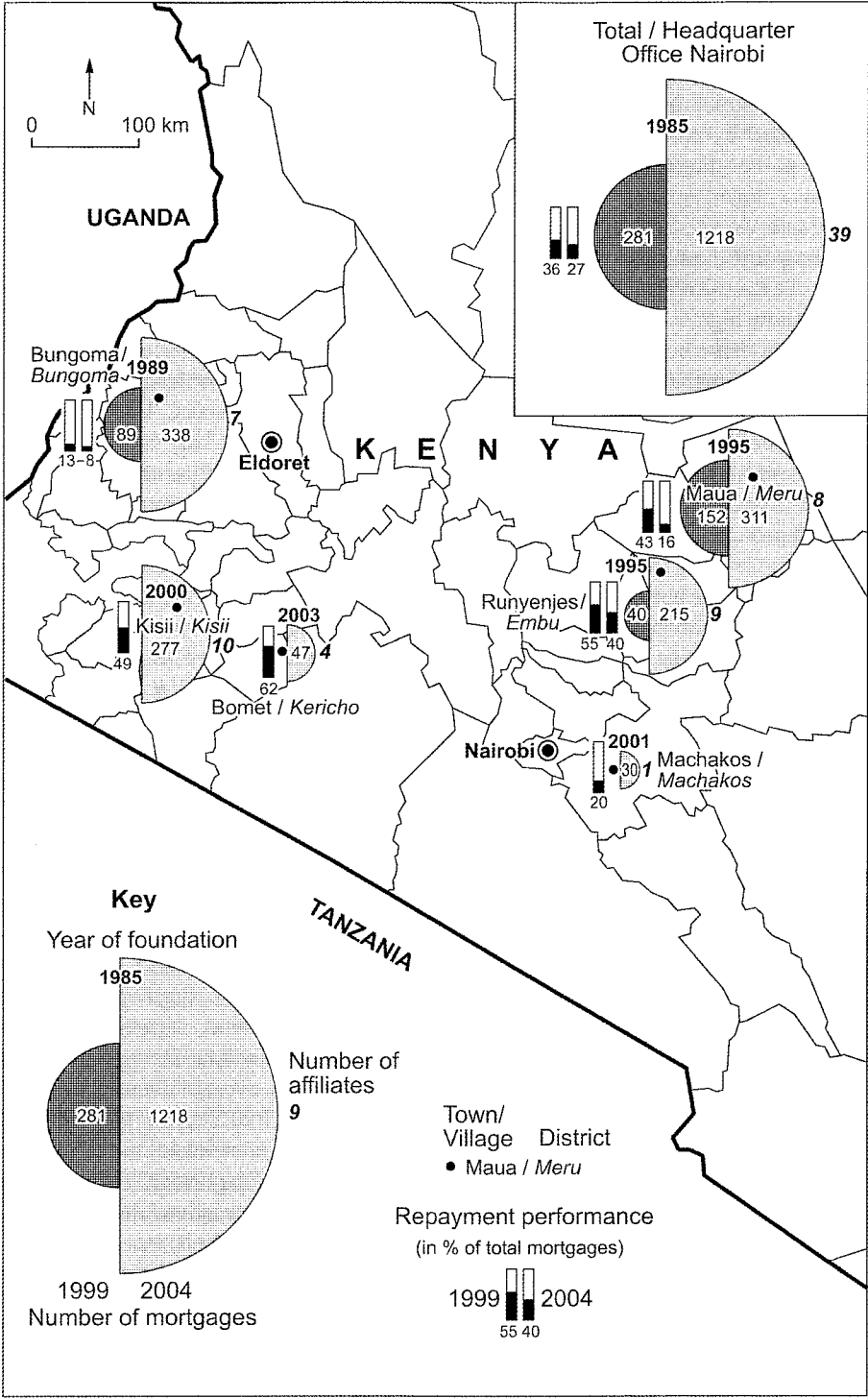


Fig. 3 Total number of mortgages and repayment performance in all Kenyan regions in March 1999 and March 2004 (Central Mortgage Database 2004) / Gesamtzahl der Hypotheken und Rückzahlungsrate in allen kenianischen Regionen, März 1999 und März 2004 (Central Mortgage Database 2004)

mathematically:

$$LAG = \left(\frac{1}{4} \sum_{q=1}^4 \frac{R_q - (t_q \cdot r_q)}{r_q} \right) + 1$$

with:

q = quarters in the year preceding the date of survey,
 R_q = total repayment received by quarter q ,
 t_q = months in which mortgage has been active by quarter q ,
 r_q = amount of monthly mortgage installment in quarter q ,

IRREGULARITY:

$$= \left(\frac{1}{3} \sum_{q=1}^3 \left[\frac{R_{q+1} - (t_{q+1} \cdot r_{q+1})}{r_{q+1}} - \frac{R_q - (t_q \cdot r_q)}{r_q} \right] \right)$$

DEFAULT:

$$= 0 \Leftrightarrow LAG \leq -6 \wedge IRREGULARITY < 0,$$

else DEFAULT: = 1.

The values of the equations for LAG and $IRREGULARITY$ are continuous. Zeller (1998: 612) jus-

tifies his choice of a continuous repayment rate variable and a tobit maximum likelihood model with the additional information it provides. While this is true, most other credit scoring models use dichotomous variables on the grounds that all failures should be treated equally as failures and all compliances as compliances without any distinction of better or worse failures or compliances (e.g. Boyes et al. 1989; Schreiner 2004; Vogelgesang 2003). We adopt the latter view and transform LAG and $IRREGULARITY$ into Boolean variables by setting all negative values to 0 ('failure') and all others to 1 ('compliance').

As cross-tabulated in Table 3, 71.7 % of sample households have arrears of more than 30 days, only 12.2 % of households both pay regularly and do not have any arrears, whereas 57.8 % both show irregular payment of installments and arrears of more than 30 days on their balance sheet. 19.1 % of all mortgages in the sample can be classified as possible defaults according to our definition. This is necessarily a rather inaccurate estimate, since it is highly likely that a certain proportion of defaulting homeowners systematically evaded interviews, thus creating a sampling bias, and since many mortgage contracts are comparatively young (mean of 24.5 months). On the other hand,

Tab. 3 Crosstabulation of LAG and CONTINUITY (n = 237; field survey 2001, 2002, 2004), logit models for determinants of repayment performance / Kreuztabellierung von LAG und CONTINUITY (n = 237; Feldstudie 2001, 2002, 2004), Logit-Modelle für die Bestimmungsfaktoren der Rückzahlungsleistung

		IRREGULARITY		Total
		Irregular (= 0)	Regular (= 1)	
LAG	Arrears (= 0)	137	33	170
	No arrears (= 1)	38	29	67
Total		175	62	237

Independent Variables	LAG		IRREGULARITY		DEFAULT	
	Coefficient	Std. error	Exp (coefficient)	Coefficient	Std. error	Exp (coefficient)
Intercept	4.709**	1.754	110.984	3.505	2.062	33.292
Endogenous Variables						
Age of affiliate	-0.703***	0.211	0.495	-0.090	0.183	0.914
Number of active mortgages	-0.090***	0.022	0.914	-0.045**	0.021	0.956
Active mortgage time	0.013	0.016	1.014	0.007	0.013	1.007
Exogenous Variables						
Sex (ref. female)						
> male	-0.582	0.611	0.559	-0.319	0.576	0.727
Legal status (ref. not married)						
> married	-0.047	0.725	0.954	0.534	0.699	1.705
Education	0.080	0.051	1.083	0.013	0.047	1.014
Age cohort (ref. 50+)						
> 20-24	-1.475	1.275	0.229	0.685	1.195	1.984
> 25-29	-0.382	0.747	0.683	-0.298	0.784	0.742
> 30-34	-1.293*	0.668	0.275	-0.373	0.619	0.689
> 35-39	-1.167**	0.549	0.311	-1.039*	0.577	0.354
> 40-44	-1.414***	0.548	0.243	-0.257	0.460	0.773
> 45-49	-1.666**	0.691	0.189	-0.929	0.591	0.395
Total dependents	-0.013	0.085	0.987	-0.084	0.090	0.919
Dependents in school	-0.017	0.102	0.983	0.201*	0.105	1.223
Monthly installment	0.001	0.002	1.001	-0.004	0.003	0.996
Income (ref. full-time employment)						
> Food crops only	-0.182	0.868	0.834	-0.143	0.915	0.867
> Wage and casual labor	-1.130	1.167	0.323	0.218	1.054	1.244
> Self-employed	0.530	0.655	1.699	-0.574	0.806	0.563
> Cash crops	0.448	0.519	1.565	0.916*	0.538	2.500
Dummy Variable						
Region (ref. Kisii)						
> Runyenjes	0.584	0.654	1.794	-1.400*	0.753	0.247
> Maua	2.123	0.817	8.354	0.120	0.866	1.127
Observations		229			226	
Nagelkerke's R-Square		0.342			0.191	
Null (-2) log likelihood		290.921			271.508	
Residual (-2) log likelihood		214.017			229.834	

Tab. 4 Logit regression models for LAG, IRREGULARITY and DEFAULT (field survey 2001, 2002, 2004; *=0.10, **=0.05 and ***=0.01 indicate significance levels; ref. indicates reference category for categorical variables) / Logit Regressionsmodelle für LAG, IRREGULARITY und DEFAULT (Feldforschung 2001, 2002, 2004; *=0.10, **=0.05 und ***=0.01 bezeichnen das Signifikanzniveau; ref. bezeichnet die Referenzkategorie für ordinale Variablen)

experience shows that even with arrears of more than six months and irregular repayment some homeowners have been able to successfully pay back their mortgages.

For modeling regression equations which involve dichotomous dependent variables, as in our case, we employ discrete choice models as they are used in credit scoring. This leaves the researcher with the option of either logit and probit analyses or discriminant analysis. Logit/probit models predict as well as discriminant analysis but have three advantages which facilitate the ensuing analysis: they estimate how each individual characteristic affects the dependent variables; they do not require strong distributional assumptions and they calculate regression coefficients as z-scores or logarithmised coefficients which make for an easy transformation into chances (Kmenta 1986: 555ff.; Schreiner 2004: 3; Wiginton 1980). The only difference between logit and probit models is their link function: probit models are based on the standard normal curve, whereas logit models are based on a logarithmic transformation. Therefore, it is only in the extremes that the values of the two models differ (Tabachnik and Fidell 2001: 517ff.).

For our analysis we have opted for a logit regression model. Table 4 depicts the results of the regression estimation for LAG, IRREGULARITY and DEFAULT. Due to missing values, the total number of cases included differs from the full sample. The column marked 'exp (coefficient)' indicates the change of the odds for each unit of change and therefore serves as a measure for the strength of the association between the respective regressor and the dependent variable.

Of all three models, LAG and DEFAULT show almost equally good model fits with high values for Nagelkerke's R-Square at 0.342 and 0.393 and reductions of the (-2) null log likelihood value by more than 26 % and 32 %, respectively. IRREGULARITY performs slightly worse though it is still able to adequately distinguish between the groups. Regional dummy variables have been included in all three models but are only significant for the case of Runyenjes in the IRREGULARITY model.

With age of affiliate, active mortgages and age cohort two endogenous and one exogenous variable enter the regression equation of the LAG model at a significance level of 0.10 or lower. With each year that the affiliate matures, chances that there are no arrears in the affiliate are almost halved. However, this does not seem to be related to the generally increasing chance of arrears with increasing duration of the mortgage, since interestingly, the age of the mortgage does not enter the LAG model significantly. The number of active mortgages, used as a proxy for the size of the affiliate, exerts a highly significant influence as well, with each additional mortgage contract bringing down the probability of no arrears vis-à-vis arrears by approximately 8 %. These results confirm our hypotheses deducted from Figure 3 regarding the influence of the size and the age of an affiliate on repayment performance.

Among the exogenous variables, only age of homeowner serves as a significant predictor of arrears in some cases. All age cohorts between 30 and 49 years of age show a performance significantly worse than the one of the reference group of the cohort with homeowners aged 50 years and above. It is only young homeowners between 20 and 29 years whose

performance does not drop significantly when compared to the reference group.

IRREGULARITY is the dependent variable which is least explained through the regressors employed in our model. Irregular repayment of loans slightly increases with each additional mortgage in the affiliate and decreases by more than 22 % with each additional dependent in school. Contrary to common expectations, homeowners with cash crops as their main source of income perform significantly better in paying regularly than their full-time employed counterparts. The variability of weather conditions and the resulting fluctuations of income derived from agricultural activities would rather suggest the opposite.

Finally, our tentative *DEFAULT* indicator exhibits strong negative ties with the maturity of the mortgage (*active mortgage time*) and especially with the size of the affiliate (*number of active mortgages*), two exogenous variables. With each additional mortgage in an affiliate the odds that a loan is classified as a default according to our definition grow by almost 20 %. Similarly, some age cohorts appear to be significantly more prone to default than others. However, our classification of defaults is only preliminary and cannot substitute an analysis once sufficient data on de facto defaults are available.

5. Discussion: Reducing Mis-Targeting and Mortgage Default

5.1 Predicting default statistically

As a classification tool, our regression models show overall prediction success of between 76 % and 84 % for the present dataset (cf. *Tab. 5*). For the *LAG* and *IRREGULARITY* models type I errors are remarkably low, i.e. non-compliance is correctly diagnosed at a level of 90 % and higher. This prediction success is offset, however, by high type II errors: almost 60 % of non-*LAG* homeowners were predicted as *LAGs*, and almost 80 % of regular payers were predicted as irregular payers. The regression models therefore result in overly cautious predictions and tend to exclude more applicants than necessary if used for credit scoring and applicant screening. On the other hand, debtor selection on the basis of these models would contribute to ratcheting up repayment performance by determining probable non-compliance with repayment requirements.

Yet, as the regression models show, repayment performance is mainly associated with endogenous variables like size and age of an affiliate which cannot be manipulated by applicant selection procedures. In fact, none of our models have established occupation or education as significant predictors for deficient repayment performance.

Tab. 5 Classification diagrams for *LAG*, *IRREGULARITY* and *DEFAULT* regression models (separation value: 0.5) / Klassifizierungsdiagramme für *LAG*, *IRREGULARITY* und *DEFAULT* Regressionsmodelle (separation value: 0,5)

	Predicted								
Observed	LAG		Correct classifications	IRREGULARITY		Correct classifications	DEFAULT		Correct classifications
	Yes	No		Yes	No		Yes	No	
Yes	146	16	90.1%	159	7	95.8%	17	26	39.5%
No	39	28	41.8%	47	13	21.7%	9	174	95.1%
Total			76.0%			76.1%			84.5%

This should be stressed explicitly since it is good news for the poor who tend to be endowed with lower levels of human capital. Even variance in endogenous variables only partially explains, however, variance in repayment performance. High incidences of arrears and irregular payment across the board suggest that there could be a more fundamental, systemic deficiency in the mortgage and repayment system.

5.2 Managing timely repayment and financial sustainability

The incentive system for timely repayment lends itself as a first point of inquiry. Currently, there are no credible measures in place to provide disincentives for individual repayment default. In theory, the homeowners could be evicted and expropriated in the case of complete default, a measure which is difficult to realize in practice in rural areas of developing countries and has never been taken in Kenya. Instead, if repayment rates in an affiliate fall below 80 %, the whole group is penalized by freezing all funding for new houses until repayment reaches the 80 % threshold again. This system reveals two major flaws: firstly, the cut-off from funding exerts little influence on homeowners' willingness to repay since it does not adversely affect those who have already received a house, and secondly, even if the group is affected, most affiliates are far too big to make social group cohesion a significant factor in counteracting repayment default (cf. literature on collective goods and small groups, e.g. *Olson* 1965). This conclusion is also supported by the strong negative correlation between affiliate size and repayment performance in our regression equations.

Other housing loan schemes operate with group lending and joint liability and thus increase disincentives for repayment default (cf. *Mitlin* 2004). *Kritikos* and *Vigenina* (2005: 213) find that "joint liability induces a group formation of low risk borrowers. After the loan disbursement, the incen-

tive system leads to peer monitoring, peer support and peer pressure between the borrowers, thus helping the lending institution to address the moral hazard and enforcement problem."

In this context, Grameen Bank's loan scheme for self-help housing in rural Bangladesh merits attention: it managed to recuperate close to 100 % of its disbursed loans through a peer guarantee system in which groups of five members were formed to guarantee the repayment of the housing loan (*Ahmed* 1998). Recuperation rates of other group lending housing schemes in Namibia, Venezuela and India were lower than the Grameen Bank's and reported defaults of between 25 to 40 % (*Mitlin* 2004: 13). A recent contribution by *Vogelgesang* (2003) singles out four major incentives for timely repayment in micro-credit loan schemes: personal guarantees to secure the loan; denial of access to future loans in the case of non-repayment; improvement of the conditions for the present loan with timely repayment; and sufficient income to be able to repay. The conditions in the micro-credit section, however, are hardly comparable to the mortgage repayment in the housing scheme analyzed: durations of loans are shorter, installments are paid more frequently, amounts of loans taken out are smaller and micro-credit loans are usually given to finance income-creating business activities.

There seems to exist a consensus that, in general, micro-credit housing schemes, even with group lending, will hardly be financially sustainable, as housing does not constitute an income-enhancing activity (*Mitlin* 2004; *Morduch* 1999; *Zeller* 1998). Besides the financial effect, charging interest rates therefore has a more psychological side effect of not labeling the loans as 'give-aways' but rather as financial contracts with corresponding obligations. In the Kenyan case, in view of total organizational expenditure (administration, training, transportation etc.) reaching more than twice the direct house construction costs, viability without external subsidies is be-

yond reach. *Morduch* (1999: 1587) argues that only 1 % of NGO programs worldwide is currently financially sustainable and therefore considers subsidies for housing as legitimate. Nevertheless it must be emphasized that loan repayment is one of the essential financial and programmatic pillars of any aided self-help housing scheme.

5.3 Including the poor

While we have seen that in the current state inclusion of more disadvantaged groups of the population would not have adverse effects on repayment performance, it remains unclear whether the program will ever be able to target the poorest with its current design. At around USD 1,000 per loan, the size of the loan is one serious factor which hampers self-targeting of the poor from a purely financial point of view. Even with an average housing loan of USD 370 in the Grameen Bank's case *Imran Matin* (1998) found that credit deepening was correlated with increasing mis-targeting. For two villages in South Africa *Hendriks and Lyne* (2003) calculated that absolute budget shares of housing expenditure are between 2 and 6 % of the total budget, for wealthier households this ratio reaches 10 %. *Malpezzi and Mayo* (1985) argue that the percentage of income that lowest-income households could actively devote to housing might be as low as 8 % to 10 %, whereas *Grimes* (1976) sets this percentage at 15 %.

Thus in the best case, with an average monthly installment of KES 572, as in our scheme, this would require a monthly income of more than KES 3,800 or almost USD 50. Although figures for income are notoriously unreliable, judging from the acreage of an average shamba, for example in the Kisii region, the poorest deciles of the population certainly fall significantly below this mark. With building costs ranging from KES 3,000 to 5,000, depending on the size of the house and the skills of the builder, grass-thatched houses with mud and wattle walls are about one-twen-

tieth the cost of a scheme house in Kisii Central District. In light of this striking gap between income and expenditure it must remain highly questionable, however, whether a policy of 'downward drift' will be able to successfully include the poorest fractions of the population in the housing scheme if the general principles of the scheme are to remain unaltered.

6. Conclusion

This paper has tried to shed light on the development of housing conditions in a part of rural Kenya and elucidate the exclusion of the poorest from improvement in housing structures over a period of almost 25 years from 1980 to 2004. We have made an inquiry into the determinants of mortgage repayment and the conditions for including the poor in an aided self-help housing program which operates on a mortgage basis in selected rural areas of Kenya.

In the first part of our contribution, we have replicated a study in one rural district of Kenya dating back to 1980. We have found that a significant improvement of housing standards has taken place over the course of time, even in the absence of any significant political or financial facilitation. At the same time, however, we have established a link between deficient housing conditions and the presence of poverty which suggests that it is the poorest fractions of the rural population who suffer most from inadequate housing.

People living under deficient housing conditions in rural areas constitute the target group of the self-help housing scheme we have analyzed in the second part of the paper. Like numerous similar programs the scheme is afflicted by two major shortcomings: Firstly, although explicitly targeting them, it largely excludes the poorest deciles of the rural population. Secondly, the overall repayment rate of mortgages disbursed under the scheme is currently relatively low and

thus puts considerable pressure on the financial component of the program.

Based on our statistical data we have built regression models which correctly predict successful regular repayment at a percentage of 90 % and higher by using exogenous and endogenous variables for the regression equation. It is endogenous variables like the size and the age of an affiliate which exert the most significant influence on repayment. At the same time we have established that for our sample, low levels of education or classification into a lower occupation group, which are generally associated with poverty, do not negatively affect repayment performance. Thus, somewhat paradoxically, poorer and wealthier homeowners perform equally well in repaying their dues. These results indicate that the newly implemented policy of downward drift through inclusion of poorer households is unlikely to be foiled by deteriorating repayment performance as common sense would suggest.

The comparison with other aided self-help housing schemes yielded further suggestions for changes in the incentive structure to encourage timely repayment, especially with regard to reducing group size and introducing group lending and joint liability. The current disincentives for falling into arrears are skewed and not sufficient to tackle payment defaults. In the ongoing expansion of operations of the scheme these issues of mis-targeting and financial sustainability need to be addressed in order to comply with the initial mission of supporting the poor and to prevent further depletion of funds in order to ensure replicability.

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Summary: Improvement of Housing Conditions and the Performance of an Aided Housing Scheme in Selected Rural Areas of Kenya

While housing issues in urban agglomerations of sub-Saharan Africa have attracted considerable scholarly attention, comparatively little is known about housing problems in rural areas, which are characterized by two interrelated problems: a lack of data on housing conditions and a lack of intervention in the case of substandard housing. Taking issue with these shortcomings in our contribution, we first replicate a survey of housing conditions in Kisii District, a rural district of Western Kenya with high population pressure, by Sterkenburg et al. (1982) dating back to 1980. Although we observe a significant improvement of housing structures over the

past 25 years in this particular district, we can also establish that deficient housing conditions fall disproportionately on the poor. This problem is exacerbated by dwindling land holding sizes which jeopardize the already fragile livelihood basis of the rural poor even more. Departing from this result, we secondly analyze an aided self-help housing scheme which aims to facilitate the improvement of housing conditions for the poor in rural areas of Kenya by providing loans for the construction of houses and support in the construction process. Based on data gathered from 263 face-to-face interviews we examine the financial sustainability of the underlying mortgage system and aim to identify the main drivers of mortgage default through multivariate logit analysis. For this purpose we build three regression models which capture different aspects of repayment performance and are better able to predict non-performing mortgages. Our statistical results indicate that it is mainly endogenous variables like the size and the age of the program in certain locations which drive mortgage default. At the same time, typical poverty variables like education or holding size are not significantly correlated with mal-performance in mortgage repayment and therefore increased targeting of poorer population groups is unlikely to result in declining repayment rates. In a comparison with other aided self-help housing schemes we conclude to suggest a range of organizational adjustments which are designed to generally encourage timely repayment of mortgages.

Zusammenfassung: Verbesserung von Wohnbedingungen und Leistungsfähigkeit eines unterstützten Hausbauprogramms in ausgewählten ländlichen Regionen Kenias

Haben Wohnungsfragen in den Agglomerationsräumen Subsahara-Afrikas bisher relativ intensive wissenschaftliche Beachtung erfahren, so ist über die Wohnungsprobleme in ländlichen Gebieten vergleichsweise wenig bekannt. Vor allem zwei miteinander verschränkte Probleme charakterisieren die Situation in ländlichen Gebieten: fehlende Daten zu Wohnbedingungen und dementsprechend fehlende Interventionen gegen mangelhafte Wohnsubstanz. Als Beitrag zur Linderung dieser Mängel replizieren wir in unserem Artikel

zunächst eine 1980 von *Sterkenburg et al.* (1982) durchgeführte Studie zu Wohnbedingungen im Distrikt Kisii, einem ländlichen Distrikt mit hohem Bevölkerungsdruck im Westen Kenias. Zwar ist in diesem Distrikt eine deutliche Verbesserung der Wohnungssubstanz über die vergangenen 25 Jahre zu beobachten, jedoch zeigen unsere Resultate, dass mangelhafte Wohnbedingungen überproportional die arme Bevölkerung treffen. Diese Situation wird noch verschärft durch abnehmende Grundstücksflächen, die die ohnehin fragile Livelihood-Basis der armen ländlichen Bevölkerungsschicht gefährdet. Ausgehend von diesem Ergebnis betrachten wir im zweiten Teil unseres Beitrags ein NGO-unterstütztes Hausbauprogramm, das sich zum Ziel gesetzt hat, die Wohnbedingungen der armen Bevölkerung in ländlichen Regionen Kenias zu verbessern, indem Kredite zum Hausbau und Unterstützung im Bauvorgang selbst angeboten werden. Auf Grundlage von 263 Leitfadeninterviews untersuchen wir die finanzielle Nachhaltigkeit des Kreditprogramms und versuchen die Hauptfaktoren für Zahlungsvorzug bzw. Komplettausfall der Rückzahlungen zu identifizieren. Zu diesem Zweck konstruieren wir drei multivariate Logit-Regressionsmodelle, die unterschiedliche Aspekte des Rückzahlungsverhaltens abbilden und imstande sind, Zahlungsausfall oder -vorzug besser vorherzusagen. Die statistischen Resultate zeigen, dass in der Hauptsache endogene Variablen wie die Größe oder das Alter des Hausbauprogramms in bestimmten Gemeinden mit Zahlungsverstößen korrelieren, wohingegen typische Armutsindikatoren wie Bildung oder Landbesitz unsignifikant korrelieren. Dies legt die Schlussfolgerung nahe, dass eine stärkere Einbindung ärmerer Bevölkerung keineswegs zu einem Sinken der Zahlungsmoral führen muss. Abschließend schlagen wir aus dem Vergleich mit anderen unterstützten Hausbauprogrammen noch eine Reihe organisatorischer Anpassungen vor, die eine Erhöhung der Rückzahlungsraten erhöhen sollen.

Résumé: Amélioration des conditions de logement et la performance d'un projet de soutien à l'auto-développement de l'habitat dans des milieux ruraux choisis de Kenya

Alors que les problèmes de logement dans les agglomérations de l'Afrique subsaharienne ont été l'objet

de beaucoup d'études, comparativement les problèmes liés à l'habitat dans les milieux ruraux sont peu connus. En partant de ces manquements pour le développement de nos recherches, nous nous sommes tout d'abord basés sur une étude des conditions de logement dans une région rurale de l'ouest du Kenya datant de 1980. Alors qu'à travers notre étude historique nous observons une amélioration significative de l'habitat au cours des 25 dernières années, nous pouvons établir que proportionnellement les populations pauvres sont plus affectées par une insuffisance des conditions de logement. A partir de ce résultat, nous avons dans un second temps analysé un projet de soutien à l'auto-développement de l'habitat comme thème de cet article, dont l'objectif est de faciliter l'amélioration des conditions de logement pour les pauvres dans les milieux ruraux du Kenya. En se basant sur les données recueillies à travers de 263 interviews face-à-face nous examinons le caractère durable du financement du système de prêt sous-jacent et nous efforçons d'identifier les raisons principales des défauts de paiement à l'aide d'une analyse multivariée logit. Nos résultats statistiques indiquent que ce sont principalement des variables endogènes telles que la dimension et l'âge du programme qui sont à l'origine des défauts de paiement. Parallèlement, les variables de pauvreté typiques ne sont pas significativement corrélées avec les mauvaises performances des remboursements de prêt et ainsi il est peu probable que le ciblage de groupes de population plus pauvres se traduise par une baisse de l'intention de rembourser le crédit.

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