

This version of the article has been accepted for publication, after peer review (when applicable) and is subject to Springer Nature's AM terms of use but is not the Version of Record and does not reflect post-acceptance improvements, or any corrections. The Version of Record is available online at: <http://dx.doi.org/10.1007/s10668-014-9529-6>

Land poverty and emerging ruralities in Cambodia: insights from Kampot province

Arnim Scheidel¹ • Katharine N. Farrell • Jesús Ramos-Martin • Mario Giampietro • Kozo Mayumi

Received: 4 March 2013 / Accepted: 22 September 2013

Abstract Rural change in Cambodia manifests itself in rapidly declining land availability for the smallholder sector, posing the question of how farmers may be able to deal with limited access to land. In this paper, we discuss with a case study village and household livelihood strategies of smallholders currently operating under land-constrained conditions. Based on an integrated assessment of a smallholder village in Kampot province, we illustrate in quantitative terms how land shortage is creating problems of surplus generation and liquidity issues in monetary and non-monetary flows. At the household level, livelihood diversification based on the involvement of productive resources other than land may play an increasing role, particularly in the future, when levels of land shortage may increase. At the village level, smallholder may respond through institutional innovation, in particular through the establishment of a community banking system and a paddy rice bank to provide money and rice credits to overcome transitory shortages and to cover investment costs for additional productive resources. Thus, in this case, we observe the emergence of new patterns of livelihood in rural areas, based on the integration of non-land-based economic activities and new institutional settings.

¹ A. Scheidel, K. N. Farrell, J. Ramos-Martin, M. Giampietro
Institut de Ciència i Tecnologia Ambientals (ICTA), Universitat Autònoma de Barcelona (UAB), 08193
Bellaterra, Barcelona, Spain
e-mail: arnim.scheidel@gmail.com

K. N. Farrell
Division of Resource Economics, Department of Agricultural Economics, Humboldt-Universität zu
Berlin, Unter den Linden 6, 10099 Berlin, Germany

J. Ramos-Martin
Departament d'Economia i d'Història Econòmica, Universitat Autònoma de Barcelona (UAB), 08193
Bellaterra, Barcelona, Spain

M. Giampietro
ICREA Catalonia, 08010 Barcelona, Spain

K. Mayumi
Faculty of Integrated Arts and Sciences, University of Tokushima, Minami-Josanjima 1-1, Tokushima
770-8502, Japan

Keywords Cambodia, Smallholder agriculture, Land poverty, Livelihood strategies, Emerging ruralities, Societal metabolism

1 Introduction

In Cambodia, availability of productive land is a central livelihood condition for the majority of the population (ADB 2001). However, the recent emergence of a global rush for land resources (Borras et al. 2011; Scheidel and Sorman 2012; von Braun and Meinzen-Dick 2009; Zoomers 2010) has also affected Cambodia and is provoking processes of rural change through an increased overall demand for land: While the rapidly growing rural labor force is driving the need for smallholder land, land availability is drastically declining due to the large granting of Economic Land Concessions (ELC) to foreign and domestic agribusinesses, governed by the urban elites to foster tax revenues and trade flows (Borras and Franco 2011; Leuprecht 2004; Scheidel et al. 2013; Thiel 2010). Since a large share of the population faces lack of access to land (ADB 2001; Ballard et al. 2007) and pressures are likely to further increase through ‘land grabs’ in Cambodia (Licadho 2009) but generally also in other countries of the global South (GRAIN 2008; Hall et al. 2011), it becomes crucial to better understand which measures smallholders may take to overcome challenges of land shortage.

Relevant lessons regarding this issue may be learned by analyzing the performance of smallholders currently operating under land-constrained conditions. Within this context, this paper analyses livelihood strategies and diversification (Ellis 2000) in relation to land shortages in a smallholder village in Kampot province, Cambodia. Based on a quantitative integrated assessment of the metabolic pattern of rural systems (see introductory paper to this special section: Ravera et al. 2014), we discuss how land shortages relate to liquidity issues in monetary and non-monetary flows and how land poverty violates the viability of subsistence agriculture and produces farm income gaps. Related livelihood strategies at the village level, as well as for four individual households, are presented. The analyzed households have been purposively selected in order to illustrate a variety of different strategies in relation to different degrees of land shortage. Thus, the results presented here are not necessarily representative, on a country-wide basis. Instead, they provide a theoretically informed reflection on the challenges that many rural people face nowadays in Cambodia and elsewhere, as they develop new ruralities (Ravera et al. 2014; Hecht 2010; Kay 2008) under land-constrained conditions.

In doing so, the paper aspires to contribute to three closely related themes. First, with regard to the special section theme (see Ravera et al. 2014), we address in quantitative terms how lack of access to land may be closely associated with the emergence of new ruralities in terms of the adoption of new economic activities and institutions. Second, regarding the reasons for and effects of livelihood diversification (Ellis 2000), the paper presents a quantitative illustration of different strategies, accounting for the linkages between various relevant dimensions such as land, labor, income and food production and consumption. In addition to a household analysis, we further illustrate how institutional innovation may serve as collective livelihood strategy at the village level in terms of the introduction of a community banking system to manage both monetary and rice surpluses and deficits, within the context of land shortage. Finally, regarding Cambodia’s situation in terms of declining land availability for the smallholder sector

(Leuprecht 2004; Licadho 2009; Scheidel et al. 2013; Thiel 2010), some final conclusions are drawn from the lessons learned, regarding the future role of diversification for emerging ruralities in Cambodia.

The paper is structured as follows: Sect. 2 provides background information on rural change in Cambodia. Section 3 presents the methodological framework and the data sources. Section 4 shows the results from the village and household case study, while Sect. 5 discusses individual and collective responses to deal with limited access to land. Section 6 concludes with reflections on the role for further livelihood diversification within the emergence of new ruralities.

2 Background: rural change in Cambodia

Within the last 50 years, Cambodia experienced radical regime changes that drastically affected rural populations and their ways of making use of their land resources. During the colonial French protectorate (1863–1953), farmers continued to cultivate land based on the traditional ‘acquisition by the plow’ principle, despite property rights and land concessions being first introduced. The radical Khmer Rouge Rule (1975–1979) abolished all forms of private property and uprooted urban and rural populations to force them to collectively cultivate the land. Solidarity farming groups followed under the subsequent Vietnamese occupation and the socialist People’s Republic of Kampuchea (1979–1989), and finally in 1989, private property and land concessions were reintroduced under the transitional regime of the State of Cambodia (1989–1993). Since the establishment of the Kingdom of Cambodia in 1993 as a constitutional monarchy, Cambodia has pursued a transition toward a market economy, with particular attention to developing the rural sector (Chandler 2008; RGC 2004). At present, Cambodia remains a largely agrarian country with 80 % of the population living in rural areas and around 75 % of the active labor force working in agriculture, forestry, hunting and fishing (NIS 2008b). However, the country is entering deep processes of rural change associated with rapidly declining land availability for smallholders.

On the one hand, the demand for resources from the countryside has substantially increased within the rural population itself, due to demographic changes: an endogenous driver of rural change. Recent discussions on globally increasing urbanization rates (which is a relative measure, gauged in terms of percentage) have mainly brought attention to the fact that, for the first time in human history, the global urban population exceeds the global rural population (UN 2012). However, in terms of absolute population growth, pressure on rural land nonetheless continues to grow among many rural populations. Being home to around 11 million rural people, Cambodia has never before, in its entire history, been inhabited by so many farmers as today (Fig. 1a). Cambodia’s population is a special case, due to a demographic legacy of the devastating Khmer Rouge rule, under which an estimated number of 2.2–2.8 million people died earlier than was to be expected (Heuveline 1998). As a consequence, at present, cohorts above 30 years of age are vastly diminished and the cohorts below 30 years are rapidly growing (Fig. 1b). In fact, no less than 1.3 million persons entered the labor force during 2004–2009, 1 million of which were located in rural areas (NIS 2010). This constitutes an overall increase in the rural labor force of 22 %, whose central activity is farming, which has drastically increased the overall endogenous demand for land, as this is the major rural livelihood asset in Cambodia.

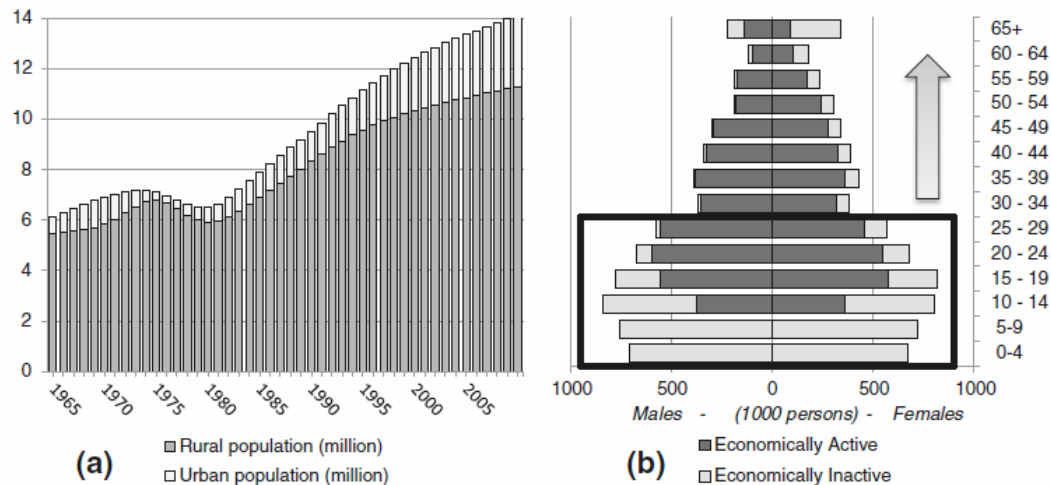


Fig. 1 Demography in Cambodia: **a** population growth since 1965; **b** population structure of Cambodia (2008), decomposed for economically active/inactive persons. *Source* own elaboration, based on FAO (2013) and NIS (2008a)

At the same time, demand from the urban population for land resources has also drastically increased since the 1990s, adding an exogenous driver of rural land use change. Urban growth in Cambodia has led to a total urban population of around 3 million people (Fig. 1a), which is also a unique number in Cambodia's history. In order to provide commodities, trade flows and tax revenues from Cambodian land resources for overall economic growth, the Royal Government of Cambodia (RGC) established the Economic Land Concession (ELC) (RGC 2004, 2005). ELCs can be granted to foreign and domestic companies for the development of agro-industries, and contracts are usually made for 70 years (MAFF 2011). Data from the Ministry of Agriculture, Fisheries and Forestry (MAFF) indicate a total concession area of 1.15 million ha in 2009, of which around 957,000 ha have been validated with 85 companies (MAFF 2011). This is a rather conservative number, since MAFF data do not include concessions below 1,000 ha. Other calculations indicate a total of 2 million ha of ELC land (Vrieze and Naren 2012), which is a substantial amount of land for a few companies. To put this number into context, the smallholder sector, consisting of no less than 10.7 million Cambodians, accounts merely for 3.1 million ha of land (NIS 2008b; Scheidel et al. 2013).²

Summing up, we can see that both rural and urban populations are increasingly claiming land resources, leading to decreasing land availability for smallholders. While land shortage thus might increase in the future, insufficient access to land is already now a fundamental concern for the rural population and affects large parts of rural communities (ADB 2001; Ballard et al. 2007). The following case study from Kampot province provides some lessons on how smallholder that currently operate under land-constrained conditions may be able to deal with limited access to land through livelihood diversification (Ellis 2000) both at the village and household level.

² On May 7 2012, a subdecree was approved to place a moratorium on further land leases through ELC. However, a few concessions continued to be granted in the absence of transparency surrounding approval and extent of ELCs (see, e.g., Boyle and Tithara 2012).

3 Methodological framework and data

3.1 Methodological framework

Following the approach of this special section, the paper conducts an ‘integrated assessment of the societal metabolism’ of rural systems (see Ravera et al. 2014). Generally, the concept of societal metabolism refers to the transformation processes of materials and energy in order to sustain a given identity of a socio-ecological system and to perform a given set of structural and functional activities (Giampietro et al. 2011). An integrated assessment of societal metabolism focuses simultaneously on the performance of various dimensions (e.g., economic, ecological and social) and scales (e.g., village and household scale) of societal metabolism. In order to formalize the concept of societal metabolism, we adopt the flow/fund framework for the parameterization of processes, as developed by Georgescu-Roegen (1971). ‘Funds’ refer to those elements of the system that are maintained constant, for all intents and purposes, during the processes under analysis, typically economic factors such as Ricardian land, capital and human activity (e.g., labor). These elements provide important transformative services for a process to happen. ‘Flows’ refer to those elements that are transformed by the funds and may either enter or leave the process under analysis, such as agricultural goods, energy and materials, or added value.

In this paper, we consider available land and human activity in terms of time use to be crucial funds of rural systems and analyze the associated production and consumption of biophysical and monetary flows. The focus on land and time use is justified based on the assumption that within subsistence economies, land and time (i.e., labor) are important locally available livelihood resources; however, they also act as crucial livelihood constraints, as land and labor are only limited available (Giampietro 2004; Grünbu“hel and Schandl 2005; Pastore et al. 1999). While a focus on land use and time use in subsistence economies thus addresses the (limited) resources available to the society under investigation, it further reflects relevant parts of the identity of rural systems: Time use patterns (i.e., time for sleeping, eating, labor, leisure and socio-cultural activities) ultimately form part of the identity of social systems, and land use patterns (i.e., vegetation types and habitats, recreational landscapes and infrastructure) are ultimately reflections of the structure and functions of biophysical systems.

The following integrated assessment thus quantifies land use, human activity, produced and consumed agricultural commodities, energy flows and monetary flows for the whole case study village Kcheay Khang Lech (Kampot province, Cambodia) as well as for individual households. For the analysis at the household level, four households were purposively selected, based on their different degrees of land shortages and their use of other productive funds, with the aim to illustrate a vivid variety of livelihood strategies operating under land-constrained conditions. Thus, the examples presented in Sect. 4.2 are not representative on a statistical level, but instead are examples provided for a theoretically informed reflection. Variables are presented both in extensive terms (i.e., absolute quantities of funds and flows) and intensive terms (i.e., fund/fund and flow/fund ratios). For the discussion of the village metabolism, we adopt the representation scheme developed by Serrano and Giampietro (2009) that consists of an exhaustive visualization of the monetary and non-monetary flows that are produced, traded and consumed by the funds of human activity and land (see Fig. 2). For the household analysis, we conduct an impredicative loop analysis (Giampietro 2004). ‘Impredicativity’ occurs when a definition depends on a set of elements of which it

forms part; in other words, when what is defined is involved in determining its own definition. In this respect, an impredicative loop analysis (ILA) is a quantitative analysis that illustrates the forced quantitative relations between the whole and selected parts that determine the whole and vice versa. We use an ILA to illustrate the quantitative relationship between various funds (i.e., available land and household size) and flow elements (farm income, expenditure, paddy rice consumption and production) in both extensive and intensive terms. The conducted ILAs (Figs. 3, 4, 5 and 6) are explained in detail in Sect. 4.2.

3.2 Data sources

Field data were gathered during March and May 2011 with a field team consisting of a research coordinator (first author), one assistant and translator and three local enumerators. Research activities included participant observation of household activities; 19 semi-structured interviews with key informants (village chiefs, village group members, NGO members and agricultural experts); and a random household survey (number of sample households = 92/total number of households in the surveyed village = 195) on demography, land use, livelihood activities, income and expenditure, time use and institutional activities. Six samples needed to be dropped due to mistakes during the enumeration process, resulting in a total random sample of 86 households out of 195. This is a representative sample at the village level with a confidence level of 95 % and a margin of error of 8 %, assuming a normal distribution of selected characteristics across the surveyed population. Detailed survey design, data processing methods and background information are reported elsewhere (Scheidel 2013b). Additional data sources included the village statistics from 2008, and the village report book maintained by the committee of the ‘village community.’³ Further, the full accounts of the savings group over the last three years were kindly provided by the secretary of the village community committee. Cambodian Riels were converted to dollars based on the exchange rate of 1\$ = 4,100 Riels (exchange rate as of end of year 2010/beginning of 2011, see also Scheidel 2013b).

4 Results: emerging ruralities in Kampot province

4.1 Liquidity problems and institutional innovation at the village level

Kcheay Kchang Lech (hereafter KKL) is a smallholder village located in Damnak Sokram Commune of Dang Tong district in the coastal province Kampot. Non-mechanized rice production, cultivated during wet season, dominates the subsistence-oriented agricultural practices of the village and open access resources such as forests are scarce. The whole commune, consisting of 5 villages with a total of 3,954 inhabitants, has only 2 ha of forest land. Public infrastructure is generally not very developed in the region (NCDD 2009), and in KKL, no single household accesses wired electricity. The only larger dirt road was constructed in 2002 with support from the German aid organization GTZ (Gesellschaft für Technische Zusammenarbeit).⁴ Figure 2 shows a detailed representation of the societal metabolism of KKL, for which we discuss below the allocation of the funds, human activity (donut-chart on the left of Fig. 2) and land use (box-chart on the right of Fig. 2).

³ The village community—a term chosen by the villagers and the supporting NGO’s—is a bottom-up, self-organized villagers’ group, concerned with community issues in the village. Its functioning can be compared with a grassroots association (see Sect. 4.2).

⁴ GTZ is now called GIZ (Gesellschaft für Internationale Zusammenarbeit).

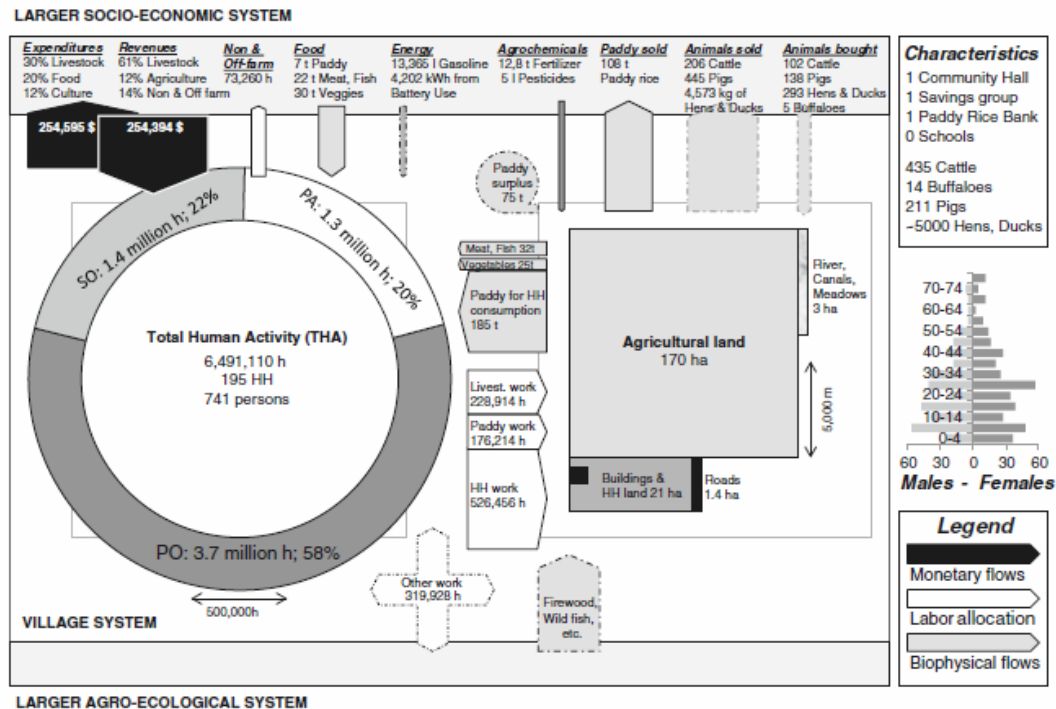


Fig. 2 The societal metabolism of the case study village in 2010/2011. HH household, PO physiological overhead, SO social overhead, PA productive activities. The sizes of the arrows representing labor allocation, monetary and biophysical flows are scaled within their respective units (dollars, hours and tons). Arrows that indicate mixed flows or flows for which no size or allocation is available are marked with dashed lines. Source own elaboration, based on survey data

and how they metabolize (i.e., produce, trade and consume) the associated flows. Black arrows indicate monetary flows, gray arrows indicate biophysical flows, and white arrows indicate allocation of productive activities.

Regarding human activity in KKL, we can see a time use allocation common for agrarian communities (cf. NIS 2007; Grünbühel and Schandl 2005). Villagers have a generous share of total human activity (THA) dedicated to the physiological overhead (i.e., sleeping, eating and personal hygiene: 58 %) and the social overhead (leisure: 18 %; education: 4 %). All productive activities (household work, on- and off-farm work and other work) account for 20 % of THA, whereas most of the time is allocated within the village itself, thus showing at the aggregated level the predominance of subsistence activities. Looking at the population pyramid of KKL (Fig. 2, right side), we can observe a similar pattern of a young and growing labor force as at the national level (Fig. 1b). While already nowadays average agricultural land holdings of 0.9 ha/household in KKL are substantially lower than the national average of 1.7 ha (ACI 2005), land scarcity might increase in the future when the younger inhabitants of KKL start to have their own households. During 2008 and 2011, the total number of households in KKL increased from 172 to 195 (own survey data and Provincial Department of Planning 2009).

Figure 2 further shows that the current production of flows associated with the limited availability of the land fund just meets the consumption of flows processed by the human activity fund, with only a very small amount of surplus production. Total village expenditure (254,600\$) and revenues (254,400\$) more or less cover each other; however, here there is no income surplus at all. Livestock production (61 %) is most

important for income generation, followed by non- and off-farm work (14 %). Paddy production in the village reached in 2010 with 2.1 t/ha a higher yield than in 2008 (1.5t/ha) (own survey data and Provincial Department of Planning 2009) but remains below the Cambodian average of 2.5 t/ha (NIS 2008b). Produced paddy rice is most important for meeting own food needs, yet a share is also required for income generation as well as for storage for food security reasons. Finally, the values in Fig. 2 are aggregated, and what appears to be a small surplus at the village level may be a deficit for some families at the household level. For example, while the village seems to be food secure, single households with land shortage or with failed paddy production may face a transitory food deficit. Likewise, livestock purchase and expenditure may produce transitory debt and income gaps that, however, could be paid back in the future when selling grown livestock. Hence, the lack of surplus production translates into liquidity issues both in terms of monetary and non-monetary flows.

KKL seems to have tackled the problems of liquidity through institutional innovation, in particular through the establishment of a strong village community, supported by an international network of aid organizations. GTZ supported (materially and ideologically) the construction of a community hall providing the physical space for institutional activities and further assisted villagers in the development of a paddy rice bank with defined rules to provide rice credits with interest rates paid in rice. In the year 2010, the bank had a stock of 28 tons of paddy rice, of which 7 tons were provided as credits to villagers. Based on average paddy rice consumption of 223 kg/cap/year in Cambodia (ACI 2005), 28 tons of paddy rice stock correspond to the annual paddy rice needs of around 126 persons, equaling 17 % of KKL's population. Received rice dividends from rice credits were used to support community work such as renewing the dam and repairing the road as well as for compensation for the working hours of the paddy bank committee.

Moreover, CEDAC (a large Cambodian agricultural NGO), supported by international funds from ACT (Asian Community Trust), actively promoted the establishment of a community savings group to fosters household saving, capital pooling and the provision of micro-credits to villagers. At the time of field research, the group consisted of 168 villagers. In order to facilitate access to community-based micro-credits, the interest rate, fixed at 2.5 %/month in 2011, was purposefully lower than the rates of professional microfinance institutes. Further, a poorest group was established as a subgroup of the savings group, with a lower interest rate of 2 %/month. Data from the 2010 banking year show that the savings group, consisting at that time of 83 villagers, had a pooled capital of roughly 34,850\$ at the end of the year. Credits provided to villagers during 2010 amounted to 18,736\$ and produced a total dividend of 6,071\$ from interest payments, resulting in average shareholder revenues of around 73\$ per member. Individual revenues however differed largely from the average value due to an unequal distribution of the capital savings across members. In fact, the top quintile accounted for no less than 86.8 %, while the lowest quintile accounted for only 0.12 % of the total savings capital. There might be the risk that economic inequality will further be reproduced in the future as monetary flows are moving from debtor to creditor villagers. Nevertheless, it is important to see that if the credits were provided by external and more expensive micro-finance institutes, money from interest payments would have left the village and benefited other (urban) areas. Thus, the establishment of a community banking system successfully increased access to credits that may help to overcome

transitory shortages as well as to enable investment in new productive capital apart from land.

Both the savings group and the rice paddy bank are part of the village community named ‘Rathanak Samaky Rung Roeung,’ meaning ‘sharing and helping each other in order to be prosperous.’ The group was established as a democratic grassroots group with a president, cashier and secretary and elections every 3 years. Although external organizations such as GTZ and CEDAC have been very influential in establishing the village community, the members underpinned that themselves took main responsibility in establishing the groups and their rules. At the time of field research, the village community was functioning independently, without financial or intellectual support from outside. KKL is thus an illustrative example of an emerging rurality (Ravera et al. 2014; Hecht 2010; Kay 2008) that has combined subsistence farming activities with modern institutional banking arrangements into a collective livelihood strategy performed at the village level, in order to overcome liquidity issues in terms of both monetary and non-monetary flows.

4.2 Land poverty and livelihood diversification at the household level

We now turn to the household level in order to explore how individual household types in KKL manage to make a living based on small limited access to land.

Participative poverty assessments from Cambodia have generally shown that insufficient own rice production for household consumption due to lacking access to land is perceived as a central element of rural poverty in Cambodia (ADB 2001; Ballard et al. 2007). However, assessing the degree of subsistence land poverty of a household is not straightforward, since a land poverty line defined as a fixed amount of land can neither account for specific paddy rice needs, due to varying household size and consumption rate, nor for specific yields due to varying productivity. Therefore, we define an ‘impredicative’ land poverty line, understood as the amount of land necessary to cover subsistence needs in terms of paddy rice production for paddy rice household consumption.⁵ Such an impredicative land poverty line can be well expressed as the maximum population in terms of hours of human activity that can be sustained by a given area under specific production techniques without additional purchase of rice, hence as a subsistence density threshold in terms of h/unit of area. Based on this ratio, the minimum amount of land required for subsistence can be calculated in relation to the total household size. We distinguish two kinds of subsistence densities, explained below: an actual subsistence density threshold and a fixed subsistence density threshold.

The actual subsistence density threshold refers to the maximum amount of hours of human activity that can be sustained by a certain land area, based on actual paddy rice yields and actual paddy rice consumption rate of the given household. This subsistence density threshold expressed as h/ha thus accounts for the specific paddy rice consumption and rice-growing technology (i.e., yields) of the household. It thus indicates the impredicative subsistence land poverty line effective for that household. The difference between this production level and the actual production of the household is the production gap that must be filled with purchased rice. In addition to the actual subsistence density threshold, we also calculate a fixed subsistence density threshold to

⁵ Paddy rice, of course, is only one component of Cambodian diet; thus, it is necessary to state that other components such as vegetable and meat are also important for subsistence. Nevertheless, rice is the most crucial component, and in fact, the Khmer word for ‘eating’ means ‘eating rice.’

be used as a benchmark value, based on average paddy rice consumption of 223 kg/cap/yr in Cambodia (ACI 2005) and a fixed yield of 2 t/ha, which corresponds to the village average, thus representing a potentially achievable yield [average paddy yield in Cambodia is at 2.5 t/ha (NIS 2008b)]. The fixed subsistence density threshold (h/ha) is thus the same for all households; however, absolute land requirement (ha) still depends on total household size. This benchmark allows us to compare the land endowment across different household sizes.

The following analysis focuses on four households, purposively selected based on their differences in land shortages and associated livelihood strategies. In particular, we conduct an imprecursive loop analysis (ILA) for each household, in order to analyze the quantitative relationship between (1) the household size in terms of THA, (2) its dependent share of hours in relation to food and income production (thus, all activities that do not produce food or income itself, i.e., physiological and social overhead plus household work), (3) the total cash expenditure, (4) total monetary income from on-farm production and (5) total productive land (TPL) available to produce food for the household and agricultural goods for farm income generation (Figs. 3, 4, 5, 6). The actual and fixed subsistence density thresholds are indicated at the interface between THA and TPL and are compared with the household density. The household expenditure is compared with farm income generated from the available land in order to identify the farm income gap that is closed by diversification of income sources apart from farming.

4.2.1 A small farmer's family: a land-based livelihood

Our first analysis focuses on a rather little diversified farmer's household of KKL whose livelihood is fully based on activities requiring sufficient access to land. Figure 3 shows the ILA for the household: the extensive values, total human activity (THA) in the household— h/yr, total productive land (TPL) used by the household—ha/yr, dependent hours (number of non-productive hours—h/yr) and monetary flows in terms of farm income and household expenditure, can be found on the four main axes of the figure. The intensive values are the ratios of the extensive values and consist of household density (THA/TPL— h/ha), dependent share (dependent hours/THA—%), household expenditure rate (household expenditure/dependent hours—\$/h) and farm income generation rate (farm income/TPL—\$/ha). The subsistence density thresholds and related land requirements are indicated at the interface of THA/TPL with dashed lines, expressed in h/ha.

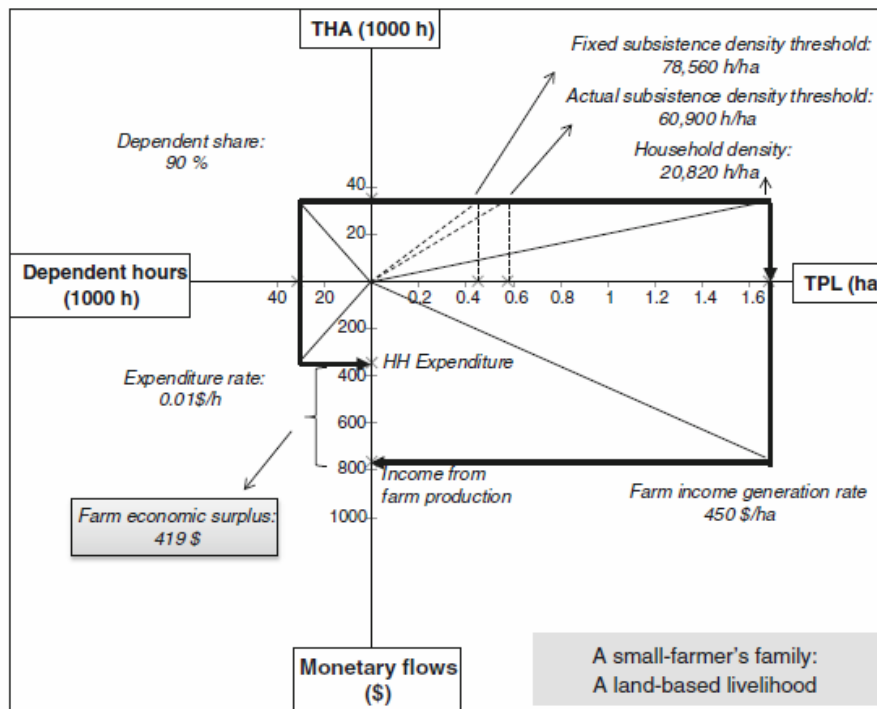


Fig. 3 Impredicative loop analysis of a small farmer's household. Source own elaboration, based on survey data. HH household, THA total human activity, TPL total productive land

The four-person household with a THA of 35,040 h has a paddy land endowment of 1.68 ha. This represents an average value for Cambodia, in which average household size amounts to 4.7 persons/household (NIS 2008a) and average land holdings are of about 1.7 ha/household (ACI 2005). The household density amounts to 20,820 h/ha, which is well below the actual and fixed subsistence density threshold of 78,560 and 60,900 h/ha, respectively, which translate into a subsistence land poverty line of 0.45 and 0.58 ha, respectively. Hence, the household can maintain food security through a large surplus and further produce paddy for the market. Total annual farm income amounts to 764\$, generated through selling 1.5 tons of paddy as well as vegetables and livestock products, resulting in an average annual return of 450\$/ha of productive land. Monetary income is further increased by 244\$ through collecting and selling firewood from (remote) forests, which however is not presented in Fig. 3 as this income is not generated by the land owned by the household.

In comparison with the household expenditure of 345\$, the monetary farm income generated from the available land (excluding firewood from remote forests) produces a monetary surplus of 419\$. This surplus however depends not only on the amount of farm income generated through available land, but also on the consumption rate and related household expenditure. A monetary expenditure of less than a dollar-a-day per household could be interpreted as a shocking low level of consumption. Yet, such a household operates, in large part, outside the cash economy, and only a small amount of meat and vegetables is bought from the market, while all other food is self-produced. In fact, food consumption in rural Cambodia accounts on average for no less than 52 % of the total household expenditure/consumption value (NIS 2010), thus being self-sufficient can drastically reduce expenditure. Having the own farm as the center of livelihood also keeps other costs low, as the household does not need a motorbike or

gasoline to maintain its general livelihood activities. Thus, the above illustrated household can generally be seen as an example of a small farmer's household whose livelihood strategy is based on having, although not much, enough land for self-sufficiency as well as using open access resources such as forests.

4.2.2 A taxi-driver's family: additional capital investment

The next example shows a rural household whose 'land budget' is drastically reduced. As above, it is a four-person household (THA = 35,040 h), but owns only 0.48 ha of productive land (Fig. 4). This amount of land endowment is also a reflection of common rural life in Cambodia: More than half of all households have less than 1 ha of land (NIS 2010).

Due to the small landholding, the household density of 72,880 h/ha is very close to the fixed subsistence density threshold. While this household may produce just the paddy needed for self-consumption, it cannot produce much surplus and did not sell any paddy to the market. Farm income results exclusively from livestock production, yielding a higher average annual return of 860\$/ha. However, it generates in absolute terms only 415\$. Moreover, this household needs to spend substantially more money on food from the market (322 \$/year more than the previous example) because production for self-consumption is limited. Thus, higher expenditure and lower farm income leave the household with a farm income gap of 918\$, which needs to be closed by additional labor and capital investment into non-farm activities, which in the case of this household is taxi-driving, thus

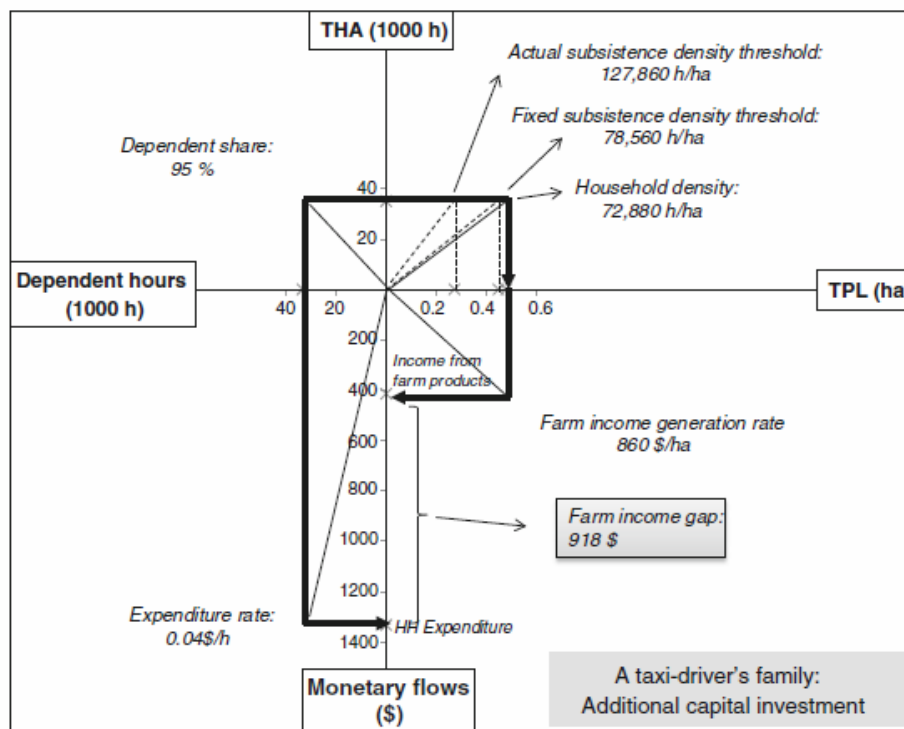


Fig. 4 Impredicative loop analysis of a taxi-driver's family. Source own elaboration, based on survey data. HH household, THA total human activity, TPL total productive land

entering the service economy. With a net return of 0.6 \$/h, taxi-driving is three times better paid than the general off-farm work in KKL (working on farms of others during transplanting, harvest, etc.). It thus represents a successful 'asset strategy' for livelihood

diversification (Ellis 2000), yet this also requires initial capital investment for the motor-taxi as well as a high levels of fossil energy consumption of 1.3 liter gasoline/h of work and thus increases fossil energy dependency.

4.2.3 A land-poor household: diversification by necessity

Figure 5 represents a land-poor household. With 0.38 ha, total productive land is small not only in absolute terms, but particularly in relation to the household size of nine persons (THA = 78,840 h). The household density of 204,980 h/ha far surpassed the actual subsistence density threshold of maximum 35,940 h/ha, which would require a minimum amount of subsistence land of 2.19 ha (Fig. 5: dashed lines). The actual subsistence density threshold of this household is particularly low due to the low paddy rice yields. Technological improvements to close the yield gap—defined as the difference between the actual paddy rice yield of the household (0.78 t/ha) and the average paddy rice yield of the village (2 t/ha) understood as potentially achievable yield—would improve the household situation in terms of food supply. However, household density is still well above the fixed subsistence density threshold, which would require at least 0.62 additional hectares to cover subsistence paddy production. The farm income obtained from the available land is generated mainly from livestock products and does not reach more than 174\$, which is definitely too small to cover expenditures of the nine-person household.

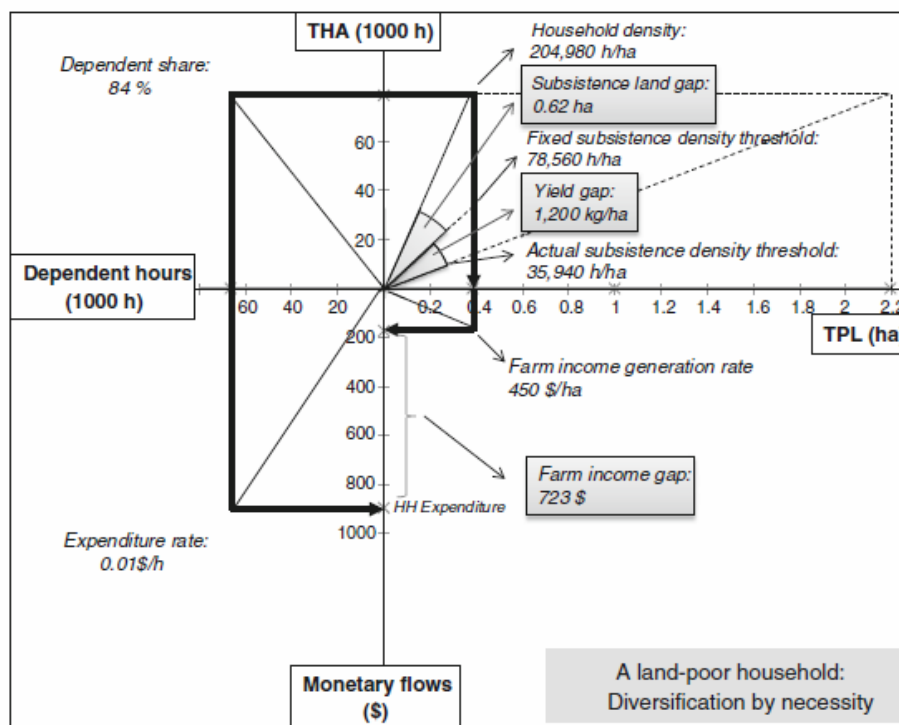


Fig. 5 Impredicative loop analysis of a land-poor household. Source own elaboration, based on survey data. HH household, THA total human activity, TPL total productive land

Thus, such drastically reduced access to land not only makes farming-based livelihoods economically unviable, but also undermines subsistence security. For such types of households, livelihood diversification becomes a crucial necessity, not only for closing the farm income gap, but for survival in terms of meeting daily food requirements. Where land endowment falls short and investment in other asset strategies is not possible due to lack of capital, only labor power in combination with available labor

markets is left to create a livelihood, which might in turn explain the large household size. Apart from having a significantly lower share of dependent hours (84 %), also the absolute number of available working hours is very high due to the large household size. Between May 2010 and April 2011, five household members were involved with a total of 3,925 h in seven different off- and non-farm jobs, including seasonal migration to work in the garment industries and the construction sector, receiving a total average return of 0.19 \$/h. The generated income of 774\$ is enough to close the farm income gap, yet it does not allow for any surplus accumulation and the household has to live with vulnerability all the time.

4.2.4 An aging, female headed, single household: land and labor-poor

Finally, we close our analysis of land shortage at the household level by looking at how an aging, female headed, single household with an extremely reduced land budget manages to survive. Figure 6 shows the ILA for the household of an old widow.

The household owns only 0.24 ha of productive land; however, as a single person household with a THA of 8,760 h/year, the household density of 36,440 h/ha is still lower than the fixed and actual subsistence density thresholds. Thus, the household can be self-sufficient in paddy production and consumption; however, the little amount of land makes it impossible to generate any substantial surplus, particularly as the household faces an additional shortage in funds: its own labor power. The dependent share of hours amounts to no less than 96 % in relative terms, which can hardly be maintained by the remaining 4 % (= 365 h/year) of food and income generating activities.

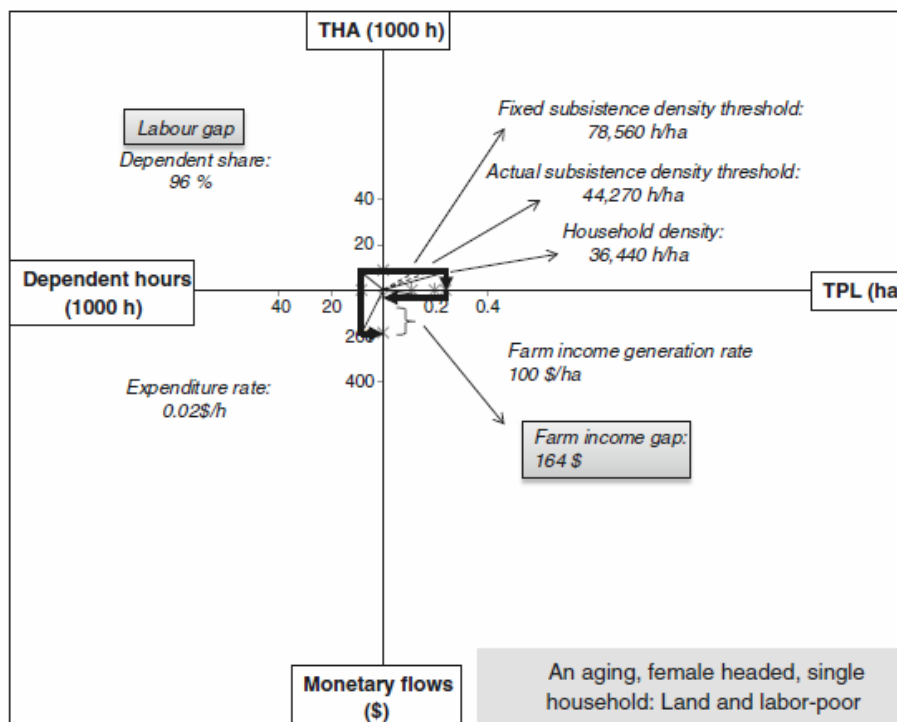


Fig. 6 Impredicative loop analysis of an old widow's household. Source own elaboration, based on survey data. HH household, THA total human activity, TPL total productive land

Thus, the household faces a labor gap in terms of lack of labor hours required to produce sufficient paddy rice for subsistence, as well as a labor and land gap in order to

close the farm income gap. Relatives helped to close the labor gap by assisting with around 150 h of labor for paddy rice production (twice as much labor as provided by the widow herself) and with around one million Riels (244\$) to close the farm income gap. In such a case, livelihood diversification at the household level does not offer a solution due to the lack of labor power and traditional kinship institutions, which may form part of a livelihood portfolio in terms of social capital (Bebbington 1999; Scoones 1998), assuring assistance in labor and consumption goods, become crucial. These in turn however depend also on the proximity of family households and their capacity to generate sufficient surplus, which, however, might be challenged if access to land may further decrease in the future.

5 Discussion: individual and collective responses to deal with land shortages

Section 4 has shown four different stories that all share a common feature: how current land shortages affect smallholders in terms of food security and economic viability of the farm enterprise. As illustrated in Sect. 4.2.1, farmers with sufficient, although not much land, will never become rich in monetary terms; however, they have at least a secure livelihood, as they are in the possession of productive funds. Lacking access to land, as illustrated in the other examples (Sects. 4.2.2, 4.2.3, 4.2.4), does not only decrease food security and farm income generation, but may increase at the same time expenditures due to growing dependency on food from the market. Land-poor households thus face not only a lack of access to flows such as food and income in the short term, but particularly a lack of productive resources to produce flows and create stable livelihoods over the long term (Bebbington 1999; Scheidel 2013a; Scoones 1998). The particular responses to the challenges of land poverty differ across the presented cases and may be manifold, yet they share a common pattern: livelihood diversification (Ellis 2000) needed to compensate for insufficient access to land.⁵ Within the national context of rapidly declining land availability in terms of both smallholder land and open access resources, associated with increasing pressure on smallholders (see Sect. 2 and ADB 2001; Ballard et al. 2007), it can be expected that diversification processes further rapidly increase nationwide in the future, becoming an increasing feature of emerging ruralities across Cambodia.

Diversification beyond the farm enterprise however requires availability of non-land-based livelihood opportunities, which in turn require availability of other productive funds. At the household level, we have seen the importance of additional labor investments into on-farm and non-farm work in combination with seasonal migration and available labor markets. Here, work in the new industries such as garment factories or the construction sector is thus becoming a key feature of emerging ruralities, which however also requires sufficient employment opportunities. Further diversification may also come from pursuing new asset strategies (Ellis 2000) through the acquisition of new productive funds such as the motor-taxi in the above example, which however may require either sufficient surplus generation or further access to capital and credit.

The previous sections (4.2.1, 4.2.2, 4.2.3, 4.2.4) have shown constraints and strategies to assure subsistence of individual households. These, however, do not happen in a vacuum. The viability of these various household types also depends on the capacity of the community to support their continued existence. This capacity depends, in part, upon the institutions that the community has at its disposal. For the case of KKL, we have seen the introduction of a community banking system and a rice paddy bank. In

order to cover acquisition costs of new productive funds, such as livestock or a motor-taxi, increased access to credits has become increasingly important in Cambodia (Ballard et al. 2007) and could be achieved in KKL thanks to the community banking system. Moreover, the paddy rice bank could not only reduce food insecurity at the village level, but also produce rice dividends, used to support community work (repairing the road, dam construction). Thereby, it can be seen as a measure that further helped to increase the productive capacity at the village level. Thus, institutional innovation, in terms of the introduction of new institutional arrangements in KKL, can generally be seen as a collective livelihood strategy based on investment into the social capital of the village (Bebbington 1999; Scoones 1998), intended to enhance other productive capital available at the community level.

6 Conclusions

Based on a case study from Kampot province, Cambodia, the paper has illustrated how current smallholders may operate under land-constrained conditions and the measures they may take to maintain and make a living. Individual and collective responses to deal with land shortage, limited farm surplus production and problems of liquidity in monetary and non-monetary flows have been illustrated both at the household and village level. Within this context, livelihood diversification, such as for example through (seasonal) migration, additional labor investments in combination with new labor markets and new asset strategies based on investment into new productive funds, is playing a crucial role at the household level. As also seen in the presented case study, institutional innovation, such as the establishment of a formal grassroots village community, a village banking system and a paddy rice bank, may further offer a collective response to facilitate and enhance availability of productive capital required to create new livelihood strategies.

Living with insufficient access to land is currently a pressing issue for many Cambodian smallholders (ADB 2001; Ballard et al. 2007) and unfortunately likely to increase in the future (Scheidel et al. 2013). Thus, increased livelihood diversification by necessity (Ellis 2000) due to lack of land might become a central feature of emerging ruralities in Cambodia. Subsistence fears—which Scott (1976) argued to be at the bottom of peasant's resistance to innovation in pre-colonial times—are turning nowadays for many smallholders into acute survival threats, due to insufficient access to land, resulting in a requirement for innovation in rural life in order to survive. Meanwhile, as the smallholder economy is adapting to land shortages, linkages to urban areas are increasing, not only through seasonal work in the new industries, but also, as seen in this case study, through increased capital and information flows from a growing network of global and local aid organizations. Thus, many new ruralities across Cambodia may be understood to emerge in complex interactions between the local and the global, and the rural and the urban, showing a highly adaptive capacity to integrate new economic activities and institutions into diversified rural livelihoods.

Acknowledgments This research was funded by (1) research grants (FI-DGR 2010 and BE-DGR 2011) from the Catalan Government, Spain; (2) the Consolidated Research Group 'Economic Institutions, Quality of Life and Environment' SGRZ009-00962; and (3) the Spanish Ministry for Science and Innovation Project HAR-2010-20684-C02-01; and (4) the EU-Project MARSS (LIFE11ENV/DE/343). The authors particularly thank the villagers of Kcheay Kchang Lech for their hospitality during field research and for their cooperation with the research activities. Further thanks go to the Mekong Institute

for Cooperation and Development in the Greater Mekong Sub-region for providing institutional support; CEDAC for institutional support, contacts and feedback on the survey design; and Bunchhorn Lim, Duk Piseth and Kimchhin Sok from the Royal University of Agriculture, Phnom Penh, for assistance as researchers and friends during the first author's stay in Cambodia. The constructive comments of two anonymous reviewers are thankfully acknowledged. The paper was largely written at Tokushima University, Japan.

References

- ACI. (2005). Final report for the Cambodian Agrarian Structure Study. Prepared for the Ministry of Agriculture, Forestry and Fisheries, Royal Government of Cambodia, the World Bank, the Canadian International Development Agency (CIDA) and the Government of Germany/Gesellschaft für Technische Zusammenarbeit (GTZ). Bethesda, Maryland: Agrifood Consulting International.
- ADB. (2001). Participatory poverty assessment in Cambodia. Asian Development Bank. Manila. <http://www.adb.org/sites/default/files/pub/2001/poverty-assessment-cambodia.pdf>. Accessed Jan 22, 2013.
- Ballard, B., Sloth, C., Wharton, D., Fitzgerald, I., Murshid, K., Hansen, K., et al. (2007). "We are living with worry all the time"—A participatory poverty assessment of the Tonle Sap. Phnom Penh: Cambodia Development Resource Institute.
- Bebbington, A. (1999). Capitals and capabilities: A framework for analyzing peasant viability, rural livelihoods and poverty. *World Development*, 27(12), 2021–2044.
- Borras, S. M., & Franco, J. (2011). Political dynamics of land-grabbing in Southeast Asia: Understanding Europe's role. Amsterdam: Transnational Institute (TNI).
- Borras, S. M., Hall, R., Scoones, I., White, B., & Wolford, W. (2011). Towards a better understanding of global land grabbing: An editorial introduction. *Journal of Peasant Studies*, 38(2), 209–216.
- Boyle, D., & Titthara, M. (2012). Not all economic land concessions listed. Newspaper report. Phnom Penh: The Phnom Penh Post, 5 July 2012. <http://www.phnompenhpost.com/national/not-all-economic-landconcessions-listed>. Accessed July 24, 2013.
- Chandler, D. (2008). *A history of Cambodia* (4th ed.). Boulder: Westview Press.
- Ellis, F. (2000). The determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics*, 51(2), 289–302.
- FAO. (2013). FAO statistical databases. Food and Agriculture Organization of the United Nations. <http://faostat.fao.org/>. Accessed Feb 12, 2013.
- Georgescu-Roegen, N. (1971). *The entropy law and the economic process*. Cambridge, London: Harvard University Press.
- Giampietro, M. (2004). *Multi-scale integrated analysis of agroecosystems*. Florida: CRC Press LLC.
- Giampietro, M., Mayumi, K., & Sorman, A. H. (2011). *The metabolic pattern of societies: Where economists fall short*. Abington: Routledge.
- GRAIN. (2008). SEIZED! The 2008 land grab for food and financial security. GRAIN Briefing October 2008. <http://www.grain.org/briefings/?id=212>. Accessed 15 Sept 2010.
- Grünbühel, C., & Schandl, H. (2005). Using land-time-budgets to analyse farming systems and poverty alleviation policies in the Lao PDR. *International Journal of Global Environmental Issues*, 5(3–4), 142–180.
- Hall, D., Hirsch, P., & Li, T. M. (2011). *Powers of exclusion: Land dilemmas in Southeast Asia*. Singapore: NUS Press.

- Hecht, S. (2010). The new rurality: Globalization, peasants and the paradoxes of landscapes. *Land Use Policy*, 27(2), 161–169.
- Heuveline, P. (1998). 'Between one and three million': Towards the demographic reconstruction of a decade of Cambodian history (1970–79). *Population Studies*, 52(1), 49–65.
- Kay, C. (2008). Reflections on Latin American rural studies in the neoliberal globalization period: A new rurality? *Development and Change*, 39(6), 915–943.
- Leuprecht, P. (2004). Land concessions for economic purposes in Cambodia. A human rights perspective. Phnom Penh: Special Representative of the Secretary General of Human Rights in Cambodia.
- Licadho. (2009). Land grabbing & poverty in Cambodia: The myth of development. Phnom Penh: LICADHO—Cambodian League for the Promotion and Defense of Human Rights. <http://www.licadho.org/reports/files/134LICADHOREportMythofDevelopment2009Eng.pdf>. Accessed July 24, 2013.
- MAFF. (2011). Economic land concession—Cambodia. <http://www.elc.maff.gov.kh/>. Accessed March 12, 2013.
- NCDD. (2009). *Kampot data book*. Phnom Penh: National Committee for Sub-National Democratic Development (NCDD).
- NIS. (2007). *Cambodia socio-economic survey 2004—Time use in Cambodia*. Phnom Penh: National Institute of Statistics (NIS), Ministry of Planning, Cambodia.
- NIS. (2008a). *Cambodia General Population Census 2008*. Phnom Penh: National Institute of Statistics (NIS), Ministry of Planning, Cambodia.
- NIS. (2008b). *Statistical yearbook of Cambodia 2008*. Phnom Penh: National Institute of Statistics (NIS), Ministry of Planning, Cambodia.
- NIS. (2010). *Cambodia Socio-Economic Survey 2009*. Phnom Penh: National Institute of Statistics (NIS), Ministry of Planning, Cambodia.
- Pastore, G., Giampietro, M., & Ji, L. (1999). Conventional and land-time budget analysis of rural villages in Hubei province, China. *Critical Reviews in Plant Sciences*, 18(3), 331–357.
- Provincial Department of Planning. (2009). *Commune report 2009 for management and basic development: Damnak Sokram commune, Dang Tong district, Kampot province*. Dang Tong Town: Provincial Department of Planning.
- Ravera F., Scheidel A., Dell' Angelo J., Gamboa G., Cabello V., Serrano T., Arizpe N., Mingorri' a S., & Ariza P. (2014). Pathways of rural change: An integrated assessment of metabolic patterns in emerging ruralities. *Environment, Development and Sustainability*. doi:10.1007/s10668-014-9534-9.
- RGC. (2004). *The rectangular strategy for growth, employment, equity and efficiency in Cambodia*. The Royal Government of Cambodia (RCG). Phnom Penh. http://www.cdc-crdb.gov.kh/cdc/aid_management/RGC_Rectangular_Strategy_2004.pdf. Accessed Feb 28 2012.
- RGC. (2005). *Sub-decree on economic land concession*. The Royal Government of Cambodia (RGC). Phnom Penh. <http://www.elc.maff.gov.kh/en/laws/13-sub-decree-on-elc.html>. Accessed March 1, 2012.
- Scheidel, A. (2013a). Flows, funds and the complexity of deprivation: Using concepts from ecological economics for the study of poverty. *Ecological Economics*, 86, 28–36.
- Scheidel, A. (2013b). *From MuSIASEM theory to practice: Report and reflections from field research in Kampot province, Cambodia*. Reports on Environmental Sciences. Institute of Environmental Science and

- Technology (ICTA). Barcelona: Autonomous University of Barcelona (UAB). <http://www.recercat.net/handle/2072/16100>. Accessed July 24, 2013.
- Scheidel, A., Giampietro, M., & Ramos-Martin, J. (2013). Self-sufficiency or surplus: Conflicting local and national development goals in Cambodia. *Land Use Policy*, 34, 342–352.
- Scheidel, A., & Sorman, A. H. (2012). Energy transitions and the global land rush: Ultimate drivers and persistent consequences. *Global Environmental Change*, 22(3), 588–595.
- Scoones, I. (1998). Sustainable rural livelihoods: A framework for analysis. IDS working paper. Institute of Development Studies.
- Scott, J. (1976). *The moral economy of the peasant: Rebellion and subsistence in Southeast Asia*. New Haven and London: Yale University Press.
- Serrano, T., & Giampietro, M. (2009). A multi-purpose grammar generating a multi-scale integrated analysis of Laos. Reports on Environmental Sciences. Institute of Environmental Science and Technology (ICTA). Barcelona: Autonomous University of Barcelona (UAB). <http://hdl.handle.net/2072/40519>. Accessed July 24, 2013.
- Thiel, F. (2010). Donor-driven land reform in Cambodia—Property rights, planning, and land value taxation. *Erdkunde*, 64(3), 227–239.
- UN. (2012). *World urbanization prospects—The 2011 revision*. New York: United Nations Organization. <http://esa.un.org/unpd/wup/index.htm>. Accessed Feb 12, 2013.
- von Braun, J., & Meinzen-Dick, R. (2009). “Land grabbing” by foreign investors in developing countries: risks and opportunities. IFPRI Policy Brief 13. International Food Policy Research Institute.
- Vrieze, P., & Naren, K. (2012). Carving up Cambodia—One concession at a time. Newspaper report. Phnom Penh: The Cambodian Daily Weekend, March 10–11, 2012. <http://www.licadho-cambodia.org/land2012/>. Accessed May 29, 2012.
- Zoomers, A. (2010). Globalisation and the foreignisation of space: Seven processes driving the current global land grab. *Journal of Peasant Studies*, 37(2), 429–447.