



Universiteit
Leiden
The Netherlands

Figuring rural development : concepts and cases of land use, sustainability and integrative indicators

Hobbes, M.

Citation

Hobbes, M. (2010, March 4). *Figuring rural development : concepts and cases of land use, sustainability and integrative indicators*. LUP Dissertations. Leiden University Press, Leiden. Retrieved from <https://hdl.handle.net/1887/15036>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/15036>

Note: To cite this publication please use the final published version (if applicable).

Summary

This dissertation represents a confluence of rural development studies and sustainability science. Its aim is to contribute significantly to the growth of sustainable rural development as a systematic discipline.

Chapter 1 forms the introduction. It contains an overview of substance and methodology of the two ‘mother disciplines’ and then develops the questions of the dissertation as a whole.

Chapter 2 focuses on the explanation of land use change in four villages close to the rainforest in the Philippine uplands. The basis of the study is the application of two frameworks from sustainability science. The four villages lie on a gradient of distance to the major markets, varying between a village with year-round accessibility and an isolated village with recent immigrants. Irrigated rice, yellow corn and bananas are the most important agricultural crops, but all villages were also involved in (illegal) logging in the forest. The differences in land use between the villages could not be explained by their differences in population density or distance to market. Rather, it appeared that the slope of the land was the decisive factor. The relative profitability of the crops was strongly dependent on slopes, with rice as best on flat land, corn on mild slopes and bananas on steep slopes. Since rice/corn/banana is also the sequence of profitability on these slopes, farmers first plant rice on flat land until slopes become too steep and corn becomes more profitable, then plant corn if they have time left and then follow with banana if time is still available, until at some distance from the road, transport cost becomes too high and profits drop to zero. Through these mechanisms, agricultural incomes were highest in the village with most of the flat land, and land use was fully predictable through the local slope patterns. In a hypothetical perfectly concave landscape, a land use zonation arises with the zones arranged by distance from the valley center, fully analogous to the classic Thünian pattern of zones around the city on perfectly flat land. It is Von Thünen in the mountains, with the same underlying micro-economic cause. Chapter 2 ends with an exploration of policy scenarios that address the problems of unsustainability of the corn system and forest exploitation.

Chapter 3 focuses on Tat, a village in the uplands of Vietnam, and explores the possibility and the advantage of connecting two frameworks from the Industrial Ecology branch of sustainability science, material flows analysis (MFA) and Action-in-Context (AiC), to each other. Tat is inhabited by the ethnic Tay and lies in a narrow valley between mountai-

Summary

nous slopes. The valley floor was fully occupied by rice fields, and slash-and-burn agriculture was practiced on the slopes. Furthermore, people gathered several timber and non-timber products in the forest, mainly on the territories of other villages because their own forest was already depleted. The village was connected to the lowland market by a road that was built in 1992 and was being improved at the time of the research.

The material flow analysis that follows the standard ('bulk') MFA framework was completely dominated by the road works, with flows per capita close to those in industrial societies. This is an incidental indication the standard MFA is not a fully adequate tool for village-level analysis. A more structural indication of this problem is that the MFA of a hypothetical sustainable scenario, in which the land use system of Tat is fundamentally changed, is virtually indistinguishable from the MFA of the present situation. The conclusion is that standard MFA is not connected to important themes in rural development.

Separate material flows (of timber, rice etc.) did generate an adequate system description, however, as well as an adequate problem description if strengthened with additional data. It appeared that the cash earned in the village was based on unsustainable and partly illegal biomass flows, and that this cash was needed to a large extent to finance food import and fertilizer import to produce the (rice) subsistence crop.

In order to enable an explanation of the unsustainable material flows (and with that, arrive at adequate policy recommendations), the AiC framework was applied. On the level of the land users, the general explanation turned out to hinge around the limited availability of favored options. The two most attracted options, were limited in space (in the case of rice growing) or in time (in the case of broomgrass gathering). The next-best two options, broomgrass and timber, were limited in time or market, respectively. People put their remaining energies in slash-and-burn agriculture, even though this was hardly profitable and very tough work. As was the case in the preceding chapter, this is a 'cascade down the options' explanation, and fully based on rational choice theory.

Besides enabling explanations such as these, AiC contains an 'actors field' element that traces the causal linkages between the land users and other actors that influence the land user decisions. Main drivers turned out to be commercial market chains that included traders and government actors. The government actors were mainly present through deliberate non-action. Motivated by sentiments and bribes, they

Summary

closed their eyes to illegal activities in stead of protecting the people against themselves.

Based on this 'socially extended MFA' analysis, sustainable policy options could be designed that included improvements in the rice system, alternative forest products, value-added industry and out-migration. Overall, markets were not only the cause of unsustainability but also offered opportunities for a sustainable future.

Chapter 4 develops the framework of rural material flow analysis (rMFA), based on the idea that material flows can express more about rural communities than standard MFA does. The rMFA first inventories all separate flows and subsequently puts them in a classification that (1) keeps the sources and destinations of the flows visible, (2) distinguishes between economic sectors as well as human or animal systems and (3) is flexible in structure and terminology. These categories may then be modeled into synthetic indicators that express important phenomena in rural development, such as productivity, intensity, incorporation and food security. The rMFA has been applied to three villages, namely Nalang (Laos), Tat (Vietnam; Chapter 3) and Dy Abra (Philippines; Chapter 2).

Rice was the most profitable crop as well as the staple food and people were inclined to grow as much of it as they can. The productivity and intensity of the rice farming tells much about the availability of land that is suitable for rice. Tat displayed the highest land productivity (tons per ha) for rice, with Dy Abra in the middle and Nalang lowest. The reverse sequence showed up for the production per capita. This shows the scarcity of rice fields in Tat. People spend much labor on the small area, resulting in a high yield per hectare but low yields per working hour. The reverse is true for Nalang, where people can afford to grow only one cropping in the rainy season, without the need to irrigate. The figure on intensity (material input per hectare) is highest in Tat, which confirms these findings.

Incorporation is the degree to which people draw their inputs from or deliver their outputs to external markets. Especially incorporation on the input side (e.g. seeds, fertilizer) is often seen as a form of dependency. Of the three villages, Dy Abra showed up as the most incorporated, on both the input and output accounts. Nalang showed the reverse image, with a high level of food autarky. Farmers grew cucumbers for the market in the dry season in order to assure cash income. In Tat, the agriculture was largely independent from the markets but the extracted forest products were basically all exported. This was necessary to buy food and fertilizer.

Summary

rMFA generates five indicators of food security. The first shows the degree to which food is available in the village compared to what people need according to international standards. This indicator was around 1 for all three villages. The second indicator shows the degree to which this food is grown by the villagers themselves. This figure remained at 1 for Nalang but was less than 0.5 for Tat, showing the importance of food imports there. The third indicator of food security calculates the degree to which the villages could feed themselves if food imports would fall away (e.g. due to exploding food prices) and in order to compensate for this, people would eat all food they now export or feed to livestock (e.g. cassava or corn). In that case, people in Tat would still not have enough, while they would have an enormous surplus of corn in Dy Abra. In other words, Dy Abra is quite dependent on the fertilizer market but not on the food market. The fourth indicator calculates how much food people would have (compared to what they need) if not only the food market but also the input markets would fall away. This 'actual food autarky' indicator shows that there would not be much left to eat in Dy Abra, that Tat would again fall back to the famine level of 0.5 while Nalang would hardly be disturbed by all these events. The final, and 'deepest', food security indicator has been called 'potential food autarky' and expresses the food situation (again as ratio of available and needed food) if the agricultural system would be adapted to put all available manure to use in food production. This does not deliver much extra in Tat because all manure is in fact used already in Tat's intricate farming system. This is very different for Dy Abra, where much unutilized manure is present. Potentially, Dy Abra could feed itself well without exchange with any market. Even for Dy Abra there is of course nothing desirable *per se* to such a situation, if only because households would be poorer than they are now. Potential autarky is relevant as a measure of resilience, however, and strengthens farmers' bargaining position.

On a quantitative quality level, the indicators support a number of important insights. In Nalang, the ample availability of suitable land resulted in a high yield per capita and a low dependence on external circumstances. On that safe subsistence foundation, the farmers accessed the market through the cucumber cash crop. Dy Abra was on a pathway with more short-term risk, focusing as it did on timber extraction and a market crop that heavily depended on fertilizer. With that, it had high indicator values on capital intensity and market incorporation, and would fall into an acute crisis if markets would fall away (low 'actual autarky'). The high levels of fertilizer use point to a risk of unsustainability but at the same time, there were many options left for a more organic and less dependent agriculture ('potential autarky'). In Tat, risks were

Summary

of a much deeper kind. The high levels of extraction from the forest point to unsustainability, but this extraction was necessary because it took care of 90 percent of the cash income – income that the village could not do without because it needed to buy much of its staple food on the market. Tat would be able to supply only 60 percent of its food needs if the extraction itself or the extraction market would fail. Thus, the indicators teach us that a village such as Tat, with its sophisticated organic agricultural system, is actually much worse off than a village such as Dy Abra that focuses on a single, fertilizer-based commercial crop. In Dy Abra, the risks were more visible, but much more superficial at the same time. The village of Nalang, finally, well-endowed with land and relying on a simple rice system, could look at a secure future in both the short and long run.

Chapter 5 is dedicated to the development of a framework that generates an indicator called “freely disposable time” (FDT). This indicator integrates data on time use and cash flows of households into a single number (hours per day) that expresses how much time the productive household members have left after satisfying the basic needs of themselves and the basic needs they need to supply for other household members (e.g. children and the sick). Basic needs concern food, shelter, social participation, care needs and so on. The framework is founded on an exhaustive list of categories on which people spend time and money, such as sleep, work, care and chores. Basic needs per day are specified for each category, such as 2500 kcal of food per male adult, some cash for communication, three hours of care giving if there are three children, zero hours for work, and so on. In combination with data on household composition, this enables to determine the needs that the productive household members have to supply. This in turn is compared with the degree to which the household actually avails of these categories, so that surpluses or deficits can be assessed. The next step is to determine how much time the productive household members have needed to supply these (T_{EX}). This is done by adding the actual time they spent on it plus the amount of cash spent on it, expressed in equivalent time. Equivalent time is calculated through the household income; e.g. if one hour of work delivers 10 \$, spending 10 \$ is equivalent with spending one hour. Summed over all categories, these time/cash time equivalents end up at 24 hours per day for each productive household member. With the help of the surpluses and deficits on the basic needs, it can be calculated how much of the T_{EX} has been needed for the basic needs (T_{BN}) and how much of it represents deficit (T_{DEF}) or surplus (T_{SUR}). “Freely disposable time” (FDT) equals the sum of all surpluses minus the deficits.

Summary

FDT is not the same as leisure time, and neither is it available instantaneously. People may for instance work hard on the land, a business or job in order to secure a degree of above-basic housing, consumer goods, mobility, health care and so on. FDT represents the time that people *can* make free and spend freely, e.g. on leisure but also to invest in improving the farm, work for luxuries or work to send a child to college. In other words, FDT expresses the capacity that people have to make choices – their ‘freedoms’ in Sen’s terminology. With that, FDT is a fundamental indicator of poverty and wealth. The fundamental poverty line is when FDT = 0 hours per day, implying that people need all their time and all the cash they can generate with it to satisfy their basic needs. On that level, people have nothing left to invest in a better future. If FDT is below zero, people can only live in chronic deficits of sleep, health, food or cash. Because everybody needs some 10 hours per day for basic sleep and self-care, some 13 to 14 hours of FDT is characteristic for the very rich. The FDT of the very poor ranges from below zero to, say, 6 hours per day. ‘FDT profiles’ describe how people spend their freely disposable time, e.g. on work for consumables, work for savings, or leisure or learning.

The FDT system has been tested on four complex households (two poor, one middle, one rich) in Kashimpur village near Calcutta (India) and two simpler households (one middle, one poor) in the Netherlands. The Indian households were composed of farmers that work for subsistence as well as the market, and also engaged in various other jobs and trades. The Dutch households represented an academic family with one and a half income and three young children, and a family of a single mother with a minimum wage and three young children. In Kashimpur, the productive members of the poor households needed 2 to 3 hours per day to secure basic food while the poor household in the Netherlands needed the same time for other basic goods. The FDT profiles showed that the two poorest Kashimpur households, even though truly poor, still availed of enough FDT to make the choice to keep the wife away from employment and concentrate on housekeeping and supply ample care to the children (household 1) or to buy some luxury goods and put some cash aside as savings (household 2). One of the middle-FDT households in Kashimpur has a very low income (0.37 dollar per capita per day, which is way below the global poverty line of 1 dollar per capita per day) but relatively much FDT (7.7. hours per day), which was used, among others, to allow a young household member to study in stead of work. The poor household in the Netherlands had a lower FDT (2.3 hours per day) than had the poor in Kashimpur (about 5.5. hours per day). It should be noted here however that basic needs in the Netherlands are higher than in India. Partially, this creates no differ-

Summary

ence in real welfare because the same goods and services just happen to be more expensive in the Netherlands. For another part, the basic needs difference does create a real welfare difference. Basic health insurance in the Netherlands, for instance, is not only much more expensive but also much better than in India.

Because the FDT framework integrates time and money, it is able to incorporate many basic needs, also those that are primarily written in time terms, such as the time needed for care for children and the sick. Moreover, it does not only reflect the welfare effects of changes in cash terms (e.g. loss of a job) but also of changes in time terms, such as the loss of a forest so that more time is needed for firewood, or the arrival of a solar cooker or a HIV/AIDS patient in the household. For this reason, and because FDT expresses to a high degree the freedom that people have to make choices, FDT has a much deeper meaning than the globally used poverty and welfare indicators that are based on cash or food only. In Chapter 5, this is illustrated by means of different strategies and circumstances of a hypothetical household.

FDT may be a good candidate for research into the correlation with subjectively felt poverty (and happiness). FDT also has a direct relevance for sustainability in rural areas, because the key to the transition to sustainable agriculture is that farmers invest in their land (e.g. terraces), learning and innovation. FDT expresses exactly how much investment capacity rural households have. Finally, FDT is a new instrument with the potential to compare household types within regions and across regions, countries, cultures and times. Uniformity of methods to study time and cash needs and expenditures is essential to foster this comparative potential. Looking at health care, for instance, it might be established what sort of care package may deliver a life expectancy of, say, 65 years in both India and the Netherlands, and that 'equal welfare package' may then be translated into different insurance costs in the two countries.

Chapter 6 comprises a number of discussions that are all based on material from more than one chapter.

Section 6.1 discusses three themes on land use change, all based on a Table that overviews the five villages studied in preceding chapters. The first theme concerns the temptation to treat typologies of villages or farming styles as phases of development. The second theme focuses on the status of population and market based theories that predict the intensity of land use. It is seen, for instance, that the population densities in Tat and Kashimpur are both very high but totally different in nature

Summary

and consequences. The primary thing to do for making good use of these ‘grand theories’, however, is to abstain from all claims and bickering about their substantive truth content and use them as methodological tools that separate in each empirical case what can be explained through the theory’s causal logic and what is identified as anomaly. The third theme in this section discusses adequate terminology for rural development. Often, the rural areas in the developing countries are assumed to be lived in by ‘farmers’ that have ‘strategies’. The implicit assumptions and values that come with these terms often mislead the researcher.

Section 6.2 goes deeper into issues of indicators and epistemology that were already touched upon the first chapter. Chapters 2 and 3 have shown that profitability (the central concept in rational choice theory) has been able to fully explain land use change and patterns in the studied villages. Surprisingly, this factor does not emerge from the usual explanatory methods of land use studies. This is the consequence of the common choice to use statistical-inductive methods that search for correlations between the dependent variable (e.g. land use change) and a series of independent variables. Partially, the latter variables are usually derived from rational choice in some more or less vague manner, but without representing its central concept. The (often weak) correlations that are then found do therefore not represent causal insight and do not reveal central mechanisms. Central mechanisms can be found, however, through deductive use of explanatory (causal) models such as rational choice.

Section 6.3 is devoted to an exploration of how the indicator “freely disposable time” (FDT) (Chapter 5) could serve as a broad indicator of development at the village level. FDT expresses the capacity of households to invest in the future. Based on FDT, it can be calculated how much (in dollars per day) a household could maximally invest. In that calculation, the household lives on the level of its basic needs and invests all its FDT in (a) work that delivers cash that is subsequently put into development, such as having a well drilled or sending a child to college, or (b) direct individual or collective development actions such as plant trees, follow a training course, build a village cooperative or improve the irrigation system. The latter type of activities may be expressed in monetary terms through the profitability of work (‘maxEFF’) in the indicator formula. Stepping up from the household to the village level, all investment capacities of the households are added up but a new, village-level factor appears as well, which often has great influence on the effectiveness of individual as well as collective action: collective social capital (CSC). The sum of FDTs and CSC are combined through a fac-

Summary

tor α that expresses the degree of influence of CSC on an action's effectiveness. The central assumption of the indicator is that the higher the effective investments, the higher the rate of development of the village. Development also has to be sustainable, however, and for that reason only those activities are taken up that fall between boundaries of acceptable risk (e.g. on physical sustainability or health), acceptable external effects (e.g. on biodiversity or other villages) and acceptable quality of life during investments (implying that on the village level, not all FDT should spent on developmental actions only). Jointly, these factors determine the synthetic indicator of 'maximum rate of community development'. This is an indicator of *capacity*. Addition of a motivational factor ('MOT' in the formula) then expresses which part of the capacity is actually 'put into development', therewith assessing the actual rate in which a village develops (or falls apart). The indicator can be quantified by means of integrated frameworks, databases and fieldwork. Informal quantifications and discussions on underlying assumptions (including basic needs) may however also be used to discover, jointly with the communities themselves, what factors and mechanisms determine their development or lack thereof, and identify options for change.

Chapter 7 presents the results of the study in the form of 24 conclusions. The most important ones relate back to the central questions of Chapter 1 and deal with the adequacy of rational choice theory, Thünian land use patterns, the avoidance of closed terminology, the connections of MFA with the themes of rural development, the content and use of the FDT indicator and the importance of deductive and actor-based methodology.



Planting corn in Puerta