# survival or accumulation

## migration and rural households in burkina faso

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|---|---|
| Promotor | Prof. dr. A Kuyvenhoven<br>Hoogleraar ontwikkelingseconomie<br>Wageningen Universiteit |
| Co-promotor: | Prof. dr. R. Ruben<br>Hoogleraar ontwikkelingsstudies en directeur Centre for International Development Issues Nijmegen,<br>Radboud Universiteit Nijmegen. |
| Promotiecommissie: | Prof. dr. A.J. Dietz, UVA, Amsterdam<br>Prof. dr. F. Ellis, UEA, Norwich<br>Prof. dr. A. Oskam, Wageningen Universiteit<br>Prof. dr. L. Stroosnijder, Wageningen Universiteit |

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## migration and rural households in burkina faso

F.S. Wouterse

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ABSTRACT

Migration plays an important role in development and as a strategy for poverty reduction. Burkina Faso, a country where conditions for agriculture are far from favourable, has a long history of migratory movement. Migration within West Africa (continental migration) has since long taken place in response to drought and low agricultural productivity. Migration to destinations outside the African continent and in particular to Western Europe (intercontinental migration) has become more important over the last decades for migrants from Burkina Faso.

This study provides a quantitative analysis of the determinants and effects of migration for rural households in four villages on the Central Plateau of Burkina Faso. It sheds new light on the migration-remittances-development debate by analysing migration from a whole-household perspective combining determinants and consequences of migration; by including both the production and the consumption side of the rural household economy in an imperfect market environment; and by allowing for heterogeneity in migration through a distinction of two different migratory movements: continental and intercontinental migration.

An extended farm household model that includes a migration component forms the basis of the econometric analysis of cross-section data from 223 households. Findings reveal that the two migratory movements are indeed different strategic decisions. Households with intercontinental migrants are able to overcome entry constraints that exist for this more lucrative (in terms of remittances) form of migration because of their wealth. In an imperfect market environment remittances from intercontinental migration help these households to overcome entry constraints existing for other activities and to greatly improve their welfare. Continental migrants appear to be pushed out due to insufficient land and consumption pressure. Loss of labour negatively influences income generated in labour-intensive activities and household welfare only slightly improves due to the migration induced reduction in household size.

ACKNOWLEGEMENTS

When I returned to The Netherlands in 2001 having spent four years in the UK, I had never heard of Wageningen or its university. Strange perhaps but it shows the extent to which (at least from my perspective) the reputation of a Dutch city hinges on having a train station. I have learned since then that Wageningen University and its research are considered somewhat of an institution abroad of which I am proud to have been a part.

Starting a PhD in the Netherlands, having been molded into the English university system, where little own initiative in terms of organization is required, proved difficult at first. My great thanks for helping me with nearly all problems that I encountered be they personal, organizational or scientific go out to Marijke Kuiper who was there when I started my PhD and contrary to expectations nearly witnessed the end of it from inside the Development Economics Group.

Initially, my plan was to finish the PhD as quickly as I could and disappear to bigger and more exciting places. I soon realized that speed and quality do not necessarily coincide and decided to slow down and enjoy the experience. I was able to go abroad a number of times, though. Less than a year after I left the UK, I found myself there again. I would like to thank the Sussex Centre for Migration Research at the University of Sussex for their support and in particular Richard Black. My thanks also extend to Barry Reilly of the economics department who tirelessly struggled through many versions of my research proposal and questionnaire.

Soon after my return from the UK, field data had to be collected in Burkina Faso. I mentioned to Ruerd that I did not mind going but did not like to go alone. Ruerd immediately found a solution in the form of an assistant Froukje Kruijssen. She and I spent two months in a number of villages in Burkina and I can only say that she has been a great assistant, staying cool and controlled in all circumstances and dealing with my Lariam induced nightmares in a resolute manner. Whilst in the field data were collected by my four great field assistants: Assietta, Salie, Cyrille and Lingham Jacques Parfait. Adama Belemvire was instrumental in organising the fieldwork for which I am thankful.

Having come near the end of my thesis, I found myself at a bit of a deadlock. Work was not progressing as I wanted it to and frustration took over. It was then that I decided to escape

the Dutch winter and spend three months at the University of California in Davis. I would like to thank Ed Taylor for his hospitality and scientific input resulting in a nice joint paper.

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CHAPTER 1

# introduction

## 1.1 problem statement

Migration plays an important role in development and as a strategy for poverty reduction. Experts from the FAO and World Bank estimate that exit from agriculture and migration could account for 30 per cent, respectively 50-60 per cent of poverty reduction in the agro-pastoral millet/sorghum system and pastoral/arid areas in West Africa (Dixon *et al.* 2001). A recent World Bank investigation identifies a positive significant relationship between international migration and poverty reduction at the country level (Adams and Page, 2003).

The African continent has a long history of migratory movement and labour is still particularly mobile in this part of the world. Migratory movements in West Africa have since long taken place in response to drought and low agricultural productivity, but have become institutionally induced during colonial times when labour was needed in mines and on plantations. Intercontinental migration, in particular to Western Europe, has become more important over the last decades for African migrants (Adepoju, 1977; Arthur, 1991; Findley, 1997; Yusuf, 2003).

When analysing the determinants and effects of migration, a distinction between different migratory movements is essential. Following Adam's work on Pakistan (1998), instead of a general concept of migration, two different forms of migration are distinguished in the present study. One form concerns rural household members who migrate to a destination outside the African continent (intercontinental migration). A second form concerns rural households who migrate within the African continent (continental migration).

Migration can be viewed as a livelihood diversification strategy, as remittances resulting from migration form a source of income that is uncorrelated with household income from agriculture. Motives for income diversification by rural households in developing

countries, which implies allocation of assets across various income-generating activities, can be categorised in push and pull factors. According to the "push factor perspective" diversification is driven by the limited risk-bearing ability of farm households in a context of incomplete or weak financial systems forcing households to select a portfolio of activities to reduce income risk. Households are also "pushed" into diversification in response to diminishing factor returns due to, for example, population pressure and land degradation (Barrett *et al.*, 2001a). From the "pull factor perspective" attractive, emerging opportunities for income generation represent a "profit pull" for farm households suitably placed to take advantage of such engines of growth (Barrett *et al.*, 2001a).

Reardon *et al*. (1992) investigated the determinants of income diversification amongst farm households in Burkina Faso. They emphasise that credit and insurance markets in Burkina Faso are severely underdeveloped and that the possibility of inter-household transfers ('social safety net') is not sufficient to compensate for harvest shortfalls. In terms of push factors, they find that income diversification is a plausible response to agricultural risk in the face of missing or imperfect markets for credit and insurance, and an ineffective social safety net. Pull factors, however, can also explain diversification, and arise if households diversify in order to take advantage of strategic complementarities between activities (Barrett *et al.*, 2001a).

Diversification often involves entry costs, which could prevent the poorest households from making use of this coping strategy. Reardon *et al*. (1992) found that the income of relatively poor households in Burkina Faso has a smaller component of non-farm income compared to richer households. Entry costs may also inhibit migration. Intercontinental migration is a constrained choice in the sense that it is characterised by high entry cost, particularly in the form of transport. Continental migration is much less constrained as transport costs can be kept to a minimum. The existence of an entry barrier to engagement in intercontinental migration suggests that not all households are able to engage in this form of migration. At the basis of heterogeneity in migration thus lies heterogeneity in households.

The need for diversification may be linked to missing and imperfect markets. At the same time the consequences of a strategy of diversification need to be viewed in this context. Savadogo *et al.* (1998) have investigated the relationship between non-farm income and adoption of animal traction in Burkina Faso. Non-farm income in their analysis refers to the

income from non-cropping sources including migration. Their results suggest that non-farm income is an essential source of liquidity for investment in animal traction and is used as a substitute for formal and informal credit, which is generally unavailable for the purchase of animal traction equipment. Because animal traction farms are thought to be more productive compared to manually operated farms, non-farm income can be linked to increased productivity and the ability to intensify production.

Migration as a diversification strategy has two main effects: the lost-labour and the remittance effect. An imperfect market for labour implies that the lost-labour effect may impact on activity choice and activity income of households. A missing market for credit and insurance implies that the remittance effect is also likely to influence activity choice and activity income. The New Economics of Labour Migration (NELM) theory pioneered by Stark (1991) formalises this theory and suggests that the impact of migration on other activities in a context of missing or imperfect markets are unlikely to be zero. Tests that have appeared in the literature confirm the hypothesis of the NELM theory (Lucas, 1987; Taylor *et al.*, 2003).

In the present study determinants and consequences of migratory movement in four villages situated on the Central Plateau of Burkina Faso are investigated. Importantly, a distinction is made between continental and intercontinental migration in investigating both the causes and the consequences of migration. An extended farm household model that includes a migration component forms the basis of the analysis. Utility maximisation of households subject to a number of constraints reveals the conditions that influence migratory movement. Taking the stock of migrants as given, the impact of migration on activity choice and income is analysed using an amended version of the same farm household model. The main activity of rural households is staple cropping and this activity is analysed in more detail. In particular, consequences of migration for input use and conservation measures in staple cropping are unravelled. In addition to the production side, the consumption side of the farm household model is analysed. Differences in consumption behaviour of non-migrant, continental and intercontinental migrant households are uncovered. Finally, a simulation model is developed to enable policy recommendations concerning the consequences of migration to be made.

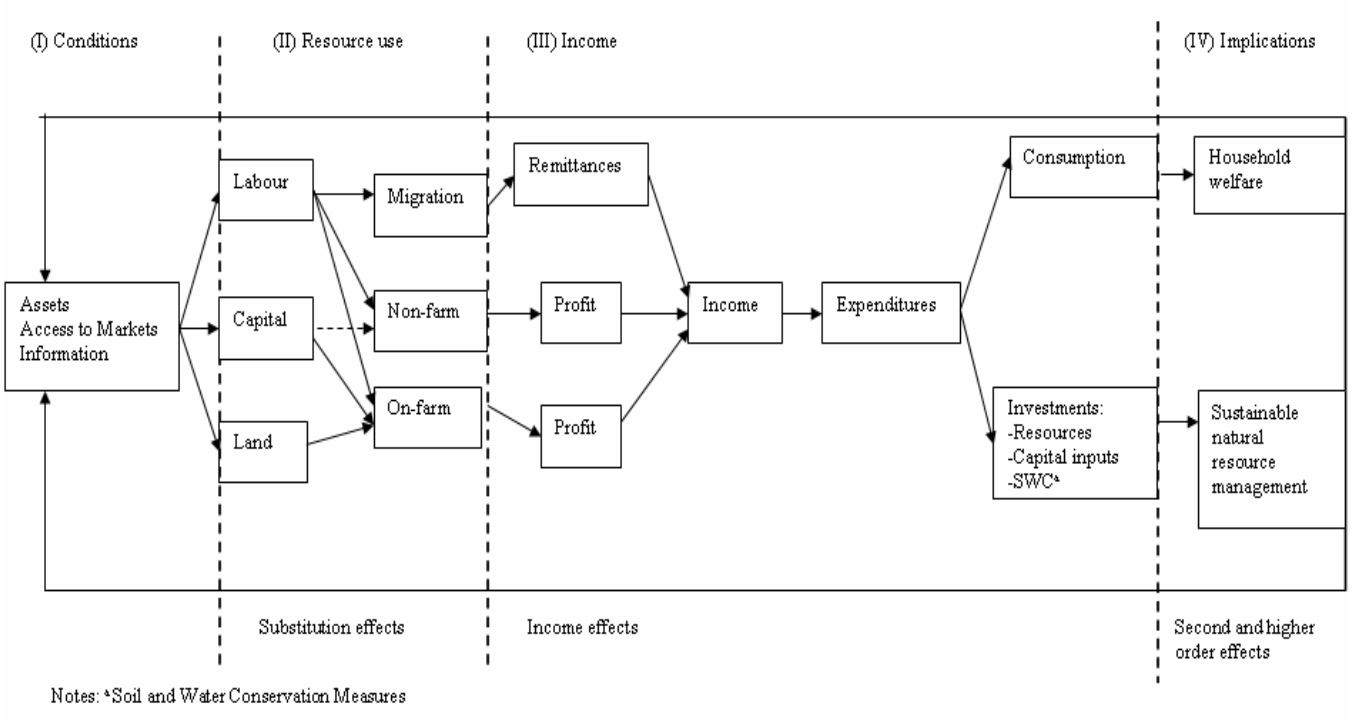
## 1.2 analytical framework

The framework in which farm household decision making concerning income generation and consumption takes place is given below. Figure 1.1 represents the whole-household economy approach to migration as one of the income-generating activities. This approach allows for the linking of determinants of migration with its consequences, which can be traced through the productive as well as the consumptive spheres of the household economy. Section (I) refers to the conditions under which resources are used, which are linked to household assets, access to markets and information. Constraints limiting resource allocation to activities need to be viewed taking into account these conditions. Households have access to resources and section (II) depicts how these resources can be used. The household can use its available labour in migration, non-farm activities and in agriculture (on-farm). Capital and land are used in on-farm activities: cropping and livestock keeping. Capital[1] refers to equipment used in agriculture, such as for traction, and to livestock. Resource use in the different activities generates income in the form of remittances and profit, depicted in section (III). Household expenditures consist of consumption and investment[2]. Households are limited in their spending by a budget constraint as total spending cannot exceed income. The implications of household decision-making concerning expenditures are shown in section (IV).

[1] Although it is possible for capital to be used in other activities, in this study non-farm activities are generally capital-extensive and labour intensive

[2] Savings are not included in this static model as there is no rationale for households to forego current consumption when there is no future period in which savings can be used.

*Figure 1.1 Farm household-decision-making*



Migration clearly affects all the sections of the model. In section (II) migration, in the absence of a labour market, may affect labour allocation of the household to non-farm and agricultural activities. Remittances resulting from migration affect expenditure patterns. In the absence of a credit or insurance market, they may lead to investment in resources, inputs or conservation measures. Remittances may also enable the household to increase investment in education. Expenditure decisions of the household, influenced by migration, may have an impact on household welfare and natural resource management. These may in turn influence the conditions under which resources are allocated.

## 1.3 research questions

This study deals with four major questions. These four questions relate to the four parts of the framework that describes the whole-household economy, combining determinants with consequences of migration on productive as well as consumptive behaviour of the household.

### *1.3.1 motives for migration*

Various explanations exist as to why migration takes place in less-developed countries. The traditional focus has been on rural-urban labour migration and explanations offered were mainly based on individual calculations regarding wage differentials (Todaro, 1976). Stark (1991), however has extended the analysis of the determinants of migration by emphasising, amongst others, that migration is not the result of individual decision-making but of a complex set of negotiations within the household. Stark holds that migration takes place in response to other factors than wage differentials. Variables such as income uncertainty should be considered. He also emphasises the relevance of missing or imperfect markets in less developed countries, such as those for credit and insurance in explaining much migratory movements. Rural risk is considered to be an important factor in explaining migration due to agricultural activities in less developed countries being fraught with uncertainties caused amongst others, by variable rainfall, fluctuating prices on the world market, and pests and diseases. One way to reduce risk is to place a household member in a labour market that is not related to the agricultural activities of the

household, assuming that the household member will remit part of his income to the remaining household members.

Explanations for migration have generally not distinguished different migratory movements. However, in the context of this thesis taking into consideration heterogeneity in migration is essential. The hypothesis to be tested is that continental and intercontinental migration should be viewed as two different strategic decisions, for survival and accumulation, respectively. Following Stark's theory, the determinants of continental and intercontinental will be sought primarily at the household level. In terms of Figure 1.1, labour allocation to migration stems from conditions for resource use in section (I).

### *1.3.2 migration and income diversification*

Rural households in Burkina Faso tend to diversify their livelihoods. Migration is one diversification strategy, but households also engage in livestock keeping and non-farm activities in addition to cropping activities. In a setting characterised by imperfect or missing markets engagement in migration may influence engagement and income earnings in other productive activities. According to the New Economics of Labour Migration (NELM) theory pioneered by Stark (1991), migration resulting in remittances could enable households to overcome a credit or insurance constraint by providing a source of liquidity. However, when there is a missing market for labour, households are not able to replace the labour lost to migration by hired labour, and this may impact negatively on engagement in and income generated through other activities.

The lost-labour and remittance effects are likely to impact differently on the various household activities. If engagement in a particular activity is constrained through entry costs in terms of a fixed initial investment, for example, remittances may enable a household to opt for engagement in this activity. If an activity is particularly labour-intensive, however, the lost-labour effect may lead to abandonment of this activity.

The discussion above calls for an investigation into the impact of migration on household activity choice and income in the context of missing or imperfect markets. Again, when analysing the impact of migration on activity choice and income, the distinction between continental and intercontinental migration is crucial. Intercontinental migration is much more

lucrative in terms of remittances and the remittance effect may therefore be particularly strong. With reference to Figure 1.1, sections (II) and (III) are relevant as they constitute substitution and income effects of migration.

### *1.3.3 migration, cropping practices and resource management*

The NELM theory can be applied to cropping activities of the household. On the one hand, migration implies the removal of household labour that can hardly be substituted by hired labour. The lost-labour effect implies a reduction in the capacity of farm households to respond to labour demands, possibly resulting in a decline in the cultivated area and agricultural production. Labour shortages due to migration could lead to insufficient attention being paid to cropping (e.g. less application of inputs, abandoning conservation measures), leading to environmental degradation and reduced output.

With regard to remittances often resulting from migration, a distinction again needs to be made between those from continental and intercontinental migrants. Remittances could enable households to overcome labour shortfalls through investment in capital inputs for agriculture in the absence of a labour market. Remittances could also influence crop choice and enable households to focus more on commercial crops.

The consequences of migration for staple cropping are difficult to predict *ex ante*. If staple cropping offers the farm household the potential for increases in output, it is likely that households are willing to make in-depth investments in cropping. It is also possible that households, whilst continuing engagement in staple cropping, direct their resources towards more lucrative non-staple cropping activities. Again, referring to Figure 1.1, sections (II) and (III) describe substitution and income effects of migration. Implications of migration for sustainable natural resource management are also relevant so that section (IV) is included in the analysis.

*1.3.4 migration and household welfare*

In the context of perfect markets, remittances, which constitute part of farm household income, increase the utility of the farm household by loosening the budget constraint. When markets are perfect and relative prices remain unchanged, this would be the only effect of migration on farm household income (Taylor, 1992). However, recent theoretical and empirical evidence suggests that net remittances may not represent the entire contribution of migration to incomes of rural households (Stark, 1982).

The implications of the NELM theory are that, in the absence of perfect markets, other sources of household income will be influenced by migration. The lost-labour effect is likely to impact negatively on income derived from labour-intensive activities, whereas the remittance effect may lead to an increase in income from more capital-intensive activities. The missing market for labour necessitates the derivation of a household specific price for labour (shadow wage). The shadow wage, which is equal to the marginal value product of labour in staple cropping, is thus not independent of the household migration status.

Clearly, in this more complex context, migration and (related) remittances enter into the farm household economy in a number of ways. Household income (and expenditures) is not only influenced by remittances but also by changes in income from other activities, changes in the shadow wage, and changes in the resident household size. The analysis is further complicated because two different forms of migration need to be considered. Differences in the level of remittances between the two groups are likely to lead to different consumption patterns and diverging states of household welfare. In Figure 1.1 income effects of migration can be found in section (III). A further step is made through simulation of the effects, generating results in particular for household consumption and welfare (see section (IV)).

## 1.4 outline of the study

The analysis of the causes and consequences of migration requires a thorough investigation of the survey households and villages. In Chapter 2 the context in which the research takes place is described. Four study villages are introduced and a description of the data and the survey

households is given. The village environment embedding the survey households is also described.

In Chapter 3, motives for migration are investigated. An extended version of the farm household model, which explicitly incorporates migration, is used. The farm household model allows for the lost-labour and remittance effects as well as the reduced- consumption effect of migration. The model reveals how migratory movement is related to household characteristics and impacts on household activities and consumption. In the model a distinction is made between continental and intercontinental migration. The focus is on household characteristics that can explain both migratory movements. Estimation results confirm the hypotheses that intercontinental migration is engaged in by households with access to substantial wealth, whereas continental migration stems from a lack of wealth.

The focus of Chapter 4 is the investigation of the influence of migration on activity choice and activity income of households. An amended version of the farm household model, presented in Chapter 3, is used to analyse household engagement in staple cropping and other activities: cash cropping, livestock keeping and non-farm activities. Selectivity occurs because not all households engage in the other activities. Engagement may be restricted due to the existence of entry constraints. Applying the NELM theory, entry constraints are modelled as a function of migration. Separating the activities in staple and non-staple cropping allows for the introduction of such entry constraints. Household utility maximisation is used as the basis for household decision-making concerning labour allocation to different activities. Given engagement, income derived from the different activities is subsequently analysed and the role of migration highlighted. The results demonstrate that both the lost-labour and the remittance effects are operational in activity choice and activity income of households.

In Chapter 5 the implications of migration for cropping activities are discussed. Although agro-ecological conditions between the two locations appear to be similar, the sample is separated on the basis of location to account for differences in technology. Households in the two locations are subdivided into three groups: households without, with continental and with intercontinental migrants. An overview is given of fixed and variable input use and soil and water conservation (SWC) measures for the three above-mentioned groups. A separate production frontier is estimated for each of the two locations. Following the estimation of the

production frontiers, technical inefficiency and marginal products of labour are calculated for the three groups of households. The findings of the chapter lead to the conclusion that migration does not lead households to abandon staple cropping activities and that a move away from traditional to more modern cropping practices does not occur.

In Chapter 6, the consumption side of the farm household model is analysed. Income derived from different activities, a valuation of household time (using the shadow wage), and remittances are included to define shadow full income. Shadow full income constrains household consumption behaviour. Demand functions are estimated for the three groups of households that maximise utility on the basis of a Stone-Geary utility function. The results from the estimation of the demand functions move the analysis of household behaviour from the partial to the comprehensive level. A comprehensive analysis enables the tracing of the implications of migration in terms of loss of labour and remittances through all the facets of the farm household.

A 10 percent increase in migration is simulated and implications for activity income, consumption and household welfare are described. As the shadow wage is not independent of household behaviour, second-order effects need to be taken into account, which lead to the incorporation of the change in the shadow wage in full income. Results confirm the hypothesis that continental migration, although welfare-improving, merely increases full income through a reduction in household size. Intercontinental migration has a strong impact on household welfare as the remittance effect greatly exceeds eroding profits in other activities.

## 1.5 relevance of the study

Migration is considered, by amongst others the World Bank, to play an important role in development and as a strategy for poverty reduction (Adams and Page, 2005). Official remittances from international migration are said to represent the second most important source of external finance in developing countries. These remittances are about twice as large as the level of official aid-related inflows to developing countries (Adams and Page, 2005). Considering the magnitude of remittances, Burkina Faso as one of the poorest countries in the world could clearly benefit from migration (and related remittances).

The interactions between migration, remittances and development have been the topic of a controversial debate occupying researchers and policy makers for a number of years. Traditional models of migration have sought determinants of migration in push and pull factors, whilst ignoring the impact of remittances on the sending area. Other models focusing on the effects of remittances on the sending area do not take determinants of migration into account.

When a more integrated approach is taken where both migration and remittances are considered, consequences for development are usually thought to be one of two extremes. On the one extreme there is the optimistic perspective associated with NELM. According to NELM, migration and remittances as part of a household strategy to raise income, investment funds and insurance protection, can promote development by loosening production and investment constraints. A more pessimistic approach to consequences for development emphasises the "Dutch disease" effect. Migration implies a loss of labour and (human) capital (brain drain) for the sending area, with negative implications for local production. Due to the self-perpetuating effect of migration (Massey *et al.*, 1993) the sending area could eventually become specialised in migration.

This study contributes to the migration-remittances-development debate by taking a number of commonly ignored issues into account. First, determinants of migration are likely to shape the effects of migration and remittances (Taylor, 1999). Not all migration in Burkina Faso involves leaving the African continent, although this is the most lucrative form of migration. An investigation in conditions underlying continental and intercontinental migration reveals to whom benefits of migration accrue. In this study, a whole-household economy approach to migration combines determinants with consequences of migration.

Second, the pessimistic view of the consequences of migration for development is often tied to the finding that remittances are not used for productive investment (Connell *et al.*, 1976; David, 1995; De Haan, 1999). According to the NELM theory other consequences of migration are likely to occur in an imperfect-market situation. The NELM theory has been tested extensively for China (Taylor *et al.*, 2003) and to a limited extent for Africa, but not related to other than agricultural activities (Lucas, 1987). A distinction between different forms of migration has not been made, whereas clearly effects of continental and intercontinental migration on activity choice and income are likely to be different. Testing the NELM theory is

particularly relevant in the context of rural Africa, which is fraught by missing and/or imperfect markets. This study provides a test of the NELM theory by determining the effects of both continental and intercontinental migration on the entire portfolio of household activities.

Third, remittance-use studies tend to focus on how migration remittances are spent, whereas household expenditures are actually shaped by consumption preferences and constrained by household budgets. A comprehensive approach is needed to investigate how migration and remittances affect household welfare. This study by using a whole-household economy approach incorporates the production as well as consumption side of the farm household. In a non-recursive household model decisions regarding production and consumption are taken simultaneously. Remittances influence expenditures by loosening the budget constraint. This leads to changes in household demand for goods and home-time, which, in the context of a missing market for labour, affect the production side of the farm household model. Incorporating migration and remittances in a farm household model enables capturing both direct and indirect income effects of migration; effects that influence production, income, consumption and household welfare.

## 1.6 limitations

Without detracting from the contribution of this study to the migration literature, a number of limitations of its approach need to be emphasised. A first limitation arises from the availability of only cross-section data. Ideally, migration effects would be analysed in a dynamic context to capture long-term impacts of migration. Second, household behaviour is analysed in isolation and interactions between households in a village are not taken into account. Migration and remittances are likely to reshape migrant sending economies through indirect channels (Taylor, 1999). Migration's most important impacts may thus not be found in the sending household, but in an economy-wide context (Kuiper, 2005). Third, an investigation of more than 200 households in four villages does not enable country-wide conclusions to be drawn. Findings are specific for the Central Plateau of Burkina Faso, which is distinct due to its high population density, land degradation and a history of out-migration. Finally, it is important to realise that the observed migration to Italy is a localised phenomenon and, although lucrative, only takes place from one particular region of Burkina Faso.

# CHAPTER 2

## study villages and methodology

### 2.1 research area

Burkina Faso is a poor, landlocked country situated in the West African Semi-Arid Tropics (WASAT). With a population of around 12.1 million people (World Bank, 2005), Burkina Faso is one of the most densely populated countries of the West African Sahel (World Bank, 2003). For the majority of the population, agriculture forms the main source of subsistence (World Bank, 2005). However, conditions for agriculture are far from favourable in most of Burkina Faso. It has a limited resource base and an unfavourable climate with unreliable rainfall (World Bank, 2003). In addition, land degradation is a predominant feature. Performance on social indicators (life expectancy, education) is poor even by African standards (World Bank, 2005).

The growth performance of Burkina Faso shows year-to-year fluctuations mainly due to the prominence of rain-fed agriculture (IFAD, 2001). To achieve development emphasis has long been put on the agricultural sector as, due to its importance in terms of employment and export revenue, economic growth and improvement in the standard of living of the population are thought to be difficult to achieve without it (Asenso-Okyere *et al.*, 1997). Severe droughts (1972-73 and 1983-84) have affected agricultural production in Burkina Faso during the last decades and actual crop yields are still low compared to potential yields (IFAD, 2001). Poor households commonly have diverse sources of livelihood to deal with income risk and to achieve food security in adverse conditions. Recently, migration has been recognised as a development pathway for Less Favoured Areas (LFA), which constitute a large part of Burkina Faso (Ruben and Pender, 2004).

The analysis of the determinants and consequences of migration for rural households in Burkina Faso has been carried out in four villages in the country's central region. Two villages,

Boussouma and Korsimoro, are situated in the province of Sanmatenga in the northern part of the Central Plateau (Figure 2.1).

*Figure 2.1 Location of the study villages*


They were selected on the basis of their accessibility as both are situated on the main road from Ouagadougou to the north. The other two villages, Niaogho and Béguédo, are situated in the southern part of the Central Plateau in the Boulgou province (Figure 2.1). These two villages were selected for two reasons. First, their location is relatively isolated as they can only be reached by a three-hour journey on a dirt road. Second, from both villages intercontinental migration takes place to Italy, whereas in Boussouma and Korsimoro migrant destinations are within the African continent.

The Central Plateau represents a part of Burkinabé territory where the intensity of soil occupation is much higher compared to other regions. The Central Plateau has a population density of 54 inhabitants per $km^2$ whereas population density is 30 inhabitants per $km^2$ for the country as a whole (Breusers, 1998). Occupation is particularly intense in, amongst others, the regions where the survey villages are located (Djiguemdé, 1988). High population density is said to have led to a saturation of space in the Central Plateau. In addition, lands on the Central Plateau are generally overexploited and degraded (Reyna, 1987; Breusers, 1998; Brasselle *et al.*, 2002). The north-central region of the Central Plateau, which comprises the provinces of Sanmatenga, Bam and Namentenga, is characterised by average yearly rainfall ranging from 600-700 mm, which is variable and unevenly distributed in space and time (Kessler and Geerling, 1994). The landscape is made up of hills and slopes broken up by bottomlands. Vegetation mainly consists of bush and tree savannah formations with some gallery forests. Soil types are sandy and clay, which are fairly infertile due to their chemical composition and low organic matter content (Breusers 1998). The village of Korsimoro is situated close to a lake and a large irrigated zone has been created.

Boulgou has average annual rainfall of between 700 and 800 mm and is relatively favourable agro-climatically. Vegetation in this zone is bush savannah with interspersed trees. The province is predominantly made up of two soils: a sandy to silty soil and a deeper brown soil with silty to clay structure. These soils are generally poor in organic matter, which limits the agricultural potential of the province (Breusers, 1998; INSD, 1999). Boulgou is dominated by a number of important rivers such as the Red and White Volta and the Nouhao. Several dams have been constructed, one of which is in the White Volta River close to the Bagré River, which has created a large reservoir that could sustain vast irrigated zones. However, until now an irrigated zone has not been created in either Béguédo or Niaogho. Although households do engage in the cultivation of irrigated crops, this cultivation takes place next to the river and irrigation is done manually.

Activities on the Central Plateau are mainly subsistence cropping, resulting in the production of primarily sorghum and millet often intercropped with cowpea and to a lesser extent maize. In addition, groundnuts are sown on small plots of land with sandy soils (Breusers 1998; INSD 1999). In both provinces crop production is often combined with livestock keeping,

which has as its advantages the supply of manure, residue grazing and animal traction (INSD 1999). The main characteristics of the villages are given in Table 2.1.

The major objective of subsistence agriculture in the Central Plateau is to ensure food security. However, cereal deficits are a frequent and structural phenomenon. The current situation is thought to be particularly serious due to environmental degradation, which could undermine the population's resource base (Breusers 1998). Due to soils being chemically poor their vulnerability to erosion is high. Degradation is thought to be largely due to the persistence of traditional land use practices, which exist in both Sanmatenga and Boulgou. In both provinces agriculture is characterised by little investment in fertilisers, little use of animal traction, and limited application of manure and animal husbandry. As a result the reduced availability of land has led to overgrazing and compactation (Breusers 1998).

*Table 2.1 Characteristics of the study villages*

| | ***Niaogho*** | ***Béguédo*** | ***Boussouma*** | ***Korsimoro*** |
|---|---|---|---|---|
| ***Province*** | Boulgou | | Sanmatenga | |
| ***Rainfall*** | 700-800 | | 600-700 | |
| ***Soil type*** | Sandy-silty, Silty-clay, Poor in organic matter | | Sandy-clay Fairly infertile Poor in organic matter | |
| ***Population (1995)*** | 15,066 | 13,847 | 8,708 | 12,015 |
| ***Distance from the capital (km)*** | 98.4 | 100 | 72.3 | 66.5 |
| ***Major crops*** | Millet, sorghum, groundnuts, onions, maize | | Sorghum, millet, groundnuts | |

2.2 data

Data for the year 2002 were collected during February-March of 2003. Cross-section data were recorded by four local enumerators for a random sample of about 60 households drawn in each study village. Households were selected as randomly as possible in the absence of any official documentation. Generally, this involved gaining an impression of how the village was set up (normally a central part surrounded by a number of peripheral areas). Subsequently, each enumerator was sent in a different direction and selected households at an equal distance

from each other, ensuring that all peripheral areas were covered. Although an attempt was made to interview several household members, in practice the head of the household answered most of the questions. An overview of the parameters of the survey is given in Box 2.1.

*Box 2.1 Parameters of the survey*

| | | |
|---|---|---|
| ***1. Household inventory (all members)*** | Name<br>Relation to head<br>Age | Sex<br>Education level<br>Primary and secondary activity (including migration) |
| ***2. Migration (to migrant if returned, else head)*** | Information source<br>Reason for migrating<br>Period of absence<br>Destination | Transfer given by household<br>Remittances received<br>Reason for remitting<br>Reason for returning (if present) |
| ***3. Productive assets*** | Sort of equipment owned<br>Year of purchase | Purchase price<br>Years of usage remaining |
| ***4. Cropping practices (each plot)*** | Plot size<br>Period of usage<br>Main crop/other crops<br>Irrigation status<br>Type/quantity/price of fertiliser applied<br>Use of insecticide | Labour input (household male, female, child, non-household)<br>Type/duration/cost equipment use<br>Quantity harvested<br>Quantity sold/price<br>SWC measures (grass strips/stone lines) |
| ***5. Livestock keeping*** | Type of animals<br>Stock/flow (incl. value of purchases and sales) | Costs (feed, veterinary)<br>Labour input<br>Marketed produce |
| ***6. Non-farm (member involved)*** | Activity type<br>Labour input | Other input costs<br>Income earned |
| ***7. Credit and Loans*** | Type | Amount |
| ***8. Consumption*** | Consumption of (quantity/cost) | Own food<br>Purchased food<br>Non food<br>Durables and other expenses |

The household survey contains information on household composition; age, sex, education level and activities of all household members were recorded. Farm households in Burkina Faso can generally be described as extended, as they often comprise not only the household head and his wives, but also their grown up sons with their wives and children. Family members were

included in the extended household definition on the basis of living in the same compound and normally having meals together. Furthermore migrated members were included if they were taken into account by the head of the household in the household inventory. Migration status of household members was recorded including duration of absence, destination, and reasons for migrating and remittances received by the household.

Households were found to cultivate a number of plots, and crop cultivation data collected are quite detailed, covering crop type, input and output data at the plot level. Input use was recorded for three stages of the agricultural production process: preparation and planting, crop maintenance and harvesting. Equipment use, owned or rented, was recorded as well as the type of fertiliser used. Information was also gathered on the type of productive equipment owned by the household, the year of purchase, the purchase price as well as an estimation of the number of years during which the equipment can be used. This information can be used to calculate the current value of households' productive assets. Information on soil and water conservation (SWC) measures, mainly stone lines and grass strips, was also included.

The section on livestock contains data concerning the stock and flow of the different animals, mainly cattle and small ruminants. Data were also gathered on non-farm activities including the time spent in these activities and net income. Extensive research into the role of farm supplementary activities of rural households in Burkina Faso has been carried out by Brons (2005).

An attempt was made to collect information on credits and loans. Only a couple of households were found to have to have taken out a loan at a bank in a nearby city. However, the informal exchange of funds between households was not recorded.

Finally, consumption data were collected of own products as well as purchased goods. In order to facilitate the recalling of information, households were asked to give information on their regular consumption patterns. Spending on non-food items such as transport, health, education and clothes was also included.

Due to time limitations only cross-section data were collected. When trying to explain an intertemporal phenomenon such as migration, using cross-section data is likely to lead to endogeneity problems. The problem of possible endogeneity has been recognised and an attempt has been made to find variables that have remained unchanged over time or where possible

instruments have been used. Although households were selected as randomly as possible, in the absence of official lists on which sampling could be based a second-best sampling method was used. It is possible that sample selection bias has arisen, however nothing can be said about the strength or direction of this bias.

## 2.3 survey households

In the four study villages a random sample of 223 households has been used as the basis for the analysis. An overview of household characteristics in each of the four villages is given in Table 2.2.

*Table 2.2 Household characteristics of the four villages (2002)*

| | ***Niaogho (N=60)*** | ***Béguédo (N=43)*** | ***Boussouma (N=60)*** | ***Korsimoro (N=60)*** |
|---|---|---|---|---|
| ***Household size*** | 11.73 (6.81)[a] | 12.60 (7.05) | 10.50 (5.06) | 10.75 (6.63) |
| ***Average age*** | 25.34 (6.23) | 23.19 (4.92) | 24.59 (5.24) | 25.26 (5.84) |
| ***Males*** *(share of total)* | 0.48 (0.17) | 0.51 (0.14) | 0.50 (0.13) | 0.50 (0.17) |
| ***Active members*** *(share of total)* | 0.58 (0.16) | 0.59 (0.21) | 0.61 (0.17) | 0.64 (0.19) |
| ***Continental migrants*** *(share of active members)* | 0.09 (0.13) | 0.04 (0.12) | 0.14 (0.18) | 0.14 (0.21) |
| ***Intercontinental migrants*** *(share of active members)* | 0.06 (0.13) | 0.05 (0.09) | ~ | 0.003 (0.02) |
| ***Cropping activities*** *(share of active members)* | 0.88 (0.14) | 0.93 (0.10) | 0.87 (0.17) | 0.85 (0.17) |

Notes: migrants not included as household members
[a] standard deviation in parentheses

As mentioned, households are often extended and the average resident household contains 12 members of whom between 58 and 64 per cent is active. Correcting for migration, households in the four villages contain equal numbers of men and women. Cropping is the main primary activity for the majority of active household members. All households were found to engage in the cultivation of staple crops, mainly millet and sorghum. A number of households engage in horticulture on waterside (Niaogho and Béguédo) or irrigated plots (Boussouma and Korsimoro). Continental migration is more prominent in Boussouma and Korsimoro as 14 per

cent of active household members have migrated continentally. Intercontinental migration only occurs in Niaogho and Béguédo, although household members from one household in Korsimoro were found to have migrated intercontinentally.

More information on intercontinental migration from Niaogho and Béguédo is given in Box 2.2.

*Box 2.2 Burkinabé migrants in Italy*

***In order to analyse intercontinental migration from both the side of the household and of the migrant, 20 migrants, whose families were included in the household survey, were located in Italy and surveyed. The survey was mainly concerned with the contractual arrangement underlying migration and remittance behaviour. Clearly, a sample size of 20 does not enable a statistical analysis to be carried out. A couple of general comments can be made, however.***

- The migration movement to Italy started in the early 1980's when a Burkinabé from Béguédo working in Cote d'Ivoire was invited by his employer, who was Italian, to work for him as a driver in Italy. A similar story holds for Niaogho. The migration movement gained momentum through a network of mainly information and sometimes family-based financial support from migrants in Italy to young males in the two villages in Burkina Faso. Initially most migrants found themselves around Naples where they lived in a "ghetto" with other immigrants and worked in horticulture. Some obtained a VISA and moved to northern Italy to work in heavy industry.

- All migrants send money back to the household in Burkina Faso. Some a fixed amount, others depending on household requests.

- Most migrants received financial support from the household in financing their move, generally through livestock sales. The remittances of migrants that received such financial assistance are about double that of migrants who did not.

- Most migrants intended to return to their village or origin in the long term, although this did not appear to influence the level of remittances.

- The importance of networks in migration is illustrated by the existence of two associations ARBI and ARNI respectively for migrants from Béguédo and those from Niaogho. In addition to organising monthly meetings, these two organisations collect money from their members, which is invested in the two villages in Burkina Faso amongst others in electricity and cellular telephone networks (Béguédo) and ambulances (Niaogho)

A household member was classified as a migrant if he or she had been absent for more than one month over the past 12 months. The majority of migrants (more than 90 per cent) in all four villages were found to stay away permanently (absence for more than one year). Permanent migration involves a one-time change of residence, which means that the migrated member does

not return to the village regularly to engage in the economic and social life, although often migratory household members do return to visit the household. With regard to the destination of migrants, in Niaogho and Béguédo Europe (primarily Italy) is an important destination for migrants, whereas most migrants from Boussouma and Korsimoro stay within Africa and had left particularly for the Côte d'Ivoire. Both Boussouma and Korsimoro have a higher percentage of migrants who had left towards the urban centres, particularly the capital Ouagadougou. An overview of migrant destination is given in Table 2.3

*Table 2.3 Migrant destination in four villages (% of migrants) (2002)*

| | ***Rural national*** | ***Urban national*** | ***International Africa*** | ***International Europe*** | ***International Other*** |
|---|---|---|---|---|---|
| ***Niaogho*** | 2.4 | 22.9 | 42.2 | 31.3 | 1.2 |
| ***Béguédo*** | 4.9 | 14.6 | 22.0 | 58.5 | ~ |
| ***Boussouma*** | 12.1 | 33.0 | 54.9 | ~ | ~ |
| ***Korsimoro*** | 4.7 | 40.7 | 53.7 | ~ | 0.9 |

In addition to cropping and migration, households engage in livestock keeping and non-farm activities to generate income. Many households keep cattle and small ruminants. Income derived from livestock is mainly in the form of embodied production (increase in weight or herd size) and the sale of livestock produce is rare. Livestock should be considered as a store of wealth serving as an important insurance mechanism as these assets can be sold in poor years (Reardon *et al.*, 1988). Non-farm activities tend to be self-employment activities and are generally labour-intensive. Local non-farm income is derived almost entirely from artisanal manufacturing of pots, potholders and cotton rugs and services such as food preparation or sorghum beer making. These findings tie in with Brons (2005) who finds for rural Burkina Faso that prevailing supplementary activities are mainly linked to output of primary sector activities and have a limited growth potential.

The income composition of households in the study village is thus diverse. Income composition for households in the four villages is shown in Table 2.4. The table shows that there are no great differences in income per capita for households in Niaogho, Béguédo and Korsimoro. Income for households in Boussouma is lower compared to the other three villages.

In terms of income composition, agriculture forms the most important source of income. However, it is interesting to note that the share of income from agriculture is larger for households in Boussouma and Korsimoro. Non-farm income shares are similar but differences are found in the share of remittances in total income. Although there are some small differences between the shares of active household members involved in migration across villages (Table 2.2), the larger share of remittances from intercontinental migration can be attributed to the size of the transfers.

*Table 2.4 Per capita income composition (2002)*

| | ***Income*** (FCFA)[b] | ***Agriculture*** | ***Non-farm*** | ***Remittances*** intercontinental | ***Remittances*** continental |
|---|---|---|---|---|---|
| ***Niaogho*** | 56,316 (0.82) | 65 (0.48)[a] | 17 (1.41) | 11 (2.20) | 7 (2.43) |
| ***Béguédo*** | 56,312 (0.76) | 67 (0.42) | 19 (1.42) | 12 (1.92) | 2 (4.85) |
| ***Boussouma*** | 50,290 (0.66) | 77 (0.26) | 16 (1.13) | ~ | 7 (1.50) |
| ***Korsimoro*** | 57,996 (0.60) | 75 (0.25) | 20 (0.85) | ~ | 5 (1.83) |

Notes: migrants are not included as household members
[a] mean intra-household coefficient of variation for the level of income and shares in parentheses
[b] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)

The coefficients of variation give an indication of income variability and show that remittance income from both continental and intercontinental migration is highly variable across households. Variability in income from agriculture is comparatively low but non-farm and remittance income create differences between households.

## 2.4 village environment

Economic activities of the households in the study villages need to be viewed in a context of missing and imperfect markets. Three missing or imperfect markets were identified in the research villages: labour, land and credit or insurance. Households in the villages were found to hardly make use of hired labour on their farms[3]. Similar findings have been recorded by Mazzucato and Niemeijer (2000) who emphasise that working on someone else's field in order

[3] In cases were labour was hired this often involved the tractor driver that was hired with the tractor.

to earn revenue is looked upon negatively, and is considered to be a sign of inability to sustain one's household with own agricultural production. Households were found to resort to a form of exchange labour. So-called work parties are common, particularly in cash crop cultivation when labour requirements peak. Work parties, according to Mazzucato and Niemeijer (2000), can be seen as an occasion where "people are invited to work on a person's field in exchange for a meal and/or drinks". These parties often take place on a reciprocal basis with different households organising them in turn, and are beneficial to production, although they were found to fulfil a social purpose as well.

Land markets in rural Africa often barely function and are generally quite thin (Lanjouw et al., 2001). For Burkina Faso in general commercial land market transactions were found to be extremely rare (Ouedraogo et al., 1996). Udry (1999) using a four year panel study (ICRISAT) of households in three different agro-climatic zones of Burkina Faso finds evidence for a missing land market when testing for profit maximization in agriculture. In the study villages, where high population density has led to land scarcity, cultivation on the basis of hereditary possession was found to be most common (Kessler and Geerling, 1994).

The lack of commercial land market transactions implies that land cannot function as collateral for credit. Restricted options for collateral and collateral substitutes imply severe limitations in access to a formal credit market In addition to a lack of collateral, it has been shown that credit and insurance markets in low-income countries often suffer from moral hazard, information problems and covariance of crop output for households in the same region (Binswanger and Rosenzweig, 1986; Binswanger *et al.*, 1989; Reardon *et al.*, 1992; Fafchamps *et al.*, 1998).

An imperfect market environment has implications for household behaviour. Migration as an aspect of household behaviour can thus not be analysed in isolation. Conditions underlying migration as well as consequences of migration are tied in with the village environment and its markets in particular. Hence, household migration behaviour in a perfect market setting is likely to differ from behaviour in an imperfect setting.

CHAPTER 3

# motives for migration

## 3.1 introduction

Various theories that explain why people migrate have been postulated. According to Ravenstein (1889) household members migrate from areas with few opportunities to areas of high opportunity predominantly motivated by economic considerations. Lee (1966) has subdivided these economic considerations in push and pull factors. Todaro (1976) has highlighted the importance of the expected rather than the actual earnings differential as a pull-factor. Todaro bases his analysis on a rational individual who calculates the expected gain of migrating on the basis of the expected wage at the destination and the costs involved in migrating. Stark and Taylor (1991) have emphasised that migration is not necessarily an individual decision, but the result of a complex set of negotiations within the household. According to Stark, to explain migratory movement, attention needs to be paid to conditions at the area of origin, in particular to income uncertainty, missing or imperfect markets and risk.

These studies consider migration to be a homogeneous act, whereas this study postulates the distinction of two forms of migration: migration within the African continent and migration between continents, primarily to Europe. These two forms of migration may in fact have different explanations. Intercontinental migration involves high entry costs amongst others because of transport. It is therefore likely that households able to engage in intercontinental migration are comparatively wealthy and are able to respond to opportunities for wealth accumulation elsewhere. Explanations for continental migration are more diverse. Household may be comparatively poor and members may be pushed out of rural areas due to insufficient income, or they may perceive opportunities for income generation elsewhere.

In this chapter the conditions that underlie the two different forms of migration are investigated. Explanations will be sought at the area of origin, and in particular in household

characteristics. Following a discussion of household descriptives in section 3.2, a modified form of a farm household model is developed in section 3.3, which includes continental and intercontinental migration as a productive activity. The model also allows for a consumption effect of migration. In section 3.4 first-order conditions are derived on the basis of utility maximisation for labour allocation to different activities. The variables influencing the probability that continental or intercontinental migration takes place in a household are subsequently derived from the model and discussed in section 3.5. In section 3.6 a multinomial logit model is estimated and conditions underlying migration are identified. The final section 3.7 presents the main conclusions concerning conditions underlying migratory movement on the basis of the multinomial regression.

## 3.2 household descriptives

Two different forms of migration are distinguished on the basis of the destination of the migrant. Continental labour migrants are generally young men who leave to attempt to find work elsewhere. As mentioned in Chapter 2, the destination of many continental migrants has until recently been Côte d'Ivoire, but is now more geared towards areas of presumed higher opportunity within Burkina Faso, such as the capital Ouagadougou. Although not many new migrants leave for Côte d'Ivoire due to the unstable political situation and ethnic tensions, Table 2.3 illustrates that many households do still have migrants there.

Some continental migration also involves young boys from Muslim households being sent mainly to the capital to live and study the Koran with a marabou (spiritual leader). These boys have to beg to provide for their own food requirements. This type of migration does not result in remittances, but reduces the consumption pressure of the sending household.

Intercontinental migration is in nearly all cases embarked upon by young men who initially leave for southern Italy to engage in horticulture. These men tend to leave alone but may send for their wife and children to come over at a later stage. As this form of migration entails high entry costs, it seems not to be undertaken out of necessity but more out of choice. Pull factors as the search for higher income appear to be the main drivers underlying the decision to leave the African continent. This form of migration can be considered as an accumulation strategy.

Intercontinental migration only takes place in two out of the four survey villages, Niaogho and Béguédo. This illustrates the role of a network as an information provider and/or a source of reduction of entry costs through help of family and/or friends at the place of destination. Past absentees could reduce entry costs of migration by sharing information about jobs (De Brauw *et al.*, 2001). Furthermore, potential migrants may be able to rely on networks that have been set up by past absentees at the destination. These networks provide the migrant with, for example, credit and accommodation, thereby further reducing the cost associated with migration (Carrington *et al.*, 1996).

As can be seen in Table 3.1 in the surveyed villages the share of cropping falls across quintiles, and the share of non-cropping income increases. Similarly, Abdulai and CroleRees (2001) find for rural Mali that participation in non-cropping activities increases across income quartiles. Participation rates in continental migration are highest for households in the middle income groups whereas intercontinental migration takes place mainly in the highest income group. Clearly, the highest income households earn a higher share of income in remittances from intercontinental migration. These results correspond to the findings of Adams (1998) for rural Pakistan.

*Table 3.1 Income composition across income per capita quintiles (2002)*

| ***Quintile*** | ***Income*** (FCFA)[a] | ***Staple cropping*** | ***Cash cropping*** | ***Live-stock*** | ***Non-farm*** | ***Migration*** continental | ***Migration*** intercontinental |
|---|---|---|---|---|---|---|---|
| Lowest | 19,214 (5404)[b] | 70 (100)[c] | 11 (58) | 0 (35) | 12 (40) | 3 (44) | 4 (5) |
| Second | 32,494 (3285) | 61 (100) | 13 (70) | 3 (55) | 15 (55) | 4 (55) | 4 (9) |
| Third | 43,125 (3554) | 57 (100) | 10 (66) | 5 (64) | 18 (73) | 7 (59) | 3 (13) |
| Fourth | 58,761 (6916) | 50 (100) | 8 (66) | 6 (50) | 26 (75) | 5 (52) | 4 (11) |
| Highest | 106,043 (8515) | 46 (100) | 9 (77) | 9 (75) | 19 (73) | 6 (41) | 11 (30) |

Notes: migrants are not included as household members
[a] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)
[b] standard deviation in parentheses
[c] figures in parentheses are percentage of households in income quintile that participated in respective activity

When a household allocates its members across different activities, it takes into consideration the income it will receive from these activities. If it is assumed that a household sends out migrants in response to an expected income differential (Todaro, 1976), then the income it earns through engagement in different activities will influence migration. Table 3.2 depicts the income generated by different activities for households without migrants and households with continental or intercontinental migrants.

*Table 3.2 Income per capita from different activities by household migration status (2002)*

| | ***Non-migrant (N=79)*** | ***Continental (N=112)*** | ***Intercontinental (N=32)*** |
|---|---|---|---|
| Income (FCFA)[a] | 42,621 | 47,060 | 67,803 |
| Staple cropping | 24,420 (100)[b] | 26,219 (100) | 22,168 (100) |
| Cash cropping | 4,940 (66) | 4,604 (64) | 6,031 (88) |
| Livestock | 2,710 (37) | 2,327 (57) | 4,313 (97) |
| Non-farm activities | 10,551 (61) | 9,024 (72) | 7,779 (41) |
| Remittances | ~ | 4,886 | 27,512 |

Notes: migrants are not included as household members
[a] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)
[b] figures in parentheses are percentage of households in income quintile that participated in respective activity

Table 3.2 shows that households with intercontinental migrants generate more income from cash cropping, livestock keeping and, most importantly, remittances. Remittance income of households with intercontinental migrants is more than five times that of households with continental migrants. It is important to note that income from non-farm activities is lowest for households with intercontinental migrants. Clearly, households with intercontinental migrants generate the highest total income.

It can be hypothesised that continental migration is generally undertaken out of necessity as opposed to choice. Push factors such as lack of work and insufficient income are likely to figure importantly in the decision to migrate continentally. Continental migration can then be seen as a strategy for survival undertaken by comparatively poor households.

On the other hand, intercontinental migration seems not to be undertaken out of necessity but more by choice. Pull-factors such as the search for higher income could be said to

figure more importantly in the decision to leave the African continent. Because entry costs for intercontinental migration are high, this form of migration needs to be considered as a constrained choice. Households may be willing to engage in intercontinental instead of continental migration, but may not be able to do so. Intercontinental migration can be seen as an accumulation strategy undertaken by comparatively wealthy households.

In addition to comparisons between the three groups of households with regard to income, the three groups can also be distinguished on the basis of other characteristics, which could underlie migratory movement, depicted in Table 3.3.

*Table 3.3 Descriptive statistics for sample groups of households (2002)*

| ***Variables*** | ***Non-migrant (N=79)*** | ***Continental Migrant(s) (N=112)*** | ***Intercontinental Migrant(s) (N=32)*** |
|---|---|---|---|
| Number of migrants | ~ | 1.77 (1.27)[a] | 1.69 (1.09) |
| ***Household composition*** | | | |
| Number of adults sons | 2.29 (1.47) | 4.18 (2.05) | 5.41 (2.01) |
| Age head of household | 49.14 (12.40) | 54.62 (15.15) | 58.59 (10.64) |
| Number of past absentees | 0.27 (0.45) | 0.43 (0.50) | 0.37 (0.49) |
| ***Human capital*** | | | |
| Primary education (number of adults) | 0.59 (0.97) | 1.13 (1.71) | 1.69 (1.94) |
| Secondary education (number of adults) | 0.19 (0.75) | 0.49 (0.90) | 0.38 (0.66) |
| Years education head | 0.57 (1.78) | 0.47 (1.49) | 0.88 (3.37) |
| ***Physical capital*** | | | |
| Land (hectares) | 4.24 (3.06) | 4.38 (2.77) | 7.40 (6.12) |
| Irrigated land ($m^2$) | 161 (617) | 608 (1587) | 851 (2498) |

Notes:[a] standard deviation in parentheses

Because data are cross-section and migration is often permanent with the migration decision taken at some time in the past, the variables according to which the three household groups can be compared need to be stable over time. With regard to household composition it is important to realise that, primarily due to polygamy, household size is often not stable over time. In Burkina Faso, as in other parts of West Africa, the majority of the rural population lives in complex household units. Often, households are either fraternal and married brothers of the head

of the household live in the same compound and work the household fields, or paternal in which married sons work on their father's fields (Becker, 1990). Both household forms imply that sons tend to stay within the household whereas daughters move to the household of their husband. The number of adult sons can therefore serve as a proxy for household size at the time of migration.

Table 3.3 shows that households with migrants have more adult sons, indicating that they were larger, which in turn implies a higher availability of labour. The age of the head of the household is found to be higher for migrant households. The age of the household head gives an indication of the structure of the household. The older the household head, the larger the household tends to be and the more likely it is that there are young male adults in the household who are able to migrate. In addition, when a household head is older, family and kinship ties are often more extended and this could facilitate migratory movement. The past absentees variable refers to household members who were absent for a significantly long period in the past but have now returned to the household. Past absentees are likely to have established contacts at the destination area and could therefore facilitate migratory movement within the household. The number of past absentees is found to be higher for households with migrants.

In addition to household composition, human capital indicators have been included in the table. For education, the number of adults in the household with primary or secondary education may be taken to have remained constant over time. Migration could of course influence the education status of household members but remittances in this case are invested in household children and not adults. Households without migrants have fewer adult members with primary and secondary education compared to households in the other groups. Human capital in the form of education may facilitate migration as it could function as an information provider and increase the possibilities for migrants to secure a job elsewhere.

With regard to physical capital, the quantity of land available for cultivation is shown to be lowest for households without migrants and much higher for households with intercontinental migrants compared to households in the other groups. Land is considered as a determinant of the income generation ability of the household. The quantity of land is assumed to be fixed. In rural Africa land markets often barely function and are generally quite thin (Lanjouw *et al.*, 2001). For Burkina Faso, as discussed in Chapter 2, research has shown that

cultivation on the basis of hereditary possession is most common. In addition, commercial land market transactions were found to be extremely rare (Ouedraogo *et al.*, 1996). These findings, in combination with the previously mentioned saturation of space on the Central Plateau, make it acceptable to include the quantity of land as an exogenous variable. The discussion above also applies to waterside or irrigated land, availability of which is shown to be lowest for households without migrants. Arguably the larger the area of waterside or irrigated land, the wealthier is the household, as these plots are used for the cultivation of cash crops.

The differences in descriptive statistics between continental and intercontinental migrant households enable the postulation of the hypothesis that intercontinental migration in contrast to continental migration is an accumulation strategy embarked on by relatively wealthy households.

## 3.3 analytical model

The descriptive statistics presented in section 3.2 give an indication of the differences between households without, with continental and with intercontinental migrants. To formally assess the determinants of both types of migration, a farm household model with a migration component has been developed and the migration equations derived from this model have been estimated. The present section describes the formal model.

When migration is viewed as a household decision, migration by one person can be undertaken in pursuit of utility maximising behaviour by the household (Stark, 1991). This particular approach to modelling the migration decision does not explicitly incorporate the utility of the migrant. This approach does not detract from the importance of bargaining models of migration used by amongst others Burger (1994) and Mensah-Bonsu (2003). Modelling migration purely as a household decision is a logical choice in this study, because particularly for intercontinental migration the ability of the migrant to reach an intercontinental destination is directly related to the household's willingness and capacity to finance such a move.

Although migration may take place for different reasons, a rational, utility maximising household will only send out migrants if this migration is expected to increase utility of the household. Here, the utility function only allows migration to affect utility through consumption. Other ways in which migration may affect utility are not included in the analysis but exist,

particularly in the form of social costs. Palmer (1985) finds for southern Africa that migration weakens kinship and affinal bonds in particular in patrilineal societies. Kinship and affinal bonds are thought to weaken when women lose male support in agriculture for example in the form of ploughing assistance. In a similar vein, Adepoju and Mbugua (1997) view migration as a cause of a decline in social cohesion. However such views are contested by De Haan et *al.* (2002) for Mali who consider migration as an integral part of livelihoods, embedded in societal rules and norms. Bryceson (1999) finds for a number of African countries that in spite of the economic imperative of migration, scepticism exists about the cost/benefit ratio particularly on the part of the older generation and women. Social costs of migration include the fear of women that migrating males contract AIDS. Although, including social costs of migration may yield interesting insights such inclusion would also greatly increase the complexity of the model.

The utility function, which is concave and non-satiated, can be described as follows:

$$u = u(x_i ; Z_U) \qquad i = s,o,m,h \tag{3.1}$$

where $x_i$ is consumption of own staple produce ($s$), output of other activities ($o$), purchased goods ($m$) and home time ($h$) per adult equivalent. Home time is measured in days and includes leisure but also activities such as food processing and preparation, wood collecting, water and fuel carrying, childcare etc. $Z_U$ is a vector of household characteristics.

Equation (3.1) shows that utility depends on consumption. Consumption is constrained by household income, which can be represented by the following cash income constraint:

$$H_1( p_m x_m + p_s x_s + p_o x_o ) = p_s Q_s - p_s^v V_s + p_o Q_o - p_o^v V_o + R \tag{3.2}$$

The left-hand side of equation (3.2) represents household consumptive expenditures on purchased goods, own staple crops and output from other activities at respective prices $p_m$, $p_s$ and $p_o$. $H_1$ represents the number of resident adult equivalents, which determines household consumption of own produce and other goods and is given by:

$$H_I = N - M_C - M_I + \beta D \tag{3.3}$$

In equation (3.3) the number of adult equivalents that consume within the household, $H_I$, depends on the number of active household members, $N$, the number of migrants within the African continent, $M_C$, the number of intercontinental migrants, $M_I$ and the number of dependants, $D$, which are scaled to an adult equivalent consumption level by a parameter, $\beta$.

The right-hand side of equation (3.2) represents household income, which consists of the value of staple cropping output minus amount of inputs ($V_s$) times input price, $p_s^v$, the value of other output minus input costs, $p_o^v V_o$, and remittances. Staple cropping output, $Q_s$, is given by:

$$Q_s = f_1(L_s, A_s, K_s, V_s) \tag{3.4}$$

In equation (3.4), staple cropping output is a function of household labour ($L_s$), land ($A_s$) and capital inputs ($K_s$). It is assumed that households do not make use of hired labour as in the survey only two per cent of total labour use in agriculture in days was found to consist of paid labour. Households were found to make more use of unpaid hired labour, but still only three per cent of total labour use in days on average for the four villages. The missing market for labour in this case may further be explained by the lack of a landless class and high homogeneity in factor endowments (De Janvry *et al.*, 1991). There also appears to be a cultural barrier to offering one's own labour for a wage as it is thought to be a sign of a lack of ability to sustain production on one's own fields (Mazzucato and Niemeijer, 2000). In staple cropping the use of variable inputs ($V_s$), such as inorganic inputs, is rare but a tractor is sometimes hired.

Other activities include cash cropping $(cc)$, livestock keeping, $(lv)$, and non-farm activities $(nf)$.

$$Q_o = f_2(L_o, A_o, K_o, V_o) \qquad o = cc, lv, nf \tag{3.5}$$

Output from other activities, $Q_o$, is a non-decreasing function of labour ($L_o$), land ($A_o$), fixed ($K_o$) and variable inputs ($V_o$). As livestock is grazed on communal lands, land in this case refers to irrigated or water-side land used for cash crop cultivation, the quantity of which is assumed to be exogenously given. Other activities will be discussed in more detail in Chapter 4.

The last component of income earned by the household are remittances, $R$. The remittance function for the household is given by:

$$R = f_3(M_C, M_I; Z_R) \tag{3.6}$$

Remittance income is thought to be a function of the number of migrants involved in continental or intercontinental migration. In equation (3.6) $Z_R$ refers to migrant and household characteristics that influence the level of remittances; these are discussed in more detail in Chapter 6.

As shown in equation (3.2), a household can use its available labour in a number of income-generating activities. Income generation can take place within the village through agriculture and non-farm activities. In addition, income can be generated outside the village through migration resulting in remittances. If it is assumed that only resident household members consume home time, households can allocate members to these different activities subject to a time constraint expressed as:

$$x_h H_2 = T - L_s - L_o - tM_C - tM_I \tag{3.7}$$

where

$$H_2 = N - M_C - M_I \tag{3.7a}$$

Equation (3.7) is the time constraint for the household. It shows that home time of active and present household members is equal to $T$, the total time available to the household, minus time spent on staple-cropping, other activities and migration (Singh *et al.*, 1986; Barro and Sala-I-

Martin, 1995). For consistency purposes the number of migrants has been converted to time spent in migration. As mentioned in Chapter 2, most migration is of a permanent nature so that $t$ may be set equal to 365 days.

Intercontinental migration, as discussed previously, is considered a constrained choice requiring a certain amount of wealth in order to overcome the entry barrier that exists in the form of primarily transport costs. The equation describing intercontinental migration as a constrained choice is given in (3.8)

$$M_I \leq M^I_{max}(Z_M) \tag{3.8}$$

where $M^I_{max}$ is the maximum number of intercontinental migrants in a household, which is a function of $Z_M$, a vector of household and individual characteristics, including human and physical capital. Migration within the African continent is not constrained in the sense that if a household member wants to leave, costs for transport can be kept to a minimum and hardly present a barrier to migration. It is important to bear in mind, however, that returns to migration within the African continent are often comparatively low.

Households in the four villages are confronted in their decision making concerning production and consumption with three missing markets (see Chapter 2), for land, for labour and for credit/insurance. Non-existence of a market can be said to be the extreme case of market failure. It implies that the market is not used for the transaction because the dis-utility generated by the costs of using market exchange for the transaction exceeds the utility gain that it generates (De Janvry *et al.*, 1991)

When markets are perfect, prices are determined exogenously and production and consumption decisions can be taken independently. However, if there is more than one missing market, prices are determined within the model and production and consumption decisions cannot be separated. This implies that labour supply, household consumption and farm output and resource use need to be determined simultaneously (Ahn *et al.*, 1981), and a non-separable household model needs to be used.

3.4 utility maximisation

According to the analytical model presented in the previous section, households maximise utility subject to a budget, a time and a production constraint. Substituting the production functions for staple and other activities, (3.4) and (3.5) as well as the remittance function (3.6) in the budget constraint, (3.2), yields a single constraint given in equation (3.9).

$$\begin{aligned} &H_1(\, p_m x_m + p_s x_s + p_o x_o\,) = p_s(\, f_1(\, L_s, A_s, K_s, V_s\,)) + \\ &p_o(\, f_2(\, L_o, A_o, K_o, V_o\,)) - p_s^v V_s - p_o^v V_o + f_3(\, M_C, M_I; Z_R\,) \end{aligned} \tag{3.9}$$

The right-hand side of equation (3.9) denotes total household income where $p_s(\, f_1(\, L_s, A_s, K_s, V_s\,)) - p_s^v V_s$ may be interpreted as a constrained measure of farm profits (Singh *et al.*, 1986). Similarly, $p_{o(\, f_2}(\, L_o, A_o, K_o, V_o\,)) - p_o^v V_o$ is a constrained profit function for other activities. In the context of an existing labour market the opportunity cost of time spent in staple and non-staple cropping activities is just the wage rate, which tends to be taken as exogenous to the individual. However, a missing market for labour implies that the opportunity cost of time is determined from within the household rather than by market conditions (Jacoby, 1993). The left-hand side of the equation shows that total household expenditure consists of market-purchased products and household's "purchase" of its own staple and other output.

The constraint given in (3.9) combined with the utility function (3.1), the function for household consumption size (3.3), the time constraint, (3.7) and the constraint for intercontinental migration (3.8), yields the following Lagrangian form for household utility maximisation:

$$\begin{aligned} L = {} & u(\, x_s, x_o, x_m, \frac{T - L_s - L_o - tM_C - tM_I}{H_2}; Z_U\,) + \lambda_0(\, p_s f_1(\, L_s, A_s, K_s, V_s\,) \\ & + p_o f_2(\, L_o, A_o, K_o, V_o\,) - p_s^v V_s - p_o^v V_o + f_3(\, M_C, M_I; Z_R\,) - \\ & (\, N - M_C - M_I + \beta D\,)(\, p_m x_m + p_s x_s + p_o x_o\,)) + \lambda_1(\, M_{max}^I - M_I\,) \end{aligned} \tag{3.10}$$

In equation (3.10) the Lagrange multiplier $\lambda_0$ should be interpreted as the amount by which the maximand would increase given a unit relaxation in the income constraint (Deaton and Muellbauer, 1980). The multiplier $\lambda_0$ can thus be said to represent the marginal utility of household income, whereas $\lambda_1$ refers to the marginal utility of intercontinental migration.

The first-order conditions for labour allocation are given below[4]:

$$\frac{\partial u}{\partial x_h H_2} = \lambda_0 p_s \frac{\partial f_1}{\partial L_s} \tag{3.11}$$

Equation (3.11) shows that in the optimum the marginal value product of household labour in staple cropping production times the marginal utility of income is equal to the opportunity cost of household time in terms of utility loss through sacrificing home-time consumption. Differentiating the Lagrangian with respect to labour use in other activities yields the following results:

$$\frac{\partial u}{\partial x_h H_2} = \lambda_0 p_o \frac{\partial f_2}{\partial L_o} \tag{3.12}$$

Equation (3.12) shows that in the optimum households will devote labour to other activities to the extent where the marginal value product of labour in terms of profit times the marginal utility of income equals the opportunity cost in terms of sacrificing home-time consumption.

In addition to staple and other activities, household members devote labour to migration. Differentiating the Lagrangian function with respect to either form of migration, $M_C$ and $M_I$, yields the following first-order conditions[5]:

---

4 $\frac{\partial L}{\partial L_s} = -\frac{\partial u}{\partial x_h}\frac{1}{H_2} + \lambda_0 p_s \frac{\partial f_1}{\partial L_s} = 0$

5 $\frac{\partial L}{\delta M_C} = \frac{-\partial u}{\partial x_h}\frac{t}{H_2} + \lambda_0(\frac{\partial f_3}{\partial M_C} + p_m x_m + p_s x_s + p_o x_o)$

$\frac{\partial L}{\partial M_I} = \frac{-\partial u}{\partial x_h}\frac{t}{H_2} + \lambda_0(\frac{\partial f_3}{\partial M_C} + p_m x_m + p_s x_s + p_o x_o) + \lambda_1$

$$\frac{\partial u}{\partial x_h H_2} = \frac{1}{t}( \lambda_0(( \frac{\partial f_3}{\partial M_C} ) + ( p_m x_m + p_s x_s + p_o x_o ))) \quad (3.13)$$

$$\frac{\partial u}{\partial x_h H_2} = \frac{1}{t}( \lambda_0(( \frac{\partial f_3}{\partial M_I} ) + ( p_m x_m + p_s x_s + p_o x_o )) + \lambda_1 ) \quad (3.14)$$

$$\lambda_1 = 0 \quad \text{if } M_I < M_I^{max} \quad , \lambda_1 > 0 \text{ if } M_I = M_I^{max} \quad (3.14a)$$

Condition (3.13) shows that households will send away migrants to the extent where the marginal value product of continental migration in terms of remittances and reduced consumption in the household times the marginal utility of income equals the opportunity cost of this form of migration expressed in foregone home time. Condition (3.14) shows that for intercontinental migration a similar condition holds, but that the marginal value product needs to be increased by $\lambda_1$ if intercontinental migration equals the maximum number of migrants the household can send out. The conditions above highlight two important effects of migration: an income effect and a reduced consumption effect. It may therefore be profitable to send migrants away even if there are no remittances received by the household as a reduction in household size may relieve consumption pressure.

Combining equations (3.11), (3.12), (3.13) and (3.14) results in the following equation:

$$\begin{aligned} p_s \frac{\partial f_1}{\partial L_s} &= p_o \frac{\partial f_2}{L_o} = \frac{1}{t}( \frac{\partial f_3}{\partial M_C} + ( p_m x_m + p_s x_s + p_o x_o )) \\ &= \frac{1}{t}( \frac{\partial f_3}{\partial M_I} + ( p_m x_m + p_s x_s + p_o x_o ) + \frac{\lambda_1}{\lambda_0} ) \end{aligned} \quad (3.15)$$

Equation (3.15) shows that in the optimum the household equalises the marginal value product of staple and other activities, continental migration and intercontinental migration. In equilibrium, therefore, the shadow wage of each active household member is equal to the marginal product of staple cropping labour. These shadow wages can be used to determine farm profits as well as household labour supply (Jacoby, 1993).

3.5 econometric model

The analytical model distinguishes between two different forms of migration: continental and intercontinental. To determine what conditions underlie these forms of migration, a multinomial logistic model specified as follows can be estimated:

$$prob(Y_i = j) = f(T, D, Z_M, Z_U, Z_R, K_s, K_o, A_s, A_o, p_m, p_s, p_o, p_v), \qquad j = 0,1,2 \tag{3.16}$$

Equation (3.16) estimates the probability that an adult male between 20 and 40 years of age becomes a continental $(j = 1)$ or an intercontinental migrant $(j = 2)$ with $j = 0$ as base outcome. The probability that continental or intercontinental migration will take place in a household is influenced by the time endowment of the household, $T$, which can be approximated by using a variable for household size as is common practice in modelling migration (De Brauw *et al.*, 2001). As mentioned, the number of adult sons presents a stable indicator of household size over time.

A second factor that is shown by the model to influence the nature of migration is the number of dependants, $D$, in the household. As the number of dependants in the household at the time of departure is unknown and cannot be assumed to have remained stable over time, this variable cannot be included in the regression.

Other household characteristics that are assumed to influence the probability to migrate, $Z_M$, are the age of the household head as well as the years of schooling he has received and the number of adult members who have been educated to primary or secondary level. Household members who have migrated in the past but have now returned could influence migratory movement. A dummy for past absentees is included to capture this household characteristic.

Household characteristics related to utility maximisation, $Z_U$, such as the number of people in each age and sex category do come out from the model as exogenous variables, but cannot be assumed to have remained stable over time and can therefore not be included in the model.

Individual characteristics such as the age of the (potential) migrant as well as the years of education the (potential) migrant are included in $Z_R$. These characteristics are thought to

influence the capacity of the migrant to remit and thus the migration decision taken at the household level.

Fixed inputs in other activities, $K_o$, and in particular in staple cropping, $K_s$, could influence the probability that a household has migrants through the possibility of substitution of labour by equipment, which would loosen the labour constraint faced by the household. However, fixed inputs cannot be taken to be exogenous as most migration is of a long-term nature, and remittances may induce households to invest in equipment.

As mentioned previously, a commercial land market is missing, and land quantity for staple cropping, $A_s$, can be taken as given. Hence, a variable for household access to agricultural land is included in the regressions. It can be argued that not only the quantity of land available to the household influences agricultural production but also the quality. Soils in both provinces have been found to have low fertility and low levels of organic matter. The soil quality of individual plots is difficult to determine if soil samples are not taken. However, it can be assumed that plots that are situated next to the Volta (Niaogho and Béguédo) or to the irrigation channel (Korsimoro), $A_o$, are able to sustain more lucrative (cash) crops. Hence, in addition to the land quantity variable, a dummy set to one to capture the effect of access to waterside plots or irrigated land has been included.

Prices for household produce and purchased goods ($p_m, p_s, p_o$) as well as prices of variable inputs, $p_v$, are assumed to be region specific. Current prices, clearly, cannot explain a migration decision taken in the past. However, it is possible to include a location dummy to capture regional differences as both Niaogho and Béguédo and Boussouma and Korsimoro are situated next to each other. This dummy is set to one for the villages with easy access - Boussouma and Korsimoro - and to zero for the others. An overview of the variables included in the estimation of (3.16) is given in Table 3.3.

## 3.6 estimation results

The results of the estimation of equation (3.16), given in Table 3.4, demonstrate for the land variable that the two migration decisions are indeed different strategic decisions. Continental

migrants are likely to originate from poorer households, *i.e.* households with less land and no access to irrigated land, while intercontinental migrants tend to come from wealthier households. These two results support the hypothesis that continental migration arises from a lack of wealth and should be linked to push factors, whereas intercontinental migration stems from wealth and could be linked to pull factors. With regard to household size it was found that the larger the household *i.e.* the more adult sons, the more likely it is that continental migration will take place. This result is conform expectations as in the absence of a labour market, household size is thought to positively influence migration. In addition, a larger household may be forced to send out continental migrants to reduce consumption pressure.

*Table 3.4 Multinomial logistic estimation results for migration (2002)*

| ***Explanatory variables*** | ***Continental migration*** | ***Intercontinental migration*** |
|---|---|---|
| ***Personal characteristics*** | | |
| Age | 0.12 (0.02)[b]**[a] | 0.22 (0.03)** |
| Years of education | 0.09 (0.04)** | 0.12 (0.05)** |
| Own field | -3.73 (0.59)** | -36.59 (0.00) |
| ***Household composition*** | | |
| Number of adult sons | 0.14 (0.08)* | -0.14 (0.13) |
| Age head | -0.02 (0.01)* | 0.01 (0.02) |
| Dummy for past absentees | 0.42 (0.25)* | -0.02 (0.41) |
| ***Human capital*** | | |
| Primary education (number of adults) | -0.14 (0.08)* | 0.13 (0.14) |
| Secondary education (number of adults) | 0.69 (0.19)** | 0.45 (0.28)* |
| Years education head | -0.08 (0.10) | -0.20 (0.18) |
| ***Physical capital*** | | |
| Land (hectares) | -0.07 (0.04)* | 0.13 (0.05)** |
| Dummy for cultivation of irrigated land | -0.59 (0.26)** | 1.05 (0.46)** |
| ***Village characteristics*** | | |
| Location dummy | 0.04 (0.24) | 0.20 (0.39) |
| McFadden R-squared | 0.27 | |
| Number of observations | 470 | |

Notes: [a] * denotes significance at the 10% level, ** significance at 5% level
[b] standard error in parentheses

The positive coefficient for the past absentees dummy indicates that a household member is more likely to migrate continentally if there are past absentees in the household. This result indicates the importance of the existence of a network facilitating migration. The insignificance of the past absentees dummy for intercontinental migration should not lead one to conclude that a network for this form of migration is irrelevant. It was found that in Italy a strong network exists for migrants from Burkina Faso with a particular role as an information provider. Potential migrants are informed and sometimes aided primarily by family members already in Italy; however this does not show up in the regression, as these persons have not yet returned.

For both forms of migration the number of adults in the household educated up to secondary level is positively related to migration. The presence of adults with secondary schooling in the household may provide the potential migrant with information concerning migration possibilities. If the potential migrant himself has received education, this may enlarge the possibilities of securing employment elsewhere. The result indicates that human capital is a determinant of migration.

For both continental and intercontinental migration, the older and more educated the person, the more likely he is to migrate. Access to own cultivation has a negative influence on continental migration.

## 3.7 conclusions and discussion

In this chapter the conditions underlying the different forms of migration have been investigated. The econometric findings identify continental and intercontinental migration as two different strategic decisions. A positive significant relationship is established between wealth and intercontinental migration. Households with intercontinental migrants are wealthier and able to respond to opportunities for wealth accumulation outside Africa. The negative significant relationship between wealth and continental migration combined with the positive significant relationship between the latter and the number of adult sons indicates that households that send out continental migrants are less well-endowed and are not able to take advantage of more

lucrative opportunities for migration. It is likely that these households send out migrants in response to push factors such as lack of land and consumption pressure.

The findings suggest that a distinction between the two different forms of migration is not only useful, but also necessary to acquire an understanding of the causes and consequences of migration for developing countries. Continental migration leads to a loss of labour to the household but does not generate much income in the form of remittances. In contrast, intercontinental migration generates high returns in terms of remittances. The loss of labour may have consequences for engagement in and income generation through other activities such as cropping, livestock keeping and non-farm activities. These consequences are likely to depend on the extent to which labour can be substituted for. It should be clear that remittances may allow for substitution of labour as well as investment in other activities. Again, the distinction between continental and intercontinental migration is crucial and may also determine the consequences of migration for household activity choice and income, which will be analysed in subsequent chapters.

CHAPTER 4

# migration and diversification

## 4.1 introduction

Income diversification by rural households in developing countries refers to the allocation of assets across various income-generating activities both on- and off-farm (Barrett *et al.*, 2005). Motives for income diversification can be categorised in push and pull factors. Push factors prompting diversification are often linked with risk reduction (Barrett *et al.,* 2001). Rural households in Burkina Faso usually have to cope with both poverty and income variability. One strategy adopted by households in an imperfect market environment to minimise income variability and to ensure a minimum level of income is income diversification (Reardon *et al.,* 1992). Pull factors are prominent in determining diversification if farm households want to take advantage of strategic complementarities between activities, such as crop-livestock integration (Barrett *et al.*, 2001a).

As previously demonstrated, one diversification strategy for rural households in Burkina Faso is to send out migrants. Households also engage in livestock keeping and non-farm activities in addition to staple and cash cropping activities. Studies often distinguish between cash and staple cropping as separate activities. Households engaging in cash cropping are considered to be diversified, because cash cropping may be considered as a substitute for non-farm activities. However, cash-oriented and staple food cropping have highly correlated returns, whereas the rationale for diversification is income generation from activities not correlated with income from cropping (Reardon *et al.,* 1992). Cash cropping will be included in the analysis not so much as a diversification option, but more as a lucrative complement to staple cropping.

Missing markets may prompt diversification, but also imply that households willing to diversify may not always be able to do so. For migration, for example, only relatively wealthy households have been shown to be able to engage in intercontinental migration, which is clearly the most lucrative in terms of remittances received by households. Entry barriers to

diversification can exist for various reasons, but need to be viewed in a context of missing and incomplete markets.

In a setting characterised by imperfect or missing markets the engagement in a particular activity may influence the engagement and income earned in other activities. According to the New Economics of Labour Migration (NELM) theory pioneered by Stark (1991), migration resulting in remittances could enable households to overcome a credit constraint by providing a source of liquidity. However, when there is a missing market for labour, households are not able to replace the labour lost to migration by hired labour, and this may impact negatively on engagement in and income generated through other activities.

In this chapter both impacts of migration - on activity choice and on income earned in different activities – are investigated, and in doing so a test for the NELM theory is provided. The remainder of the chapter is organised as follows: in section 4.2 the NELM theory is discussed. In section 4.3 the farm household model introduced in Chapter 3 will be modified and first-order conditions are derived for household labour input in different activities on the basis of which engagement in different activities is determined in section 4.4. Lee's generalisation of Amemiya's two-step estimator to a simultaneous equation model is used in section 4.5 to establish the role of continental and intercontinental migration in determining household activity choice and income. In section 4.6 the main findings are summarised and discussed.

## 4.2 incomplete market mechanisms and the new economics of labour migration

The primary activity of rural households in Burkina Faso is agriculture. The conditions for agriculture in most of Burkina Faso are far from favourable. Cropping is characterised by one short, single cropping season per year, cropping labour productivity tends to be low, there is a general lack of irrigation, rainfall is low, and soils are generally poor (Kessler and Geerling, 1994). The consequence of engagement in rainfed agriculture in a drought-prone environment is that households face substantial risk. This is where market or other exchange mechanisms become relevant. To mitigate risk, crop-insurance could be provided. However, formal crop insurance does not exist in the West-African Semi-Arid Tropics. The lack of such insurance is thought to be caused by high spatial covariance of rainfall shocks and to moral hazard problems

associated with crop insurance in general.

Restricted options for collateral and collateral substitutes imply severe limitations in access to a formal credit market (Binswanger and Rosenzweig, 1986; Binswanger *et al.*, 1989; Reardon *et al.*, 1992; Fafchamps *et al.*, 1998). As discussed in Chapter 2, land in the study villages is generally cultivated on a hereditary basis and a land market is missing. The lack of commercial land market transactions implies that land cannot function as collateral for credit.

Missing or imperfect markets for credit and insurance imply that risk cannot be mitigated through formal institutions. Diversification of productive activities enables the household to reduce the risk it faces through generating income from sources not correlated with cropping income. Households are found to diversify by engaging in migration, livestock keeping and non-farm activities. The diversification options for the survey households differ in their input requirements. Non-farm activities are generally labour-intensive and capital-extensive whereas livestock keeping requires substantial investment and is labour-extensive.

As Table 3.1 in Chapter 3 shows, the share of non-cropping income tends to increase across income quintiles. If, as widely believed, risk aversion is decreasing in income and wealth (Barrett *et al.* 2001), then the poor will display a greater need to diversify. These same poor, however, are less able to overcome the entry barriers to diversification.

Perfect markets would mean that entry barriers to diversification are less severe. Households could obtain credit to purchase livestock and labour could be hired if shortages were present preventing households from engaging in non-farm activities. Under perfect market conditions, households are also able to insure themselves against risk, which would increase willingness to engage in risky activities. Perfect markets also imply that engagement in a particular activity does not have an impact on engagement in other activities. When household members migrate, a household loses labour but often gains income in the form of remittances. When markets function perfectly, labour lost to migration can be replaced by hired labour so that other activities such as agriculture are not affected. Perfect markets also imply that households can obtain credit and insure against risk, and remittances should not be necessary to provide the household with the liquidity to branch out into other activities.

In the study villages there are missing or imperfect markets for credit and insurance as well as, as discussed in Chapter 2, for land and labour. When market mechanisms are imperfect,

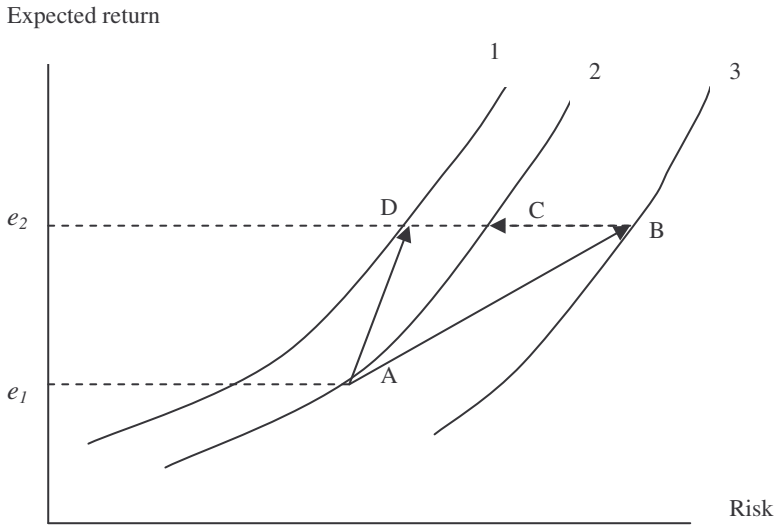
migration, as one of the diversification options, can itself influence the productive activity choices and practices available to the household. According to the NELM theory, migration is likely to have multiple and often counteracting impacts on the productive activities of the household due to the constraining effect of imperfect market mechanisms. Migrants can be considered as financial intermediaries providing the remaining household members with a source of liquidity through remitting.

The two main effects of migration for the household, remittances and lost-labour, imply that a migrant is not necessarily the decision-making unit concerning his migration. Migration decisions should be viewed as a household decision involving an implicit contractual arrangement between the migrant and the household. This contractual arrangement can be considered as an alternative mechanism of exchange emerging from market imperfections. Such an arrangement spells out the distribution of gains (remittances) and losses (labour) associated with migration (Stark and Bloom, 1985). The rationale for entering in such a contract is that each party, the migrant and the household, faces an income-time profile where a risk has to be incurred first and increased benefits are derived later. The potential migrant faces entry constraints in terms of transport costs for example (particularly for intercontinental migration). In addition, the migrant faces the risk of not being able to find employment initially. The household could face a risk-increasing situation if it wants to adopt a new production technology. Investments in capital and inputs present the household with a risk-increasing situation because the return is uncertain but funds need to be committed.

Figure 4.1 serves to explain this idea and depicts a situation in which a household wants to adopt a new production technology with a subjective high risk content. In the absence of formal insurance the conflict that arises between the increased-risk presented by the technological innovation and household risk aversion, needs to be resolved internally. Objectively the higher risk entailed in the technological innovation is rewarded by higher expected output. But it is the subjective risk that determines whether the innovation takes place. The figure presents a risk/expected-return plane. The initially assumed equilibrium position is *A* and a necessary condition for the household to move from this position is that the risk involved in obtaining the higher expected return matches the household's subjective preferences, represented by frontier 2. The new technology is shown in the figure to involve an initial

objective move from *A* to *D*. However, the household considers its (new) subjective position to be in B where the subjective risk is much greater compared to its frontier 2. Because frontier 2 represents the situation where the higher expected returns match the household's subjective preferences, the household would not consider an innovation that constitutes a move to B. Given the higher expected return involved in the technological innovation $e_2$ the household would only be willing to move up in terms of risk to *C* on its frontier. For the household to remain on frontier 2 but increase its expected return, a simultaneous risk-depressing strategy needs to be undertaken.

*Figure 4.1 Farm household investment and risk preference*




Source: Stark (1991)

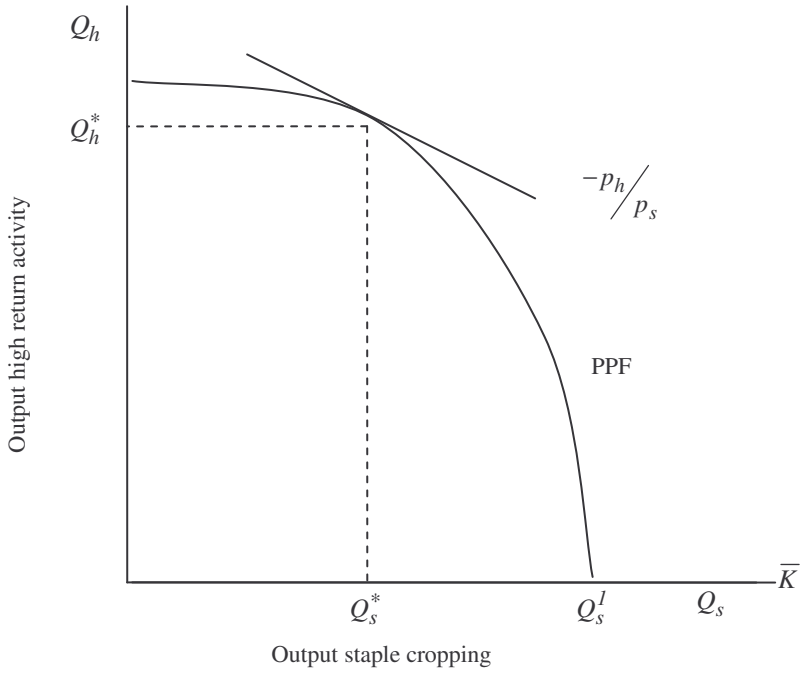
Migration viewed as a contractual arrangement in which the household and the migrant act in turn as insurer and insuree presents an alternative mechanism of exchange in the absence of a formal insurance market. The household acts as the insurer in the period immediately following migration so that the insuree (the migrant) receives a less variable set of outcomes. In

the subsequent period, the migrant can act as the insurer enabling the insuree to enter into a risk-increasing situation (Stark, 1991).

It is also possible that migration, by providing an alternative to the formal credit market, enables households to engage in other activities, such as livestock keeping. Livestock keeping tends to be highly rewarding in labour, but requires high capital inputs (purchase of livestock) in particular.

Figure 4.2, adapted from De Brauw et al. (2001), illustrates how migration can loosen the constraint limiting the households' engagement in a high-return activity.

*Figure 4.2 Effect of migration on activity choice*




Source: adapted from De Brauw et al. (2001)

The figure differs from De Brauw et al. (2001) because households in this study were not found to specialise in one particular activity, but to complement staple cropping with other activities,

cash cropping, livestock keeping, non-farm activities. Another difference is that in this study it is assumed that a capital constraint prevents households from allocating any fixed resources to the high-return activity. In the figure PPF represents the production possibilities frontier. At relative prices, $p_h / p_s$ , the household would want to devote part of its fixed resources to a high-return activity[6]. However, engagement in such an activity requires a substantial initial investment, $\overline{K}$ . The required initial investment presents an entry barrier to the high-return activity and thus coincides with the horizontal axis. Market constraints limit household access to credit. Households are thus dependent on their own wealth to meet the initial investment. Migrants when sending remittances improve the liquidity position of the household and thus add to household wealth. Following the NELM theory, it can therefore be hypothesised that migration resulting in remittances influences the ability of the household to engage in a high-return activity.

Figure 4.2 shows that an increase in the production of the high-return activity through a loosening of the constraint does imply a fall in the production of staple crops from $Q_s^1$ to $Q_s^*$ . This fall occurs, amongst other things, because in the absence of a labour market, more labour allocation to the high-return activity implies less availability of labour to allocate to staple cropping. It is thus possible that migration, which itself reduces the availability of household labour, also affects output from labour-intensive activities such as staple cropping and non-farm activities for which labour substitution possibilities are limited, by drawing labour into high-return activities.

The above discussion makes clear that in an incomplete market environment it is possible that migration affects activity choice and income. By increasing the willingness of households to engage in a risky investment, migration allows for an increase in expected returns from agriculture whilst by loosening a capital constraint, migration allows for diversification into a high-return activity. However, as has been demonstrated previously, it needs to be borne in mind that engagement in intercontinental migration, which is the most lucrative, is itself constrained. This implies that the beneficial effects associated with this form of migration are likely to accrue only to households who are able to bear the costs to send out a migrant to a

[6] High-return activities can refer to any activity in the other activities category but in the current study, livestock keeping in particular can be considered as a high-return activity.

destination outside the African continent, *i.e.* those that were wealthier, primarily in terms of land, from the outset.

Tests of the NELM theory have appeared in the literature. Lucas (1987) investigates the consequences of emigration to South Africa's mines for agricultural activities in Botswana, Lesotho, Malawi, Mozambique and the South African homelands. He finds that emigration reduces crop production in the subsistence sector in the short run, but that remittances enhance both crop productivity and cattle accumulation in the longer run in all but one country. For rural China, De Brauw *et al*. (2001) extend the test of the NELM theory to include non-farm self-employment in addition to agricultural activities. Their findings that remittances partially compensate for the lost-labour effect and stimulate crop and possibly self-employment production provide evidence in favour of the NELM theory.

However, these studies include a single variable for migration whereas it is important, especially in the context of the present study, to distinguish different types of migration. The present study will test the NELM hypothesis for both activity choice and income generation including different forms of migration using the analytical model given below.

## 4.3 analytical model

In Chapter 3 a farm household model was introduced; in order to keep the model simple a few alterations to the model are presented here. In this chapter, decisions concerning activity choice are assumed to be made at the start of the survey year, taking the stock of migrants as given[7]. In the previous chapter households were assumed to be utility maximisers where utility was given as a function of consumption of household produce, purchased goods and home-time at the adult equivalent level. Here, utility is assumed to be a function of household consumption of all goods[8]. In equation (4.1) $C$ represents household consumption of all goods and $X_h$ is household home-time consumption.

[7] In Chapter 3 conditions underlying migratory movement were investigated necessitating the inclusion of migration as one of the activity choices. In the current chapter the stock of migrants is taken as given, allowing for simplification of the model.

[8] The consumption effect of migration no longer needs to be taken into consideration because the stock of migrants is taken as given.;this permits using consumption of the resident household in the utility function

$$U = u(C, X_h; Z_U) \tag{4.1}$$

The household budget constraint is similar to the one given in Chapter 3, but has total household consumption on the left-hand side:

$$C = Y_s + Y_o + R \tag{4.2}$$

Net income from staple production, $Y_s$, is given by a net income production function.

$$Y_s = p_s f_1(L_s, A_s, K_s, V_s) - p_s^v V_s \tag{4.3}$$

All households in the survey were found to engage in staple cropping. Many also cultivate a number of so-called cash crops: onions, rice, cotton and maize. In addition to cropping activities, many households keep livestock and derive income from a number of non-farm activities.

Livestock in Burkina Faso tends to be kept by farm households for multiple purposes. In the survey villages, sales of so-called recurrent production of livestock such as milk, wool etc. are extremely rare. Households derive income from livestock mainly through embodied production: increases in weight or herd size. Other functions of livestock, cattle in particular, include transport and traction. The manure of livestock is used as an input in the agricultural production process. But, most importantly livestock can be considered as liquid capital. Livestock keeping can enable the farm household to meet unexpected expenditures, for example when income is low due to a shock such as drought. When a farm household has livestock at its disposal that can be sold at any time, it can avoid making use of both formal and informal credit or insurance institutions, if they exist at all, and avoid transaction costs that can be substantial (Udo and Cornelissen, 1998). Livestock also functions as a portfolio investment option in the absence of other mechanisms for wealth storage (Moll, 2005).

Many households also derive income from a number of non-farm activities. These tend to be self-employment activities and not wage labour, as a formal labour market does not exist in the survey villages. Important activities, particularly for women, are food preparation and sales

whereas men engage in a number of artisanal activities. Most non-farm activities are labour-intensive and capital-extensive, although a small number of households were found to engage in more commercialised activities.

Following Abdulai and CroleRees (2001), households' net income derived from activities outside staple-crop production, $Y_o$, can be denoted as:

$$Y_o = p_o f_2(L_o, A_o, K_o, V_o) \mid \overline{K}_o - p_o^v V_o \qquad o = cc, lv, nf \tag{4.4}$$

In (4.4) $\overline{K}_o$ represents an entry constraint such as investment capital, in the context of a missing market for formal credit. In terms of Figure 4.2 such a constraint coincides with the horizontal axis so that, it prevents households without sufficient capital from allocating any fixed resources (land and labour) to this activity. The household's ability to make the initial investment required for entrance into other activities depends on its wealth, including the stock of continental and intercontinental migrants.

$$\overline{K}_o \leq W^{max}(\overline{M}_C, \overline{M}_I, Z_W) \tag{4.5}$$

In the absence of a perfect labour market, labour availability for production and migration is constrained by the time endowment of the household.

$$L_s + L_o = T - t\overline{M}_c - t\overline{M}_I - X_h \tag{4.6}$$

where $t$ as in Chapter 3 refers to time spent in migration, which can be set to 365 as most migration is permanent. Combining the model's equations yields the following Lagrangian form for household utility maximisation:

$$\begin{aligned} L = u(C, T - t\overline{M}_C - t\overline{M}_I - L_s - L_o; Z_U) + \lambda_0(p_s f_1(L_s, A_s, K_s, V_s) - p_s^v V_s + \\ p_o f_2(L_o, A_o, K_o, V_o) \mid \overline{K}_o - p_o^v V_o + R - C) \end{aligned} \tag{4.7}$$

## 4.4 migration and diversification

According to De Brauw *et al.* (2001) who apply the NELM perspective to rural households in China, imperfect markets imply that the constrained vector of income sources depends on migration and remittances. Assuming migration and remittances to be endogenous, they estimate a simultaneous system of equations determining migration, remittances and income derived from the different sources. The null hypothesis associated with the recursive household model is that neither migration nor remittances influence income from other sources.

However, solely focusing on estimating income from different sources would result in an incomplete analysis. Simply estimating the different income equations for the sample of households would ignore the fact that not all households engage in each and every activity. In fact, migration may influence activity choice itself through its impact on the time and liquidity constraint of the farm household. Analogous to Taylor and Yunez-Naude (2000) for returns to schooling in Mexico, an analysis of the impact of migration and remittances on household income needs to take into account the influence migration and remittances may have on activity choice, as these may lead households to diversify into new activities. Ignoring the endogeneity of activity choice therefore leads to a selection bias in the results.

An analysis similar to Abdulai and CroleRees (2001) can be used to model the household decision-making process. The household derives utility from consumption and this utility is a positive function of net income, both in-kind and in-cash from all sectors (Nakajima, 1986; Reardon *et al.*, 1992). The variability of income and the household's attitude toward risk are not incorporated here in the definition of utility, which is purely a function of net income.

Households engage in a particular activity if their expected utility from doing so exceeds that from not investing in the activity, subject to capital constraints. In a perfect market setting, without consideration of risk, this implies that when expected income from specialising in staple cropping exceeds income from diversifying into other activities, households will specialise in staple cropping and not allocate labour to other activities. When markets are missing, households may prefer to diversify, rather than specialise in cropping. Diversification may reduce expected income but also reduces the variance of income. Risk-averse households

may therefore prefer to diversify even if this means a reduction in expected income (Abdulai and CroleRees 2001).

As mentioned previously, entry constraints in an imperfect market environment may preclude households from engagement in activities outside staple cropping. In the absence of a formal credit market, only households able to meet the entry constraint, if existent (i.e. those that can afford $\overline{K}_o$) will allocate labour to these other activities. Households will thus fall in one of two categories regarding labour allocating to other activities depending on their ability to make the initial investment.

$$\begin{cases} u_C \dfrac{\partial C}{\partial L_s} = u_C \dfrac{\partial C}{\partial L_o} & \text{if } W_{max} \geq \overline{K} \\ u_C \dfrac{\partial C}{\partial L_s} < u_C \dfrac{\partial C}{\partial L_o} & \text{if } W_{max} < \overline{K} \end{cases} \tag{4.8}$$

Given participation, the income of household from staple and other activities can be represented in reduced form as:

$$\begin{aligned} Y_s &= \gamma_{0s} + \gamma_{1s}\overline{M}_C + \gamma_{2s}\overline{M}_I + \gamma_{3s}X + \varepsilon_s \\ Y_o &= \gamma_{0o} + \gamma_{1o}\overline{M}_C + \gamma_{2o}\overline{M}_I + \gamma_{3o}X + \varepsilon_o \end{aligned} \tag{4.9}$$

In equation system (4.9), $\gamma_{1i}\ (i = o,s)$ denotes the returns from continental migration when the household participates in a particular activity, $\gamma_{2i}$ denotes these returns from intercontinental migration. $X$ denotes all other exogenous variables from the structural model $(Z_U, A_s, K_s, p_s, p_s^v, A_o, K_o, p_o, p_o^v, Z_W, T)$[9] and $\gamma_{3i}$ is the marginal impact of these variables on income derived from that activity. The null-hypothesis with NELM as tested by De Brauw *et al.*

[9] The structural model here applies only to a one year period (as opposed to Chapter 3, where migration is explained as an intertemporal phenomenon) so that household characteristics, fixed inputs and variables related to household wealth can be taken as given.

(2001) for rural China states that $\gamma_{1i}$ and $\gamma_{2i}$ are equal to zero so that neither continental nor intercontinental migration impact on the income generated in the different household activities.

The observation of income generated in an activity is conditional upon participation in that activity. To correct for censorship, the equations in (4.9) are estimated jointly controlling for activity choice utilizing Lee's (1978) generalisation of Amemiya's (1974) two-stage estimator. This procedure consists of firstly separately estimating probits for participation in each activity (including those for which no capital constraint exists): cash cropping, livestock keeping and non-farm activities, using the complete set of explanatory variables in equations (4.9). The probit indicator function thus estimated is of the following form:

$$I = \gamma_{0o} - \gamma_{0s} + (\gamma_{1o} - \gamma_{1s})\overline{M}_C + (\gamma_{2o} - \gamma_{2s})\overline{M}_I + (\gamma_{3o} - \gamma_{3s})X \tag{4.10}$$

The estimated coefficients from the probit regressions for each activity choice are then used to calculate the inverse Mills ratios:

$$IMR_o = -\phi(I_o)/\theta(I_o) \tag{4.11}$$

Where $\phi(\cdot)$ denotes the normal density function and $\theta(\cdot)$ denotes the cumulative normal distribution function. In the second stage of the estimation, these inverse Mills ratio are included as an additional explanatory variable in the income regressions for other activities cash-cropping, livestock, and non-farm production; *i.e.*

$$Y_o = \gamma_{0o} + \gamma_{1o}\overline{M}_C + \gamma_{2o}\overline{M}_I - \sigma IMR_o + u_o \tag{4.12}$$

One advantage of this two-step approach is that one obtains estimates of the effect of each explanatory variable on the probability of participating in each income activity, as well as the effect on activity incomes given participation. The censorship corrected income equations are estimated jointly for all households using iterated least squares to exploit the information

contained in the cross-equation error correlations. Income equations are estimated for all activities staple cropping, cash cropping, livestock keeping and non-farm activities.

To account for the fact that many households have livestock at the start of the survey period, the decision to be modelled for livestock keeping is whether the household increased its herd size through livestock purchase. The income equation to be estimated in this case is the actual value of the investment, which can be considered as implicit income.

The vector of explanatory variables *X* includes resident household size and number of dependants; physical capital variables (land, the quantity of which is assumed to be exogenously given, the number of cattle at the start of the survey year, a dummy for access to irrigated land and the value of farm equipment); and household characteristics (human capital variables such as age of the head of the household, number of adults with primary and secondary education, and the number of past absentees, *i.e*., household members who have migrated in the past but have returned). Prices are assumed to be region-specific and are captured by location dummy variables.

Variables for continental and inter-continental migration also need to be specified. Migration represents an endogenous activity choice. However, most migrants in the surveyed households were found to have left in the past, typically several years prior to the survey. It is therefore possible to consider the number of past migrants as a predetermined 'migration capital stock' variable (Taylor and Yunez-Naude, 2000). The migration capital stocks, or number of household members at each migrant destination, prior to the survey year are used to measure continental and intercontinental migration in the econometric model[10]. Land size and a dummy for irrigated land that were included in Chapter 3 as exogenous variables explaining migration, are also included in the current analysis.

An overview of the variables included in the analysis is given in Table 4.1. It shows that households with intercontinental migrants are better equipped in terms of assets (land, cattle and value of farm equipment) compared to households without and households with continental migrants. Households with continental migrants are only slightly better off in terms of assets

[10] One could argue that, although the migration variables are pre-determined, they may be stochastically related to activity incomes and participation over time; for example, all three could be correlated with unobserved household variables. One way to deal with this problem is to estimate fixed-effects models; however, this is not possible using cross-section data. No other candidates for migration instruments are available from the survey

compared to households without migrants. As discussed in Chapter 3, households without migrants have fewer adult members with primary and secondary education compared to households in the other groups. Income data used in the analysis are given for the three groups of households in Table 3.2.

*Table 4.1 Descriptive statistics by household migration status (2002)*

| ***Variables*** | ***Non-migrant (N=79)*** | ***Continental migrant (N=112)*** | *t-test means*[b] | ***Intercontinental migrant (N=32)*** | *t-test means*[c] |
|---|---|---|---|---|---|
| ***Household composition*** | | | | | |
| Household size | 9.57 (5.52)[a] | 13.34 (6.17) | -4.34 | 18.56 (9.11) | -6.37 |
| Dependants (number) | 4.11 (3.10) | 4.76 (3.33) | -1.36 | 7.38 (6.41) | -3.61 |
| Age household head | 49.14 (12.40) | 54.62 (15.15) | -2.65 | 58.59 (10.63) | -3.78 |
| Stock of continental migrants, lagged | ~ | 1.10 (1.14) | ~ | ~ | |
| Stock of intercontinental migrants, lagged | ~ | ~ | ~ | 1.56 (1.13) | |
| ***Human capital*** | | | | | |
| Past absentees | 0.27 (0.45) | 0.43 (0.50) | -2.33 | 0.37 (0.49) | -1.14 |
| Education level of household head (years) | 0.57 (1.78) | 0.47 (1.49) | 0.41 | 0.88 (3.37) | -0.62 |
| Primary education (number of adults) | 0.59 (0.97) | 1.13 (1.71) | -2.53 | 1.69 (1.94) | -3.95 |
| Secondary education (number of adults) | 0.19 (0.75) | 0.49 (0.90) | -2.43 | 0.38 (0.66) | -1.22 |
| ***Physical capital*** | | | | | |
| Land (hectares) | 4.24 (3.06) | 4.38 (2.77) | -0.34 | 7.40 (6.12) | -3.62 |
| Cattle, lagged (number) | 0.86 (1.34) | 1.19 (1.45) | -1.76 | 6.03 (8.16) | -5.97 |
| Value farm equipment, lagged (FCFA)[d] | 34,078 (53,822) | 40,050 (54,162) | -0.75 | 53,708 (47,550) | -1.80 |

Notes: [a] standard deviation in parentheses
[b] non-migrant versus continental migrant households
[c] non-migrant versus intercontinental migrant households
[d] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)

## 4.5 results

The results of the probit estimation[11] for activity choice are given in Table 4.2.

*Table 4.2 Probit estimation results for activity choice (2002)*

| ***Explanatory variables*** | ***Cash cropping*** | ***Livestock purchase*** | ***Non-farm activities*** |
|---|---|---|---|
| Constant | 0.27 (0.53) [a] | -1.79 (0.47)** | 0.23 (0.43) |
| ***Household composition*** | | | |
| Household size | -0.04 (0.05) | 0.06 (0.04)* | 0.00 (0.04) |
| Inactive members | 0.02 (0.07) | -0.06 (0.05) | 0.02 (0.05) |
| Age household head | -0.01 (0.01) | -0.01 (0.01) | -0.01 (0.01) |
| Stock of continental migrants, lagged | 0.01 (0.10) | 0.03 (0.09) | 0.03 (0.09) |
| Stock of intercontinental migrants, lagged | -0.21 (0.26) | 0.26 (0.15)* | -0.31 (0.17)* |
| ***Human capital*** | | | |
| Past absentees | 0.14 (0.25) | 0.16 (0.22) | 0.30 (0.21) |
| Education level head | -0.07 (0.08) | -0.11 (0.08) | 0.10 (0.07) |
| Primary education (number of adults) | -0.03 (0.10) | 0.01 (0.08) | - 0.01 (0.07) |
| Secondary education (number of adults) | -0.05 (0.22) | 0.23 (0.13)* | 0.25 (0.15)* |
| ***Physical capital*** | | | |
| Land (hectares) | 0.10 (0.06)*[b] | -0.01 (0.03) | 0.05 (0.04) |
| Cattle, lagged | 0.02 (0.07) | -0.03 (0.04) | -0.01 (0.06) |
| Log value farm equipment, lagged | 0.02 (0.03) | 0.03 (0.02) | -0.00 (0.02) |
| Dummy for irrigated land | 2.75 (0.47)** | 0.52 (0.26)* | -0.18 (0.23) |
| ***Village characteristics*** | | | |
| Location dummy | -0.32 (0.32) | 0.68 (0.28)** | 0.61 (0.25)** |
| Pseudo R-squared | 0.44 | 0.14 | 0.14 |
| Number of observations | 223 | 223 | 223 |

Notes: [a] standard error in parentheses
[b] * denotes significance at the 10% level, ** denotes significance at 5% level

Figures show the estimated percentage point change in the probability of participating in a particular activity associated with a one-unit change in the corresponding explanatory variable.

The table reveals a significant positive relationship between intercontinental migration and livestock purchase. As mentioned previously, remittances from intercontinental migration are much more substantial than those from continental migration. The finding that intercontinental migration increases participation in livestock is consistent with the hypothesis that having intercontinental migrants enables households to overcome liquidity and/or risk constraints on livestock production.

Intercontinental migration has a significant negative effect on participation in non-farm activities. These activities are often labour-intensive and can thus be expected to compete with intercontinental migration for household labour. Intercontinental migration tends to generate higher returns in terms of remittances and may therefore lead to abandonment of non-farm activities.

The positive significant coefficient of the location dummy, which is set to one for the easy-access villages Boussouma and Korsimoro, suggests that market access stimulates non-farm activities (a large regional market is held regularly in Korsimoro).

The number of adults with secondary education has a significant positive influence on engagement in non-farm activities, signifying the importance of education for activity diversification. Abdulai and CroleRees (2001) uncover a similar relationship between education of the head of the household and diversification into non-farm activities for rural Mali

No relationship is apparent between migration and participation in cash cropping. Assets are important in determining engagement in cash cropping and in particular the access to irrigated or waterside plots on which cash crops are often cultivated.

The results of the estimation of the income equations given participation, which correspond to the second stage of the model, are given in Table 4.3. This table reports the estimated absolute effects of a one-unit change in the corresponding explanatory variables on income from the different activities.

The findings in Table 4.3 show that, other things being equal, an additional intercontinental migrant reduces net income from staple cropping by 61,900 FCFA[12], consistent with a missing market for labour[13].

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[11] The first step of Lee's generalization of Amemiya's two-stage estimator (page 59)
[12] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)

*Table 4.3 2SLS estimation results for net income (FCFA/10,000)[a] (2002)*

| ***Explanatory variables*** | ***Staple cropping*** | ***Cash cropping*** | ***Livestock keeping*** | ***Non-farm activities*** |
|---|---|---|---|---|
| ***Constant*** | -16.04(18.20)**[c] | -2.96 (3.53)[b] | -55.66 (34.32)* | -1.41 (8.94) |
| ***Household composition*** | | | | |
| Household size | 0.92 (0.45)** | -0.18 (0.19) | 1.47 (0.85)* | 0.60 (0.36) |
| Inactive members | -0.68 (0.66) | 0.13 (0.27) | -1.75 (0.78)** | -0.27 (0.53) |
| Age household head | 0.15 (0.10) | 0.09 (0.04)* | -0.20 (0.11)* | -0.17 (0.10) |
| Stock of continental migrants, lagged | -0.51 (1.06) | 0.30 (0.44) | 0.78 (0.56) | -1.68 (0.84)** |
| Stock of intercontinental migrants, lagged | -6.19 (2.16)** | 0.81 (0.90) | 2.70 (1.44)* | -5.93 (2.64)** |
| ***Human capital*** | | | | |
| Past absentees | 0.63 (2.66) | 1.40 (1.11) | 3.39 (2.18) | 3.38 (2.81) |
| Education level head | 0.64 (0.91) | -0.53 (0.38) | -0.17 (0.44) | 1.25 (0.80) |
| Primary education (number of adults) | -2.19 (0.96)** | 0.08 (0.40) | -0.58 (0.70) | 0.01 (0.76) |
| Secondary education (number of adults) | -1.93 (1.67) | -1.01 (0.69) | 5.56 (2.42)** | 6.43 (1.93)** |
| ***Physical capital*** | | | | |
| Land (hectares) | 3.75 (0.49)** | 0.40 (0.22)* | 0.20 (0.23) | 1.87 (0.48)** |
| Cattle, lagged | 1.91 (0.46)** | -0.18 (0.19) | 1.81 (0.21)** | -0.71 (0.37)* |
| Value productive assets | 0.57 (0.25)** | 0.22 (0.11)* | 0.31 (0.34) | 0.35 (0.20)* |
| Dummy for irrigated land | 2.48 (8.16) | 6.19 (3.39)* | 13.26 (6.07)** | -1.48 (2.61) |
| ***Village characteristics*** | | | | |
| Location dummy | 10.66 (3.14)** | -1.79 (1.36) | 15.10 (6.96)** | -0.83 (4.70) |
| IMR (cash cropping) | | 0.33 (3.40) | ~ | ~ |
| IMR (livestock keeping) | | ~ | -25.37 (16.25) | ~ |
| IMR (non-farm activities) | | ~ | ~ | - 7.74 (11.38) |
| R-squared | 0.54 | 0.28 | 0.42 | 0.27 |
| Number of observations | 223 | 223 | 223 | 223 |

Notes: [a] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)
[b] standard error in parentheses
[c] * denotes significance at the 10% level, ** denotes significance at 5% level

[13] As discussed in Chapter 2 households were found to make hardly any use of hired labour

There is some evidence in the data of some labour substitution through equipment hire; however, use of labour-saving equipment increases the cost of staple cropping. A negative effect of intercontinental migration on staple income is also consistent with a risk explanation. Households with intercontinental migrants may reduce the effort they invest in staple cropping knowing that they can rely on remittances should shortfalls occur. In contrast to staples, intercontinental migration has a significant positive effect on livestock investment. Households with intercontinental migrants are not only more likely to purchase livestock but also to invest more in livestock production than households without intercontinental migrants. These findings are consistent with liquidity constraints that are binding for households without intercontinental migrants but loosened by remittances sent home from abroad.

Both continental and intercontinental migration have a significant negative effect on income from non-farm activities but the effect of intercontinental migration is about three times larger. This result is not unexpected given the labour intensity of most non-farm activities. A loss of labour to migration, without access to hired labour markets, appears to reduce investment in non-farm activities, leading to a reduction in net income.

Resident household size is positively related to income from staple crop production in which labour is an important input. Household physical capital has a significant positive effect on income from all activities. These findings coincide with the findings of Abdulai and CroleReese (2001) for rural Mali that household wealth (measured by landholding and value of equipment) positively influences income from cash cropping (cotton), non-farm activities, and livestock.

Human capital is important in explaining income generation in livestock keeping and non-farm activities. Taylor and Yuñez-Naude (2000) establish the importance of education for income generating activities in rural Mexico, where they find large returns from household head's schooling in cash-crop production. Here, the coefficient for the secondary education variable, which refers to the number of adults in the household for whom this education level is the highest attained, is positively significant in non-farm activities and livestock investment.

The inverse Mills ratios are not significant in any of the income equations. The significance of the Mills ratio would have underlined the importance of the self-selection of farm households into activities in determining the income derived from those activities (Taylor and

Yunez-Naude, 2000). However, here the self-selection of households in activities does not significantly bias the estimation results.

## 4.6 conclusions and discussion

In the context of missing or incomplete markets, migration activities that absorb household labour while contributing liquidity through remittances may influence both the activity choice and income generated in different activities. The NELM theory points to the important role that migration plays in enabling households to overcome credit constraints and to facilitate investment, in particular in relatively high-return activities. However, testing the NELM theory by only considering the actual income earned in different activities would ignore the role that migration plays in enabling households to engage in these activities in the first place.

Taking the stock of continental and intercontinental migrants at the beginning of the survey year as given and using a two-stage selection model, intercontinental migration is found to play an important role in household income diversification in livestock keeping and non-farm activities, positively affecting the first but negatively affecting the second. The positive effect of this form of migration on livestock suggests that intercontinental migration enables households to overcome entry barriers resulting from missing and imperfect markets. The negative effect on staples and non-farm activities is consistent with a missing or imperfect labour market and household labour constraints that create a trade-off between migration and non-farm activities. It appears that receipt of substantial sums of remittances make it more likely for households with intercontinental migrants to abandon or not engage in these activities, which compete with migration for household time while producing returns inferior to those from intercontinental migration. That is, intercontinental migration is complementary with livestock production but not with other production activities in the households studied.

These findings, in combination, offer tentative support of NELM theory in rural Burkina Faso and highlight the importance of intercontinental migration in overcoming entry constraints to high-return but low labour-intensity activities. Negative effects of migration on non-farm and staple activities suggest that migration may lead households to diversify less when activities are labour-intensive.

The findings in this chapter highlight the important role that inter-household heterogeneity plays in explaining diversification because of entry constraints. This finding is similar to Dercon and Krishnan (1996) for rural Ethiopia and Tanzania who suggest that constraints on entering activities figure importantly in amongst other things livestock keeping. In addition, due to incomplete credit markets only wealthy households are able to take up such activities. Similar findings are reported by Barret *et al.* (2005) for rural populations in Cote d'Ivoire, Kenya and Rwanda. The role of migration in alleviating entry constraints has been demonstrated by Lucas (1987) for emigration to South Africa's mines.

It is important to realise that intercontinental migration that enables households to invest in high-return activities, is itself constrained. It is therefore likely that differences in wealth between households underlying migratory movement, as demonstrated in Chapter 3, are further exacerbated by migration

CHAPTER 5

# migration, cropping practices and resource management

## 5.1 introduction

Migration is likely to influence household staple cropping practices for several reasons. In the absence of a perfect labour market, the removal of labour could make it difficult, if not impossible for households to meet labour demand, and therefore lead to a decline in output. Remittances could be used to overcome labour shortfalls by providing the household with a source of liquidity that can be used for investments in labour-substituting inputs. In addition, remittances as a source of liquidity can be used for the purchase of additional inputs. A loss of labour, as a result of migration, may also have repercussions for natural resource management and sustainability as it may lead to the abandonment of certain soil conservation practices.

Chapter 4 demonstrates that household engagement in intercontinental migration has a negative impact on net income generated in staple cropping. It has been suggested that this may be due to the costs of the use of labour-substituting technologies, or that households with intercontinental migrants have the possibility to reduce effort in staple cropping as they can rely on substantial remittances if shortfalls occur. No effect was found of continental migration on net income earned in staple cropping. It is, however, possible that continental migration influences staple cropping activities in less obvious ways.

In order to properly understand the relationship between migration and staple cropping, a maximum likelihood estimation (MLE) method is used to estimate two production frontiers for the staple crops millet and sorghum. To account for differences in technology, separation of the sample is done on the basis of location, so that one production frontier is estimated for Niaogho and Béguédo and one for Boussouma and Korsimoro. To facilitate a detailed analysis of the relationship between migration household labour use in staple cropping, the agricultural production process is separated into three stages: preparation and planting, crop maintenance, and harvesting. As in previous chapters, three groups of households are distinguished on the

basis of migratory status: households without, with continental and with intercontinental migrants. The results of the production frontier estimation enable the calculation of technical inefficiency and marginal products. These are then compared across the three household groups so as to shed light on differences in production practices in relation to household migration status.

The remainder of the chapter is organised as follows: in section 5.2 migration and possible consequences for agricultural practices are discussed in a wider context. In section 5.3 staple cropping practices for the three groups of households in the study villages are described. In section 5.4 the analytical model used for estimation of the production frontiers and calculation of technical inefficiency is presented. Estimation results are discussed in section 5.5. In section 5.6 the main findings are summarised and discussed.

## 5.2 migration and agricultural practices

The two important aspects of migration, earnings in the form of remittances and a loss of labour, may lead to changes in agricultural production, although in terms of income from agriculture they can offset each other. Jokisch (2002) finds for the Ecuadorian Andes that land use and agricultural production of international migrant households are not significantly different from non-migrant households. He concludes that agriculture is not abandoned even though investments in agriculture are not made. His case study appears to suggest that a middle path is followed by households that continue to practice agriculture because it remains an important cultural and risk-averse activity. But at the same time in-depth investments in cultivation are not made given poor environmental quality and low returns on cultivated crops. When agricultural innovation does not take place, agricultural practices of migrant households may become stagnant in the long run.

Consequences of migration, labour scarcity and/or the household relying on remittances as an income source, can cause inadequate attention to be paid to agriculture, which can lead to environmental degradation. Black (1993) finds for two counties in northern Portugal that migration has led, amongst others, to a reduction in the size of the herd and to application of poorer quality forms of manure to the land. In addition, he finds evidence that migrant

households abandon certain conservation practices, which previously helped to maintain levels of production as well as soil fertility.

Changes in input use due to migration may affect technical efficiency in agricultural production. Low (1986) argues for Southern Africa that inefficiency in production would increase with migration, as the departure of young, educated and adult male members leads to changes in the quality and quantity of the household labour force. According to Palmer (1985), migration in Southern Africa reduces farm output and women's welfare in particular due to the loss of male labour. However, in the case of Burkina Faso the extended farm household structure implies that the wives of migrants will continue to live in the compound of their husband and are normally supported by the head of the household, who is usually their father-in-law (David, 1995). An extended family structure is likely to imply that the loss of labour to the household is less severe, so that effects on technical inefficiency may be less than has been argued for Southern Africa.

Finally, migration can lead to an increased workload for the remaining household members, possibly implying that not all agricultural tasks can be carried out. It has been reported that the effects of international migration tend to be more severe compared to those of national migration. Mines and De Janvry (1982) find for Las Animas in Mexico that U.S.-oriented migration leads to more neglect of the village economy compared to internal migration. They attribute this neglect to the more permanent character of international migration of which the resulting remittances were found not to be used for investment, productive ventures or agricultural improvement. Kuiper (2005) finds for China that an increase in outside province migration, which has a more permanent character, induces households to change from two-season to one-season rice, which is less labour-intensive.

For Africa, Hyden *et al*. (1993) find no general tendency that migration has halted agricultural intensification or has given rise to stagnation. They do find that remittances are rarely used for capital investments in agriculture. Given the fungibility of money, however, a direct analysis of remittance use may not yield adequate insights into the consequences of migration for agriculture. Hyden *et al*. conclude that many households experience diminished agricultural production and display inadequate land improvements, primarily due to the absence of male labour, but point to large regional variation in impacts..

The central difference between households with and without migrant remittances is the relative availability of finance and labour. If households that currently send out migrants can be assumed to have more cash than those without migrant income, comparison of the two groups sheds light on the importance of financial liquidity for agricultural production (Mochebelele and Winter-Nelson, 2000). However, the distinction that is relevant here is not just between migrant and non-migrant households, but between non-migrant, continental migrant and intercontinental migrant households. As mentioned, intercontinental migration only takes place from Niaogho and Béguédo, and the influence of patterns of migration on staple cropping may be analysed investigating production technologies for the four villages.

## 5.3 staple cropping practices in the study villages

The four study villages are situated in the Central Region of Burkina Faso, which is one of the five agro-ecological zones distinguished by Kessler and Geerling (1994). Soils in the Central Region are generally characterised by limited fertility, but all four villages are situated in regions (around Kaya and Tenkodogo) in which the soils are said to be more fertile compared to other areas in the same zone. The four villages are situated in the most intensively cultivated areas of the Central Region. Annual rainfall in Boulgou, where Niaogho and Béguédo are located, is between 700 and 800 mm. This is slightly higher compared to annual rainfall of between 600 and 700 mm in Sanmatenga, where Boussouma and Korsimoro are located. Soils in Boussouma and Korsimoro as well as in Niaogho and Béguédo are characterised as shallow sometimes on an iron crust with a gravely topsoil (Kessler and Geerling, 1994).

Farm household characteristics of the two locations are given below. Table 5.1 shows that differences in these characteristics are generally small. It is, however, important to note the much higher value of remittances from intercontinental migration that only accrue to households in Niaogho and Béguédo.

In all four villages millet and sorghum are generally cultivated under traditional crop management practices where farmers use little external inputs such as purchased seed and inorganic fertiliser. Traditional crop management practices mean that labour in particular is strongly related to output. To obtain a clear insight into how exactly migration affects labour use

in staple cropping, three stages have been distinguished in the production process: preparation and planting, crop maintenance, and harvesting. An initial impression of the differences in cultivation practices between the three groups of households can be obtained by comparing these groups in terms of input use and output for these two crops.

*Table 5.1 Household descriptive statistics by location (2002)*

| ***Variables*** | ***Niaogho and Béguédo*** | ***Boussouma and Korsimoro*** |
|---|---|---|
| ***Household composition*** | | |
| Household size | 13.30 (7.66)[a] | 12.28 (6.52) |
| Inactive members | 5.86 (5.02) | 5.36 (4.46) |
| Number of wives head | 1.69 (0.93) | 1.90 (1.10) |
| Age household head | 51.83 (13.37) | 54.47 (14.45) |
| Stock of continental migrants, lagged | 0.54 (0.77) | 1.23 (1.55) |
| Stock of intercontinental migrants, lagged | 0.50 (0.96) | ~ |
| ***Human capital*** | | |
| Past absentees | 0.27 (0.45) | 0.44 (0.50) |
| Education level head | 0.62 (2.33) | 0.53 (1.57) |
| Primary education (number of adults) | 1.02 (1.42) | 1.03 (1.86) |
| Secondary education (number of adults) | 0.35 (0.92) | 0.38 (0.75) |
| ***Physical capital*** | | |
| Land (hectares) | 4.68 (4.22) | 4.83 (3.15) |
| Cattle, lagged (number) | 2.39 (3.56) | 1.23 (3.84) |
| Value productive assets, lagged (FCFA)[b] | 34,831 (49,630) | 44,239 (56,083) |
| Remittances (continental) (FCFA) | 37,937 (20,541) | 37,608 (79,044) |
| Remittances (intercontinental) (FCFA) | 70,800(192,748) | ~ |

Notes: [a] standard deviation in parentheses
[b] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)

Table 5.2 gives an overview of household labour use and yield for the three groups of households in Niaogho and Béguédo. For both millet and sorghum, Table 5.2 shows a clear difference between households belonging to the different groups. Households with continental migrants apply more labour compared to households with intercontinental migrants, but generate a slightly lower yield. It is important to note that households with continental migrants as well as

those with intercontinental migrants use much less labour, compared to households without migrants, in crop maintenance, which is clearly the most labour-intensive stage of the production process. No inorganic fertiliser was found to be used in staple cropping; application of manure is not included in the table as only a couple of households were found to use this input.[14] Households with intercontinental migrants generate the largest yield per hectare for millet and sorghum but apply the least amount of labour. The last column of Table 5.2 depicts average labour productivity, which increases with the migration status of the households.

*Table 5.2 Input use and yield for millet and sorghum cultivation in Niaogho and Béguédo (2002)*

| | ***Non-migrant (N=38)*** | ***Continental migrant (N=36)*** | ***Intercontinental migrant (N=31)*** |
|---|---|---|---|
| ***Preparation and planting*** (days/ha) | 51 (67)[a] | 51 (62) | 49 (42) |
| ***Crop maintenance*** (days/ha) | 146 (116) | 90 (82) | 92 (61) |
| ***Harvesting*** (days/ha) | 43(40) | 46(59) | 39 (38) |
| ***Yield*** (kg/ha) | 466 (167) | 507 (356) | 569 (334) |
| ***Yield*** (kg/day) | 3.18 (2.89) | 3.95 (2.70) | 4.05 (2.82) |

Notes: [a] standard deviation in parentheses

A table similar to Table 5.2 is given below for the other two villages, Boussouma and Korsimoro. Table 5.3 shows that for Boussouma and Korsimoro the situation is different. Interestingly enough, households with continental migrants in Boussouma and Korsimoro use more labour, particularly during the crop maintenance stage, which again is the most labour-intensive stage. Differences in terms of yield per hectare between households with and without continental migrants are negligible. Manure is widely used as an input in staple cropping in Boussouma and Korsimoro and appears to increase with migration status, but standard errors are large.

[14] Insecticide is used by most households but application does not vary across households in the four villages

*Table 5.3 Input use and yield for millet and sorghum cultivation in Boussouma and Korsimoro (2002)*

| | ***Non-migrant (N=41)*** | ***Continental migrant (N=76)*** |
|---|---|---|
| ***Preparation and planting*** (days/ha) | 28 (46)[a] | 32 (41) |
| ***Crop maintenance*** (days/ha) | 78 (58) | 104 (76) |
| ***Harvesting*** (days/ha) | 27 (19) | 32 (34) |
| ***Manure*** (kg/ha) | 212 (441) | 280 (534) |
| ***Yield*** (kg/ha) | 771 (482) | 776 (552) |
| ***Yield*** (kg/day) | 7.75 (5.70) | 6.82 (6.15) |

Notes: [a] standard deviation in parentheses

The last row of Table 5.3 shows that average labour productivity for households with continental migrants is lower compared to households without migrants. Comparing Tables 5.2 and 5.3 reveals that households in Niaogho and Béguédo generate much less output in staple crop cultivation.

In addition to input use, which consists of mainly household labour, farming practices are largely determined by equipment use. Animal traction in particular should be considered as a labour-saving technology device during the preparation and planting stage (Pingali *et al.*, 1989). In Niaogho and Béguédo a (rented) tractor is often used during the harvesting stage of millet in particular. The usage of animal traction as well as the tractor in staple crop cultivation should give an indication to what extent labour can be substituted for. Table 5.4 gives an overview of plough and/or tractor use at the plot level for the cultivation of the two, previously discussed crops.

*Table 5.4 Plough and tractor use in sorghum and millet cultivation (2002)*

| ***Niaogho and Béguédo*** (% of plots) | ***Non-migrant (N=55)[a]*** | ***Continental migrant (N=51)*** | ***Intercontinental migrant (N=46)*** |
|---|---|---|---|
| Animal traction | 43 | 53 | 59 |
| Tractor | 53 | 54 | 67 |
| ***Boussouma and Korsimoro*** (% of plots) | ***Non-migrant (N=167)*** | ***Continental migrant (N=306)*** | |
| Animal traction | 32 | 40 | |

Notes: [a] number of plots

Table 5.4 shows that animal traction and tractor use are most prominent on sorghum and millet plots cultivated by households with intercontinental migrants. This finding is consistent with the fact that these households use the least labour in the cultivation of these crops. Animal traction use is comparatively lower for households with continental migrants in Niaogho and Béguédo, and higher in Boussouma and Korsimoro.

Combining the findings from Tables 5.2 and 5.4, shows that in Niaogho and Béguédo households with intercontinental migrants are able to substitute labour by animal traction during the preparation and planting stage and by tractor during the harvesting stage. This does not appear to be the case for households with continental migrants whose labour input remains high for the two stages. For households with continental migrants in Boussouma and Korsimoro that use more labour in all three stages (Table 5.3), substitution does not seem to take place either. It is therefore possible that remittances primarily from intercontinental migration enable households to substitute labour by making use of labour-saving production technologies. However, it is important to realise that in Niaogho and Béguédo labour use of continental and intercontinental migrant households is lowest for the crop maintenance stage for which no equipment substitution is possible as most weeding is done by hand.

According to Fafchamps (1993) farmers in Burkina Faso retain a significant amount of flexibility in their weeding (crop maintenance) decisions and adjust their weeding effort depending upon available information at the time. Fafchamps asserts that a short agricultural season leads households to behave in particular ways in response to information. If, after planting, rains are poor so that weed grows slowly, farmers compensate the expected reduction in yield by more careful weeding. If rainfall is abundant so that weed grows faster, farmers increase effort in weeding but, due to the increased opportunity cost of labour, this increase is not proportional to weed infestation, which implies that yields do not reach their full potential. Migrant households are likely to be more responsive to poor rainfall, which involves a decrease in weeding effort compared to household without migrants, as, due to migration in the absence of a labour market, supply of labour is tighter. This scenario could describe the situation in Niaogho and Béguédo. In Boussouma and Korsimoro, households with continental migrants appear to opt for a more general strategy of intensification.

Current and future plot yields are related to soil fertility. As mentioned, soil types in the four villages are similar. However, soil and water conservation (SWC) measures may affect soil fertility. Two conservation measures were found to be common in the study villages: stone lines and grass strips. Stone lines are formed by lining up rocks along the sides of the field. Grass strips are formed by planting grass in an earth barrier along the sides of the field (Mazzucato and Niemeijer, 2000). Sometimes a combination of the above-mentioned measures is constructed where grass is planted in between the line of rocks to enhance its effectiveness. These barrier-type conservation measures are constructed in order to control run-off and erosion, and to keep organic matter on the field (Erenstein, 1999). Table 5.5 depicts the incidence of stone lines and grass strips by location and household migration status. The most important thing to note is that both grass strips and stone lines are much more common in Boussouma and Korsimoro compared to the other two villages, Niaogho and Béguédo. Construction and maintenance of the above mentioned SWC measures is mainly intensive in terms of labour input. It is possible, therefore, that the lost-labour effect of migration affects the construction of either measure. However, as Table 5.5 demonstrates, a negative relationship between migration and SWC measures cannot be established.

*Table 5.5 SWC-measures for plots by household migration status (2002)*

| ***Niaogho and Béguédo*** (% of plots) | ***Non-migrant (N=55)[a]*** | ***Continental migrant (N=51)*** | ***Intercontinental migrant (N=46)*** |
|---|---|---|---|
| Grass strips | 2 | ~ | 2 |
| Stone lines | 2 | 4 | 13 |
| ***Boussouma and Korsimoro*** (% of plots) | ***Non-migrant (N=167)*** | ***Continental migrant (N=306)*** | |
| Grass strips | 33 | 39 | |
| Stone lines | 41 | 47 | |

Notes: [a] number of plots

## 5.4 analytical model

The impact of migration on agricultural production may be further analysed by estimating a production frontier as proposed by Aigner *et al.* (1977) and calculating technical inefficiency. A

production frontier reflects the maximum obtainable output given a set of inputs; technical efficiency, in this case, relates the proximity of a farm household's output to this maximum feasible output (Coelli *et al.*, 2002).

To investigate the relationship between migration and agricultural production, an approach similar to Mochebelele and Winter-Nelson (2000) could have been followed. They estimate two separate production frontiers including maize, sorghum and wheat, and analyse technical efficiency of non-migrant and migrant farms. However, the assessment of productivity and efficiency should be restricted to relatively homogeneous production technologies (Ali and Byerlee, 1991), and in the survey villages only cultivation practices of millet and sorghum were found to be relatively similar. Maize plots, for example, are generally small and inorganic inputs are applied whereas this is not the case for millet and sorghum. It is therefore not logical to assume that the production technology of maize and staple crops, millet and sorghum, is similar.

When other crops cannot be included, the limited number of observations implies that it is not possible to estimate different production frontiers for the three groups: households without, with continental and with intercontinental migrants. It is possible, however, to estimate a frontier for staple crops, millet and sorghum, that includes observations for all three groups of households.

Situation of the four villages in the same agro-ecological zone does not guarantee that production technologies in staple crop cultivation are similar. Clearly, the availability of mechanised traction in Niaogho and Béguédo indicates that differences in cropping practices exist. It seems reasonable, therefore, to estimate two production frontiers, one for Niaogho and Béguédo and one for Boussouma and Korsimoro.

The deviation from technical efficiency is measured using two error components, which separately reflect the impact of factors controlled by farm households such as errors in the timing or method of application of inputs (Ali and Byerlee, 1991), and factors that are beyond their control, such as the weather (Aigner *et al.*, 1977). In the farm household model, introduced and developed in the previous chapters, a production function has been specified (equation (3.4)). This production function is restated here for convenience:

$$Q_s = f_1( L_s, A_s, K_s, V_s ) \tag{5.1}$$

where, as before, $L_s$ is household labour used in staple cropping, $A_s$ is cultivated land, $K_s$ refers to fixed and $V_s$ to variable inputs. The stochastic production frontier for millet and sorghum at the plot level may be written as[15]:

$$Q_i = f_1(L_i, A_i, K_i, V_i)e^{\varepsilon_i} \tag{5.2}$$

In equation (5.2) the subscript *i* refers to analysis at the plot level and the term $e^{\varepsilon_i}$ implies a stochastic production frontier that varies across plots under a particular crop. The error term is given by:

$$\varepsilon_i = \upsilon_i - u_i \tag{5.3}$$

where the first term on the right-hand side is stochastic with a symmetric distribution $(-\infty < \upsilon_i < \infty)$. This term captures the random effects of factors that operate outside of the control of the farm household as well as measurement error. The second term on the right-hand side represents the effect of producer error and has a one-sided distribution $(u \geq 0)$. This error term measures the shortfall of output, $Q_i$, relative to the potential frontier production function $Q_i = f_1(L_i, A_i, K_i, V_i)$. The index of technical efficiency is then given by:

$$Q_i / [f_1(L_i, A_i, K_i, V_i)e^{\upsilon_i}] = e^{-u_i} \tag{5.4}$$

In (5.4) $u_i$ would be 0 for absolute efficiency and the index takes the value of 1. When $u_i$ diverges from 0, the index is less than 1.

Since the appropriate functional form for the analysis cannot be determined a priori, two different production functions are estimated, the Cobb-Douglas and the translog production function. The Cobb-Douglas functional form has convex isoquants and is a suitable

[15] In the interest of clarity the subscript, $s$, has been dropped

approximation for production processes for which factors are imperfect substitutes over the entire range of input values. The assumption of imperfect substitution of factors is reasonable as agricultural production of farm households in the study villages is characterised by missing markets for inputs. Although the Cobb-Douglas production function is widely used, its imposition of unitary elasticity of substitution reduces its flexibility. The production function can also be represented in translog form, which permits a greater variety of substitution patterns. The translog production function is non-homothetic and allows for more flexibility in the production technology (Christensen *et al.*, 1973). The Cobb-Douglas production function takes the following form:

$$ln\,Q_i = \beta_0 + \sum_{j=1}^{J} \beta_j \, ln\,X_{ij} + \varepsilon_i \qquad (5.5a)$$

whereas the translog production function is specified as:

$$ln\,Q_i = \beta_0 + \sum_{j=1}^{J} \beta_j \, ln\,X_{ij} + \sum_{j=1}^{J} \beta_{jj} (ln\,X_{ij})^2 + \sum_{k=1}^{J} \sum_{j=1}^{J} \beta_{kj} \, ln\,X_{ik} \, ln\,X_{ij} + \varepsilon_i \qquad (5.5b)$$

where $Q_i$ is the output of plot *i*, $X_{ij}$ is a vector of inputs used on plot *i*, $\beta_j$ is a vector of parameters to be estimated and $\varepsilon_i$ is the composed error term given in (5.3). The density for the composed error term of equation (5.5a) and (5.5b) is given by:

$$f(\varepsilon) = \frac{2}{\sigma\sqrt{2\pi}} [\,1 - F(\varepsilon\lambda\sigma^{-1})\,] \exp[-\frac{1}{2\sigma^2}\varepsilon^2\,] \qquad (5.6)$$

where $\lambda$ is the ratio of the standard errors of *u* and *v*. The average technical inefficiency, based on the half-normal distribution of $u$ index for the entire group of farm households is given by (Aigner *et al.*, 1977):

$$E(\varepsilon) = E(u) = \left(\frac{\sqrt{2}}{\sqrt{\pi}}\right)\sigma_u \qquad (5.7)$$

In order to investigate differences between the three groups of households, technical inefficiency may also be calculated at the individual plot level. Following Jondrow *et al.* (1982) this may be done using equation (5.8)

$$E(u/\varepsilon) = \frac{\sigma_u^2 \sigma_v^2}{\sigma^2} \left( \frac{f(\varepsilon\lambda/\sigma)}{[1 - F(\varepsilon\lambda/\sigma)]} - \varepsilon\lambda/\sigma \right) \tag{5.8}$$

In (5.8) the individual technical inefficiency index is the expected value of $u$ conditional on $\varepsilon$.

Given the production frontier the marginal product of labour is given by:

$$\frac{\partial f_1}{\partial L_s} = \frac{\hat{Q}_i}{X_{L_i}} (ES_L) \tag{5.9}$$

where $\hat{Q}_i$ is the estimated plot output, $X_{L_i}$ signifies the total days of household labour used at each stage (planting and preparation, crop maintenance, and harvesting) of the production process on a particular plot and $ES_L$ is the estimated coefficient for household labour. In the case of the Cobb-Douglas production function the elasticity of substitution is equal to the estimated coefficient for labour, $ES_L = \beta_j$ .

## 5.5 results

When a joint Cobb-Douglas production function is estimated for sorghum and millet cultivation at the plot level for farm households in all four villages (see appendix), it becomes clear that the location dummy is strongly significant. This indicates that there may be differences in the production technology between the villages in the south, Niaogho and Béguédo, and those situated in the north, Boussouma and Korsimoro, of the Central Plateau. A Chow-breakpoint test was carried out to test for the existence of a breakpoint between the two locations. The null-hypothesis of no structural break is decisively rejected at the five per cent level. It is reasonable

therefore to estimate two separate production functions, one for Niaogho and Béguédo and one for Boussouma and Korsimoro.

Two translog equations as specified in equation (5.5b) were estimated initially. To determine whether to use the translog or Cobb-Douglas specification in the further analysis, an F-test can be used, testing whether the squared and cross-terms of the translog estimations are significantly different from zero. If this is not the case the translog specification simplifies to the Cobb-Douglas functional form. The restrictions put on the translog specification could not be rejected for households in Boussouma and Korsimoro[16], as well as for Niaogho and Béguédo[17]. Further analysis will therefore be based upon the Cobb-Douglas specification for both production functions. In order to do justice to the importance of household labour in the production process, the three stages of the process are included separately in the production function. The two production functions are estimated using a maximum likelihood (MLE) procedure.

The results of the frontier estimation are given in Table 5.6. For both locations labour and land determine the production frontiers to a large extent. However, there are differences in production technology between the two locations. In terms of household labour use in Niaogho and Béguédo, labour used in crop maintenance does not contribute positively to yield. This finding offers support for the poor rainfall scenario, where weed growth is limited so that labour in weeding can be decreased without affecting yield. In Boussouma and Korsimoro, labour in weeding contributes positively to yield so that for households with continental migrants that appear to follow a strategy of intensification, higher labour input during this stage is realistic. In terms of traction use, clearly both plough and tractor are important in explaining output for Niaogho and Béguédo, whereas in the other two villages only the plough is used. In Boussouma and Korsimoro labour used in crop maintenance and harvesting stages contributes significantly to yield, as does manure. It is important to note that the production elasticity of labour is much higher in Boussouma and Korsimoro whereas the production elasticity of land is higher in Niaogho and Béguédo.

[16] the calculated F-value of 1.48 does not exceed the critical F-value $_{(21, 443, 0.01)}$ of 1.88
[17] the calculated F-value of 1.71 does not exceed the critical F-value $_{(21, 122, 0.01)}$ of 2.03

*Table 5.6 MLE estimation results for sorghum and millet output (Kg) (2002)*

| ***Explanatory variables*** | ***Niaogho and Béguédo*** | ***Boussouma and Korsimoro*** |
|---|---|---|
| Constant | 5.45 (0.26)[a]**[b] | 4.93 (0.23)** |
| Area of land cultivated | 0.33 (0.06)** | 0.23 (0.04)** |
| Labour preparation/planting | 0.20 (0.07)** | 0.06 (0.06) |
| Labour crop maintenance | -0.11 (0.05)** | 0.11 (0.05)** |
| Labour harvesting | 0.20 (0.05)** | 0.29 (0.06)** |
| Manure quantity (kg) | ~ | 0.04 (0.01)** |
| Insecticide (kg) | -0.02 (0.02) | 0.04 (0.01)** |
| Tractor cost (FCFA) | 0.07 (0.02)** | ~ |
| Dummy for plough use | 0.27 (0.10)** | 0.13 (0.06)** |
| Dummy for crop type (millet=1) | -0.04 (0.14) | -0.36 (0.06)** |
| Dummy for intercropping | 0.15 (0.12) | -0.03 (0.04) |
| Average inefficiency | 0.51 | 0.41 |
| Number of observations | 152 | 473 |

Notes: [a] standard error in parentheses
[b] ** denotes significance at the 5% level, * at the 10% level

The production frontier, as mentioned, describes the maximum attainable output given inputs. Given the production frontier it is useful to further investigate labour use in the production process in order to analyse the possible links between migration and staple cropping practices. For millet and sorghum labour is the most important variable input. The marginal physical product of labour for the three groups of households is calculated on the basis of the MLE estimates of the production frontier, using (5.9). Table 5.7 depicts some interesting findings. A first thing to note is that the overall marginal physical product of labour is much higher for households in Boussouma and Korsimoro. The table also shows that in Niaogho and Béguédo the marginal product of labour in harvesting of households with intercontinental migrants is much higher compared to households without migrants, whereas the marginal product of labour in preparation and planting is significantly higher for households with continental migrants. In contrast, in Boussouma and Korsimoro, the marginal product of labour of households with continental migrants is lower for all three stages.

*Table 5.7 Marginal product of household labour (kg/day) (2002)*

| ***Niaogho and Béguédo*** | ***Non-migrant (N=38)*** | ***Continental migrant (N=36)*** | ***Intercontinental migrant (N=31)*** |
|---|---|---|---|
| Preparation and planting | 6.49 (2.98)[a] | 6.68 (4.51) | 5.91 (4.87) |
| Crop maintenance | -0.84 (0.93) | -0.86 (0.80) | -1.14 (0.94) |
| Harvesting | 6.92 (5.34) | 5.92 (4.99) | 8.59 (9.64) |
| ***Boussouma and Korsimoro*** | ***Non-migrant (N=41)*** | ***Continental migrant (N=76)*** | |
| Preparation and planting | 3.60 (1.39) | 3.44 (1.30) | |
| Crop maintenance | 1.83 (0.80) | 1.66 (0.99) | |
| Harvesting | 11.58 (3.93) | 10.85 (3.78) | |

Notes: [a] standard deviation in parentheses

As shown in Table 5.3, households with continental migrants in Boussouma and Korsimoro use more labour in particular for the crop maintenance stage. Women in particular are found to increase their labour input during this stage, but it is possible that they are not as productive as men, as demonstrated for example by Jacoby (1993) for Peru. The marginal product of labour during the crop maintenance stage is negative for households in Niaogho and Béguédo, hence the rationale for reducing this type of labour input. Households with intercontinental migrants in Niaogho and Béguédo generate a higher marginal physical product of labour during the harvesting stage, which may be explained by their higher level of tractor use.

In addition to the marginal physical product of labour, inefficiency in staple crop production can be analysed. Average inefficiency, calculated by using equation (5.7) and reported at the bottom of Table 5.6, is different for households in the two locations. In Niaogho and Béguédo 49 per cent of potential production is reached whereas plots in Boussouma and Korsimoro yield on average 59 per cent of the yield of the most efficient plots that determine the frontier. The difference in technical inefficiency between the two locations should not be surprising given the much lower average labour productivity in Niaogho and Béguédo.

In order to further compare the three groups of households, technical inefficiency is also calculated at the individual plot level using equation (5.8). Results are given in Table 5.8.

*Table 5.8 Technical inefficiency for individual plots (2002)*

| ***Niaogho and Béguédo*** | ***Non-migrant (N=55)[a]*** | ***Continental migrant (N=51)*** | ***Intercontinental migrant (N=46)*** |
|---|---|---|---|
| | 0.53 (0.30)[b] | 0.46 (0.21) | 0.52 (0.32) |
| ***Boussouma and Korsimoro*** | ***Non-migrant (N=167)*** | ***Continental migrant (N=306)*** | |
| | 0.41 (0.18) | 0.41 (0.18) | |

Notes: [a] number of plots
[b] standard deviation in parentheses

The table demonstrates that there is no difference between household migratory status and inefficiency in Boussouma and Korsimoro. Inefficiency is slightly lower for households with continental migrants in Niaogho and Béguédo, but the difference across household groups is not significant.

It is possible that efficiency is related to plot size, where large plots would enable more efficient production. Plots may be stratified in three types, small (<0.5 ha), medium (0.5-1.5 ha) and large (>1.5 ha). Table 5.9 depicts inefficiency for the three types of plots. and shows that inefficiency falls with plot size in Niaogho and Béguédo whilst a similar relationship between plot size and inefficiency is not found for Boussouma and Korsimoro.

*Table 5.9 Technical inefficiency and plot size (2002)*

| ***Niaogho and Béguédo*** | ***Small plots (<0.5) (N=28)[a]*** | ***Medium plots (0.5-1.5) (N=60)*** | ***Large plots (>1.5) (N=64)*** |
|---|---|---|---|
| | 0.58 (0.45)[b] | 0.53 (0.29) | 0.45 (0.16) |
| ***Boussouma and Korsimoro*** | ***Small plots (<0.5) (N=257)*** | ***Medium plots (0.5-1.5) (N=135)*** | ***Large plots (>1.5) (N=80)*** |
| | 0.41 (0.20) | 0.40 (0.16) | 0.43 (0.16) |

Notes: [a] number of plots
[b] standard deviation in parentheses

Table 5.8 suggests that efficiency in millet and sorghum cultivation does not change significantly with migration status in either of the locations. These findings are in contrast with Mochebelele and Winter-Nelson (2000) who find for Lesotho that inefficiency falls with migration, and who attribute the greater inefficiency of non-migrant farms to the absence of

remittance income. The findings here do not support Mochebelele's hypothesis that migration does have an impact on technical efficiency. It is possible, of course, that remittances provide migrant households with the financial liquidity to respond better to farm management imperatives compared to households without migrants. However, this may not compensate for the loss of labour the household suffers in the absence of a labour market and suitable substitution possibilities.

## 5.6 conclusions and discussion

When markets are incomplete or missing, migration is likely to have an impact on cropping practices. In this chapter the consequences of continental and intercontinental migration for staple cropping practices are analysed. Staple cropping practices are characterised as traditional, with little use of external inputs and households relying heavily on labour input. A missing market for labour implies that labour lost to migration cannot be replaced by hired labour and the consequences of migration may therefore be severe. To do justice to the importance of labour in the production process, three stages are distinguished in staple cropping: preparation and planting, crop maintenance, and harvesting. Labour substitution possibilities in the form of equipment exist only at the preparation and planting and harvesting stage. Both continental and intercontinental migration represent a loss of labour to the household, but also a gain in the form of remittances that is more substantial for households with intercontinental migration.

Separate production frontiers are estimated for the two locations, Niaogho and Béguédo versus Boussouma and Korsimoro, and clear differences are found to exist between these locations. Labour use in crop maintenance has a negative, significant impact on yield in Niaogho and Béguédo where both the tractor and the plough are important in explaining yield. In Boussouma and Korsimoro, labour use in the crop maintenance and harvesting stages contributes positively to output. In addition, organic fertiliser partly explains yield, and plough use is important.

Taking the incidence of SWC measures as well as the application of fertiliser to be indicators of the sustainability of cropping practices, a relationship at the household level between migration status and sustainability has not been uncovered. Substantial differences in

sustainability of practices do exist at the location level as, in contrast to Niaogho and Béguédo, in Boussouma and Korsimoro households apply organic fertiliser, and stones lines, and grass strips have been constructed on a large number of plots.

It appears that in response to migration, households in all four villages adjust to changing factor endowments. In Niaogho and Béguédo, the lost-labour effect leads to a reduction in labour use in crop maintenance, and households with intercontinental migrants resort to a strategy of substitution for the planting and preparation as well as the harvesting stage. Arguably, households with intercontinental migrants are able to do so because they receive substantial amounts of remittances. Households with continental migrants in Niaogho and Béguédo do not substitute in response to the loss of labour, but are able to reduce labour used in crop maintenance without affecting yields. The flexibility retained regarding effort in weeding may allow for lower labour input of households with continental and intercontinental migrants during this stage. Households in Boussouma and Korsimoro resort to a strategy of intensification, increasing labour input and manure application in response to migration. It is possible that labour is relatively abundant in these two villages, leading households with migrants to increase labour input beyond the optimum. In Niaogho and Béguédo capital appears to be relatively abundant rendering a strategy of substitution for labour logical.

The ability of households to adopt their staple cropping practices to changing factor endowments implies that migrant households remain involved in staple cropping. At the same time in-depth investments in staple cropping are not made by continental or intercontinental migrant households. With the exception of the rental of a tractor, staple cropping practices remain traditional for households with either type of migrant in all four villages. These findings tie in with for example Jokisch (2002) for the Ecuadorian Andes, where land use and agricultural practices were found not to differ between international and non-migrant households. It is possible that in the study villages staple cropping does remain an important activity for migrant households, but that poor soil quality and low returns render investment in staple cropping unattractive.

CHAPTER 6

# migration and household welfare

## 6.1 introduction

A shock in migration influences household behaviour in a number of ways. As mentioned, the NELM theory predicts that migration affects activity choice and derived income. Chapter 4 demonstrates that continental migration does not influence household activity choice. Intercontinental migration, however, increases the probability of the household to invest in livestock, whereas it reduces the probability of engagement in non-farm activities. In terms of sources of income, the incidence of continental migration was found to reduce household income from non-farm activities. Having intercontinental migrants increases the income of households from livestock keeping, but has a negative influence on income earned in staple cropping and non-farm activities.

Changes at the production side of the farm household model imply changes in full income. Full income constrains consumption of goods and home-time of households. Changes in consumption impact on household utility and welfare. In addition, migration leads to a reduction in household size, which may lead to changes in consumption.

In this chapter the effects of an increase in migration (and related remittances) will be traced through facets of the farm household model. Changes at both the production and the consumption side of the model will be analysed and the relationship between changes n migration and welfare of households will be explored. The distinction between households with continental and intercontinental migrants is maintained.

This chapter continues as follows: in section 6.2 the concept of shadow full income is introduced, which includes a valuation of household time. So far, remittances have been omitted from the analysis but in section 6.3 a remittance function is estimated enabling household income to be fully defined. The application of the concept of shadow full income also enables a broadening of the analysis of household behaviour so that all facets of the household are

included. Having completed the analysis of the components of shadow full income, section 6.4 discusses the consumption side of the farm household model using demand functions. The demand function for home time also constitutes a function for household labour supply so that the influence of changes in migration on the shadow wage can be analysed. Equivalent Variation (EV) is introduced in section 6.5 as a measure through which welfare changes are established. In section 6.6 a 10 per cent increase in migration is simulated and the impact on production, consumption as well as welfare changes of the household is estimated. Section 6.7 summarises the main findings.

## 6.2 shadow full income

The household utility function that was presented in Chapter 4 now explicitly includes the categories for consumption and is given in 6.1.

$$U = u(X_s, X_o, X_m, X_h; Z_U) \tag{6.1}$$

Households derive utility from consumption of own staple crop, $X_s$, other output, $X_o$, purchased goods $X_m$, and home-time, $X_h$. Households are limited in their consumption by a budget constraint, since they cannot spend more than they earn. In order to determine household earnings, full income needs to be calculated. Full income refers to a definition of household income that includes a valuation of household time. When determining full income in the absence of a labour market, the shadow wage may be included to value household time, yielding "shadow full income" (Jacoby, 1993). At the equilibrium point, the shadow wage of each farm worker, $\hat{w}$, is the marginal product of household labour in staple cropping as derived in Chapter 5.

$$\hat{w} = p_s \frac{f_1}{L_s} \tag{6.2}$$

A production function for staple cropping was estimated in Chapter 5, where labour input in three different stages was included separately. In this chapter the staple cropping production frontier is re-estimated using only one labour variable. The results from the estimation are used to calculate the marginal value product or the shadow wage of labour in staple cropping. Following Jacoby (1993) shadow full income is calculated using the shadow wage to determine profits in agriculture and to value household time.

$$Y^* = \pi_s(\hat{w}) + \hat{w}T + R + \pi_o(\hat{w}) \tag{6.3}$$

and

$$\pi_s = Max_{L_s}\, p_s f_1(L_s, A_s, K_s, V_s) - \hat{w}L_s - p_s^v V_s \tag{6.4}$$

In equation (6.3) and (6.4) $\pi_s$ represents "shadow" farm profit, where the opportunity cost of household labour as well as the costs of other inputs are deducted. The opportunity cost of labour consists of the labour used in agriculture, $L_s$, times the shadow wage, $\hat{w}$.

Functions for the net incomes from other activities were estimated in Chapter 4. In equilibrium the household equalises the marginal value product of staple and non staple-cropping activities so that the shadow wage, as derived from the staple cropping production function, may be used to calculate "shadow profit" in non-staple cropping activities (Skoufias, 1994).

Remittance income, $R$, is considered as an external source of income from which shadow wages are not subtracted. However, in order to incorporate remittances in the simulation, it is necessary to estimate a remittance function.

## 6.3 determinants of remittances

Remittances were not included in the system of income equations estimation in Chapter 4. A separate remittance function given in Chapter 3 and restated here for convenience is estimated in order to incorporate remittances into shadow full income.

$$R = f_3(M_C, M_I; Z_R) \quad (6.5)$$

Given migration, motivations to remit are considered complex (Taylor *et al.*, 2003). It is often suggested that the remittance level may be influenced by village norms to remit (Taylor *et al.*, 2003). However, in the current study the destination of migrants is likely to explain most of the variation in remittances. Intercontinental migration leads to substantially larger amounts of remittances received by the household (see Table 3.2).

Lucas and Stark (1985) have argued that migrants remit both for altruistic and selfish reasons. Altruistic reasons suggest that migrants would remit more to households with a larger number of dependants (Hoddinott, 1994). Selfish reasons could be linked to the migrant's aspiration to inherit. A middle-path between altruistic and selfish reasons for remitting is the suggestion of an existence of a contractual arrangement between the household and the migrant. Such a contractual arrangement has been discussed in Chapter 4.

In order to gain a more complete picture regarding remittance behaviour, interviews have been held with Burkinabé migrants in Italy (see Box 2.2). The results from these interviews offer support for the contract theory, as it was found that often the departure of the migrant has indeed been financed by the household, primarily through livestock sales. The level of remittances was often found to depend on requests of the household, which may be motivated by investment motives but could also be related to shocks for example in cropping.

Education of the migrant is likely to increase the wage earned by the migrant and could therefore positively influence the level of remittances (Lucas and Stark, 1985). Hoddinott (1994), for example, finds that the level of remittances is positively related to the attainment of primary and secondary education. Education may also influence the remittance level if it is viewed as part of the contractual arrangement according to which the investment in the migrant's education needs to be repaid (Lucas and Stark, 1985).

A simple OLS regression is used to estimate remittances. As not all households with migrants receive remittances, selectivity bias is controlled for by including an inverse Mills ratio generated through the estimation of a probit determining the likelihood of remittances received by the household. The results of the probit regression are given in the appendix.

In order to capture the influence of education on the level of remittances, the average number of years of education of migrants in the household is included. To account for the influence of migrant experience on remittances, the average age of migrants in the household is taken. In rural Burkina Faso, as in other African countries, adult sons are most likely to take over as head of household. The size of the inheritance is therefore likely to be related to the current number of adult sons in the household. Finally, to capture altruistic motives for remitting, the number of dependants has been included in the regression. A location dummy serves to capture the role of a village norm for remitting. Results of the estimation of the remittance equation are given in Table 6.1.

*Table 6.1 OLS estimation results of remittances (FCFA[a]/10,000) corrected for selectivity bias (2002)*

| ***Explanatory variables*** | ***Remittances*** |
|---|---|
| Constant | 12.29 (30.79)[b] |
| Number of intercontinental migrants | 17.39 (3.47) **[c] |
| Number of continental migrants | 0.93 (3.21) |
| Education level of migrant(s) | 0.66 (0.35)* |
| Average age of migrant(s) | -0.07 (0.41) |
| Number of dependants | 0.89 (0.30)** |
| Number of adult sons | -2.03 (0.95) |
| Household land holdings per adult son | -0.45 (1.56) |
| IMR | 3.84 (19.82) |
| Adjusted R-squared | 0.75 |
| Number of observations | 96 |

Notes: [a] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)
[b] standard error in parentheses
[c] * denotes significance at the 10 percent level, ** denotes significance at 5 percent level

Table 6.1 confirms that the destination of migrants is most important in determining the level of remittances. As remittances from intercontinental migrants are more than five times larger than those from continental migrants (Table 3.2), this result is not surprising. The role of the number of dependants in explaining the level of remittances could be an indication of altruistic motives for remitting. The positive influence of the education level of the migrant on the level of remittances could point to a contractual arrangement according to which investments in the

education of the migrant are paid back to the household. It is also possible that the positive influence of education on wages increases the level of remittances.

## 6.4 household utility

The estimation of remittance income completes the budget constraint faced by the household when maximising utility. The income equation given in (6.3) includes a valuation of the stock of time available to the household. The explicit recording of the value of time is based on Becker's concept of full income. According to Becker (1965) the time that can be used productively should be valued at the market price (in this case the shadow wage). The value of time is included in the full income constraint because time can be converted into goods by spending more of it in productive activities.

The budget constraint that the household faces when maximising utility looks as follows:

$$\pi_s(\hat{w}) + \hat{w}T + R + \pi_o(\hat{w}) = p_s X_s + p_o X_o + p_m X_m + X_h \hat{w} \tag{6.6}$$

When maximising the household utility function (6.1) subject to equation (6.6) and a time constraint as in (4.6), the same first-order conditions result, but the problem now looks like a pure consumer problem (Jacoby, 1993).

$$\frac{\partial u}{\partial X_s} = \lambda_0 p_s \tag{6.7a}$$

$$\frac{\partial u}{\partial X_o} = \lambda_0 p_o \tag{6.7b}$$

$$\frac{\partial u}{\partial X_m} = \lambda_0 p_m \tag{6.7c}$$

$$\frac{\partial u}{\partial X_h} = \lambda_0 \hat{w} \tag{6.7d}$$

Equations (6.7a-d) correspond to the standard first-order conditions of consumer demand theory. Utility maximisation implies that the household demands the goods it consumes at the level where the marginal utility of consuming the good is equal to the opportunity cost in terms of lost utility from other uses of household income. The opportunity cost of consumption is determined by the marginal utility of income, $\lambda_0$. The solution to the revised utility maximisation problem is a set of Marshallian demand curves for goods and home-time of the form:

$$X_i = X(\hat{w}, p_m, p_s, p_o, Y^*, Z_U) \qquad i = s,o,m,h \tag{6.8}$$

Equation (6.8) shows that consumption demand depends on the shadow wage, prices, shadow full income as well as other household characteristics that influence utility maximisation.

A functional form needs to be selected to estimate the demand functions of (6.8). The Linear Expenditures System (LES) developed by Stone (1954) may be used. Other functional forms such as the Almost Ideal Demand System (AIDS) or the Generalized Ideal Demand System (GAIDS) are often preferred due to their more flexible forms and the possibility to use linear estimation techniques (Sadoulet and De Janvry, 1995). However, both AIDS and GAIDS require the use of prices, information on which was not available. It is possible to obtain and use unit prices from the survey data for several goods by dividing expenditure on that good by the quantity consumed. However, due to quality effects and measurement errors, household unit values cannot be used as direct substitutes for true market prices when analysing demand. Demand functions for categories such as meat, cereals, etc. can be estimated using unit values given data that contain a sufficient number of geographical clusters, which enable usage of information on the spatial distribution of prices (Deaton, 1988). However, in the current study expenditure on non-food items, such as luxury goods, but also health and education, is relevant. The non-food category is heterogeneous, so that it is more reasonable to use expenditure data instead of calculating unit values for these goods. In addition, clustering is only possible at the village or regional level so that only a limited number of clusters (4 or 2) is available. It was

therefore opted to use the LES despite its well-know limitations. The LES is derived from the Stone-Geary utility function of the form[18]:

$$u = \prod_{i=1}^{n} ( x_i - c_i )^{b_i} \text{ with } \begin{array}{l} 0 < b_i < 1 \\ \sum_i b_i = 1 \\ x_i - c_i > 0 \end{array} \tag{6.9}$$

In (6.9) the $c_i's$ may be interpreted as consumption to which each adult equivalent is committed or subsistence requirements below which the adult equivalent cannot fall. The demand functions derived from maximisation of (6.9) subject to (6.6) constitute the LES:

$$p_i x_i = c_i p_i + b_i ( y^* - \sum_i c_i p_i ) \tag{6.10a}$$

$$\hat{w}( t - l ) = c_j \hat{w} + b_j ( y^* - \sum c_i p_i - c_j \hat{w}_j ) \tag{6.10b}$$

Demand equations for goods (6.10a) and home-time (6.10b) have been separated in order to facilitate the estimation process. Demand for home time has been defined as total time available minus time used in productive activities.

There are several reasons why demand at adult equivalent level yields better insights regarding household behaviour. One important reason for modelling demand on an adult equivalent basis is migration. As mentioned in previous chapters, migration reduces consumption needs of the resident household. Household expenditures on subsistence goods are likely to decrease because migration reduces household size. In terms of equations (6.10) this would imply a change in parameters allocating income to subsistence and above subsistence expenditure. If demand is defined at adult equivalent level, parameter changes can be avoided. Expenditure per adult equivalent will change, but the allocation parameters remain the same. Other reasons for estimating demand at adult equivalent level exist. Larger households are likely to allocate more income to subsistence expenditure than smaller households at the same income

[18] The use of lower case letters in (6.8) and subsequent equations indicate that the analysis is carried out at adult equivalent level

level. In addition, different household members may have different consumption needs. A distinction can be made, for example, by age and sex of household members (Kuiper, 2005).

The demand functions at per adult equivalent level are obtained by dividing consumption, subsistence consumption, and income by the number of adult equivalent consumers in the household:

$$H_I = N - \overline{M}_C - \overline{M}_I + \beta D \tag{6.11}$$

Equation (6.11) is similar to equation (3.3) except that for modelling demand, the stock of continental and intercontinental migrants $\overline{M}_C$ and $\overline{M}_I$ is taken as exogenous to reduce the complexity of the model. In the simulation model, the number of migrants will be varied.

In (6.10a) each adult equivalent is committed to expenditure on subsistence of $c_i p_i$ whereas "uncommitted" or "supernumerary" income is represented by the term in brackets. In equation (6.10b) subsistence consumption of home time is given by $c_j \hat{w}$. Households thus use up to a certain amount of their income on subsistence consumption and then distribute the remainder of their income over other commodities in fixed proportions given by the $b's$, which are the marginal budget shares (Stone, 1954; Sadoulet and De Janvry, 1995).

## 6.5 parameter estimation

As mentioned, information on prices was not collected and cannot be extracted from the data. Prices can be normalised to one so that expenditures on the different categories can be included in estimation of the system of equations defined in (6.10). Information on shadow wages has been extracted from the estimation of the staple cropping production function so that shadow wages can be included in the estimation. The Stone-Geary utility function, specified in (6.9) requires that the marginal budget shares sum to one. This implies that an estimate of the final equation follows from the estimates of the other equations.

A limitation of the Stone-Geary utility function is its inability to allow for inferior goods. To avoid negative income elasticities the different commodities are aggregated into five

groups (own food, purchased food, non-food, durables and other expenses and home time). Table 6.2 depicts household expenditure on the above-mentioned commodity categories.

*Table 6.2 Expenditure categories by migration status (FCFA)[a] (2002)*

| | ***Non-migrant (N=78)*** | ***Continental migrant N=112)*** | ***Intercontinental migrant (N=32)*** |
|---|---|---|---|
| Full income per a.e[c] | 82,674 (34,422)[b] | 86,044 (35,344) | 94,020 (46,728) |
| Own produced food per a.e. | 28,132 (23,403) | 31,977 (33,369) | 26,263 (19,271) |
| Purchased food per a.e. | 13,247 (9,519) | 13,632 (13,410) | 16,311 (13,292) |
| Nonfood per a.e. | 12,028 (10,238) | 12,223 (13,110) | 27,458 (27,818) |
| Durables and other expenses per a.e. | 5,363 (6,766) | 4,879 (5,790) | 10,421 (15,188) |
| Home time per a.e. | 23,904 (20,990) | 23,333 (21,185) | 13,567 (24,382) |

Notes: [a] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)
[b] standard deviation in parentheses
[c] a.e. is migration corrected adult equivalent consumers, see (6.11)

Households are again grouped by migration status: households without, with continental and with intercontinental migrants. Differences between consumption and income, derived from the production side are found to be small so that the finding of minimal use of credit and loans by households is consistent with the data. Data on full income as well as expenditure on the different consumption categories permit the calculation of budget shares, which are given in Table 6.3

*Table 6.3 Budget shares for expenditure categories by migration status (2002)*

| | ***Non-migrant (N=78)*** | ***Continental migrant (N=112)*** | ***Intercontinental migrant (N=32)*** |
|---|---|---|---|
| Own produced food per a.e.[b] | 0.34 (0.15)[a] | 0.37 (0.17) | 0.28 (0.22) |
| Purchased food per a.e. | 0.16 (0.09) | 0.16 (0.10) | 0.17 (0.12) |
| Nonfood per a.e. | 0.15 (0.12) | 0.14 (0.11) | 0.29 (0.17) |
| Durables and other expenses per a.e. | 0.06 (0.07) | 0.06 (0.07) | 0.12 (0.08) |
| Home time per a.e. | 0.29 (0.18) | 0.27 (0.17) | 0.14 (0.18) |

Notes: [a] standard deviation in parentheses
[b] a.e. is migration corrected adult equivalent consumers, see (6.11)

Combining the findings from Tables 6.2 and 6.3 yields some interesting insights regarding the differences between the groups. Spending patterns of household without and with continental migrants are quite similar. Households with intercontinental migrants, which earn the highest full income, spend a substantially larger share of their income on non-food items and durables, whilst home-time and own-produced food consumption constitute a smaller share of expenditures.

The lower share of own-produced food for households with intercontinental migrants is conform Engel's law of consumption. The non-food category is quite heterogeneous and includes beauty products and health care. This category considers a number of items that can be considered luxury goods and it is therefore not surprising that the share increases with household income. Although the share of durables and other expenses is higher for households with intercontinental migrants, the difference is small compared to the other groups of households.

Consumption of home-time constitutes a particular important expenditure category for households with continental and intercontinental migrants. Given the seasonality of cropping activities, a large part of home time may be considered as "committed" i.e. consumed when there are no cropping activities. This would explain why the share of home time does not increase for households with intercontinental migrants.

To solve for the system of equations in (6.10), a two-stage iterative procedure is followed. This procedure exploits the fact that, for given $b$, the LES is linear in $c$ (Sadoulet and De Janvry, 1995), so that the following functions may be estimated:

$$p_j q_j - b_j y^* = c_j(\hat{w} - b_j \hat{w}) - \sum_{j \neq i} c_i b_j \qquad (6.10c)$$

$$p_j q_j - c_j \hat{w} = b_j(y^* - \sum_i c_i - c_j \hat{w}) \qquad (6.10d)$$

Because the demand function for home time is the only category for which prices (shadow wage) are available, this function is estimated initially. Estimating (6.10c) using OLS regression without intercept and using an initial value of $b_j$, yields values for $c_i$ as well as $c_j$. These are

inserted in (6.10d) to yield estimates for $b_j$ again using OLS regression without intercept. The iteration continues until the sequence converges to stable estimates of $b_j$ and $c_j$.

The value for subsistence consumption of all expenditure categories as well as the marginal budget share of home time is inserted in a system of the remaining demand functions, which is solved using Zellner's seemingly unrelated regression procedure. In the last system equation a restriction is included so that $\sum_i b_i + b_j = 1$. The following marginal budget shares and subsistence consumption shares result from the system and home demand estimations.

*Table 6.4 Marginal budget shares (2002)*

| | ***Non-migrant (N=78)*** | ***Continental migrant (N=112)*** | ***Intercontinental migrant (N=32)*** |
|---|---|---|---|
| Own produced food per a.e.[a] | 0.25 | 0.39 | 0.20 |
| Purchased food per a.e. | 0.27 | 0.16 | 0.16 |
| Nonfood per a.e. | 0.24 | 0.28 | 0.39 |
| Durables and other expenses per a.e. | 0.15 | 0.10 | 0.15 |
| Home time per a.e. | 0.09 | 0.07 | 0.10 |

Notes: [a] a.e. is migration corrected adult equivalent consumers, see (6.11)

*Table 6.5 Subsistence consumption shares[a] by expenditure category (2002)*

| | ***Non-migrant (N=78)*** | ***Continental migrant (N=112)*** | ***Intercontinental migrant (N=32)*** |
|---|---|---|---|
| Own produced food per a.e.[b] | 0.60 | 0.45 | 0.57 |
| Purchased food per a.e. | 0.46 | 0.55 | 0.41 |
| Non-food per a.e. | 0.52 | 0.33 | 0.14 |
| Durables and other expenses per a.e. | 0.30 | 0.31 | 0.04 |
| Home time per a.e. | 0.85 | 0.73 | 0.35 |

Notes: [a] per cent of total expenditures by category
[b] a.e. is migration corrected adult equivalent consumers, see (6.11)

Income elasticities are calculated using:

$$\eta_{i,j} = \frac{b_{i,j}}{w_{i,j}} \tag{6.12}$$

where $w_{i,j}$ is the budget share as given in Table 6.3. The income elasticities for the three groups of households are given in Table 6.6. One important feature that emerges from the table is the comparatively low income elasticity for home time, so that households display low responsiveness to income changes in home time consumption. Low income elasticities point to high subsistence quantities (Table 6.5). The low elasticity for home time indicates that consumption of this good has a large "committed" component, which is not surprising taking into consideration the seasonal character of agriculture. Although farm households retain a certain flexibility regarding their labour input in staple cropping, particularly during the crop maintenance stage (see Chapter 5), production flexibility suffers from missing markets, which imply that bottlenecks in, for example, labour demand cannot be resolved (De Janvry *et al.*, 1991). The importance of cash cropping activities, which have a less seasonal character for households with intercontinental migrants, may explain the more elastic response of home time consumption to income changes.

*Table 6.6 Income elasticities by household group (2002)*

| | ***Non-migrant (N=78)*** | ***Continental migrant (N=112)*** | ***Intercontinental migrant (N=32)*** |
|---|---|---|---|
| Own produced food per a.e.[a] | 0.74 | 1.05 | 0.71 |
| Purchased food per a.e. | 1.69 | 1.00 | 0.94 |
| Non-food per a.e. | 1.50 | 2.00 | 1.34 |
| Durables and other expenses per a.e. | 2.50 | 1.67 | 1.25 |
| Home time per a.e. | 0.31 | 0.26 | 0.71 |
| Labour supply per a.e. | -0.44 | -0.80 | -2.78 |

The category of durables and other expenses is most sensitive to income changes for households without migrants. This expenditure contains items such as radios, clothes, money spent on weddings, funerals, some of which may be considered luxury items. For households with continental and intercontinental migrants the non-food category is most elastic.

Consumption of own produced food, which would be expected to represent high subsistence quantities, is fairly elastic with respect to income, in particular for households with continental migrants. Due to high transport costs and low agricultural productivity, rural food

markets in Burkina Faso are thin and isolated. This implies that farm households face food prices that are volatile and highly correlated with their own agricultural output (Strauss, 1982). As mentioned previously, the own food category also includes meat and vegetables, which are likely to be more income elastic.

The labour supply elasticities are derived from the elasticities for home-time demand using (Barnum and Squire, 1979):

$$\frac{\partial l}{\partial y^*}\frac{y^*}{\partial l} = -\frac{\partial x_h}{\partial y^*}\frac{y^*}{x_h}\frac{x_h}{l} = -\frac{\partial x_h}{\partial y^*}\frac{y^*}{x_h}\left(\frac{t-l}{l}\right) \tag{6.13}$$

The results in Table 6.6 show that households with intercontinental migrants are most responsive to income changes in terms of labour supply per adult equivalent. Home time is a normal good, so that an increase in income leads to a reduction in labour supply. The low elasticity of labour supply for households without and with continental migrants illustrates the emphasis on food security of these comparatively poor households. In a context of thin and isolated rural food markets, food security is best assured through food self-sufficiency (Fafchamps, 1992), hence the lack of response in labour supply to an income change. For households with intercontinental migrants, own produced food constitutes a smaller share in their budget. A smaller share of own-produced food in total consumption and higher income increase the risk-bearing ability of households with intercontinental migrants, which means they are able to devote more or of their resources to cash cropping (Fafchamps, 1992). Cash cropping, as mentioned, is less seasonal compared to staple cropping so that home-time has a smaller pre-committed component.

## 6.6 welfare implications

Changes in income or household characteristics change utility. Implications for household welfare can be measured using equivalent variation (EV). EV is the minimum amount of money that the farm household requires to accept a change. From any base run scenario, the equivalent variation is monotonic with the level of utility which would have been achieved by the change; in other words, the greater the increase in utility brought about by the proposed change the more

money is necessary to achieve that change provided marginal utility is always positive. The compensating variation (CV) which measures the amount of money that the farm household would accept to compensate it for the change is not monotonic and therefore not suitable for the ordering of welfare changes (Foster and Neuburger, 1974). The EV for a Stone-Geary utility function is calculated as follows (Sadoulet and De Janvry, 1995):

$$EV = y^1 - y^0 - [e(p^1, u^1, Z_u) - e(p^0, u^1, Z_u)] \tag{6.14}$$

where the superscript $0$ refers to income, prices, and utility in the initial situation, and $1$ to these variables after the change. Substituting $y^0$ for expenditure at current prices and with current utility yields the following simplified expression for the EV:

$$EV = e(p^0, u^1, Z_u) - y^0 \tag{6.15}$$

In the LES system the expenditure function is defined as:

$$e = \sum_i p_i c_i + vb \prod_i p_i^{b_i} / b_0 \tag{6.16}$$

with

$$b_0 = \prod b_k^{b_k} \tag{6.16a}$$

and $v$ is the indirect utility function defined as:

$$v = (y^* - \sum_i p_i c_i)\lambda \text{ , with } \lambda = b_0 / \prod_i p_i^{b_i} \tag{6.17}$$

In (6.17) the usage of lower case letters for subsistence consumption indicates that changes are analysed at adult equivalent level. The results of the simulation can be substituted in (6.17), for which prices are set to unity, to measure welfare implications at adult equivalent level.

## 6.7 simulation of household behaviour

To understand how the two forms of migration affect the behaviour of the farm household, simulation techniques will be used to trace the effects of changes in migration through the facets of the farm household model. As Chapter 4 demonstrates, migration influences activity choice and income derived through changes in labour supply and a gain in remittances. Clearly, migration influences the shadow wage, derived as the marginal value product from the staple cropping production function, through a loss of labour. The shadow wage is incorporated together with remittances in the shadow full income. Migration thus impacts on income in several ways, through activity income, but also through labour supply and remittances. Full income as well as the shadow wage is used to derive demand equations for goods and home time. In section 6.5 a measure, EV, has been developed to analyse welfare changes resulting from a change in migration.

Households are again categorised in two groups: households with continental and with intercontinental migrants for which a 10 per cent increase in migration is simulated.

### *6.7.1 increased migration: activity choice and income*

The results derived in Chapter 4 are used to simulate changes in activity income[19] with a 10 per cent increase in the stock of continental or intercontinental migrants and a reduction of a similar magnitude in resident household size. Correcting for selectivity, the effects of the increase in migration on net income derived from the different activities are reported in Table 6.7.

*Table 6.7 Income changes with a 10 per cent increase in migration (%)*

| ***Activity*** | ***Continental migrant*** | ***Intercontinental migrant*** |
|---|---|---|
| Staple cropping | -1.6 | -7.2 |
| Cash cropping | 1.4 | 2.2 |
| Non-farm activities | -5.3 | -14.3 |
| Livestock investment | 0.4 | 2.9 |
| Remittances | 4.0 | 10.6 |

[19] The increase in migration has a limited impact on household activity choice and results are not reported here

In addition, the estimates from the remittance function are used to calculate the change in remittances as a result of the migration increase.

A 10 per cent increase in migration causes households to receive 4 per cent more in remittances from continental migrants and about 11 per cent more from intercontinental migrants. For households with either type of migrant a 10 per cent increase in migration leads to a reduction in income derived from staple cropping and non-farm activities. Clearly, labour-intensive activities, staple cropping and non-farm activities suffer from an increase in either form of migration. As discussed in Chapter 2, a labour market does not exist in the villages so that lost labour cannot be replaced by hired labour. Effects are stronger for households with intercontinental migrants that can rely on substantial amounts of remittances.

Income derived from cash cropping and livestock keeping, which may be considered as capital-intensive activities, increases with more migration of either type, pointing towards the role of migration as a credit and/or insurance provider. Again, percentage income increases are larger for households with intercontinental migrants.

### *6.7.2 increased migration: consumption and labour supply*

Changes in the various income generating activities as a result of an increase in continental or intercontinental migration, lead to changes in shadow full income. Keeping shadow wages constant, the changes in shadow full income and consumption at adult equivalent level[20] are given in Table 6.8. The table shows the different effects of a 10 per cent increase in migration. The increase in continental migration leads to a much smaller increase in full income compared to the increase in intercontinental migrants because the gain in remittances is less able to offset the income loss suffered in non-farm activities. In fact, the positive increase in full income is due to the reduction in household size. At the household level the simulation leads to a fall in full income. Surplus income increases by more than full income for both household groups because prices do not change.

[20] Results at adult equivalent level are obtained by dividing household level results by (6.11) correcting for the reduction in household size through migration

*Table 6.8 Full income and welfare change with a 10 percent increase in migration (%)*

| | ***Continental migrant*** | ***Intercontinental migrant*** |
|---|---|---|
| Shadow full income a.e.[a] | 1.6 | 3.2 |
| Surplus income a.e | 3.4 | 5.0 |
| Welfare (EV) in FCFA[b] a.e. | 1,409 | 3,224 |
| ***Consumption*** | | |
| Own produced food a.e | 2.2 | 2.2 |
| Purchased food a.e. | 1.4 | 2.9 |
| Nonfood a.e. | 3.0 | 4.7 |
| Durables and other expenses a.e. | 3.1 | 5.9 |
| Home time a.e. | 0.4 | 2.6 |
| Shadow wage | 0.2 | 2.1 |

Notes: [a] a.e. is migration corrected adult equivalent consumers, see (6.11)
[b] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)

The increase in full income impacts positively on particularly consumption of non-food items and the category of durables and other expenses. A 10 per cent increase in intercontinental migration increases welfare per adult equivalent by 3224 FCFA[21] whereas the 10 per cent increase in continental migration increases welfare per adult equivalent by 1,409 FCFA[22]. Changes also take place in home time consumption (labour supply) as migrant households now consume more home time, although the increase is of a much larger magnitude for households with intercontinental migrants. Changes in labour supply are likely to have an effect on the shadow wage. The shadow wage was derived from the staple cropping production function estimated in Chapter 5. However, labour allocation to the different activities has not yet been investigated. A regression similar to the activity-incomes equation as in Chapter 4 is estimated with as dependent variables the share of labour days allocated to each activity. Results are given in Table 6.9. Households with continental migrants devote a larger share of labour to non-farm activities, whereas for households with intercontinental migrants cash cropping is relatively important. It is interesting to note that households with continental migrants spend more of their time in staple cropping compared to households with intercontinental migrants.

[21] 3,224 FCFA constitutes 3.4 per cent of full income per adult equivalent (Table 6.2)

*Table 6.9 Shares of labour in activities (2002)*

| *Income category* | *Continental migrant* | *Intercontinental migrant* |
|---|---|---|
| Staple cropping | 0.51 | 0.41 |
| Cash cropping | 0.24 | 0.42 |
| Non-farm activities | 0.16 | 0.06 |
| Livestock | 0.09 | 0.11 |

The share of labour devoted to staple cropping is used to determine how the change in labour supply due to more migration impacts on labour input in this activity. The staple cropping production function has been estimated at the plot level, so that it needs to be assumed that the change in labour supply is of the same magnitude for all plots. Effects of the fall in labour supply in staple cropping on the shadow wage are given in the bottom row of Table 6.8. Households with continental migrants increase their consumption of home time by much less so that the shadow wage increase is not as strong compared to households with intercontinental migrants. Changes in the shadow wage have second-order effects on shadow full income through the valuation of the time endowment and home-time consumption.

In Table 6.10 first- and second-order changes are given compared to the base scenario.

*Table 6.10 First and second order full income and welfare change with a 10 percent increase in migration*

| | *Continental migrant* | *Intercontinental migrant* |
|---|---|---|
| Full income a.e.[a] | 1.7 | 3.4 |
| Surplus income a.e | 1.9 | 6.0 |
| Welfare (EV) in FCFA[b] a.e. | 1,500 | 3,627 |
| ***Consumption*** | | |
| Own produced food a.e | 1.3 | 2.5 |
| Purchased food a.e. | 0.6 | 3.4 |
| Nonfood a.e. | 2.0 | 5.6 |
| Durables and other expenses a.e. | 2.2 | 7.1 |
| Home time a.e. | 0.4 | 3.7 |

Notes: [a] a.e. is migration corrected adult equivalent consumers, see (6.11)
[b] 168 FCFA=1$ (PPP 2002) (World Bank, 2005)

[22] 1,409 FCFA constitutes 1.7 per cent of full income per adult equivalent (Table 6.2)

For households with intercontinental migrants, the combination of first- and second-order effects leads to a further increase in full income when changes in shadow wages and home-time consumption are corrected for. This is due to the increased shadow wage that raises the value of labour endowment and thus household income. For households with continental migrants, full income also increases. However, due to the much higher consumption of home time, the increase in the shadow wage has a smaller impact on surplus income, as subsistence expenditure on leisure greatly increases. Changes in consumption are therefore smaller compared to the first-round results. For both forms of migration, an increase in migration leads to an increase in household welfare; the effects of intercontinental migration, not surprisingly, are by far the largest.

## 6.8 conclusions and discussion

In this chapter the analysis of farm household behaviour has been broadened to encompass both the production and consumption side. In the analysis, the shadow wage forms the bridge between the production and the consumption side of the model. The shadow wage, equal to the marginal value product of labour in staple cropping, enables the calculation of shadow full income. Shadow full income, which incorporates a valuation of household time, constrains the consumption behaviour of households, described by a Stone-Geary utility function. The estimation of a home-time demand function results in the necessary parameters to estimate a system of demand functions for the remaining four consumption categories.

Marked differences exist between consumption behaviour of households without, with continental and with intercontinental migrants. Most importantly, for households without and with continental migrants, home time has a large subsistence consumption share and a comparatively low income elasticity. By the same token, labour supply shows a relatively inelastic response to income changes. For households with intercontinental migrants, the subsistence share of home time is much lower and labour supply shows a much more elastic response to changes in income.

Simulation of household behaviour is used to trace the effects of migration through the household model. Migration increases by 10 per cent for households with continental and with intercontinental migrants. For both household groups, such an increase has negative implications

for income derived from staple cropping and non-farm activities, and positive implications for income derived from cash cropping and livestock investment. In addition, more migration leads to more remittances. The positive as well as the negative effects of the migration increase are of a much larger magnitude for households with intercontinental migrants.

For both households the change in full income is positive, although for households with continental migrants this is only due to the reduction in household size, which is taken into account when moving from the household to the adult equivalent level of analysis. This finding clearly illustrates the survival motive of continental migration. Not surprisingly, the change in full income is larger for households with intercontinental migrants experiencing a welfare increase, which is more than double that of continental migrant households in absolute numbers.

For consumption, the difference in the increase in home-time consumption between households with continental and with intercontinental migrants is particularly interesting. An increase in home-time consumption affects labour supply and the shadow wage. A change in the shadow wage implies that the simulation leads to second-order effects in household behaviour. When correcting for the higher shadow wage, which increases much more for households with intercontinental migrants, the inclusion of the valuation of household time exceeds the eroding profits from income-generating activities and leads to a larger increase in full income compared to the base scenario.

Taking into account the second-order effects demonstrates the accumulative character of a strategy of intercontinental migration, which leads to strong increases in home-time consumption and the shadow wage, implying that full income will continue to increase. For households with continental migrants, second-order effects show that this strategy will not lead to further increases in full income as the consumption of home-time does not increase further after correcting for the shadow wage change.

The findings of this chapter again illustrate the different strategic character of continental versus intercontinental migration. Continental migration improves the welfare of the household through a reduction in household size and may therefore be preferred to non-farm activities. Intercontinental migration enables the household to accumulate wealth and greatly improve its welfare.

CHAPTER 7

# conclusion

## 7.1 introduction

Poor households in developing countries are thought to follow one of three livelihood strategies: hanging in, stepping up or stepping out (Dorward *et al.*, 2005). Some households engage in activities to maintain livelihood levels often in the face of adverse socio-economic circumstances (hanging in). Others choose to intensify agricultural production in order to increase production and income (stepping up). Households also often opt for diversification and move into different activities (stepping out). When intensification is not feasible, diversification is a logical alternative to secure a livelihood. Households can diversify in terms of crops cultivated, activities (including non-farm labour) and migration. The actual stepping-out is most likely to succeed when diversification takes place from a so-called launch pad for which assets are initially accumulated.

Migration as a diversification strategy has received much attention from researchers and policy makers mostly due to its consequences for development. Research regarding the interactions between migration, remittances and development has often been partial in the sense that the determinants of migration have been analysed independent of the consequences of migration. Partial analyses of migration in developing countries have not led to a consensus concerning the interaction between migration, remittances, and development. In fact, conclusions drawn from such partial research are often found to be contradictory.

In this study, in order to understand migration and its implications for development, a whole-household economy approach is taken that combines the determinants and the consequences of continental and intercontinental migration for productive as well as consumptive behaviour of the household. A whole-household economy approach to migratory movement is based upon a model for farm household decision-making (Figure 1.1). This model

is applied to data collected in 2003 for 223 households in four villages on the Central Plateau of Burkina Faso (Niaogho and Béguédo, situated in the southern part of the Plateau, and Boussouma and Korsimoro in the northern part). Two forms of migration are identified: migration outside the African continent (intercontinental migration) and migration within the African continent (continental migration).

The remainder of this chapter continues as follows: First, in section 7.2 the main findings of this study and their place in the development economics literature are discussed. Next the contribution of this study to the migration, remittances and development debate is outlined (section 7.3). In section 7.4 policy implications of the study are presented and in the final section 7.5 directions for further research are identified.

## 7.2 key debates and main findings

### *7.2.1 migration decisions*

Determinants of migration have traditionally been sought in individual calculations regarding wage differentials (Todaro, 1976). Stark (1991) extended the analysis of the determinants of migration by emphasising, among other things, that migration is not the result of individual decision-making but of a complex set of negotiations within the household. Stark holds that migration may well take place in response to other factors than wage differentials. Variables such as income uncertainty should also be considered. He emphasises the relevance of missing or imperfect markets in less-developed countries, such as those for credit and insurance, in explaining much migratory movements.

Explanations for migration have generally not distinguished between different migratory movements. However, in the context of this study, taking into consideration heterogeneity in migration is essential. Households allocate labour to migration given their constraints and preferences. Unconstrained households opt for the form of migration that yields the highest returns. Economic theory predicts that *ceteris paribus* returns to an activity such as migration are increasing in the difficulty or costliness of entry into that activity (Barrett *et al.*, 2001b). Intercontinental migration generates a high level of remittances, but presents the

household with high entry costs. High entry costs imply that not all households willing to engage in this high-return form of migration are able to do so.

Findings in the current study suggest that continental and intercontinental migration do indeed constitute two different diversification strategies. Intercontinental migration is a strategy for accumulation only accessible for households that have a certain level of wealth at their disposal, such as land or access to irrigated land. Continental migration can be viewed as a survival strategy stemming from a lack of wealth but positively related to household size. The findings highlight the importance of considering heterogeneity in migratory movement. A distinction between the two different forms of migration is not only useful but necessary to acquire an understanding of both the causes and consequences of migration for developing countries.

### *7.2.2 implications of migration for factor allocation and income*

In a perfect market remittances constitute the only direct effect of migration. In contrast, a missing market for labour implies that labour lost to migration cannot be replaced by hired labour (lost-labour effect). A missing market for credit/insurance implies that remittances, through providing a source of liquidity, could enable households to make productive investment or branch out into more lucrative ones (remittance effect). Consequences of migration and related remittances for development are usually thought to be one of two extremes.

According to the New Economics of Labour Migration (NELM) pioneered by Stark (1991), migration, in a context of missing and/or imperfect markets, constitutes part of a household strategy to raise income and insure against various risks. Remittances, under this scenario, could promote development through their ability to lessen production and investment constraints. Taylor *et al*. (2003), for example, find for rural China that remittances stimulate crop production and compensate for the lost-labour effect. Lucas (1987) finds that for a number of countries in southern Africa remittances enhance both crop productivity and cattle accumulation in the longer run. For Burkina Faso, Savadogo *et al.* (1998) find that non-farm income, including remittances, is an important source of liquidity for investment in animal traction.

Another, more "pessimistic", view argues that lucrative migration activities drain migrant-sending areas of labour and capital and crowd-out local productive activities. Reichert (1981) in his research on Mexican migration to the United States identifies a phenomenon termed "the migrant syndrome" according to which increased standards of living in the sending economy can only be maintained through recurrent migration. In addition, pessimism concerning development impacts of migration on the sending areas is fuelled by findings that remittances are not used for productive investments (Connell *et al.*, 1976; David, 1995; De Haan, 1999).

The investigation into the role of continental and intercontinental migration in household activity choice and related income in this study constitutes a test of the NELM theory. Previous research has not considered heterogeneity in migration when testing the NELM theory. In addition, research in Africa concerning NELM has been confined to agricultural activities whereas households generally have a diverse income portfolio.

Findings of this study reveal that the lost-labour effect is operational for both groups of migrant households, suggesting that migration crowds out labour-intensive activities. The remittance effect is only operational for households with intercontinental migrants that are able to overcome an entry barrier, which exists for capital intensive activities. These findings together clearly support the NELM theory but also lend support to the hypothesis that the different migratory movements, taking into account their causes and consequences, could increase household inequality.

### *7.2.3 implications of migration for agricultural technology*

Agriculture, in particular staple crop cultivation, constitutes the main activity of the survey households both in terms of income generation and labour absorption. A diverse range of inputs used in cropping suggests that the impact of migration for cropping activities is more complex compared to other income-generating activities. Cropping practices on the Central Plateau of Burkina Faso are characterised as traditional, with limited application of fertilisers and little use of traction. Both the lost-labour and remittance effect are likely to have implications for agricultural technologies. Migration, leading to labour scarcity, can cause environmental

degradation if inadequate attention is paid to agriculture. Black (1993) finds for two counties in northern Portugal that migration has led to a reduction of herd size and application of lower quality manure to the land. Households were also found to abandon certain conservation practices that were important in maintaining levels of production and fertility. According to NELM, migration and remittances can stimulate crop production through facilitating adoption of new production technologies.

Previous studies on the implications of migration on agricultural practices in developing countries have not distinguished between different forms of migration[23]. Heterogeneity in migration needs to be considered when investigating implications of migration for agricultural technology choice. This study differs from previous studies in its attempt to disentangle the lost-labour and remittance effect for different stages in the cropping production process. These stages: planting and preparation, crop maintenance, and harvesting, differ in their labour-input requirements.

Findings of this study suggest that households respond to changing factor endowments resulting from the lost-labour and remittance effect of migration, but that these changes are location specific. The lost-labour effect prompts migrant households in Niaogho and Béguédo to use less labour in crop maintenance. Households with intercontinental migrants also resort to a strategy of labour-substitution in the other two stages. Migrant households of either type generate a higher yield per hectare compared to non-migrant households. Continental migrant households in Boussouma and Korsimoro use more labour, particularly during the crop maintenance stage, and manure compared to non-migrant households; suggesting a strategy of intensification. This strategy of intensification, however, does not lead to higher yields.

Differences in labour input during the crop maintenance stage depending on migration status point toward flexibility in production. In traditional rain-fed agriculture, such flexibility allows farm households to deal with exogenous shocks. Farm households retain particular flexibility regarding their labour effort in crop maintenance depending on the information available to them at the time (Fafchamps, 1993). Changes in factor endowments due to migration combined with a missing market for labour partly explain why migration does not transform staple cropping practices from traditional to modern. Whilst intercontinental migration

in particular provides the households with the liquidity to invest in staple cropping, in the context of a missing market for labour, farm households are aware that overly ambitious production plans will lead to seasonal manpower constraints that are more severe due to the lost-labour effect (Fafchamps, 1993). Farm households act therefore so as to retain flexibility and intercontinental migration prompts investments in technological innovation, not to increase productivity but to retain flexibility regarding labour input. As migration does not lead to in-depth investments in staple cropping, it should not be surprising that a relationship between migration and sustainability cannot be established.

### *7.2.4 migration and household consumption*

Studies on expenditure effects of migration have often solely considered how remittances are spent. They generally conclude that remittances are consumed instead of invested (Lipton, 1980). Given the fungibility of money simply observing that remittances are not invested is not sufficient for analysing the contribution of migration to the household. Remittances loosen the budget constraint and free up other resources for expenditures on investment. Adams (1991a) finds for rural Egypt that international migrant households are less likely to spend additional increments of expenditure on consumption compared to non-migrant households. As remittances are considered as temporary earnings, migrant households spend their earnings on durable items including investment in housing and the purchase of building and agricultural land.

This study in making use of a comprehensive approach, considering both productive and consumptive behaviour of the farm household and linking them, gives precise estimates of the impact of migration and related remittances on income. In addition, consumption of home-time plays a pivotal role in expenditure analysis, as in the absence of a labour market home-time consumption is directly related to household labour supply.

Findings reveal differences between consumption behaviour of households without, with continental and with intercontinental migrants. Home-time consumption per adult equivalent of households without and with continental migrants is comparatively unresponsive to income changes. This finding, combined with the larger budget share of own produced food

[23] A notable exception is Kuiper (2005) who makes a distinction between within and outside province migration when

for these two groups of households, suggests that poor households are likely to focus on food self-sufficiency and are heavily reliant on own production, which is seasonal. Wealthier households, such as those with intercontinental migrants, are able to purchase food and are thus less reliant on own-production. Thus, they can devote more time to cash cropping, which is less seasonal. A low income elasticity for home-time demand implies an inelastic labour supply for households without and with continental migrants. Expenditure on non-food items and durables is most elastic with respect to income changes for all three groups of households.

### *7.2.5 welfare implications of migration*

The analysis of the production as well as the consumption side of the household model enables an overview of the implications of migration for household welfare. Research on household welfare in relation to migration has often been concerned with inter-household inequality. Previous studies have compared Gini coefficients for households with and without remittances (Stark *et al.*, 1988; Adams, 1991b), but only consider the direct short-run impact of remittances. Taylor (1992) considers both direct, indirect and inter-temporal effects of remittances in rural Mexico. His findings illustrate the potential for indirect effects of remittances on income inequalities between households. The study does, however, not distinguish different forms of migration, e.g. to the United States and within Mexico.

The current study takes into consideration heterogeneity in migration when analysing welfare impacts on the basis of a simulation of increased migration. First-order simulation results reveal that an increase in migration raises welfare for households with continental and intercontinental migrants. For households with continental migration the increase only materialises after correcting for a reduction in household size, and is of a much smaller magnitude compared to intercontinental migrant households. The reduced-consumption effect demonstrates that even in the absence of remittances, migration can improve household welfare through a reduction in resident household size, which means a reduction in expenditures on consumption. First and second-order simulation results combined, incorporating changes in the shadow wage, brought on by changes in home-time consumption; show an increase in welfare

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analyzing implications of migration for rural China. However, in her study migrants do not cross national boundaries.

for households with intercontinental migrants. For households with continental migrants, for which home-time consumption is relatively inelastic, welfare increases but to a lesser extent compared to households with intercontinental migrants. The simulation clearly shows that the two different migratory movements both increase household welfare, but that the difference between the welfare increase for continental and intercontinental migrant households is so large that inequality in the village income distribution increases.

## 7.3 contribution to the migration-remittances-development debate

This study contributes in a number of ways to the debate concerning interactions between migration, remittances and development. In addition to considering heterogeneity in migratory movements, this study takes a whole-household economy approach so that both determinants and consequences of migration are taken into account. A comprehensive approach is taken to analyse the consequences of migration, combining consumptive with productive behaviour of the farm household. Findings of this study can be summarised in a number of migration effects. As mentioned there are lost-labour, remittance and reduced-consumption effects. An overview of these effects (in the grey boxes) in terms of income, resource use and expenditures is given in Figure 7.1. The most discussed contribution migration makes to the local economy comes in the form of the direct use of remittances. Remittances add directly to income and Figure 7.1 shows that remittances have a stronger income effect for households with intercontinental migrants compared to households with continental migrants (++ versus + in the income box).

In this study, conducted in an imperfect market environment, indirect effects of migration are also taken into account. The lost-labour and remittance effect cannot be disentangled and impact jointly on resource use and income of migrant households. In terms of resource use, these effects lead households with intercontinental migrants in Niaogho and Béguédo to substitute for labour in staple cropping by increased use of capital, whereas this is not the case for households with continental migrants. Input use in staple cropping in terms of purchased inputs does not differ for migrant households.

In Boussouma and Korsimoro, continental migrant households appear to follow a strategy of intensification and use more labour and inorganic fertiliser compared to non-migrant

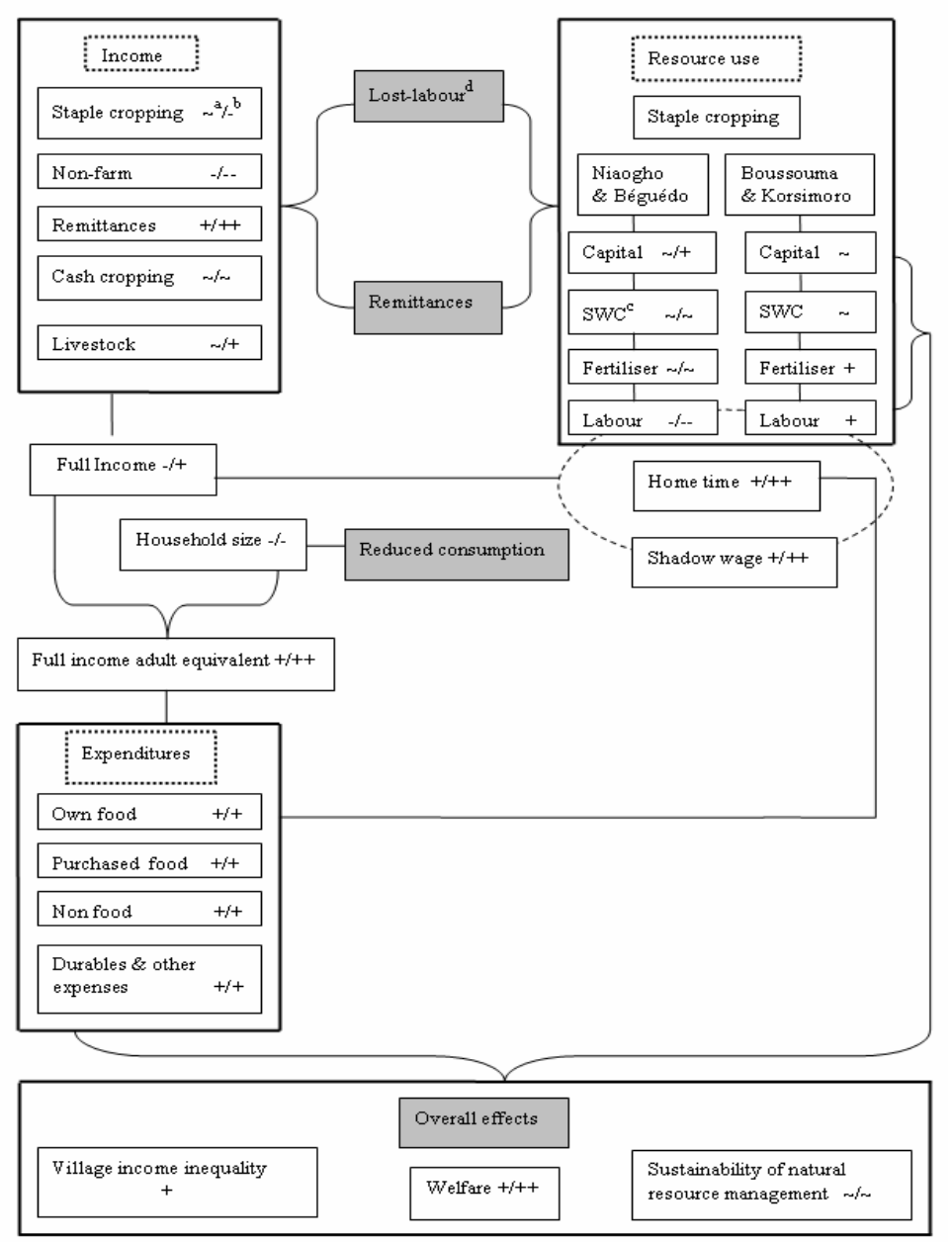
households. In terms of investments in soil and water conservation measures, no differences due to migration status in any of the villages are found.

In terms of income for households with intercontinental migrants, the lost-labour and remittance effect reduce income from labour-intensive activities (staple cropping and non-farm activities) and increase income from capital-intensive activities (livestock investment). For households with continental migrants income from non-farm activities falls. Despite the receipt of remittances, households with continental migrants experience a loss in full income due to migration, whereas intercontinental migration increases household full income.

When income is spent, the reduced-consumption effect becomes relevant as a reduction in household size due to migration increases income per adult equivalent. The income increase is much stronger for households with intercontinental migrants. Without an allowance for inferior goods, migrant households increase their consumption of all goods. The more elastic response of home-time consumption to income changes leads to a stronger increase in home-time consumption for households with intercontinental migrants. More home-time consumption reinforces the overall effect of migration for households with intercontinental migrants, as less labour supply increases the shadow wage and shadow full income.

Overall effects of migration are given in the bottom panel of Figure 7.1. As staple cropping practices do not make a transition from traditional to modern due to migration, an effect of migration for the sustainability of natural resource management is not found. In addition to the large difference in remittances received by households with continental and intercontinental migrants, the elasticity of home-time demand leads to divergence in the overall effects of migration.

*Figure 7.1 Overview of effects of both forms of migration compared to base scenario*




Notes: [a] continental migration effects (+increase, -decrease, ~no change)
[b] intercontinental migration effects (+ increase, -decrease, ~no change, ++large increase, -- large decrease
[c] Soil and Water Conservation Measures (grass strips and stone lines)
[d] migration effects in grey boxes

Although both forms of migration increase household welfare, intercontinental migration has a much stronger effect. As a result, inequality between continental and intercontinental migrant households increases.

## 7.4 policy implications

Both migration and remittances have been extensively discussed in this study and have implications for development, which is most relevant for policy makers. A benchmark for development that is useful in the current context is how migration and related remittances reshape migrant-sending economies. Views regarding this issue are often strongly opposed, and an added complication is that a distinction needs to be made between two forms of migration that are likely to have a different impact on the sending economies. Consequences of migration for the sending area are difficult to assess. At the household level, this study demonstrates that migration is welfare-improving for both households with continental as well as households with intercontinental migrants, although much more so for the latter. For households with continental migrants the improvement in welfare is related to a survival strategy and stems from a reduction in household size. For households with intercontinental migrants the remittance effect reverses the negative lost-labour effect of migration.

The migration-development debate should be viewed in the context of the three *R's*: remittances, recruitment and returns (IOM, 2005). One important advantage of remittances is that they constitute a structured financial flow earned by members of developing countries. The fact that remittances are private transfers and migrants and their families decide on their allocation, does not detract from them possibly being at least as effective in targeting the poor in both conflict-ridden and stable developing countries (IOM, 2005). Remittances, in enabling households to overcome production and investment constraints could stimulate the local economy. In fact, multiplier effects on incomes, employment and production in migrant sending economies could set in motion development dynamics. However, previous studies suggest that productive investments are strongly related to the level of market formation and local economy conditions (Taylor, 1999).

Recruitment deals with the question of who migrates as the conditions underlying migration cannot be viewed independently of the impact of migration. Contrary to historical

migratory movements such as the one from the United Kingdom to the United States, in the current study intercontinental migration is undertaken by relatively wealthy households so that benefits of migration can increase inequality between migrant and non-migrant households. It is likely that members of wealthy households migrate intercontinentally in response to a lack of productive-investment opportunities in the local economy. An imperfect market environment, poor infrastructure and public services are likely to limit the potential of remittances to stimulate local production (Taylor, 1999).

Finally, returns refers to the issue of migrant return with new technologies and ideas of use to them and their country, or return to rest and retire. Migrants display a certain risk-taking behaviour, which when combined with skills and capital required abroad can lead to economic take-off. But it is thought that take-off behaviour is most common in countries poised for economic growth (IOM, 2005).

In terms of policy implications, benefits of migration to development in the sending country depend crucially on the institutional setting. Although members of developing countries themselves may be best placed to oversee their own needs and the needs of their local economy, it is possible that in the context of a weak institutional setting, the impact of remittances on economic growth is not maximised (OECD, 2005). Maximisation of the impact of remittances can be achieved through implementing sound macroeconomic policies and policies of good governance, as well as development strategies involving all actors in the economy (OECD, 2005). Policies directed at improving poor public services and infrastructure could improve the productive investment potential of the sending economies. Interestingly enough, research of remittance behaviour of Burkinabé migrants in Italy (see Box 2.2) suggests that such investments are in fact being made by the two migrant organisations in Italy that have funded amongst others electricity and telephone networks in the sending villages.

Governments in developing countries also have a role to play in enabling poorer households to escape poverty through migration. This could be done through the provision of information on migration opportunities and risks (World Bank, 2005). Finally, creation of investment opportunities would also enable returning migrants to become a force of economic growth in their local economy.

It is clear that conditions are still to be met for the three *R's* of migration to produce a virtuous circle of development not the least in terms of sound macroeconomic policies and policies of good governance. It is also important to realise that remittance income is highly unequally distributed across regions. Asia receives the largest share of remittances with Africa lagging far behind (OECD, 2005). Thus, at this point although the potential of remittances as a source of development should certainly be highlighted, they can not replace overseas development assistance (ODA). The possibility of a virtuous circle of development also hinges on policy in the receiving countries.

It is important to realise that migration and related remittances can directly benefit the sending as well as the receiving economy. Low-skill migrants constitute a source of cheap labour for the receiving economy. In fact, it is thought that a country like the Netherlands is loosing out by not allowing more migrants to enter as labour migrants to increase economic activity and therefore welfare (Jorritsma, 2005). In addition, it is important to realise that the aging of the population in Europe shrinks the workforce and raises the overall dependency ratio (World Bank, 2005).

The success of migration for both the sending and receiving economies is thought to crucially depend on agreements between these economies. A country like the Netherlands by attempting to close its borders to migrants from developing countries is thought to disturb the self-regulating mechanism of migration by capturing migrants in the immigration country whilst many migrants are not looking for permanent residence in the host country (Sassen, 2005). Often heard arguments that migrants would replace the autochthonous population on the labour market or increase pressure on the welfare state can be refuted. It is thought that in Western Europe there are three categories of jobs, in particular, where competition and the issue of displacement hardly arises between migrants and natives: first, many dirty, difficult and dangerous jobs; second, a wide variety of service jobs; third, low-skilled jobs in the informal economy. In these sectors low-skilled migrants are thought to be able to balance distorted labour demand (IOM, 2005). With regard to pressure on the welfare state, although in the Netherlands unemployment is relatively high among the migrant population, convincing evidence that the Netherlands is functioning as a kind of "welfare magnet" for migrants does not exist (Jorritsma, 2005).

Italy, the host country in this study is, with its southern border, an easy target for undocumented migrants. The Burkinabé migrants interviewed in Italy had, however, in many cases arrived by plane and were able to disappear into the informal economy fairly easily. Italy's migration policy much more so than Dutch policy is influenced by its business community, which continues to be a powerful voice for increased legal migration. Italy is faced with the reality of a rapidly aging population and it needs migrants to sustain certain key sectors of its economy (Levinson, 2005). Under Berlusconi Italian labour law has been revised and allows employers to hire an undocumented migrant first and then regularise the worker's status (Okoth, 2003). However, Italy as a member of the European Union has to devise migration policy conform European norms.

Thus, in terms of policy implications, benefits of migration to the receiving economies should be recognised at the European level. In terms of protection of the welfare state, it should be possible to device a system under which migrants build up their right to social security over a number of years (Jorritsma, 2005). Calls are made to liberalise international labour migration through new types of temporary foreign worker programmes (TFWPs) for particularly low-skilled foreign workers. Although arguments have been made mainly on ethical grounds against such programmes it is thought that their existence is both desirable from and ethical point of view and feasible in the sense that adverse and unintended consequences of most past and existing guest worker programmes can be avoided (IOM, 2005).

## 7.5 further research

Intercontinental migration from Niaogho and Béguédo to Italy is not only a localised but also a relatively recent phenomenon. Migrants are generally first-generation often intending to return to their village of origin (Box 2.2). The current analysis shows that, in the short term, intercontinental migration has positive welfare effects on the sending households. In the long-term, the third *R* of the migration development debate becomes particularly relevant. Return of migrants is a crucial factor in determining whether a virtuous development circle may result from this particular form of migration. A virtuous circle leading to economic take-off can only be meaningfully analysed in an economy-wide context that allows for the spreading of positive

welfare effects of migration to other households. The availability of only cross-section data at the household level limits the current study so that future research should be directed towards migration studies carried out in a dynamic and economy-wide context.

Intercontinental migrants in this study are mainly employed in heavy industry, most likely working for a lower wage compared to their Italian counterparts with presumed advantages for the Italian economy. If intercontinental migration has long-term positive impacts on the sending economies and also contributes positively to the economy of the receiving country, it should be interesting to investigate how such a system of a mutual beneficial exchange may be institutionalised in the context of European countries with systems of strong social security, where minimum wages and employment benefits are determined institutionally.

APPENDIX

*Table A.5 OLS estimation for the joint production function for sorghum and millet output (Kg) (2002)*

| ***Explanatory variables*** | ***OLS*** |
|---|---|
| Constant | 4.58 (0.17)[a]**[b] |
| Area of land cultivated | 0.32 (0.04)** |
| Labour preparation/planting | 0.12 (0.05)** |
| Labour weeding/fertilising | -0.01 (0.04) |
| Labour harvesting | 0.27 (0.04)** |
| Manure quantity (kg) | 0.03 (0.01)** |
| Insecticide (kg) | 0.02 (0.01)* |
| Tractor cost (FCFA) | 0.08 (0.01)** |
| Dummy for plough use | 0.16 (0.06)** |
| Dummy for crop type (millet=1) | -0.31 (0.06)** |
| Dummy for intercropping | -0.02 (0.04) |
| Location dummy | 0.37 (0.17)** |
| Adjusted R-squared | 0.60 |
| Number of observations | 634 |

Notes: [a] standard error in parentheses
[b] * denotes significance at 10% level, **significance at 5% level

*Table A 6 Probit estimation for incidence of remittances (FCFA)(2002)*

| ***Explanatory variables*** | |
|---|---|
| Constant | -0.79 (0.57)[a] |
| Number of continental migrants | 0.39 (0.14)**[b] |
| Number of intercontinental migrants | 0.46 (0.22)** |
| Education level of migrant(s) | 0.00 (0.03) |
| Average age of migrant(s) | 0.02 (0.01)* |
| Number of inactive members | 0.02 (0.04) |
| Number of adult sons | -0.08 (0.10) |
| Household land holdings per adult son | -0.10 (0.14) |
| Pseudo R-squared | 0.13 |
| Number of observations | 138 |

Notes: [a] standard error in parentheses
[b] * denotes significance at 10% level, **significance at 5% level

REFERENCES


Abdulai, A. and A. CroleRees (2001). Determinants of income diversification amongst rural households in Southern Mali. *Food Policy* 26: 437-452.

Adams, R.H. (1991a). The Economic Uses and Impact of International Remittances in Rural Egypt. *Economic Development and Cultural Change* 39: 695-722.

Adams, R.H. (1991b). *The Effects of International Remittances on Poverty, Inequality and Development in Rural Egypt*. Washington D.C., IFPRI.

Adams, R.H. (1998). Remittances, Investment, and Rural Asset Accumulation in Pakistan. *Economic Development and Cultural Change* 47(1): 155-173.

Adams, R.H. and J. Page (2003). International Migration, Remittances and Poverty in Developing Countries. Washington, World Bank.

Adams, R.H. and J. Page (2005). Do International Migration and Remittances Reduce Poverty in Developing Countries? *World Development* 33(10): 1645-1669.

Adepoju, A (1977). Migration and Development in Tropical Africa: Some Research Priorities. *African Affairs* 76(303): 210-225.

Adepoju, A and W. Mbugua (1997). The African Family: An Overview of Changing Forms in A. Adepoju, (Ed.) *Family, Population and Development in Africa.* London: Zed Books.

Ahn, C.Y., I. Singh and L. Squire (1981). A Model of an Agricultural Household in a Multi-Crop Economy: The Case of Korea. *The Review of Economics and Statistics* 63(4): 520-525.

Aigner, D., C.A.K Lovell and P. Schmidt (1977). Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics* 6: 21-37.

Ali, M. and D. Byerlee (1991). Economic Efficiency of Small Farmers in a Changing World: A survey of recent evidence. *Journal of International Development* 3: 1-27.

Amemiya, T. (1974). Multivariate Regression and Simultaneous Equation Models when the Dependent Variables are Truncated Normal. *Econometrica* 42(6): 999-1012.

Arthur, J.A. (1991). International Labor Migration Patterns in West Africa. *African Studies Review* 34(3): 65-87.

Asenso-Okyere, W.K., G. Benneh and W. Tims (1997). *Sustainable Food Security in West Africa*. Dordrecht: Kluwer.

Barnum, H.N. and L. Squire (1979). *A Model of an Agricultural Household*. Baltimore: The Johns Hopkins University Press.

Barrett, C.B., M. Bezuneh and A. Aboud (2001b). Income Diversification, Poverty Traps and Policy Shocks in Cote d'Ivoire and Kenya. *Food Policy* 26(4): 367-384.

Barrett, C.B., M. Bezuneh, D. Clay and T. Reardon (2005). Heterogeneous Constraints, Incentives and Income Diversification Strategies in Rural Africa. *Quarterly Journal of International Agriculture* 44(1).

Barrett, C.B., T. Reardon and P. Webb (2001a). Nonfarm Income Diversification and Household Livelihood Strategies in Rural Africa: Concepts, Dynamics, and Policy Implications. *Food Policy* 26(4): 315-331.

Barro, R.J. and X. Sala-I-Martin (1995). *Economic Growth*. New York: McGraw-Hill, Inc.

Becker, G.S. (1965). A Theory of the Allocation of Time. *The Economic Journal* 75(299): 493-517.

Becker, L.C. (1990). The Collapse of the Family Farm in West-Africa? Evidence from Mali. *The Geographical Journal* 156(3): 313-322.

Binswanger, H.P., J. McIntire and C. Udry (1989). Production Relations in Semi-Arid African Agriculture in Bardhan, P. (Ed.) *The Economic Theory of Agrarian Institutions*. Oxford: Clarendon.

Binswanger, H.P. and M.R. Rosenzweig (1986). Behavioural and Material Determinants of Production Relations in Agriculture. *The Journal of Development Studies* 22(3): 503-539.

Black, R. (1993). Migration, return, and agricultural development in Serra de Alvao, Northern Portugal. *Economic Development and Cultural Change* 41: 563-585.

Brasselle, A.S, F. Gaspart and J.P. Platteau (2002). Land tenure security and investment incentives: puzzling evidence from Burkina Faso. *Journal of Development Economics* 67: 373-418.

Breusers, M. (1998). *On the move: mobility, land use and livelihood practices on the Central Plateau in Burkina Faso*. Ph.D. thesis, Wageningen: Wageningen University

Brons, J. (2005). *Activity Diversification in Rural Livelihoods: The Role of Farm Supplementary Income in Burkina Faso*. Ph.D. thesis, Wageningen: Wageningen University

Bryceson, D.F. (1999). *Sub-Saharan Africa Betwixt and Between: Rural Livelihood Practices and Policies*: Leiden: ASC.

Burger, K. (1994). *Farm Households, Cash Income and Food Production: The Case of Kenyan Smallholdings*. Ph.D. thesis, Amsterdam: Vrije Universiteit.

Carrington, W.J., E. Detragiache and T. Vishwanath (1996). Migration with Endogenous Moving Costs. *The American Economic Review* 86(4): 909-930.

Christensen, L.R., D.W. Jorgenson and L.J. Lau (1973). Transcendental Logarithmic Production Frontiers. *The Review of Economics and Statistics* 55(1): 28-45.

Coelli, T.J., S. Rahman and C. Thirtle (2002). Technical, Allocative, Cost and Scale Efficiencies in Bangladesh Rice Cultivation: A Non-parametric Approach. *Journal of Agricultural Economics* 53(3): 607-626.

Connell, J., B. Dasgupta, R. Laishley and M. Lipton (1976). *Migration from Rural Areas: The Evidence from Village Studies*. New Delhi: Oxford University Press.

David, R. (1995). *Changing Places: Women, Resource Management and Migration in the Sahel*. London: SOS Sahel.

De Brauw, A., J.E. Taylor and S. Rozelle (2001). Migration and Incomes in Source Communities: A New Economics of Migration Perspective in China. Davis: University of California.

De Haan, A. (1999). Livelihoods and Poverty: The Role of Migration. A Critical Review of the Migration Literature. *The Journal of Development Studies* 36(2): 1-47.

De Haan, A., Brock. K. and N. Coulibaly (2002). Migration, Livelihoods and Institutions: Contrasting Patterns of Migration in Mali. *The Journal of Development Studies* 38(5): 37-58.

De Janvry, A., M. Fafchamps and E. Sadoulet (1991). Peasant Household Behavior with Missing Markets - Some Paradoxes Explained. *Economic Journal* 101(409): 1400-1417.

Deaton, A. (1988). Quality, Quantity and Spatial Variation of Price. *The American Economic Review* 78(3): 418-430.

Deaton, A. and J. Muellbauer (1980). *Economics and Consumer Behaviour*. Cambridge [etc.]: Cambridge University Press.

Dercon, S. and P. Krishnan (1996). Income Portfolios in Rural Ethiopia and Tanzania: Choices and Constraints. *The Journal of Development Studies* 32(6): 850-875.

Djiguemdé, A. (1988). *Les conditions agricoles du Plateau Mossi out les vicissitudes d'une production alimentaire*. Ouagadougou: CEDRES/AGRISK.

Dorward, A., S. Anderson, Y. Nava, J. Pattison, R. Paz, J. Rushton and E. Sanchez Vera (2005). *A Guide to Indicators and Methods for Assessing the Contribution of Livestock Keeping to the Livelihoods of the Poor.* London: Imperial College.

Erenstein, O.C.A. (1999). *The Economics of Soil Conservation in Developing Countries: The Case of Crop Residue Mulching*. Ph.D. thesis, Wageningen: Wageningen University.

Fafchamps, M. (1992). Cash Crop Production, Food Price Volatility, and Rural Market Integration in the Third World. *American Journal of Agricultural Economics* 74: 90-99.

Fafchamps, M. (1993). Sequential Labor Decisions under Uncertainty - an Estimable Household Model of West-African Farmers. *Econometrica* 61(5): 1173-1197.

Fafchamps, M., C. Udry and Czukas (1998). Drought and Saving in West Africa: Are Livestock a Buffer Stock. *Journal of Development Economics* 55(2): 273-305.

Findley, S.E. (1997). Migration and family interactions in Africa in A. Adepoju (Ed.) *Family, population & development in Africa*. London: Zed Books.

Foster, C.D. and H.L.I. Neuburger (1974). The Ambiguity of the Consumer's Surplus Measure of Welfare Change. *Oxford Economic Papers* 26(1): 66-77.

Hoddinott, J. (1994). A Model of Migration and Remittances Applied to Western Kenya. *Oxford Economic Papers* 46: 459-476.

Hyden, G., R.W. Kates and B.L. II Turner (1993). Beyond Intensification in B. L. I. Turner, G. Hyden and R.W. Kates. (Eds.) *Population Growth and Agricultural Change in Africa*. Gainesville: University of Florida Press.

IFAD (2001). *Rural Poverty Report 2001*. Oxford: Oxford University Press.

INSD (1999). Annuaire Statistique du Burkina Faso. Ouagadougou, Ministère de l'économie et de finances.

IOM (2005). *World Migration 2005: Costs and Benefits of International Migration*. Geneva: IOM.

Jacoby, H.G. (1993). Shadow Wages and Peasant Family Labour Supply: An Econometric Application to the Peruvian Sierra. *Review of Economic Studies* 60: 903-921.

Jokisch, B.D. (2002). Migration and Agricultural Change: The Case of Smallholder Agriculture in Highland Ecuador. *Human Ecology* 30(4): 523-550.

Jondrow, J., C.A. Knox Lovell, I.S. Materov and P. Schmidt (1982). On the Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model. *Journal of Econometrics* 19: 233-238.

Jorritsma, E. (2005). *Illegale arbeid is goed voor de productiviteit*. *NRC Handelsblad,* December 15

Kessler, J.J. and C. Geerling (1994). *Profil Environnemental du Burkina Faso*. Wageningen: Wageningen University.

Kuiper, M. (2005). *Village Modeling - a Chinese Recipe for Blending General Equilibrium and Household Modeling*. Ph.D. thesis, Wageningen: Wageningen University.

Lanjouw, P., J. Quizon and R. Sparrow (2001). Non-agricultural earnings in peri-urban areas of Tanzania: evidence from household survey data. *Food Policy* 26: 385-403.

Lee, E.S. (1966). A theory of migration. *Demography* 3(1): 47-57.

Lee, L.-F. (1978). Unionism and Wage Rates: A Simultaneous Equations Model with Qualitative and Limited Dependent Variables. *International Economic Review* 19(2): 415-433.

Levinson, A. (2005). The Regularisation of Unauthorized Migrants: Literature Survey and Country Case Studies. Oxford, Centre on Migration, Policy and Society.

Lipton, M. (1980). Migration from Rural Areas of Poor Countries: The Impact on Rural Productivity and Income Distribution. *World Development* 8: 1-24.

Low, A. (1986). *Agricultural Development in Southern Africa: Farm Household-Economics & the Food Crisis*. London: James Currey.

Lucas, R.E.B. (1987). Emigration to South Africa's Mines. *The American Economic Review* 77(3): 313-330.

Lucas, R.E.B. and O Stark (1985). Motivations to Remit: Evidence from Botswana. *The Journal of Political Economy* 93(5): 901-918.

Massey, D.S., J. Arango, G. Hugo, A. Kouaouci, A. Pellegrino and J.E. Taylor (1993). Theories of International Migration: A Review and Appraisal. *Population and Development Review* 19(3): 431-466.

Mazzucato, V. and D. Niemeijer (2000). *Rethinking Soil and Water Conservation in a Changing Society: A Case Study in Eastern Burkina Faso*. Ph.D. thesis, Wageningen: Wageningen University.

Mensah-Bonsu, A. (2003). *Migration and Environmental Pressure in Northern Ghana*. Ph.D. thesis, Amsterdam: Vrije Universiteit.

Mines, R. and A. De Janvry (1982). Migration to the United States and Mexican rural development: A case study. *American Journal of Agricultural Economics* 64: 444-454.

Mochebelele, M.T. and A. Winter-Nelson (2000). Migrant Labor and Farm Technical Efficiency in Lesotho. *World Development* 28(1): 143-153.

Moll, H.A.J. (2005). Costs and benefits of livestock systems and the role of market and nonmarket relationships. *Agricultural Economics* 32: 181-193.

Nakajima, C. (1986). *Subjective Equilibrium Theory of the Farm Household*. Amsterdam: Elsevier Press.

OECD (2005). *Migration, Remittances and Development*. Paris: OECD.

Okoth, K. (2003). *Undocumented Immigration Haunts Italy's Ruling Coalition*. Washington DC: Migration Policy Institute.

Ouedraogo, J.P., J.P Sawadogo, V. Stamm and T. Thiombiano (1996). Tenure, agricultural practices and land productivity in Burkina Faso: some recent empirical results. *Land Use Policy* 13(3): 229-232.

Palmer, I. (1985). *The Impact of Male Out-Migration on Women in Farming*. West Hartford, CT: Kumarian Press.

Pingali, P., Y. Bigot and H.P. Binswanger (1989). *Agricultural Mechanization and the Evolution of Farming Systems in Sub-Saharan Africa.* Washington DC: World Bank.

Ravenstein, E.G. (1889). The Laws of Migration. *Journal of the Royal Statistical Society*: 241-301.

Reardon, T., C. Delgado and P. Matlon (1992). Determinants and Effects of Income Diversification Amongst Farm Households in Burkina-Faso. *Journal of Development Studies* 28(2): 264-296.

Reardon, T., P. Matlon and C. Delgado (1988). Coping with Household-level Food Insecurity in Drought-affected Areas of Burkina Faso. *World Development* 16(9): 1065-1074.

Reichert, J.S. (1981). The Migrant Syndrome: Seasonal U.S. Wage Labor and Rural Development in Central Mexico. *Human Organization* 40(1): 56-66.

Reyna, S.P. (1987). The Emergence of Land Concentration in the West African Savannah. *American Ethnologist* 14(3): 523-541.

Ruben, R. and J. Pender (2004). Rural diversity and heterogeneity in less-favoured areas: the quest for policy targeting. *Food Policy* 29: 303-320.

Sadoulet, E. and A. De Janvry (1995). *Quantitative Development Policy Analysis*. Baltimore, London: The Johns Hopkins University Press.

Sassen, S. (2005). *Migratiebeleid is onhoudbaar*. *NRC Handelsblad,* 15 December

Savadogo, K., T. Reardon and K. Pietola (1998). Adoption of Improved Land Use Technologies to Increase Food Security in Burkina Faso: Relating Animal Traction, Productivity, and Non-Farm Income. *Agricultural Systems* 58(3): 441-464.

Singh, I., L. Squire and J. Strauss (1986). The Basic Model in Singh, I., Squire, L. and Strauss, J. (Eds.) *Agricultural Household Models - Extensions, Applications and Policy*. Baltimore: The Johns Hopkins University Press.

Skoufias, E. (1994). Using Shadow Wages to Estimate Labour Supply of Agricultural Households. *American Journal of Agricultural Economics* 76: 215-227.

Stark, O (1982). Research on Rural-to-Urban Migration in LDC's: The Confusion Frontier and Why We Should Pause to Rethink Afresh. *World Development* 10(1): 63-70.

Stark, O (1991). *The Migration of Labour*. Cambridge: Basil Blackwell.

Stark, O and D.E. Bloom (1985). The New Economics of Labor Migration. *The American Economic Review* 75(2): 173-178.

Stark, O, J.E. Taylor and S. Yitzhaki (1988). Migration, Remittances and Inequality: A Sensitivity Analysis Using the Extended Gini Index. *Journal of Development Economics* 28: 309-322.

Stark, O. and J.E. Taylor (1991). Migration Incentives, Migration Types: The Role of Relative Deprivation. *The Economic Journal* 101(408): 1163-1178.

Stone, R. (1954). Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand. *The Economic Journal* 64(225): 511-527.

Strauss, J. (1982). Determinants of Food Consumption in Rural Sierra Leone. *Journal of Development Economics* 11: 327-353.

Taylor, J.E. (1992). Remittances and Inequality Reconsidered: Direct, Indirect, and Intertemporal Effects. *Journal of Policy Modeling* 14(2): 187-208.

Taylor, J.E. (1999). The New Economics of Labour Migration and the Role of Remittances in the Migration Process. *International Migration* 37(1): 63-88.

Taylor, J.E., S. Rozelle and A. De Brauw (2003). Migration and Incomes in Source Communities: A New Economics of Migration Perspective from China. *Economic Development and Cultural Change* 52(1): 75-101.

Taylor, J.E. and A. Yunez-Naude (2000). The Returns from Schooling in a Diversified Rural Economy. *American Journal of Agricultural Economics* 82: 287-297.

Todaro, M.P. (1976). *Internal Migration in Developing Countries*. Geneva: International Labour Office.

Udo, H. and T. Cornelissen (1998). Livestock in resource-poor farming systems. *Outlook on Agriculture* 27(4): 237-242.

Udry, C. (1999). Efficiency and Market Structure: Testing for Profit Maximization in African Agriculture in G. Ranis. and L.K. Raut (Eds.) *Trade, Growth and Development*. North Holland: Elsevier Science.

World Bank. (2003). "Burkina Faso at a glance." from http://www.worldbank.org/data/countrydata/aag/bfa_aag.pdf.

World Bank. (2003). "Burkina Faso: Country Brief." from http://www.worldbank.org/afr/bf/bf_ctry_brief.htm.

World Bank (2005). Global Economic Prospects 2006. Washington D.C., World Bank.

World Bank. (2005). "World Development Indicators." from http://devdata.worldbank.org/wdi2005/Section2.htm.

Yusuf, S. (2003). Globalisation and the Challenge for Developing Countries. *Journal of African Economics* 12(AERC Supplement 1): 35-72.

SUMMARY

The diversification of income sources into non-crop production has been identified as a critical livelihood strategy for rural households, particular in Africa. Migration as a diversification strategy has received much attention from researchers and policy makers mostly due to its consequences for development. Official remittances from international migration are said to represent the second most important source of external finance in developing countries.

Burkina Faso, a country where conditions for agriculture are far from favourable, has a long history of migratory movement. Migration within the African continent has since long taken place in response to drought and low agricultural productivity and has become institutionally induced during colonial times when labour was needed in mines and plantations in amongst others the Côte d'Ivoire. Migration to destinations outside the African continent and in particular to Western Europe has become more important over the last decades for migrants from Burkina Faso.

Considering the magnitude of official remittances from international migration, Burkina Faso as one of the poorest countries in the world could clearly benefit from migration (and related remittances). However, the interactions between migration, remittances and development have been the topic of a controversial debate occupying researchers and policy makers for a number of years.

The current study provides a quantitative analysis of the motives for and consequences of migration for rural households in four villages on the Central Plateau of Burkina Faso. A distinction is made between migration within the African continent (continental migration) and migration to a destination outside Africa (intercontinental migration) in investigating the motives for and consequences of migration for rural households. An extended farm household model that includes a migration component forms the basis of the econometric analysis.

The study contributes to the debate concerning migration, remittances and development in a number of ways: (i) in contrast to previous studies, this study analyses migration from a whole household-economy perspective combining determinants and consequences of migration and (ii) including both the production and the consumption side of the rural household economy in an imperfect market context; (iii) instead of a general concept of migration this study allows

for heterogeneity in migration and distinguishes two different migratory movements: continental and intercontinental. Intercontinental migration generates a high level of remittances but high entry costs imply that not all households can engage in this form of migration.

In Chapter 1 the approach used as a basis for the study is introduced in the form of a model that describes farm household decision-making from a whole-household economy perspective. The whole-household economy approach allows for the linking of motives for migration with its consequences for both productive and consumptive behaviour of the rural household.

In Chapter 2 the study sites are introduced. Data for 223 households were collected in February-March 2003 in four villages on the Central Plateau of Burkina Faso. Two villages (Boussouma and Korsimoro) are situated on the main road from Ouagadougou (the capital of Burkina Faso) to the north. In these villages migrant destinations are within the African continent (continental migration). The location of the other two villages (Niaogho and Béguédo) is relatively isolated as they can only be reached by a three-hour journey on a dirt road. From these villages migration takes place within (continental) as well as outside the African continent (intercontinental migration), particularly to Italy.

In Chapter 3 motives for the different forms of migration are investigated. A household model that allows for migration in terms of the lost-labour, the remittance and the reduced-consumption effect, is described. Maximising household utility, subject to a budget and a time constraint, enables the derivation of a reduced form equation for the decision to migrate continentally or intercontinentally. Data are cross-section and as most migration is permanent, time-invariant variables are used to explain the decision to migrate, which has taken place sometime in the past. Results from the estimation of a multinomial logistic model identify continental migration and intercontinental migration as two different strategic decisions. Households with intercontinental migrants are wealthier and able to respond to opportunities for wealth accumulation in Europe whereas households that send out continental migrants are less well-endowed and appear to send out migrants in response to push factors such as lack of land and consumption pressure.

Migration is only one of the income diversification options of rural households that typically have a diverse portfolio of activities (staple and cash cropping, livestock investment

and other activities). The allocation of labour to migration and the receipt of remittances in an imperfect market environment have implications for resource use and income earned in other household activities. Migration presents the household with a loss of labour (lost-labour effect) and a gain in liquidity (remittance effect). In Chapter 4 the implications of migration for both the activity choice of households and income generated in different activities are investigated. Such an investigation constitutes a test of the New Economics of Labour Migration (NELM) theory. The NELM theory points to the important role that migration could play in enabling households to overcome credit constraints and facilitate investment in particular in high-return activities. Results from the estimation of a two-stage selection model point to the importance of the remittance effect that enables households with intercontinental migrant to overcome entry barriers that exist for capital intensive activities. The lost-labour and possible the remittance effect for households with intercontinental migrants, are found to crowd out labour intensive activities. These findings together clearly support the NELM theory and highlight the importance of considering heterogeneity in migration when analysing its consequences.

In Chapter 5 implications of migratory movements are analysed for staple cropping practices, the main activity of most rural households both in terms of labour use and income share. Staple cropping practices are generally traditional with little use of external inputs. Such traditional practices are considered to be unsustainable in the long-run. In an imperfect market environment, the remittance and lost-labour effect could affect aspects of staple cropping, such as production technologies and sustainability. The results of the estimation of two-production functions (one for each location) suggest that households do adjust to changing factor endowments. Households are not found to abandon staple cropping practices in response to the lost-labour and remittance effects of migration. However, migration does not lead households to change cropping practices from traditional to modern. In other words, in-depth investments are not made and where cropping practices from migrant and non-migrant households differ, this is only in relation to labour-substitution strategies.

In Chapter 6 the consumption side of the farm household model is analysed. A missing market for labour necessitates the inclusion of the shadow wage, derived as the marginal value product of labour in staple cropping, to enable the calculation of shadow full income. Shadow full income, which incorporates a valuation of household time, constrains the consumption

behaviour of households, described by a Stone-Geary utility function. The estimation of a home-time demand function, results in the necessary parameters to estimate a system of demand functions for the remaining four consumption categories as well as labour supply in productive activities. Findings suggest that differences in consumption exist between the household groups. For households without and with continental migrants home-time shows a comparatively low income elasticity. By the same token, labour supply shows a relatively inelastic response to income changes. For households with intercontinental migrants labour supply shows a much more elastic response changes in income.

Simulation of household behaviour is used to trace the effects of migration through the household model. Findings from a migration increase illustrate the different strategic character of continental versus intercontinental migration. Continental migration improves the welfare of the household through a reduction in household size and may therefore be preferred to other activities. Intercontinental migration enables the household to accumulate wealth and greatly improve its welfare.

Contributions of the study to the migration, remittances and development debate and implications for policy making are discussed in Chapter 7. The role of migration in the development of the migrant-sending economies is analysed with reference to the three *R's*: remittances, recruitment and returns. Remittances, from intercontinental migration, are found to enable households to overcome production and investment constraints. In the current study recruitment of intercontinental migrants amongst wealthy households implies that migration can increase inequality between migrant and non-migrant households. Returns can only be properly analysed in a long-term context. Whether the three *R's* of migration can produce a virtuous circle of development depends crucially on the institutional setting particularly the implementation of sound macroeconomic policies and policies of good governance, as well as development strategies involving all actors in the economy.

The benefits of intercontinental migration for the sending economy have been clearly demonstrated in this study. Although these are not studied here, benefits are also likely to accrue to receiving countries as low-skill migration constitutes a source of cheap labour in the context of a shrinking workforce and a rising overall dependency ratio in much of Western Europe. This study therefore propagates the recognition of the economic benefits of migration to the sending

economies at the European level so that a system can be devised under which low-skill migrants can access the labour market.

Availability of only cross section data limits this study in fully assessing the implications of migration for the sending economy. The third *R* of migration, returns, is a crucial factor determining whether a virtuous circle may result from migration. This study by only using household level data cannot take interactions between households into account. It is also important to realise that a sample of more than 200 households in four villages does not enable country-wide conclusions to be drawn. The current analysis could be complemented in the future with long-term as well as economy-wide studies. In addition a village model would allow for interactions between households.

# SAMENVATTING

Inkomensdiversificatie, ofwel inkomensverwerving uit bronnen naast gewasteelt wordt beschouwd als een belangrijke strategie van bestaansverwerving voor rurale huishoudens, vooral in Afrika. Migratie als één van de diversificatie strategieën heeft veel aandacht gekregen van onderzoekers en beleidsmakers vooral vanwege gevolgen voor ontwikkeling. Er wordt geschat dat officiële overmakingen van internationale migratie de tweede meest belangrijke bron van externe financiering vormen in ontwikkelingslanden.

Burkina Faso, een land waar omstandigheden voor landbouw ver van gunstig zijn kent een lange geschiedenis van migratie. Migratie binnen het Afrikaanse continent vindt sinds lange tijd plaats als reactie op droogte en lage landbouw productiviteit en werd tijdens de koloniale periode, toen arbeid nodig was in mijnen en op plantages in onder andere de Ivoorkust, geïnstitutionaliseerd. Migratie naar bestemmingen buiten het Afrikaanse continent en vooral naar West Europa is de laatste paar decennia belangrijk geworden voor migranten uit Burkina Faso.

Gezien de hoogte van het bedrag van officiële overmakingen van internationale migranten, kan Burkina Faso als één van de armste landen van de wereld duidelijk profiteren van migratie (en gerelateerde geldovermakingen). Interacties tussen migratie, geldovermakingen en ontwikkelingen zijn sinds een aantal jaar het onderwerp van een controversieel debat gevoerd door onderzoekers en beleidsmakers.

Deze studie voorziet in een kwantitatieve analyse van de motieven voor en gevolgen van migratie voor rurale huishoudens op het Centrale Plateau van Burkina Faso. In het onderzoek wordt onderscheid gemaakt tussen migratie binnen Afrika (continentale migratie) en migratie naar een bestemming buiten Afrika (intercontinentale migratie). Een versie van het boerenhuishoudmodel uitgebreid met een migratie component vormt de basis voor de econometrische analyse.

Deze studie draagt op verschillende manieren bij aan het debat rondom migratie, geldovermakingen en ontwikkeling: (i) in tegenstelling tot eerdere studies, beschouwt deze studie migratie vanuit het perspectief van een volledige huishoudeconomie waarin oorzaken en gevolgen van migratie worden gecombineerd en (ii) waarin de productie en de consumptie kant van het boeren huishouden in een imperfecte markt omgeving zijn verwerkt; (iii) in plaats van

een algemeen begrip van migratie wordt er in deze studie rekening gehouden met heterogeniteit in migratie en worden twee migratie vormen onderscheiden: continentaal en intercontinentaal. Intercontinentale migratie levert veel geld op in de vorm van overmakingen, maar hoge toegangskosten voorkomen dat alle huishoudens deel kunnen nemen aan deze vorm van migratie.

In Hoofdstuk 1 wordt de benadering die de basis vormt van de studie uiteengezet in de vorm van een model dat de besluitvorming binnen het huishouden beschrijft vanuit het perspectief van een volledige huishoudeconomie. Deze volledig huishoudeconomie benadering maakt het mogelijk een verband te leggen tussen motieven voor migratie en gevolgen voor productief en consumptiegedrag van het rurale huishouden.

In Hoofdstuk 2 wordt het onderzoeksgebied geïntroduceerd. In februari en maart van 2003 zijn data voor 223 huishoudens verzameld in vier dorpen op het Centrale Plateau van Burkina Faso. Twee dorpen (Boussouma en Korsimoro) bevinden zich aan de hoofdweg van Ouagadougou (de hoofdstad van Burkina Faso) naar het noorden. Vanuit deze dorpen vindt migratie plaats naar bestemmingen binnen Afrika (continentale migratie). De positie van de andere twee dorpen (Niaogho en Béguédo) is meer geïsoleerd omdat ze slechts bereikt kunnen worden via een drie uur durende tocht over een onverharde weg. Vanuit deze dorpen vindt migratie plaats naar bestemmingen binnen (continentaal) alsook buiten Afrika (intercontinentale migratie), vooral naar Italië.

In Hoofdstuk 3 worden de motieven voor de twee verschillende migratievormen onderzocht. Een huishoudmodel wordt beschreven dat rekening houdt met migratie in termen van arbeidsverlies, overmakingen, en verminderde consumptie. Het model maximaliseert huishoudnut gegeven een budget- en tijdsbeperking. Hieruit kan een gereduceerde-vormvergelijking voor het besluit om continentaal of intercontinentaal te migreren worden afgeleid. Data zijn cross-sectie en aangezien het overgrote deel van migratie permanent is, worden tijdsinvariante variabelen gebruikt om de migratie keuze, gemaakt in het verleden, te verklaren. Schattingsresultaten laten zien dat continentale en intercontinentale migratie beschouwd moeten worden als twee verschillende strategische keuzes. Huishoudens met intercontinentale migranten zijn meer vermogend en daardoor in staat kansen aan te grijpen voor inkomensverwerving in Europa terwijl huishoudens met continentale migranten minder rijk zijn

en migranten lijken te sturen als reactie op push-factoren zoals gebrek aan land en consumptie-druk.

Migratie vormt slechts één van diversificatie mogelijkheden van rurale huishoudens die vaak een scala van activiteiten ondernemen (teelt van voedsel- en marktgewassen, veeteelt en andere activiteiten). In een imperfecte marktomgeving heeft migratie gevolgen voor het gebruik van hulpbronnen en het inkomen dat wordt verdiend in andere huishoud activiteiten. De gevolgen van migratie voor de activiteiten keuzes en voor het inkomen dat wordt verdiend in de verschillende activiteiten worden onderzocht in Hoofdstuk 4. Een dergelijk onderzoek vormt een test van de *New Economics of Labour Migration* (NELM) theorie. De NELM theorie benadrukt de belangrijke rol die migratie kan spelen bij de financiering van investeringen in activiteiten met een hoge opbrengst. De resultaten van de schatting van een tweefase selectie model laten zien dat overmakingen van groot belang zijn omdat ze huishoudens in staat stellen toegangsbarrières die bestaan voor kapitaal intensieve activiteiten te overbruggen. Door arbeidsverlies en misschien ook het overmakingeffect blijkt intercontinentale migratie arbeidsintensieve activiteiten te verdringen. Samen staven deze bevindingen de NELM theorie en benadrukken zij dat het nodig is rekening te houden met heterogeniteit in migratie in een analyse van de gevolgen van deze migratie.

In Hoofdstuk 5 worden de implicaties van migratie voor de teelt van voedselgewassen geanalyseerd. Voedselteelt is de hoofdactiviteit van de meeste rurale huishoudens in termen van arbeidsgebruik en aandeel in het inkomen. Voedselgewassen worden meestal op traditionele wijze verbouwd met weinig gebruik van externe inputs. Dergelijke traditionele manieren van gewasverbouw worden gezien als niet duurzaam op lange termijn. In een imperfecte marktomgeving kunnen overmakingen en arbeidsverlies effect door migratie invloed hebben op aspecten van voedselverbouw, zoals productietechnologieën en duurzaamheid. De resultaten van de schatting van twee productiefuncties (één voor de dorpen in het noorden en één voor de zuidelijke dorpen) tonen aan dat huishoudens zich aanpassen aan veranderende factor verhoudingen. Arbeidsverlies en overmakingen nopen huishoudens er niet toe af te stappen van de teelt van voedselgewassen. Migratie brengt huishoudens er echter ook niet toe om de wijze van voedselverbouw te veranderen van traditioneel naar modern door bijvoorbeeld diepte-investeringen.

In Hoofdstuk 6 worden de consumptiebeslissingen van boerenhuishoudens geanalyseerd. Het ontbreken van een arbeidsmarkt maakt het noodzakelijk een schaduwloon te berekenen, als het marginale waarde product van arbeid in voedselteelt. Het consumptiegedrag van huishoudens wordt bepaald door het schaduw volledig inkomen, waarin een waardering van huishoudtijd tegen het schaduwloon is opgenomen, en een Stone-Geary nuts functie. Het schatten van een vraagfunctie voor thuistijd, resulteert in de benodigde parameters voor schatting van een systeem van vraagfuncties voor de overige vier consumptie categorieën en het arbeidsaanbod in productie activiteiten. De resultaten laten zien dat er verschillen in consumptie bestaan tussen de huishoudgroepen. Voor huishoudens zonder migranten en met continentale migranten laat thuistijd een relatieve inelastische reactie zien op inkomensveranderingen. Voor huishoudens met intercontinentale migranten reageert arbeidaanbod juist sterker op inkomensveranderingen.

Simulatie van huishoudgedrag wordt gebruikt om de effecten van migratie door het huishoudmodel te traceren. Simulatie van een toename in migratie laat het verschillend strategische karakter van continentale versus intercontinentale migratie zien. Continentale migratie verbetert het welzijn van het huishouden door een verkleining van de omvang van het huishouden. Intercontinentale migratie stelt het huishouden in staat om vermogen te accumuleren en daarmee welzijn sterk te verbeteren.

De bijdragen van deze studie aan het debat over migratie, overmakingen en ontwikkeling en de gevolgen voor beleidsmakers worden in Hoofdstuk 7 besproken. De rol van migratie in de ontwikkeling van migrantensturende economieën wordt geanalyseerd met behulp van drie factoren: overmakingen, werving en terugkeer. Overmakingen van intercontinentale migratie blijken huishoudens in staat te stellen productie- en investeringsbeperkingen te boven te komen. In deze studie betekent werving van intercontinentale migranten bij vermogende huishoudens dat migratie ongelijkheid tussen migranten en niet-migranten huishoudens kan vergroten. Het belang van terugkeer van migranten kan alleen worden bekeken op lange termijn. Of deze drie factoren van migratie een zogenaamde “virtuous circle”van ontwikkeling in gang kunnen zetten hangt in hoge mate af van de institutionele omgeving en dan vooral de totstandbrenging van degelijk macro-economisch beleid en goed bestuur, alsook ontwikkelingsstrategieën die betrekking hebben op alle actoren in de economie.

De voordelen van intercontinentale migratie voor de migrantensturende economie worden in deze studie duidelijk aangetoond. Het is waarschijnlijk dat er ook voordelen bestaan voor de landen die migranten ontvangen, hoewel deze in dit proefschrift niet worden bestudeerd. Laagopgeleide migranten vormen een bron van goedkope arbeid in de context van een krimpend arbeidsaanbod en een toenemend afhankelijkheids ratio in een groot deel van West Europa. Deze studie propageert erkenning op Europees niveau van de economische voordelen van migratie voor de migrantsturende en ontvangende landen zodat een systeem kan worden ontwikkeld waarin laagopgeleide migranten toegang krijgen tot de Europese arbeidsmarkt.

Beschikbaarheid van cross-sectie data beperkt deze studie in een volledige analyse van de gevolgen van migratie voor de migrantensturende economie. De derde factor van migratie, terugkeer, speelt een belangrijke rol in het ontstaan van een “virtuous circle”van ontwikkeling als gevolg van migratie. Deze studie op huishoudniveau kan geen rekening houden met interacties tussen huishoudens. Het is duidelijk dat een steekproef van iets meer dan 200 huishoudens in vier dorpen in Burkina Faso het niet mogelijk maakt conclusies te trekken op nationaal niveau. De huidige analyse zou in de toekomst kunnen worden aangevuld met langtermijn en landelijke studies. Tevens maakt het gebruik van een dorpsmodel het mogelijk om rekening te houden met interacties tussen huishoudens.

CURRICULUM VITAE

Fleur Stephanie Wouterse was born October 8th, 1977 in Twisk, Noord Holland. She obtained a propedeuse in Human Geography at the University of Utrecht and subsequently moved to the UK to study Politics, Philosophy and Economics at the University of York from 1997 to 2000 resulting in BA(hons.) degree. From 2000 to 2001 she studied for her MSc degree in Environment and Development at the University of East Anglia in Norwich, UK. For the writing of her MSc thesis on indigenous conservation measures of small-scale fisheries she carried out field research into two villages situated on the lakeshore of Lake Malawi in Malawi. Her research was carried out in the context of a larger project termed LADDER (Livelihoods and Diversification Directions Explored by Research) of ODG (Overseas Development Group).

In January 2002, she was appointed as a PhD researcher at the Development Economics Group of Wageningen University. Her PhD research was conducted in the context of the NWO (Netherlands Organisation for Scientific Research) programme Milieu en Economie (Environment and Economics). Her PhD research was largely based upon a household survey, which she carried out in four villages in Burkina Faso. As part of her PhD research she spent three months at the Sussex Centre of Migration Research at the University of Sussex, UK and three months at the Department of Agriculture and Resource Economics, University of California, Davis. In 2005 she successfully completed the doctoral training programme of the Netherlands Network of Economics (NAKE).

TRAINING AND SUPERVISION PLAN

| *Description* | ***Institute*** | ***Year*** | ***Credits*** |
|---|---|---|---|
| ***General courses*** | | | |
| Research Methodology | Mansholt Graduate School | 2002 | 1[24] |
| Professional Communication Strategies | Wageningen Graduate Schools | 2005 | 0.7 |
| ***Mansholt-specific courses*** | | | |
| Mansholt Introduction Course | Mansholt Graduate School | 2002 | 1 |
| ***Discipline-specific courses*** | | | |
| Models in Agricultural Economics | Wageningen University | 2002 | 5 |
| Advanced Econometrics | Wageningen University | 2002 | 3 |
| Macro Economics | UC, Davis, US | 2005 | 5 |
| Micro Economics | University of Sussex, UK | 2002 | 5 |
| Bio-economic Modelling | Mansholt Graduate School | 2002 | 1 |
| Applied General Equilibrium Models | NAKE[25] | 2003 | 2 |
| Natural Resource Economics | NAKE | 2004 | 2 |
| Migration in a Globalizing World | NAKE | 2004 | 2 |
| Behavioural Modelling of Government Decision-Making | NAKE | 2005 | 2 |
| International Trade, Growth and the Environment | NAKE | 2004 | 2 |
| Theory of Monetary Policy | NAKE | 2005 | 2 |
| ***Presentations at conferences and workshops*** | | | 2 |
| 85th European Association of Agricultural Economists seminar, Florence, Italy | | 2004 | |
| CERES Summer school, ISS, The Hague, The Netherlands | | 2005 | |
| European/ EAAE PhD Workshop, Wageningen, The Netherlands | | 2005 | 1 |
| ***Teaching activities*** | | | |
| Methods, Techniques and Data Analysis for Field Research | Wageningen University | 2004/ 05 | |
| Rural Household and Livelihoods | Wageningen University | 2006 | |
| Agricultural and Rural Development: Economic Perspectives | | 2002 | |
| Total (min 20 credits) | | | 36.7 |

[24] 1 credit represents 40 hours
[25] Nake stands for Dutch Network of Quantitative and General Economics