

Interactions between desertification and population movements

- *Draft version* -

by

Beatrice Knerr

University of Kassel / Faculty 11

Dept. of Development Economics and Agricultural Policy

Steinstrasse 19

D-37213 Witzenhausen

e-mail: knerr@wiz.uni-kassel.de

Abstract

This paper analyses the relationship between human migration strategies and desertification. It challenges the hypothesis that migration movements which take place in reaction to increasing discrepancies between carrying capacity and population density in regions affected by desertification tend to support the way to an equilibrium between both. The empirical analysis first considers general investigations about people's reactions to a deteriorating relationship between economic carrying capacity and population density. Built on that, it tests if the rules deduced from theories and general empirics are valid in rural areas of low-income countries. For that purpose it draws on experiences made in different low-income countries, relying on case studies from Asia, Africa and Latin America carried out by the author and by other researchers. The results demonstrate that predicting adjustment processes by applying conventional theoretical models may be insufficient or even misleading, as - for economically rational reasons - individuals and households may prefer strategies which accelerate desertification and imply cumulating downward processes characterised by a discrepancy between their own short-term interests and the longer term ecological stability. These strategies might contribute to a permanently unstable situation, implying a threat to the natural environment and to the people living in and from it.

1 Introduction

Problems associated with desertification¹ are a central issue of the future of mankind. Hence, humans as part of the eco-system are faced with declining productivity of their natural environment. More than 250 million people in over 110 countries currently are directly affected by desertification, and about one billion are at risk. Around one-sixth of the world's population is living in arid and semi-arid regions, in countries with population growth rates of around 1.5% p.a. (World Bank 1999). At the beginning of the 21st Century arid regions² are among the most threatened living spaces, and world-wide they are increasing. Some arid countries like Jordan, Iraq, Morocco or Iran display growth rates of 2.2% and more, which are among the highest in the world (UNDP 1999). Within North Africa (Sahara, Sahel) where the major arid regions affected by desertification are located, e.g., the population has doubled over the last three decades while the strip with 100 to 150 ml of annual precipitation has shifted by 6 kms p.a. southwards between 1970 and 1990.

Since the 1980s, this development increasingly raises concern of the international community. After a period during which the natural environment and the ecological aspects of the phenomenon have been in the focus of interest, since the 1990s, the relationship between desertification and population growth has aroused increasing attention, and has alarmed politicians and scientists alike. High rates of population growth in arid regions whose limits of ecological carrying capacity are obvious, suggest that out-migration of part of the population would be a positive solution. Hence, observed adaptive processes by out-migration are regarded as more a problem of the receiving regions, like urban centres, than of the sending areas. The question what results for arid source regions raises less concern, as out-migration from there is considered as a relief.

As those who are not able to improve or at least maintain their living standard locally tend to move to other regions where they suppose conditions are better, the eroding environment usually does not remain a problem of the people living there, however, but spreads to other parts of their country, and might also reach neighbouring as well as distant countries. Capacities to integrate additional in-migrants are already strained in many parts of the world, however, and hence, social conflicts tend to escalate within arid regions as well as far from them (Bächler 1995). This development has required urgent political action.

¹ At the 1992 Earth Summit, desertification has been defined as "land degradation in arid, semi-arid and sub-humid areas resulting from various factors, including climatic variations and human activities." (Secretariat of the UNCCD 1995:12)

² According to the World Resources Institute's definition, arid regions are defined here as those with an average precipitation of less than 200 mm p.a. Semi-arid regions are defined as those with a precipitation of 200 to 400 mm p.a. (WRI, 1994)

As these reactions have impact on the social, political, economic and ecological conditions, their implications must be predicted in order to shape preventive policy measures against undesired consequences, as far as this is possible. Within the spectrum of reactions, demography comes more than ever into the foreground. To collect, compare and draw conclusions from experiences made in this area is of vital and growing importance as increasing desertification is, in many regions all over the world, both a result of and a threat to human activities. It is developing into a central issue of the future of mankind, implying questions of food security, of social peace and of international conflicts.

Against that background, it is essential for policy makers, to gain deeper insights into the causes and consequences of migratory movements and about their interrelationship with the process of desertification. Without specific knowledge about these issues, serious development policies in regions which are significantly effected by desertification are not possible. This is demonstrated by the case studies presented below. They show that out-migration provoked by increasing discrepancies between population density and economic carrying capacity may lead to implications in the source regions which would not have been anticipated by reflections based on theoretical considerations or general experiences (see also Knerr 1998 and 2000).

Based on the results of the theoretical reflections, the paper starts from the hypothesis that population movements lead to a declining discrepancy between economic carrying capacity³ and population density in regions affected by desertification. The carrying capacity (cc) of a certain region is determined by its available natural capital; its available physical capital; the human resources, the claims of the population living there; the technologies used in the region; the institutional arrangements, like land-rights or habits of sharing among each other; and the possibilities to exchange goods and services with the outside (see Knerr 1998b). The fact that cc and the population density do not develop independently of each other is an essential aspect within the present analysis. Where the population density grows, people might react by trying to increase cc too. For that purpose they might develop or adopt new technologies (Boserup 1981). Or they might react by out-migraton. These reactions may occur simultaneously, they may reinforce each other, or they may substitute each other. Where the relation between population density and cc has increased to more than 1, natural capital would be used up if other adaptations are not chosen or are not successful. History has shown that migratory movements are the most common reaction. This paper turns to the

³ The economic concept of carrying capacity (cc) used in the present context refers to human beings. It explains carrying capacity as the ability of an economic space to maintain a certain population sustainably. From an ecological point of view the term "carrying capacity" denominates the maximum number of persons able to live in a certain region on the basis of the resources necessary for life while maintaining their living standards and their quality of life in the long term (Borchert and Mahnke, 1973).

aspect of population movements which are lead by economic considerations, i.e. by the desire to improve one's material situation.

The empirical investigation carried out to test the above hypothesis considers comprehensive investigations as well as case studies about how people react to a deteriorating relationship between carrying capacity and population density. It draws on experiences made in different arid regions of low income countries in Asia, Africa and Latin America carried out by other researchers as well as by the author. The analysis includes the family, the household-farm unit, the region, the national and international level, where potentials, restrictions and institutional arrangements may coincide in a way which contributes to improve the situation or to turn it from bad to worse. By identifying conditions which promote adverse effects and reflecting on possibilities to modify them, the author intends to join in the effort to bring ecological and demographic developments in regions threatened by desertification on a way towards a socially accepted equilibrium.

Well known and influential theories on migration stress the advantages of such migratory movements out of strained regions as they seem to take population pressure away from them and imply a better relationship between carrying capacity and population density. According to the traditional neo-classical theory of migration⁴, people move to where they expect to have a higher income, taking care of transaction costs (Schwartz 1973), risk and uncertainty (Greenwood 1969) and employment possibilities (Todaro 1976). In agricultural regions, the living standard of the population is largely determined by the natural resources. Spreading desertification then implies a higher pd/cc ratio and hence c.p. increasing out-migration. In addition, assuming that increasing pd/cc results in decreasing marginal productivity of labour, the hypothesis is deduced that migratory movements contribute to balancing the population densities between regions with a lower pd/cc-coefficient and those who have a higher one.

In fact, extensive migratory movements out of arid regions are observed all over the world, and out-migration with the purpose to settle elsewhere seems to be a most simple reaction to increasing drought and/or population density. Yet, the times, when peaceful settlement migration on a large scale was possible for the population of regions hit by desertification are over as in-migrants pose economic, social and political pressure on the receiving regions. This applies, first of all, to migration across international borders, but increasingly also to internal migration (Knerr 1998a). Over the last decades migratory movements have become more and more temporary and the outflow of labour is often accompanied by an in-flow of capital brought by the migrants. Networking based on traditional relationships is an important social capital for pursuing migration strategies as following paved ways reduces transaction costs.

The case studies presented in this paper demonstrate the impact of out-migration under the different socio-economic and cultural conditions.

That there is a striking lack of research in this area is demonstrated by the example of Egypt, which exemplifies the conditions which prevail in the Middle East / North Africa region. Population movements that take place in reaction to increasing desertification, can hardly be overestimated. Nevertheless, when going through the available literature it becomes obvious that almost no research has been done about this issue. Hence, a paper issued by the World Bank with the initial intention to provide an overview over Egypt's demographic development, its causes and consequences, starts with the diagnosis: "Data on migration are so unreliable and the prospects for migration to relieve population pressure are so uncertain that this paper concentrates on changes in mortality and fertility" (Cochrane and Massiah 1999:1). Only few studies have been made about the impact of international labour migration on the rural home regions of the migrants, in spite of the fact that international labour migration is a dominant factor of the country's economic development. Even more scarce are studies which focus on the impact of internal migration on the rural source regions.

In order to stimulate the discussion in this area, the author presents theories and experiences made in arid regions affected by desertification. By this, it is intended to provide a background for building up scenarios which might be used as a basis for formulating research hypotheses for individual cases.

Egypt is among the most arid countries in the world with almost 100% share of arid land in total land (WRI 1999), characterised by increasing desertification. With a population growth of almost 3% p.a. (World Bank 1999). The move from the rural regions to the urban centres, in particular to Cairo and Alexandria has been steadily increasing and has reached more than 45% of the population. The question what this implies for the rural regions, from where the migrants come has not been answered sufficiently. Egypt is at a critical stage, where the gap between population growth and growth of food production becomes increasingly wider, desertification proceeds, and population movements out of rural regions accelerate, with unknown outcome for the rural regions carrying capacity. In spite of the fact that it is a century old phenomenon in Egypt which has significantly gained momentum over the last decades, and in spite of its close relationship with core political issues of the country (Toth 1999), internal migration in its consequences has been insufficiently investigated. In her book about the consequences of migration on Egypt's labour market, el-Hawari states that although a wide-spread phenomenon with far-reaching economic and political

⁴ There are a number of variations to this basic theory. For details see Knerr 1998a:31ff.

consequences, internal migration in Egypt is not reflected in the actual literature (el-Hawari 1998:127).⁵.

A major consequence of temporary migration patterns is the permanent interaction between the migrant and his family/household in the source region. This interaction extends to many levels of the migratory process, from the decision who will migrate and when, over the extent and use of remittances up to decisions of return. Moreover, interactions with the home community build up migration chains which promote and shape following-up migration processes.

The following case studies demonstrate a set of different consequences of out-migration which result under various socio-economic and cultural conditions.

2 Circular labour migration within the framework of traditional family / household strategies

Strategies to cope with adverse environmental conditions have existed in arid regions since ancient times. In many regions, they have been essential for the survival population. In many locations, they continue according to established patterns, although in the present time, due to rapidly changing external conditions, i.e. desertification and population growth, they have assumed other dimensions. Adaptations take place within this given framework, often build on long-term stable adaptations to stable arid environments, such pastoralism or patterns of regular seasonal and circular labour migration (see, e.g. Scoones 1995, Prothero 1998).

An example of this kind of migration are the people of Senegal. Their migratory patterns are pre-determined by historically established survival strategies which display typical differences between ethnics. This is demonstrated by Dia's detailed study of the migration strategies of the Kaskas, the Soninké, the Seres and the Haal Pular (Dia 1992). Common to them is that migration decisions are taken jointly by the social unit the migrant belongs to, and that migration/remittance strategies are pursued with the intention of supporting the existence of the reproductive unit at the place of origin.

⁵ More attention is paid to international migration. It is important for Egypt's economic development, and due to its contribution to the country's inflow of foreign exchange and its relief for the labour market, has received much attention on the political level. At the same time, it has been investigated far more from the scientific side than internal migration. One reason might for this might also be that data about international migration are more easily available as they imply across-border transactions (out-migration, in-migration, bank transfers) which are registered more than internal transactions. Hence, a number of sophisticated studies about the impact of international migration exists, often concentrating on the macro-level impact of remittances (see, e.g. Farrag 1995). Investigations about the economic and demographic determinants and social implications of international migration allow some rough and indirect conclusions about the impact on the source regions (see, e.g. Adams 1993; Nasrat 1999). This contrasts sharply with the lack of knowledge about internal migration, its dimensions and consequences.

The Kaskas live under climatic conditions which make labour demand on the farms peak over a short period. In addition, due to insecure rainfall, irrigation is essential for increasing and securing agricultural productivity. On the irrigated lands, external labour is particularly important due to the extremely narrow calendar of cultivation.

The Kaskas on the average have 1.5 out-migrants per household. Their agricultural development strategies include special forms of temporary migration which embrace mainly the younger age groups. Migration income is the most important component of non-agricultural income among the Kaskas. In 1988, each household on the average received 65.800 F CFA p.a. which is equivalent to a salary for 188 to 268 working days.

Behind this average migration situation there are important differences between household groups which have a decisive impact on the economic situation of the whole region. Three typical groups can be identified: a) households where about 75% of the men are migrants. They are able to subsidise their farms by migrants' remittances which pay for inputs and external labour. b) large production units with few migrants; in spite of large areas of land per household (74 ha on average) only an average of 2.6 ha is cultivated due to lack of external income to hire labour, buy inputs and finance irrigation parameters. Here, land productivity is low, farm households are indebted and suffer from food deficits. c) small production units without migrants; they are the worse off. In spite of their small area of land, they are not able to satisfy their need for labour. Although they employ innovative technologies, like direct seeding etc., they are not able to compensate for the lack of labour and inputs. As a consequence of this, families with migrants accumulate large land holdings. The head of the production unit secures the farm management. The production units which have the most migrants are enlarging their irrigated area at the most, and their mechanise more than others. Yet, these farm activities are not sustainable out of their own resources. The net return of their investment is negative, and it would not be possible to finance them out of the farm income. Hence, the applied migration-remittance strategies allow the families to continue their life in their arid home region, which otherwise might not be possible.

Similar strategies are common in other ethnic groups of the population of Senegal (Dia 1992). Of the Haal Pular more than 90% of the men between 30 and 60 years of age have migrated at least once in their life. 58% of the migrants move to towns within Senegal, 35% to those in Mauritania, and 6% even further away. Households in the home villages on average consist of 1.4 men present, 2.2 women present and two absent men or women, not including the seasonal migrants. Close ties maintained within the clan support highly organised seasonal migration patterns. So, households established in Dakar take over the responsibility for young migrants arriving there.

High rates of migration are also observed among the Seres, with 48%, and the Soninké. The movements of the Seres whose tradition of migration to Dakar only dates back to the 1980s

have intensified significantly with the increasing droughts in the region. As a result, the Seres are distributed over Dakar, the Terres Neuves and their home region in Central Senegal, and between these regions there are intense movements, supported by strong social networks. Decisions about migration are usually taken within the family subgroup consisting of the mother and her children, in co-ordination with the head of the farm-household unit.

The Soninké are specialised in long-distance migration. In the 1960s they had taken part in the labour force agreement between Senegal and France. In 1975, when the French government decided to stop in-migration from Africa, 83% of the out-migrated Soninké were in France. Afterwards, some illegal movement to France carried on, and in addition new international paths established themselves, in particular to Central and Western Africa. At the Soninké, the oldest who heads the social group living, cultivating and consuming together, decides on migratory movements, organises the out-migration and decides on the use of remittances. On the average such a group consists of 16 persons.

Similar strategies of maintaining the reproductive unit in the rural area by subsidising agricultural activities by migrants' remittances are common in other arid regions of Africa, as, for example, in the Communal Areas of Zimbabwe where the subsistence needs of the smallholder families can only be met due to migrants' remittances which are used to buy the necessary inputs (Hedden-Dunkhorst 1993). In addition, this is accompanied by long-term migration-cum-remittance strategies, which aim at giving the children a good school education which later on will put them into a position to earn a higher income allowing for higher remittances.

All of the described strategies can only be successful, as long as the migrants are able to find employment which provides them with a surplus to transfer to their home region. With increasing desertification, accompanied by mounting population pressure these strategies are increasingly threatened to fail. Mauritania provides an example where they definitely have collapsed (Fahem 1998). While the country's nomadic areas are emptying, urbanisation increased from 8% to 47% between 1965 and 1988. This development has been promoted by the availability of water and food supplied by international aid organisations to urban centres. Hence, many were attracted by these supplies and not by well-paid jobs. Although out-migration from rural areas is highly selective in favour of the younger males, which deprives the rural regions of their most productive labour force, hardly any resources flow back there. The gender distribution in the rural areas is significantly in favour of women, while in the urban areas it is the reverse. One third of all households in the country are headed by women. In the face of increasing desertification on the one hand and continuing high population growth on the other hand, the largest part of Mauritania's population today is threatened by hunger and thirst. For a large part of them, only international aid secures the survival.

In addition, as has been demonstrated through a study by Knerr and Schrieder (Schrieder and Knerr 2000), migration-cum-remittance strategies seem to support first of all those in the home region who possess productive resources. It shows that in rural regions of Cameroon, not all of those who have migrant family members are supported in case of need. The amount of remittances received is not negatively correlated with the income of the migrant's family member at home, - as would be expected under the assumption of altruism -, but positively with the number of animals and the amount of land the remittee holds, and the remitter might inherit. The example of Cameroon demonstrates that migration strategies might be more a way to preserve productive capital in a strained region, than just a strategy to maintain the living standard of those left behind. A study made by Lucas in the mid-1980s in Botswana seems to point into a similar direction (Lucas 1985; Lucas and Stark 1985).

3 Out-migration for resettlement

Migration out of arid regions for resettlement as a rule means movement to urban centres and increasing urbanisation. In fact, in all arid countries, cities are spreading and the growth rates of the urban population are significantly higher than the average growth rate of the whole population.

When individuals or families leave for good, remittances might be sent for a shorter or longer time span to those left behind, but as a rule they tend to decline and eventually dry out. How this process develops, depends on the economic and cultural context.

Sending remittances to secure the survival of the family/household left behind is, for example, less common for internal settlement migration in the social context of Latin America. Therefore, the implications of out-migration from overpopulated regions are quite different from those described above. They are analysed by Müller (1993) for the Valle Grande in Bolivia, a smallholder region characterised by long-term net population loss, selective out-migration and no significant remittances received from those who have out-migrated. 76% of the population of Valle Grande live in rural areas where non-agricultural sources of income are largely lacking. With the applied techniques, only 10% of the province area can be cultivated by field crops. Over the past decades the region was hit by repeated periods of drought. Desertification is accelerated by deforestation and soil erosion which is mainly due to cattle holding in unregulated pasture economies.

Between 1950 and 1992, the Valle Grande lost 20% of its population by out-migration. Out-migration is promoted by the fact that the Valle Grandinos dispose over alternatives to agriculture for gaining an income. Traditionally they are engaged in trade and transport. Under these conditions, they have concentrated less on agricultural innovations to improve their farms.

Out-migration seems to bear a negative ecological impact. It has not led to a reduction in the number of cattle kept, but only to a stronger concentration of cattle holding. In addition, deforestation has accelerated due to a lack of labour force. As the fields weed up extremely rapidly, and herbicides are very expensive as compared to labour, it is more profitable for the farmers to burn down forest areas to gain new fields than weeding old ones. This development has resulted in increasing desertification.

In addition, out-migration has brought a permanent erosion of the region's productive human capital. The major reason is that out-migrants tend to be the younger and more productive persons, while the weaker sections of the population stay behind. As the better qualified leave, more demanding jobs cannot be filled adequately, neither in the private sector nor in the provincial administration. As this pattern has persisted over decades, social problems, like over-ageing of the population, high dependency rates, alcoholism and high suicide rates prevail.

As unfavourable areas are increasingly emptying and isolated, critical numbers of inhabitants for maintaining the public infrastructure in many places do not exist anymore, which provides further incentives for out-migration.

Declining productivity has been particularly pronounced in agriculture. For almost all crops for which Valle Grande once had an almost monopolistic standing, like maize, land productivity has fallen far beyond the average of the departamento and the country.

Out-migration hence has led to an erosion of the physical as well as the human resources. As a result, the region suffers from a steep economic and social decline. Life expectancy is below and child mortality is above the Bolivian average. As the economic potential of the region has dramatically declined, the remaining populations find it increasingly difficult to maintain itself.

A case of involuntarily permanent out-migration from an arid region hit by desertification is described by Randall (Randall 1998). In her study she demonstrates for the Malian Gourma that traditionally based strategies to temporarily escape from drought can end up in permanent displacement, the loss of the traditional socio-economic life style people and, as a result, accelerating degradation of the region's natural resources and desertification, if too much physical and social capital is lost. " ..both those maintaining a nomadic lifestyle and those who have migrated to towns are modifying their use of natural resources in ways which are inevitably likely to increase demand and probably lead to over exploitation. The very basis of existence in the arid rural region cannot go back because no more resources are available." (Randall 1998:172). The loss of herds is the key to this development. "Unfortunately, human exploitation is probably less controlled than animal numbers and poverty is leading both rural and peri-urban populations to depend more and more on the only 'free' resources around" (Randall 1998:172).

An important but largely neglected aspect to consider when asking for the impact of out-migration on the carrying capacity of arid regions is the fact that the maintenance of irrigation systems often requires a certain social organisation of the population in the region. When this social organisation is disturbed, such systems tend to collapse, and, as a consequence, desertification accelerates. Such a situation is described, e.g. by Amini for desert border regions of Iran, where the flight from the countryside and the depopulation of numerous villages entailed a drop in the number of ecologically very important “qanat” irrigation systems, and their replacement by deep wells, all of which led to the desertification of wide areas (Amini 1999).

4 International migration: support by high remittances

Strategies of labour export from arid regions are also pursued on a large scale at the international level, often actively supported by governments. Arid countries are among the world’s major labour exporting countries, and it is a striking fact that those arid countries which are not in a position to earn a significant amount of their foreign exchange by oil exports are labour exporters⁶. In these countries, remittances are so high that they have a significant, and in many cases a dominant, influence on the macro-economic development of the whole country⁷. In 1998, Egypt received an amount of US\$ 4.360 bio. and in 1997 US\$ 4.528 bio. as workers’ remittances, which is equal to a per capita receipt of US\$ 71.0, resp. 75.14 per capita of the population⁸.

This amounts to more than 10% of the country’s GDP and about 25% of its export earnings in 1998. These official figures still underestimate the total amount of remittances coming into the country, as much of the money earned abroad is sent back or brought back through informal channels. According to estimates by Adams for the period 1985 to 1986, almost one-third of the total remittances entered the country without being registered officially (Adams 1991). In spite of its still high significance for Egypt’s economy, remittances have been declining. Ten years before, in 1987, they still amounted to US\$ 9.807 bio.

For the households involved in international migration to high income industrialised and/or capital rich countries, like the U.S., Saudi Arabia or France, the monetary gain from migration is so large that their reactions and the consequences resulting from this differ significantly from those of intra-national migration or migration to poor neighbouring countries. Therefore, this form of migration requires separate consideration.

⁶ Labour exporting countries are defined as those who receive more than 50% of their foreign exchange through migrants’ remittances (Knerr 1998b).

⁷ For details see Knerr 1998b

⁸ Calculated with data from the World Bank (World Bank 2000). Remittances can be calculated there as the category “net current transfers from abroad”.

Most often, international migration is so profitable for the households that remittances exceed all other sources of income. Against that background, it is not unusual for regions of international out-migration that agricultural productivity declines because a large part of the younger male labour force is absent for a longer span of time, and remittances are hardly spent on productive farm investment. Striking examples to this are Yemen (Knerr 1998b), the Mexican province of Zacatécas (Moctezuma 1999), and Pakistan (Knerr 1998b, Batzlen 2000). Typical investment categories are houses, furniture and vehicles, and in some regions, as, e.g. Pakistan, the marriage of the migrant himself, his brothers and sisters (Batzlen 2000). The last investment category might be quite rational from the individual point of view as it provides a social safety net which might be helpful in adverse situations in a hostile environment. A similar pattern has been observed by Reichert in his case study on six Egyptian villages, where the major specific motivations and goals of international migrants were building or rebuilding a house and marriage (Reichert 1993).

6 Conclusions and policy recommendations

On the grounds of empirical evidence the hypothesis that population movements lead to a declining discrepancy between economic carrying capacity and population density in regions affected by desertification has to be rejected. There are economically sound reasons for utility maximising individuals to react to desertification in a way which, under certain institutional conditions, depresses the carrying capacities even further, so that the human adaptation process makes the situation worse than before. Hence, it cannot be expected that the population's migration strategies lead to a new sustainable equilibrium. Population movements which take place in reaction to increasing population pressure on a given resources' basis and/or in reaction to an erosion of the resource basis might as well contribute to a permanently unstable situation, implying a threat to the natural environment and to the people living in it. The out-come of the interactions depends on the social, political and economic framework which is set on the international, national and local level.

Still in many regions, migration strategies are an effective means to support and subsidise the farms and the households belonging to them, and hence contribute to counterbalance a declining relation between cc and population density. As the survival of the farms increasingly depends on labour migration and remittances, agricultural production systems in regions affected by desertification more and more become a function of the prevailing migration strategies.

Today, it is a matter of fact, that in many regions hit by desertification the population can only be sufficiently supported by the remittances of out-migrants who make a living abroad. Migratory movements are a structural element of the economic behaviour of people in arid

regions, and not a short-term reaction to short-term events. When pressure arises, adaptations take place within the given framework. Traditional settings pre-determine the reactions to current changes and introduce inflexibilities. This has the advantage of reducing the transaction costs, but at the same time migration patterns which had been useful for a community some years, decades or centuries ago, can be disastrous today, contributing to worsening instead of improving the situation.

By emphasising the pathways of vicious cycles, the author wants to point out the high probability that adaptive migration processes initiated by a widening relation between population density and cc might not improve the situation but make it worse. She does not intend to deny that there also exist forces which lead to a new sustainable equilibrium.

Although much more research is required in this area to get a more complete picture, the available experience suggests some policy recommendations to different levels of decision making. They are as follows.

With regard to the implications of migration, any development policy, and in particular local development projects, have to take care of the fact that in regions with significant out-migration it might be expected that those remaining in the region are negatively selected with regard to their productivity. Where a large share of those present are women with small children and elder people, development projects should not be too ambitious with regard to rising the productivities. They might better have an emphasis on health care, schooling etc.

The problems arising from large scale migratory movements have their roots in the regions under desertification, but - on a political, social and economic level - may bear consequences for the global human community through across-border migrations, water shortages, food deficits and social unrest. Therefore, they constitute a challenge to international co-operation to influence this process where necessary which is in the self-interest of other nations, too. Scientific co-operation is necessary on a global scale to collect, compare and draw conclusions from experiences made. This is a central issue of the future of mankind, implying questions of food security, of social peace and of international conflicts.

In general, trying to keep potential migrants at their place of origin or to bring migrants who have arrived in the towns back to there might paradoxically increase it even more as now, there is no more migrant income to support the household in the source region. As it might not be able to subsist on the available resources, the result might just be that the whole household is forced to move.

References

Adams, R.H. (1991): The effects of international remittances on poverty, inequality and development in rural Egypt. International Food Policy Research Institute (IFPRI). Research Report No. 86. Washington.

- Adams, R.H. (1993): The economic and demographic determinants of international migration in rural Egypt. *The Journal of Development Studies* 30 (1), pp. 146-167.
- Amini, S. (1999): Water use and forms of social organization in desert border regions in Iran - a socio-ecological analysis. *Natural Resources and Development* 49/50. Institute for Scientific Co-operation, Tübingen, Fed. Rep. of Germany, pp.81-98.
- Andreae, B. (1977): *Agrargeographie*. Berlin.
- Bächler, G. 1995. *Umweltflüchtlinge. Das Konfliktpotential von morgen?* Münster
- Batzlen, Ch. 1999. *Migration and economic development. Remittances and investments in South Asia: A case study of Pakistan*. Ph.D. thesis. University of Hohenheim.
- Boserup, E. 1981. *Population and technological change: A study in long-term trends*. Chicago.
- Caldwell, J. 1982. *Theory of fertility decline*. London.
- Cochrane and Massiah (1999): Recent changes in population growth, their causes and consequences. World Bank, Washington. <http://www.worldbank.org>
- Dia, I. 1992. Les migrations comme strategie des unités de production rurale. Une étude de cas du Senegal. *Poverty and Development. Sustainable Development in Semi-Arid Sub-Saharan Africa* (Ministry of Foreign Affairs, The Hague). Pp. 57-64.
- El-Hawari, H. (1998): *Die Auswirkung der Migration auf den Arbeitsmarkt in Ägypten*. Ph.D. Dissertation. Wirtschaftswissenschaftliche Fakultät der Universität Leipzig.
- Fahem, A.K. 1998. *Population and desertification in Mauretania*. In: Clarke, J. & Noin, D. *Population and environment in arid regions* (Man and the Biosphere Series 19). UNESCO. New York.
- Farrag, M. (1995): Black markets in foreign exchange and international migration: The case of Egypt. *International Migration* 33 (2), pp. 177-207.
- Greenwood, M. 1969. An analysis of determinants of geographic labour mobility in the United States. *Review of Economics and Statistics* 51: 189-94.
- Hedden-Dunkhorst, B. 1993. *The contribution of sorghum and millet versus maize to food security in semi-arid Zimbabwe*. Ph.D. thesis. Stuttgart Hohenheim.
- Knerr, B. 1998a. *Labour migration from developing countries. Macroeconomic impacts and policy interventions*. Kassel.
- Knerr, B. 1998b. *Impacts of labour migration on the sustainability of agricultural development in arid regions*. In: Clarke, J. & Noin, D. *Population and environment in arid regions* (Man and the Biosphere Series 19). UNESCO. New York.
- Knerr, B. (2000): *Economic-demographic strategies and desertification: Interactions in low-income countries*. In: Breckle, S.; Veste, M. and W. Wucherer: *Sustainable land use in deserts*. Heidelberg, Stuttgart, New York.

- Lewis, W.A. (1954): Economic development with unlimited supplies of labor Manchester School 22, pp.139-191.
- Lucas, R.E.B. (1985): Migration amongst the Botswana. The Economic Journal 95, pp. 358-382.
- Lucas, R.E.B. and O. Stark (1987): Motivations to remit: Evidence from Botswana Journal of Political Economy 93 (5), pp.901-917.
- Moctezuma Longoria, J. M. (1999): Redes Sociales, Comunidades Filiales, Familias Y Clubes De Migrantes. El circuito migrante Sain Alto, Zacatécas-Oakland, Ca. Ph.D. thesis, Universidad Autonoma de Zacatécas.
- Müller, P.M. 1993. Tragfähigkeitsveränderung durch Bevölkerungsverlust. Beispiel Valle Grande/Bolivien. Geographische Rundschau. 3:173-179.
- Murthy, M. 1998. Demographic development in Rajasthan. Paper presented at the Conference on "Population and Environment in Arid Regions". Amman/Jordan, 24-27th October 1994.
- Nasrat, S.M. Mohiey El-Din (1999): The relationship betewen out-migration and some structural and functional changes of the rural families. Bull. of the Fac. Agric., Cairo Univ., 50 pp 575-590.
- Nerlove, M. 1991. Population and the environment: A parable of firewood and other tales. Paper presented at the Fifth Annual Meeting of the European Society for Population Economics (ESPE), Pisa, 8 June 1991.
- Prothero, :Circular mobility in part of the West African dry zone In: Clarke, J. and D. Noin, Population and environment in arid regions. Paris, New York and Casterton Hall. Pp. 61-76.
- Randall, S. (1998): The consequences of drought for populations in the Malian Gouna. In: Clarke, J. and D. Noin, Population and environment in arid regions. Paris, New York and Casterton Hall. Pp. 211-246.
- Ranis, G. and J.C.H. Fei (1961): A Theory of economic development. American Economic Review 51, pp. 533-556.
- Reichert, Ch. (1993): Labour migration and rural development in Egypt. A study on return migration in six village. Sociologia Ruralis XXXIII (1), pp. 42-60.
- Schrieder, G. and B. Knerr (2000): Labour migration as a social security mechanism for smallholder household in Sub-Saharan Africa: The case of Cameroon. Oxford Development Studies. Vol. 28 (2).
- Schultz, T.W. 1974. Economics of the family: marriage, children and human capital. Chicago.
- Schwartz, A. 1973. Interpreting the effect of distance and migration. Journal of Political Economy.81:1153-1169.
- Scoones, J. (1995): Living with uncertainty. London

Secretariat of the United Nation Convention to Combat Desertification (UNCCD) (1995):
Down to Earth. Bonn.

Shahnaz, L. and Khan, A.H. 1997. Impact of male out-migration of female decision making:
A case study of selected areas of Kharian. Paper presented at the Regional
Workshop on Return Migration and Long-term Economic Development in South Asia,
Islamabad, Pakistan.

Toth, J. (1999): Rural labor movements in Egypt and their impact on the state, 1961-1992.
University Press of Florida. Gainesville et al.

Todaro, M. (1976). Internal migration in developing countries. Geneva.

United Nations Development Programme (UNDP) 1999. www.undp/hdro/population.htm.

Willis, R.Y. 1980. The old-age security hypothesis and population growth. In Burch, T.K.
(ed.), *Demographic Behavior: Interdisciplinary Perspectives on Decision Making*.
Boulder Co.

Wolff, P. (1993): Wüstenkultivierung und Neulanderschließung. *Der Tropenlandwirt. Journal
of Agriculture in the Tropics and Subtropics*. 94, pp.103-117.

World Bank (1999): World Development Report. Washington.

World Bank (2000): Country data; Egypt, Arab. Rep.

<http://www.worldbank.org/data/countrydata/aag.htm>

World Resources Institute (WRI) (2000): Resources Report. Washington. Var. Issues.

World Resources Institute (WRI) (2000): Egypt at a glance. <http://www.wri.org>