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**Inter-Related Effects due to Droughts for Rural Populations:
A Qualitative Field Study for Farmers in Iran**

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Abstract

This paper provides in-depth information on the multiple realities and time-dependencies during droughts over different sub-groups of an affected society. Dynamics are analyzed based on categorization of impacts into human, social, financial and natural capital effects and using the theory of conservation of resources for the behavioral explanation of selected coping strategies. A qualitative field study based on this approach was conducted in a village in southern Iran. It was found that droughts can cause waves of negative effects on various capital dimensions to farmers, especially the poor. The dimensions are very much interrelated and can multiply negative effects, decreasing resilience to drought to very low levels that can eventually lead to poverty trap-like situations. Furthermore, it was found that government aid interventions unintendedly worsened the situation of the poor. To avoid such situations it is suggested to shift from relief or ex-post interventions to a proactive risk management approach.

Keywords: Drought effects, farmers, household level, inter-related effects, qualitative study, Iran.

Introduction

Drought is a recurring climatic event that can happen in all parts of the world. In terms of people affected, it is the number one risk of all natural hazards, with more than 1 billion people affected in the last decade (World Disaster Report 2010). This situation is likely to worsen in the future, with an already observed increase in droughts and predicted increases in extreme droughts in the future due to climate change (Schneider et al. 2007). For example, the frequency of exceptionally hot years has significantly increased in Australia and this trend is projected to continue (Hennessy et al. 2008). Iran, the study region in this paper, expects negative climate change impacts, especially in the agriculture sector, e.g. significant reduction in rainfed wheat yield (Nasiri et al. 2006). However, the effects of droughts to human society depend not only on the severity of the event (such as lack of rainfall) but also on the resources the society and its members have to cope with this shock. Such resources can include formal market mechanisms as well as informal/traditional ones, e.g. from crop insurance to kinship arrangements (see Skoufias 2003 for a comprehensive list). Consequently, dependent on the coping strategies available, the short and long term effects may differ greatly among sub-groups within the affected population. Additionally, the action taken by one sub-group to cope with the event may have important implications for other groups as well. Furthermore, the actions of one group and the implications for another group may not be necessarily on the same dimension (e.g., financial or social) and can cause devastating negative feedback loops. It is the primary goal in this paper to shed more light on these interrelationships and negative feedback loops during a drought.

While it is recognized in the literature that droughts and strategies to lessen the impacts have to be analyzed from a broad based perspective, i.e., including psychological, economic, sociological and institutional dimensions (see Campbell et al. 2011; Easdale and Rosso 2010; Gilbert and McLeman 2010; Edwards et al. 2009; Eriksen and Silva 2009; Wilhite 2002; McKee et al. 2002; Paul 1998), most existing research tends to focus only on certain dimensions. Sometimes the focal point is on economic consequences (Edwards et al. 2009; Horridge et al. 2005; Mahul et al. 2005; Paul 1998), whereas others focus on environmental effects (Speranza et al. 2008) or agricultural adjustments within sustainability frameworks (Ha et al. 2007), with only a few addressing detailed social (see Gilbert and McLeman 2010; McAllister et al. 2008) or psychological adjustments (Coelho et al. 2004). However, interrelated and dynamic (time-dependent) effects among those dimensions (and within sub-groups of the affected population) may play a more important role than assumed in the past and therefore should not be neglected, as they can be long lasting. For example, school dropouts due to a drought (Eriksen et al. 2005) can cause serious negative long term consequences as education is now recognized as an important element for development (Crespo and Lutz 2007; Lutz et al. 2007, 2008). The possibility of dropping out of school, as well as other socio-

economic dynamics during a drought may differ greatly among household groups (Hochrainer et al. 2009; Mechler et al. 2009). Furthermore, attitudes of farmers toward drought and drought management are closely linked with their behavioral management and experience with past events (Zarafshani et al. 2005; Zarafshani et al. 2007; Lindell and Perry 2004). Hence, attitude and past experience can affect the assessment of coping strategies in the future, which is especially important from a preventive action point of view (see Krömker and Mosler 2002). From a (quantitative) modelling perspective, knowledge of time-dependencies over different dimensions and sub-groups is important and should be explicitly incorporated to determine suitable coping and risk management strategies, especially for the poor (Barrett et al. 2007).

Generally speaking, while detailed large scale analyses of social and economic impacts of drought on farmers (and households) in regional, rural, and urban areas are necessary (see for example Edwards et al. 2008), there is also a need to better understand the dynamics during the drought. If this is neglected, not only is the “disaster landscape” of the drought incomplete, but policy solutions may be inadequate or even exacerbate the problem for some sub-groups. However, to assess these dynamics and interactions between human, economic and social dimensions, qualitative rather than quantitative approaches seem to be appropriate. Hence, a qualitative study was conducted to find in-depth information on the multiple realities and dynamics during droughts including social, economic and human/psychological related consequences over different sub-groups of the effected population. The chosen study site is a village in southern Iran where drought has been a recurring phenomenon in the past and farmers continually cope with high rainfall variability (Foltz 2002). The paper is organized as follows. The next section presents the theoretical framework used for the case study. Afterwards, in section 3 the case study site is introduced. Section 4 presents the detailed results and section 5 ends with a conclusion.

Framework

Household level effects due to droughts can be multidimensional and are dependent on the availability of relevant coping strategies (Zarafshani et al. 2005; Zarafshani et al. 2007; Ingram et al. 2002). Important variables in that regard include dimensions such as household structure, gender, education, property features, condition and size of farm, educational level of household members, as well as financial and economic conditions (Speranza et al. 2008; McIntire 1991). The combination of these and related variables will make some people more vulnerable than others in the face of extreme events (Paul 1998). The poor especially tend to be exposed to environmental risk more than the wealthy, as the latter are better able to take protective measures and can avoid some environmental risks completely—e.g., health or psychological related risk (Brouwer et al. 2007).

To avoid confusion between the different interrelated effects, we separate them into different kinds of “capital”. In more detail, we use the “four capitals” framework (Australian Bureau of Statistics 2001; Australian Bureau of Statistics 2002) to define household and community resilience due to droughts. Such frameworks (and as a part of larger frameworks such as the sustainable livelihood approach, see DFID 1999) proved successful in a number of past studies in identifying conditions that either promote or hinder resilience and therefore should also serve well here. Consequently, household resilience and its dynamics are assessed and investigated in relation to levels of various stocks within the four available capitals and their changes over time (Australian Bureau of Statistics 2004; McIntosh 2008). The definitions for each type of capital are given below.

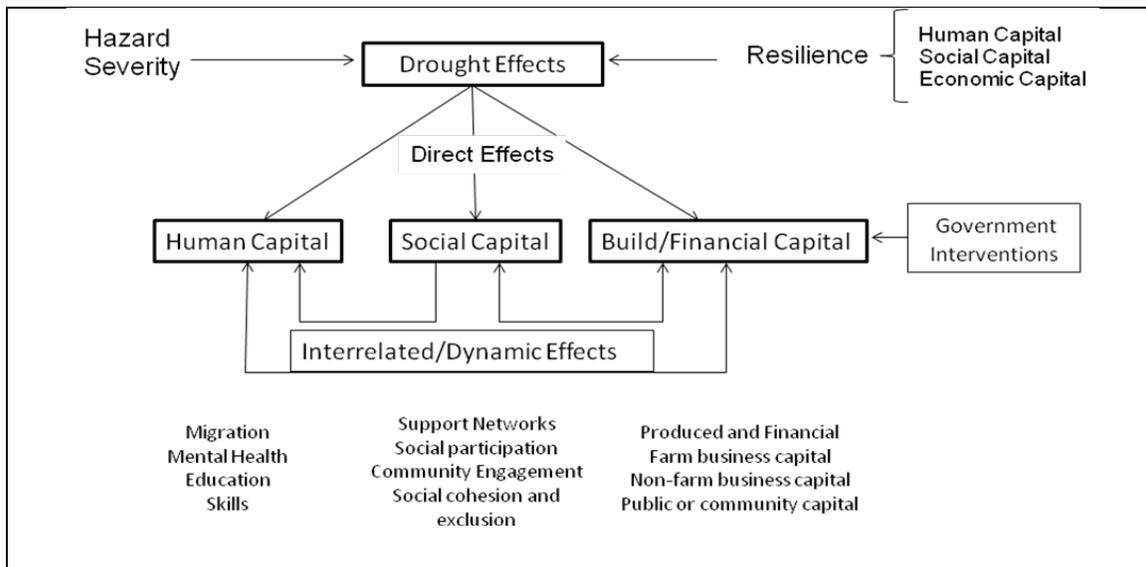
- Human Capital: Refers to the knowledge, skills, competencies and general capacities of individuals. The focus here is on capacities of individuals.
- Social Capital: Refers to networks, features of social organization, such as norms, values, trust and understanding that facilitate co-operation. Here, the focus is on capacities of groups.
- Built and Financial Capital: Refers to the built environment and anything that has been made by human hands, including the physical assets of the private and public sector. Financial capital refers to the funds (money) that are available to individuals and groups.
- Natural Capital: Refers to renewable and non-renewable resources of the bio-physical systems of a region or community, which enter the production process and satisfy consumption needs.

To explain the dynamics of resilience due to the “actions” of different kinds of risk bearers to cope with the drought, we use the so-called “Conservation of Resources Theory”(COR—Hobfoll 1988, 2001). COR provides a behavioral explanation of the decisions made during the drought. It is a motivational stress theory based on the hypothesis that people have a desire to conserve their resources and to limit any state that may jeopardize the security of these resources. Accordingly, if resources are threatened, lost or one fails to gain resources after investments, this will lead to mental or physical stress outcomes. Three premises can be outlined in COR relevant in our study. First, (acute) resource loss is central to the stress process. Second, people invest in resources to protect themselves against resource loss, to recover from loss, and to gain resources. Third, those who lack resources are more vulnerable to resource loss (eventually leading to loss spirals).

Several studies on the household, community, and national level can be found in the literature using similar kinds of approaches (for a literature review on droughts see Zamani et al. 2006). However, explanation of time-dependent interactions between

household sub-groups as well as the community level over time is lacking. This paper should fill part of this gap by analyzing the process in detail. Furthermore, direct and interrelated effects are distinguished, so that the dynamics can be separated into the different capitals (Figure 1). We excluded natural capital as this is assumed to be constant in our analysis, i.e., the same environmental conditions (droughts are not spatial limited events and happen over large regions). Note that this may not hold true in the context of climate change.

Figure 1: Framework for the Analysis of Household Effects



As Figure 1 shows, in our approach drought effects are dependent on the hazard severity (e.g., lack of rainfall) and the resilience of the household to this shock. Resilience is determined by the level of available capital stock to cope with the event. This will have direct effects on the capital stocks and over time there are additional interrelated effects (possible feedback loops) between those forms of capitals. Furthermore, government interventions can come into play, additionally changing the system and affecting the households’ resilience.

Methodology

Study Population

The Shahnia village in the Boushehr province in southern Iran (Figure 2) was chosen as the study site. Geographically, it is near the Persian Gulf (about 20 km away) and a river (the Mond) is about 2 km north to the village. The total number of households is around 236 with a total population of about 1,300 people. The village is very susceptible to rainfall shortages and has experienced several droughts in the past. The major soil type

biased responses. However, all dialogues were well documented afterwards (Varjas et al. 2005).

Interviews

In-depth unstructured interviews and participatory observations were applied to gather the data. In that way, a comprehensive discussion between the two sides happened naturally over the course of the interview, allowing for the collection of valuable information about farmer's daily life and experience in droughts.

Sampling Procedure

In contrast to quantitative research sampling approaches, qualitative sampling is a selective and, thus non-probability, sampling approach (Popay et al. 1998). Hence, the sample size is deliberate and based on the research goal. We selected our cases using two different methods. At the beginning, we utilized key informants (i.e., persons who knew best what was going on in their communities). These people included community leaders (elected leaders), professionals (agriculture officers), and those who had firsthand knowledge about the community (Berg 2007). We asked the local informants to introduce us to some rich, moderate, and poor farmers in the drought-affected region. Additionally, we used a snowball sampling method (chain referral sampling in which current informants used their social networks to refer the researcher to others who might contribute to the study). Snowball sampling is often used to find and recruit 'hidden populations', that is, groups that are not easily accessible to researchers through other sampling strategies (Stahler and Cohen 2000). Finally, we selected 36 cases that were most frequently mentioned within both methods. We included a larger number of very poor farmers as they were expected to experience the most varied of effects. Hence, we selected 7 rich, 11 moderate, and 18 poor farmers and investigated their coping strategies and effects due to droughts.

Recruitment

Three to four interviews in various places were performed for each case. The first interview was always performed in the participant's house when he was alone, the second took place at his farm, the third in other places where he worked (shops, farms of wealthy farmers), and last in a group of friends. Although this method is very time-consuming, it has the advantage of assuring that the interviewer receives true information. For example, it was found that it's very likely that initially, the interviewed person mistrusted the interviewer—assuming that he/she was from a government agency—and as a result, may not have accurately responded to some questions. To overcome this barrier, more

interviews were carried out, potentially resulting in an increase in trust and enabling the interviewer to check the reliability of responses.

Results

Table 1 shows some of the socio-demographic variables for each of the three wealth classes.

**Table 1. Socio-demographic Information of the Sample Cases:
Mean Values, Standard Deviation in Brackets.**

	Poor farmers (N = 18)	Moderate farmers (N = 11)	Rich farmers (N = 7)
Age	59 (7.1)	48 (6.5)	63 (5.8)
Education ¹	2.44	7	7
Family members	7.88 (2.8)	7.18 (2.1)	9.57 (3.2)
Rain land (in ha)	36 (15.6)	157.3 (214.1)	212.9 (54.9)
Irrigated land (in ha)	0.08 (0.19)	4.63 (4.17)	45.71 (28.2)
Garden (ha)	0	0.18 (0.34)	1.78 (1.72)
Agricultural tools used	No	Few needed assets	All assets needed
Main Second jobs	Wage	Shops, Taxi driver	Trade

¹ Number of years in School: 5 years= Primary School, 9 years= Secondary school, 12 years= High School

Next, we separate our analysis into the three types of capitals as shown in Figure 1—human capital, social capital, and built/financial capital. We always explicitly refer to the respondent's wealth class if there are differences compared to other wealth classes. The observations are explained using the COR theory introduced in section 2 and are summarized again at the end of the paper.

Built/Financial Capital Effects

All farmers believed that droughts severely affected their financial status. However, poor farmers suffered the most, as they had no crop yields in the last three years due to precipitation shortages. Hence, resilience was already very low. Crop diversification as one agricultural adjustment strategy (which can be seen as part of the resource investment premise within the COR theory) served well for some wealthier farmers. For example, two rich farmers and one moderate farmer believed that during a drought they were able to produce more tomatoes with better quality from their lands than in normal times. One farmer stated:

When we have less rain, tomato products will be better because rain increases the probability of diseases. Also precipitation itself causes damages to plants.

Job opportunities, especially farm wage income, decreased during the drought. This affected the poor the most, as this was their main additional second income source. Hence, the decrease in financial capital of poor households during the drought was affected due to at least two reasons: Firstly, many poor farmers could not farm for themselves any longer as there was no available water for irrigation. Secondly, while in “normal” times poor farmers simultaneously worked on both their own plots and those of rich farmers (to earn additional money), during droughts they lost this alternative income source as well. A poor farmer stated:

Good old years; when there was lots of rain; I worked on my own farm. My sons and I were busy working for other, too. Now I can't work for myself and only my elder son was lucky enough to catch a job in others' tomato farm.

Interestingly, government aid interventions worsened the situation of the poor in the long run. Basically, the Iranian government is concerned about its rural farmers during droughts and its intention is to manage drought and vulnerability in rural areas through economical and infrastructural aid such as offering loans, retrofitting canals, watershed management projects, establishing local dams and other supports for modern watering methods. However, only the rich and moderate farmers usually benefit from this kind of governmental emergency assistance (see also Brouwer et al. 2007; Paul 1998). Reasons for that include lack of knowledge and/or capacities to apply for loans, reflected in the following statements of poor farmers:

I don't know anything about these loans. Even if I knew, it wouldn't matter; because loans are for the rich.

Another poor farmer said

I don't have any official document of my own land nor a bailsman, I had been asked for it whenever I demanded to take a loan...I have none

One other noted that

My lands are under dry farming. Loans are for the rich who owns a bore hole or sprinkle irrigation system.

Another continued

My lands are far from rivers, so I can't retrieve water to irrigate. These loans don't suit me.

As could be expected, rich and moderate farmers were satisfied with governmental assistance. Some even believed to have benefited due to the drought. Their replies reflected satisfaction. For example,

I took two kinds of loans. A thousand Rials (Iranian currency) went to increase the depth of my well (2 meters) and with the other I became able to establish drip irrigation systems on my tomato farm. All that caused me to put some more hectare of land under tomato cultivation

Another rich farmer believed that the loans were very beneficial:

I could equip my tomato farm with modern irrigation systems, save some water and put at least 30% more under cultivation. I also was able to level 10 hectare of my dry lands which will be ready to be planted next year.

and,

By receiving loans I became able to buy some equipments and plumbs, sprinkle irrigation system near my bore hole to provide better condition for wheat lands to earn as much as it costs, no profit, no loss! By increasing the depth of my bore-hole, there will be no problem for years.

According to COR (premise two) these people invested in resources not only to protect themselves against resource loss but also to gain resources. This is not possible for poor farmers and therefore increase (according to premise one) their stress level and vulnerability to resource losses (premise three of COR). The next statement indicates problems for poor farmers inherent in governmental disaster emergency assistance. A rich farmer claimed:

With traditional irrigation systems, I planted 20 hectare and needed 20 farmhands. Now I plant 35 hectare with the help of 12 farmhands and drip irrigation system. Costs and weeding activities have been cut. By well-ordered irrigation, productivity booms up and I hired fewer workers.

Hence, government interventions, although beneficial (for resource investment, premise two of COR theory) for some parts of the rural population, namely the moderate and rich farmers, have detrimental effects for the poor due to the decrease of job opportunities. That is, rich farmers needed fewer laborers as they had equipped their farms with modern technology (such as sprinkler or drip irrigation systems). Water efficiency also increased, while demands for labor went down; subsequently some workers were fired. As Figure 1 illustrates, government intervention changed the built and financial capital and therefore the future resilience of households, but the effects differ between household groups and are especially negative for the poor, who needed help the most. Another consequence due to increasing unemployment during drought (Paul, 1998) is the increase in labour supply which subsequently decrease wages as well (according to the law of supply and demand).

The moderate farmers' situation lies between those two extremes. Not surprisingly, they lost many things, but not at the same magnitude as the poor, especially as they still had some financial and built capital to cope with the situation (although not on the same scale as the rich farmers). One moderate farmer said:

I didn't had any yields from my rain feed lands but I can manage it. I could borrow from my friends and I get some loans from the Bank as they are sure I can pay it back.

Another moderate farmer said

Yes, I lost many things but I had some savings and I used it. Also the government helps me. Although I believed they can do it better. There was some delay but I was able to borrow and will pay it back in the future.

Remittances seemed to play a crucial role, especially for the moderate farmers. One said:

Drought affected my farming, my shop and many things but it couldn't affect my relatives and family in city. They helped me a lot.

Another coping strategy (typically the evidence of resource loss cycles) is economic adjustments related to asset management (Zamani et al. 2006) and this was also found here, however, only for poor farmers. This included decreases of livelihood assets,

My refrigerator broke down, but I couldn't repair it or bought a new one. In this hot and humid weather we don't have an essential thing.

or the farmer's personal resources

I sell the gold of my wife. She is very sad but we had to do it.

as well as activities

In normal years we have a lot of hobbies, like swimming, camping, fishing, but in droughts we couldn't do them. It upsets me.

Summarizing, built and financial capital are severely affected during droughts and resource investment seems beneficial only for moderate and rich farmers, as they have access to additional help from the government and enough built and financial capital. This, in turn, has long lasting effects on the poor as they have less financial capital in the future due to the decrease in both job opportunities and wages. Furthermore, only in this group are economic adjustments found to be taking place, eventually leading to poverty trap like situations (see Carter et al. 2007; Barrett et al. 2007). The decrease in this form of capital has important consequences on the human and social capital as well.

Human Capital Effects

The majority of poor farmers stated that drought greatly affected their food consumption and resulted in a decrease in educational and health standards. The situation of having no or inadequate food supplies directly affected the health of household members. Since physical activity is the only way they can produce income, an insufficient amount of food reduces their ability to work in the future, exacerbating the negative consequences. Probably most important in the long run is the finding that all of the poor farmers stated that they could not meet the needs of their children's schooling, with two of them expressing that they have been forced to stop their daughters from studying. They also remarked that if they were able to find money to buy clothes or other basic needs, it would go to family members in the following order: father, sons, mother and daughters. Most of the time, nothing is left for the mother and daughters. One said:

First me, second my sons who work, than the wife and at last daughters.

These findings show that droughts can cause additional negative effects on poor women and that gender discrimination increases during such times. On the other hand, such affects were not observed for moderate and rich farmers. In this regard one moderate farmer said:

My economic situation has been weaker than past, but I can provide food and educational facilities for my family.

Education seemed to be very important for all groups. Regarding coping strategies one moderate farmer stated:

We reduced some extra and not necessary cost. But honestly I couldn't see my children leaving school. Maybe we would reduce our food consumption, buy cheap clothes or even sell some things such as my wife's gold but the real gold is my children and their education.

and a rich farmer said:

We don't have any problem in these issues (food and education)

Education is now seen as an important element for development (Crespo and Lutz 2007; Lutz et al. 2007, 2008) and goes along with increasing standards of health. Due to school dropouts, drought is likely to cause negative development effects for as long as decades, especially for the very poor and within this group especially for women. This decrease in human capital is alarming and should be taken seriously as a development problem. The next focus is on psychological issues.

The first premise of COR theory states that the "acute" loss of resources will lead to stress outcomes, especially for less resilient households. In line with that, farmers believed that the very first effect of droughts is a psychological one due to waiting for rain and constantly searching the sky for a sign of rain or clouds. They reported that when rain doesn't come in time, it results in stress and pressure, and they believed this psychological effect caused health problems. Typical statements of poor farmers were:

When rainfall is delayed, I feel pressure and stress. Over the night I dream to see clouds or rain but, when I wake up and don't see it, I feel bad. I am sad and this feeling rises up some gastrointestinal disease and blood pressure to me.

Poor farmers also indicated that they lose hope and are very upset during droughts. For relaxation some smoke drugs and cigarettes. One of them said:

I am very upset and don't have any hope. I lost my self-confidence and I cannot do any things just go close to drug

This behavior could be interpreted as a form of psychological coping strategy (additional to agricultural and economic adjustments) to decrease stress levels.

Summarizing, all the poor farmers said that the situation—encompassing a lack of crop production, debts, school dropout, unsatisfying wages for women and children, emigration, and unemployment—led them to depression and a loss of self confidence. Most of these effects were not found for the medium and rich farmers due to their ability to cope with the event (due to their higher resilience). In other words, using COR theory, there was not an “acute” resource loss situation imminent for them; resource investment, as well as expected gains, protected their current capital stocks and increased their future financial resilience. The very poor, who lacked resources (small resilience or less human and built/financial capital), experienced “acute” resource losses, anticipated limited diversification possibilities (like job opportunities) and had to rely on economic adjustments resulting in negative psychological and health related effects. This seems to support the third premise of COR theory, which states that those who lack resources are more vulnerable to resource losses, which could eventually lead to loss spirals.

Social Capital Effects

One important social capital effect due to drought is youth migration (see for example for Australia the large scale analysis by Edwards et al. 2009). However, this should be considered within the broader context of other household coping strategies (usually migration is not the first choice, see Gilbert and McLeman 2010). In our study, we found that most poor families sent at least two of their children to industrial regions to work during droughts (specifically to the southern Pars, an area with large oil and gas industries). Although youth migration also occurred for moderate farmers, poor farmers sent their children to work the whole year, while moderate farmers sent their children to work only during the school holidays. It was already noted that education is important for all wealth groups and therefore long term migration can be seen as one of the last economic adjustment options chosen by the households. It can also be mentioned that migration can shatter personal (human) resource capital, such as self-esteem and status (Bosch 2003). Rich farmers did not experience migration or school dropouts. Hence, it should be emphasized that migration and dropout rates among the poor are most likely during droughts and have long-lasting effects on their socioeconomic status. Abandoning education results in the family staying in low educational levels and losing potential human (working) capital as those who migrate do not come back to their village. Therefore, poor households cannot increase/improve their human capital resources, and agrarian families will eventually stay in a retrograde cycle, perhaps leading to a breakdown of community structures. Drought also causes loss of trust among farmers, or in other words, reduces social capital (support networks, social participation, community engagement, social cohesion, see Figure 1). Poor farmers believe that during a drought they are in a weak position and exploited by rich farmers. One of the poor farmers said:

They (rich farmers) borrow money, we use the document as a guarantee hold and eventually the owner will be them.

and another adds,

Drought is an opportunity to take our lands out of our hands.

A poor farmer said:

Rich farmers pay our wives and kids low wages, instead of helping us. And if there is a nag, they dismiss us and hire another one quickly.

From the other (rich farmers) point of view, it is believed that drought worsens the situation of the poor, who therefore try to rob the assets of the rich. A rich farmer stated:

Robbing is booming up. Thieves are mostly the kids of whom their farms suffered from drought badly.

Also the (unintended) uneven distribution of government aid causes tensions. A poor farmer stated:

I myself had not received any kind of loans, so governmental exemptions did not have anything to do with me. Everything went to the rich.

Taking loans seemed useless to others as they thought that only the rich were able to take loans, as they had an extended network of relationships.

The rich have money, friends, relations and they bribe to receive loans and take financial aid out of turn. If I wanted to get a financial aid, I would be told to bring bailsmen or documents for deposit. Well... I do not have any.

Related to this topic a poor farmer reported:

Mr... had a huge amount of money as a loan for drip irrigation systems. He equipped his farm in a new way and bought some pieces of my brother's dry land next to him.

Such perceptions can lead to social disruption and disloyalty in rural areas. The poor see themselves as isolated and being discriminated against by the government.

As was already indicated, poor farmers use different activities to survive during an extreme situation. Some of these include illegal activities such as robbing or smuggling

drugs, guns, and alcohol, causing additional social problems, such as distrust between different social groups. In the response to our question: “who is doing all these things? And who is responsible for burgling?” a majority of the moderate and rich accused the poor and landless rustics.

Who can do all these bad things? Just poor and beggars! They destroy social safety. They don't let us have peace. We want security to farm.

On the one hand, the poor farmers feel disloyalty towards the rich ones and accuse them of favoritism and exploitation whereas the rich farmers consider their poor neighbors as addicts, thieves, smugglers and vandals. They also don't trust them and use other methods to cope with this situation.

We hire Afghan workers and make them guard during nights. Afghan's payment is lower than Iranian.

This situation (the poor against the rich) eventually puts the community in a retrograde cycle of sustainability. Social capital decreases and therefore the resilience of all households drop as well. However, the poor will be affected the most, as all other forms of capital are decreasing too. Taking credits is sometimes one of the last options for the poor but can have serious consequences in the long run. One farmer said:

Many farmers are indebted. When drought happened they cannot pay back money to creditors. Therefore conflicts and quarrel rise up.

Another adds:

In a drought period local creditors easily confiscate our land and property and it is a reason for conflict.

Furthermore, all the poor and moderate farmers mentioned that in the past, they could participate in feasts, religious ceremonies, and help relatives or friends when they were in need. It has been assumed such activities left them brimming with confidence. But as social interactions are reduced, farmers cannot do any of these things, so they turn to solitude and they are instead burdened with depression. In this regard one poor farmer said:

In normal years I could present some things (money or gifts) for religious and cultural ceremonies. But in a drought period I couldn't. So I shy and

don't like to participate in these social events. It made me sad and unhappy.

Social support seeking is an important strategy (within the COR theory) to mitigate the effects of drought. However, such coping strategies, which could play an important role in conserving human capital (personal resources), are no longer available. This increases drug consumption (as a psychological adjustment) causing additional problems within the dimension of social capital.

Summarizing, effects and interrelationships between the built/financial, human and social, capital during droughts—(unintentionally) exacerbated due to government intervention—were discussed. Resilience increased (for both short and long terms) for some subparts of the farmers' population, mainly the moderate and rich farmers, and decreased for those who need the help the most, i.e., the poor farmers. Ending this section, Table 2 summarizes our results from the qualitative study and shows the capital effects of drought on the three different wealth classes of farmers, as well as severity of the effects—severe, moderate, minimal, and none found).

It should be noted that the increase in productive/built capital will also have consequences on other capital dimensions in the future, such as an increase in economic and financial capital as well as education and community engagement. The same is also true on the negative side. Built capital resources are often used in developing countries as kind of insurance in case of economic stress situations, which is especially problematic if resources are low (Delacote 2009), eventually leading to poverty trap like situations (see Carter and Barrett 2006) that are even more likely if other kind of stresses (and reduced resilience resources) are exacerbating the already negative situation.

Discussion

Drought is a natural and recurrent phenomenon in Iran and causes different effects on different wealth groups of farmers. These effects are very complex and cannot easily be separated from each other, as they are interrelated and can impact farmers in many ways. As it was shown, the related economic, social, psychological and health consequences can differ widely among farmers. Furthermore, government ex-post interventions can have unintended negative side effects for sub-groups of the rural population. The poorer farmers especially are less resilient as they have only limited resources from various forms of capitals—e.g., no savings, no possibilities to take out (cheap) loans, few livelihood assets (all of which are parts of built/financial capital), no reliable job opportunities, negative health effects due to stress, increased school dropout rates (all of which are parts of human capital), and no social networks to be supported during a drought (all of which are parts of social capital).

Table 2. Summary of Drought Effects Differentiated Into Different Wealth Classes.

		Poor Farmers	Moderate Farmers	Rich Farmers
Social Capital	Community engagement	Severe	Moderate	Moderate
	Participation	Severe	Moderate	Moderate
	Cohesion	Severe	Severe	Severe
Human Capital	Quality of life	Severe	Minimal	No effect
	Happiness	Severe	Minimal	Minimal
	Depression	Severe	Minimal	No effect
	Self-confidence	Severe	Minimal	No effect
	Well-being	Severe	Minimal	Moderate
	Education	Dropouts	Can't afford to buy everything needed for school	No effect
	Health	Severe (blood pressure, heart disease)	Influence	Moderate
	Migration	Yes	Yes (partly)	No
	Unemployment	Severe	Minimal	No effect
	Built/ Financial Capital	Economic	Losses below subsistence level	Losses large, but not below subsistence
Financial		Not adequate	Adequate	Adequate
Built		Decrease	Small increase	Increase

We explained the effects of droughts on the individual level via the Conservation of Resources theory, which explained the different coping strategies used by the different households via the premise of resource investment. From a time-dependent perspective, in the very beginning (first phase) of a drought (i.e., when it does not rain in time) the farmers are faced with psychological effects (due to stress), eventually leading to illnesses, such as blood pressure, heart disease, gastrointestinal disease and digestive system disease, headache, inaction and narcosis. In a later stage (second phase), during and shortly after the drought, financial, economic and social effects begin to emerge. For poor farmers, two effects simultaneously materialize. First, as they are subsistence farmers, reduction in crop yields directly affect their consumption patterns and productivity. Second, additional income sources (mostly job opportunities for wealthier farmers) decrease or are less well paid, due to an increase in the labor force. Hence, poor farmers frequently have to use illegal income sources, resulting in an increase of conflicts between rich and poor farmers, and a decrease in social capital. The need for nutrition puts pressure on poor farmers to take children out of school (reduction of happiness not only for children, but also for parents, as well as an increase in stress levels), which leads to a decrease of human capital within the family. This can have long-term consequences, especially for women due to gender discrimination, as human capital is now seen as an important driver for development (Crespo and Lutz 2007; Lutz et al. 2007, 2008). Also,

migration of young family members to work abroad reduces the family workforce and can cause some negative psychological effects. In the third phase, conflicts among farmers reduce social capital (including trust) in rural areas, further exacerbated by government intervention, which has diametrically opposite effects for rich and poor farmers. Furthermore, sales of assets and land, as well as increasing debt, add to farmers' stress level and reduce their self-confidence and happiness. That puts the farmer, and eventually society, in a progressive low-cycle stage, or even into a poverty trap like situation. If such situations cannot be prevented, they could result in mass migrations from rural to urban areas and an increasing dependency on food imports (Foltz 2002; Balali et al. 2009). While these very extreme negative effects are most notable for the poor, the moderate farmers are also severely affected. However, it seems that they are resilient enough—via the use of savings, job diversification, government help, or selling some of their non productive assets—to limit the negative effects to the short run. However, such coping strategies will likely fail in the case of recurrent severe droughts and may cause the same effects as observed for the poor farmers.

As it was shown, government interventions could cause additional problems via the false assumption that all farmers are in the same socio-economic condition. It was found that the rich and moderate farmers are able to utilize government assistance, and these programs result in unintended negative side effects for the very poor farmers over time. That is, higher productivity results in fewer job opportunities for poor farmers after the drought. Specifically, because of the assumption of homogeneity of farmers, the government treats the drought as a crisis and therefore uses crisis management for solving the problem (for more detail see Wilhite 2002). Crisis management focuses on relief, and within the relief process it was found that this strategy results in unintended negative side effects, including a decrease in social capital, an increase in poverty and increase in conflicts eventually leading to an unstable situation within the society.

One alternative to avoid such problems would be the shift from relief or ex-post interventions to “proactive” risk management (Lindell and Perry 2004), like in the case of Australia (for an extensive discussion see Botterill and Wilhite 2005). Here, all aspects of society, sub-groups and individuals are incorporated in a systematic manner. It seems that early warning systems and preparedness strategies are key elements. Undoubtedly, in the Iranian situation where drought happens frequently, risk management could be a suitable alternative. The government, as a key actor in this process, should increase its efforts to target the very poor, not only in the immediate aftermath or emergency phase of the event, but also in the disaster recovery phase (Lindell and Perry 2004) by focusing on decreasing the likelihood of possible negative long term effects such as dropouts and gender discrimination.

From a modeling perspective, the analysis showed (see also Nelson et al. 2010) that adequate sustainable development modelling approaches need to incorporate interdependencies among different population groups at various spatial scales—from the

individual to the national level—as well as the economic, human and social dimensions of capital. Furthermore, the different factors can be closely linked and thus interdependencies need to be explicitly incorporated. Otherwise, government intervention could result in a biased output, eventually leading to the wrong crisis or risk management strategies—at least for some sub-groups. It should be noted that empirical information on interrelated effects (flow effects) over different sub-groups are difficult to gather within quantitative based approaches and in this case, qualitative approaches may be the superior method.

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