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Drought Impacts and Potential for Their Mitigation in Southern and Western Afghanistan

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International Water Management Institute

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Summary

After 25 years of consecutive war, the people of Afghanistan are particularly vulnerable to droughts and other natural disasters. Weak or nonexistent government institutions and the vacuum of physical or social information related to droughts or people's coping strategies create a gap in developing or implementing a coherent and effective response to drought. To fill this gap, at least partially, Catholic Relief Services (CRS) has conducted a quick situation analysis of drought-coping measures and responses in Afghanistan in partnership with the Agricultural Faculty of Kabul University, FAO-Afghanistan and the Ministry of Irrigation, Water Resources and Environment of the Government of Afghanistan. The purpose of the study was to explore indigenous drought-coping strategies in Afghanistan, evaluate potential mitigating strategies and provide recommendations to the government and other institutions on developing improved drought responses in Afghanistan in the future. The study consisted of a survey with farm families and key government officials and covered two western provinces of the country. It also drew from other similar surveys, for example the one conducted in 12 southern and western provinces by the Government of Afghanistan.

Four of the last five years (except 2003) were drought years in Afghanistan, and the rural population suffered from shortage of potable water and falling groundwater levels. Many shallow wells (up to 30 meters deep) dried up. The irrigation potential in Ghor and Badghis provinces reduced from 17% to 88%, depending on the crops and area. Poppy cultivation is in the rise as a mechanism to maximize the profits from shrinking cultivable area. Crop diversity was reduced by 71% and productivity by over 50% in the western provinces of the country. Animal population, productivity and selling price also decreased significantly. Because of the lack of employment opportunities, migration was rampant and desperate measures, including indentured child labor and early marriage of girls, have increased.

Overall, government anti-drought policies and practices in the country at present are at the embryonic stage. On the other hand, village-level institutions like *shuras* and water *waqils* are not meeting the expectations of the farmers to manage scarce water efficiently or equitably. An emerging commission at the central level and its regional suboffices may give some focus to drought-related issues. The Government of Afghanistan has already taken some positive steps to mitigate drought. A monthly bulletin on food-security analysis is an important first step in this direction. However, it will take a long time before its benefits are felt at the ground level mainly because of poor extension systems.

One possible drought mitigation strategy for Afghanistan is to divert excess water from water-rich river basins to water-scarce river basins in cases where this is technologically, economically and environmentally feasible. However, this paper argues that the best option for mitigating drought is community-based water harvesting and that in drought-prone areas, micro-watersheds are more useful than larger watersheds for augmenting agricultural production and increasing water security. Hypothetical scenarios suggest that it is possible to provide 15 liters of water per person per day throughout the year for drinking and domestic use by harvesting watersheds of 2.5 to 8 hectares per village. As 30% of livelihoods in Afghanistan depend on animal husbandry in rangelands, increasing the carrying capacity of rangelands through micro-watershed water harvesting may also have a long-term positive impact.

Introduction

The western parts of south Asia, comprising parts of west India, Pakistan, Afghanistan and Iran constitute, perhaps, the largest contiguous geographical area in the world affected by droughts. The situation needs special attention because of the high frequency of drought occurrence, high population density and poor economic conditions of the population in this region. Governments and other stakeholders in the region need to be informed on the causes of droughts and their possible mitigation measures in order to alleviate human sufferings. In 2003, the International Water Management Institute (IWMI) initiated a regional study on drought assessment and mitigation in southwest Asia, including individual studies in west India, Pakistan and Afghanistan. Catholic Relief Services (CRS) conducted a quick situation analysis of drought mitigation in the country, focusing primarily on southern and western provinces. The study was conducted in cooperation with the Faculty of Agriculture of Kabul University, Ministry for Irrigation, Water Resources and Environment (MIWRE) and FAO-Afghanistan. The purpose of this component was threefold:

- To survey farmers' attitude and level of knowledge for coping with the drought.
- To asses the current level of response from government and other agencies.
- To suggest possible approaches/measures for drought mitigation in the future.

Study Areas

Many parts of Afghanistan with the exception of northeastern highlands are facing frequent droughts. This survey focused on the southern and western provinces for the following reasons:

- Southern part of Afghanistan is receiving the least rainfall (100–300 mm per year) followed by western (200–400 mm) and northern parts.
- Shallow soils and bare rocks in all these regions do not retain moisture.
- Lack of vegetative cover and the high population density in the region make this area highly vulnerable to droughts.
- Strong winds from April to August have a severe desiccative effect.
- Food insecurity levels are very high in these parts of the country.

According to Asian Development Bank (ADB), localized droughts in different parts of the country have a return period of 3 to 5 years. Droughts, covering large areas recur every 9–11 years, while droughts of a nationwide extent have a return period of about 20–30 years (ADB cited in WFP 2003). According to the ADB report, the latest (and still current) drought is unusual because of the combined effect of its duration and wide geographical extent. This combination has made this drought especially destructive to the natural resource base and subsequently to the livelihoods of millions of people residing in the drought areas.

The South

The southern provinces of Nimroz, Kandahar, Uruzgan and Zabul (figure 1) extend from the foothills of the central and southern mountains into open plains dominated by rocky outcrops and desert sands. Four main rivers originating in the mountains to the north and east—the Khash, the Helmand, the Arghandab and the Arghistan—flow though the area around which most agricultural activities take place. Along these watercourses and in the urban centers, population density is high. The rest of the area is relatively uninhabited due to the hostile natural environment, though small settlements can be found around desert oases and *karezes* (covered springs). In recent times, the south has experienced heavy fighting and conflict, with much infrastructure—including irrigation systems—being neglected or destroyed.

Low altitude rain-fed lands are found in parts of Helmand, Kandahar, Uruzgan and Zabul provinces though most agriculture is conducted in fields irrigated through canal systems along the river courses. More than half of the agricultural systems in Uruzgan (estimated at 60% of agricultural activity) rely on karezes and intermittent flood irrigation, closely followed by Zabul (estimated at 40%), Kandahar (estimated at 20%) and Helmand (estimated at 15% [WFP 2003]). The main crops are wheat and, to a lesser extent, barley. There are two agricultural seasons: the first cultivation takes place from November to December, and the second from June to July. Secondary crops include maize, cotton, beans, pulses, melons, cumin and poppy. Vineyards, pomegranate and almond orchards are also found in the area.

The West

The western areas of the country extend south from the rolling hills and pistachio forests of northern Badghis to the Hirat province, from the rocky arid lands of western Hirat and Farah provinces eastward to steep mountain regions of Ghor and southern Badghis. People are concentrated in the provincial cities and urban centers scattered throughout the provinces. The city of Hirat, one of the outposts along the ancient silk route of the east, is the main urban hub of the area. In comparison to other parts of Afghanistan, the rural areas are not overly populated, with villages concentrated westwards from the mountains. Three main rivers—the Murghab, Harirud and Farahrud—flow through the area where irrigated agriculture and horticulture take place along their banks.

In the arid lands of central and southern Hirat and Farah provinces, farming relies on karez irrigation—estimated at 40% and 90%, respectively, while in the mountainous areas agriculture centers around rain-fed (approximately 65%) and mountain spring irrigated lands (estimated at 35%) with wheat being the predominant crop. In eastern Badghis and into western Hirat, there is an extensive belt of primarily rain-fed land on which most agricultural activity takes place, estimated at 90% and 60%, respectively, for the two provinces. A few large landowners, with whom most of the rural population share the crop or for whom they work, are found in the area. However, the majority of rural families are small landholders. The main crop is wheat, with secondary production of barley, peas, corn and cumin. In normal years, many farmers cultivated a second crop of rice, corn and lentils, though this has decreased due to water shortages, with the exception of the irrigated lands along the Murghab river in the Badghis province. In some districts of Hirat and Farah provinces vineyards and orchards consisting of peach, apricot, plum and walnut trees are watered from the rivers. Fruits and vegetables—melons, eggplants, tomatoes and okra—are also grown in the area.

Data and Methods

Survey of Farmers' Perception on Drought-Related Issues

Over the past 25 years, not much research or interventions has occurred in Afghanistan due to persistent war and government instability. Therefore, field data collection was the primary activity of this study. Unfortunately, deteriorating security in the study areas (both south and west) precluded the research team from visiting many sites.

The survey focused on Ghor and Badghis provinces (figure 1), severely affected by the recent drought and, at the same time, the least accessible due to lack of roads and security reasons. Therefore, special emphasis was given to collect data from these two areas. A bilingual (Dari and English) questionnaire was developed and pretested. Students from Ghor and Badghis provinces were identified in the Agriculture Faculty of the Kabul University. These students were trained in the data collection procedure before being sent to the field. At the provincial headquarters, through interactions with government officials, most drought-affected districts were identified. Further, at the district headquarters, government officials located severely affected villages, some of which were so difficult to reach that the interviewers had to use donkeys as transport. Data were collected from five villages in each of the provinces and from each village five farmers were interviewed. In some places women schoolteachers were contacted as well.

Figure 1. Provinces and locations surveyed by different organizations.

A comprehensive study was conducted by MIWRE in several other provinces including Khost, Paktia, Paktika, Ghazni, Zabul, Uruzgan, Ghor, Kandahar, Farah, Helmand, Nimroz and Hirat. The study was conducted from 13 May to 15 June of 2004 and the results are summarized in the report on "Emergency Drought Assessment in 12 Vulnerable Southern Provinces" prepared by MIWRE (Anonymous 2004). FAO, in consultation with MIWRE, WFP and several Ministries (Internal Affairs, Agriculture and Animal Husbandry, Rural Rehabilitation and Development, Urban Development and Housing and Mine and Industry) prepared a questionnaire that was used for information collection. The mission that collected the information was a multidisciplinary team which included high-level government officials, intellectuals, people's representatives, councils, deputies and elders. The members of the multidisciplinary drought study team visited water-storage dams, water-prevention structures, rivers, canals, springs, karezes, provinces, districts and villages. The mission also visited shallow wells, deep wells, arable lands, gardens, vineyards and cattle herds. It reviewed living and dwelling conditions of people, refugees' repatriation, recent immigrations, security and health conditions.

Additional data on rural vulnerability and food-needs assessment in Nimroz, Kandahar, Urozgan, Zabul, Badghis, Ghor, Hirat and Farah provinces were available from WFP (WFP 2003). Danish Agency for Coordination of Assistance to Afghan Refugees (DACAAR) supplied drought-related information from the Pastun Zargon district in the Hirat province. IWMI-Pakistan conducted a separate survey of households and communities in the Helmand and Khandagar provinces (Qureshi and Akhtar 2004).

Survey of Government Officials

In addition to field surveys of the drought-affected population and review of the relevant supporting reports produced by other organizations listed above, the study set to interview some government officials who deal with different aspects of droughts due to the nature of their responsibilities. A bi-lingual (English and Dari) questionnaire was prepared for interviewing different government officials for capturing their thoughts and ideas in drought-related issues. Prof. Mohsini, Dean of the Faculty of Agriculture at Kabul University and one of the coauthors of this paper, conducted the survey.

Rainfall Data

Although rainfall analysis itself was not part of this study, the collection of rainfall data (for parallel studies) was. More specifically, the study attempted to collect long-term monthly time series on rainfall. Such data are required for accurate quantification of drought occurrence and severity in different parts of the country. The availability of long-term records in Afghanistan, however, is extremely limited. Over the last 20 years, very limited data collection activities were conducted, while many historical data from previous years were lost. Other historical records are scattered in different reports, in different institutions and are difficult to access. It is commonly unclear where the data may be available and the data "collection" is effectively the process of trial and error. Different organizations were approached in the search for rainfall data, including national Ministries (e.g., Ministry of Agriculture, Ministry of Aviation, etc.). During this process, the rainfall time series were collected for 17 locations in the country. Only 5 rainfall stations (primarily located at the airports) have rainfall records for 20 years and longer. Others have data only for 4 to 13 years. None of the stations cover the period after 1992. Recently, FAO started to consolidate historical rainfall data along with the analysis of current rainfall. FAO has data on long-term average rainfall for 77 rainfall stations throughout the country. However, to date, the authors have not been able to find the monthly rainfall time series for these stations.

Impacts of Drought

The impacts of current and future droughts in Afghanistan have to be evaluated not only in the context of the country's history of war and unrest but also in the context of the general agricultural statistics. The detailed pooled provincial land cover statistics gives the following information (table 1).

Table 1. Land cover of Afghanistan (Anonymous 1999).

Land cover	Area (ha)	Area of the country (%)
Urban	29,494	0.05
Orchards	94,217	0.1
Agricultural land irrigated	3,207,790	5
Intensive	1,559,654	2.4
Intermittent	1,648,136	2.6
Agricultural land rain-fed	4,517,714	7
Forests	1,337582	2.1
Rangelands	29,176,732	45.2
Barren land	24,067,016	37.3
Marshland	417,563	0.6
Water bodies	248,187	0.4
Snow-covered areas	1,463,101	2.3
Total	64,559,396	100

The area covered by agricultural land is 12% of Afghanistan's land area, which amounts to 7,725,504 hectares. Of the total agricultural land, 5% is under irrigation (both intensive and intermittent) and 7% under rain-fed agriculture (table 1). Importantly, over 45% of the total land is rangelands (table 1). It is clear from these data that the contribution from animal husbandry to livelihoods in Afghanistan is substantial although it naturally differs between provinces (Grace and Pain 2004).

Livelihoods and Impacts of Drought in the South

Livelihoods

The results of the surveys suggest that the main *livelihoods* for Afghans in the south are based on agricultural and livestock production. Labor opportunities revolve around agricultural seasons, where work can be found in the fields of larger landowners—owning medium to large-sized agricultural plots that range from 10 to 300 *jeribs* (1 jerib = 2,000 m^2 of land). Some additional labor opportunities exist in the urban centers and the frontier trading towns of Zaranj, on the Iranian border and Spin Boldak, on the Pakistani border. The majority of the people, however, are sharecroppers and small landowners, with plots typically ranging from one to ten jeribs. Animal husbandry also plays a significant role in people's livelihoods, where they own herds of camels, cattle, sheep and goats. Additional household income is derived from handicrafts made by women for trade in the local area with some export to Pakistan.

Limited Irrigation Water

Lack of snowfall during the winter and less-than-normal rain have decreased water availability for irrigation in the south, especially in summer. Generally, the only irrigated areas are upstream-irrigated fields at the base of the mountains and canal irrigated fields along the banks of Helmand river, as far south as the town of Garmseer. All other rivers and watercourses are almost, if not completely, dry. Underground water tables have fallen significantly negatively impacting agricultural producers who rely on springs and karezes. Villagers have estimated that the water levels in their wells have dropped by as much as 5 to 10 meters compared to the situation in 2001. These survey results are supported by similar findings from FAO (annex 1), which shows that during the latest drought, in most of the provinces of the south and west, there was a marked reduction in the number of shallow wells, deep wells, karezes and hand pumps.

Reduction of Crop Yields

With the exception of the upstream canal irrigated districts of Helmand province, where surpluses have been recorded, wheat losses in other irrigated areas have been severe. Downstream canal and karez irrigated farmlands in both highland and lowland areas have been acutely affected as a result of the decrease in water sources. Many fruit trees and vineyards have died. Yield reductions of up to 75–100% of the normal harvest have been recorded in these areas. Rain-fed agriculture has failed, and a vast expanse of dusty, dry farmlands dominates the countryside. Due to this lack of water, many farmers did not plant second crops in most areas outside of Helmand province.

Potable Water

Safe potable water is a serious concern, as many wells have dried up completely. Communities keep deepening their wells, but wells continue to run dry and people are becoming too impoverished to afford the digging of deeper wells. Deepening a well can cost, on average, about 35,000 Afghanis, while a government employee brings home a salary of 2,000 Afghanis a month (Kabul Weekly, August 25, 2004). In the Zaranj district of Nimroz province, people are forced to buy water for 2 to 3 Afghans per liter from suppliers.

Coping Strategies

The traditional coping mechanisms for people in the south are close to exhaustion. They have sold belongings—agricultural lands, livestock, and household assets—taken loans and mortgaged their lands. This is particularly true for families living in the spring, karez and downstream irrigated agricultural areas. Farmers have reported that the prices of these irrigated lands have dropped by more than 50% compared to those in normal years, and they are now battling with the double-edged sword of desperately trying to sell their lands at a time of reduced prices. Labor opportunities are now almost entirely limited to the main provincial cities as a result of agricultural failure and restrictions across the borders.

1In this report, “local knowledge” is used to refer to both the indigenous technical knowledge of fishers and the broader technical and other knowledge of all stakeholders including that of communities and local officials.

Livelihoods and Impacts of Drought in the West

Livelihoods

Livelihoods for people living in the west, with the exception of Badghis and Ghor provinces, are relatively more diverse than in other regions of the country. In addition to agriculture, livestock ownership plays a large role in people's livelihoods—cattle, donkeys, and camels are owned, and large herds of sheep and goats are used for dairy production, sale, trade and transport. Wool and hides from the Badghis province are sold within the country and these are major exports to Pakistan. Work opportunities are based on agricultural activities with seasonal migration to Iran for work.

Currently, the main sources of income for many people in the west are seasonal agricultural labor, sale of livestock and other household assets, sale of agricultural production, remittances from family members working in Iran, loans and mortgaging of land. It has been estimated that 20% to 30% of the population work within the districts during the cultivation and harvesting seasons, or as sharecroppers and shepherds. An estimated 30% to 40% of male laborers seasonally migrate to the urban centers of Hirat and Farah, while up to 40% to 50% cross the border into Iran in the hope of finding work and sending back remittances to their families.

Livestock

Livestock numbers have been greatly reduced over the last few years due to continuous drought, while animal birth rates have also gone down due to poor-quality pasturelands.

Lack of Access to Safe Drinking Water

In many areas, people are facing shortages of safe potable water due to the decrease of water in the underground aquifers. In the Sange Atash district of Badghis province, drinking water is salty and unpalatable, forcing people to spend their meager incomes on purchasing drinking water.

In some provinces, springs and karezes are 90% dry. In many shallow wells, the water levels have dropped up to 12 meters. In some areas, especially in Nimroz, salty water has percolated into the wells. Many shallow wells up to 30 meters in depth are dry. In some parts of Khost, people have to travel up to 12 km to collect drinking water from the closest usable source. In urban areas, the old water supply systems cannot cope with the expanded city limits and water supply networks. In Ghor and Paktia provinces, there are no city water-supply networks.

In many villages, especially in Ghor and Badghis, there were traditional systems of collecting *cha* (winter snow) in underground storage tanks (figure 2). Cha can be as deep as 20 meters. They used to be not only sufficient for the needs of the families but also provided enough water to sell to other families during summer. It appears from the survey results that the government and NGOs are, however, not promoting this traditional snow-/water-harvesting technology.

Irrigation and Cultivation

Due to the current drought, irrigation potential of the existing water bodies and storage dams has been greatly reduced. In Kandahar province, the main gates in the Dahla dam have been reconstructed but, due to increased sedimentation, the capacity of the reservoir has decreased. In the villages of Ghor, Badghis and Hirat, where surveys were done, irrigated cultivation has decreased by 15–70%. Operational and semi-operational karezes, especially in Uruzgan, Helmand, Gazni and Hirat need urgent cleaning and improvement.

Figure 2. Cha (harvesting snow in wells) in Ghor.

Reduction in Crop Diversity and Yield

Most farmers interviewed said that the area under cultivation had decreased while crop diversity had also reduced substantially. Many farmers in Ghor, Hirat and Badghis reported that in normal years they were cultivating seven different types of crops: wheat, barley, peas, mung bean, clover, cotton and melon. But due to the drought they are cultivating only wheat and peas and, in some cases, barley. Farmers interviewed in these three villages indicated a yield reduction of about 17–88%. Peas and cotton recorded the highest (88%) and the lowest (17%) yield reductions, respectively. In cereals like wheat and barley the reductions were around 50–70%.

Expansion of Illicit Crops

In some provinces, like Helmand, Kandahar, Zabul, Urozgan and Ghor, an increasing number of landlords are engaged in poppy cultivation. Because of low levels of production of agriculture crops due to the drought, even the expenditure on seeds and fertilizers cannot be compensated for by the expected harvests. In the Guzara district of Hirat, sporadic cultivation of smoking cannabis is also observed mainly for the same reasons.

Forests, Pastures and Animal Stocks

Forests and pastures in the drought-affected areas have been decreased by around 80% in Nimroz, Helmand and Farah provinces. Communal grazing lands have been eliminated in many parts of the country, especially in the western and southern parts due to drought and the movement of sand dunes. Even when the communal grazing land exists, its productivity and carrying capacity have been greatly reduced. When asked about the current levels of productivity of pasturelands as compared to normal and average rainfall years, the farmers in Ghor and Badghis indicated that the level is below 50%. In Ghor, Badghis and Herat provinces the animal population has decreased significantly. While the number of cows has decreased by 20–50% the number of goats and sheep has decreased by 40–65%. Farmers stated that birth rates of animals have also gone down. The degradation of the pasturelands has resulted in a significant decrease in the available forage for the livestock of the *kuchi* (pastoral nomads) (figure 3) and the number of their animals has decreased significantly as compared to the number in normal rainfall years. The selling price of animals has gone down by 15–30% as compared to the number in non-drought years.

Figure 3. A settlement of the kuchi (nomadic shepherds).

Migration and Joblessness

Economic difficulties in the rural areas leading to joblessness have increased poverty levels. In most rural areas, particularly in Ghor, Nimroz, Paktia, Gazni and the upper part of Helmand provinces, many villagers have migrated to provincial centers because of the lack of both water and employment opportunities. Many families, and in particular the young and able-bodied persons, have migrated to cities, the capital (Kabul), and further to Iran and Pakistan.

Impacts on Children

One effect of the above migration on young people is the high rate of child labor in various provinces. Also, at least 5% to 7% farmers who were interviewed in Ghor and Badghis provinces admitted that due to drought they arranged and received money for early marriage of their daughters.

Tables 2 and 3 summarize the impacts of the recent drought on different aspects of life in the surveyed provinces.

Table 2. Decline in agricultural parameters in surveyed villages of Ghor, Badghis and Hirat.

Province	Decline in 2004 (drought year) to 2003 (normal year)						Social effects
	Crop diversity (%)	Area cultivated (%)	Yield (%)	Area irrigated (%)	Water table (m)	Number of animals (%)	
Badghis	30 – 60	15 – 70	20 – 78	50 – 75	3 – 4	20 – 60	M, EM, CL, IC
Ghor	40 – 65	20 – 60	25 – 75	50 – 75	2 – 4	25 – 55	M, EM, CL, IC
Hirat	25 – 70	21 – 67	17 – 88	51 – 86	2 – 4	20 – 50	M, IC

Note: M = Migration; EM = Early marriage of daughters; CL = Child labor; IC = Illegal crops.

Table 3. Summary of impacts and coping methods.

Effects/symptoms of drought	Coping strategies adopted
• Shortage of potable water and groundwater	• Unplanned digging of wells
• Shortage of irrigation water for cultivation	• Increasing joblessness and selling of assets
• Shrinkage of rain-fed agriculture	• A rise in the cultivation of poppy and other illegal crops
• Reduction in animal husbandry	• Migration and related social problems
• Diminished forests	• Child labor
• Diminished quality of rangeland	• Early marriage of girls in exchange for money
• Loss of crop diversity and productivity	

Possible Measures for Future Drought Management

Current Activities and Perceived Needs

Drought impact management implies both short-term measures and long-term planning. Interviews with villagers and government officials helped identify some current activities and future anti-drought needs and strategies.

The Government of Afghanistan has undertaken certain steps for drought mitigation. A Dari/English bilingual monthly bulletin on food security is now being published by the Ministry of Agriculture with the support of the FAO—to inform a wider audience of meteorological conditions in different parts of country and potential impacts on agriculture.

In the Ministry of Internal Affairs, a special division has been organized to respond to emergency situations. It is not clear, however, whether drought "falls" under this department. Currently, MIWRE examines possibilities to improve drought monitoring in collaboration with other ministries such as the Ministry of Agriculture and Animal Husbandry and the Ministry of Rural Development and Reconstruction.

In addition to the already mentioned emergency drought assessment in 12 southern provinces, MIWRE has initiated a similar survey in 14 provinces (central and northern) of the country. The purpose of these surveys is to understand the realities on the ground and to identify which priorities should be presented to international donors for emergency drought relief and mitigation.

Many interviewed persons of authority felt that establishing a Drought Commission at the national level as well as its regional suboffices may help alleviate the impacts of future droughts.

Also, many felt that to tackle drought, Afghanistan needs appropriate laws on forest conservation, utilization of underground water resources, land tenure and land taxes.

Most villagers felt that local *shuras* and water *waqils* (see annex 2), who were functioning well in the past, were not very effective in handling water issues, especially in the recent drought years. At the same time, people still feel that shuras can play a significant role in community-based drought management. Waqils are also suffering due to low production. Their income, often paid in kind by farmers, has reduced significantly. Consequently, they have lost interest in that work.

In the context of Afghanistan, livestock and rangeland issues are closely related to drought mitigation. During droughts, farmers often increase their reliance on livestock as a coping mechanism; because animals are a valuable asset, they can be moved when people are forced to migrate, and they can either be eaten or sold. Afghanistan farmers traditionally keep large herds,

which they can use as a cushion against shocks. In drought-prone areas, about 25–30% of livelihoods is dependent on rangelands. Droughts negatively influence the carrying capacity of rangelands. Increasing this capacity through soil and water conservation along with identifying appropriate breeds and their improvement would be a logical and sound strategy for reducing the negative impacts of droughts.

One possibility for drought mitigation is diverting excess water from river basins with surplus water to water-deficit basins, i.e., large-scale water diversion. In northeastern parts of the country, precipitation is generally higher with a perennial snowcap, but very little land is available for agriculture. The feasibility of diverting surplus water from such regions to water-deficient regions should be investigated. The MIWRE in Afghanistan is considering this idea and many donors are interested in investing in such projects. While this could be a long-term, centralized strategy for augmenting water supplies in drought-prone areas, a lot can be achieved in both the short term and the long term with community-based water-harvesting measures.

Micro-Watershed after Harvesting as a Drought-Mitigation Measure

When it comes to water resources development, there is often a dilemma between the pursuits of large-scale and small-scale interventions. In most cases, policymakers tend toward medium and large dams and give lower priority to community-based and diversified water-harvesting projects. *In Afghanistan, hydrologically wet months do not coincide with the agriculturally active season* as in India or Pakistan. In southern and western parts of the country, the most active agricultural months are March through October, when there is hardly any precipitation. Nearly all precipitation comes from November through early March. Also, nearly 100% of annual precipitation may come only in 50–60 hours a year. This water needs to be captured and stored until the growing season. It may be argued that in such conditions, *rainwater harvesting managed by local communities based on historical systems is the most promising option for mitigating drought*. An important policy question is, can community-based water-harvesting provide enough for potable water and agriculture?

There is scientific evidence, which shows that village-scale rainwater harvesting may yield greater and more sustainable benefits than big or medium dams, making small-scale interventions more effective and more cost-efficient (table 4). Some very instructive lessons on water harvesting can be drawn from the Israeli scientist Michael Evenari who has studied drought and water harvesting in the Negev desert where the average precipitation is about 105 mm (cited in Agarwal 2001).

Evenari was intrigued by the fact that the ancient Israeli civilization had built towns in the middle of Negev desert with their own agriculture and water supply systems. In his effort to reconstruct the ancient farms of the Negev, Evenari concluded that water harvested from small watershed areas was proportionately much greater than that collected over larger watersheds (figure 4). While a collection of 345 1-ha sized watersheds in the Negev yielded as much as 95 m^3/ha/year, a 345-ha watershed yielded only 24 m^3/ha/year. In other words, as much as about 75% of the water that could be collected within a larger watershed was lost (most likely during additional transmission time and associated evaporation and infiltration) by pursuing a one-point catchment approach. One of Evenari's conclusions was that "During drought years with less than 50 mm of rainfall (normal of Negev is 105 mm) watersheds larger than 50 ha will not produce any appreciable water yield while small natural watersheds will yield 20–40 m^3/ha."

Figure 4. An illustration of a one-point catchment approach versus multiple point approach

Table 4. Effect of catchment size on runoff water harvesting (Agarwal 2001).

Size of catchment (ha)	Quantity of water harvested (m^3/ha)	% of annual rainfall collected
Microcatchment: 0.1–1	160	15.2
20	100	9.52
300	50	3.33

Simple calculations can demonstrate the potential of rainwater availability if it is harvested efficiently. We use a scenario of 1 hectare of land located in Zaranj or Deshu, which are the driest places in Afghanistan with a rainfall of about 60 mm per year. The hypothetical maximum annual harvest with an assumption of zero losses will then be 600 m^3. This should be enough to meet drinking and cooking water needs of about 110 people at a rate of 15 liters per person per day (SPHERE-Humanitarian Charter—standards and minimum standard in disaster response). Of course, it will not be possible to capture and retain all rainwater, as losses by infiltration and evaporation will be significant. One could still, even with a rudimentary technology, capture some 150 m^3 of water per year (25% of the above: it has been shown by Maitra [2001] that, on a relatively plain area with little cultivation and light rains, the percentage of rainfall converted into surface runoff may be equivalent to 28%). This should be sufficient for 27 persons per year.

Table 5, compiled on the basis of statistics provided by AIMS, gives an estimate of areas required for micro-watershed water harvesting at 25% harvesting efficiency. The table takes into account only the settled population. Also, the 25% efficiency is still unlikely to be achievable in

the conditions of high water losses in arid areas. It rather represents some theoretical maximum and more realistic efficiencies will be in the range of 1–10%. Due to the above, the area required to supply the same amount of water will increase proportionally. At the same time, even at low efficiencies of water harvesting, the positive side effects will be the additional recharge and enhanced vegetal cover for livestock.

Table 5. Area required for community-based water harvesting.

River basins	Area (ha)	No. of villages	Average area of a village (ha)	Settled population (excluding nomads)	Average population per village	Average rainfall in the area (mm)	Area (ha/village) required to provide 15 l/ person/day at 25% efficiency
Amu-Darya	9,069,189	4,152	2,184	2,968,122	715	500	2.6
Harirod-Murghab	7,760,366	2,959	2,622	1,722,275	582	225	5.6
Helmand	26,234,136	14,041	1,868	5,881,571	419	150	6.2
Kabul	7,690,829	7,039	1,887	7,184,974	1021	300	8.0
Northern	7,090,127	2,969	2,388	2,783,033	937	300	6.8
Non-drainage	6,735,636	69	97,818	151,629	2,197	175	
Total	64,580,283	31,229	2,068	20,691,604	663	250	

Traditional Water-Harvesting Technologies

Apart from the micro-watershed water harvesting, which needs more insights and testing in the field, there is a strong tradition of innovative and effective small-scale water harvesting in Afghanistan and other arid areas of Asia. Large communities have survived in extremely arid environments of Asia through the ingenuous use of limited water resources. Such indigenous water-harvesting systems that deserve more attention at policy level include *tankas* (underground storage tanks widespread in arid areas of Rajasthan), *khadins* (small bunds in India within a catchment to retain rainwater and snow-melt), cha *(*already mentioned traditional systems in Afghanistan that collect snow in underground storage tanks), karezes (already mentioned underground tunnels to transport water across large distances) and some others. These simple, but effectives, technologies are apparently rarely promoted or supported by governments or NGOs, according to interviewed farmers.

Conclusions and Recommendations

In the past decades, little research or few interventions were made in Afghanistan to combat drought. The institutional capacity is limited and there is an acute lack of data and knowledge on almost all aspects related to drought mitigation. A number of “needs assessment” projects have been conducted in Afghanistan by many international and national organizations. They have set a solid starting point on which to build specific interventions.

Irrigation water management is an important area which needs significant attention. Usually, the non-furrow flood irrigation method is employed for irrigating crops and fields. Hardly any water-saving techniques or devices are used. Relevant research, especially on its economics, to make the technology appropriate to small farmers, is long overdue.

Water waqils who were working efficiently earlier are not functioning because they are also suffering due to low production resulting in the reduction in their incomes. These village water institutions should be revived and maintained to ensure efficient water distribution.

As a significant proportion of livelihoods in Afghanistan is derived from livestock, rangeland and livestock management issues are closely related to drought mitigation and cannot be separated from water management.

Good steps already taken by the government (like the food security bulletin) will reach farmers only through a strong and efficient extension system, which currently does not exist and needs to be developed and strengthened.

Water transfers may be an option for mitigating drought in the long term by diverting excess water from a water-surplus river basin to a water-shortage river basin. However, before implementing such projects, detailed techno-economic, political and environmental feasibility studies need to be undertaken.

The traditional technologies of cha and karez should be rehabilitated along with health and hygiene education regarding the purification of water. In general, the rehabilitation of traditional methods of water management should be given priority. Farmers' age-old traditional knowledge should be rediscovered before or in parallel with introducing new, particularly large-scale and technologically advanced, projects.

It is important to consider ancient knowledge of clustering of micro-watersheds for local water supply. A micro-watershed approach may have a good potential in drought mitigation. Its proper utilization requires research supported by appropriate crop variety and animal breed selection. Currently, not much research has been done on these issues in Afghanistan.

In the studies and surveys made earlier, the views of women could not be captured properly. Recently, an organization has been located in Afghanistan that will undertake gender-related studies. Initial agreement has already been made and a questionnaire for surveying women's perception is being prepared.

One of the immediate possible actions is to arrange field trips to neighboring countries, e.g., western parts of Rajasthan in India, to show working water-harvesting technologies (tanka, khadins, etc.) to leaders in the arena of drought in Afghanistan and practitioners or farmers. Reverse field trips to Afghanistan to view karez and cha systems can also be useful. Cross-breeding of ideas may help in developing community-based drought-mitigation approaches in Afghanistan.

Annex 1

Effect of the current drought on different types of water bodies and structures (based on the information provided by FAO-Afghanistan).

Type of water resource/Province	Previous year	Present drought year	Reduction in the no. of wells	Reduction (%)
		Shallow wells (no.)		
Farah	62	42	20	32
Gazni	59	50	9	15
Ghor	80	67	13	16
Helmand	60	54	6	10
Hirat	91	81	10	11
Kandahar	71	68	3	4
Khost	76	67	9	12
Nimroz	80	79	1	1
Paktia	54	43	11	20
Paktika	84	80	4	5
Urozgan	2	28	-26	-1,300
Zabul	31	24	7	23

Type of water resource/Province	Previous year	Present drought year	Reduction in the no. of wells	Reduction (%)
		Deep wells (no.)		
Farah	74	77	-3	-4
Gazni	100	100	0	0
Ghor	0	0	0	0
Helmand	69	66	3	4
Hirat	87	84	3	3
Kandahar	69	65	4	6
Khost	54	50	4	7
Nimroz	50	50	0	0
Paktia	79	94	-15	-19
Paktika	71	71	0	0
Urozgan	80	69	11	14
Zabul	52	42	10	19

Type of water resource/Province	Previous year	Present drought year	Reduction in the no. of wells	Reduction (%)
		Karez (no.)		
Farah	21	25	-4	-19
Gazni	31	26	5	16
Ghor	48	43	5	10
Helmand	38	35	3	8
Hirat	50	35	15	30
Kandahar	46	44	2	4
Khost	33	33	0	0
Nimroz	0	0	0	0
Paktia	34	38	-4	-12
Paktika	51	45	6	12
Urozgan	65	61	4	6
Zabul	24	21	3	13

Type of water resource/Province	Previous year	Present drought year	Reduction in the no. of wells	Reduction (%)
		Springs (no.)		
Farah	100	93	7	7
Gazni	20	15	5	25
Ghor	48	48	0	0
Helmand	42	37	5	12
Hirat	60	38	22	37
Kandahar	25	30	-5	-20
Khost	63	56	7	11
Nimroz	0	0	0	0
Paktia	31	33	-2	-6
Paktika	42	73	-31	-74
Urozgan	53	40	13	25
Zabul	23	15	8	35

Type of water resource/Province	Previous year	Present (drought year)	Reduction (No.)	Reduction (%)
		Hand pumps (no.)		
Farah	69	43	26	38
Gazni	98	95	3	3
Ghor	78	82	-4	-5
Helmand	76	65	11	14
Hirat	94	61	33	35
Kandahar	68	64	4	6
Khost	67	46	21	31
Nimroz	80	85	-5	-6
Paktia	71	57	14	20
Paktika	85	83	2	2
Urozgan	72	56	16	22
Zabul	36	35	1	3

Annex 2

Village Institutions in Afghanistan

Water Waqils

A water *waqil* (water judge) is selected by the villagers usually for a year for dealing with water-related issues. The waqil's main function is to ensure equitable distribution of water from the canal to the fields as per defined rules observed by the local community. For administrative problems related to canal water, waqils are always in touch with the Irrigation Department and with *mirabs* (water distributors) in villages. He can complain and take action according to the severity of offenses regarding violation of water rights. He supervises various works, e.g., desilting, construction or repair of the canal. He is instrumental in choosing the families/laborers for these jobs. He makes frequent inspections and thereby exercises considerable power in maintaining canals. The waqil depends financially on the village community. He gets paid in kind from the produce of the communities that obtain water from the canal.

Shuras

A *shura* is an institution whereby members of the community select their leader(s) to represent them. A typical shura would include a Head, an Assistant, a Secretary and a few other members. Shura members are normally selected based on their commitment and they are usually elderly people of the village. The shuras are supposed to solve a variety of economic, cultural and civil problems, including rehabilitation of roads and canals, construction of bridges and schools, etc. The number of shuras in a village may be proportional to the village population. The shura is a religious and administrative entity. A shura head chairs all the village meetings, arbitrates the disputes within a village, etc. For an outsider, the shura head is the top village functionary to get permission from for any kind of work. Shura heads are elected and sometimes this position may be hereditary. A shura head receives gifts from the community during festivals and also grows his own crop.

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