HELVETAS Swiss Intercooperation | AFGHANISTAN

Water Systems

Integrated Water Resources Management

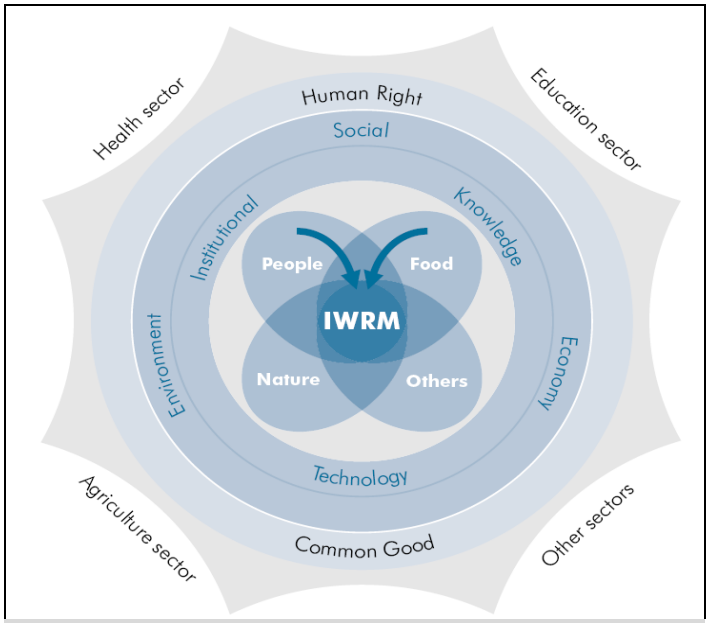

Figure 1: The concept of Integrated Water Resources Management (SDC, 2005)

along its green banks define the landscape and are a major part of its beauty.

Water is essential for many reasons and has many different uses, all of which are essential to our lives, and all of which deserve adequate attention. One way to assure this attention is **Integrated Water Resources Management (IWRM)**. The concept of IWRM is presented in Figure 1.

Zertoot is a small stream that runs through the village of Katili in Nangarhar. Every day the villagers fetch water for their domestic use - for drinking, cooking and washing. Herders drive their cattle, the sheep and goats to the stream to quench the animals‘ thirst. In summer the stream’s water is diverted to irrigate the home gardens and orchards, and the crops in the fields. Downstream, there is a swampy area inhabited by myriads of insects, frogs and birds. Farmer Lal Sher recently bought a micro-hydropower wheel. His two daughters read their schoolbooks in the evenings by the light of a flickering bulb. The water from the stream is used for ritual ablutions prior to praying; its banks offer a relaxing spot, and kids enjoy a refreshing bath on a hot day. The blue ribbon at the bottom of barren ochre slopes, and the willows and popular trees

Box 1: Definition IWRM

“IWRM is a process that promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Integrated management has to be applied through a complete rethinking of water management institutions – putting people at the centre.” (SDC, 2005).

Water for Food

IWRM differentiates between “Water for People”, “Water for Food”, “Water for Nature” and “Water for Other Uses”. Depending on our personal history, education, profession, values and beliefs, we will view this resource differently. In the following section, we are looking through the lens of development workers aiming to improve the livelihoods of rural women and men. Nevertheless, we should be conscious that we are looking through this lens! From an agronomist’s point of view, we pay particular attention to “Water for Food” and may differentiate two fundamentally different farming systems, namely **rain-fed and irrigated agriculture**. It is the input water that makes the difference. If we add other inputs (the vertical axis in Figure 2 on the next page), such as labour, energy, quality seeds, nutrients, and pest and disease control measures, we can distinguish various typical farming systems in the Central Highlands of Afghanistan (see Figure 2).

In the semi-arid climate of Afghanistan’s Central Highlands, the availability of a regular and secure water supply has a fundamental influence on what type of agriculture can be practised. 70% of fresh water use worldwide is dedicated to agriculture, mainly through irrigation. In Asia this share rises to 87%, and to 98% in Afghanistan (Aquastat, FAO). Food production requires about one litre of water per calorie. So, although an average of 3,500 litres of water is necessary to produce food for one person for one day, only two or three litres are needed for drinking. But the food regime strongly influences water needs: for example, it takes 1,500 litres of water to

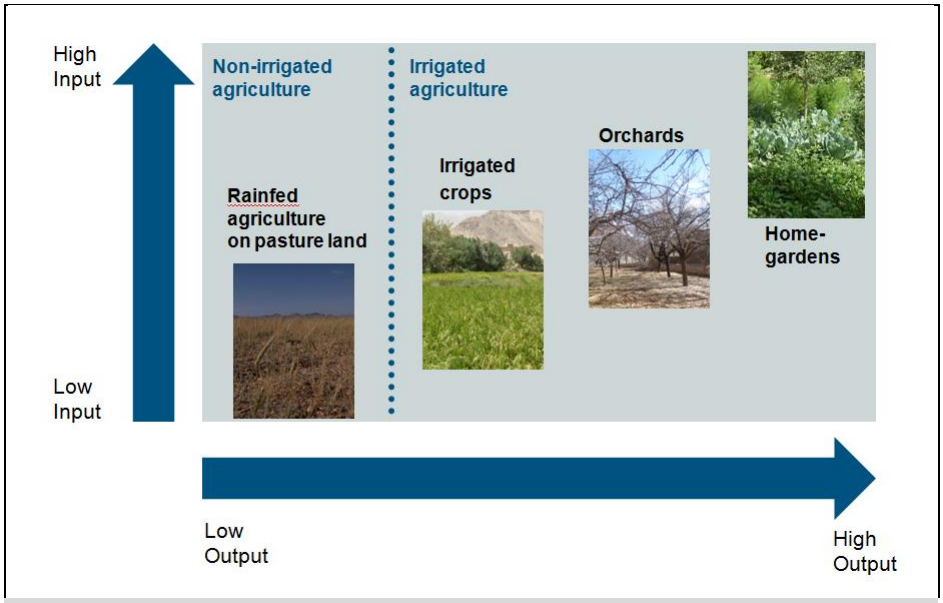

Figure 2: Crop production systems in the Central Highlands of Afghanistan

Agriculture is one of the main polluters of water, e.g. through livestock-transmitted pathogens (e.g. salmonella, E. Coli), pesticides and inappropriate use of chemical fertilisers. Moreover, inadequate irrigation techniques cause soil salinisation.

IWRM is a people-centred approach. The sustainable use of water depends much more on **individual behaviour**, the **functioning of organisations** and the **values** of a society than on technical solutions. It is the interaction of interventions ranging from education, economic incentives, regulations and their enforcement that leads to systemic changes (Simonovic, 2009). Experience suggests that the elaboration of Water-Use Master Plans (WUMP) is a practical approach to addressing the complexity of water-use systems.

produce one kilo of grain, but 15,000 litres for one kilo of beef. A growing global population and changing food habits are the main drivers for an increasing need for water for food. Efficient irrigation is thus imperative: "More crop per drop."
Yet it is not only a question of quantity, but also of water quality. Worldwide, seven million persons die each year from waterborne diseases (http://www.inforesources.ch/pdf/focus1_e.pdf).

Box 2: Water and food

"Inefficient irrigation techniques and management combined with water losses through evaporation, groundwater that is overdrawn or polluted by fertilisers, pesticides, household effluents and hazardous chemicals and water and soil salinisation, all endanger the availability of fresh water and jeopardise food supply and health." (SDC, 2005).

Watershed approach

"A watershed refers to an area of land where all of the water that is flowing over or under it drains into the same place. It includes rain, snow, melt, streams and rivers, lakes, ponds and wetlands. A watershed is separated from adjacent watersheds by a geographical barrier such as a hill or a mountain, which is known as a 'water divide'. Watersheds drain into larger basins in a hierarchical pattern, with different watersheds combining into one larger river basin" (ILEIA, 2009, p. 26). A watershed can serve as a unit for planning and intervention, for example in the frame of geographical or livelihood projects. This is called "**watershed management**". The total amount of water in a watershed is finite and depends on the precipitation in the area. But the way the land is managed and the water is used can be influenced. The main challenges here tend to be social and economic aspects rather than the technical solutions. Among the questions to be addressed are:

- Access and property rights,
- Participation and ownership of involved stakeholders,
- Gender / social equity: who benefits, who is excluded,
- Social organisations (community/watershed councils, pasture management committees, water user associations e.g. the Mirab system in Afghanistan); their governance and accountability mechanisms,
- Conflict prevention, transformation and solution,
- Cost–benefit analysis of interventions.

Women are often ignored in watershed planning and implementation activities. Social equity is, however, crucial to promoting sustainability in water management. Access to water resources, but also participation in the management processes, has to address women and men equally.

Participatory methods – such as the elaboration of a Water-Use Master Plan – are therefore extremely promising tools for achieving sustainable solutions.

Box 3: Water-Use Master Plan (WUMP)

WUMP is a planning tool and process similar to a Participatory Rural Appraisal (PRA) and uses some of its instruments. It focuses on water, its sources and uses, and it applies an Integrated Water Resources Management (IWRM) approach. WUMP is not just a new and attractive theoretical concept; it is a tool that has been developed based on a series of experiences and can be adapted to different contextual situations. It is a response to the widely-felt need for an instrument for local actors to address water management issues properly. WUMP is not developed around a particular project or for a specific water sector (e.g. irrigation or sanitation projects) but looks at water resources, water demands and potential uses in a broad and overarching way, hence the term "Master Plan". The planning unit is the local community, which acquires ownership over the plan and responsibility for its implementation through the planning process acquires. As a participatory and transparent planning process, WUMP empowers marginalised groups to access water while pursuing equitable sharing of water within and between communities (Helvetas, Water Use Master Plan).

Watershed management is essential in Afghanistan, as climate change will have a strong impact on water resources. There is an increasing risk of erratic and unpredictable rains, extended drought periods and floods from the melting of glaciers, and this will greatly affect agricultural production. In any case, water scarcity will dominate future water management efforts. Efficient use of water in agricultural production is key.

3R (Water)

"3R" stands for "**Recharge, Retention and Reuse**" (link: http://www.wotr.org/tags/watershed-development). In many areas in the world, people experience periods of water scarcity, even though there is enough rainfall and run-off over the year. At moments when water is plentiful, a large proportion often disappears unused through floods, surface runoff and evaporation. The essence of **water buffering** is to manage natural recharge better and to retain water longer, reducing unused runoff and evapotranspiration. The broader intention is that tackling a local water crisis is not so much about re-allocating scarce water, but about storing water when it is plentiful and making it available during dry periods – and also extending the chain of uses. **Storage** is, thus, the main objective. Often, storage is associated with large surface reservoirs and mega-dams. 3R presents an alternative concept: using many smaller systems, and storing water in the landscape. Much water storage is invisible: it takes place in the ground - in the upper part of the soil, the unsaturated zone, or below the water table (the saturated zone). In addition, water can be stored in many small surface systems.

Recharge adds water to the buffer and, as such, it adds water to the cycle. Recharge can be natural – the infiltration of rain and run-off water across the landscape - or it can be managed (artificial recharge) through special structures or by considerate planning of roads and paved surfaces. Recharge can also be a welcome by-product of inefficient irrigation or leakage in existing water systems, for instance.

Retention is the process by which the speed of the natural water cycle is reduced in order to create large wet buffers. This process can be increased artificially, for example by slowing down (ground)water flow, or by hindering surface water runoff with dams and reservoirs. It thus extends the chain of water uses and can have a considerable impact on agricultural productivity. For example, "Kanda" is the traditional Afghan technology for storing surface runoff and snowmelt.

Reuse is the third element in buffer management. The big challenge of 3R is to make water circulate as much as possible. Scarcity is resolved not only by managing demand through reduced use, but also by keeping water in active circulation (Akvopedia, 2014).

Efficient use of water

Whether in rain-fed or irrigated agriculture, the **choice of crops and varieties** that are well adapted to the agro-ecological situation is the first step in coping with adverse climatic conditions (extended drought periods, erratic and unpredictable rains, frost and other extreme weather events).

Moving further down the watershed, we come to irrigated cropland. Irrigation is not simply "applying water to a field"; irrigation is an entire system made up of many components. It is not just a technical, but also an institutional issue. There are many different methods of irrigation, and it should not be forgotten that irrigating crops can have several negative side effects if it is not properly managed. Improved irrigation practices can immediately lead to more benefits for farmers (Pluess, 2005 and Helvetas, Food Security).

The efficient use of water for food is an imperative of our time, especially in situations of water scarcity and increasingly with global warming. Figure 3 summarises interventions that help to make the best use of water in agriculture. Careful application of water according to the needs of the crop at the same time contributes to soil fertility by avoiding erosion and salinisation. Practitioners distinguish between four main basic irrigation systems, as shown in Table 1, which gives examples of sustainable irrigation techniques. Any technical solution implies costs, and so a cost-benefit analysis should precede any intervention or recommendation.

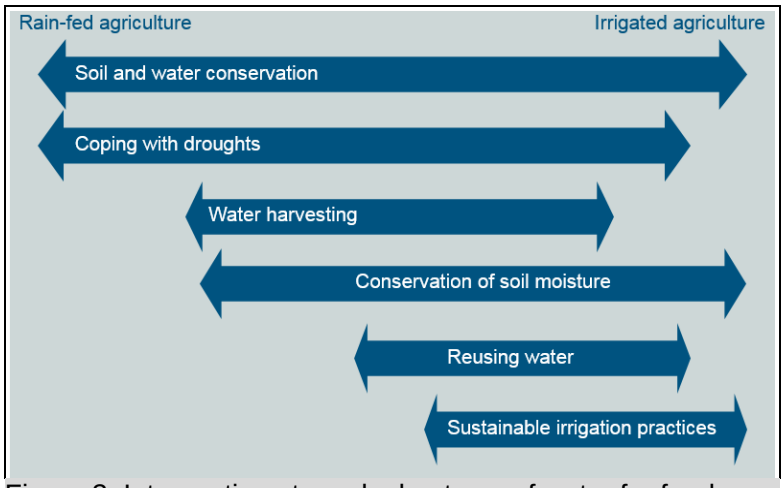

Figure 3: Interventions to make best use of water for food

Table 1: Sustainable irrigation systems	
Irrigation system	Examples of sustainable techniques
Surface irrigation	Gravity system, short furrows
Groundwater irrigation	*Kareez*
Flood-based irrigation	Riverbed farming
Small-scale irrigation	Sprinklers, watering cans and drip irrigation

Author(s): Peter Schmidt, April 2014

Further reading

- Akvopedia, 2014, available at: http://akvopedia.org/wiki/Main_Page
- Helvetas Swiss Intercooperation Kyrgyzstan, Irrigation videos, available at: http://kyrgyzstan.helvetas.org/en/publications/ egory/implementation-tools/water-sources
- Helvetas Swiss Intercooperation Nepal, Water Use Master Plan video, available at: http://www.youtube.com/watch?v=9OwVo73eJ6g
- Helvetas Swiss Intercooperation, Food Security – Every Drop Counts. Helvetas' approaches and experiences in water management, available at: http://www.helvetas.org/news___resources/publications/ Helvetas Swiss Intercooperation, Water Use Master Plan, Helvetas Project Experience, available at: http://www.helvetas.org/news___resources/publications/
- WOCAT, 2007: where the land is greener – case studies and analysis of soil and water conservation initiatives worldwide, eds: Hanspeter Liniger and William Critchley
- WOTR, 2014, available at: http://www.wotr.org/tags/watershed-development

References

- SDC, 2005: Water 2015. Policy Principles and Strategic Guidelines for Integrated Water Resource Management – IWRM, available at: http://www.deza.ch/ressources/deza_product_en_1750.pdf
- ILEIA, 2009: Learning AgriCultures Module 2, Soil and water systems, available at: http://www.agriculturesnetwork.org/resources/learning/mod2
- Simonovic, S.P., 2009: Managing Water Resources: Methods and Tools for a Systems Approach, UNESCO and Earthscan, available at: http://www.siwi.org/documents/Resources/Water_Front_Articles/2009/WRMASystemsView.pdf
- Pluess, L., 2005: Designing Attractive Extension Material – The Example of Irrigation in Kyrgyzstan, dissertation, HAFL, Switzerland