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Addressing water scarcity in agriculture: how can indigenous or traditional practices help?

About this document

This document summarizes the online discussion *Addressing water scarcity in agriculture: how can indigenous or traditional practices help?*, which was held on the FAO Global Forum on Food Security and Nutrition (FSN Forum) from 12 June to 6 July 2018.

The discussion was facilitated by Patrick Bahal'okwibale from FAO, Ethiopia and Jean-Marc Mwenge Kahinda from CSIR, South Africa and aimed at exploring the role that indigenous and traditional practices can play to support climate change adaptation efforts and reduce water scarcity in agriculture.

Over the three weeks of discussion, participants from 29 countries shared 45 contributions. The topic introduction and the questions proposed, as well as the contributions received, are available on the discussion page: www.fao.org/fsnforum/activities/discussions/water-scarcity

General remarks emerging from the comments

The need to mainstream indigenous knowledge and traditional practices into sustainable development has been well acknowledged, including through the 1989 Indigenous and Tribal Peoples Convention, the 2007 United Nations Declaration on the Rights of Indigenous Peoples and the 2015 Paris Agreement on Climate change.

Indigenous knowledge is developed and adapted continuously to gradually changing environments gets passed down from generation to generation and is closely interwoven with people's cultural values. Indigenous knowledge belongs to peoples from specific places with common cultural and social ties. Such form of knowledge addresses local problems and solutions that are context specific.

Participants to this online discussion largely agreed on the importance to take traditional and indigenous practices into consideration, especially when looking at ways to address water scarcity. Examples of such practices come from all over the world and many have been used for centuries. By being adapted to the specific conditions of a certain location, these practices can provide sustainable solutions that benefit local agriculture and biodiversity.

Challenges remain on how to upscale such approaches and the degree of transferability remains uncertain in some cases. While some practices could be systematized and adapted to different settings some are applicable only in a very limited agro ecological zones.

Participants also highlighted the need to integrate both traditional and modern practices and overcome the still widespread perception that both approaches are mutually exclusive or that the former is necessarily inferior to the latter.

In some cases however traditional and modern practices can clash. The introduction of commercial crops stemming from other geographic areas can for example jeopardize the relevance of traditional practices, which might have developed around local species. Participants also mentioned examples of infrastructure programmes such as road building impacting negatively on established traditional practices used, for instance, to channel water from rivers to fields.

The contributions to this exchange also identified traditional communal resource management systems, often reinforced by local believes and legends as having an important role to play in guiding the behavior of local farmers. By regulating the access to recourses, forests and land, such social norms can be beneficial to biodiversity preservation and hence contribute to more sustainable local agriculture.

Participants also highlighted the need for a continuous evolution of traditional and indigenous practices and that they need to be able to adapt to changing environmental and social conditions. Here, agricultural research institutions play a role in supporting such practices by providing people with quality inputs, information and training.

It was also stated that at times traditional practices can no longer provide the needed results and need to be replaced by more modern approaches. Such a shift can however lead to problems when the traditional practices also include social components or at least influence social structure.

Examples

Theme 1: Technologies and practices

Grazing and livestock management

Scouting for water

In some pastoral communities, reconnaissance scouts are sent to gather information out about resource availability in certain areas to then inform their village elders who would follow up with negotiations before communities would move to these areas for access.

These practices can be modernized and made more efficient through the adoption of technology. This could include mobile phones for facilitating communication and motorbikes for quick movement. Satellite generated data that communities can access in real time to observe resource fluctuations could also help decision-making by advising on when and how to move. (Vivian Onyango)

Soil and water management

Pitcher irrigation

Pitcher irrigation is an indigenous system of irrigation used in Northern Kerala during summer for crops like coconut, cocoa and areca nut. This techniques consists of a buried porous earthen pot which can carry 5-10 litres of water. A hole is made at the bottom plugged by a long wig through which water droplets move to the areas that needs to be watered. (Kuruppacharil V. Peter, Vijay Vallabh Barthwal, Mithare Prasad)

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Canals

The Zenu tribe in northern Colombia created a network of canals perpendicular to the main rivers to take advantage of water excess during the rainy season, and reduce water scarcity during the dry season. This network was formed by long and short canals that reduced water speed during the rainy season and lead the water to lower areas used for growing crops and aquaculture. As an additional benefit the water also carried along sediments that improved soils fertility. (Liliana Castillo)

Wells

In the Cuvelai, Okavango and Zambezi river basins in the north of Namibia, pastoralist communities obtained water through hand-dug wells sited along the banks of the river channels in anticipation of the floods.

Whenever the river floods, the wells trapped the flood water. Water stored in wells after the floods receded and the river eventually ran dry was used for the livestock.

This traditional practice is at the basis of the current practice of modern earth dams for which the government of Namibia has a standard design to minimise seepage, evaporation losses and sedimentation. (Ruhiza Jean Boroto)

Bhandara phad

The system starts with a bhandhara (check dam) built across a river, from which kalvas (canals) branch out to carry water into the fields in the phad (agricultural block). Sandams (escapes outlets) ensure that the excess water is removed from the canals by charis (distributaries) and sarangs (field channels).

Bamboo drip irrigation

This is an indigenous system of efficient water management that has been practised for over two centuries in northeast India. The tribal farmers of the region have developed a system for irrigation in which water from perennial springs is diverted to the terrace fields using varying sizes and shapes of bamboo pipes. Best suited for crops requiring less water, the system ensures that water drops are delivered directly to the roots of the plants.

Vetiver system

The native Indian vetiver grass (*Vetiveria zizanioides* or *Chrysopogon zizanioides*), can be used to hedge against water loss. Due to its deep and vertical roots this grass can provide a sturdy barrier against soil erosion by forming a dense vegetative barrier that slows and spreads runoff creating an excellent stabilizing hedge for stream banks, terraces and rice paddies. This plant is highly tolerant of adverse soil conditions like soil acidity, salinity, sodicity and acid sulphate states and can endure extreme climatic variations like prolonged period of drought, flood, submergence and temperature fluctuations. The valuable oils extracted from its roots are playing an increasing role in the perfume, food and pharmaceutical industries. (Debarati Chakraborty)

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Communal water saving activities

The Boran in East Africa monitor the use and conditions of their water resources by digging deep wells in areas considered dry seasons grazing areas/reserves. These wells are often labour intensive in construction and also in drawing water from, thus necessitating people coming together and on rotational basis fetch water for all entitled households' livestock. These areas also have restricted access with preferences being given to nearby households, and later sometimes only to calves as they cannot travel to other distant water sources. In wet seasons, water is collected in shallow ponds or pans and use is often unrestricted. (Vivian Onyango)

Water harvesting and storage practices

Jessour

The "Jessour" is an ancient system, which consists of a series of stone and compacted earth walls called "tabias" in the thalwegs to retain runoff water and erosion products.

The volume of accumulated runoff water and sediment washed down by torrential rain retained by the tabias is related to the size of the catchment area, which is located at the upstream of each Jesr.

In fact, these small hydraulic units (Jessour) allow the local population to develop in the mountainous regions their own production system based on rain fed agriculture despite the low potential of the area. Accumulated sediments coming from the upstream form the cultivated area, which allow the plantation of some trees mainly olive and fig trees and of some annual crops (cereals, vegetables, etc.) while the accumulated water, will serve as a good reserve in the deep soil during extended droughts. (Ines Gasmi)

Ellangava system

The Ellangava or Cascaded Tank-Village System used widely in the dry and intermediate zones of Sri Lanka consists of a connected series of tanks organized within a micro-catchment area storing, conveying and utilizing water from

small rivulets. In this systems, excess water from a tank at the higher elevation, spills over to the one below. Paddy fields are located in the valley of the drainage line below the tank. A sluice releases water for irrigating the paddy.

There are over 1 000 of such cascade systems functioning at present. The principle behind the cascade or Ellangava system is to take advantage of the topographical features and manage natural hydrological functions while minimizing any disturbances to the ecosystem.

This practice can also help save water for the minor season, when there is insufficient rainfall to sustain paddy agriculture, by using the tanks in the in the upper area of the cascade system as reservoirs that can release water to lower tanks around which the crops are grown. (Chandima Gunasena, P.B. Dharmasena)

Jhalara

Jhalaras are typically rectangular-shaped stepwells that have tiered steps on three or four sides. These stepwells collect the subterranean seepage of an upstream reservoir or a lake. Jhalaras were built to ensure easy and regular supply of water for religious rites, royal ceremonies and community use.

Talab/Bandhi

These are reservoirs that store water for household consumption and drinking purposes. They may be natural, such as ponds at Tikamgarh in the Bundelkhand region or man-made, such as the lakes of Udaipur (India). A reservoir with a small area is called a talai, a medium sized lake is called a bandhi and bigger lakes are called sagar or samand.

Bawari

Bawaris are unique stepwells that were once a part of the ancient networks of water storage in the cities of Rajasthan and Deccan region of India. The little rain that the region received would be diverted to man-made tanks through canals built on the hilly outskirts of cities. The water would then percolate into the ground, raising the water table and recharging a deep and intricate network of aquifers. To minimise water loss through evaporation, a series of layered steps were built around the reservoirs to narrow and deepen the wells.

Taanka

It called as tank in English is a traditional rainwater harvesting technique indigenous to the Thar Desert region of Rajasthan and Gujarat (India). A taanka is a cylindrical paved underground pit into which rainwater from rooftops, courtyards or artificially prepared catchments flows. Once completely filled, the water stored in a taanka can last

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throughout the dry season and is sufficient for a family of 5-6 members. An important element of water security in these arid regions, taankas relieve families from the everyday drudgery of fetching water from distant sources.

Johads

These are one of the oldest systems used to conserve and recharge ground water, are small earthen check dams that capture and store rainwater. Constructed in an area with naturally high elevation on three sides, a storage pit is made by excavating the area, and using the excavated soil to create a wall on the fourth side. Sometimes, several johads are interconnected through deep channels, with a single outlet opening into a river or stream nearby. This prevents structural damage to the water pits that are also called madakas in Karnataka and pemghara in Odisha (India).

Khadin

These are indigenous constructions designed to harvest rainwater for agriculture. The main feature of a khadin, also called dhora in India, it is a long earthen embankment that is built across the hill slopes of gravelly uplands. Sluices and spillways allow the excess water to drain off and the water-saturated land is then used for crop production.

Kund

A kund is a saucer-shaped catchment area that gently slopes towards the central circular underground well. Its main purpose is to harvest rainwater for drinking. Kunds dot the sandier tracts of western Rajasthan and Gujarat (India). Traditionally, these well-pits were covered in disinfectant lime and ash, though many modern kunds have been constructed simply with cement.

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Baolis

These were secular structures from which everyone could draw water. These beautiful stepwells typically have beautiful arches, carved motifs and sometimes, rooms on their sides. The locations of baolis often suggest the way in which they were used. Baolis within villages were mainly used for utilitarian purposes and social gatherings. Baolis on trade routes were often frequented as resting places. Stepwells used exclusively for agriculture had drainage systems that channelled water into the fields.

Nadi

These are village ponds that store rainwater collected from adjoining natural catchment areas. The location of a nadi has a strong bearing on its storage capacity and hence the site of a nadi is chosen after careful deliberation of its catchment and runoff characteristics. Since nadis received their water supply from erratic, torrential rainfall, large amounts of sandy sediments were regularly deposited in them, resulting in quick siltation.

Zing

These can be found in Ladakh region of Himalayas (India), are small tanks that collect melting glacier water. A network of guiding channels brings water from the glacier to the tank. A trickle in the morning, the melting waters of the glacier turn into a flowing stream by the afternoon. The water, collected by evening, is used in the fields on the following day. A water official called a Chirpun is responsible for the equitable distribution of water in this dry region that relies on melting glacial water to meet its farming needs.

Zabo

The Zabo (meaning 'impounding runoff') system combines water conservation with forestry, agriculture and animal care. Practised in Nagaland and Indian sub-continent. Rainwater that falls on forested hilltops is collected by channels that deposit the run-off water in pond-like structures created on the terraced hillsides. The channels also pass through cattle yards, collecting the dung and urine of animals, before ultimately meandering into paddy fields at the foot of the hill. Ponds created in the paddy field are then used to rear fish and foster the growth of medicinal plants.

Jackwells

The Shompen tribe of the Great Nicobar Islands lives in a region of rugged topography that they make full use of to harvest water. In this system, the low-lying region of the island is covered with jackwells (pits encircled by bunds made from logs of hard wood). A full-length bamboo is cut longitudinally and placed on a gentle slope with the lower end leading the water into the jackwell. Often, these split bamboos are placed under trees to collect the runoff water from leaves. Big jackwells are interconnected with more bamboos so that the overflow from one jackwell leads to the other, ultimately leading to the biggest jackwell. (Mithare Prasad)

Modernizing home water storage

In Martinique people had the habit of harvesting rainwater in several different kinds of containers (clay pots, wooden and plastic barrels, plastic buckets, gourds, etc.) according to the season, their capacity and their social level.

For the purification of this water, they used natural substances like wood charcoal and/or sulphur, which they left at the bottom of the receptacle.

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These old ways of storing are now again in general use even if they have been a bit modernized. The new roadmap for transverse sustainable development (SDG 6: Clean water and sanitation) adopted by the Ministry of Ecological and Inclusive Transition, recommends the use of cisterns for household use, in the context of improving the management and preservation of natural resources. State assistance is now provided to allow everyone to have a cistern conforming to European sanitary norms for the storage of rainwater. (Audrey Pomier Flobinus)

Forest management as a coping strategy to water scarcity

Community forests

In Africa most of the forests commonly known as "community forests" survived due to the use of indigenous/customary rules and regulations on rights, access and management of the shared forest and water resources.

Rights and access to particular forests came with clear roles, benefits and responsibilities: who could access which forest, when, what forest products to harvest (fruits, firewood, timber, herbs), and how much. To ensure adherence to the rules of access and harvest, the communities had narratives and practices spelling out the type of punishment for those who defied the rules. (Eileen Omosa)

Taboo, cultural, religious and spiritual beliefs

Management of water in the Brong Ahafo region in Ghana includes holding some rivers such as the Tano River as deities or as inhabited by a god, hence prohibiting people from fishing in it. This causes people to stay away from these water bodies, keeping them well protected. (Cecilia Akita)

To ensure adherence to the rules of access to certain areas and the harvest of certain products, communities had narratives and practices spelling out the type of punishment for those who defied the rules. Who would cut down a tree at the very top of a hill reserved as sacred for prayer sessions when the consequence was death of a loved one or incapability of one's body? Who would water livestock at locations reserved for portable water when the punishment would be the death of their livestock? (Eileen Omosa)

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Communal governance

Under communal governance systems, decisions are negotiated such as when to construct new wells, who is responsible and in effect who has access, when and for how long. This implies a coordinated approach in addressing water scarcity that combines local/ traditional knowledge on the landscape including pasture availability and development of new water infrastructure. (Vivian Onyango)

Theme 2: Semantics

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More work is needed on how indigenous knowledge is defined. Current definitions often portray indigenous knowledge as an attribute of less technologically advanced societies. However, findings from the Karoo region of South Africa show that such practices are also being employed by commercial farmers. A source of ambiguity in this regard might be that commercial farmers may not necessarily be seen as forming part of the indigenous farming culture and society. (Bongani Ncube)

The term indigenous knowledge might be misleading as it could be interpreted as implying an exclusive link with the ethnic groups indigenous to a certain area. (Mylene Rodríguez Leyton)

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