COMPENDIUM OF BEST PRACTICES
WATER MANAGEMENT IN TRIBAL AREAS

AGA KHAN RURAL SUPPORT PROGRAMME (INDIA)
A PROGRAMME OF THE AGA KHAN DEVELOPMENT NETWORK

AXIS BANK FOUNDATION

AXIS BANK

INCREASING POWER OF STREAMS FOR STABILIZING RAINFED KHARIF

RATIONALE - THE WHY

The contiguous belt stretched across the belly of the nation from Banaswara in Rajasthan to Purulia in West Bengal is characterized by undulating terrain, uneven topography, shallow top soils and hard rock aquifers.

Rainfed Kharif Paddy is the most common crop cultivated by tribal farmers. Given the increased vagaries of the climate in recent years, crop failures are becoming an increasingly common phenomenon due to dry spells at crucial crop growth periods. This is making incomes from rainfed agriculture extremely uncertain and affecting adversely the food security of tribal farmers. The most important precondition for making farming profitable for these small and marginal tribal farmers is stabilisation of the Kharif crop (Phansalkar & Verma , 2004).

To provide critical irrigation to crops during dry spells, most tribal farmers in the hilly terrains rely upon seasonal streams or nalas which run dry two months post monsoon. Such streams act as lifeboats for resource-less farmers in times of critical irrigation requirements. However, these streams are mostly seasonal in nature and provide at the most 2 additional irrigation to crops.

Undulating terrains, and increased intensity of rains, due to climate change impact, lead to heavy runoff. This coupled with suboptimal baselevels is resulting in drying of the seasonal streams faster than ever before. The rejuvenation of such streams/nalas will not only increase the power of these streams but also recharge groundwater and provide for the irrigation needs of small and marginal farmers.

DOHA – THE WHAT

Dohas are saucer-shaped structures built along the length of the stream to enable a renewed period of vertical erosion, which leads to achieving a new and lower base level (Vedpathak & Hangargekar, 2019). This lowered base level allows for more quantum of water to stored thus increasing the storage and recharge capacity of the stream. This in turn increases the power of the stream.

Dohas are by no means a new technological innovation. Farmers of the water scarce Vidarbha and Marathwada have a long history of building saucer shaped structures in beds of streams and nalas to improve the water harnessing potential of the streams. This structures referred to as 'doh' in Marathi are built at the bed-level of stream at the spot in the stream which stores water even when the rest of the stream dries up (Bringing water to parched Vidarbha, 2018). This enabled storing rainwater below ground level. Several dohas are constructed in the stream-bed, along the distance of the stream separated by some distance.

IMPLEMENTATION PROCESS - THE HOW

The process followed to enable community-led development and maintenance of Dohas is below:

1. Selection of stream for excavation of Dohas
2. Formation of Water User Groups (WUGs)
3. Excavation of Doha pits
4. Handover of Dohas to WUGs
5. Water distribution for irrigation

Selection of stream for excavation of Dohas

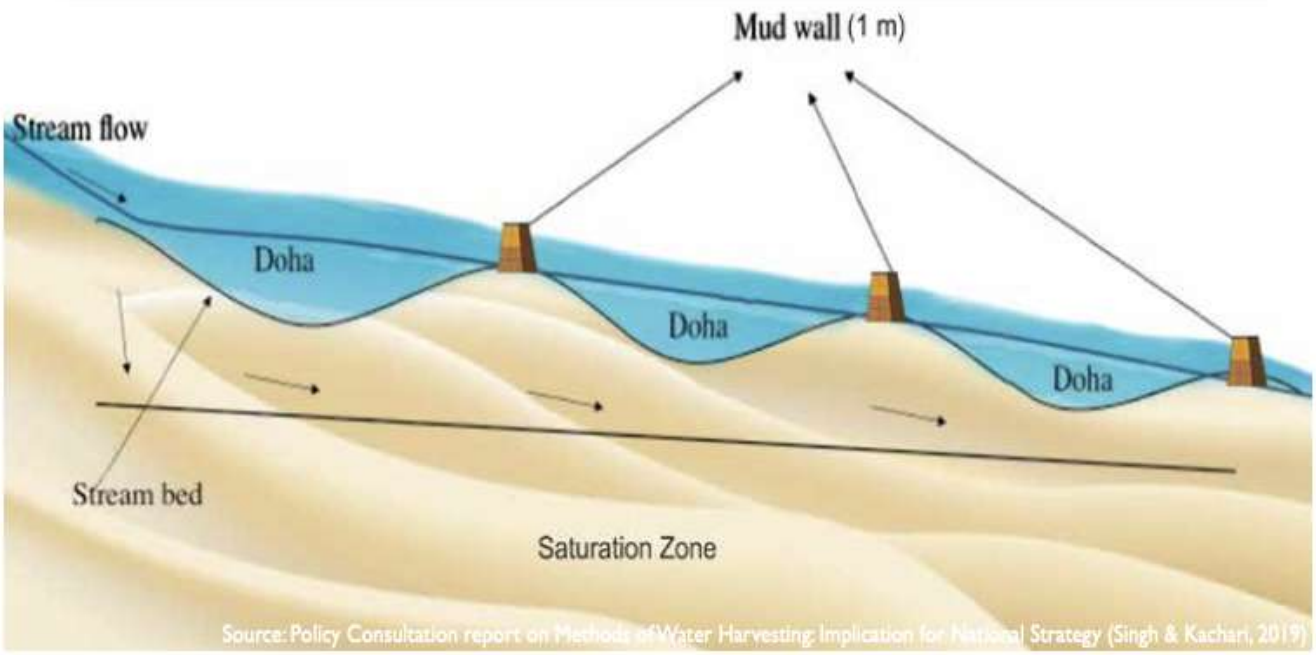
The most crucial aspect of Doha development is the selection of the appropriate stream for excavation. The bed slope of the stream should be less than 3%. Dohas are thus suitable intervention in second and third order streams with a network of 1000 hectares onwards.

Formation of Water User Groups

Formation of Water User Groups (WUG) is undertaken by holding village-level meetings. As several Dohas are to be excavated along the length of the stream, several water user groups are formed. For instance, User Group A will comprise of farmers who have farm lands near Doha 1. The user groups play an important role in excavation of the dohas and their eventual maintenance.

Excavation of Doha pits

The excavation of Dohas can be undertaken through excavators or through physical labour contributed by WUG members. The excavated soil is used for bunding the structure, particularly the bank sides of the Doha.



Source: Policy Consultation report on Methods of Water Harvesting: Implication for National Strategy (Singh & Kachari, 2019)

TECHNICAL SPECIFICATIONS OF DOHA

1. Selection of a stream network of 1000 Hectare onwards
2. The bed slope of the Doha site should be less than 3%
3. The Doha should be saucer shaped to minimize siltation
4. Dohas are most suitable on IInd and IIIrd order streams, however Ist order streams with low elevations can also be considered.
5. The depth of the Doha pit should be within 1.5-4 metres.
6. Adoption of Top to Bottom approach should be followed while construction of Doha pits.
7. 1 metre high retaining wall can be constructed at the end point of each Doha pit to create additional storage capacity.
8. The width for Doha will vary from one stream to another and will be in the range of 10 to 20 metres.
9. 10-15 metres of stream width should be left on both sides of the excavated structure to act as a natural bund.
10. Two consecutive Doha pits are separated by a gap of 15- 20 metres.
11. Dohas are not excavated on sections of a stream with a natural bend or turn.

Handover of Dohas to WUGs

Post the excavation and bunding, the Dohas are handed over to WUGs associated with the Doha structure. The responsibility of repair and maintenance of the structure lies with the relevant WUG. As the construction of the structure is simple, it needs minimal maintenance. Regular desilting of the structure is a must, as it is built in stream beds.

Water distribution for irrigation

It is crucial that the farmers regulate water distribution from Dohas to ensure equity. As Doha's are dug in stream beds, the farmers with fields or wells in the vicinity of the stream are at an advantage as they can easily access the Doha for irrigation purposes. The farmers further away from the stream can benefit, if they lift the water using pumps and transport it using pipes. Only those farmers with the wherewithal can benefit, which usually leaves out the small and marginal farmers. WUGs can play a crucial role in regulating water distribution such that all farmers with land in a Doha stretch, are benefitted equally, if possible.

Implementation of Doha on any seasonal stream leads to increase in water availability in existing sources but does not increase the number of irrigation sources. It recharges groundwater thereby creating a community asset and not multiple individual assets (Deora & Nanore, July 2019). It is important for the community to understand this nuance to enable the sustainability of the structures.

IMPACT

1. Dohas create water storage potential of 850 cubic meter to 2,00,000 cubic meters per Doha and Water recharge potential of 4250 cubic meters to 10 lakh cubic meter per Doha. The wide range mentioned here is due to the variation in the size of the Doha depending upon stream order and slope. Lower order streams can have longer Dohas, measuring 200 m(l)*15 m(w) separated by gap of 100 metres, while higher order streams will have shorter Dohas, measuring 30 m (l)*15(w), separated by a gap of 15 meters.
2. Kharif paddy stabilisation due to availability of critical irrigation during dry spells.
3. Rainfed tribal farmers shifted to double cropping, particularly those with fields proximate to Dohas.

REPLICATION AND SCALE-UP POTENTIAL

A key feature of Doha is that it is an earthen structure constructed without the need of cement or other construction material. As it is constructed in stream beds, there is no issue of ownership. Their low-cost and eco-friendly nature provides a good potential for replication and scale up of the structures in seasonal/ perennial streams.

The first Doha structures were built by Dilasa Sansthan in Maharashtra, and in the last decade more than a dozen different Civil Society Organisations have implemented Dohas in their working areas. Action for Social Advancement (ASA) and SRIJAN (Self Reliant Initiatives for Joint Action) have built Dohas on a large scale in North-central and Central India.

These structures have had good success in most terrains and different stream orders indicating a decent scope of scaling up the intervention. The scale-up of Dohas at National level is possible by including it as a standard intervention under the Mahatma Gandhi National Rural Employment Guarantee Scheme.

GRASSROOTS IMPLEMENTATION: LESSONS FROM THE FIELD

Action for Social Advancement (ASA) initiated work on Dohas in 2018 after a few of its team members visited the field areas of Dilasa Sansthan. They saw potential in Dohas and replicated the structures in undulating terrains of the Satpura Maikal landscape. While the structures were built in IInd and IIIrd order streams in Maharashtra in uniform plain landscapes, ASA piloted the intervention on Ist order streams of undulating landscapes of Mandla, Dindori, Shahdol, Annupur and Betul districts situated in eastern Madhya Pradesh.

Location and Context

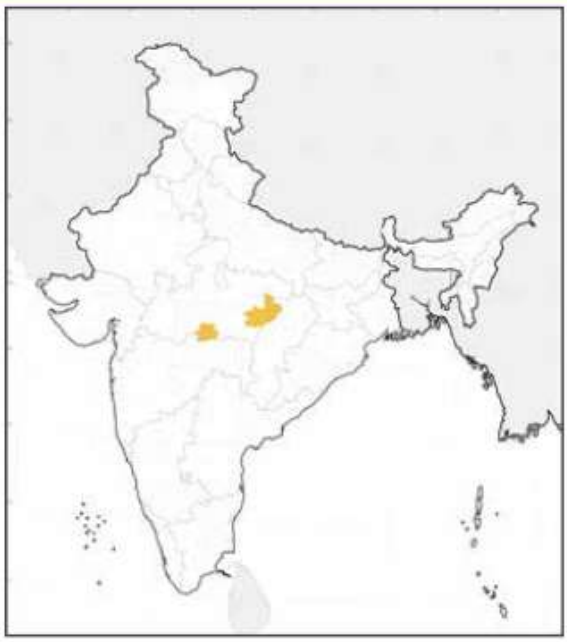
Scheduled Tribes are the dominant population of the region making up for more than 40% of the total population in these districts. Despite the fact that this region receives around 1000 mm of annual rainfall, the tribal community members of the region cultivate only Kharif crop as most of the rainfall received flows down the mountains. The only reliable source of irrigation for the tribal farmers are seasonal streams in which water is retained only till a few months post monsoon.

Intervention

The Doha model offered a viable solution to rejuvenate the seasonal streams thereby improving the agriculture-based livelihood of these tribal farmers. As the conditions and streams differs in the hilly landscape, the average size of Doha built by ASA in Ist order streams is smaller than those built by Dilasa Sansthan.

The average Doha in the region is 30-meter long and 1.5 to 3 metre deep. One such Doha stores 850 cubic meters of water and enables 3-4 farmers having land in proximity to irrigate their fields. Two such Dohas are separated by a distance of 15 meters. A one-kilometre long stream has around 10-12 Dohas and each Doha has 2-3 beneficiary farmers. The stream sections with curves and bends are excluded while excavating the structures.

At a Glance	
Intervention	Doha
Location	Mandla, Dindori, Shahdol, Annupur and Betul districts in Madhya Pradesh
Implementation	Action for Social Advancement (ASA)
Period	2018 - Ongoing
Unit Cost	Rs. 14,000/Doha with excavator; Rs. 30,000/Doha with labour; Dimensions: 30m(l)x15m(w)x3m(d)



A key aspect taken into consideration by ASA while implementing Dohas in any village, is the formation of Water user groups comprising of direct beneficiaries of the Doha; who use the water from the structure for irrigation, to ensure the maintenance of the structures. Due to the undulating landscape, the Dohas are vulnerable to continuous silting, which needs to be periodically removed to ensure optimum storage of water. The assumed life-span of these structures without maintenance is four to five years. This makes community participation an inalienable part of the intervention.

Impact

Over the last 2 years, ASA has led the construction of 750 Dohas directly benefitting around 1400 tribal farmers by bringing 1100 hectares of rainfed land under irrigation.

REFERENCES

- Bringing water to parched Vidarbha. (2018). Retrieved from Social Work India, An initiative of VikasAnvesh Foundation: https://www.socialworkindia.in/profiles/madhukar-dhas
- Deora, S., & Nanore, G. (July 2019). Socio economic impacts of Doha Model water harvesting structures in Jalna, Maharashtra. Agricultural Water Management, 141-149.
- Phansalkar, S. J., & Verma , S. (2004). Improved Water Control as Strategy for Enhancing Tribal Livelihoods. Economic and Political Weekly, 3469-3476.
- Singh, J., & Kachari, S. (2019). Methods of Water Harvesting: Implication for National Strategy. Rajiv Gandhi Institute for Contemporary Studies. Pune: VikasAnvesh Foundation.
- Vedpathak, P.A., & Hangargekar, P.A. (2019). Impact Assessment of Jalyukt Shivar Structures on Five Villages in Ambajogai, Maharastra. International Journal for Research in Applied Science & Engineering Technology, 2620-2626.