CHECK DAMS

A WATER HARVESTING TECHNIQUE FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT

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ABSTRACT

This paper highlights the impact of check dams built by the Aga Khan Rural Support Programme (India) in a drought prone area of Gujarat. AKRSP is a Non-Governmental Organization working in rural Gujarat for natural and human resource management.

Check dams are low cost dams (approximately below one lakh rupees), which are built across streams to prevent rain water from flowing away into the sea. Check dams serves mainly two purposes: the first is to provide direct irrigation when rain fails, and the second is to facilitate the recharging of surrounding wells through percolation of water. Additionally, check dams provide water for other uses also.

The objectives of the study are to assess the benefits of check dams by analyzing cropping patterns, yield rates, water levels in wells, number and depth of irrigations and other benefits. 20 beneficiaries (100%) and five non-beneficiaries of 4 check dams (10% of total 54 check dams) were selected for the purpose of the study. The data has been collected for three periods of time (1) before construction of check dams: 1993-94 (average rainfall year - 550 mm), (2) after construction of check dams 1994-95 (above average rainfall year - 915 mm), (3) after construction of check dam 1995-96 (below average rainfall year - 315 mm).

The finding of the study shows that due to the check dams, there has been an improvement in the water table of the wells, intensity of irrigation, and yield rate of some major crops and cropping areas. Women are benefited, as water for bathing, washing clothes and for animals is available near the house.

In spite of their positive impact, check dams have some negative aspects such as submergence of land, and siltation of wells. However, the positive impact outweighs the negative impact. Check dams are a sustainable source of water.

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INTRODUCTION

Water is a scarce resource in the drought prone area of Surendranagar district of Gujarat, one of the Programme areas of the Aga Khan Rural Support Programme (lndia) (AKRSP (I)), a Non Government Organization working in rural Gujarat, mainly on Natural and Human Resource Management. Conservation of each drop of water acquires importance in light of the gravity of the situation. AKRSP(I), in this direction, has made tangible advances; building and renovating water tanks, directly recharging wells and building small check dams on streams. Though AKRSP (I) employs a variety of water Harvesting Structures to conserve water the present study highlights the quantitative and qualitative impact of the check dams only.

Small check dams which cost below one lakh rupees are built across streams to prevent the seasonal water from flowing away into the sea. Their capacity to conserve water is from 0.01 - 0.1 mcft (million cubic feet). Check dams are a micro level treatment and their size and their characteristics arc place specific. The command area is very small, ranging from 20 - 40 hectares. Check dams are primarily built for two purposes; -The first is to provide direct irrigation when rains fail and _he second is to facilitate the recharging of surrounding wells through percolation of water from check dams. Additionally they also provide water for other purposes such as bathing, washing clothes, and drinking water for animals.

Being shallow structures, with the accumulated water body distributed over a large space, water logging does not take place. Silt deposited provides fertile soil for the fields. A series of check dams built on a stream help conserve a phenomenal amount of water, and they are a prime example of. Thinking globally and acting locally.

STUDY AREA:

Surendranagar is a drought prone area with an annual rainfall of 490 mm and 80 percent variability of rainfall. The area is hilly and semi arid where 25 percent area is under wasteland and 60 percent is under cultivation. There is a great need for soil and water conservation in this region. AKRSP (I) is involved in contour bunding, gully plugging, land leveling and water harvesting through small check dams to improve the capability of land for cultivation.

Till 1994, AKRSP (I) had achieved a target of building 54 small check dams in the Surendranagar district, in nine villages. The crop damage foreseen by the month long delay of the second spell of the rains in 1995 was considerably offset by support watering from these structures.

OBJECTIVES

The objectives of this study are to assess the benefits of check dams by analyzing the following:

- Change in cropping pattern
- Change in yield rates
- Change in water table in wells
- Change in number and depth of irrigation given to crops
- Other benefits

METHODOLOGY

Multi-stage sampling method has been adopted for the selection of the sample (Table #1). The sample comprises of 4 out of 9 villages where check dams have been built of which 10% check dams have been selected, and *100%* beneficiaries of selected check dams have been surveyed. A total of 20 beneficiaries have been interviewed of which 17 are small farmers and the remaining large farmers. For the purpose of comparison five non-beneficiaries near the command area have also been studied. Besides formal survey through filling up of questionnaires, informal discussions with beneficiaries and non beneficiaries have also been held. A conscious effort has been made to get the women's point of views.

Data has been collected for three periods of time -

1. Before construction of check dams - 1993-'94
   (Average rainfall was 550 mm)

2. After construction of check dams - 1994-'95
   (Rainfall was above average, 915 mm.)

3. After construction of check dams - 1995-'96
   (Rainfall was below average, 312 mm)

Taking data for three years has helped to assess the true impact of check dams by comparing low and high rainfall years.

Table No. – 1
Village, Check dams and beneficiaries wise sample size:

Villages	No. of Check dams	Beneficiaries			Non-beneficiaries.
		SF*	MF&LF*	Total	
Dhandhalpur	2	8	1	9	2
Madargadh	2	5	1	6	2
Kherdi	1	2	1	3	1
Sangani	1	2	-	2	-
Total	6	17	3	20	5

* SF: Small Farmers: 2.5 – 5 acres of land
MF: Medium farmers: 5.01 – 20 acres of land
LF: Large farmers: above 20 acres of land.

Table No. – 2
Water table wise no. of wells in the command area of sample check dams:

Water table from ground in feet	Number of wells		
	Before		After
	1993-94	1994-95	1995-96
5-10 feet	-	7	-
11-15 feet	-	3	-
16-20 feet	6	4	6
21-25 feet	10	6	12
Above 25 feet	2	-	2
Total	18	20	20

Source: Fieldwork, 1996, and AKRSP records.

FINDINGS

WATER TABLE IN WELLS

Table no. 2 shows that the water level in wells has increased after the construction of check dams. It also indicates the number of wells having different water tables in different years. Before the check dams were constructed, 18 beneficiaries of the 20 had wells in their fields, while afterwards, two more were built.

The water table in wells in 1992 -1993, before check dams, and in 1995 after check dams, was the same, in spite of large variations in rainfall in the two time periods. While there was good rain in 1993 (550 mm), the rainfall in 1995, after construction, was poor (312mm). This is an indication that check dams have helped in recharging water in wells. In 1994 when rainfall was much above average (315mm) the water table went up by 40 - 50 % more, further corroborating this evidence.

In the wells of non- beneficiaries, the water table was different during the three years and after check dams it was much lower than the beneficiaries' wells. The comparison between table no. 2 and 3 indicates that in the beneficiaries' wells the water table was almost similar during average year and the drought year of 1995, while in the case of non-beneficiaries' wells, the water table during 1995 was 5-10 feet lower than that of average year of 1992-'93. This is yet another evidence of the benefits of check dams. .

Check dam aids in improving Dhadhabhai's life . . .

Dhadhabhai Vithalbhai, of Dhandhalpur village, which comes under S'nagar programme area, has a unique story to relate. He is a medium farmer, who until last year was totally dependent on his Kharif crop to sustain him throughout a year. His condition changed with the intervention of AKRSP (I) in the village. When a check dam was constructed here, he thought he would not benefit from the structure as his land was not adjoining it. However, as the check dam got filled after the first rains, Dhudhabhai saw a sudden increase in the water table of his well, which is located upstream. With this increase of water he thought of growing vegetables in the summer. He succeeded in this and even had enough vegetables for marketing. The income earned out of this was used to meet his consumption needs during summer and his savings from the Kharif remained intact. He narrates this story with pride and gives all the credit to the check dam constructed by AKRSP (I).

Table: 3
Average water table in non-beneficiaries well:

Year	Water table in feet
1992 – 93	20’
1994	15’
1995	30’

Source: Field work 1996

Table: 4
Number of irrigations required and actually provided before and after check dams:

Crops	No. of irri. required	Provided		
		Before	1994	1995
Cotton	15	8	9	10
Bajara	7	3	4	3
Sesamum	5	2	2	-
Mung	5	1	1	1
Groundnut	10	5	2	7
Cumin	8	7	7	8
Wheat	11	6	9	7
Summer g’nut	10	-	10	-
Summer jowar	15	12	10	11
Vegetables	12	5	9	7

Source: Field Work, 1996

Increase in Intensity of Irrigations

Farmers have reported that though there isn't much of an increase in area under irrigation, the intensity of irrigation has significantly increased (Table4). The number of irrigations that could be given increased by 2-3 times, resulting in yield increase. Though increase in yield is a significant achievement of check dams, the saving of crops during crucial times like that of low rainfall as in 1995 is seen as the main benefit. Cotton is the major crop of the area which requires on average 15 waterings during its growth. Before the construction of check dams farmers could give only eight support irrigations, while in 1994 beneficiaries could give nine irrigations and in 1995 ten irrigations. In 1995, due to low rainfall, sesamum and summer groundnut were not grown. In 1993, due to non-availability of water, summer ground nut was not produced. Table 4 indicates that in 1993 five irrigations were given to the Kharif ground nut crop, while in 1995, the same crop received seven irrigations. By way of comparison, in 1994 only two irrigations were required for the ground nut crop. The reason for this is that in 1994 water was available through natural rainfall and therefore there was no need to give extra irrigation. In 1995, in spite of low rainfall, irrigation could be provided due to the availability of water from check dams. Non-beneficiaries could not save their cotton crop in this year.

Due to the presence of check dams, water was available in the wells for the winter crop and farmers increased the area under wheat cultivation. On average wheat requires 10 waterings. Before check dams only six irrigations were possible while in 1994-'95, after check dams, nine irrigations were provided and in 1995-'96, in spite of low rainfall, seven irrigations were provided.

There was a significant increase in vegetable production due to the availability of irrigation. Earlier farmers were growing vegetables for household consumption only, but now they are growing surplus enough to market. Earlier, with much difficulty they could provide only 5 irrigations, and that too for a limited area, but after the check dams they could provide seven to nine irrigations for a larger area. (Since vegetables are grown in homestead fields, the area is difficult to compute, and we relied on farmer impressions only.)

In the summer of 1995 the beneficiaries could choose high value summer crops like groundnut, while non-beneficiaries could choose only a fodder crop. This indicates that the 1994 rain water was conserved through the check dams, which helped recharge wells of farmers.

After construction of check dams beneficiary farmers were more confident about water availability, and therefore they increased their input spending by 10-20 percent, and could harvest 30-40 percent yield.

Amarshingh's family journeys towards a better life.....

Amarsingh Bijal is a resident of Madargadh village. There are six members in his family: two daughters, two sons himself and his wife Margaben. He has 8.5 acres of land. Before the construction of check dams his land was un-irrigated, and he could harvest only Kharif (Monsoon) crop from his land. Eight months in a year he and his family used to migrate to Junagadh for labour work. After construction of the check dam near his land, the average water table in his well increased from 10 feet. Looking at the availability of water, he dug a bore well in the already existing well. To purchase a diesel engine, he borrowed Rs. 25,000/- from the local money lender.

He found that water could be drawn from the bore well through his eight HP engine pump, for 24 hours in the monsoon season, 12 hours in the winter and six hours in the summer. His family started taking three crops in a year. Now the family no longer migrates to Junagadh for work.

Margaben, the wife of Amarsingh, saves money every day in her Galla (a closed earthern pot with a small hole). Every year during the Diwali she breaks her Galla and buys some assets for the house. She says that she could save money because of their increased farm income. Furthermore, she adds that she had learned the savings habit from the AKRSP - formed Mahila Mandal (women's group) in the village, where each member is encouraged to save money. Every year she could save Rs.1800 to 2000. Giving credit to AKRSP, Margaben says that "AKRSP (I) has changed our life for the better".

Yield Rates

Table no. 5, which compares yield rates of different crops of beneficiaries during three different periods, shows that before check dams (1992 - 1993) and after (i.e.1995-'96), the rates were almost the same, in spite of the large difference in rainfall levels in the two time periods.

By contrast, in 1995-96 non beneficiaries found a 50-60 percent reduction in their yield rates. In 1994-'95, a good rainfall year, both beneficiary and non-beneficiary yields were high, but the beneficiary groups' yield was 10-20 percent higher.

Table: 5
Average per hectare yield in Kgs before and after check dams:

Crops	Per ha. Yield rate in kgs.		
	Before check dam	After check dam	
		1994–95	1995-96
Cotton	923	1462	933
Bajara	649	985	609
Sesamum	227	300	100
Mung	455	600	180
Ground nut	757	909	550
Wheat	3000	5000	Not grown

Source Field work, 1996

Table: 6
Net area sown and gross cropped area in command area of check dams:

	Net area sown (in ha)	Gross cropped area (in ha.)		
		1992-93	1994-95	1995-96
D'pur	17.6	25.4	35.3	22.5
M'gadh	28.1	35.5	48.2	30.2
Kherdi	12.2	18.5	28.5	17.2
Sangani	16.0	24.0	30.3	18.0
Total	73.9	103.2 (139%)	142.3 (192%)	87.9 (119%)

Source: Field Work, 1996
(figures in bracket shows percentage to net area sown)

Increase in Gross Cropped Area

Table no. 6 shows that due to availability of water in different seasons, the gross cropped area has increased by 40-50 percent. Obviously, 1994-95 was a good year for rainfall, and crops were harvested in all the three seasons; but in 1995-96, a drought year, the gross cropped area was still similar to that of 1992 -1993, an average year, for beneficiaries. In the same drought year (1995) non- beneficiaries could not take any Kharif crop in the entire cultivated area, due to the non-availability of support irrigation. Their gross cropped area was reduced significantly in that year.

OTHER BENEFITS

Women have benefited through the availability of water for bathing and washing clothes. in winter and in the rainy season. On average women had to walk 2-3 kms to perform this activity. However, they now are able to save 30-40 minutes, as well as energy, as a direct result of easily available water. Unfortunately, in summer their plight remains the same as before due to the high evaporation rate of check dam water.

NEGATIVE OUTCOME

In spite of the positive impacts of check dams the negative aspects must not be ignored. In many villages some grazing land has come under submergence, which causes inconvenience and results in searching for other pastures further away. During high rainfall years, nearby houses also experience water seepage. Wells of farmers near the construction site get silted with dam construction wastes. In Dandhalpur village Jeeva Lakhabhai experienced this phenomenon which rendered his well completely useless. Though compensation was given to two farmers as a result of their cultivable land being submerged, it is a fact that some of their livelihood has been taken away.

CONCLUSION

The above study is a strong indication of the benefits perceived from the construction of check dams at the micro level. Though there are some negative impacts, the positive benefits largely outweigh these. Small check dams should be built for water conservation at the micro level and to help farmers for support irrigation.

RECOMMENDATION

Besides irrigation, water has many other uses like drinking, bathing, and washing. At the time of construction of the check dam, provision of a platform to wash clothes and a place to bath will facilitate the participation of women to carry out these activities. If more care and precautions are taken in the construction of check dams, the negative impacts such as siltation of wells and the submergence of cultivated land can be avoided.

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