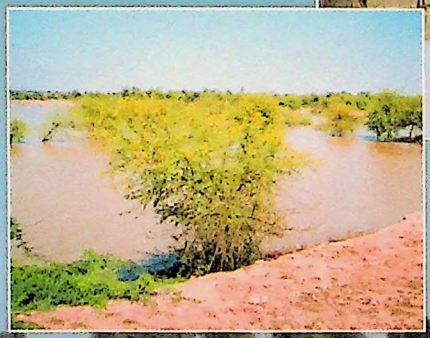
Bapugaon

Community based Watershed Development Approach



cecoedecon

Centre for Community Economics and Development Consultants Society (CECOEDECON)

CECOEDECON is a non-profit organisation, which has been working relentlessly for the downtrodden and the marginalized section since 1980s. CECOEDECON's mission is to take direct action to build the capacities of its target groups - Scheduled Castes and Scheduled Tribes, marginal farmers, the landless and the deprived women and children, so that they are able to take action, independently and effectively, to secure their long term well-being thereby, promoting their self-reliance and empowerment. CECOEDECON's core programmes run in the areas of natural resources management, health, gender and development, child development, in[illegible] at the local le[illegible]

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PREFACE

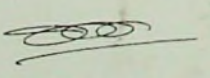
Natural Resource Management is one of CECOEDECON's major area of intervention. The purpose of the NRM programme is two-fold, firstly, to increase the sustained productivity of its partner communities' natural resources, secondly to build the institutional capacities of the partner communities to manage the natural resources. For CECOEDECON's partner communities, soil and water are the main resources that are used in agriculture - their major activity. This issue has been addressed by the organization through its work in watershed development.

Effect of deteriorating ground water situation became apparent in the early nineties in the form of low agricultural production and social consequences. CECOEDECON began its interventions on soil and water management in the year 1994 with the formation of a Village Development Committee. Since then water recharging structures and land development activities, *etc.* have been taken up. This publication stems from the need to assess and document the impact of CECOEDECON's field interventions.

In the context of watershed development CECOEDECON has tried to assess the ecological, economic, social and institutional impact of its interventions. The study documents the experiences of seven villages located in the vicinity of a major water storage and recharging structure. The effects experienced range from water availability and water quality to agricultural productivity, gender issues, community-based systems of maintenance of assets created, and empowerment of village community.

I would like to thank Mr. Arun Kumar Singh for preparing this document. I would also like to thank Mr. Rajesh Soni for his contribution in text editing and graphic layout. I earnestly hope that the findings of this study will enhance our understanding of the impact of management approaches adopted for natural resources.

Wishing you an insightful reading.



(Sharad Joshi)
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1. INTRODUCTION

The presence of water source in a village is often a focal point around which the rural populace can weave a series of developmental and economic activities. This assumes greater significance in arid areas, where availability of water becomes an issue of survival and existence. Often the women-folk have to travel a long distance for fetching water, which may be even unfit for human use as per the established standards. Consumption of such water over longer period of time can lead to prevalence of water borne diseases among the population consuming sub-standard water, resulting in their inability to work and thereby affecting their income. The situation is further compounded by the recurring droughts in Rajasthan, especially since last 8 years, with the exception of somewhat normal monsoon in 2003 and less than average rainfall in 2004. This has increased plight of rural population manifold in Rajasthan.

The pink city of Jaipur is the capital of Rajasthan. At present, the Jaipur district has 13 *tehsils*, Chaksu being one of them. CECOEDECON, a non-governmental organization and primarily an agro-action group, engaged in the field of agriculture and natural resource management, has been actively engaged

with the rural communities towards improving their economic life since last two decades in Rajasthan, including Chaksu *tehsil*.

1.1. Agro-Climatic Zone and Characteristics

In the nation-wide classification of India based on agro-climates, Jaipur falls in the Agro-Climatic Zone III-A, along with Dausa, Tonk and Ajmer. Banas is the only major river flowing in this zone, originating from the western slopes of the Aravali mountain ranges.

Annual rainfall in this zone ranges from 50-60 cm and the average number of rainy days in a year are 32-33, except Ajmer where it falls to 25. Temperatures in summer and winter are not as extreme as in the desert of western Rajasthan, but still reach around 45^0 Celsius in summer and may plunge to 8^0 Celsius in winter. The water table varies from 20-30 meter but the annual fluctuations are steep, especially in case of failure of yearly monsoon and the replenishment of groundwater is low. Since there is almost no major river in this zone, withdrawal of groundwater is going on at a very high rate, as the demand for water is ever-increasing, resulting in the steady fall of water table in the zone.

The natural vegetation is a mix of xerophytes and mesophytes but the excessive felling of trees has robbed the surface of its most precious constituent - top soil. The major crops of the zone are Wheat, Mustard, Barley and Gram in the *Rabi* season and Bajra, Sorghum and pulses in the *Kharif* season. Productivity of the soils of this zone is relatively better than the productivity of the area west of the Aravali mountain ranges.

1.2. Bapugaon Village

Bapugaon village falls in revenue village Rupadi Khurd, Chaksu *tehsil* of Jaipur district, and is spread over an area of 625 ha. The caste-wise break-up of the village community is

shown in Table-1. Bapugaon started facing water crisis since 1980s. The situation was aggravated in 1986 when the river Dhund, an important water source for Bapugaon, went dry and since then quantity and quality of water, both, started gradually deteriorating. Main occupation of the villagers is agriculture and animal husbandry. Major crops of *Rabi* are Wheat and Mustard and *Kharif* are Bajra, Groundnut and Gwar. Due to rain-fed nature of irrigation till 1995, coupled with degraded agricultural lands and depleted natural resource base, low agricultural productivity was prevalent, adversely affecting human and cattle, both.

Table-1

Caste-wise Break-up of Families in Bapugaon

S. No.	Caste	Number of Families
1.	Jat	40
2.	Brahmin	35
3.	Bairwa	25
4.	Raigar	25
5.	Rajput	20
6.	Meena	10
7.	Kumhar	10
8.	Baniya	02
Total No. of Families		**167**

1.3. Strategy and Intervention

CECOEDECON's interaction in Bapugaon began in 1994, in which non-availability of a water source and resultant loss of productivity often came to the fore. In 1995, an 11-member Village Development Committee (VDC) was constituted in Bapugaon. This was done after a meeting in which

representatives of all the families of the village participated. The committee has representation from all castes and class of the village and works towards the overall development of the village, especially the marginalized sections. As an unwritten law, no incumbent *Panch* or *Sarpanch* has ever been elected to become a member of this village development committee. This ensured that the local skirmishes of *Panchayat* body do not spill over to VDC. Though, a few former *Panch* and *Sarpanch,* once their terms expired, have joined this committee after following the due process of nomination and election.

This was first important step towards intervention because CECOEDECON, as a principle, does not work with individuals but with the entire village community, in order to promote village level institutes. Secondly, this agro-action group, again as a policy, does not bear the total cost of any work undertaken by it. The 33 per cent of the total expenditure incurred must be borne by the community, in the form of cash, services or man-days, and the remaining 67 per cent is contributed by CECOEDECON. The philosophy hidden in this arrangement is to inculcate a feeling of '*belonging*' and '*ownership*' of the asset thus built, among the community, without which the sustainability of the assets created can not be ensured. In addition, people also understand the true worth of any utility in which they have invested their own money, time and efforts.

CECOEDECON, concerned with the non-availability of water in the village, in conjunction with the community, started exploring various options for building a water storage utility in the village. In the first phase several meetings-cum-awareness generation sessions were held with the members of VDC. It came to the knowledge that water flowing over 150 ha of pastureland during monsoon just goes away as run-off and so attention was paid to convert this run-off into water storage and its better utilization. This issue was seriously discussed and 1995 onward smaller earthen bunding was done on the ground, as per the slope and gradient, to ascertain the most effective direction for maximizing water storage.

This site also has an interesting history. Earlier, about 20-25 years back, there used to be a small pond at this site. When this pond went dry during one of the droughts, the Forest Department took up this site under its control and developed it as a nursery. Meanwhile, another piece of land, adjacent to this nursery, was taken up for building a new small pond to store water. After a few years, the Forest Department abandoned this site of nursery and this area was once again merged with the newly built pond, thus enlarging the total area of the pond. Due to the meager rainfall, most of the area was never filled with water and it was used as pastureland, because the sub-surface moisture trapped in this trough encouraged growth of grasses and weeds.

Finally in 1996, construction of an earthen-dam with anicut was taken up in the pastureland, at the aforementioned site, lying 2.5 km east of Bapugaon (an anicut is designed to harvest water that flows during the rainy season and raises the local water level through ground water recharge thereby catering to the needs of drinking water for the human beings and livestock and irrigation and checks soil erosion). Total length of structure is 800 meters at a cost of Rs. 239,000/-. This structure is an excellent example of

co-ordination among four different agencies, striving towards a common goal - CECOEDECON, *Gram Panchayat* (Bapugaon), Village Development Committee (Bapugaon) and *Panchayat Samiti* (Chaksu). The contribution made by the three agencies involved is shown in Table-2. An employment of about 2,250 man-days was generated during its construction, which took three months at a stretch for completion, ending on June 30th, 1996. For increasing the storage capacity, the structure was further extended in 2000. The total capacity of this earthen-dam is the quantum of water standing at a height of 5 feet in 150-200 ha. The sad part is that after the completion of this structure, it has never been filled to its capacity to demonstrate its immense true worth and utility, due to erratic rainfall.

Table-2

Cost of Earthen Dam and Anicut at Bapugaon

No.	Contribution towards Cost	Total Amount (Rs.)
1.	CECOEDECON	76,400/-
2.	*Panchayat Samiti*	125,000/-
3.	Village Development Committee	37,600/-
	Total	**239,000/-**

One of the remarkable features is that it is strictly prohibited to withdraw water directly from this storage and this rule is followed very rigidly. The primary, and in fact the sole, function of this storage is to recharge the ground water through seepage and run-in, thereby augmenting the water level in the existing wells. The water from the well is subsequently withdrawn for irrigating agricultural fields. Since irrigation by wells is the most common mode in the area, every farmer has a well or two in his fields. It thus ensures the equitable distribution of water to all the farmers of the village.

2. PROCESS OF IMPACT ASSESSMENT

The Bapugaon anicut was completed in 1996 and its storage facility was enhanced in 2000 by increasing its length. It is therefore an appropriate time to make an impact assessment of this structure on the nearby area, in general, and Bapugaon, in particular.

2.1. Selection of Area for Impact Assessment

For this assessment, an area broadly within a 5-km radius was selected. The primary reason for selecting 5-km radius was extrapolated from the size of the structure, assuming that it would benefit this area. This study becomes important in the light of the fact that Rajasthan has been reeling under drought since last ten years, barring two years, and the efficacy and utility of this structure was thus put to utmost test, right from the onset. There are seven villages falling within the 5-km radius, which namely are Bapugaon, Rupadi Khurd, Radoli, Maharampura, Bibi ka Baad, Bilaspura and Sawai Jaisinghpura. The relevant information of these seven villages, including agricultural land and number of wells, is shown in Table-3.

Table-3

Primary Information of Villages under the Impact Assessment

Village	Families/ Population	Agri. Land (ha)	Cattle/ Goat	*Gochar* (ha)	Wells
Bapugaon	167/2,250	2,500	2,000/ 3,000	none	125
Rupadi Khurd	50/650	225	300/100	7	35
Radoli	127/1,265	300	1,000/ 500	17	150
Maharampura	45/600	125	300/400	none	15
Bibi ka Baad	100/1,000	125	150/250	5	25
Bilaspura	40/350	200	300/100	17	25
Sawai-Jaisinghpura	80/700	1,100	250/300	15	40

Out of these seven villages, due to topographic elevation of three villages (namely Maharampura, Bibi ka Baad and Bilaspura) and their location upstream of the earthen-dam, no impact was expected, in any case. The capillary action of water, necessary for its lateral spread and maintaining moisture, can not work against the force of gravity beyond a certain point, especially when the downstream offers a smooth capillary flow.

However, field trips were made to these three villages too because they provide a cryptic clue to the situation prevailing in the entire area of study before the construction of the earthen-dam and hence these villages are important in establishing benchmark for the present study. From this point, it is also pertinent to look at the agricultural yield per hectare in these three villages vis-à-vis

the remaining four villages.

2.2. Methodology of the Impact Assessment

The methodology of the impact assessment involved a three-pronged approach. The first was to collect primary data by intense interaction with the farmers during the field trips to the concerned villages. Second was to make careful direct observations in the field and collecting as much ground truth as possible for cross-verification of the data gathered from the villages as well as extrapolating newer information, if any. And the last is to gather data from the official records, and other public sources, wherever possible. All the data thus generated was subjected to analysis and interpretation for reaching inferences.

The lack of crucial background relevant data (necessary for a comparative account), at *Panchayat* and *tehsil* levels, both, restricts the present assessment and evaluation to a limited contemporary time frame of about ten years only.

2.3. A Brief Note on Field-Visit and Observations

Based on the above-mentioned methodology, data was collected from the area identified and selected for the impact assessment. A brief note on the field visit to the seven aforesaid villages and observations, with reference to impact assessment, is being given here.

Bapugaon is the closest village to the earthen-dam and hence it is naturally expected that the maximum impacts will be observed in this village. In 1996, the total population of the village was 1900 spread among 150 families. The non-availability of water for irrigating agriculture fields, forced half of these families to migrate to nearby towns in search of work as daily wagers. About 80 per cent of these migrant families were land-owners and the remaining were landless labourers. After the completion of the earthen-dam with anicut in 1996 there was not substantial

change in ground reality for the next two years, as the Rajasthan was undergoing an extraordinary longer spell of drought, continuously since 1996. Owing to failure of monsoon, storage in the earthen-dam never reached to the level. However, with the feeble rains during the next three years, despite the continuing drought, scenario began to change slowly. At first, moisture was retained in the subsurface and it was reflected in the slight increase in production per unit area. Moreover, the empty part of the structure showed lush growth of grass and weeds which was excellent for the cattle.

Encouraged by these gradual changes, in consultation with all stakeholders it was decided to enlarge this earthen-dam by extending the existing embankment. Therefore another appendage was added to this structure in 2000, as already mentioned. Due to this addition, the total storage-area of the earthen-dam was increased substantially. Consequently, the moisture retained underneath too expanded exponentially.

It is important to have a look at the rainfall pattern since 1996, when the first phase of the structure was completed. From 1996-1999 there was drought condition prevailing in the area. In 2000 there was somewhat normal rainfall in Jaipur district. This resulted in an immediate rise of the water table in the village, as testified in the rising water level in the wells. Again in 2001 and 2002 there has been very weak rainfall leading to drought conditions in these years, but the village was protected from the ill-effects of the drought, courtesy the earthen-dam.

Since 2000 onwards, most of the farmers started taking three crops in a year - in addition to normal *Rabi* and *Kharif*, another crop of *Jayad* is also being taken in the village [*Jayad* is the practice of growing vegetables when the fields are empty between the two main seasons of *Rabi* and *Kharif*]. Most commonly grown vegetables under *Jayad* in this village are - Tomato, Chilly, *Arbi* and Watermelon. This practice continued in next two drought years also. Increased humidity for longer spell in soil-moisture zone, emanating from the storage of water, directly resulted in

Box - 1

Badri is a farmer with 6 ha of land and three wells. Till 1996 he was taking only one crop in a year and the productivity was very low, for Wheat and Mustard it was hardly 4.5-7.5 Q/ha. After 1996, initially, per unit yield started showing some increase, which encouraged him to go for two crops from the next year. It was only in 2000, that the yield of Wheat gave a bumper harvest of +48 Q/ha and Mustard gave a return of 24-30 Q/ha. He also started taking *Jayad* in between.

Jagdish, another farmer, has 3 ha of land with one well and he is also taking two crops per year since 2000 onwards, compared to earlier one crop a year with lower yields. The harvest of Wheat comes to 48-54 Q/ha and Mustard is 24 Q/ha.

Rajesh has 23 ha of land with 4 wells. After 2000, his yield of Wheat is 60 Q/ha and Mustard has risen to 30 Q/ha. Another farmer Laxman Singh has 25 ha of land with 3 wells. He grows wheat as a major crop which gives him a return of 48-60 Q/ha.

Kudda is one farmer with a relatively smaller land-holding of less than 1 ha with one well. Prior to 1996 he was forced to go to Jaipur, since poor yield made farming a losing venture. However, the things have changed for him and now he is getting a return of 60-72 Q/ha for Wheat.

Another farmer Shrikrishna has 8 ha of land with 4 wells. He is also taking two crops per year from 1999 onwards Wheat giving a return of 60 Q/ha. Similarly Omprakash is taking two crops per year with a return of 48-60 Q/ha. All the farmers are getting an average yield of Bajra at 24-30 Q/ha.

Slowly the water of anicut is absorbed as run-in, and this newly emptied part starts having lush green grass consumed by cattle. Moreover, the part of reservoir lying empty again provides good fodder for cattle. This is accessible for all the cattle of the village without any discrimination.

more than average yield of agricultural produce per unit area. In 2003, again there was normal rainfall in Jaipur and about 50 per cent of the structure was filled, though only to an average height of 2-3 feet, even this showed very good result, in terms of agricultural yield.

The growth of cattle wealth in the village is a direct indicator of better and easier availability of fodder. In 1996, for example, there were 1,000 cattle (restricting to cows and buffaloes only) as the fodder was difficult to get. Today in 2004, the number of cows and buffaloes in the village has risen to 2,000. In addition to these, there are 3,000 small animals that includes goats and sheep, in the village. And all this increase has been registered in spite of the fact that the village does not has a *gochar* (community pastureland).

This has also added another related positive dimension. Due to the easier availability of fodder for cattle, farmers of the village have now started raising improved species of cattle which produce higher quantity of milk, thereby supplementing the family income. Since the cattle-raising and domestic milk management primarily rests in the hands of women-folk, the income too goes to the women. It leads to their economic emancipation.

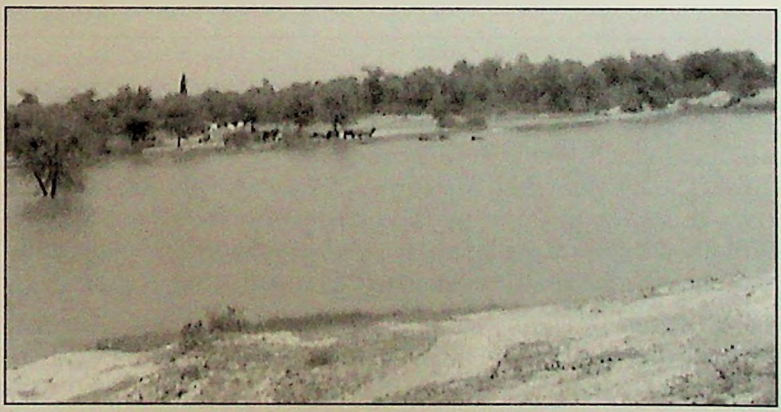
The water in wells started falling in early 1980s and by 1986 the water started vanishing for most part of the year and this continued for the next ten years. The roots of this were embedded in the drying up of river Dhund, flowing close to the village.

After the construction of this structure, slowly but steadily water level in the wells of the village started going up from 1996 itself (year of construction of the earthen-dam). In the following years the duration of availability of water in the wells started increasing in terms of months and now from 2000 onwards water is available in all the wells of the village throughout the year. This easier accessibility to water in village has indirectly affected to better public hygiene and sanitation, as these are directly linked to the availability of water. This has reduced the health-related

expenses to the minimum, on the one hand, and increased the nutritional intake, in general, on the other hand. The net result is relatively much improved health indicators of the village.

But the most profound impact has been noticed regarding the quality of water. The quality of water in Jaipur district generally is brackish or saline, Bapugaon being no exception. The villagers recall that the increase in the hardness and salinity content of water was noticed with the decreasing quantum of water availability, implying an inverse relationship between the two. Since 1996 onwards, the quality of water started showing gradual improvement and by the year 2000 it has improved to a substantial extent. The process continues till today and the villagers feel that now water in their village has almost reached to the potable standards.

Yet another significant social impact is the restoration of human dignity and increase in the social status of the villagers. Migration of land-owner farmers to work as labourers inflicts a severe dent to their psyche, making them undergo an inferiority complex, which only they can feel. This kind of indirect benefits can never be quantified in monetary value (see Box-2). After all is there any formula which can fix a value for the loss of human dignity? Can the humiliation and insults heaped on an individual be quantified in equivalent money?



Box - 2

It would be relevant here to cite the inferences of a world-wide survey of poverty carried out in 2000, in more than 100 developing nations of Africa, Asia and Latin America. The primary objective of this survey was to understand what poor think of their poverty, so that the poverty alleviation strategies are designed to be more effective. One question asked from all the poor persons participating in this survey was common - What will be the single most important thing which they would need to remove themselves from the clutches of poverty? The obvious answer which comes to our mind is - of course they would ask for money. But it is not the line of thinking of the poor themselves. More than 85 per cent of the poor, cutting across the geographical boundaries, replied that they want a dignified life first. The way they are looked down in society should stop, they should be recognized with an equal status within the society, irrespective of their monetary position, rest of the things they would manage themselves, including how to come out of the poverty. Poor people feel that it is this rejection and neglect by the society which crushes their innate self to the extent that they adopt a feeling of neutrality towards the life, leaving themselves to the turn of events. The morale of the story is that social dignity is of paramount importance for rural poor people.

It is in this context that this community asset has played a decisive role. The migration form the village started registering a declining trend post-1996 and has come to a virtual halt since 2000. The landless daily wagers too have stopped their seasonal trips in search of work, as the newly better economic state of farmers provides them an opportunity to take help of these daily wagers on their farms, to ease their physical burden.

This increase in social status is reflected in another newer trend. Villagers having their sons of marriageable age have suddenly found themselves flooded with offers to marry their daughters in

this village. Because the families of the prospective brides know that their daughters will not have to undergo daily drudgery for fetching water, which is readily and easily available in the village itself.

The **Rupadi Khurd** village is located 2.5 km east of Bapugaon in the downstream. Here too, prior to 1996, water shortage was acute, as the wells have gone dry and remained so practically throughout the year. Post-1996 there has been improvement in the availability of water. Throughout the drought of 1997-1999 wells always have water for the villagers remained functional throughout the year. From 2000 onwards water has been available in plenty in the wells. Thus the drought proofing of the village has been very effective.

After 1996, there has been an increase in the availability of fodder and fuel wood, initially marginally and post-2000 significantly. This is a direct result of increased water in the soil moisture zone for longer duration.

Here too, the remarkable improvement is noticed in the quality of water. The deterioration of water quality began with the decreasing water quantum and by early 1990s water was very hard and saline, eventually vanishing completely. The reappearance of water in wells and increased quantum is coupled with the improvement of water-quality. The earlier salinity has disappeared and water has become potable.

Presently a nursery of Babool (Acacia) has been established at *gochar*. This serves the purpose of providing fodder for goats and fuel wood to the villagers. There is a *Gram Seva Samiti* in the village which is responsible for selling the twigs and fodder to the villagers in need and uses the money thus generated in the developmental activities of the village.

Laduram Jat is a farmer with 15 ha of land with 2 wells. He started taking two crops every year since 2000 and the yield has doubled - Wheat (30 Q/ha), Mustard (12-18 Q/ha), Bajra (12-18 Q/ha), and Groundnut (9-12 Q/ha). He grows crops only in half of his land. He informed that since 2000 water is now

available in the wells round the year.

Omprakash Choudhary has 5 ha land with 3 wells. He too is taking two crops in a year since 2000 and his yields too have also doubled - Wheat (24-30 Q/ha), Mustard (12-15 Q/ha), Bajra (3-12 Q/ha) and Jowar (3-12 Q/ha). He too is very happy at the availability of water throughout the year. Harnath has 2 ha of land with 2 wells. He says that in his 62 years of life he never imagined of taking two crops in a year and it is hard to believe that he is doing this from 2000. His yields have also registered very high returns, compared to earlier periods, just like other farmers. He recalls that post-1996 throughout the long drought of five years the wells remained functional in the village, which he considers a miracle.

All the other villagers have the same story to tell. Jagdish with less than 1 ha of land with one joint well is happy with the smaller land holding for the first time in his life as it has yielded very good results. Similarly, Kamlesh with 3 ha of land with 2 wells is taking two crops since last 4 years. Ramrai has also started taking two crops on his 4 ha with the help of his two wells. The yields of all these farmers are same as of the other farmers in the village today.

The villagers are unanimous in their opinion - the increased yields and water availability in wells round the year in their village is a direst result of the earthen-dam constructed at Bapugaon. They consider it their good luck that they are also reaping the fruits of this community effort made by people of Bapugaon.

Maharampura is characterized by lower agricultural yields. There is no direct water source and it has resulted in the over-exploitation of groundwater to such an extent that now water table has gone as low as 400-450 feet. Normally Wheat requires 4-5 watering during its entire three-month life cycle and Mustard demands at least 2-3 watering and the absence of water is root-cause of lower productivity. So irrespective of the size of land-holding the lower yields are uniform throughout the entire

village. For example, Ganga Bakhsha and Bomaram both have 5 ha of land with one well each whereas Laxminarain Meena has less than 1 ha of land with 4 wells. The average yield for both the farmers is same - in case of Wheat it is 7.5-9 Q/ha and for Mustard it is 4.5-9 Q/ha.

But one significant change has taken place. Since last two years, without any effort of village community, the water is available in their wells throughout the years. At least one important aspect of their day-to-day life (searching for water) is taken care of, though the lower agricultural yields continue to be a matter of concern.

That the water availability has touched this village is indeed a miracle as it is located 4 km upstream of the earthen dam. The delayed impact can be understood from this. However, the water is now increasingly being consumed, as farmers in Bapugaon and Rupadi Khurd have started taking two crops per years, little is left for its sub-surface spread.

Moreover, this has also to be taken into consideration that the earthen-dam has not been filled to its capacity during the seven years of its entire existence. Even the 40-45 per cent filled up earthen-dam to a height of hardly 3-3.5 feet (against an average standing water column of 5 feet, as per its total capacity) has provided complete drought proofing - in terms of agricultural yields and round the year availability of water over the last four years in two villages and in terms of water availability in one village additionally in last two years.

Therefore the significance of Bapugaon earthen-dam is not lost on the residents of Maharampura. They acknowledge that the water present in their wells has come from there and they now want to increase their agricultural yield. They have an easier solution - increase the depth of this earthen-dam to store more water which will finally increase its area of influence and impacts. And they are so convinced of this approach that during discussions when it was pointed to them that the dam has never been filled to its capacity in last seven years, so increasing its capacity will not be effective, they simply shrugged.

In **Beebi ka Baad / Baad Firozpur**, the nature of the soil is generally sandy, quality of which has further deteriorated after the floods of 1981. Since then only one crop is taken in the village. Very rarely, if the monsoon season offers good rains, then farmers opt for the second crop. The only source of water in this village is nearby river Dhund, which is lying dry since last five years.

A farmer Gopal (1.5 ha land with 1 well) told us that the yield is so poor that he is afraid of applying any input to his farm as it will go waste, in the absence of water. The average yield for all crops is 4.5-7.5 Q/ha. Another farmer Jagdish Saini has 5 ha of land with one well but he too is not very enthusiastic about his occupation of farming because of low return of 4.5-7.5 Q/ha. Ramnarain too has less than 1 ha of land and hardly takes one crop a year. Farmers in this village barely manage to meet their ends with their land.

Bilaspura has a majority of Jat community. Neither there is any community organization to address the problems of the village at a collective forum nor any *Panchayat*. Because of low productivity, migration from the village to nearby towns is common. In the drought of 2003, one member of every family worked as daily wager in the drought relief work.

There are 300 cattle in the village, which also has a *gochar* spread over 17 ha. However, the *gochar* serves the purpose only during rainy season (if there are rains) otherwise most of the time it has no vegetation. During drought, the problem of cattle is compounded. Taking loans for purchase of fodder is prevalent in the village, sometimes to the tune of Rs. 20,000-25,000. Because of repeated crop failures, it becomes very difficult to pay back these loans and more difficult to procure loans in future, sometimes leading to the death of cattle. The farmers are thus trapped in a vicious cycle of indebtness. There is no family in this village which is not buried under loans, often heavy.

The farmers like Bajranglal (8 ha), Govindilal Dangi (2.5 ha), Ramsahai (5 ha), and Ramkalyan (8 ha) all have 2-3 wells. Their yield is 4.5 Q/ha when crop is rain-fed, and in case of good rains it is raised to 9 Q/ha. Despite heavy loans they feel if water crisis is

somehow solved then they will be able to pay back their loans.

Farmers are willing to contribute in any effort aimed towards resolving their water problem, but they are not willing to take any initiative. The seat of *Panch* from this village is reserved for scheduled tribes and the *Panch* has no interest in the problems of village dominated by Jat community, making the matters worse.

Radoli has a 50-year old pond in the village. Earlier it was smaller in size but over the years it has been enlarged by digging for increasing its storage capacity. Despite the pond and *gochar*, fodder is a major problem - available in *gochar* for only 3-4 months of rainy season. Another aspect is that about 10-12 ha of *gochar*-land has fallen in the submergence of pond and hence is lost permanently.

The lower productivity of agricultural land, in spite of the pond is intriguing. But in recent years (post-2000) the productivity has been increased substantially. For example, Babulal has 1 ha of land and one well. In 1995 he was taking crop in only half a hectare and the yield of Wheat was 6 Q/ha and for Barley it was 3 Q/ha. In comparison, in 2004 the yield of Wheat is 42-48 Q/ha and for Mustard it is 24-30 Q/ha. Another farmer Babulal Gujar has 2.5 ha of land with one well. He informed us that compared to the yields of 1994-95, the yield today in 2004 have doubled. Today he is getting the yield of 28.5 Q/ha for Bajra, 24-30 Q/ha for Wheat, and 9-12 Q/ha for Mustard. Other farmers like Jagdish (half a hectare of land and one well), Brijmohan Sharma (less than 1 ha of land and two wells) and others have also experienced doubling of their yield in last three-four years.

It was important to explore this dimension further. Because pond has been in existence since last 50 years and the yields have only increased in recent times. First, why pond failed to contribute even though it had sufficient water? Discussions with farmers cracked this mystery. One farmer Kaluram (with 1 ha of land and one well) informed us that there is a hard pan underneath the pond and hence the water in pond is unable to spread laterally in the sub-surface. Kaluram says if the percolation holes are made

in this hard pan, then pond will serve as an effective source of irrigation through spreading water underneath. He has already discussed this issue in the *Gram Panchayat* meeting, three months back, which is now deliberating on the course of action, in this matter.

Kaluram is convinced that water from the earthen-dam (Bapugaon) has played a decisive role in the increased yield in the village in last 3-4 years. He further corroborates it by pointing to the fact that earlier boring the wells too failed to bring water in wells but after the construction of earthen-dam, water reappears in the well after the boring.

There are other factors too responsible for this increased yield, along with the increased content of water in soil moisture zone. Village was provided with electricity in 1989. Awareness was generated among farmers regarding the improved agriculture practices, importance of humus content, application of organic manures, controlled use of chemical fertilizers and pesticides, and necessary training was imparted to them. Farmers also got their soil tested to ascertain the best suitable crop for obtaining better yields. A *Gram Sevak*, in-charge of 14 villages, regularly visits this village every Tuesday to discuss the problems of farmers and offer remedial measures. He also attends the *Gram Panchayat* meetings. Radoli is headquarter of the *Gram Panchayat*, representing six villages. The increased yield is a cumulative result of all these above factors.

Village **Sawai-Jaisinghpura** (Bapugaon *Panchayat*) is reeling under acute water shortage, so only one-third of its total agricultural land is used for cultivation. There is no water in the wells and even during the rains water stays hardly for 2-3 hours in the wells and then disappears. There is a pond in the village covering 50 ha but in reality water exists only in 8 ha. Seven years of continuous drought have further aggravated the situation. Due to lack of water availability, only one crop is taken, mostly it is Bajra, with a yield of 4.5-9 Q/ha, and sometimes Mustard with a yield of 4.5-7.5 Q/ha. The nearest source of water river Dhund is

5 km away from the village. Though the river has gone dry since last 5 years, the villagers believe that it has sufficient water underneath it. This sub-surface water should be transported through a pipe, villagers proposed.

2.4. Impact Assessment

On the basis of detailed discussions with members of village community, office bearers of VDC, SHGs and Mahila Mandals, and observations made during the field visit, following significant impacts are specifically recorded, under socio-economic and environmental categories :

2.4.1. Socio-Economic Impacts

1. The earthen-dam with anicut built in 1996 has provided food security to three villages, namely Bapugaon, Rupadi Khurd and Radoli through increased agricultural productivity.

2. The agricultural productivity of the land, in fact, has increased four times, considering the fact that yield per unit area has more than doubled, and both *Rabi* and *Kharif* crops are now being taken per year. And here we are not taking cognizance of *Jayad* (Table-4).

3. The structure has turned out a boom to the cattle of the villages where it has made positive impact through increased availability of fodder. 5,000 cattle have been directly benefitted by the structure, in addition to others. Moreover, the villagers of Bapugaon are also engaged in improving the breed of the cattle for increasing their productivity.

4. The overall economic life of the people of three villages, namely Bapugaon, Rupadi Khurd and Radoli has been qualitatively enhanced. A population of 4,165, distributed in 344 families has been directly benefitted so far.

Table-4

Agricultural Yield in Villages under the Impact Assessment

Village	Crop		Agricultural Yield	
			Pre-1995-96	Post-2000
Bapugaon	*Rabi*	Wheat	4.5-9 Q/ha	48-60 Q/ha
		Mustard	4.5-7.5 Q/ha	24-30 Q/ha
	Kharif	Bajra	12-15 Q/ha	24-30 Q/ha
		Groundnut	7.5-9 Q/ha	24-30 Q/ha
	Jayad		not taken	Tomato, Chilly, *Arbi*, Watermelon
Rupadi -Khurd	*Rabi*	Wheat	7.5-12 Q/ha	36-44 Q/ha
		Mustard	4.5-7.5 Q/ha	24-27 Q/ha
	Kharif	Bajra	4.5-7.5 Q/ha	20-24 Q/ha
		Groundnut	7.5-9 Q/ha	21-24 Q/ha
	Jayad		not taken	Tomato, Chilly, *Arbi*, Watermelon
Radoli	*Rabi*	Wheat	7.5-9 Q/ha	36-44 Q/ha
		Mustard	4.5-7.5 Q/ha	9-12 Q/ha
	Kharif	Bajra	4.5-7.5 Q/ha	20-21 Q/ha
		Groundnut	4.5-7.5 Q/ha	12-20 Q/ha
	Jayad		not taken	Tomato, Chilly, *Arbi*, Watermelon
Maharam -pura	Only 1 crop/year, yield of Wheat 7.5-9 Q/ha, Mustard 4.5-9 Q/ha			
Bibi ka -Baad	Only 1 crop/year, average yield for all crops is 4.5-7.5 Q/ha			
Bilaspura	Only 1 crop/year, average yield of Bajra 4.5 Q/ha (normal) - 9 Q/ha (good rains)			

5. The cost-benefit analysis shows that the structure has recovered its total cost, has started giving profits and will yield enormous benefits to the population of the area for a long time, given the proper maintenance, up-keep and care of the structure.

6. Increased participation of community in the village level institutions has strengthened democratization in the village functioning. Self Help Groups of women have been formed in the villages, bringing women to the core of the developmental activities.

7. The level of awareness among farmers regarding their livelihood resources, neighbouring environment and its management has shot up considerably.

2.4.2. Environmental Impacts

1. Land quality has been improved in about 2,900 ha through better soil and water management, coupled with advance agricultural practices.

2. Around 25 ha land, highly susceptible to erosion, has been covered under the farm field bunding. To ensure the safety of the earth work, waste-weirs were constructed at appropriate places to facilitate easier drainage of excess run-off.

3. The structure has provided effective drought-proofing by making water available to three villages round the year namely Bapugaon, Rupadi Khurd (since 1997 in both cases) and Maharampura (since 2002). A total of 310 wells have been enriched by the earthen-dams.

4. The earthen-dam has been instrumental in natural transformation of the quality of water, from brackish-saline to potable, in three villages - Bapugaon, Rupadi Khurd and Maharampura.

5. The structure has increased water-content in the soil

moisture zone in its area of influence. This is very important for maintaining physical, chemical and biotic character of the soil, which finally determines its fertility. Moreover, it is equally essential in maintaining the balanced level of micro-nutrients.

6. The overall number of healthy well-grown plants has increased and the rate of survival of plantations has also shown improvement in the area of influence.

7. The general standard of public health and hygiene has gone up, courtesy easier access to quality water.

8. Fishing is being done in the dam-reservoir (for the first time in the area) since 2001. The contracts are being awarded season-wise in an open conclave to the highest bidder. Income is deposited in the name of VDC. Details of the contracts are as follows:

Year	Amount
2001-02	Rs. 15,000/-
2002-03	Rs. 20,000/-
2003-04	Rs. 25,000/-
2004-05	Process due for Oct.-Nov.

3. ROLE OF THE VILLAGE DEVELOPMENT COMMITTEE

After construction, this earthen-dam with anicut was handed over to the community, i.e., the Village Development Committee of Bapugaon in 2000. Since then the VDC is directly responsible for the management, operation and co-ordination of this community asset. The VDC has taken steps to ensure the sustainability of the structure, listed below :

1. In order to maintain the health and well-being of the earthen-dam, upstream catchment of about 150 ha was treated.

2. In 2000, a part of embankment was on the verge of collapse. VDC mobilized the villagers and carried out the necessary repair work protecting the structure.

3. The top of this earthen-dam was slowly getting weathered, as a result of natural process, to the extent of beginning to threaten the structure in last one year. VDC prepared a plan of action and submitted a proposal to the *Gram Panchayat* in 2002. Finally in 2004, the necessary amount of Rs. 1.25 lakh was procured and the required retro-fitting of the top was done immediately.

4. The erosion of the slopes has now started as is evident by the presence of visible gullies and rills on the slope of the earthen-dam. VDC has embarked on an ambitious plan of stone pitching the entire slope of the earthen-dam. For this purpose, VDC has submitted a proposal under the state government's MADA Scheme in 2003-04, at a cost of Rs. 5 lakh. VDC is actively engaged in pursuing this proposal in official circles, along with the *Gram Panchayat*. Sustained efforts of VDC in this direction will soon show positive result, in the form of getting the proposal sanctioned, according to office-bearers. This will take permanent care of the erosion of slopes.

Thus the community asset jointly constructed by CECOEDECON and village community has been successfully managed by VDC since last four years. It is a beautiful example of building community asset through joint efforts and then its subsequent operation and management by the village community. This experience also shows that the coming together, VDC and *Panchayat*, jointly have a potential to work for their common goal - inducing qualitative improvement in village-people's life.

4. OTHER RELATED ASPECTS

It is important to understand that making a water source available to a village is not an end in itself. After building a community asset, and handing it over to the community, it is more important to rightly address the larger issues concerned with optimum utilization of water, sustainability of the community asset built, appropriate agricultural practices, restoring health and well-being of the catchment area through various techniques of treatment, management, operation and control of the community asset, regular maintenance and upkeep of the community asset, and other related factors, for its efficacy and sustainability.

The real challenge therefore starts after the completion of a community asset and its taking over by the community. The all-round balanced development of any area demands an integration of all natural, physical, man-made, technical, economic and financial resources, existing within its territorial boundaries, leading to optimization of output on a sustainable basis.

In this backdrop, CECOEDECON has initiated other related activities, crucial for the all-round development of the village, with a long-term perspective in mind. It will be relevant here to briefly overview these works.

4.1. Controlling Soil Erosion

Agricultural fields often suffer from soil erosion, leading to substantial decrease in the yield per unit area. It is essential to check soil erosion at the earliest, as it is relatively cheaper to arrest this menace in the beginning itself. The intervention of farm field bunding calls for construction of earthen bunds (embankments) around the affected land. In addition to checking soil erosion, this also helps directly in maintaining soil moisture by storing water run-off. This technology has been a great success in the area and farmers have readily adopted it.

Around 25 ha land, highly susceptible to erosion, has been covered under the farm field bunding. To ensure the safety of the earth work, waste-weirs were constructed at appropriate places to facilitate easier drainage of excess run-off. The result of this intervention is reflected in twin benefits generation of 750 man-days for employment and increase in the total yield by 30 per cent, compared to the current production level.

4.2. Empowerment of Village Community

Training module was designed on sustainable agriculture and improved technologies to impart among the beneficiaries aimed towards enhancing their capacities and capabilities.

4.3. Promotion of Gender in Developmental Issues

Women constituted 50 per cent of the population in Bapugaon and it was important to involve them in income generation and productive activities. For this purpose, 'Parvati'- a Self Help Group is constituted, having 20 members. Each member is saving Rs. 50/- per month since last two years. The group has opened a saving account in the bank with Rs. 30,000/- and is actively involved in thrift and credit works, both, at the organization and personal level. The members have started inter-loaning among themselves and credit is being used for both consumptive and

productive purposes like, health, marriage, agriculture, livestock purchasing, children's education, *etc.* Interest rate varies from 18 to 24 per cent per annum on reducing balance.

The socio-political empowerment of women is achieved through linking them with various development institutions like, banks, insurance, dairy and action committees. Training is being provided to these members on several subjects of relevance to day-to-day life such as, *Panchayati Raj* Institutions, micro-enterprises, *etc.* The members of this SHG are also being involved in various advocacy roles of the organization like drought monitoring, minimum support price, girl child education, *etc.*

4.4. Linkages with Panchayati Raj Institutions

CECOEDECON has adopted the Institutional Development Programme as a major strategy to bring about a qualitative change in the lives of the people in this village. As already mentioned, VDC is vibrant in facilitating the people's demands to reach the *Panchayati Raj* Institution. The primary objective of VDC is to make a platform available to the village community to deal with the village problems on a community basis. Similarly, it is also facilitating various *Panchayat* schemes and programmes to reach to the people of the village. The organization, with the help of the people and various other stake-holders has been instrumental in the construction of a community asset, which has literally transformed the economic life of the people of the area.

The formation of Self Help Groups and *Mahila Mandals* has catalyzed the process of women's participation in community level activities in the village.

4.5. Children's Education

It has also facilitated the starting of a school for the children of the village since no educational facility exists in Bapugaon. Earlier, villagers through *Gram Sabha* have submitted a proposal to the

Gram Panchayat to open a school in the village. Somehow due to reasons best known to them, *Gram Panchayat* did not accept this proposal. Therefore, the organization decided to provide educational facility and a local teacher was identified from the village, imparted with the necessary training and provided with an opportunity to teach the children of the village. The ready access to school for the children has helped in reducing the illiteracy in the village.

4.6. Awareness Campaign for Voters

Through different trainings and various awareness programmes, the organization played a vital role in helping people to become aware of their voting rights and the values of democratic process. This exercise has paved way for a fair election process in the region, which in its own turn has helped in selecting leaders contributing to the overall development of this area. This in no way should be misconstrued as the organization's support to any political party. It is primarily focused at making people aware of their legal and constitutional rights and their duties as responsible citizens.

5. SUMMARY AND CONCLUSIONS

The example of Bapugaon offers some valuable insights. Conservation and enrichment of natural resource base is of vital importance for ecological and environmental reasons and benefits accruing to dependent rural population. Community participation in this exercise is a decisive element. It emphasizes the need to replicate such smaller water harvesting structures in the villages, operated, managed and regulated by the community through village level institutions. This requires enhancing capabilities and building capacities of the community, hand in hand. Networking at district and state level is an important tool.

Advocacy with government apparatus and elected representatives is equally essential. Only a blending of all these elements can ensure the sustainability of a community asset. The Bapugaon presents a good example of all these components.

The immense benefits and related transformation of the rural economy accruing from this community asset highlights the fact that similar initiatives must be replicated on a large scale in rural areas, with the active involvement of local community. The case also demonstrates that community has the basic capacity, capability, talent and skill to manage, operate and maintain such assets for their sustainability, provided, a conducive atmosphere is created to it along with other inputs.

More significantly, the Bapugaon example offers cryptic plausible clues to the failure of co-operatives movements in 1950s and 1960s. These co-operatives were largely state-driven, too bureaucratic, cumbersome in structure, procedural-ridden in functioning, and controlled by rural elites; consequently were ill-fated to doom. This failure virtually destroyed the basic skeleton of co-operation among the village community. The case of Bapugaon shows that co-operation among different sections of the community at village level is possible, if an institution created is truly democratic in functioning, participatory in nature, and beneficial to the community as a whole, cutting across all the barriers of political and economic stratifications existing in the village.

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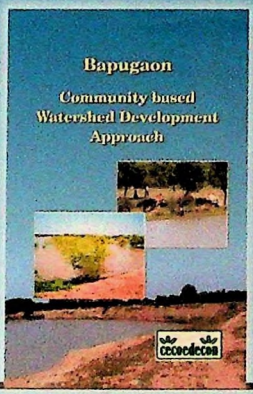

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