

# **ARTIFICIAL RECHARGE TO GROUND WATER IN HIVRE BAZAR, TAL/DIST. AHMEDNAGAR, (NASHIK REGION)**

## **SUCCESS STORY**

### **1. Brief Profile -**

Gram panchayat Hivre Bazar is located in Ahmednagar district of Maharashtra having about 226 families are residing in this village population of the village is about 1250. As per 1992 Survey, about 168 families were below B.P.L. Present day out of 226 families only 3 families living B.P.L.. Per capita income of the village is increased from Rs. 824 to Rs. 24,000. The village Hivre Bazar implemented the Ideal Village Project of Govt. of Maharashtra with the help of peoples of Hivre Bazar and NGO namely “Yashawant Krishi Gram and Watershed Development organization” in such a way that, Hivre Bazar was declared as Adarsh Gaon or Ideal Village.

### **2. Previous background –**

Before 1989, Hivre Bazar was a village known for the all the wrong things, It was known with problems, crime was high, infighting frequent and murders were happening too. Illicit liquor was plenty and most people migrated from the village in search of better earning opportunities .A village famous for the wrestlers had turned to be a village gangsters .All the activities in the village were focussed around the liquor dens.

Education was only till 4<sup>th</sup> standard that too only in a school of two rooms. Whoever wished to study high was required to go walking for 16 kilometers. The women percentage of literacy was mere 5 %. The income of the village was so less that only 5 families could be taken care of while the rest had to go to nearby villages in search of work to earn their daily bread. The health care scenario too was at its worst. There was no proper government care available. All these problems were silently giving rise to the crime rate and just to vouch for all these problematic scences, any govt.official used to get his transfers here as punishment.

### **3. Adarsh gaon panchasutri –**

In 1994 the ideal village project of state government was implemented in the village and was declared as an Adarsh gaon where the following panchsutras are followed and thus Hivre Bazar became an inspiration for all Indian villages.

- 1. Ban on free grazing.**
- 2. Ban on cutting trees.**
- 3. Ban on liquor.**
- 4. Family planning.**
- 5. Shramdan.**

#### 4. Watershed Development Programme –

Under the comprehensive watershed development programme, implemented by Zilla panchayat, the water conservation structures are constructed in the village given in the chart below.

<b>Water conservation structures of the village</b>					
<b>Sr. No</b>	<b>Type</b>	<b>No</b>	<b>Capacity</b>	<b>Percolated water</b>	<b>Store water</b>
<b>1</b>	<b>Percolation tank</b>	<b>2</b>	<b>100</b>	<b>10</b>	<b>140</b>
<b>2</b>	<b>Cement bandhara</b>	<b>4</b>	<b>2</b>	<b>0.4</b>	<b>5.6</b>
<b>3</b>	<b>Gabbian bandhara</b>	<b>0</b>	<b>0.5</b>	<b>0</b>	<b>0</b>
<b>4</b>	<b>Farm pond</b>	<b>3</b>	<b>7</b>	<b>1.05</b>	<b>14.7</b>
<b>5</b>	<b>Earthen Dam</b>	<b>52</b>	<b>0.5</b>	<b>1.3</b>	<b>18.2</b>
<b>6</b>	<b>CCT</b>	<b>210</b>	<b>Ha</b>	<b>37.8</b>	<b>0</b>
<b>7</b>	<b>Underground bandhar</b>	<b>0</b>	<b>0.5</b>	<b>0</b>	<b>0</b>
<b>8</b>	<b>Looze boulder</b>	<b>3035</b>	<b>0.01</b>	<b>1.52</b>	<b>21.25</b>
<b>9</b>	<b>Kolhapur type bandhara</b>	<b>6</b>	<b>2</b>	<b>0.6</b>	<b>8.4</b>
<b>Total</b>				<b>52.67</b>	<b>Cr.,ltrs</b>

#### 5. Water auditing and watershed management –

Hivre Bazar is a village in Maharashtra's drought prone Ahmednagar district. It was environment degraded, but less than a decade it turned itself into one of the most prosperous villages of the country. Water harvesting and watershed management depends on rainfall received by the watershed and its lithology. In village Hivre Bazar water harvesting and watershed management works are done after studying and analyzing water budget of the village. This budgeting was done under the technical guidance given by the District Groundwater Department. (G.S.D.A.)

Groundwater budgeting program was started in 2004 by people's participation in this village. By this innovative program total availability of water was calculated by measuring rainfall received by the village and regular monitoring of water level of six observation wells established in the watershed of the village. Collecting of rainfall and water level data is done by the villagers.

A budget of available water of the village was presented before gram sabha after monsoon season. After keeping drinking water and day today requirement of human beings and animals, Seventy percent of remaining water was used for irrigation purpose. Management of this water was done by modifying area of cultivation and type of crop to be cultivated and such resolution was passed in gram sabha. Since the village experienced drought in the past years and its position in drought prone area, about thirty percent of available water (excluding drinking and

domestic water) is preserved for future use by allowing it to recharge to the groundwater. So that declining groundwater level of the village is restored.

Water audit based on rainfall up to the month September for the year 2004 indicated that 8.65 crore litter of water deficient in the village as per proposed area of cultivation. Available water was managed for drinking, domestic and irrigation purpose according to the proposed water budget. In 2005 total 271 mm of rain fall was received by the village. During this year also 4.39 crore litters of water was deficit as per the proposed water budget. This deficiency was overcome by increasing drip irrigation from 57 hec. to 87 hec., decreasing area of higher water required crops and change in cropping pattern. During the year 2006 village received 549 mm of rainfall. As per last year's planning of cropping pattern, about 147.5 crore litters of water was surplus in the village. This surplus quantity of water was used for irrigation by increasing 150 hec. of jawar, 60 ha. of wheat & 50 ha. of Gram in rabbi and vegetable in hot weather.

From water audit it was cleared that if village receives above 400 mm of rainfall, it can manage ground water scarcity in summer season. Since the village receives an average rainfall of 350 to 400 mm rainfall, it experienced a shortage of water in the range of 5 to 8 crore liters. To overcome this shortage gramsabha of the village decided to ban drilling of bore wells for irrigation.

Area and type of crop during the year 2006-07

Sr .No	Season	Type of Crop	Required water/Ha in cr.ltrs	Area in Ha	Required water in cr.ltrs
1	Kharif	Moong	0.05	70	3.50
2	Kharif	Bajri	0.1	60	6.00
3	Kharif	Tur	0.05	7	0.35
4	Kharif	Onion	0.15	105	15.75
5	Kharif	Flower	0.1	10	1.00
6	Kharif	Green peas	0.05	30	1.50
7	Kharif	Jwari	0.05	15	0.75
8	Kharif	Maize	0.05	18	0.90
9	Kharif	Gram	0.05	12	0.60
10	Kharif	Gram	0.05	2	0.10
11	Kharif	Jwari (hulga)	0.05	2	0.10
12	Kharif	Vegitable	0.1	105	10.50
13	Rabbi	Jwari	0.35	210	73.50
14	Rabbi	Oil seed	0.15	17	2.50
15	Rabbi	Wheat	0.5	100	50.00
16	Rabbi	Gram	0.4	45	18.00
17	Rabbi	Onion	0.15	85	12.75
18	Rabbi	Potato	0.15	25	3.75
19	Rabbi	Vegitable	0.2	110	22.00
20	Perennial	Horticulture	0.15	40	6.00
Total				1057.66	229.55

Total available water

Available water = Area. in Ha x Rainfall in m	307.70	cr.ltr
Water stored in the soil 5%	15.39	cr.ltr
Water percolated in soil 10%	30.77	cr.ltr
Soil moisture 30%	92.31	cr.ltr
Additional water percolated due to water conservation	52.67	cr.ltr
Total available water	191.13	cr.ltr

Required water

Population x required water 50 lpcd x 365 days	2.08	cr.ltr
cattle x required water 30 lpcd x 365 days	1.31	cr.ltr
Water required for cultivation	229.55	cr.ltr
Water required for other purpose ( 2% of rainfall)	3.822691	cr.ltr
Total Required water	236.76	cr.ltr

Total available water - Required water =	-45.63	cr.ltr
Total reserved water =	-45.63	cr.ltr

Since rainfall is less when compared to previous year, area of cultivation and type of crop should be changed to manage above deficit

Area and type of crop proposed for the year 2007-08 in Gramsabha held on 25/11/07

Sr .No	Season	Type of Crop	Required water/Ha in cr.ltrs	Area in Ha	Required water in cr.ltrs
1	Kharif	Moog	0.05	110	5.5
2	Kharif	Bajri	0.1	75	7.5
3	Kharif	Tur	0.05	5	0.25
4	Kharif	Onion	0.15	137	20.55
5	Kharif	Flower	0.1	10	1
6	Kharif	Green peas	0.05	38	1.9
7	Kharif	Bajri	0.05	15	0.75
8	Kharif	Maize	0.05	20	1
9	Kharif	Gram	0.05	18	0.9
10	Kharif	Gram	0.05	2	0.1
11	Kharif	Jwari ( hulga)	0.05	2	0.1
12	Kharif	Vegetable	0.1	100	10
Water used in the kharif season cr.ltr					49.55
13	Rabbi	Jwari	0.35	125	43.75
14	Rabbi	Oila seed	0.15	20	3
15	Rabbi	Wheat	0.5	70	35
16	Rabbi	Gram	0.4	35	14
17	Rabbi	Onion	0.15	60	9

18	Rabbi	Green peas	0.15	20	3
19	Rabbi	Vegitable	0.2	45	9
20	perennial	Horticulture	0.15	40	6
Water usable in the next season cr.ltr					122.75
Total					172.3

Availability of water as per proposed cropping pattern

Population x required water 50 lpcd x 365 days	2.08	cr.ltr
cattle x required water 30 lpcd x 365 days	1.31	cr.ltr
Water required for cultivation	172.30	cr.ltr
Water required for other purpose ( 2% of rainfall)	3.822691	cr.ltr
Total Required water	179.51	cr.ltr
Total available water - Required water =	11.62	cr.ltr
Total reserved water =	11.62	cr.ltr

## 6. Artificial Recharge to Ground water and Rain Water Harvesting -

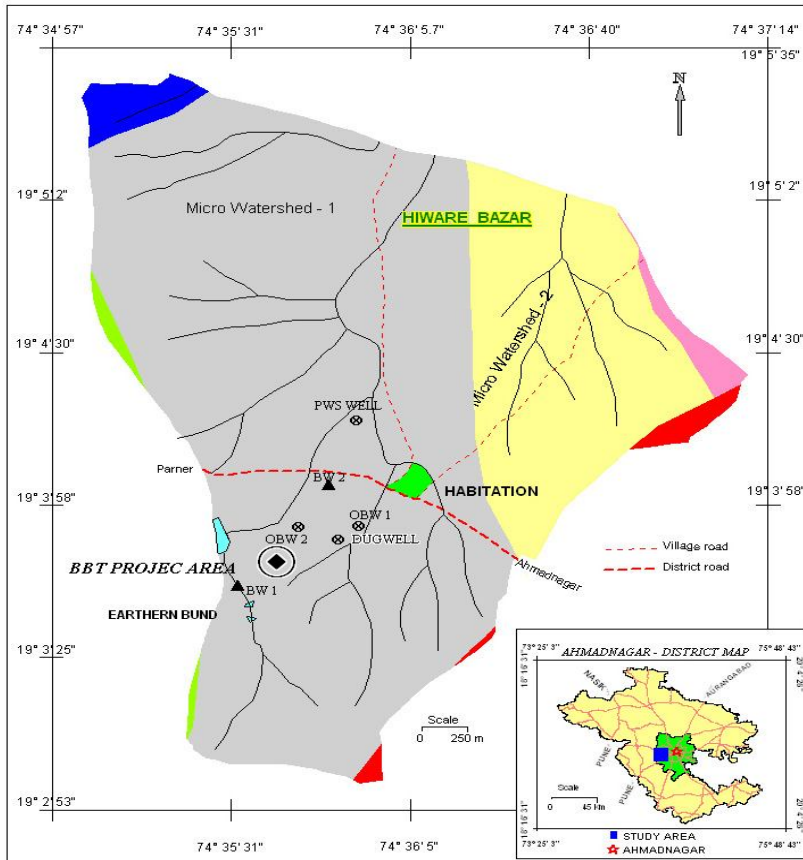
### A. Bore well Blast Technique (BBT) –

In 2006-07 after budget gramsabha decided to implement “Bore well Blast Technique (BBT)”, an unconventional method developed by Ground water Surveys and Development Agency ,Govt.of Maharashtra in the village to increase groundwater storage and recharge, to improve strengthen source of drinking water exists along down stream side of watershed. Geophysical study of village indicated that area above gaathan is favourable for BBT to interconnect the upper and lower fractures to improve ground water storage aquifer system in the area. About 103 bore wells of depth 5 to 18 meters were drilled by maintaining hydrostatic gradient in 1620 sq m of land. These bore wells are charged by ammonium nitrate based explosives and blasted to create artificial fractures and cracks in hard massive basalt formation.

#### TECHNICAL DESCRIPTION :-

The borehole blast technique was selected for artificially deviating shallow aquifer water of micro watershed in sw to microwatershed lying in the village shown in figure 1. The total of 103 bore holes were selected with the depth range of 5 to 18 mts. Vertical section of the project is shown in figure 2. Pre project water level of handpumps few mt south of project area and other drinking water bore well north of project area with two irrigation dugwells were selected to monitor the impact of project.

Bore holes of 150 mm. diameter were drilled in 18 rows with 2 to 12 numbers. Depth of bore holes are decided such, that hydrolic gradient is towards the drinking water source. The depth of bore holes are limited to shallow aquifer depth range 5 to 18 mts.



**Fig-1 Map showing location of the Hiware Bazar project area.**

**A total of 103 boreholes were selected with the depth range of 5 to 18 mts vertical section of the project is shown in fig. 2.**

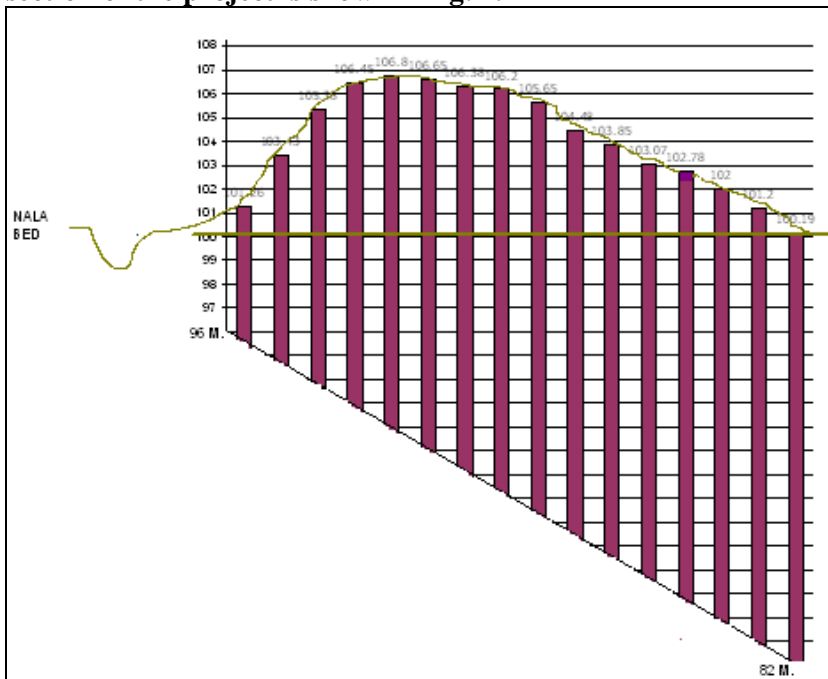


Fig-2: Map showing vertical section of BBT project area.

**IMPLEMENTATION:-**

The bore holes are drilled by DTH air hammer rig the collapsible portion of bore hole (weathered) was cased with pvc pipe. The distance between the bore holes that spacing 10 mts between 2 rows and 5 mts between two bore holes. The bore holes are arranged in staggering pattern. After drilling of bore holes suitable slurry based explosive was selected and lowered in bore holes to be blasted. Control blasting is preferred. 83mm diameter slurry explosive ammonium nitrate based with weight per bag 2.78 kg was used. Total 932 kg explosives was used. For each bore hole about 3 to 5 bags of explosives is put inside the bore hole at different depth. On an average about 2 bags are kept at the bottom followed by sand stemming. Each explosives was connected through the detonating cord (fuse) independently. Detonating cord coming out for each bore hole is connected to each other in series and finally one electrical detonator is used for firing. The short hole instantaneously fired with the help of firing cable and electrical exploder machine. Explosion at Hivre Bazar is done in two phases on 13<sup>th</sup> july 2007 48 bore holes was blasted and remaining 55 on 20<sup>th</sup> july 2007.



**RESULT:-**

It has been observed that hard rock shattered and fractures created show interconnectivity, large sound of moving water was heard from the bore hole and the water level of observation well increased to small extent. After the first phase of blasting impact on water level is not seen to large extent but after second phase of blasting water level is seen sudden rising and after 40 days rise of water level was about 12 mts and drinking water handpump become free flowing. Table no. 1&2. Thus the drinking water source become perennial, this is observed after post project study and reporting from local people. Rise in water level is shown on Plate no. 1 & 2. This project has benefited number of farmers like Shri Rawsaheb Pawar, Shri Shivaji Thange, Shri Laxman Pawar and Shri Pandurang Thange, who where taking one crop like maize / millet / onion / pulse and rarely second crop as wheat . Now they are taking 3<sup>rd</sup> crop like flower, vegetable, pea etc. Last year rainfall was 315 mm and this year rainfall is 277 mm, normally good rainfall in this area start from September month onwards. Thus the project success is clearly seen in the form of rise in water level in the benefited area towards village and water from one water shed / aquifer is diverted to other by artificial fracturing, by Borehole Blast Technique (BBT). Thus the additional water that will be made available from this B.B.T. method is 1.3 crore liters and per capita cost is 0.028 per litre.

**Table No. 1 - MONITORING OF BORE BLAST TECHNIQUES (BBT)**

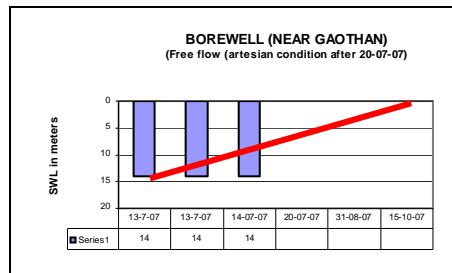
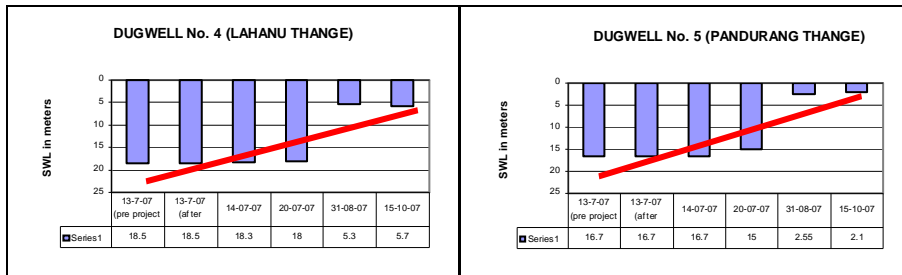
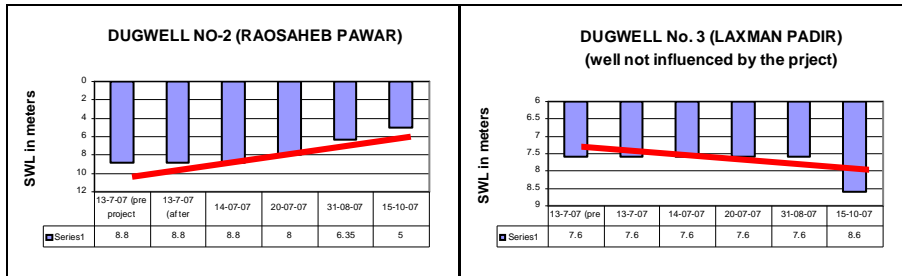
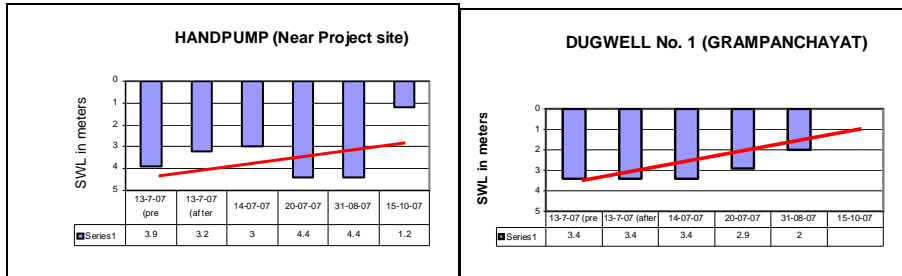
Sl. No.	LOCA-TION	NAME OF OWNER	STATIC WATER LEVEL (Depth in mts)						
			Depth of well (mts)	13 July 2007 Pre project	13 July 2007 after project	14 July 2007	20 July 2007	31 Aug 2007	15 Oct 2007
1	Hand pump	Grampanchayat	60	3.9	3.2	3	4.4	4.4	1.2
2	Dug Well No.1	Grampanchayat	18.9	3.4	3.4	3.4	2.9	2	G.L.
3	Dug Well No.2	Raosaheb Pawar	9.9	8.8	8.8	8.8	8	6.35	5
4	Dug Well No.3	Laxman Padir	13.8	7.6	7.6	7.6	7.6	7.6	8.6
5	Dug Well No. 4	Lahanu Thange	23.7.	18.5	18.5	18.3	18	5.3	5.7
6	Dug Well No. 5	Pandurang Thange	16.7	Dry	Dry	Dry	15	2.55	2.1



7	Bore Well (200 m from village)	Grampanchayat	60	14	14	14	FREE FLOWING (Artesian condition)
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**Plate No. 1**

**PRE AND POST WATER TABLE TRENDS**



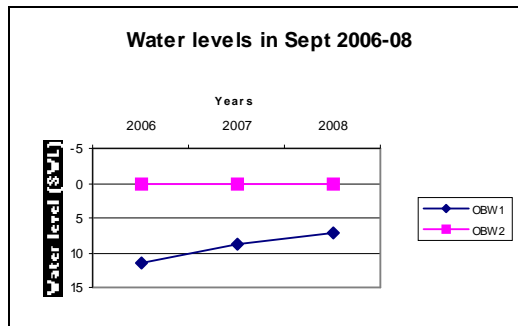
**Table no. 2 - OBSEVATION WELL SWL TREND**

WATER LEVELS (Depth in mts)			
MONTH	OBW 1	OBW 2	Remarks
<b>Before the Project</b>			
May-06	21.25	5.3	
May-07	22	6.1	
Jun-06	16.4	2	
Jun-07	14.1	4.3	
Jul-06	16	1.7	
Jul-07	13.9	3.9	
Aug-06	12.3	1	
<b>After the Project</b>			
Aug-07	11.6	0	Artesian condition
Sep-06	11.45	0.1	-do-
Sep-07	8.7	0	-do-
Sep-08	7.1	0.1	-do-
Oct-06	11.1	0.1	-do-
Oct-07	8.5	0	-do-
Oct-08	4.8	0	-do-

**Plate No. 2**

**Water levels in Sep 2006-08  
(Depth in mts)**

Month	OBW1	OBW 2
Sep-06	11.45	0.1
Sep-07	8.	0
Sep-08	7.1	0.1



**water levels in Oct 2006-08  
(Depth in mts)**

Month	OBW 1	OBW 2
Oct-06	11.1	0.1
Oct-07	8.5	0
Oct-08	4.8	0

## **REPLICABILITY:-**

This project can be replicable provided suitable site is available and there should not be restriction of strengthening only drinking water source but it should be considered for strengthening of groundwater.

## **7. Rain Water Harvesting -**

Two farm ponds and rain water harvesting structure on school building was constructed in village. This structure was constructed by school children's to generate awareness and motivation for rainwater harvesting among school children's.

Benefits acquired by implementing this project ground water storage is increased in the watershed of village. By constructing sewage water management system around hand pumps of village helped to feed water to plantation & animals. The innovative resolutions like ban on drilling of irrigational bore wells, implementation of watershed development works by 'shramadan'(voluntary labour) by the villagers, following the panchasutries of ideal village motivated the society in water harvesting and watershed management. The water available from R.W.H. is 7 lakh litres which is directly recharge to groundwater through drinking water borewell

## **8. Conclusion**

The comprehensive development of Watershed by constructing a number of bandharas, percolation tank, farm ponds, cct etc. and also by adopting the unconventional measure like bore blast technique the additional water is stored in groundwater. The village to be manages the groundwater properly to reduce the B.P.L. Just by giving water to farmer we reduce B.P.L. and also increase per capita income of village from 800 to 24000 Rupees.

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