

Environmental & Economic Sustainability Appraisal of Harsi Water Resources Project of M.P.

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Abstract

This paper presents the study of an Old Major Water Resource Project constructed on river Parwati, a major tributary of river Yamuna. The Harsi Water Resource Project comprised a construction of 29 m. high and 2133 m. long earthen/masonry Dam, along with 77 m long spillway and a construction of 418 km of earthen channel to irrigate Kharif 7085 ha Rabi 20243 & 3936 ha of sugarcane, land, in two hundred villages of Dabra & Bhitwar tehsil of Gwalior district of M.P. The paper focuses on "the environmental & economical development due to this project". The physical benefits anticipated in the project report are compared with the real sector benefits received. The after effect of this water resource project and developments have been analyzed with respect to ground water level, drinking water its quality, rain fall, soil erosion, awareness on sustenance of life, increase of dairy culture, pasty culture, health factor & food chain of the animals of the area. Thus the paper presents a scenario of environmental & economical benefits received from this Old major water resources project. This project has brought lots of development to the project command area. It proves that water resources development has friendly thread with environment, economy and ecosystem.

Introduction

Harsi Project was constructed between year 1928 - 1935. It was originally designed to irrigate 31364 hectare of crops. The cost of construction of Harsi project was Rs 31.68 lakh only. The dam is located 100 km away from the Gwalior and 55 km from Dabra town. The approach to dam site is by tar road, motorable during Monsoon.

Present Status of Project

Performance of Harsi Dam has been satisfactory since the construction. The development of irrigation was quite fast and beyond the designed potential. Due to ever increasing demand of irrigation water in the command area, shortage of water is experienced every year. It is already 70 years old system and has delivered many fold benefits

to the society and the ecosystem than originally envisaged. Harsi canal system comprises of 65 km of Main Canal with 33 distributaries, 43 minors and 17 sub- minors, having the total length of 418 km. The canal system though had been designed to irrigate 31364 hectare of land, but presently it irrigates average 39136 hectare of land i.e. 113 % of designed irrigation. The discharge carrying capacities of canals has reduced by about 25%. Harsi project is now being rehabilitated and modernized with latest state of art in the field of canal automation and Integrated Water Resources Management through World Bank Aid. After restructuring of the canal system irrigation potential of Harsi Project will be enhanced to 58158 ha that is 190 % of the original designed potential. Enhanced water demand for Harsi Project will be supplemented by Madhi Kheda dam which is situated on U/S of Harsi Dam.

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Geology of Dam Area

The dam is constructed on fairly extensive granite rocks and presently the condition of dam is satisfactory. In this region the river bed is 200m. wide with fairly extensive exposed rock. The dam axis and spillway is proposed on the rock bed. The drilling results have been logged by Geological Survey of India (GSI). The courses of rock obtain have been got tested.

Salient Features of Harsi Dam

(i)	Catchment area	777.50 Sq. km.
(ii)	Full – tank level, (F.T.L.)	R.L. 264.93 m
(iii)	Maximum water level, (M.W.L.)	R.L. 267.31 m
(iv)	Top of bund, (T.B.)	R.L. 270.36 m
(vi)	Length of dam	2133.60 m
(vii)	Maximum height of dam	29.26 m
(ix)	Agriculture Statistics -	
	(a) Number of Villages to be served	200 No.
	(b) Gross command area (GCA)	91057 Ha.
	(c) Cultural command area (CCA)	68392 Ha.
	(d) Design Irrigation (Existing)	53158 Ha.

Harsi catchment, Water Quality and Domestic water Requirement

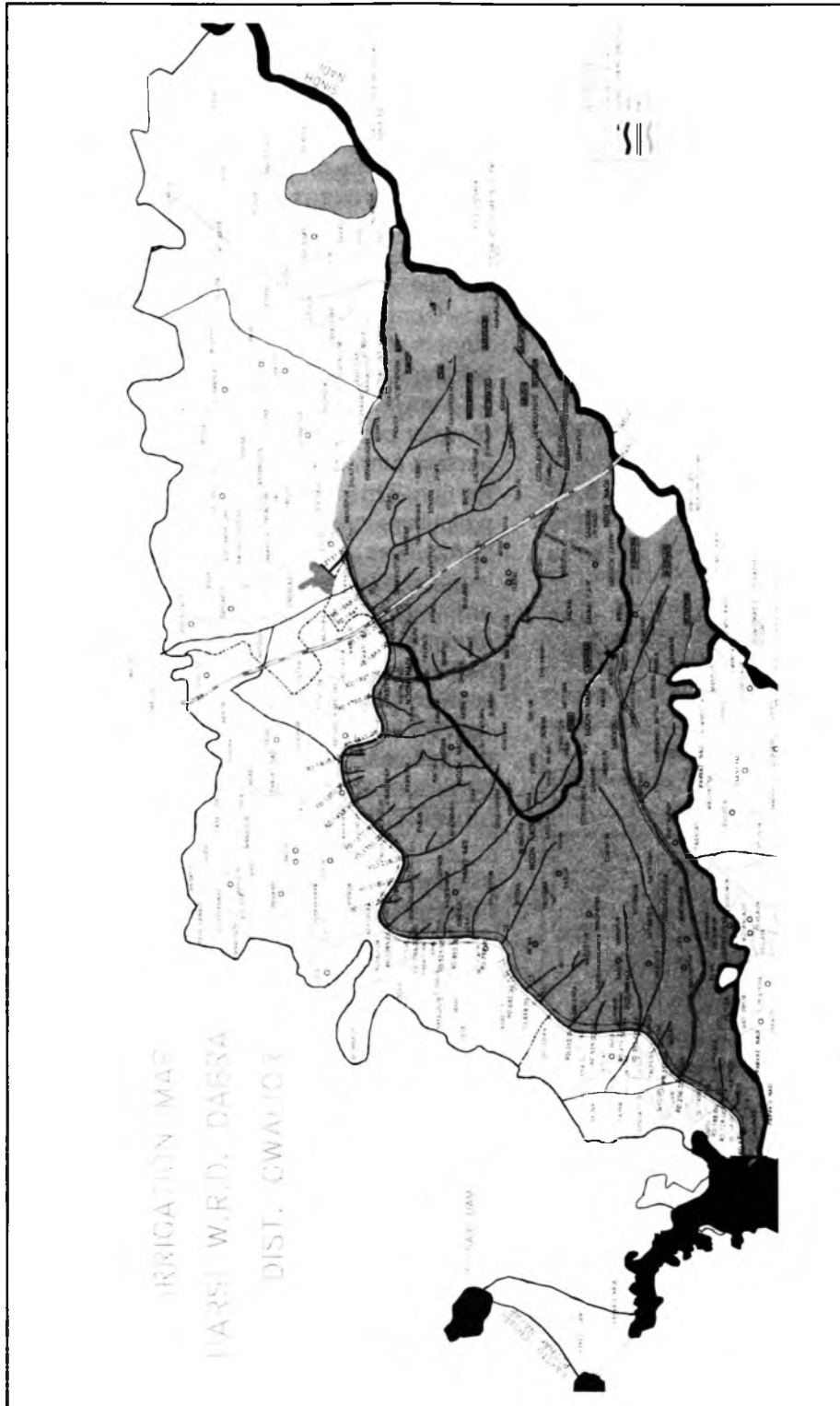
The catchment of Harsi dam is in the Shivpuri & Gwalior district and is a part of Yamuna river basin. The catchment is fan leaf shaped with gentle general slope. Most of the catchment (60% -70%) area is covered with thick forest, fairly dense jungle, so the water reaches to the dam site contains less percentage of the silt, residual fertilizers and pesticides. The quality of water stored in the reservoir full fills all the requirement of potable water of about two hundred beneficiary villages of the command area and this catchment's works like a lagoon.

Drainage and Water logging problem in Harsi command

The problem of water logging in the Harsi command had been first noticed in the early years of irrigation, it was observed mostly in the filling reaches of main canal & bigger distributaries. Seepage drains on the sides of the main canal and distributaries were constructed to drain out the excess water and reduce water logging. Further, the substantial tapping of ground water by the farmers had the positive impact that considerably reduced the water logging. It is found during the site visit and interaction with departmental officers that the proper lining of main canal, distributaries & in problematic reaches will save precious water and avoid threats of water logging in future. It is also observed during the visit of command that the cultivators of the area dug the tube well, due to which water logging problem has been eliminated up to great extent and with the help of these tube wells farmers are supplementing the crop water requirements during peak demand.

Utilization of wastewater, its effect on ground water table

It was found during the site visit that, at the time of irrigation period there is appreciable recharge in the ground water, which finds way in the local Nalla's of command areas. This substantial quantity of wastewater is collected in local nalla's ultimately join the river Noon that flows from the center of the command and forms the central drainage for the Harsi command. This wastewater is collected at Salwai Pick Up Weir constructed across Noon river and is re-utilized in irrigating 4700 ha of land in the tail areas of Harsi command there by reducing the conveyance and irrigation losses and enhancing the overall productivity of water.

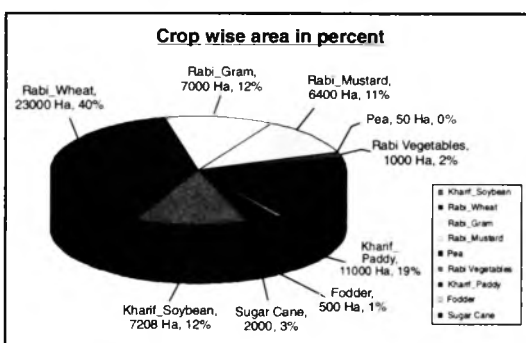
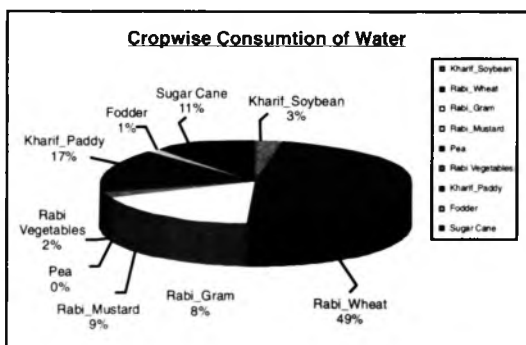


Command Area Map of Harsi Project

Enhanced crop area and water consumption under water sector restructuring programme

It is proposed to irrigate 58158 ha land after restructuring of Harsi Project. The modified crop wise area & water consumption are shown below in table/fig:

Crop	Modified area (ha)	Water consumption (in cum)
Kharif_Soybean	7208	10.30
Rabi_Wheat	23000	178.70
Rabi_Gram	7000	31.20
Rabi_Mustard	6400	34.00
Pea	50	0.51
Rabi Vegetables	1000	7.79
Kharif_Paddy	11000	63.56
Fodder	500	5.15
Sugar Cane	2000	18.60
Total	58158	349.81



Proposed Project benefit and poverty alleviation impact

The proposed area for irrigation under restructuring programme of Harsi project is 58,158 ha. The modernization proposal, of this project, focuses on maximizing water productivity, including green cover protection, picking up friendly thread with environmental, planting of tree due to easy availability of water. It is found that in the command 61% of the farmers are small farmers with an average land holding is less than one ha.. During the site visit and interaction with the villagers low level of water productivity is observed, even two-hectare farm can support only half of farmer family. This proposal aim to consider agriculture intensification, diversification with horticulture, livestock and fisheries. This targeted improved service delivery in irrigation, drainage and other sector support asset modernization program. This improved service delivery is expected to close the gap of 25% area and will provide efficient improve water delivery in the old irrigating area especially in the tail reaches. The crop wise area and benefits in percentage are shown below in figure as well as in table :

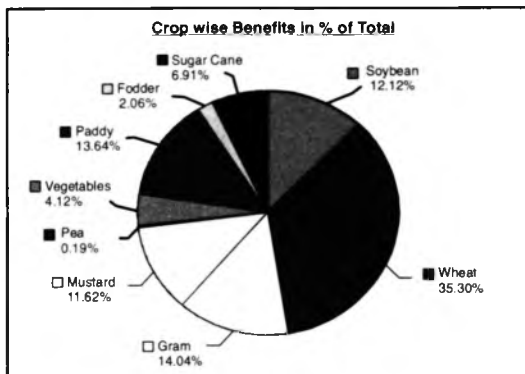
The agriculture intensification and diversification in the project area will increase the crop yields. The estimated irrigation coverage and service delivery with scheme productivity improvement interventions in the new proposal, will increase the annual production of major crops such as, cereals 405801t., soybean 105901t., pulses 5280t., oilseed 8550t., vegetable& fruit 286251t., fodder 144001t. and sugarcane 170400t. at project completion (in a period of 4-5 year). The annual incremental financial benefits arising from these agriculture production will be Rs. 36482000 in first year. It is estimated that this project proposal would positively impact 24856-farmhouse holder, out of these 18734 farm families currently living below poverty line (35% of total number of farm families presently living below poverty line)

would obtain sufficient benefits enabling them to move above poverty line.

The restructuring project proposal focuses on improving water resources management and service delivery to maximize the water productivity in 58158 hectares area. After visiting the site and interaction with people of command area, it is found that if water sector related institutional reforms and scheme based physical interventions in association with agriculture intensification and diversification are implemented in real sense, it will maximize and sustain the productivity of water and improve environmental status.

The Economic rate of return of the project will be increase to 14.50%, which is much above the opportunity cost of capital, yielding & the Net Incremental tangible benefits worth Rs.540crore during the cycle of 25 years. The

Name of Crop	Area in Ha	Net Benefits in Rs.	Area of crop in %	Crop Wise Benefits in % of Total
Soyabean	.208	7.78	12	12
Wheat	23000	225.10	40	35
Gram	7000	9.01	12	14
Rabi Mustard	6400	7.46	11	12
Pea	50	12.21	0.09	0.19
Vegetables	1000	264.26	2	4
Paddy	11000	8.76	19	14
Fodder	500	1.32	1	2
Sugar Cane	2000	4.44	3	7
Total	58158	540.34	100	100



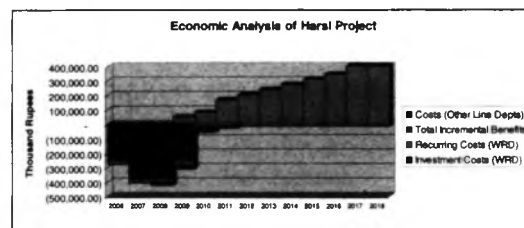
incremental benefits crop wise in percent: by the project shown below graphically.

The economic analysis of Harsi Project after restructuring is shown below in the table as well as graphically:

Animal Husbandry

It is found after the site visit and discussion with people of command and around the area of the project, that presently the area feels shortage of milk, eggs and meat products. It is found that there is rich availability of fodder and cattle feed production within the command of the project. This favorable condition should be utilized in improving the activities of animal husbandry sector. Similarly activities in the field of livestock management, production, processing and marketing of milk, egg, meat and wool may be developed. This restructuring will definitely a mile stone for development of economical and environmental status of the area.

Economic Analysis after restructuring of Harsi Project :



Agricultural Extension and Development of Agriculture Activities

The climatic conditions and soils within the command area of the Harsi project are suitable in prima-facie to grow different crops of Rabi and Kharif season. The agriculture production has been increased from 6 quintal per ha 16 quintals per ha due to irrigation facilities made available. After restructuring it will be more. It was found after the site visit that for improving cropping intensity, productivity of water and

diversification, awareness in the people will be develop for reducing dependability on costly and harmful agrochemicals and promoting ecologically sustainable irrigation. The index map of the Harsi project is shown in Fig. 1.

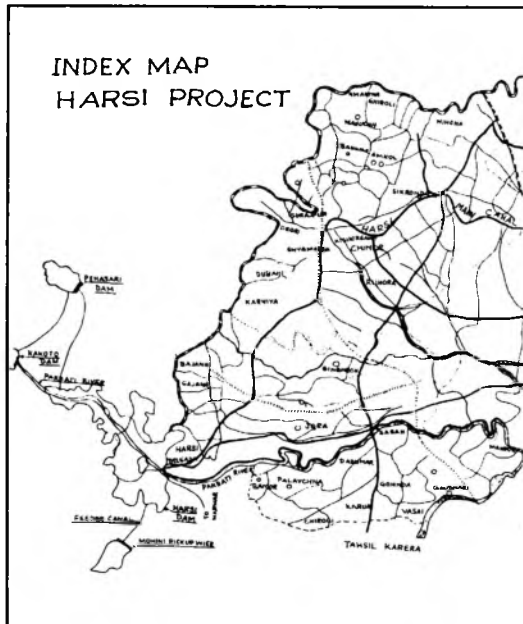


Fig. 1

Marketing of agriculture products

Marketing today depends on information system i.e. on adequate information about what

people want, at what price and demand and supply of agro based commodities, so that the farmers get a reasonably price by selling their produce in regulated markets as compared to rural village and un regulated markets.

To benefit the farming communities from the new global market access opportunities the internal Agriculture marketing system of the project area needs to be strengthened. This information communication technology will open considerable opportunities for the rural poor, both in terms of direct employment and in improving their linkages with the market.

Conclusion Remarks

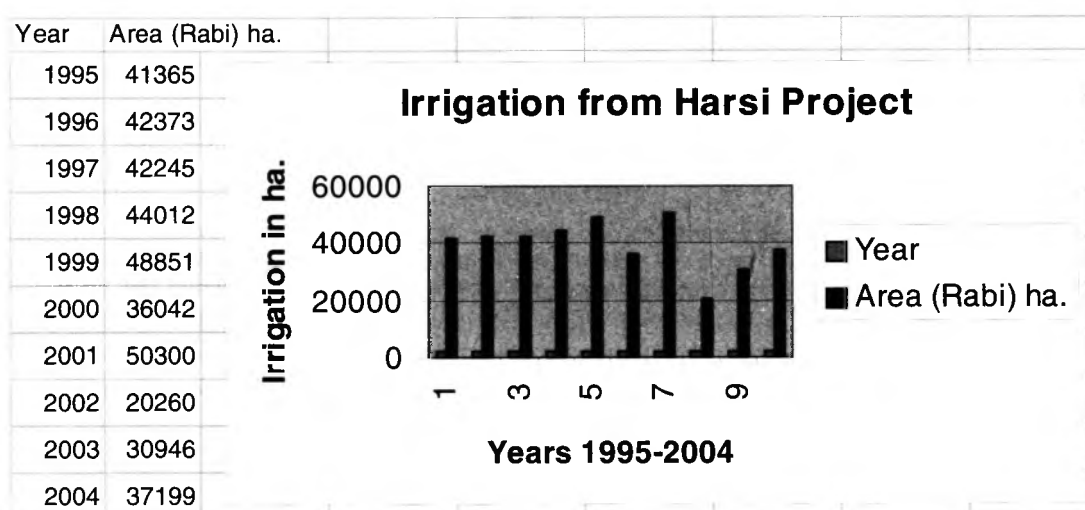
The Impact study of this Old Project of Madhya Pradesh has lot of developmental achievement in ecosystem, animal food chain improvement, water quality and availability for surface/ ground water upliftment. Its existence is a friendly thread for environmental and economy conditions for the project area. The direct and indirect benefits from this Old project prove that this dam is a life- line for command area. The submergence of small percentage of forest and agriculture land at the time of construction have no negative impact, looking to the increase in the strength of sector like dairy culture, animal husbandry, communication, bio diversity, greenery, self forestation and water productivity,

		Discount Rate =	12%	HARSİ PROJECT				
	NPV	(Thousand Rs.)	2006	2007	2008	2009	2010	2011
	(960,667)	Investment Costs (WRD)	(253,351.32)	(380,026.99)	(380,026.99)	(253,351.32)	-	-
	(134,102)	Recurring Costs (WRD)	-17098	-17098	-17098	-17098	-17098	-17098
	(84,529)	Costs (Other Line Depts)	(6,620.35)	(6,620.35)	(26,481.38)	(39,722.07)	(39,722.07)	(13,240.69)
	(1,179,298)	Total Incremental Costs	(277,069.67)	403,745.33)	(423,606.37)	(310,171.40)	(56,820.07)	(30,338.69)
	(1,404,932)	Total Incremental Benefits	-	-	-	48,993	82,132	165,219
	225,634	Incremental Net Benefits	(277,070)	(403,745)	(423,606)	(261,179)	25,312	134,880
IRR =	14.1%	Cutoff IRR =	12%					

Irrigation Figures of Last 10 Years

(Area in Hectares)

S. No.	Year	Gram	Wheat	Paddy	Soya	Sugar cane	Others	Total
1	2004	3348	26788	2747	2236	160	1920	37199
2	2003	3418	26043	0	0	0	1485	30946
3	2002	3200	15200	260	0	0	1600	20260
4	2001	6300	20450	20000	0	300	3250	50300
5	2000	3750	13967	16000	0	365	1960	36042
6	1999	5410	22115	17826	0	490	3010	48851
7	1998	6670	21934	12033	0	600	2775	44012
8	1997	6590	22010	10365	0	600	2680	42245
9	1996	6990	20689	10574	0	520	3600	42373
10	1995	6540	20190	10700	0	665	3270	41365



public health and pollution control. It also proves that the Dams built for vital development of irrigation, agriculture, water supply and flood control etc. Finally the water resources development should be encouraged. A balance auditing is necessary for negative and positive environment and economical impact for any water resource project before and after construction, which will definitely be helpful for future resource development. The water resources development project thus also justifies their need for sustainable and integrated development of the area.

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