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A CRITIQUE

BY

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ON
'UNRAVELLING BHAKRA'

BY SHRIPAD DHARMADHIKARY
OF MANTHAN ADHYAYAN KENDRA, BADWANI

July 2005

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Foreword

In the recent decades, there had been a keen debate on the role of large dams in the development of a nation. The setting up of the World Commission on dams and its report that came out in 2000, saw an even greater polarization of the dams debate. The scientific performance evaluation of some completed schemes was considered useful in taking an enlightened rational view in the matter. Thus, when an opportunity arose in 2003, the Centre for Policy Research undertook a project to study the 'socioeconomic and environmental impacts of the Bhakra-Nangal project'. The Centre was lucky to utilize the able services of R.Rangachari, Honorary Research Professor, as the project director for that study. Rangachari completed the study in a record short time. He had prepared the report in about a year but this is still under publication.

Meanwhile, our attention has been drawn to a book published in April 2005 by Shripad Dharmadhikary of the Manthan Adhyayan Kendra, entitled UNRAVELLING BHAKRA, based on a three-year study. This was found to be highly critical of the Bhakra-Nangal project.

We considered that this book by Dharmadhikary should be quickly reviewed and commented upon. We once again requested Rangachari to do so in the light of the knowledge he gained through the recent CPR study. I wish to acknowledge with gratitude Prof. Rangachari's acceptance of our request and for preparing his critique on the book in less than a month.

It gives me great pleasure to present Prof. Rangachari's "A Critique on Unravelling Bhakra". The impacts of large dams has been a subject matter of intense scholarly debate. Prof. Rangachari is one of the most eminent contributors to this debate. In that larger study and debates over the consequences of big dams, that on the Bhakra-Nangal Project will be an important landmark. In this paper Prof. Rangachari has engaged with some interlocutors whose conclusions about the Bhakra Dam differ from his own. He does this in the spirit of critical debate not in the spirit of ideological polemics. I hope this paper will contribute to better understanding of the issues.

Centre for Policy Research
New Delhi 110 021
July 2005

Pratap Bhanu Mehta
President

About the Author

R. Rangachari was formerly Member, Central Water Commission and Additional Secretary to the Government of India, Ministry of Water Resources, New Delhi; Chairman Brahmaputra Board, Guwahati, Chairman, Ganga Flood Control Commission, Patna; Member, Indo-Bangladesh Joint Rivers Commission; Chairman, Indo-Bangladesh Joint committee on Implementation of the Ganga Waters Treaty. He was also Research Professor, Centre for Policy Research on the multi-country study of cooperation on the development of the Himalayan Resources (1992-2000). His recent publication includes "A Framework for the Sustainable Development of the Ganga Brahmaputra Meghna Region – India Water Vision – International Water Resources Association – University Press, Dhaka", "Large Dams: India's Experience", a Commissioned Report for the World Commission on Dams (Mimeo), and "Cooperation on Eastern Himalayan Rivers – Opportunities and Challenges", Konark Publishers, Delhi.

A CRITIQUE ON 'UNRAVELLING BHAKRA'

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A CRITIQUE

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on 'UNRAVELLING BHAKRA' by Shripad Dharmadhikary, Manthan Adyayan Kendra, Badwani, Madhya Pradesh, India, April, 2005

1. Overview of the Manthan Study

The overview of the publication by Shripad Dharmadhikary entitled - **'Unravelling Bhakra : Assessing the Temple of Resurgent India'**, brought out by Manthan Adhyayan Kendra Badwani, Madhya Pradesh, in April, 2005 can be summed up, for the most part, in the words of the author (pp xvii to xxvii), as follows:

The mesmerising display of the 'Green Revolution" (GR) in the fields of Haryana and Punjab is matched by the spectacular statistics of agricultural growth. In Punjab, the food grains production went up from 3.389 million tons in 1965-66 to 17.221 million tons in 1985-86 and 25.197 million tons in 1999-2000. In Haryana, in the same period, food grains production increased from 1.985 million tons to 8.147 million tons and finally stood at 13.065 million tons. (p.xvii)

As a result of the Manthan studies, the old saying' appearances can be deceptive' was found to be true in this case. Manthan found that the long-held popular beliefs and perceptions are mostly just that---beliefs. (p. xvii)

Punjab and Haryana are much more than Bhakra[1]. Only 30 % of the area of Haryana lies in the gross command of Bhakra. In the case of Punjab, it is only 18.6 %. Punjab had an extensive and highly developed irrigation system for a long period before the Partition. The Western Jamuna and Sirhind Canals are more than a century old. Around 1950, 35.3 % of Punjab's sown area was irrigated. In PEPSU, it was 42.6 %. Punjab and PEPSU together accounted for 13 % of the country's irrigated area, while accounting for only 5.89 % of the total sown area (p.xviii).

The decision to build Bhakra and its design were motivated more by the desire to strengthen the negotiating positions in the inter-state disputes between the provinces of Sind and Punjab of the British days (carried over later into an Indo-Pakistan dispute), than addressing the water needs of dry areas (p.xix).

Bhakra was an over-designed dam. As in most other dam projects, the area to be irrigated by the project was exaggerated. The startling fact was that Bhakra did not add

[1] It has been clarified that throughout the 'report, unless the context so indicates, or it is specified otherwise, the term "Bhakra" or "Bhakra project will refer to the entire Bhakra-Nangal project".

any new areas under irrigation it only transferred the irrigation from one area to another- from the Sutlej valley project area to other upstream areas (p.xix).

The Bhakra project did not produce any dramatic impact on the country's food grains situation. Irrigation from Bhakra began in 1954, increased rapidly and reached its full potential by 1963. Yet India's food grain production continued to deteriorate. Imports of food grains continued for 20 years after irrigation deliveries started (p. xix).

Around 1967 came the Green Revolution (GR), primarily with the advent of high yielding variety (HYV) seeds. These needed increased inputs like chemical fertilizers, pesticides, cheap credit, minimum support prices and, of course, water. It was said that Bhakra was the key in enabling the GR and that it helped increase production by bringing hitherto wastelands into cultivation. The Manthan study found that the ground realities were quite different. Substantial increase in the cultivated area was only in the dry belt of Haryana in the Hisar tracts. The contribution of this to food grain production (FGP) was very limited. Irrigation was a crucial component in the GR but Bhakra itself played a limited role. Bhakra accounted for less than a third of the Haryana area and less than a fifth of Punjab. The rest of the canal areas were from other century-old projects (p. xx).

Far more important than canal irrigation has been the role of ground water (GW). The explosive growth of GW was the real driving force behind the GR. Tubewell (TW) productivity is also documented to be more than 1½ times canal productivity (p.xxi).

It is argued that TW irrigation in these two states was made possible by canals. TWs are lifting the water that had seeped from the canals. But this is widely off the mark. A large part of the GW drawn by tubewells in the two states is the mining of old accumulations. Manthan holds that 43-46 % of all agricultural production in Punjab is based on such unsustainable mined ground water. For Haryana, the figure is 35 % (p.xxi).

The Manthan calculations are that the contribution of Bhakra is only 11 % in Punjab and 24 % in Haryana. In other words, the contribution of Bhakra to India's foodgrain production and the agricultural prosperity of Punjab/Haryana has been limited. Bhakra has been given the credit for things it never did (p.xxii).

In evaluating the limited benefit of Bhakra, the other side of the balance sheet should not be forgotten. Water logging and salinisation in the Bhakra command is a serious issue. Diversion of most of the water at Nangal and Rupar meant serious consequences downstream. About 10% of the live capacity is lost in siltation. The oustees of the project have not been fully settled yet. The farmers of Punjab and Haryana are being pushed towards economic displacement. They are paying a high price for their short-term prosperity, which will be followed by long term permanent devastation. Even as we trumpet that we are self-sufficient in food, that we export food, millions still go hungry in the country (pp. xxiii-xxiv).

The above is the summary, in about 800 words, of the report on the Manthan study on the Bhakra-Nangal Project, running to about 300 pages. The study was

conducted by a group of activists led by Shripad Dharmadhikary over a period of more than three years between December 2001 and April 2005.

2. The Iconoclasts

The Manthan study found *everything* wrong with Bhakra. It concluded that whatever prosperity is now found in Punjab and Haryana is unsustainable and that these two states are on the brink of disaster.

Manthan found the 'Bhakra dam and project to be a most ordinary project, an ordinary dam much like any other large dam - with all its flaws and blemishes' (p. 229).

Why has Shripad Dharmadhikary been so harshly critical of Bhakra and of Punjab and Haryana? Some clues could be obtained from the concluding chapter of the book (chapter 14) where, among other things, the following points are made: (pp.229-238)

i) The areas proposed to be irrigated by the project had been highly exaggerated –-a familiar phenomenon in large dam projects.

ii) It was not much different as far as performance went. Indeed, its performance has been at gross variance with its larger-than-life public image.

iii) We started with the widespread public perception that Punjab and Haryana are the granaries of the nation and that this was due to Bhakra. The Punjab = Bhakra (and to a lesser extent Haryana= Bhakra) is an equation entrenched in popular mind in India. We found that this was far from the truth.

iv) Bhakra would not be responsible for more than 31 % of Haryana's production and 20 % of Punjab's. This is a far cry indeed from the public perception of Bhakra's role.

v) There is a huge debate that is of enormous contemporary relevance and significance, but it is not our intention to go into it here. We will touch this debate in one respect though- and that is the use of the Bhakra dam project as a model to justify large dam building programmes elsewhere in the country. Proponents of large dams point to the spectacular success of agriculture in Punjab (and to an extent in Haryana) and attribute it to the Bhakra project. This is then used as an argument to advocate, justify or otherwise push for other large dam projects.

vi) The Bhakra project, used as a proxy for the agricultural "success" of Punjab, is used as an argument to end all arguments against large dams. The Manthan study has shown that the argument is wide off the mark. The agricultural success of Punjab and Haryana has been a short burst of prosperity that is not only stagnating but also is plunging into economic, ecological and social crisis. And even this short burst has had little to do with Bhakra. Hence, the use of Bhakra as an argument to justify other large dams is a highly specious argument.

Clearly, the anti-dam lobby was highly worried about the icon-like status achieved and sustained over these years by the Bhakra project, and the overwhelmingly beneficial picture about the project embedded in the public mind. It was even more

concerned that the success of the project, if not challenged, might lead to public support for similar large dam projects elsewhere. The detractors of large dams wanted to destroy the "Icon called Bhakra". So the iconoclasts were encouraged and supported to attack it in every conceivable way. This seems to be the motivating cause for the savage attack mounted on every aspect of Bhakra in the Manthan study. (We shall soon see whether these attacks had any justification, supported by rational evidence.)

This conclusion gets strengthened by the material available in the Preface, which starts off by pointing out that –"Indeed, the Bhakra project has become an icon in the developmental history of independent India" [2] (p. ix). It further states that the prosperity of Punjab, the huge production of food grains in Punjab and Haryana, the surplus produced by these states that provide support to the rest of the country, are all repeatedly cited as testimony to great benefits of the Bhakra project" (p.ix). Referring to the Report of the World Commission on dams (WCD), the Preface says- "Against this background of India's long experience with large dams, the findings of the WCD and the mounting national and international evidence, it was intriguing to hear the unqualified absolute and lavish praise of the Bhakra project" (p.xi). This answers the question posed earlier. There was a desperate need for the iconoclasts to attack the project in every way and try to smash this icon called Bhakra into smithereens. Only thereafter, could the large dams debate be, perhaps, diverted to their advantage.

The Manthan study is not just an evaluation of the Bhakra project but a general criticism of all large dams and the listing of all likely adverse impacts, in which Bhakra is used as a typical example that allegedly confirms their pre-decided conclusions.

The author often goes back and forth in the narration, moving from the specific study on Bhakra to the general issues against large dams or mega-projects. The specifics about Bhakra and the general debate on dams could have been separated. In this analysis, as far as possible, we shall not enter into the debate on large dams but try to generally restrict ourselves to what was said about Bhakra alone.

3. What Manthan evaluated and what it did not

Any *expost facto* evaluation of a completed project seeks to find out what the Project report set out as its objectives and check what its actual performance revealed. It also seeks to ascertain the unintended, incidental and indirect impacts- positive or negative. The Preface mentions these objectives (pp. xi-xii) as the first two issues. In addition, the Manthan study decided to examine the present claims and the popular perception of the project, and compare these with ground realities. It has not been explained as to whose 'claims and perceptions' these were and how they were determined. In any case, they are not what the project report claimed that it would achieve.

[2] Here and elsewhere in this critique, sometimes in the interest of continuity or brevity, minor modifications can be found. The original version in the book can always be referred to, using page references cited.

Page xii of the Preface says that -"Due to limitations of time and resources, we have not been able to study two important aspects of the project, namely the claimed flood control and drinking water benefits. We hope to fill the lacunae in the future". Note how cautiously the author has inserted the word 'claimed' before flood control and drinking water benefits. Even when he stated elsewhere in the Preface (p xix) that "the reservoir has not filled up in most of the years", he maintained a deliberate silence regarding its implication on flood management. The study listed elsewhere (pp 139-140) the number of years in which the reservoir did not fill up to the design level, and, here too, remained silent on its implications on flood management. If a future report from the author would emerge on these two aspects, in the general pattern of the present report, one might see further criticisms on these aspects, too.

The main objectives of the Bhakra-Nangal Project, as stated in the project report (which formed the basis for its approval), were irrigation and hydropower development. The incidental and indirect benefits were listed as immunity from famines and prosperity for the agricultural community, increase in the production of food grains/ cash crops, flood control, industrial development, reclamation of state waste land and refugee rehabilitation. Manthan has not examined most of them.

There is a deafening silence in the Manthan report as to why the evaluation of the project did not examine its promise and performance over five decades with respect to hydro-power, industrial development, refugee rehabilitation etc. Even in regard to irrigation, one is intrigued by the non-mention and non-evaluation of the entire Rajasthan part of the project, covering over 1.08 million acres or 438,000 ha of the gross command. The preface says "due to the overwhelming association of Bhakra with food grains production, this is the aspect that we chose to focus on". If this were so, how can the study ignore food grain production from more than a million acres in the Rajasthan part of the Bhakra command?

The study will remain an incomplete evaluation without examining all these aspects of the Project. We shall now turn our attention to what had been evaluated. As pointed out earlier, the general discussions made in the report on all large dams (or even all schemes on the entire Indus system), as also on the agricultural and developmental policies of the Government, will not be commented upon. Only the specific points made by Manthan on the Bhakra-Nangal Project will be analyzed here.

4. Indus Basin Pre-Independence irrigation development

CHAPTERS 1 and 2

Chapters 1and 2 of the Manthan study (pp 1-31) deal with the Indus Basin, as also irrigation development there during the days of British India. Though various versions of the Bhakra dam project were prepared towards the end of this period, the Partition of the Punjab province as also of India drastically changed the picture and the entire Project was reworked after Independence. Hence, no useful purpose would be served in the present context to analyze the material presented in these chapters.

However, one notices some errors and a definite slant in the presentation to suit the later adverse comments on Bhakra.

On Page 10, while dealing with the Grey canals, a misleading and incomplete statement is made as follows:- "Many decades later, the Bhakra Project, by drying up the Sutlej was to cut off the supply to some of these canals." The correct picture would have been presented if the author had added that these areas were incorporated as a part of the Bhakra Project by adding new canals to serve their command. The Sidhwan branch, utilizing Bhakra waters, was made a part of the Sirhind canal system. It irrigates the area of the Ludhiana district lying between the outer irrigation boundary of the Sirhind system and the high banks of the river Sutlej and the Grey canal areas.

On p 13 the details of the Bhakra Nangal Project (BNP) are given. It is stated that the "project is a complex system of several dams, reservoirs, ……". This is incorrect. There is just one storage dam at Bhakra with a reservoir and a barrage at Nangal (though called Nangal dam) with a small pond. If the reference was to the Pong and Pandoh dams on the Beas River, they do not form part of the BNP, but constitute different projects called Beas I and II. However, the linking of the 'Eastern rivers' under the different projects, undoubtedly, brought much flexibility in operations.

5. The Bhakra-Nangal Project

CHAPTER 3

Chapter 3 of the Manthan study (pp 35-40) gives details of the BNP, as finalized after Indian Independence. Only the major points of the presentation are discussed here.

Three major critical comments on the planning of the BNP are made in this chapter. A discourse on the Development Paradigm adopted by Independent India has also been made.

The criticisms against Bhakra are dealt with below:-

<u>Criticism 1 by Manthan</u>

" …Bhakra project was not immune from another of the hallmarks of large dam projects - claimed project benefits being highly exaggerated, even beyond what is technically feasible, and this being done knowingly" (p 37).

Two supporting pieces of evidence for this criticism are mentioned. First, a quote from BBMB (1988)-

According to the BBMB: (the reference is to page 249 of BBMB 1988)

"…….the mean storage available from Bhakra reservoir was calculated to be 4.631 MAF against a requirement of 6.207 MAF resulting in a shortage of about 25.4%".
Hence, Manthan concluded that -

"In other words, there would be an *average* annual shortage of about 25% !" (p.37)

Comment on Criticism 1

If we look up page 249 of BBMB (1988), the correct position emerges. The next three sentences, after the sentence quoted by Manthan above, read as follows:

"Instead of cutting down the areas included in the project, the shortages were proposed to be met as under:

1. Excess supply from Jamuna River were proposed to be diverted during the period July to September into Narwana branch (old Sirsa branch).
2. A link of capacity 127.43 m3/sec (4500 cusec) was proposed from Madhopur to Beas to divert the surplus Ravi and Beas waters. The construction of Harike barrage across River Sutlej below its confluence with Beas enabled utilization of surplus Ravi water to the extent of 2.54 million acre-feet in the Bhakra system".

It is not clear whether Manthan left out these crucial sentences by oversight or otherwise. The benefits from Bhakra were not exaggerated beyond what was technically possible.

Criticism 2 by Manthan

There are quotations from (pages 53-54) a book by K.N.Raj (1960) to support the same point. The quote from Raj (1960) reproduced by Manthan on page 37 is a truncated version with some significant omissions. Manthan's quote starts with-

"…it has been estimated by the project designer, from the records that are available of rainfall and of the river discharges at Bhakra since 1909, that only in a few years will the water available be adequate to fill the reservoir to full capacity …. ….",

and it ends with,

"the irrigation facilities which have been promised appear to be in excess of what can be actually provided."

Comment on criticism 2

Some basic facts relating to Prof. Raj's book would be of relevance before we examine his comments, as Manthan quotes him repeatedly. The objective of Raj's study was not an exhaustive analysis of the BNP. He was trying to investigate the criteria which, from an economic point of view, should be used in projects of this kind - and how they might be applied in concrete cases. Bhakra was incidental to this analysis. His concluding observations make this amply clear (page 124 -Raj).

Raj collected data for the project in 1954-55, circulated his first draft in June 1956 and, by the end of 1957, was ready with the manuscript of his book. However, after a long delay, the book came out in 1960. The features of Bhakra underwent changes meanwhile in tune with Indo-Pakistan negotiations on the Indus waters. The Government of India was attending to many things relevant to the Project, simultaneously.

First, the execution of the project so that there would be the least delay in development of the waters of the 'Eastern rivers', second, on Indo Pakistan negotiations on the Indus waters and third, with internal discussions with the states concerned. The Indus Treaty was signed only in September 1960. The construction of the dam was pursued and completed by 1964 and, progressively, the Government was able to ensure all the irrigation they planned for.

Dharmadhikary, while quoting in 2005 from the book by Raj, written fifty years ago, had obviously not checked whether the quoted data was out of date or if the point made was still relevant or otherwise.

The Bhakra dam that Raj was commenting on was 680 feet high with a gross storage capacity of 7.4 M.Acft (see Raj -pages 49 and 53)), whereas the Bhakra dam that was being built then was 740 feet high with 7.8 M.Acft gross storage. A higher storage was already provided for. This position would have become obvious to everyone had Manthan not omitted the immediate preceding sentence while selectively quoting Raj.

Raj had also commented elsewhere in his book (p 49) about the Bist-Doab area, thus:

" with the large provision for storage of surplus water, it was also clear that the river would almost dry up below Rupar, where the canals take off and thus this would create more difficulties for the Bist Doab area which was already facing a sinking spring level."

The project had by then taken care of this situation, too, by incorporating as a part of the BNP, the remodelling of the Ropar headworks and a new canal to irrigate the Bist Doab area.

This criticism is not a new point discovered by Manthan. Himanshu Thakkar, one of those who has been thanked for reviewing and commenting on the draft Manthan report, had prepared in 1999 a thematic paper for the WCD on "Assessment of Irrigation options: A study of Indian Situation", which had incorporated Raj's comments.

Raj himself was most understanding about the difficulties of the Project planners. His observation made in the same book, which was neither mentioned by Dharmadhikary nor by Himanshu Thakkar, reads as follows:

" These comments, which are essentially tentative and need to be verified by closer analysis must of course be seen in their proper perspective. They are not meant to be,

implicitly or otherwise criticisms of the engineers and others associated with the designing and implementation of the Project. When a project of the dimensions of the Bhakra-Nangal is being conceived and executed numerous assumptions have necessarily to be made and some of them are bound to go wrong, whoever makes them. Anyone who examines the decisions retrospectively is in a very advantageous position" (pp.129-130).

All those who now comment with the benefit of hindsight on the decisions made fifty years ago in the face of many uncertainties should keep Raj's advice in mind.

Criticism 3 of Manthan

Manthan says that-

"An important feature of the project was that it used large amounts of critically short foreign exchange, there was extensive use of machinery and lesser use of labour, especially unskilled labour". (p.38) …… "that it is capital intensive in a capital short economy and makes relatively far lesser use of the massive human resources" (p.38).

Again, Raj has been quoted (but only selectively) in support of this 'social cost' comment (p.39, Raj).

Comment on criticism 3

The specific site conditions and the time frame for the construction have a large bearing on the extent of machinery and labour that were to be used in the construction of an engineering structure like Bhakra. The sides of the Sutlej gorge were steep and the dam itself was going to be over 200 metres high. The project planners made their best decision under these conditions. A cement concrete dam was best suited to this deep gorge. Once this decision was taken, there was no alternative to mechanisation for construction of the dam.

Here again, Raj had a clear appreciation of the matter. Unfortunately, Manthan selectively omitted what he had said, which was as follows:

" … the location and height of the dam, and the stresses it would be subject to in view of the volume of water it is to hold in the reservoir, make it absolutely necessary that it should be a cement concrete dam……..(p.39)
The use of machinery and materials in construction has to be even larger in the case of the Bhakra dam than in ordinary cement concrete dams on account of its location and height, and the scope for of unskilled manpower is almost negligible (p.40).

It is surprising that neither Himanshu Thakkar nor the Manthan study deemed it fit to quote from a later book of Dr. K.N.Raj[3] (1990) on the matter. In his book entitled 'Organizational issues in Indian Agriculture', he states that the "actual possibilities of

[3] Raj,K.N. *'Organizational issues in Indian Agriculture',* Oxford University Press, New Delhi, 1990, p 189.

realising the increases in output in a given situation, on the scale and within the period required, fix within certain limits the nature of the investments, the substitutability of labour for machinery, as well as the location of the investments." As an illustration, he cites the case of the Bhakra Nangal Project and concludes by saying, " Nevertheless, the expected increases in agricultural output in this region have been considered substantial enough to justify the choice of the scheme."

In addition to the labour force used during project construction, another relevant consideration would be what manpower was likely to be employed later for the agricultural operations from year to year. Neither of the commentators seems to have taken note of the fact that, presently, up to a million migrant agricultural labourers are employed in Punjab and Haryana. A large number of them work in the Bhakra command.

Criticism 4 of Manthan

Irrigation started from 1951 and had fully developed by the time the Bhakra dam was completed in 1963 (p.39). Later in chapter 5, it was stated that irrigation from the BNP began in 1953-54 and that, for all practical purposes, there was full development by 1964 (p.60).

Comment on criticism 4

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It would suffice to note that the point made is incorrect or, at best, a partial presentation of facts. We shall revert to this point while dealing with the criticism made in Chapter 5 that, notwithstanding the completion of Bhakra in 1964, India remained a food deficit state which imported food grains.

6. Project command

CHAPTER 4

Chapter 4 (pages 43-55) purports to analyze the Bhakra command under the various states and the categories of commands. Conditions prior to the BNP are also indicated. There seem to be some errors in the statistics compiled from many sources, but there is no point in examining each discrepancy here.

In this chapter too, while presenting statistical data and past information about the command, a slant that is critical of Bhakra (and all large dams) is noticed. Dubious information seeking to belittle the contribution of Bhakra is also pushed in. For instance, while discussing "Conditions in command prior to Bhakra" (pp 51-54), an attempt has been made to show that these areas were prosperous even before the Bhakra project and that even Hisar was being irrigated. This is not borne out by the facts. Southwestern Punjab and the adjoining areas of Rajasthan had suffered from many devastating famines as a result of severe droughts before India's Independence. Hisar District Gazetteers refer to repeated famines in this tract. There are detailed accounts, of the famines of 1860-61, 1869-70,1896-97,1899-1900,1920-30, 1932-33 &1938-40. Likewise, accounts are

available in the Gazetteers of other districts of Punjab and Rajasthan. The Report of the Famine Commission (1860-61) extensively discussed the famine conditions of the tract south of the Sutlej. These do not tally with the picture of an idyllic, prosperous countryside that Manthan wants us to believe existed prior to Bhakra. Dharmadhikary's purpose seems to provide evidence that could lead to the conclusion that Bhakra had a very limited role to play in terms of food production and agricultural prosperity.

7. Bhakra and Food Production

CHAPTERS 5, 6 and 7

Chapters 5 to 7 (pages 57-110) deal with the role of Bhakra in food production. Chapter 5 deals with the period 1950-66 and chapter 6 deals with the period beyond, 1966 having been treated as the year of the advent of the Green Revolution (GR). Chapter 7 deals with both the periods and seeks to conclude that Bhakra has played a very limited role in food production from Punjab and Haryana considered together (page 108). The discussions in these chapters are somewhat rambling with many digressions on points other than Bhakra.

Instead of dealing with the points made chapter-wise, it is proposed to deal with them together, and sum up, as also examine the criticisms made by Manthan about Bhakra. As mentioned earlier, this review of the Manthan study only responds to the main points made specifically on Bhakra. This should not lead to the presumption that we agree on all other points not specifically commented upon or refuted here.

Point 1

"Irrigation from the Bhakra-Nangal project began in 1953-54"……. by the time the dam was completed by 1963-64, it was fully developed. "For all practical purposes this was full development of irrigation from the project" (p.60). "Yet, throughout this period, the country was importing food grains" (p.60)…… "even in 1972, 18 years after irrigation from Bhakra–Nangal commenced, India was miles away from food self-sufficiency (p 60)……" For a project claimed as liberator of India from food dependency, it is a telling commentary….." (p 61).

Comment on point 1

It is incorrect to state that by 1963-64, the entire irrigation to be provided under the BNP had been fully developed. In Table 3.2, Dharmadhikary quoted year-wise figures for the area irrigated between 1951 and 1963, citing some personal communication as the source. This shows that irrigation commenced 3 years before even the Nangal barrage was opened and that development was completed even before the dam was finished. It is not clear why he chose to ignore the year-wise figures of irrigation given in the official BBMB publication of 1988 (p 280), from which he has often quoted.

There are three equally relevant considerations to be kept in mind with regard to full irrigation development namely, the physical completion of works, the freedom to fill the Bhakra reservoir under the Indus Waters treaty (1960) and the year in which the reservoir became full for the first time.

The physical works were completed by October 1963. In all irrigation works, there is a certain minimum period allowed for development, particularly in newly irrigated tracts. We are not aware of the position in this regard in Bhakra. Also, any new reservoir is not filled up at one go but in stages. More important than all these is the fact that India was not free under the IWT to fill up the reservoir as desired till 1970.

Article II of the IWT says that all the waters of the 'Eastern Rivers' (defined as the Sutlej, the Beas and the Ravi) shall be available for the unrestricted use of India, except as otherwise expressly provided. However, there was a Transition period (which ended on 31 March 1970) during which Pakistan was to receive for unrestricted use the waters of the Eastern Rivers, which were to be released by India (in accordance with the provisions of Annexure H).

Under Annexure H provisions, so far as the Sutlej was concerned, India agreed to limit its "withdrawals at Bhakra, Nangal, Rupar, Harike and Ferozpore, including abstractions for storage by Bhakra dam" to the figures specified.

These provisions of the IWT severely limited the areas that could be irrigated from diversions at Nangal/Rupar, as also storage of the waters at Bhakra till 1970. Partial storage and depletion commenced in 1958. Some problems, however, arose in 1960. After 1961, it was partially filled in and depleted each year, subject to IWT provisions and natural factors. It was only in September 1975 that the full reservoir level was reached for the first time.

There was, certainly, partial (mostly *Kharif* season) irrigation development till the early 1960s, based on run-of the river and later based on whatever storage was possible till the early 1970s. The maximum reservoir level reached in any year till 1965 having been only 484.9 m or 1591 feet, which is about hundred feet lower than the full reservoir level, the question of developing the full extent of irrigation by 1965 does not arise.

The initiation of the 'Green Revolution' (GR) in Punjab/Haryana was around 1967-68, when India imported 18,000 tonnes of HYV seeds for the first time. Thereafter, it spread quickly. It, thus, happened that the full development of Bhakra irrigation more or less coincided with the spread of the green revolution. Punjab, which was producing less than 2 million tonnes (m.t) of wheat in 1965-66 stepped it up to over 5 m.t by 1970-1971, crossed 6 m.t by 1976-77 and reached 10 m.t by 1984-85. Similarly, Haryana, which produced about 1 mt. in 1966-67, crossed 2 m.t by 1969-70, passed above 3 m.t in 1978-79 and reached 5 m.t by 1985—86. The case of rice production was similar.

India's import of food grains also tapered off after the mid-1970s.

Dharmadhikary has not clarified who claimed that the BNP was going to be the "liberator of India from food dependency." The Project report had not claimed this, but only stated that it would assist in the reduction of food grain imports. Dharmadhikary himself has stated (on p. 36) that the project claimed a food grain production of 1.13 m.t only. This is another ploy used to denigrate the project by knowingly attributing to it an exaggerated "claim to fame", or by creating the status of an icon and then going hammer and tongs to prove that it was untenable. This technique has been used in many instances in the Manthan study. The features and achievements of the Project are invariably compared with something larger to make it appear smaller. An Indian Water Resources Society publication calls this psychological strategy a "draw a longer line" trick.[4]

Point 2

'In 1950-51, unified Punjab had about 6.13% of India's area under foodgrains and it was producing 6.85% of the country's foodgrains output'.. … 'through the next 12 years this ratio remained more or less constant or increased marginally. What this means is that the food production in Punjab and Haryana showed no extraordinary increase over the all India performance (p.79).

'Bhakra had not done anything dramatic in 10 years'. … 'the actual production of foodgrains in (unified) Punjab increased from 3.489 m tons to 5.932 m. tons from 1950-51 to 1962-63' (p. 79).

Comment on Point 2

The full irrigation development under Bhakra has to be reckoned with respect to a date beyond the early 1970s, for the reasons explained under Point 1. A summarized table showing the area and production of food grains in India and the states of Punjab and Haryana from 1965-66 to 2000-01, prepared on the basis of figures given in the Manthan report, is given below.

TABLE 1
Area and Production of Foodgrains
All India, Punjab and Haryana

(Area in million hectares, Production in million tonnes)

Year	All India		Punjab		Haryana	
	Area	Production	Area	Production	Area	Production
1	2	3	4	5	6	7
1960-61	115.58	82.02	3.042	3.159	3.721	2.755
1965-66	115.10	72.35	3.097	3.389	3.023	1.985
1970-71	124.32	108.42	3.927	7.305	3.868	4.771
1975-76	128.18	121.03	4.317	8.821	4.211	5.040
1980-81	126.67	129.59	4.854	11.921	3.963	6.036
1985-86	128.02	150.44	5.388	17.221	4.043	8.147

[4] IWRS , Delhi center, May , 2005-A brief rebuttal of "Unravelling Bhakra", pages 1and 5.

1990-91	127.84	176.39	5.673	19.222	4.079	9.559
1995-96	121.01	180.42	5.706	19.806	4.021	10.172
2000-01	121.05	196.81	6.277	25.318	4.340	13.294

Source: Dharmadhikary, 'Unravelling Bhakra', Pages A-20,A-32 and A-40

Note: The corresponding figures given in the Statistical abstracts of Punjab and Haryana differ in some cases, but the deviations are insignificant.

It is seen from the table that the total production of foodgrains in India in 1985-86 was about double that in 1965-66. In Punjab, the total foodgrains production in 1985-86 was more than five times that of 1965-66. In the case of Haryana, it was over four times that of 1965-66. The significant increase in Punjab and Haryana is the result of the synergy between irrigation and the other inputs of the 'green revolution package'. It is impossible to state how much is due to Bhakra and how much to the other factors.

Point 3

The Study says that "several serious issues" were raised in the context of the Green Revolution and lists (on p. 95) five important concerns. These are:

i) lacklustre performance of non-wheat crops
ii) inequities that follow as that between big and small farmers
iii) regional imbalance
iv) ecological consequences
v) heavy mechanization displacing labour

After listing all of them, it was stated that the study would not go into these issues, as there was enough literature already on them.

Comment on point 3

The present critique, too, will not go into full detail on these stated concerns. However, it needs to be said that all these were not found to be relevant in the case of the states of Punjab and Haryana broadly, or Bhakra. The following sums up the position.

i) It is incorrect to say that increased food production or improved productivity was limited only to wheat. Punjab and Haryana have consistently shown progressive increase in production and productivity in respect of all food grains, rice and wheat from 1970-71 till 1999-2000.
ii) The GR technology is scale neutral. A field study by G.S. Bhalla and Chadha in Punjab during 1974-75 found that there was no significant difference in inputs between different sizes of farms.[5] As a result, farm income per acre did not show any significant size-class difference.

[5] G.S. Bhalla and Chadha, *Green revolution and the small peasant*, Concept publishing co, Delhi, 1983.

iii) Admittedly there were differential improvements in production and productivity in different states. It may be pertinent to help each region make the optimum use of its development potential.

iv) The point about ecological consequences is vague. Such consequences relating to Bhakra have been stated and commented upon elsewhere in this critique.

v) Punjab and Haryana resort to farm machinery. However, there is no evidence to show that the labour input decreased due to this.

The details will not be examined here.

Point 4

The Manthan study has examined the role of Bhakra in increased food production under three headings (p.104), namely,

1. Bringing new area under cultivation- that is, increase in net area sown,
2. Multiple cropping-increase in gross area sown, and
3. Increase in per hectare yield.

The salient points and the related comments are as under:

Comment on point 4

As regards item 1, Manthan studied the net area sown in Punjab/Haryana between 1950-51 and 1965-66. It conceded that "there is little doubt that irrigation from Bhakra contributed to bringing in new areas under cultivation", but added a rider that "this was limited to few parts of the two states" (p. 105).

As noted earlier, under the limitations of the Indus Treaty, India was not free till 1970 to draw waters as desired from the natural flows of the Sutlej for the irrigation of new areas. It was also not free to raise the storage at Bhakra between 1963 and 1970. The period for full development should, therefore, be a date beyond 1965.

It has been repeatedly stated that "irrigation from Bhakra has been made possible essentially by transferring irrigation from lands downstream that were already being irrigated–and being irrigated without the dam" (p. 29), thus depriving them of their then existing water use and their future rights" (p. 30).

Such a presentation is an obfuscation of facts. It ignores the partition as also the Indus Waters Treaty of 1960. The British colonial government, for reasons of its own, ignored the rightful claims to irrigation in semi-arid south Punjab, and pledged the Sutlej and Beas waters to serve areas lower down in Western Punjab. After India was partitioned in 1947 and Pakistan and India emerged as free nations, the position vastly changed. India and Pakistan freely entered into the Indus Waters Treaty, which made available all the waters of the Sutlej, the Beas and the Ravi for India's unrestricted use. Taking care of the need for water in its territory in the lower regions became the

responsibility of Pakistan A transition period of ten years was agreed upon for Pakistan to provide the replacement measures. India made a specified financial contribution to Pakistan for this purpose. Dharmadhikary himself has referred to these elsewhere (on p. 27).

Accordingly, the irrigation command under the Bhakra project constituted new areas brought under irrigation in India. The "Sutlej valley project area" constituted irrigation to areas already irrigated in Pakistan through new replacement works. In Haryana, these new areas covered most of Hisar, Sirsa and Fatehabad. In Rajasthan, the entire area under Bhakra was new irrigation. Parts of the Gaggar, Sarsuti, Sirsa canal areas now receive assured irrigation from Bhakra instead of the earlier precarious irrigation facility.

As regards 2, the statistical details given by Dharmadhikary on p. A26 for Punjab and p.A 43 for Haryana show that the gross irrigated areas as a percentage of the net irrigated area denoted a clear rising trend. His data is summarised below for reference.

TABLE 2
Net and gross irrigated areas in Punjab and Haryana

(Area in million ha.)

Year	Punjab			Haryana		
	NIA	GIA	%	NIA	GIA	%
1965-66	2.26	3.14	138.9	1.22	1.49	121.6
1970-71	2.89	4.24	146.7	1.53	2.23	145.6
1975-76	3.12	4.93	158.0	1.75	2.73	155.6
1980-81	3.38	5.78	171.0	2.13	3.31	155.1
1985-86	3.69	6.51	176.4	2.25	3.68	163.6

Note: NIA is net irrigated area, GIA is Gross irrigated area
% refers to Gross irrigated area / net irrigated area, expressed in percentage
Source Dharmadhikary, Manthan, Punjab p.A26 and Haryana p.A 43

As regards 3 too, the per hectare yield has constantly been on the rise both in Punjab and Haryana. Here too, the statistical details given in the Manthan study will prove this position. The summary is given in the table below.

TABLE 3
Increasing trend of productivity in Punjab and Haryana

(in kilograms per hectare)

Year	Total Food grains		Rice		Wheat	
	Punjab	Haryana	Punjab	Haryana	Punjab	Haryana
1966-67	1259	736	1185	1161	1524	1425
1970-71	1860	1234	1765	1709	2238	2074
1980-81	2456	1523	2733	2602	2730	2360

1990-91	3388	2343	3229	2775	3715	3479

Source : Dharmadhikary, Manthan Punjab-p A 31-32 and Haryana p A 38and 40

Point 5

It has been argued by Manthan that while irrigation has played a very important role in food grain production, "this role has been played essentially by ground water based irrigation and canal irrigation has contributed to only a little extent" (p 107). In Punjab "canal irrigation is about 24% of total irrigation" and in Haryana, "the ground water and canal irrigation have played an equal role" (p 109).

Manthan goes on to say that- "To credit the "success" of Punjab and Haryana to Bhakra and Bhakra alone is absurd- but this is the general perception" (p 108). "Even in the Bhakra command areas, there has been a huge explosion in the ground water use,….. Bhakra irrigation is primarily concentrated in the three districts of Hisar, Sirsa and Fatehabad, which account for about 75% of Bhakra 's irrigation in the state" (p 108).

Comment on point 5

All statistical compilations give the source-wise break-up of the net irrigated area, for instance, that from canals and that from wells/tubewells. However, in respect of the gross irrigated area, such a break-up is unavailable. Therefore, it is not possible to state how much of the gross irrigation was from canals and how much from wells/tubewells.

No details are available on the extent of areas in the different districts that lie in the Bhakra command. Dharmadhikary, too, recognized this and estimated it from maps and other information (see p 46). Despite this, he could not arrive at the figures for Bhakra irrigation in Punjab. He had, however, worked this out for Haryana. (Table 4.8 on pp. 46-47 and Table 4.11 on p. 50). They show that the net area irrigated by the canal was around 50 % for the state as a whole in 1998-99. However, in the nine districts which wholly or partly lie in the Bhakra command, it is around 58%. If we considered only the 3 districts in which "Bhakra irrigation is concentrated" the position would be as below:

TABLE 4

Area irrigated (1998-99) in three main districts of Haryana in the Bhakra command

S.no	District	Area in Bhakra command	Net area irrigated in thousand ha.			% of canal area to total
			Canals	Tubewells	Total	
1	Hisar	60%	243	9	252	96.4
2	Sirsa	100%	262	47	309	84.8
3	Fatehabad	100%	136	60	196	69.4
.Total of three Districts		NA	641	116	757	84.7

These figures *do not support the comment* that "canal irrigation accounted for only to a little extent" in Punjab and Haryana (see p.107).

The corresponding figures for the Ganganagar and Hanumangarh districts of Rajasthan, which have been quietly inserted under Table 4.7 (on p. 46) without bothering to draw any inference, have their own significance. They clearly show that tubewells accounted for much less than a fraction of one percent of the total area irrigated there.

As regards the statement that the success of Punjab and Haryana "goes to the credit of Bhakra and Bhakra alone", Dharmadhikary does not say who the claimant was and how he concluded this to be the general perception. This seems to be yet another instance of first creating a larger than life icon of something that one despises so that it could then become the target of the iconoclast for his attack.

8. Ground Water

CHAPTER 8

Chapter 8 (pp. 111-131) also deals with ground water, and seeks to show that it was the real driving force behind the growth in food production in Punjab and Haryana, and notes that this did not depend on the Bhakra project. The Manthan team visited some villages and interacted with the people. They are quoted in support of the points made.

The main new points made in this chapter are examined in the following paragraphs.

Point 1

"Farmers at many places told (us) that the quantity of water they got from the canals is very limited….The situation is not surprising since the Bhakra canals were meant to be used for protective irrigation, and not for intensive cultivation…. (page 115).

Comment on point 1

It is a fact that the crop pattern, water allowance and capacity factors for the new irrigation under the Project were all determined in the early 1950s. The areas to be served by the Bhakra canal system were broadly classified under three zones-

Zone I- near the hills, with good monsoon rain as in Bist-Doab, south of Patiala - Restricted perennial, water allowance 2.25 cusec/ 1000 acres CCA- at 45% intensity

Zone II Riverine area with high spring level and situated close to the river- Non Perennial, water allowance 3.5 cusec/1000 acres CCA – 35% intensity, and

Zone III Dry and arid areas like Hisar, Rajastan etc, with meagre uncertain rainfall -Perennial, water allowance 2.75 cusec/1000 acres CCA, 62% intensity.

The participating states accepted in August 1951 the areas to be included within the irrigation boundaries, water allowances, capacity factors and intensities.

It is also a fact that the cultivators have changed the cropping pattern over the years. This is a complex issue as the agriculturists will grow only those crops that they deem advantageous to them, based on the market forces, minimum support prices, procurement policies and a host of matters emanating out of the agricultural policy from time to time. All that the Project could strive for was to deliver, in an average year, the water supply as indicated under the project.

Hence, if in a semi-arid area they wished to raise two successive crops of rice and wheat, for instance, they may need to supplement the canal irrigation with tubewells, where feasible. If something went wrong in this process of adding ground water without adequate drainage and water logging resulted, how can Bhakra be blamed for it?

An interesting point to be noted is the dualism in the arguments. Sometimes, Manthan presents selective quotes and arguments by critics, alleging shortage of Bhakra canal irrigation water (as in the present case) and, elsewhere, accuses canal irrigation of causing serious waterlogging in the Bhakra command. In chapter 11 on 'Water-logging and salinisation', Dharmadhikary alleges that "vast areas are affected by water-logging and salinity in Punjab and Haryana including in the command area of the Bhakra project" (p.172). He also quotes a number of farmers on waterlogging (pp.175-180). We shall deal with the issue of waterlogging in chapter 11.

Point 2

It is stated that the productivity of land per net hectare irrigated by private wells is much higher than the corresponding figure for canal irrigated land. Some specific figures for Haryana and Punjab are given. An article by B.D. Dhawan published in a weekly in 1977 is cited as the authority. It is stated that the World Bank Review 1991 supported this (page 118).

Comment on point 2

It is highly simplistic to assume that *every single hectare* of private-well irrigated areas in Punjab produced 1.72 times that of the canal irrigated area, or that, similarly, in Haryana, the productivity of *every hectare* by private wells was 2.375 times that of the canal irrigated area. It is seen that Dhawan's figures are based on a "theoretical foodgrain energy equivalent" basis.

Dharmadhikary himself admits that it is a complex task to try and segregate the contribution of groundwater and canal irrigation. He has listed on p.119 the difficulties and pitfalls in undertaking such a task but he, nevertheless, went ahead with this task,

based on his assumptions. His is not the first such attempt in this regard; he seems to have followed the footsteps of Himanshu Thakkar who had made a similar attempt in his "Thematic Review Assessment of Irrigation Options" prepared for WCD in 1999 as an input (see para 3.3 and Table 4 in particular).

There are different types of wells/tubewells and their running depends on the type of power used for lifting. Dharmadhikary assumes that10 HP motor will run for 10 hours a day for 200 days in a year. He has not explained the basis for this. If electrically driven, it is also relevant to know if the power supply is given free, subsidized or on a cost-recovery basis. Even more relevant would be the question of whether there were power cuts, and their type, duration and time of the day/night. If canal irrigated, one should find whether the supply was as per the project schedule and, if rotationally supplied, the details thereof. The timeliness, adequacy and regulation by ground water extraction are dependent on these and other related factors. In both cases, the details of inputs used are needed. Equally relevant would be the question of whether any crop cutting estimations on a micro/minor/major level were done to ascertain actual yields before adopting the average figures on a statewide basis.

It is absurdly simplistic to state that " the productivity of tubewell irrigated areas is 1.7 times the canal irrigated areas, and the productivity of irrigated areas overall (i.e. both canal and tubewell areas) is 2.5 times the productivity of unirrigated areas" (page 119). Dharmadhikary has attributed that "the ratio of productivity of irrigated vs unirrigated areas" is from the WCD India country study (2000). Being part of the team that prepared this report, the author can state that this and the other assumptions made in the food production estimate were the view of only one member out of the team of four, with which the others did not agree. Chapter 7 - makes this clear.

Point 3

The extent of the contribution to food production by seepage from canals recharging ground water has been estimated in the study and is stated to be small (pp. 120-123).

Comment on point 3

These calculations are all based on many simplistic, non-unverified (and some non –verifiable) assumptions. These cannot be accepted without further proof. First, there is an assumption that 60% of all ground water recharge comes from canals. Secondly, the total water used by the current cropping pattern is taken as 34 MAF in the case of Punjab and 26.46 MAF in the case of Haryana. The estimation of the total water is a complex issue, which has been oversimplified here.

Point 4

While analyzing the possible contribution of Bhakra power towards running of the pumps, three points are made. It is stated that i) power generation from Bhakra is

around 6500 million units ii) there was severe power crisis which had its impact on agricultural production, and iii) Bhakra power was sufficient for running only 28% of the number of tubewells.

Comment on point 4

Hydropower generation is an important primary objective of the Bhakra-Nangal Project. As pointed out at the outset, an evaluation of the performance of the project would be incomplete without a study of the power aspect. The total installed capacity of hydropower units was 1205 M.W as initially commissioned in stages between 1955 and 1968. The present installed capacity is even higher at 1480 MW. It generates around 7000 million units of power in a year. The project has generated, between the years 1955 and 2000, over 211 billion kWh of power. The cost of generation even now is very low (a small fraction of a rupee per unit). All these should have been stated, examined and taken note of, instead of casually sneaking in the figure, as has been done here.

The Project report never claimed that all the power generated or any specified portion thereof was for running tubewells. The purpose behind stating that the hydro power generated by the project would meet only a part of the pumps installed seems to be to belittle its high power generation performance. (The reference to power cuts is to further lower the contribution.) This is another case of comparing it with a 'longer line' merely to show that, after all, it is smaller than what it is compared with.

Point 5

It is summed up that, based on the various assumptions made, the contribution of Bhakra to the agricultural production in the state is 11% for Punjab and 24% for Haryana (page 125).

"One cannot escape the startling conclusion that much of Punjab and Haryana's growth could have still been possible even if Bhakra dam had not been built" (page 126).

Comment on point 5

There have been many unverifiable, simplistic and unacceptable assumptions made while arriving at the conclusion above. Many of these have been detailed earlier in this note.

Punjab and Haryana's spectacular growth could never have been possible without the Bhakra-Nangal Project.

As the subject matter of the Manthan study was to evaluate the role and performance of the Bhakra-Nangal Project, it must be concluded that, contrary to the assertion of Dharmadhikary, all that the Project Report had stated as its objectives have

been more than fulfilled. In addition, the project is playing a significant and crucial role in fostering the prosperity of Rajasthan, Punjab, Haryana and Delhi in northwest India.

9. Without Bhakra

CHAPTER 9

Chapter 9 (pp.133-148) purports to show that even without Bhakra, all the developments could have still been realized through other options.

The main points made in this regard are examined below:

Point 1

In a way, the irrigation in the Bhakra system was made possible more by the Partition and shifting of waters from the SVP than the Bhakra dam itself (page 136).

Comment on Point 1

This is a repetition of the point made earlier, which has been commented upon. See Point 3 under Chapters 5, 6 and 7 with comments.

It is incorrect to say that Partition made Bhakra irrigation possible.

The author further obfuscates the matter by not stating all the related items together.

At the cost of repetition it has to be recalled that the Indus Waters Treaty (1960) signed by India and Pakistan enabled full development of the Sutlej waters by India. Article II says that all the waters of the 'Eastern Rivers' (defined as the Sutlej, the Beas and the Ravi) shall be available for the unrestricted use of India, except as otherwise expressly provided. Hence, India was not obliged to pass down any water of the Sutlej beyond the border with Pakistan. However India has to respect the needs and established usage of water in the Indian area downstream such as under the Sirhind canal.

The natural flow in the river during the period October to May is a small fraction of the annual flow. The dependable flow in the low season was already under use in the Sirhind canal. The Bhakra project enabled the use of the balance natural flow for the benefit of India, as the IWT put the responsibility for taking care of the needs lower down on Pakistan. The redistribution over space is enabled by the barrage and canal system.

Point 2

"…a significant part of the monsoon flow of Sutlej was being used at the Sutlej valley projects (in India and Pakistan) and possibly also further downstream" (page 139).

Thus, if allowance were made for this existing use, then there would have been no surplus. Partition allowed this water to be released for use in India (p.130).

The advantage claimed that the dam allowed monsoon surplus to be transferred to winter months when demand was high and flows less- has been a limited benefit (p.130).

Another word about the carryover of monsoon storage into winter: this comes with a heavy price tag. The price is not just the massive financial, social and other costs of such dams, but includes the huge impacts downstream of such storages. Such storages are altering the amount and pattern of downstream flows, changing the whole river ecology and economy……. (page 140).

Comment on point 2

Once again, the familiar obfuscation is noticed in these arguments. Dharmadhikary has pointed out that the monsoon flow (July-Sept) in the Sutlej is 62% of the annual mean. If we consider the filling period as from 21 May to the end of September, it is even higher. Under the IWT signed after the Partition, India is allowed the full use of this entire quantum in her territory. Whatever are the needs lower down are to be taken care of by Pakistan. Pakistan, in fact, built a number of links based on the flows of 'Western rivers' to meet the needs of the Sutlej riverine tracts. There was no other way by which India could store the monsoon surplus flows in the Sutlej except through the Bhakra dam. The main purpose of the reservoir is to redistribute water over time by storing it when it is available and releasing it later when it is required.

Point 3

An important benefit attributed to the dam is the regulation it provides, resulting in better timing of irrigation water (p.140).
(However) this regulation, reliability and timeliness of irrigation has been provided largely and in a much better way by the extensive development of tubewells and ground water …We have already seen this in detail in the chapter on Ground water (page 141).

Comment on point 3

This is a repetition of an earlier point and had been commented are in the section on "ground water". Confusion in the Manthan presentation about the role of extraction from ground water continues to prevail. Punjab/Haryana in general and the Bhakra command in particular are simultaneously stated to be waterlogged irrigated by unsustainable ground water mining, and also that ground water was providing timeliness, reliability and regulation in irrigation.

10. Crisis in Punjab and Haryana Agriculture

CHAPTER 10

This chapter (pp. 149-168) deals with numerous agrarian issues that go far beyond our focussed objective, namely, the study of the promise and performance of Bhakra. The central criticism leveled is that the agrarian economies of Punjab and Haryana are experiencing a deep crisis in recent years. This relates to a loss of diversity in the cropping pattern, increasing inputs, declining returns, worsening economics of agriculture, indebtness of farmer and increasing instances of suicides among them.

Manthan refers to a committee set up by the Punjab government under Dr. S. S. Johl. In his report (2002), he had reportedly advocated reducing "overall dependence on wheat and rice". Manthan recognizes that- " Unfortunately, it was easier said than done" (p.160).

Some of the villagers interviewed told Manthan that "things were okay till about 15 years back. All the problems have started since then" (p.152). In Haryana, they were told that "with the advent of Bhakra project the irrigation went up and agricultural productivity increased". Manthan adds that this was tempered with apprehension (p 153). Many made a reference to additional irrigation from tubewells (p 153).

Comment

Issues relating to the agricultural and agrarian policies and such related matters are beyond the scope of the present critique. The Chief Minister of Punjab has reportedly drawn attention to some of these issues at the National Developmental Council meeting held in June 2005.and sought viable solutions[6]. These are matters within the purview of the constitutional authorities.

It is, however, noted that in the recent years there has certainly been less than the required attention to maintenance of the extensive canal system under the Bhakra-Nangal project. As the system has already functioned for over five decades, one cannot over-emphasize the need for its adequate and timely maintenance as also rehabilitation and upgradation due to several years of neglect attributed to inadequate provision of funds.

11.Waterlogging and salinisation

CHAPTER 11

This chapter (pp. 171-190) largely deals with waterlogging and salinisation in the states of Punjab and Haryana. It laments that- "Unfortunately, available data is often not categorized as per project commands; it is often only at the state level, or categorized as per the districts" (page 173).

[6] Source -Indian Express, Delhi, 28 June 2005

Where farmers tend to over-irrigate by excessive water applications and where improper water management practices prevail, the problem of waterlogging could arise. An interdisciplinary inter-Ministry Working Group on "Waterlogging, soil salinity and alkalinity" set up by the Government of India reported in December 1991 on various issues. According to the Working Group, the extent of waterlogging in the Bhakra command was i) nil in Rajasthan and ii) 49, 170 ha out of the total CCA of 1,166, 000 ha. in Haryana. In the case of Punjab, no projectwise figure was reported. However, most of the waterlogging was reported to be in the Faridkot district.

Criticism of Bhakra

The specific comment on Bhakra is of certain problem places visited and the views of its villagers. Some cases from Punjab and Haryana that came to Manthan's notice are indicated. For example, people in village Badopal in Fatehabad district complained of waterlogging. It became evident in 1978 and worsened thereafter (page 175). About 10 years ago, the Government made a monsoon surface water drain. Tube wells were installed along the canals in 1994-95. These benefited the people (p.176).

Similarly, some people of village Lohgadh (dist. Sirsa) reported waterlogging problems. In this village too, the Government constructed a drain but it has no place to empty into. Besides, it is only half-complete (p 177).

Other areas mentioned are Malout in Muktsar dist. and Lambakhedi in Jind district.

Comment on Bhakra criticism

The Bhakra dam, Nangal barrage and the canal system enable the provision of the stated extent of water for irrigation. If the agricultural planning, crop pattern, pattern of field drainage etc. are not carefully made, there are bound to be local problems which can be, and are usually, solved by local measures. The dam cannot be accused of fostering waterlogging. The specific cases brought out certainly need to be examined and attended to. Moreover, it is not clear if all these areas are part of the new command brought under irrigation by Bhakra. Manthan's Map-7 at the end of the book shows the entire districts of Ferozpur, Faridkot and Muktsar as lying outside the Bhakra command.

12. Environmental impacts

CHAPTER 12

Chapter 12 (pages 191-206) constitutes a general discourse about the impacts of large dams on the environment, on the familiar pattern popularized by the WCD Report.
The Bhakra project was among the early water resource development schemes completed in independent India. There were no legal or administrative procedures at the time of the formulation and approval of the scheme for environmental impact studies. Many items, which are seen as essential components of EIAs today, were not often

considered in those days. Thus, there is always a difficulty in an *expost facto* environmental impact study. The Manthan study also states this (page 193).

This meant that the findings stated by them "are mainly indicative"(p 193).
The study lists the indicative findings under different heads and we can examine them too in the same manner.

Point 1

Impact on fisheries

Earlier, fishing in the river was informal and unorganized. It is now carried on a commercial basis, with fishing rights being licensed.
The BBMB has stated that pisciculture in the reservoir is a positive environmental benefit.

Information on the status of fishing in the river downstream of the dam, now and before the creation of the reservoir, is not available (pp 194-195).
It would be important to estimate the production of fish before and after the reservoir.

Comment on point 1

No comments

Point 2

Health impacts in the reservoir area

These have not been documented. However, a note prepared in 2000 said –
i) Gobindsagar reservoir " covered all the natural water sources and are now depending (sic) on the lake water as well as the water supply scheme provided by Govt." There are problems in the summer. The reservoir provides favourable conditions for mosquito breeding and hence incidence of malaria increased due to the reservoir.

Comment on point 2

In the absence of pre-and-post-project documentation, the types of impacts mentioned are in the nature of hearsay. Entirely different information is also given elsewhere, according to which Bilaspur town on the reservoir fringe is served by some springs and fresh water lake, both before and after the reservoir, as they do not get submerged. When there are problems in summer, tankers are used for supplying water (page 224).

Note that the Manthan study has not acknowledged the beneficial impact of the reservoir in that it serves as the source of drinking water for all the villages and towns around it.

Point 3

Downstream impacts

Dharmadhikary has stated (on p 196) that "Bhakra dam- like many others- was built with the express purpose of 'utilization' or 'prevention from going to the sea' of the last drop of water". This is incorrect. Bhakra was taken up in order to utilize beneficially, within India, the flows in the Sutlej River that were allocated to India under the Indus Waters Treaty. All requirements beyond the border, in Pakistan, were to be taken care of by that country through appropriate link(s) from the 'Western rivers.'

India had taken care of water requirements up to the border. These have been explained in the earlier comments. The point in confusing the reader by repeatedly referring to aspects taken care of (like the Grey canal or Bist Doab area), or waxing eloquent on non-relevant issues (like water requirements in Pakistan territory up to the sea) is not understood.

Point 4

Siltation in Bhakra Reservoir

During the period from 1958, when water was first impounded, till the year 2000, the extent of silting was seen to amount to 15% of the original capacity. Stated differently, the siltation was to the extent of 31.3% of the dead storage and 9.7% of the live storage, totalling to 15% of aggregate capacity. Manthan also uses these figures.

The inference made by Manthan on the impact of siltation is as follows-

"A loss of capacity means that the very justification for the dam is being lost" (p.200).

Thereafter, a generalised view is expressed that-
"In the longer term, the sedimentation of dams means that large scale hydro/irrigation dams are not a sustainable technology" (p.202).

Comment on Point 4

Sedimentation of a reservoir is an unavoidable and natural process. All reservoirs experience sedimentation. Calculations made in the Project Report estimated the life of the reservoir as over 500 years, but the Project assumed this to be only 100 years for the purpose of working out financial returns and projections. The actual rate of siltation in the reservoir is higher than originally expected but the calculations, even with the higher siltation rate, estimates its useful life as more than 100 years. There has been no impairment or diminution in any of the functions and benefits of the project so far. The

alarmist inferences made by Manthan are unwarranted and unjustified by the actual experience of over four decades.

Point 5

Public Health impacts in the Command area

Manthan voices concern about the impacts of chemical fertilizers and pesticides contaminating water resources. It says that some people argue that the "dam is not responsible for the impacts of chemical fertilizers and pesticides used in agriculture" and considers it a specious argument (pp. 202-203).
Dharmadhikary concludes by stating- "If irrigation from the project is glorified by pointing to the spectacular increase in the agricultural production, then it needs to be recognised that this production was made possible due to the heavy use of chemical inputs along with the HYV seeds. It is a package that has worked together" (p. 203).

Comment on Point 5

At the outset, the double standards and forked tongue used by Manthan in its arguments should be noted. Chapters 5, 6 and 7 (pp. 57 to 109) were devoted in presenting the Manthan thesis that Bhakra had played a very insignificant role in the Green Revolution and increased production in Punjab and Haryana. It was said that "neither irrigation nor Green Revolution came to Punjab (and Haryana) with the Bhakra Project" (p100). Elsewhere, it is stated that " …irrigation has played a very important role in this (food production). However, in Punjab and Haryana, and especially in Punjab, this role has been played essentially by groundwater based irrigation and canal irrigation has contributed to only a limited extent. Within the canal irrigation, Bhakra is only a part" (page 107).

Dharmadhikary must first make up his mind. Does he want to say that Bhakra irrigation has played an important role in the significant step-up in food production in Punjab and Haryana? Or does he want to say that Bhakra only played an insignificant role? If it is groundwater that should get the credit for all the agricultural production, should it be simultaneously blamed for the effects of chemical fertilizers and pesticides, too? He should make his comments in different places consistent with his position.

Admittedly, contamination of water resources and toxicity due to fertilizers and pesticides is an important issue relating to public health that must be tackled by the government. However, attributing the responsibility for this problem to Bhakra is unacceptable.

The Indian National Water Policy (2002) accords the highest priority to drinking water among all its possible uses. Manthan's deafening silence on the vast canal system with its distributaries serving as the source of drinking water to millions of people and animals in the irrigation command is very eloquent. Drinking water to Chandigarh, Delhi and many towns in Punjab, Haryana and Rajasthan are also based on Bhakra water.

13. Displacement and Resettlement

CHAPTER 13

The Gobindsagar reservoir covers a maximum area of 168.35 sq. km. Land to the extent of 17,984 ha was acquired by the project. 375 villages were involved in this, in addition to Bilaspur town. Of the total land required, 6844 ha was Government land. The balance 11,135 ha, that was owned privately had to be acquired for the project. This involved 7209 families. Of these, 2398 families were resettled within Himachal Pradesh by the HP Govt. 2179 families preferred resettlement within the irrigation command and the balance opted for cash compensation and resettled on their own. About 5342 ha of land in compact blocks in 30 villages in the irrigation command in the Hisar district were acquired to resettle the 2179 families who opted to settle in the command. The figures given by Manthan are broadly the same but there are small differences.

The main comment by Manthan is that the resettlement policy was hardly fair or adequate, both in its concept and in its implementation (p 211). The 'oustees' showed remarkable understanding and were cooperative at every step but were betrayed (p.213). This conclusion is wholly unjustified, as we shall see when the reasons cited are analysed. The main points made in support thereof are discussed below:

Point 1

The displaced people who opted to settle in the Bhakra command were shifted to the Hisar district. The Manthan team had visited two sites-Ahlisadar and Ratta Tibb and interviewed the settlers. The latter said that the land they got was covered with overgrowth of vegetation. Manthan asks-Why was such land chosen to be given to the oustees? They could have been settled nearer in Zone I area, say around Patiala (p.213).

Comment on point 1

The Manthan team is trying to pick holes in whatever was done by way of resettlement and rehabilitation. Their comments are contrary to the understanding shown by the displaced, or for the sensitive and humane handling of the issue by the government fifty years ago. A Bhakra Rehabilitation Committee was set up under a secretary to the Government and it included the members of the Himachal Pradesh Territorial council, and the member representing Kangra in the legislative assembly. This laid down the principles and methods of rehabilitation, place of resettlement - after ascertaining public

opinion, procedures for compensation and related matters. It is this committee that decided, in consultation with the people concerned, on the place of resettlement in Hisar. The oustees did not question that choice and willingly moved there fifty years ago. The Bhakra project was intended largely for the irrigation of semi-arid southwest Punjab and adjoining Rajasthan. Much of that land was covered with some wild growth and this was being brought under irrigated cultivation for the first time. Manthan itself concedes (on p. 213) that the "oustees did not themselves demand lands in Zone I areas."

Raj, whom Manthan has often quoted, had this to say about Region I---
" The first region is in need of flow irrigation, but there is a danger of waterlogging here and, since it is already well endowed with rainfall, irrigation providing restricted perennial supply of water has been considered adequate" (page 49, Raj 1960).

On the other hand, the Hisar area was given perennial irrigation. Perhaps, if these oustees had been settled in Region I, say near Patiala, Manthan could still have criticised that decision, quoting Raj in support.

Point 2

Manthan quotes Ajmer Singh Chandel, president of the oustees' association for many years, that the average price of the land acquired was low, while that in the resettlement villages was relatively higher. When they came to Hisar "there was no facility of even drinking water. There was no electricity. We were shifted in 1956, we got electricity in 1972. There were no schools, colleges or dispensaries (p.215)."

Comment on Point 2

The prices were determined in accordance with the land acquisition act and anyone who had a grievance could approach a court for redress. There is nothing new in these established procedures. If they have to be made more "people friendly," this can be pursued through the legislature and Government authorities. The officers in charge of any dam project are not empowered to deal with these matters. This function was, and is even now, handled by the revenue and land acquisition authorities.

With regard to facilities like water, power, schools, etc there was no discrimination between the locals of Hisar and the newly settled people.

Point 3

Manthan alleges that "the entire economic and social structure" of the oustees was "completely disrupted by displacement" (page 216). Some of the disabilities suffered on migration to Hisar were detailed as follows:

The Dogra regiment of the army recruits cadets only from Himachal Pradesh and Jammu-Kashmir. On migration, "not being able to serve in the army is not only a loss of income,

but is disheartening for the community" (p.216). In Himachal, "any one who owned less than 10 acres of land was considered poor. Now that they own 2-3 acres in Haryana, it makes the people feel they have lost their economic standing in the community (p 216). "The climate in Haryana is very different from that in Himachal" (p 217). The extent of freedom enjoyed by women was different in Haryana and Himachal. Many elderly people passed away without ever visiting their old homelands. They were derogatorily called Bilaspurias by the locals (p.217).

Comment on point 3

There is no denying the strong attachment to one's native lands and it is always a wrench to be moved out for the purpose of any project. Having conceded this basic point, it would appear that the points made above are of the nature of nitpicking. It would also seem that the Manthan team was using the alleged grievances of a few individuals to find fault with everything. It is also likely that at least some of these complainants might be more interested in strengthening their own position in the oustee community.

The Centre for Policy Research team had interviewed many of those who resettled in Hisar, Fatehabad and Sirsa on displacement and resettlement issues. It got a different feedback altogether.

The area was semi-arid with sand dunes before the irrigation canals came. Besides, there were drinking water problems in the beginning. Whenever rains failed, water was supplied through tankers mounted on bullock carts. The ground water was deep and brackish. However, the settlers were able to overcome these early difficulties. Stray delays that occurred reflected problems of governance at the cutting edge.

These people are now quite well-off. They have most essential facilities like a primary school and a health centre in each village, *pucca* roads, tractors etc. The old generation continues to be nostalgic about their old home but the younger generations have adjusted to the local environment.

Point 4

The position of those who resettled within Himachal Pradesh was not good.
"The people who took cash compensation were left to fend for themselves ------"
"There were no banks at the time when the compensation was given. Many of the people deposited their money with the local Sahukars (money lenders) who the villagers claim never returned their money to them" (page 218).
"The biggest problem was and *continues to be* drinking water (page 218).
Electricity for Bhakra village came by the intervention of Dr. K.L.Rao in 1970 (p. 220).
Being near the dam, "there is restriction in the access to the villages' (p 221).

Comment on Point 4

These complaints are also in tune with earlier ones.

When some oustees who were given choices freely opted to take cash compensation and settle on their own, what is the meaning of saying that "they were left to fend for themselves" ?

If some people decided to handle the money they received in a particular way and allegedly lost in the deal, how do we hold the Bhakra dam responsible for it? Perhaps, if the Government had insisted on advising the oustees on how they should use or invest the compensation amount, that too could be criticised fifty years later.
We have dealt with the drinking water issue earlier.

The security concerns and restrictions often imposed near vulnerable vital installations in order to protect them from possible attack and destruction is understandable.

14. In Conclusion

CHAPTER 14

In this last chapter, all issues mentioned earlier are raised in one way or the other. These do not require repetition or further comment. However, Dharmadhikary goes on to draw some conclusions about Punjab and Haryana as also all large dams. Points of such nature which are pertinent to Bhakra will be briefly stated about and commented upon here.

Point 1

Manthan alleges that the viability of agriculture in Punjab and Haryana is being threatened. Yields are stagnating (p 231). Margins of farmers are squeezed (p 231). Farmers' indebtedness has even led to suicides (p. 231). Some may be quick to argue as to what this has got to do with the project. Was the project responsible for all these problems? We would pose a counter question - how is it that the project did not prevent this? That such a situation has arisen in spite of the project (p.231).

Comment on Point 1

The counter-question posed may look clever but lacks the full understanding of the division of responsibilities in various spheres. The Bhakra Project is responsible for ensuring timely irrigation to the command to the extent assured in the Project report. The Agriculture department handles irrigated agriculture and ensures the necessary inputs (other than water), marketing, minimum support prices, etc. The government and the legislative bodies are responsible for laying down policies relating to irrigation, agriculture, marketing, food distribution and so on. If this is understood, then the Project can in no way be blamed for the omnibus issues raised here. The project authorities could not have prevented them without stepping beyond the function assigned to their organization.

Yields are not stagnant and there seems to be no threat to the viability of agriculture in Punjab. Chapter 10 quotes (page 149) from the report of a committee set up by the Punjab government, which states what is needed to be done. However, the Punjab Chief Minister had allegedly stated (page 151) that "agriculture is in doldrums" in his state and expressed his helplessness in this regard. Why blame the Bhakra Project for what even responsible constitutional authorities find difficult to enforce?

Point 3

During the visit to Haryana, the Manthan team visited Sukho Majri, famous for its rainwater harvesting and soil conservation efforts. Sukho Majri was in complete contrast to what we had seen in rest of Haryana……. .Only such a decentralized approach can meet our needs (p.236).

Comment on Point 3

The Manthan study was made to assess the Bhakra project. The point made about traditional methods of local rainwater harvesting does not assess what such methods did or did not do. It is about a hypothetical alternative that could have been considered and adopted in the 1950s. Moreover, Bhakra was a project presented as a specific Plan A while the alternative advocated is only idea B. It is, therefore, not necessary to discuss these alternative approaches always advocated by anti-dam, anti mega project activists. In any case, effective utilisation of the flows of the Sutlej allocated to India cannot have been achieved without creating the storage at Bhakra.

Point 4

The developments in Punjab and Haryana show the interdependence between ecological, economic and social sustainability. In this, they exemplify the biggest developmental challenges to India - and also show the possible directions for the country to meet its development objectives (p.238).

Comment on Point 4

Bhakra-Nangal has served the nation for five decades. The assessment of its performance over this period reveals that the project has fulfilled all its objectives. Moreover, it has provided immense additional benefits to the region and the nation. It exemplifies how all-round development can be achieved through well-conceived large dam projects.

The success of Bhakra has prompted anti-dam lobbies to, somehow, pick holes in its performance and belittle its contribution to the prosperity of the region. However, they have not succeeded in this mission, undoubtedly because Bhakra is a good example of

sustained development with largely beneficial impacts on the society and the environment of the nation.