IMPACT OF IRRIGATION

Agriculture forms the backbone of Indian economy and irrigation acts as the oxygen for the growth of agriculture in many places and States. Next to Rajasthan Tamil Nadu is the most affected State in India due to water scarcity. As the State lies on the leeward side less amount of water is received with short spell. Therefore to increase the cultivable area, dams, reservoirs, tanks and wells were constructed then and there to store water\(^1\).

The artificial supply of water to the plants received much priority in Tamil Nadu from time immemorial. But the matter got systematized only after Independence. The priority that the Indian administration gave to the irrigation sector in the Five Year Plans immediately after Independence paved the way for the significant changes in society\(^2\).

Irrigated agriculture increased the availability of farm products to achieve self sufficiency in food production. This self sufficiency of food production accelerated the economic growth and

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standard of life of the people\(^3\). Infact the impact of irrigational
development from 1947 to 1967 on various aspects of life of the people in
the State is certainly a topic for intensive and innovative study.

6.1. Economic Impact

Irrigation for agriculture has become a major source of
economic development\(^4\). The expansion and improvement of irrigation
facilities occupied a key place in India’s programmes for agricultural
development after 1950\(^5\). Water must be regarded as a national asset and
planning for water resources development seems to be multi objective and
multi disciplinary. It is therefore essential to evolve master plans on
regional and national basis ignoring political boundaries based on a clearly
defined national water policy\(^6\).

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The national resources of a country determine the economic life of a nation\(^7\). Accordingly utilization of this natural resource (water) by artificial means (irrigation systems) helps to improve agriculture and promote the economy\(^8\). Sir Charles Trevelyan rightly pointed out, “irrigation is everything in India, water is more valuable than land because when water is applied to land it increases its productiveness at least six fold and renders great extents of land productive which otherwise would produce nothing or next to nothing”\(^9\).

Every human being looks at water as a ‘Gift of God; and knows he cannot survive without it for a long time. Every other living creature, including the flora and fauna goes in search of water for its existence\(^10\). Water should be considered as a most valuable potential to ensure economic sustainability\(^11\). Expansion of irrigation facilities ensure agricultural development since the inception of planning\(^12\). Water carries

\begin{itemize}
\item \(^8\) Madras Information, Vol.XV, March 1961, p.4.
\item \(^9\) C.B. Mamoria, *op.cit.,* p.159.
\item \(^10\) A. Mohana Krishnana, *op. cit.*,p.230.
\item \(^11\) *Ibid.,* p.231.
\item \(^12\) “The Green Revolution”, Annual supplement of Sakshi Farm Weekly, New Delhi, 1972, p.180.
\end{itemize}
essential chemical nutrients to the plant, without which the plants would die\textsuperscript{13}.

Water is a fugitive ‘reusable supplied resource which has many of the characteristics of a common property resource and a public good. Also its development has obvious economics of scale\textsuperscript{14}. Tamil Nadu being an agrarian State has developed agriculture based economy. Agricultural production depends upon availability of water resources\textsuperscript{15}. Water availability can drive economic growth\textsuperscript{16}. In the light of this fact the Famine Enquiry Commission of 1945 has rightly observed that among the measures that may be adopted to increase the area under cultivation and the yield per acre the first place must be given to the works for the supply and conservation of water\textsuperscript{17}.

Down the ages irrigation has played through history a strategic role in the continuous course of agricultural development. Irrigated agriculture provided the agrarian basis of society, sufficient

\textsuperscript{13} Winin Pereina, \textit{Tending the Earth}, Bombay, 1993, p.171.
\textsuperscript{17} K. Ramakrishna Reddy, \textit{Irrigation and Agricultural Development in India}, New Delhi, 1995, p.9.
production for survival and the attainment of economic growth\textsuperscript{18}. The economy of the village changed from subsistence oriented to cash economy and from exchange to market relations. With irrigation and commercialization, there has been a transformation in the cropping pattern and greater specialization in crop cultivation\textsuperscript{19}.

Water resources of a country constitute one of its most important economic assets. This gift of nature is vitally needed for agricultural production. It is also conserved, controlled and regulated for hydro-electric power generation, industrial uses, development of recreation facilities etc. Successful agriculture is not possible without irrigation\textsuperscript{20}. The major use of water is for irrigation purposes. Without irrigation, agriculture in India would be reduced to a gamble in the hands of monsoon. A storage reservoir acts like Reserve and other Banks. Banks receive money from those who can save and release to those who are in need, just like the stored water released during the scarcity of water season\textsuperscript{21}. Irrigation systems considered to be the basis of national wealth

\begin{flushleft}
\textsuperscript{19} \textit{Ibid.}, p.224.
\textsuperscript{20} Arvind Deshpande, \textit{op. cit.}, p.111.
\textsuperscript{21} Indu Singh, Sajay Kumar, \textit{A New Concept Geography}, Vol.II, New Delhi, 2010, p.298.
\end{flushleft}
are vividly associated with large scale social, cultural and political changes of economy\textsuperscript{22}.

6.1.1. Flood Control

The problem of floods is as old as the rivers themselves. No extensive efforts were made scientifically to tackle it till the country achieved Independence in 1947 A.D. The earlier efforts were restricted to construction of embankments mainly erected by individual zamindars to protect their own lands from inundation. But after Independence the State started undertaking several irrigation projects to protect the irrigated lands from the ravages of floods\textsuperscript{23}. As the construction of dams control the frequent occurrence of flood, there is less need to spend a huge amount for relief fund. The Central Flood Control Board which was setup in 1954 took several steps to implement flood control measures\textsuperscript{24}.

The construction of various dams averted the periodical occurrence of floods and flood allied afflictions\textsuperscript{25}. The atrocities of flood can be controlled by harnessing flood control programme and by scientific

\textsuperscript{22} O.N. Srivatsava, \textit{op.cit.}, p.220.
\textsuperscript{23} The Gazetteer of India, Vol.III, New Delhi, 1975, p.91.
\textsuperscript{24} R.G. Desai, \textit{Agricultural Economics}, Bangalore, 2001, p.176.
irrigation management and water resources development\textsuperscript{26}. The expansion of irrigation, the conservation of soil and the control of floods are directly connected with the food supply of the country and the general catchment and prosperity of the people\textsuperscript{27}. Much productive cultivable land lies along river courses and in their flood plains. These areas are subjected to unpredictable floods which may destroy crops and agricultural facilities on a large scale. The artificial storages act as defence against flood damage to agricultural production during rainy seasons and the stored water is later released during subsequent dry seasons\textsuperscript{28}. Thus the major projects help to control floods and they can utilize almost the entire normal annual flow of the river\textsuperscript{29} and to avert the calamities\textsuperscript{30}.

The principal use of dams is to store a portion of the flood in order to delay or manage when the peak occurs. This minimizes the chance of coincident peaks from floods in different tributaries arriving at the same time in the main stream of the river, reducing the probability of breaching

\textsuperscript{27} Rohan D. Souza, \textit{Colonial Capitalism and Flood Control in Eastern India}, New Delhi, 2006, p.201.
\textsuperscript{28} B. Barton Worthington, \textit{Arid Land Irrigation in Developing Countries, Environmental Problems and Effects}, London, 1978, p.5.
\textsuperscript{29} Shankar Singh, Pranab Banerji, \textit{Large Dams in India, Environmental, Social and Economic Impacts}, New Delhi, 2002, p.10.
dykes and overwhelming other flood defences. The main performance parameter in assessing flood control benefits is therefore the extent of reduction of the flood peak. Indicators of the benefits derived from flood control include reduction in the area flooded and prevention of any consequent loss of life, social disruption, health impacts and property and economic losses and famine which then, and there enjoyed a free play in the country was placeless\textsuperscript{31}.

\textbf{6.1.2. Famine Relief}

Poverty is still the gravest insult to human dignity and to overcome poverty water is essential in order to increase wealth\textsuperscript{32}. Dr. Knowels writes, “The irrigation works have made security of life, they have increased the yields and the value of the land and the revenue derived from it. They have reduced the cost of famine relief and helped to civilize the whole region. In addition they yield handsome profits to the government. In fact irrigation forms the datum line for sustained successful agriculture”\textsuperscript{33}.

\textsuperscript{33} C.B. Mamoria, \textit{op.cit.}, p.189.
Irrigation boosted agricultural productivity and reduced adverse impacts of drought\textsuperscript{34}. Waste lands could be converted into productive land with the help of irrigation. Irrigation works by encouraging steady supply of water provide good protection against the ravages of famine, and thereby added revenue to the State\textsuperscript{35}. Thus one’s ability to manage monsoon will determine their ability to reduce hunger and ensure food, water and livelihood security\textsuperscript{36}.

Irrigation forms the lifeline for sustained successful agriculture. It alleviates suffering, preserves life, averts famine and advances material prosperity of the country\textsuperscript{37}. In our country the development of irrigation had taken place as a measure of famine relief and in fact, famines gave birth to the idea of irrigation\textsuperscript{38}. Artificial supply of water to the lands through irrigation appeared as the only remedy to banish famine\textsuperscript{39}. Though it is a costly affair its purpose of supplying moisture

\textsuperscript{34} Raj Kumar Sen, Biswajit Chatterjee, \textit{Indian Economy}, New Delhi, 2002, p.206.
\textsuperscript{36} \textit{The Hindu}, Daily English, Trivandrum, Monday, July 13, 2009, p.10.
\textsuperscript{37} K. Ramakrishna Reddy, \textit{op.cit.}, p.9.
\textsuperscript{38} \textit{Ibid.}, p.10.
\textsuperscript{39} C.B. Mamoria, \textit{op.cit.}, p.138.
essential for plant growth especially during stress period and assurance against short duration drought during crop season are praise worthy\textsuperscript{40}.

### 6.1.3. Area Development

An impact of irrigation through which it increases the gross cropped area is called its area effect or cultivated area effect. This phenomenon consists of three components—firstly reclamation of waste land and extension of cultivation to hitherto uncultivated land, secondly to increase the double cropped area is directly related to the irrigation facilities in any region and thirdly to increase gross cropped area. This is called area effect or cultivated area effect\textsuperscript{41}.

The irrigation projects not only increase the agricultural production but also extend land available for settlement in nearby deserted areas. These newly developed areas are integrated in the nation’s economy. The intensification and development of agriculture result in higher standard of living\textsuperscript{42}. The characteristics of water supply to irrigated

\begin{footnotesize}
\begin{enumerate}
\item S.S. Sing, and others, \textit{Hand Book of agricultural Science}, New Delhi, 2003, p.605.
\item A.B. Dhas, M.N. Chatterji, \textit{op.cit.}, p.72.
\item Y.K. Murthy, op. cit., p.18.
\end{enumerate}
\end{footnotesize}
areas are important because they determine the impact on productivity of land\(^\text{43}\).

Irrigation helps boost up productivity and overall production and to maintain soil water balance. Irrigation reduces the risk of receiving and relying on rain water for scheduling any field operation (such as land preparation, sowing and planting inter culture, fertilizer application etc.) in appropriate time and method. Assured and potential irrigation helps select a variety of high value crops suitable for agro-ecological situation and market outlets\(^\text{44}\). Unproductive land can be brought under cultivation with irrigation facilities\(^\text{45}\).

Irrigational development protects land against all forms of deterioration by building and maintaining soil fertility and increases the productivity of land in all its uses\(^\text{46}\). An effective irrigation is the controlled and uniform application of water to crop land in the required time with minimum cost to produce optimum yields without the waste of

\(^{43}\) A. Vaidyanathan, *op.cit.*, p.19.
\(^{44}\) S.S. Singh, and others, *op.cit.*, p.605.
\(^{45}\) Kenneth Blazter, Nobel Robertson, *From Dearth to Plenty*, Cambridge, 1995, p.82.
water and any adverse effect on the soil in the form of soil salinity and waterlogging problems that create wet desert\textsuperscript{47}.

Irrigation helps to increase area of cultivable land and the yield of the land. With the help of irrigation wasteland can be brought under cultivation\textsuperscript{48} and the cropping pattern could be changed from conventional single crop a year during monsoon to double cropping\textsuperscript{49}. The real benefit from irrigation is in its ability to present the manure in a suitable form for the optimum growth of the plant. As a sort of catalytic agent, it enables the plant to absorb the food\textsuperscript{50}. It also changes as soil sterility caused by drought into fertility\textsuperscript{51}.

\subsection*{6.1.4. High Production}

Expansion of irrigation has been central to the strategy for increasing agricultural production\textsuperscript{52}. Average yields of all crops are substantially higher in irrigated areas\textsuperscript{53}. Thus investment in an irrigation

\begin{flushleft}
\textsuperscript{47} S.S. Singh, and others, \textit{op.cit.}, p.611.
\textsuperscript{48} R.G. Desai, \textit{op.cit.}, p.176.
\textsuperscript{49} Ganesh Pangare, and others, \textit{Springs of Life India's Water Resources}, New Delhi, 2006, p.186.
\textsuperscript{50} P.C. Bansil, \textit{Agricultural Planning for 700 millions}, Bombay, 1971, p.296.
\textsuperscript{51} C.B. Mamoria, \textit{op.cit.}, p.160.
\textsuperscript{52} Kausik Basu, \textit{The Oxford Companion of Economics in India}, New Delhi, 2007, p.320.
\textsuperscript{53} K. Ramakrishna Reddy, \textit{op.cit.}, p.20.
\end{flushleft}
project leads to the creation of new productive activity\textsuperscript{54} and a reasonable growth rate of national income depends on economy on water use\textsuperscript{55}.

Irrigation lands yield higher than un-irrigated land. Waste land can be brought under cultivation\textsuperscript{56}. Supplementary and life-saving irrigation provides insurance against crop failure\textsuperscript{57}. Higher yields produced by irrigation raise the general level of the producer\textsuperscript{58} and ensure food for the growing millions\textsuperscript{59}. Tamil Nadu has recorded the highest increase in productivity in India. The rate of increase in agricultural production is four times higher than that of increase in population\textsuperscript{60}.

The expansion of irrigation facilities paved the way for the increase of agricultural production. So livelihood security is assured. Increase of employment opportunities became an additional factor for the development of the State\textsuperscript{61}. Efficient irrigation enables to obtain the best

\begin{itemize}
  \item\textsuperscript{54} Ibid., p.10.
  \item\textsuperscript{55} Ibid., p.18.
  \item\textsuperscript{56} A.B. Das, M.N. Chatterji, \textit{op. cit.}, p.72.
  \item\textsuperscript{57} S.S. Singh, and others, \textit{op. cit.}, p.605.
  \item\textsuperscript{58} S.M. Shae, “\textit{Cropping Pattern in Relation to Irrigation},” India Journal of Agricultural Economics, Vol. XVIII, July to September, New Delhi, 1963, p.155.
  \item\textsuperscript{59} A. Mohana Krishnan, \textit{op. cit.}, p.47.
  \item\textsuperscript{60} Census Report of India, Vol. IX, Madras, 1961, p.456.
  \item\textsuperscript{61} Ibid., p.340.
\end{itemize}
return from a crop\textsuperscript{62}. It also promotes adoption of new technology embedded in the use of high-yielding varieties, fertilizers and plant protection measures to increase the productive capacity of the land\textsuperscript{63}. The main modes of irrigation in Tamil Nadu are rivers, tanks and wells. These modes of irrigation increased the productivity of land and enabled the growth of more remunerative crops\textsuperscript{64}. Supplementary and life saving irrigation provides insurance against crop failure caused by scarcity of rain water at any particular stage of crop growth. Continuous use of water from rainfall and irrigation promotes soil moisture and increases the efficiency of available moisture and at the same time reduces the cost and induces crop production\textsuperscript{65}.

Growth of agricultural production due to irrigation in the long run leads, to the reduction of the price of food grains so as to benefit the rural and urban poor who depend on these items of food\textsuperscript{66}. The ultimate benefits of irrigation would be in the form of increased crop production, increased demand for labour, increase in the income of the farmers and other rural population and an increase in the State domestic product from

\begin{itemize}
  \item[A.M. Michael, and others,] Hand Book of Farm Irrigation Structures, New Delhi, 1970, p.69.
  \item[M.L. Dantwala,] Indian Agricultural Development Since Independence, Bombay, 1991, p.94.
  \item[http://en.wikipedia.org/wiki/greenrevol.]
  \item[S.S. Singh, and others, op.cit., p.605.]
  \item[David Hemson, and others, op. cit., p.8.]
\end{itemize}
agriculture. All these in general lead to an over all betterment in the economic welfare of the people residing around the project area\textsuperscript{67}.

In addition to direct production, irrigation stimulates a broad range of economic activities like development of animal husbandry, fisheries, growth of agro-processing industries and services linked with the availability and utilization of irrigation facilities and the infra-structure created by the irrigation projects\textsuperscript{68}.

Most of the project areas gave up their traditional appearance and outlook and assumed a new look with human habitations, roads and paths, administrative buildings, gardens and the like. Water stored and released by the schemes enabled many people to get water for their cultivation and domestic life in addition to the expected target. Improved crop production enabled by the schemes caused to attain self-sufficiency in food production\textsuperscript{69}.

To build up the wealth of a country and to increase the national income and to make all world’s good available to a common man, we must get more out of nature. Accordingly, land which is a gift of

\textsuperscript{69} Ibid.
nature is to be utilized for the said benefit. This can be made possible only with irrigation\textsuperscript{70} which may witness increasing agricultural production to usher self sufficiency in food production and Green Revolution in Tamil Nadu\textsuperscript{71}.

The first Green Revolution was a spectacular success in India and became a role model for many developing nations to improve agricultural production and technology in the dry land cultivation\textsuperscript{72}. The foundation stone for Green Revolution was laid in 1966 from Thanjavur. Thus Tamil Nadu became a pioneer in augmenting food production mainly because of irrigational development in the State\textsuperscript{73}.

\textbf{6.1.5. Employment}

Employment opportunities for skilled and unskilled labour increased significantly in the project area because of construction related activities for dams, canals, drainage system and other hydraulic structures, roads and other related infrastructures. Irrigated agriculture significantly increases the need for labour and thus employment opportunities are

\begin{itemize}
\item[71] Report of India’s Development 1999-2000, p.5.
\end{itemize}
increased\textsuperscript{74}. In an agrarian economy irrigation may be a good source of employment. Agriculture provides employment of about 65 percent of the total work in the country\textsuperscript{75}. Development of irrigational project not only ensures crop production but also reduces loss of soil and water, conserves flora and fauna and provides employment and earning\textsuperscript{76}. Irrigation raises both employment and income content of land and thus adds to capital formation\textsuperscript{77}. A presumed benefit of a large irrigation project is additional employment\textsuperscript{78}. Irrigation commonly facilitates more employment opportunities for waged labour as it allows cultivation of more crops per year as well as more labour for intensive crops\textsuperscript{79}.

In respect of providing work and jobs to the people irrigation backed agriculture gets the top position among the avenues of employment\textsuperscript{80}. Extension of irrigation provided opportunity for the productive employment of labour which was abundantly available\textsuperscript{81}. In

\textsuperscript{74} Asit K. Biswas, Olcay Unver, \textit{Water as a Focus for Regional Development}, New Delhi, 2004, p.6.
\textsuperscript{75} K.P.M. Sundaram, Ruddar Datt, \textit{Indian Economy}, New Delhi, 2004, p.535.
\textsuperscript{76} S.S. Singh, and others, \textit{op.cit.}, p.613.
\textsuperscript{77} K. Ramakrishna Reddy, \textit{op.cit.}, p.10.
\textsuperscript{78} B. Barton Worthington, \textit{op.cit.}, p.56.
\textsuperscript{79} David Hemson, and others, \textit{op.cit.}, p.8.
\textsuperscript{80} G. Anjaneya Swamy, \textit{Agricultural Entrepreneurship in India}, Allahabad, 1988, p.41.
\textsuperscript{81} O.N. Srivatsava, \textit{op.cit.}, p.11.
addition to the direct agricultural benefits, irrigation stimulates a broad range of economic activities-development of animal husbandry and fisheries, growth of agro processing industries and the infrastructure created by the irrigation projects\textsuperscript{82}. Employment also increases due to related activities like agro-industries, transport, trade and banking\textsuperscript{83}. History bears testimony to the fact that since the beginning of human civilization water has been the driving force behind the flowering of prosperity in life\textsuperscript{84}. Better employment opportunities paved the way for the better standard of living\textsuperscript{85}.

\textbf{6.1.6. Growth of Standard of Life}

Water is a bottle neck to the continued growth of economic activities. The provision of more water both in quantity and quality constitutes a necessary condition for economic growth. This economic growth laid the foundation for the growth of standard of life of the people\textsuperscript{86}. Irrigational projects are reducing unemployment and promoting

\textsuperscript{82} Sreelekha Basu, \textit{op.cit.}, p.11.
\textsuperscript{83} \textit{Ibid.}
\textsuperscript{84} Surendra Kumar Sachdeva, \textit{Competition Success Review}, New Delhi, May 2010, p.44.
\textsuperscript{85} Asit K. Biswas, Olcay Unver, \textit{op.cit.}, p.6.
regional development and thereby automatically improving the lifestyle of the people\textsuperscript{87}.

After Independence because of the assured irrigation to all possible areas of a country from being the nation of a food deficient and periodic famine prone land, India became a self-sufficient and food exporting country\textsuperscript{88}. The self-sufficiency in food production strengthened the way of life of the people\textsuperscript{89}. An assured water supply to agriculture as the blood of the nation, spells prosperity creates employment potential and increased income and enhances capital formation. This opened new prospects to the people to raise their standard of life\textsuperscript{90}.

Transport and communication facilities increased abundantly due to the undertaking of irrigation projects, which in turn contributed greater employment opportunities, increased commercial activities and social interaction\textsuperscript{91}. Similarly water availability has encouraged industries to spring up in cities\textsuperscript{92}. The economy of the village changed from

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\begin{tabular}{l}
\textsuperscript{87} Asit K. Biswas, Olcay Unver, \textit{op.cit.}, p.2. \\
\textsuperscript{88} Ganesh Pangare and others, \textit{op.cit.}, p.184. \\
\textsuperscript{89} K.P.M. Sundaram, Ruddar Datt, \textit{op.cit.}, p.535. \\
\textsuperscript{90} K. Ramakrishna Reddy, \textit{op.cit.}, p.9. \\
\textsuperscript{91} Asit K. Biswas, Olcay Unver, \textit{op.cit.}, p.6. \\
\textsuperscript{92} Report of India’s Development, 1999-2000, p.16. \\
\end{tabular}
\end{flushright}
subsistence oriented to cash economy and there has been a transformation in the cropping pattern and greater specialization in crop cultivation.\textsuperscript{93}

Launching of these schemes elevated agriculture to the status of an industry which in turn opened vistas for varieties of employment opportunities. Standard of life in the society improved highly and the mode of life of those who involved in this field advanced to an enviable position. The State’s efforts to develop agriculture through these schemes solved many problems that prevailed in the society. Eradication of basic poverty in the society brought a peaceful atmosphere and the free play of theft and transgressions that darkened the society started to diminish considerably. Ill-health and insanitation could be replaced by comfortable, clean and healthy life.\textsuperscript{94}

6.2. Social Impact

Irrigation is an important factor in the production of agriculture and its use or abuse reflects a pattern of social relationship that exists in any society.\textsuperscript{95} Water resource development acts as a powerful

\textsuperscript{93} O.N. Srivatsava, \textit{op.cit.}, p.224.
\textsuperscript{94} David Molden, \textit{op.cit.}, p.245.
\textsuperscript{95} Satyajit Singh, \textit{Taming the Waters, the Political Economy of Large Dams in India}, New Delhi, 1997, p.21.
instrument for promoting the livelihood of small farmers as those who are closely bound up with the soil and water.  

6.2.1. Growth of Peace and Tranquility

Introduction of irrigation increases the total agricultural production of the area and reduces the adverse effects and situations like flood and drought. Significantly people of the locality concerned are able to settle peacefully and families grow more food in their lands. The per capita availability of water in a country indicates the quality of life of the people and the quality of life of the people determines their status in society. Construction of dams helps to control flood and safeguard the life and property of the people to lead a peaceful life. In like manner happiness can be reaped while water is used for household purposes.

The most important activity of water development project is to link the dam sites in the upper catchment areas to the towns and cities in the lower regions. This immediately links the highlands with the low lands in terms of trade, commerce, access to educational and medical facilities.

97 Asit K. Biswas, Olcay Unver, op.cit., p.5.
100 Diana C. Gibbons, op. cit., p.1.
The access to social interactions is responsible for the introduction of new ideas and technology and numerous other direct and indirect linkages\textsuperscript{101}.

**6.3. Health related Impacts**

Man’s access to water is a necessity from the point of view of his health. Problems of water quantity or quality are the root cause of 85 percent of human illness. The irrigation projects can provide good water to the society in favour of maintaining good health\textsuperscript{102}. Availability of adequate quantities of water is one prerequisite for satisfactory personal and domestic hygiene. This was denied to majority of people of some places in Tamil Nadu in particular and India in general before the launching of most of the Irrigation Schemes\textsuperscript{103}. Altogether the social setup of the region brought tremendous changes\textsuperscript{104}. Lack of water will give rise to epidemics and would also be a severe blow to all kinds of agricultural activities. Crop failure or low yield would lead to famine, giving rise to poverty and inflation. Water is a major remedy to this malady and light bearer for a comfortable, clean and healthy life\textsuperscript{105}.

\begin{flushleft}
\textsuperscript{101} As it K. Biswas, Okay Unver, *op.cit.*, p.6.
\textsuperscript{103} Barton Worthington, *op.cit.*, p.45.
\textsuperscript{104} Asit K. Biswas, Olcay Unver, *op.cit.*, p.8.
\end{flushleft}
Malnutrition is a serious problem in arid lands. The development of irrigated agriculture together with raising livestock and fishing improves by increasing the quantity and quality of food stuff with protein contents. Standard of living including standard of health improves with the income of the population. There is a stronger desire for better health, hygiene and medical care and this longing for health becomes a major motivation behind the implementation of Public Health Programmes. Thus the inevitability of this natural resource to ensure human health and civilization is proved beyond doubt.

6.4. Environmental Impact

i) Regeneration of natural forests and other ecosystem in the catchment area. Before the launching of a scheme the particular area may be dry and arid and had the appearance of a natural desert. With the establishment of the project stagnation of water in a wider area leads to the growth of forest around it.

ii) The irrigation project, i.e., reservoir, provides a habitat to wetland species especially water birds. Trees that are flourishing in the

106 Barton Worthington, *op.cit.*, p.5.
reservoir area are being abodes to the kinds of different varieties of local and foreign origin.

iii) Reservoir can also be a source of water to the animals and plants in the adjoining areas\(^\text{109}\).

iv) The provision of water to urban and rural areas for domestic and municipal use can significantly help improving the living environment.

v) The increase in water supply from dams can help to reduce the incidents of certain water-based diseases like skin infection.

vi) The provision of water by dams can enhance environmental restoration and productivity.

vii) Regeneration of forests, habitation to wetland species, promotion of picnic and tourism and the like occur as the outcome of the schemes\(^\text{110}\).

6.5. Adverse Impacts

Every blessing is a mixed one and so in irrigation too. In some cases it becomes a setback to agricultural growth. For example,

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water logging and soil salinisation well recorded in the world history of canal irrigation bear adverse effect in the agricultural growth and food production.\footnote{C.B. Mamoria, \textit{op.cit.}, p.78.}

### 6.5.1. Water Logging and Salinisation

Some of the adverse effects of irrigation like water logging, salinity and alkalinity are supposed to arise due to lack of integration in development process. Seepage and percolation from the canals running for long distances, violation of cropping pattern and over irrigation by the farmers, lack of scientific farm development, farmer’s ignorance about water use and management practices are some of the complex problems that need to be tackled to avoid adverse effects of irrigation.\footnote{H. Ramachandran, \textit{Environmental Issues in Agricultural Development}, New Delhi, 1990, p.89.}

Over irrigation and neglect of drainage cause water logging and rise in water table which eventually leads to salinisation. In most of the major and medium irrigation projects, the drainage problem has not been given due attention resulting in steady rise over the years in the extent of water-logged areas.\footnote{Ganesh Pangare, and others, \textit{op.cit.}, p.185.} Salinisation reduced yields of crops.\footnote{The Report of the World Commission on Dam, London, November 2000, p.66.}
Irrigation has created the problems relating to drainage, congestion, water logging and salinity. No proper attention is given to distribution and to check wastage of water. Crops suffer damage when there is excess water in the soil in the root zone\textsuperscript{115}. Water-logging due to the absence of water management has posed a serious problem to the irrigation in India\textsuperscript{116}. Irrigation works depreciate with the passage of time and reservoirs and tanks suffer a loss of capacity through siltation. Tube wells deteriorate due to stain and their discharge gets reduced and some of the open wells fall into disuse\textsuperscript{117}.

The setback due to excessive siltation of dams and reservoirs press a new question on the sustainability of irrigated farming. Siltation is an inevitable process of damming a river and dam builders do reckon with this by providing dead storage\textsuperscript{118}.

**6.5.2. Eco System Effects**

The creation of large dam, reservoir necessarily involves inundation of large area and this has led to the loss of forests and wildlife habitat, the loss of species population and the degradation of upstream

\textsuperscript{115} R.G. Desai, \textit{op.cit.}, p.177.
\textsuperscript{117} S.S. Singh, and others, \textit{op.cit.}, p.628.
\textsuperscript{118} C.B. Mamoria, \textit{op.cit.}, p.79.
catchment\textsuperscript{119}. Dams mostly have the objectives of providing water for irrigation, electricity generation and prevention of flood. Some dams have the objective of providing water to industry or for urban, rural, municipal and domestic consumption\textsuperscript{120}. The degradation of the catchment results in greater silt flows into the reservoir, thereby reducing the life of the dam and also posing a threat to the safety of the dam\textsuperscript{121}.

Forest degradation takes place in the catchment area due to improved access, both during and after dam construction. After the construction of dam, the forests and other vegetation there are submerged under the reservoir\textsuperscript{122}. The construction of dams and impounding huge quantities of water may cause some ecological changes. Displacement of population from retention areas and submergence of cultural monuments are most expected ones. Microclimatic changes in the surrounding areas, change in water quality and flow regimes, flooding of forests and displacement of wildlife are reported then and there. Landslides due to reservoirs, loss of breeding ground in lake for migratory fish, reduction of fish breeding place in river downstream due to reduced flows are further

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\textsuperscript{120} Shekhar Singh, Pranab Banarji, \textit{op.cit.}, p.7.
\textsuperscript{121} \textit{Ibid.}, p.11.
\textsuperscript{122} \textit{Ibid.}
harmful effects. Chances are also there for increase in earth tremors, in waterborne diseases etc.\textsuperscript{123}.

The depletion of ground water resources affects water quality\textsuperscript{124}. At the dam site construction activities always significantly raise the levels of dust in the atmosphere\textsuperscript{125}. The soil, stones and sand required for the construction of dams and canals are often mined and quarried from around the dam and canal site. Such extraction can also have adverse environmental impacts, especially by aggravating, dust pollution. This in turn affects river and other water bodies disturbing wild life and destroying vegetation\textsuperscript{126}. Reservoirs also submerge productive agricultural land in the valley. This not only affects the social and economic cost but also adversely affects cultivated biodiversity and a host of birds, insects, mammals and reptiles that have adopted to agricultural eco system. In many cases traditional crop varieties and methods of cultivation have disappeared because of the submergence of agricultural lands\textsuperscript{127}. Above all there is a significant threat of vector breeding of diseases like malaria, filaria, dengue and other such diseases which breed in small pools of water.

\textsuperscript{123} Y.K. Murthy, \textit{op. cit.}, p.18.
\textsuperscript{124} Ganesh Pangare, and others, \textit{op.cit.}, p.24.
\textsuperscript{125} Shekhar Singh, Pranab Banerji, op.cit., p.19.
\textsuperscript{126} Ibid., p.12.
\textsuperscript{127} Ibid., p.26.
created in the edge of the reservoir due to the lowering and raising of the water level of the reservoir\textsuperscript{128}.

\subsection*{6.5.3. Mismanagement of Irrigation}

Lack of scientific administration of irrigation is also one of the defects of irrigation\textsuperscript{129}. The downstream flows have often failed to receive adequate and transparent consideration\textsuperscript{130}. Lack of co-ordination between agricultural and irrigation departments and lack of mutual adjustment lead to delay in the process of supply and demand for water in volume and time. Lack of adequate soil surveys of land and soil for irrigation and the unplanned systems in both departments result in chaos which further aggravates the problem\textsuperscript{131}. The irrigation sector suffers from the problems of under utilization, poor maintenance of infrastructure, inequitable distribution of water and heavy losses from wastage of water. Most irrigation departments are running in losses due to very low water rates and recovery of water cress\textsuperscript{132}. In addition to these, in most of the irrigation projects, there has been delay in the construction of field

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\item \textsuperscript{128} \textit{Ibid.}
\item \textsuperscript{129} R.G. Desai, \textit{op.cit.}, p.178.
\item \textsuperscript{131} R.G. Desai, \textit{op.cit.}, pp.177-178.
\item \textsuperscript{132} Ganesh Pangare, and others, \textit{op.cit.}, p.23.
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channels and water courses. Farmers do not get the assured supply of water due to deficiency in the canal\textsuperscript{133}.

6.5.4. High Cost

Irrigation is a costly proposition. For surface water resources the construction of dams, reservoirs, tanks and wells and the construction of conveying channels, pipes, sluice gates from the storage points to the fields, installation, operation and maintenance of water lifting devices, conveying system and energies involve a huge cost\textsuperscript{134}. Especially the construction of major irrigation projects involved heavy expenditure of money\textsuperscript{135}. T.A. Varghese, the Secretary of Government Public Works Department said, when a prudent investor invests his money on an industrial enterprise he looks forward to a handsome return on that money. He avoids the industry which does not promise him a rate of interest at least equivalent to the market rate. That the industry which helps to maintain is vital for the defence of the country or that, it keeps in employment thousands of his fellow countrymen, is a consideration entirely foreign to his thought. The irrigation policy of the Madras Government over the past century or more, had been one comparable to this narrow and individualistic outlook. It was based on the theory that the

\textsuperscript{133} R.G. Desai, \textit{op.cit.}, p.177.
\textsuperscript{134} S.S. Singh, and others, \textit{op.cit.}, pp.612-613.
\textsuperscript{135} A.B. Das, M.N. Chatterji, \textit{op. cit.}, p.74.
capital outlay on an irrigation scheme should promise, by way of increase in land revenue alone, a return equivalent to the interest on Government securities. Only in very exceptional cases arising from famine ridden areas was a departure from this policy permitted\textsuperscript{136}.

Environmental restoration effected by the schemes paved the way for the promotion of flora and fauna to some extent. Adverse effects are also not a rarity as they are found in the form of water-logging, salinisation, destruction of natural forests and the condition of deterioration prevailed upon varieties of fauna in the desert and project areas\textsuperscript{137}. Administrative flaws and the unnecessary expenses incurred on the works often went unnoticed. Despite all the defects, what the benefits that the society seeks from the schemes stand as landmarks for the progress of the society and its transformation in many ways.

\textsuperscript{137} Shekhar Singh, Pranab Banarji, \textit{op.cit.}, p.10.