CONCLUSIONS AND SUGGESTIONS
In the beginning of 21st century Indian population has crossed one billion and is estimated to be 1.25 billion by 2030 AD, which will require an additional foodgrains production of 100 million tones to feed its population. Therefore the future of Indian agriculture depends mainly on the development of appropriate farming system as it fits to resource poor farm families of different agro-ecological Zones”. There are 8 agro-climate zones in India. Viz. High attitude cold deserts in which millets, wheat, barely and fodders are grow, and pastures with desert region where moderate cropping, western and central Himalayas where horticultural crops, are abundantly grown and maize, rice, wheat pulses and fodder crops are grown is hilly terraces and slopes. Eastern Himalayas where agro-forestry systems are common and rice, millets, pulses are grown along with piggery and poultry rearing. Indogangatic plains where rice, wheat, maize, mustard, pulses cultivation takes place along with cattle, buffalo rearing and dairy. Central southern high lands where cotton, millets, pulses cultivation, takes places along with cattle sheep, goat and poultry rearing including animal husbandry enterprises, western Ghats where mainly plantation crops are grown and rice and pulses cultivation follows as secondary agricultural activity along with cattle, sheep and goats rearings and Delta and coastal plains where rice cultivation cum fishiculture poultry and piggery rearings are common. Caphare fisheries is also a specialised enterprise of the marine ecosystem.
Research on farming system with improved technology to replace shifting cultivation by permanent agriculture was initiated by the ICAR. It showed that bench terraces and contour bunds for conservation combined with a permanent agriculture system provide a more stable and remunerative system when compared with shifting cultivation. The conservation measures are property maintained when improved crop management practices and fertilizers were used. The research showed that the best land use pattern for hilly stapes was agro forestry for the upper third of the slope, a horticultural pastoral system for the midslope and agriculture or crop based systems for the lower part of the slope. The best land treatment was contour for the upper slope, help moon, shaped terracing for the mild slope and bench ferracing for the lower slope.

In the changing scenario in different states adoption of new high-yielding varieties and cropping systems have improved technology. It has given more yield. The most promising cropping systems include rice-wheat fallow, and rice-wheat moong bean in sub-tropical zone of Jammu and Kashmir; Sorghum-wheat-sorghum, sorghum-chickpea-Sorghum blackgram-cotton-safflower in Northern dry zone; rice-rice-mongbean rice-rice-groundnut in humid tropics; rice-sorghum-mongbean; rice-chickpea-sorghum: rice groundnut follow in north konkon region; sorghum chickpea pearl millet fodder in scarcity zone of Maharastra: rice-wheatmung bean in southern and humid zone of Rajasthan: Maize-wheat mung bean rice-wheat maize in work zone of west Bengal. Similarly-several new systems are replacing the traditional cropping systems based on cotton. Jute-sugarcane,
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groundnut, sorghum and millets. In the same way different cropping pattern has to be followed in Karnataka.

Agriculture dominates change in India through its casual links with factor and produce market. It employs sixty percent of the labour force and contributes 26 percent of the Gross domestic product. In the poorer states, its contribution to states domestic product it close to 40 percent, which is also true in case of few districts of Karnataka. Relative low productivity in agriculture led to the concentration of the poor in many sectors. Due to sheer size of agriculture economy and the importance of it's major products (cereals) in the diets of poor. Gains in agricultural productivity have significant, potential, impact on poverty. Theoretically, it is possible to reduce poverty as well as expand the domestic market for industry by raising labour productivity in agricultural and spreading its gains among the low-income groups. Modling of the linkages between agricultural and industrial growth has shows that a 10 percent increase in agriculture output would increase industrial output 5 percent and urban workers would benefit by both increased, industrial employment and price deflation [Rangarajan 1982, De January and Subbarao, 1986]. However, there is an asymmetry of adjustments in the demand and supply of agricultural goods. An increase in non agricultural production would lead to an immediate increase in demand for intermediate and final agricultural goods, where as supply side adjustments involving reallocation of resources and net additional investment for capacity expansion take a much longer period [Storm 1992]. There is a widely held view that in a large country like India, the demand stimulus for industrialisation

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would come mainly from agriculture with less social and economic costs.

In the on going globalization process, production and demand patterns undergo significant change. While better off farmers produce, high valued products for exports and for the affluent segment of domestic market the small farmers are likely to grow crops mainly to meet domestic food needs. Which is found in pavagada and chikkanayakanahally taluk in Tumkur district in Karnataka.

It is widely accepted that India needs an agricultural growth rate of 4.0-4.5 percent to reduce poverty significantly [Rao and Radhakrishna – 1999]. At this growth rate – agricultural development would diversity into dairying, animal husbandry, fisheries, floriculture, horticulture etc. This would spur the growth of agroprocessing industries in rural areas to meet the domestic as well as export-demand. The rice and wheat farmers should be induced to look for new sources of incomes in diversified agriculture to compensate the fall in incomes in rice ad wheat cultivation. As the world prices of rice and wheat are already lower than their domestic prices and are not likely to fall, the domestic prices of rice and wheat will tend to fall to align with the world prices. Moreover, the world market for rice is very limited and confined to superfine varieties. As the demand, for cereals is mainly population driven, whose growth rate is slowing down, it would be prudent to divert resources from rice and wheat cultivation to high valued crops.

Minor irrigation in agriculture has now reached the takeoff stage where growth with good spread and coverage can be generated through
normal market mechanism and right policy mix. Since income improvement in these regions is likely to increase the demand for the products, of animal husbandry, fruits, vegetable and processed food; marketing and agro-processing should receive the attention of policy makers public spending in irrigated regions should be very selective, facilitate and confined to those critical areas which would supplement private initiate. As the demand for skilled labour is likely to move ahead of its supply in rural areas, support programmes for skill development may be organised in newly emerging activities in response to economic restructuring. In short, a strategy combining promotion of agricultural growth, productive non-form employment and high levels of social development would be needed to trigger off labour intensive growth in rural areas. There should be an in-depth research and follow up action on cropping pattern in our country, particularly in Karnataka.

Among the commercial crops the largest area is under oilseeds but the growth of area under it has been very slow and there is emergence of imbalance in the cropping pattern that crop patterns has changed in drifting away from what is a desirable course. This is evident from the fact that the two source of change namely, substitution effect that is the relative decline in the area under some crops and corresponding equivalent increase in area under other substitute crops for a given gross cropped area, the farmer has been much more prominent. This is particularly so in respect of important-crops for instance, area, under the fast growing crops like wheat and paddy has continuously increased at the cost, of course cereals, millets, pulses and in some cases cotton. This is due to differences in the
technological change in the spread of the irrigation facilities the governmental support and changes in relative prices between different crops.

In this background the role of minor irrigation is economic development of Tumkur District is summarized as follows.

**Minor Irrigation and Economic Development :**

Agriculture plays an important role in the Economic development of an agrarian economy. The contribution of minor irrigation in Karnataka particularly in Tumkur district is as follows

1. Agriculture literally feeds the process of development.
2. Agriculture has contributed to development through the supply of labour.
3. Agriculture has also contributed by earning foreign currencies.
4. Agriculture has contributed large capital resource.
5. Agriculture has supported industries.
6. The budget of the government of both the state and the centre have been considerably influenced by the land revenues.
7. Internal trade too is influenced much by the agricultural operations.
8. Agriculture in Karnataka, is neither fully commercialised nor wholly of the subsistence type.
9. It has helped to remove poverty and hunger.
10. Absorption of additional labour force is possible..
11. It has helped in providing food and nutrition.
12. Created need for a large surplus of wage goods.

13. To get rid of imports it has helped to a great extent.

14. Facilitates to meet increasing demand of raw material.

15. Best possible utilisation of resources is possible as show in the study area.

16. It has contributed for development of horticulture animal husbandry and fisheries in Karnataka.


18. Diversification of employment opportunities is achieved.

19. Higher rate of growth in rural incomes is possible.

20. It has helped to create surpluses for investment.

The implementation of upper Tunga and Kalasanala Bandura Nala projects are getting delayed for want of Forest and Environment clearance. In the case of upper Tunga project the proposal for diversion of forest land has been cleared by the supreme court and formal clearance from the government of India is awaited. Environmental clearance for, this project is being pursued. The Hipparagi Barrage is nearing completion and erection of gates will be taken up shortly. It is planned to impound water by June 2004. The Harinala and Gandorinala projects are ready for providing irrigation. The field irrigation networks in these projects are being expedited and subject to availability of water. It is proposed to provide water from these project in the coming years the government of Karnataka has directed that the recently transferred Bennetora and lower mullamari project should be
taken up for speedy implementation for providing water in the drought prove area of Gulbarga district.

Considerable progress has been achieved in making participating irrigation management operational at the field level by handing over irrigation management system in Malaprabha and Ghataprabha command area to the water users. Co-operative societies for maintenance. So for 460 water users, societies have been registered against the target of 600. Irrigation management has been handed over in respect of 275 water users cooperatives. During the year 2003, an amount of Rs.6.00 crores has been provided towards special repairs of hydraulic units before such handing over in addition to Rs. 4.05 crores provided during the last year. The field irrigation potential created during the year was 17.054 Hectares.

Recommendations:

In some of the taluk like Pavagada, Madhugiri in Tumkur District there is Naxal problem and the irrigational facilities are very less hence the people are very poor. They are border Taluks. Hence border improvement programmes are very essential.

New bore wells have to be dug, Bank loan should be made available at cheaper interest rates.

Further they need more police protections to safeguard their agriculture lands, educational institutions are very few. If government take steps to provide the educational facility of the people, they will be more aware of the irrigation and economic development. Swarna Jayanti Rozgar Yojana and Jowahar Rozgar Yojana have to be implemented rigorously. KISAN cards and green cards have to be
judiciously distributed to the people below poverty line. There are many NGO's in the taluk, with the help of the Government and self help group, the NGO's can play an important role in providing well and minor irrigation facilities to the poor in Pavagada, Madhugiri Taluk, irrigation programme like the Puttaparthi in the neighboring Andhra Pradesh should also undertaken in the boarder taluks.

If “development project proposals” with a focus of alleviating poverty conceptualised since the early Nineties dared to exclude “participation” and “group formation” from its strategy, it stood little chance of being approved. Watershed projects were and are no exception. The interpretation of the conceptual frame work of these two features which influence project strategy differs from organisation to organisation and even from person to person; this is evident to any practitioner who makes the effort to analyse his or her experience with government, NGO and other institutions involved in supporting watershed programmes.

Integration of Interventions and Participation of People:

Several sectors and departments are involved in an integrated watershed programme prominent among these are agriculture, Forestry, Horticulture, soil and water conservation. This presence to integrate these interventions as a first step came mainly from Government of Karnataka in the context of the Panchayath Raj framework since one of the major objectives of the Panchayath Raj strategy was to integrate all activities of the Line Department through the Zilla Panchayath. Major bilateral / multilateral doners built on this initiative. The second world bank supported Karnataka watershed
project was being formulated in the mid 1980's, during the same period that the Panchayath Raj policy was being formalised.

The Government of Karnataka initiate to integrate intervention through the Rural landless Employment guarantee programme a step forward with the constitution of Dry land Development Board (DLDB) which had both technical staff and peoples representatives at the zilla Panchayat level. These Boards placed the Technical Team in the context of the “people's institutions” namely the Panchayat Raj where peoples participation was officially enshrined. The chairman of the Dryland Development Board was an elected representative. The dry land Development programmes therefore sought to bring together and to provide an institutional basis for the intervenor who were mainly technical staff and the representative of people.

Apart from the integrated technical support structure the Rural landless employment guarantee programme itself was conceived and presented in an integrated manner in Karnataka, During this period (1986-89) the Rural Development and Panchayath Raj seems to have had difficulty in getting the Government of India to accept its initiate to adopt an integrated, approach in its Rural Landless Employment Guarantee Programme (RLEGP). The practice at the Government of India level still required each component to be approved of and funded by the relevant ministry. To cope with this situation, the Government of India had to un-bundle its proposals, which were prepared in an integrated manner and submit them to the relevant ministries for approval. Having obtained these approvals from various ministries the proposals was integrated once again at the state level. Integration of
intervention, therefore, had still to be enshrined in an institutional at the National level.

It is thus recommended that the responsibility for planning and implementing drought prone area programme (DPAP) and District Development Programme (DDP) should be transferred to the democratically constituted LOCAL SELF GOVERNMENT INSTITUTIONS and to the voluntary organisations of the people. It is presumed that the democratically constituted institutions included those set up under the Panchayat Raj Act. The Hanumantha Rao report recommended that the support structure to foster participation should be a combination of Government Department, NGOs and people institutions and not NGOs or Government alone. The Report in several places linked participation with sustainability particularly related to the maintenance of structures. It states for example “where people have been motivated to participate from inception.... The structures are protected by them”. In brief, the report recognised that there is a causal relationship between participation and sustainability, particularly of physical structures which is true in Karnataka.

Hanumantha Rao committee had to deal with extreme positions. In fact in the first draft of the report Government was entirely excluded from the role of implementing watershed projects on the grounds that reforming government to adapt a participatory approach was hopeless. Only NGOs were to be entrusted with this role. This was the stated position of Relegaon Siddi. However it was soon realised that this position was not tenable. Both government and NGOs had a role as implementing agencies. The Hanumantha Rao committee rightly stressed that the objectives of intervenes was to build up the capacity
of the democratically constituted local self government, institutions and voluntary organisations of the people to take the lead in watershed development and maintenance which will include minor irrigation.

Water must run in the channel, at least, for two months after rainy season. In such channels where there is less than 2 percent slope, check dam could be built.

Special Structure:

Roof rainwater harvesting:

Storing water from roof of a house or building and using the stored water is called roof rain water Harvesting which is utilised for consumption of water for the residential houses which will allow more water available for minor irrigation through other sources. Storing water through filter channels, open walls and borewells and purifying the stored water and using it is also called water harvesting.

➢ Economic and environmental consciousness about the understanding the roof of pure and natural water easily available over the roof will be possible.

➢ It can fulfill the regional water demands.

➢ If this process of water harvest is used for constructing new houses it reduces the expenditure and it is useful.

➢ Water storage departments struggle to fulfill the severe water demands in the cities.

➢ Underground water level is decreasing or in many place, it is polluted.
Physically, lack of water problem is available, and economically, the value of money is increasing more importantly realising the real value of the water, it is used economically.

This is mainly useful to reduce the environment imbalance.

Agriculture in Rainwater Harvesting Region:

In a less fertile land, it is less profitable to produce annual production, but it is more profitable to harvest horticultural products along with annual productions, long term trees which have deep rooted in the earth, moisture the water from depth which is also useful for the agricultural products. This can bring in the economic improvement of the peasants. These trees are also useful when there is water failure.

Agriculture is the main occupation in Karnataka. Animal husbandry, which is inevitable for agriculture, is other occupation, peasants depend on the animals in the fields and so animal husbandry reforms and changes the economic status along with minor irrigation.

Suggestions:

In the light of the above discussion following suggestion are given to improve minor irrigation in Karnataka particularly Tumkur district.

1. Creation of mini perculation tank.
2. Creating dug out pond.
3. Strengthen stone built channel.
4. To build private check dam.
5. To have bunds.
6. Select few projects in good operating conditions and preferably small projects having moderate water scarcity in the commands.
7. Undertake a feasibility study examine the caste, class conflict, groupism, political difference and history of confrontation and conflict if any;

8. Examine whether any indigenous community irrigation practical are prevalent in the area and explore the possibility of using existing social capital. If it is seen that organisation of farmers is possible then a well designed strategy should be adopted.

9. A clear picture of government intention and outline of the programme should be given to the farmers.

10. As it is a new concept needing enough experimentation and experience before finalisation of its content and constituents in greater detail, the irrigation agency is not in a position to spell out the different components of the programme in concrete terms, the farmers should be informed accordingly. Otherwise frequent changes in the provisions will give a confusing picture to the farmers and they will lose confidence in the irrigation authority.

11. There should not be any haste and rigid time bound and target achievement objective, such stipulations dilute the real content and intention of implementing the programme.

12. A detailed plan should be prepared in consultation with the water users through participatory rural appraisal method;

13. Regular monitoring and evaluation of activities should be made.

14. After getting confidence and sufficient experience a model by law memorandum of understanding and necessary amendment in irrigation act should be made.
CONCLUSION:

In the light of the above research it is observed that in Tumkur district all the taluk and village survey reveals that the Economic conditions and social status have improved after adopting minor irrigation. The annual income has gone up. The spending and saving habits have undergone tremendous change after adopting minor irrigation system.

The first hypothesis that minor irrigation plays significant role in the development of agriculture in Karnataka has been justified and there is a positive correlation between minor irrigation and economic development has been proved.

The second hypothesis that minor irrigation helps to enhance the yield of the crop and output has also been proved by the study and there is a positive correlation between irrigation and output has been proved.

The third hypotheses that minor irrigation in Karnataka has generated employment and income has been proved and minor irrigation and employment generation are positively correlated particularly so in Tumkur district.

The last hypotheses i.e., minor irrigation will change the socio-economic aspects of the region has been proved and there is a positive correlation between minor irrigation and changes in the socio-economic aspects.

Thus the endeavour which has been launched with the purpose of finding minor irrigation in Karnataka and Agriculture development with special reference to Tumkur District has been completed.