26 ERC & 66 IEC MONTPELLIER FRANCE

Topic : 26 ERC : Innovations for small holders in irrigation

Workshop : PRECISION IRRIGATION FOR SUSTAINABLE CROP PRODUCTION

ECONOMIC ANALYSIS OF CROPS' PRODUCTIVITY POTENTIAL AND DRIP IRRIGATION SYSTEM IN INDIA – POLICY IMPLICATIONS

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1. I N T R O D U C T I O N

- India has a huge water potential barring this it faces ‘relative scarcity of water’.
- This ‘scarcity in abundance’ has been managed partly by adopting micro irrigation technology in the country.
- India has <10% area under micro irrigation and developmental agencies have been promoting it due to it’s the biggest benefit of enhancing crops’ productivity by 3-5 times.
- This study to show economic worth of Drip Irrigation vis-à-vis crops’ productivities in the light of policy implications with the specific objectives.

2. O B J E C T I V E S

- To analyze existing status of water resource potential, drip system and crops' productivity
- To work out cost effectiveness of drip irrigation system and
- To work out remedial measures against farmers' problems for providing input to the policy frame work.

3. METHODOLOGY

- **Secondary time series data collected on the existing land, water related parameters and major crops' productivities.**

- **Primary data analyzed have been collected from a sample of 130 respondents with and without drip irrigation sites from Shimla dist.**

- **Data have been analyzed by adopting suitable economic tools. Growth trends and net additional annual cash flow based on respondents' responses have been found.**

- **Inputs implication to the policy issues has been based on multiple responses, scientific recommendations and development oriented existing water resource related programs.**

4. RESULTS AND DISCUSSIONS

4.1.Existing status of Water Resource Potential, Drip Irrigation and Crops'productivity

1.1 Water Resource Potential :

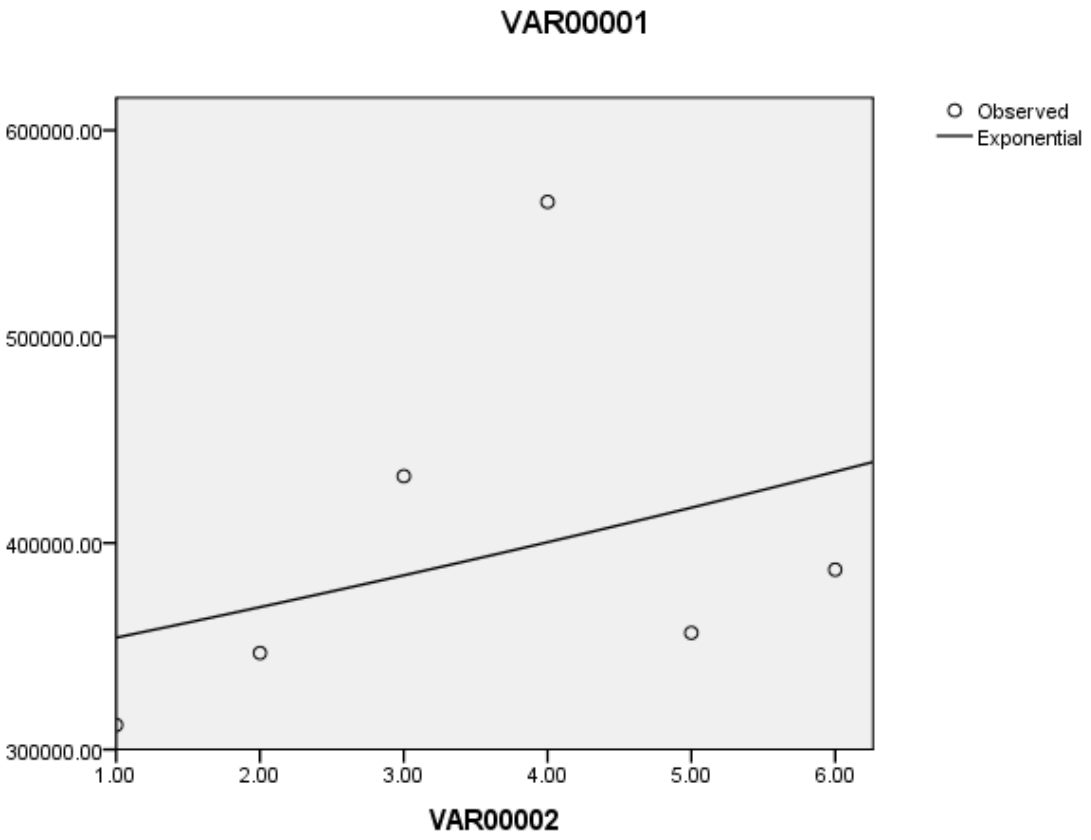
- Two major river basins – **Indus and Ganga** – have more than **1/3rd of the total catchment area of the country and 100% of the state.**
- **Average annual rain fall good - about 1300mm.**
- **Increase of 26.37% in irrigation potential through major, medium and minor schemes during last decade.**
- **Existing irrigated area 19.5% of the net cropped area as a result of on-going development programs.**
- **Ground water development (30% against 58% for the country).**
- **HUGE POTENTIAL NEED TO BE EXPLORED.**

Major River Basins of HP

Existing Irrigation potential available/created in HP

Sr. No.	Items	2003-04	2012-13	%age change
1.	Irrigation potential available			
1.1	Major/Medium Irrigation Schemes	0.50	0.50	
1.2	Minor Irrigation Schemes	2.85	2.85	
2.	Irrigation potential created	2.01	2.54	+26.37

1.2. Drip Irrigation system in India and state of HP (Micro irrigation development) gr 4.1%



4.1.2. Drip Irrigation system in India and state of HP (Drip irrigation development) gr 11.9%

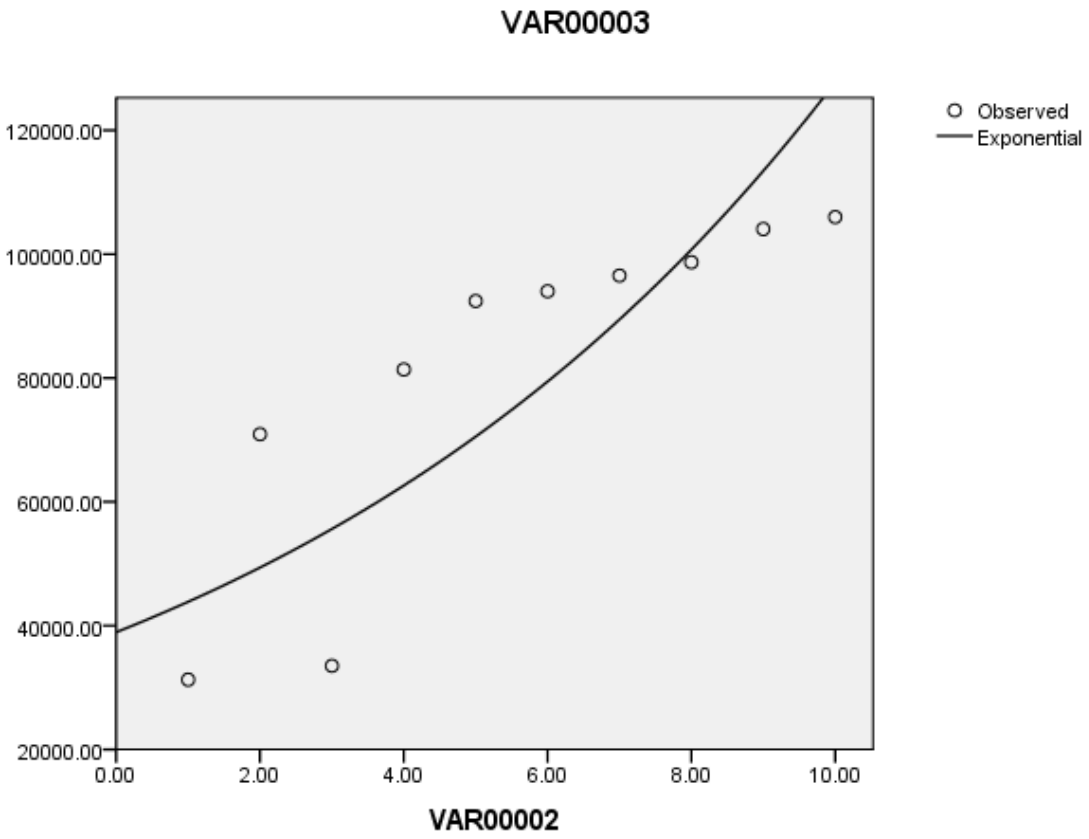


Table-4.1.3 Crops' Productivities in Himachal Pradesh, India and at global level

Sr. No.	Crops	Productivity (MT/Ha)	Productivity (MT/Ha)	Percentage change
		2008-2009	2012-2013/2010/2010	
1.	Total Food Crops	1.53	1.96/(2.8-3.3)/(8.9-10.8)	28.10
2.	Total Fruit crops	3.06	3.79/(6.3-37.8)/(40.6-59.3)	23.86
3.	Apple Crop	5.23	6.94/11.0/18.0	32.70

Table- 4.2 Cost effectiveness of Drip Irrigation System

Sr. No.	Particulars	Percentage/Rs.
1.	Water Saving	25
2.	Enhanced yield	35
3.	Saving in labour	90
4.	Control of weeds	40
5.	Economy in other cultural operations	50
6.	Improvement in fertilizer use efficiency	25
7.	Reduction in plant protection measures	30
8.	Irrigation Efficiency	66
9.	Enhanced Benefit cost ratio (Rs.)	2.98:1

χ^2 = 80.9111 significant at 0.01

Farmers'Problems and remedial measrues

Table- 4.3 Problems faced by the orchardists

Sr. No.	Problems	Percentage
1.	Expensive system	70
2.	Lack of awareness	55
3.	Lack of adequate technical know how	70
4.	Quality of the material	
	Life of the system	20
	Cracking/leakages of pipes	40
5.	Operational problem	
	Clogging of drippers	56
	Squirrels/rodents damage plastic material	90
6.	Insufficient after sale/installation service	98
7.	Lack of trainings/skill	80

χ^2 = 29.2083 significant at 0.01

4.4. Remedial measures in the light of National Water Policy

According to **National water Policy,** there has been limits on utilizable quantities of water due to uneven distribution of rain fall over time and space and large parts of India have already become water stressed, **hence unified national perspective** needed for management of water resources in the country.

(i) Purchasing Power of the beneficiaries : Small sized land holding under majority portion rainfed has ultimately lead to very l ,low yields and corresponding lower purchasing power that has, however, been taken full care during 2014-15 by raising **subsidy** level to 80% in the state. Other states also need similar incentive.

(ii) Strengthening of education system in the state to raise literacy level of the beneficiaries that will raise grasping levels to understand **technicalities**.

(iii) Strengthening of Extension Services through the development schemes of the related public and private agencies/departments in association with State Agriculture/Horticulture/Forestry Universities by imparting **trainings** on scientific lines.

(iv) Ensuring water availability by **micro level planning** of available water resource either on the farm or in the vicinity of farms. This requires immediate action due to **immediate water need** as macro level planning may take time.

(v) Top priority to water related development programs at macro level –National scheme on micro irrigation has been implemented with a missionary zeal to use this technology on the farm. The **macro level planning nation/state-wise** has been considered a **pre requisite** so as to enhance irrigation potential and save water further through such water saving methods for making food security 'an achievable challenge' on sustainable basis.

(vi) Innovative idea : Innovative ideas based on existing research make even technology a sustainable option, therefore, unified perspective by considering multi-disciplinary approach in managing available utilizable water must be adopted. This can be achieved by **taking the river basin as the basic hydrological** unit for spreading/linking branches of irrigation around this basic unit. This will not only sustain irrigation in the country as a whole but also yield multifarious advantages of water channelization.

(vii) Involvement of Applied Social Scientists. In drip irrigation scheme like other development projects questions like - What has been the **Supply level** of water and it's **demand** in various uses at a project site ? Whether Investment will be economically viable? **What will be the productivity gains**? **How much will be the water saving** etc? ; along with other important **economic indicators** like Pay Back Period, Net Present Worth, Annuity, Internal Rate of Return etc. Answer to these questions may be obtained if **involvement of Applied Social Scientists** (**Applied Economist**, Extensionist, Sociologist and Psychologist etc) is ensured at all the stages of water resource development projects/schemes **during full tenure of the project ensuring further weighted irrigation development index.** (Presently IDIw = 0.44).

Ergo, ‘a sustainable **multi-disciplinary model’ based on Supply of and demand for water** involving **Psycho-Socio-techno-economic flow of parameters** must be the back bone of water resource development projects.

CONCLUSIONS

No absolute scarcity of water only '**relative scarcity'** exists that needs water management **in the light of strategic points.**

Greater 'drip utility' if water resource available planned at micro level by enhancing irrigation potential through on going irrigation schemes and macro level by considering '**river basin'** as a **basic and starting unit** of over all water resource development in the state.

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Table-2. Water Resource Potential of two river basins having 100% catchment area in Himachal Pradesh

Sr. No. 1.	River Basin 2.	Catchment Area (Sq.Km.) 3.	Average Water Resource Potential 4.	Utilizable Surface Water Resource 5.	%age of 5 to 4. 6.
1.	Indus	321289 (9.96)	73.31 (0.71)	46 (6.67)	62.75
2.	Ganga	861452 (26.69)	525.02 (28.09)	250 (36.23)	47.62
	Sub total	(36.65)	(28.80)	(42.90)	
! 20.	! !	! !	! !	! !	! !
	Total	3227021 (100.00)	1869.35 (100.00)	690.1 (100.00)	

1.3 Major River basins in the Study area

1.4.Irrigation Potential available, created and Utilized in HP vs India

- **Huge gap among irrigation potential available, created and utilized** in the country as well as in the state.
- Although the state level percentages have been found to be higher than national level yet **approx. 40% unexplored irrigation potential** needs to be developed at both the levels **THROUGH MAJOR AND MINOR IRRGATION PROJECTS.**
- **Ground water development has been found to be lower (30%)** than the national level (58%) **Table-3**.
- **The existing irrigated area has been worked out to be 19.5% of the gross cropped area in the state as a consequence of water resource development programs (India = 40%).**
- **SEEING THE WATER POTENTIAL (Surface and Ground) AVAILABLE IN THE STATE, MACRO LEVEL PLANNING CAN MAKE I00 PER CENT IRRIGATION AVAILABLE TO THE FARMERS.**

1.5 Crops' Productivities in Himachal Pradesh - India

2. Drip Irrigation System and Crops' Productivities

- Drip Irrigation System (DIS) has many comparative advantages consequence upon which area under DIS has shown increasing trend at national level.
- At the existing level of water utilization in the state, this study has been foccused on finding out **the cost effectiveness of DIS.**
- Cost effectiveness of DIS in terms of water saving and enhancing crops' productivities have been recognized at national level and in apple crop under this study **Table-5.**
- Problems faced by the beneficiaries/orchardists during and after installation and operation **Table-6.**

3. National Water Policy framework

- As per **National water Policy,** there has been limits on utilizable quantities of water due to uneven distribution over time and space, **hence unified national perspective** needed for management of water resources in the country.
- Large parts of India have already become water stressed.
- Existing water resource development public and private agencies need multi-disciplinary efforts through synergistic approach at all development stages of water resource projects.

3.1 Implications of the study

- Suggestive measures for making water saving technology a greater success include the following points :

3.1.1. Pruchasing Power of the beneficiaries

- Majority of farmers has very small holding size accompanied by mainly rain fed situation has lead to very low income levels that has further continued their low purchasing power so they need higher level of subsidy and this demand has been taken full care during 2014-15 (raising subsidy level to 80%.

Implications of the study contd.

3.1.2. Strengthening of education system in the state to raise literacy level of the beneficiaries leading to enhancement in their grasping levels.

3.1.3. Strengthening of Extension Services through the development schemes of the related public and private agencies in association with State Agriculture/Horticulture/Forestry Universities.

3.1.4. Ensuring water availability during the deficit period in a year for successful operation of DIS.

Implications of the study contd.

3.1.5 Top priority to water related development programs - Technically irrigation efficiencies under different methods of irrigation and water use efficiencies crop wise have been reported to be higher in case of drip irrigation system, therefore, dire need of water in it's multiple uses has enforced nations to give top priority to water saving technologies in the light of increasing demand for water among multiple uses. The scheme first started in India in1982-83, has been upscaled **as National Mission** on Micro Irrigation during Xi plan period, seeing it's cost effectiveness.

Implications of the study contd.

3.1.6. Innovative idea : (may not be exactly innovative but missing in plans) For growth of water resource on sustainable basis and related water saving technologies simultaneously, the present water management at different levels has been alarming to plan, develop and manage water resources in a unified perspective considering local, regional, state and national context on environmentally sound basis, keeping in view the human, social and economic needs in the light of **following suggestions** to be included in a systematic way in water related plans, policies and programs :

Implications of the study contd

3.1.6.1. All the elements of water cycle like river, lakes, soil moisture, ground water and sea etc. are interdependent and the basic hydrological unit is **the river basin** which should be considered as the **basic hydrological unit for planning.**

3.1.6.2. Nation and State wise river basins (Macro level planning) need to be planned and integrated on sound scientific lines by synergistic action of all the multi disciplinary experts. Any gap will lower down the **total irrigation development index.**

3.1.6.3. All natural water resources need to be tapped simultaneously due to multiple immediate uses of **water at micro level** as macro level planning may take a few years.

Implications of the study contd

3.1.6.4. Most importantly, there has been an urgent need to have **economic and social indicators of drip irrigation/micro irrigation** in general for dissemination of technical and economic information based on scientific data to every agency involved at every stage of the scheme because every scheme remains silent with respect to questions from the beneficiaries like What has been the **Supply level of water and it's demand in various uses at a project site ?** Whether **Investment will be economically viable** ? **What will be the productivity gains** ? How much will be the water saving etc ? - **along with other important economic indicators like Pay Back Period, Net Present Worth, Annuity, Internal Rate of Return etc.**

These questions generally arise due to non involvement of the Applied Social Scientists (Applied Economists, Applied Extensionists, Sociologists and Psychologists etc) at different stages of the water resource development projects/schemes.

Implications of the study contd

ERGO, A SUSTAINABLE

MULTI-DISCIPLINARY MODEL BASED ON SUPPLY OF AND DEMAND FOR WATER

INVOLVING

PSYCHO-SOCIO-TECHNO-ECONOMIC FLOW OF PARAMETERS

MUST BE THE

BACK BONE OF WATER RESOURCE

DEVELOPMENT PROJECTS.

CONCLUSIONS

- **Two major river basins namely Indus and Ganga has huge unexploited water potential which need to be exploited at national and state level by formulating multi disciplinary integrated water resource development projects strictly and seriously on scientific lines accompanied by adoption of water saving technologies by the farmers.**
- **The relative scarcity of water and it's multiple uses steer to plan water in a scientific way by adopting multi objective planning. Water due to its multiple-uses requires sensitive and serious efforts from one and all departments by keeping budgetary provisions in a frame and undertaking jobs related to water conservation and its judicious utilization for enhancement of specifically apple productivity and crops' productivity in general.**

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