A Study on Impact of Training for Efficient Water Management in Agriculture

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Abstract

Extension functionaries play a catalytic role in adoption of agricultural innovations where water management is no exception. Training plays a pivotal role for enhancing the competence of extension functionaries' through diffusion of innovations at actual workplace. In this stride, training on scaling up of water productivity in agriculture was organized and evaluated at all the stages of the Knowledge, Attitude, and Skill and Aspiration (KASA) model. The model assumes that change in knowledge, attitude, skill and aspiration leads to modification in practices for creating desired changes in water management in agriculture. Significant change in acquiring knowledge, developing participatory skills, changing attitudes and fulfilling aspirations towards scaling-up of water productivity in agriculture was observed. Hence, the enhanced learning will be effectively diffused among the farmers at the actual workplace for effective water management.

Keywords: Water Management, Training, Extension Personnel.

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1. Introduction

India is endowed with rich and vast diversity of natural resources, water being one of them. Water resources of a country constitute one of its vital assets and its significance is well evident globally. Hence, efficient management is vital for poverty reduction, environmental sustenance and sustainable economic development. Competition among agriculture, industry and cities for limited water supplies is already constraining development efforts in many countries including India. As populations expand and economies grow, the competition for limited supplies is most likely to intensify, resulting in potential conflict situation among water users in days to come (Singh et al 2013). Despite shortages of water, its misuse is widespread, be it in small communities or large cities, farmers or industries, developing countries or industrialized economies every where the mismanagement of water resources is evident. Surface water quality is deteriorating in key basins from urban and industrial wastes (Singh et al. 2013). Water resource development and management is imperative for sustainable agriculture in water scarce areas (Ashraf *et al.,* 2007). In recent years development strategies have undergone a dramatic shift, with the emphasis changing from the state being the central sector toward greater participation by government or non-governmental organizations (Yercan, 2003). Bihar is one of the flood affected states where 71% area is flood prone therefore management of water resources could be a boon. There is need to effective management of available water to make it granary of India. A.P.J Abdul Kalam—the former President of India clearly stated the importance of water management while inaugurating the 3rd Bihar Science Congress-2011 at Gaya as "There are no other scientific and technological challenges for Bihar other than river water management by generating huge reservoirs and canal system and linking all other rivers to major rivers to combat floods". The long-term water management strategy in Bihar must embrace the community-based fisheries and flood management systems; also extension and training activities in coordination with non-governmental actors (Gulati *et al.,* 2011). The critical issues in water and sanitation sector in the Bihar identified by the State Water Policy 2010 are (i) Uncertainty in availability of water; (ii) Low operational efficiency of water resources systems; (iii) Depleting ground water resources and deteriorating quality of water (iv) High cost of service, low cost recovery and low level of expenditure on operation and management; (v) Lack of ownership amongst the

stakeholders; (vi) Low awareness about sanitation and adoption of hygiene practices; (vii) Weak intersect oral convergence; (viii) Lack of community participation.

Extension functionaries play a catalytic role in the adoption of water management innovations. Moving toward a more decentralized, participatory and market driven approach, extension system will require substantial investments in up-grading the skills and knowledge of all extension personnel, especially those at field level (Swanson, 2008). Hence, need for strengthening the extension-personnel through effective training programs has become an integral part of agricultural development strategy. Monitoring and evaluation are the in-built component of extension and training systems. Through evaluation process, learning can be enhanced and transferred to the workplace (Bartram and Gibson, 1999). Hence, initiatives were undertaken to develop the capabilities of extension functionaries' through training programmes on water management. The study was undertaken to get hands-on-experience for efficient use of water; enhance the scientific outlook in water management which will lead to increase in their knowledge, skill and attitude level of extension personnel.

2. Agricultural Water Management in India

Water development and management plays a vital role in agriculture production. Since independence, India's primary goals have been economic growth and food security, completely disregarding water conservation. This has caused serious ramifications being felt today, as many citizens still operate under these principles. Unlike many other developing countries, especially those with acute water scarcity issues such as China, Indian law has virtually no legislation on groundwater. Anyone can extract water: homeowner, farmer or industry as long as the water lies underneath their plot of land (Sengupta, 2006). The development and distribution of cheap electricity and electric pumps have triggered rapid pumping of groundwater and subsequent depletion of aquifers. More than two billion people worldwide live in regions facing water scarcity (Celia, 2006) and in India this is a particularly acute crisis. Millions of Indians currently lack access to clean drinking water, and the situation is only getting worse. India's demand for water is growing at an alarming rate. India currently has the world's second largest population, which is expected to overtake China's by 2050, putting increase strain on water resources as the number of people grows. A rapidly growing economy and a large agricultural sector stretch India's supply of water even thinner.

The tragedy of India's water scarcity is that the crisis could have been largely avoided with better water management practices. There has been a distinct lack of attention to water legislation, water conservation, efficiency in water use, water recycling, and infrastructure. Traditionally water has been viewed as an unlimited resource that did not need to be managed as a scarce commodity or provided as a basic human right. Now-a-days these attitudes are changing in India; there is a growing desire for decentralized management developing, which would allow local municipalities to control water as best needed for their particular region. Due to a variety of socioeconomic processes and demographics, dramatic rises in water demands have been seen in India. Hence, water scarcity is becoming a major constraint in producing food for growing population, ecosystem protection, and maintaining health and social security. Increasing competition and conflicts also pose social and ecological risks. Demand for water will grow by leaps and bounds during the next few decades due to population growth (especially in urban areas), concentration of urban population in a few urban cities, rising income levels and rapid industrial growth. While water resources would continue to deplete, water scarcity problems would grow in terms of both intensity and extent.

The Government of India has formed various water management systems and authorities including Central Water Commission, Central Ground Water Board, National Water Development Agency, National Projects Construction Corporation Ltd. etc. for efficient water resources management. The policies thus formulated include Irrigation Management Policy, National Policy Guidelines to allocate water resources like rivers flowing through multiple states, National Commission for Integrated Water Resources Development Plan, Water Information Bill, River Basin Organization Policy, and many more. Various water reservoir projects were also taken up by the Ministry of Water Resources like construction and management of dams on various rivers. Three main issues limiting sustainable management of water resources in the South Asia have been described by U.S. Agency for International Development (USAID) namely: (i) Policy failures and institutional weaknesses, including cost recovery issues; (ii) Competition for water, and (iii) Health and environmental needs and effects. United Nations International Children's Emergency Fund (UNICEF) report on Indian water reveals that "There will be constant competition over water, between farming families and urban dwellers, environmental conservationists and industrialists, minorities living off natural

resources and entrepreneurs seeking to commodify the resources base for commercial gain" (Anand, 2005).

Kumar and Vishwa Ballabh (2000) mentioned the challenges for evolving the sustainable, equitable and efficient management of India's water resources as: (i) the non-availability of adequate scientific data on water supplies, demand and problems; and economically viable and socially acceptable technological solutions (ii) existing institutions in the water sector are technically oriented, sectoral and centralized, having the mandate of managing supplies. They adopt piece-meal approaches to solve sectoral problems, and seriously lack capabilities to alter social systems to promote efficient water use and control pollution. The agencies fail to respond to the conflicting needs and interests of different stakeholders due to poor organizational co-ordination. They also lack institutional capabilities to ensure equitable allocation and efficient use of water across sectors and to resolve conflicts. Meanwhile, India's supply of water is rapidly dwindling primarily due to mismanagement of water resources, although over-pumping and pollution of water bodies are also significant contributors. Climate change is expected to exacerbate the problem by causing erratic and unpredictable weather, which could drastically diminish the supply of water coming from rainfall and glaciers. India's water crisis is predominantly a manmade problem. India's climate is not particularly dry, nor is it lacking in rivers and groundwater. Extremely poor management, unclear laws, government corruption, and industrial and human waste have caused this water supply crunch.

3. Research Methodology

A fourteen days intensive training program on water management was organized and evaluated. Data were solicited from 25 state level extension personnel across the Indian states working in the institutes of Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs), Krishi Vigyan Kendra (KVK) and development departments. The training was conducted through lecture method followed by result or method demonstration following the *"Learning by Doing"* and *"Seeing is Believing"* principles. Training program was divided into following modules:

(i) Socio-economic facets of water saving technologies;

(ii) Water management in agronomic and horticultural crops;

(iii) Water management in livestock and fishery sector;

(iv) Agricultural engineering technological interventions;

(v) Integrated nutrient and disease management;

(vi) Role of women, financial institutions and participatory approach; and

(vii) Result/method demonstration/interactions/group discussions with farmers, extension functionaries and scientists.

Evaluation of trainees was done at all the stages of Knowledge, Attitude, Skill &Aspiration (KASA) model. The model assumes that change in knowledge, attitude, skill and aspiration leads to modify in the scientific practices, which create desired change for effective water management. Before and after design with singe-group was pursued to measure the impact of training.

4. Results and Discussion

4.1 Descriptive statistics

Descriptive statistics of the study shows that age of extension functionaries ranged from 25 to 49 years with a mean of 39 years. Majority of them were male and had rural family background. Most of them had master degree in agriculture followed by bachelor degree. Respondents' job experience varied from 1 to 28 years with a mean of 11 years. Most of them are engaged in research followed by extension activity. Surprisingly, only few of them had less than one year working experience in water management related activities. Information seeking behavior show that 92% extension personnel contacted the scientists of ICAR, SAU and KVK for getting agricultural related information. However, mass media (Television) is also playing a key role in dissemination of proven technologies as reported by 52% respondents followed by Kisan mela, Radio and News paper.

4.2 Impact of the training program

Non-parametric test (Wilcoxon Signed Rank test) employed to test the difference in paired data. The test is based on the magnitude of the difference between the pairs of observation. The values in two groups compared are naturally linked, and usually arise from individuals being measured more that gather before and after the measurements.

4.2.1 Gain in Knowledge and participatory skill development

Training is as an act of increasing the knowledge and skills of employees for doing a good job. This process includes a sequence of experiences, a series of opportunities to learn, in which the trainee is exposed in some more or less systematic way to certain materials or events. Training for development focuses on training not primarily as a source of new information, but rather as a

means for changing behaviour for lasting improvement on the job (Lynton and Pareek, 1990). Table-1 shows that initial knowledge score ranged from 8 to 26 with mean score of 19.76. After exposure to training, knowledge score ranged from 20 to 29 with mean score of 24.68. Thus, overall gain in knowledge was found to be 16.13%. However, this improvement was found significant (Z=4.21) as Wilcoxon Signed Rank Test is higher than table value. As far as participatory skill development is concerned, pre-training score varied from 11 to 37 with a mean of 23.91. The score of post-training was ranged from 25 to 48 with the mean score 38.74. Thus, the difference was found 30.92% which is significant at 0.01% (Z=4.41).

Table-1 Gain in Knowledge and participatory skills

Particulars	Gain in Knowledge			Skill Developed		
	Pre-Training	*Post-Training*	*Change (%)*	*Pre-Training*	*Post-Training*	*Change (%)*
Minimum & maximum score	7-29	7-29		0-48	0-48	
Range of score obtained	8-26	20-29		11-37	25-48	
Mean score	19.76	24.68		23.91	38.74	
Overall gain (%)	68.13	85.10	16.13	49.83	80.75	30.92
'Z' Value			4.21**			4.41**

*** Significant at 0.01 % level*

Source: Meena et al. (2010)

4.2.2 Changes in attitude and aspirations fulfilled

Table-2 depicts that pre-evaluation attitude score ranged from 7 to 10 with 9.04 mean score while post-training score was observed in the range of 14 to 20 with mean value 19.08. Consequently, study shows about 50% change in attitude toward scaling up of water productivity. The pre and post-evaluation scores for expectation/aspirations ranged from 6 to 12 and 12 to 18, respectively. The average score was found to be 8.64 and 14.64, respectively. The aspirations level increased from 55.38 to 93.46% with a difference of 38.46%, which is significant (Z=5.00). The study concludes that a significant change in knowledge, attitude, skill and aspiration was observed, hence, null hypothesis is rejected.

Table-2 Change in attitude and aspiration level

Particulars	Change in Attitude			Aspirations fulfilled		
	Pre-Training	*Post-Training*	*Change (%)*	*Pre-Training*	*Post-Training*	*Change (%)*
Minimum & maximum score	0-20	0-20		6-18	6-18	
Range of score obtained	7-10	14-20		6-12	12-18	
Mean score	9.04	19.08		8.64	14.64	
Overall gain (%)	45.20	95.40	50.20	55.38	93.84	38.46
'Z' Value			4.26**			5.00**

*** Significant at 0.01 % level*

Source: Meena *et al* (2010)

5. Conclusion & recommendations

Moving toward a more decentralized, participatory and market driven approach, extension system will require substantial investment and improvement in upgrading the field extension personnel. A significant impact of the training was observed where extension personnel acquired new knowledge, developed participatory skills, changed in their attitude and aspirations fulfilled toward scaling-up of water productivity. Hence, enhanced learning must be effectively transferred to the farmers' field for effective water management. Surprisingly, only few extension personnel had a little experience in water related technologies. Hence, there is a great need to keep them updated in technological advancement on water management. This systematic appraisal will also provide corrective measures to improve an on-going or future training program on water management. However, the extension system needs to be re-oriented and revitalized with new knowledge base in emerging technologies and methodologies for impact assessment.

Based on this study some policy initiatives for effective water management in India as per the National water policy (2012), which envisages that the water resources of the country should be developed and managed in an integrated manner; hence it needs to make the water management as a national priority at par with food security. Trainings are effective in changing the knowledge, attitude, skill and aspiration levels of the extension personnel, these attributes becomes more permanent in nature when the training programme facilitates it, can be recommended. Thus, efforts should be made for (i) Adequate capacity building programmes on water management; (ii) Water management technologies can be transferred through group approach (self-help groups) for speedy diffusion among the social system, which promote

participatory extension; (iii) Countryside water management practices/innovations and success stories can be promoted through mass media; (iv) There is also a need to speed up the rainwater harvesting for efficiently taping the huge quantity of monsoon rain and efforts are needed to motivate the extension administrators and farmers for ground water harvesting as well.

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