



Enhancing the capacity of the women led Agricultural Innovation System through its Diagnosis

KEYWORDS

Agricultural innovation system, farm women, , focus group discussion, RBQ analysis, stakeholders.

Rema Das

Kausik Pradhan

Department of Agricultural Extension, Uttarbanga Krishi Viswavidyalaya, Pundibari, Coochbehar 736165, West Bengal.

Department of Agricultural Extension, Uttarbanga Krishi Viswavidyalaya, Pundibari, Coochbehar 736165, West Bengal.

ABSTRACT

Rural Indian women are extensively involved in agricultural activities. The Agricultural Innovation System framework considers women to be critical actors in an innovation system. In the study area women are engaged in production related activities and are making greater contribution in the process of generating, diffusing and applying of new knowledge in agricultural sector. So to make women led agricultural innovation system more effective, knowledge vibrant and market oriented there is a need to build capacity of each and every actor associated with the innovation system. Therefore now it is very pertinent to identify all the stakeholders, their role and activities involved in the system. Hence, the study aims to identify the existing agricultural innovation system dealt by women and to explore the stakeholders' role, activity and the enabling environment including the developmental programs and policies which supports women led agricultural innovation system of the study area. A Rank Based Quotient Analysis (RBQ) was also carried out to prioritize the areas of intervention made by each actor to the innovation system.

Introduction

Almost half of the (48.27%) women of our country are mostly associated with the sustainable household activities; not only that but also women are critical to the wellbeing of farm household. Women are involved in all aspects of agriculture and allied activities from land preparation to marketing of agricultural produces. Today 44% world's food is produced by women which indicate the importance of women in farming. Many studies also revealed that women play an important role in decision making in various domains of the innovation system. In the study area women are associated throughout the existing agricultural production and marketing system and are making greater contribution in the process of generating, diffusing and applying of new knowledge in agricultural sector. Despite the fact that they are performing several farm activities, their roles have been overlooked by the agriculturalists and policy makers as they have less access to resources. In such a resilient research climate there is a need to reemphasize the role of farm women in women led agricultural innovation system. An agricultural innovation system is "a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance. The innovation systems concept embraces not only the science suppliers but the totality and interaction of actors involved in innovation as well. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways" [1]. From the perspective of the Agricultural Innovation System framework, the active engagement of women is no longer only a right but is an imperative to future farming, processing, and marketing systems that can improve livelihoods and agribusiness development. This framework proposes that innovation involves not only new actors but also new roles and many relationships that can sustain knowledge generation and learning if technical and economic successes, together with social and environmental sustainability, are to be achieved [2]. An analysis based on an innovation systems framework can contribute to addressing the discrepancy between the changes in policies, actors, and relationships, on the one hand; and productivity on the other. The framework draws attention to the diverse actors that contribute to agricultural innovation processes—public research organizations, private companies, non-government organizations (NGOs), civil society organizations, and smallholders themselves—by shedding light on the roles and responsibilities, actions and interactions, and institutions that condition behaviors and practices [3]. An innovation system consists of the participants or actors and

their activities and interactions, as well as the socio-economic environment within which these actors or participants function that together determine the innovative performance of the system [4]. Hence, keeping this in mind the study aims to identify the existing agricultural innovation system dealt by women and to explore the stakeholders' role, activity and policy support or the enabling environment in women led agricultural innovation system of the study area.

Methodology

The study was conducted in Coochbehar district of West Bengal. Coochbehar block-I has been purposively selected for the study. The purposive and random sampling procedure has been followed in this study. For collection of data regarding the enabling environment and policy support associated with the agricultural innovation system in the study area had been consulted with the Department of Agriculture at district level and Block Development Officer respectively. Total hundred respondents were randomly selected for the study out of which the number of farmers, input dealers, NGO staff, Bank employees, staff of village resource centre, KVK staff, NABARD officials, farmer's club members and state extension professionals were 40, 10, 5, 5, 10, 5, 5, 10, 10 respectively. A semi structured interview schedule was prepared to collect information regarding the actors, their role, activities with the help of focus group discussion method by involving farmers, farmer's club, NGOs, input dealers, service providers and extension personnel etc. Rank Based Quotient was calculated for each activity performed by each actor with the formula:

$$RBQ = [\sum Fi (n+1-i) / N n] \times 100$$

Where, F_i is the frequency of farmers for the i th rank of the activities; N and n denote the total number of respondents and total number of activities performed by each actor respectively.

Results and Discussion:

Table-1 represents the various stakeholders of the agricultural innovation system. The women stakeholders are presented in the table according to their perception regarding importance of their contribution in the innovation system. The study reveals that the women farmers are mainly engaged in improved agricultural production practices, input dealers are associated with providing of inputs, NGO staffs are concerned with knowledge dissemination, bank is providing financial assistance, KVK and extension department are the part of knowledge generating and knowledge disseminating system and also facilitates in capacity building of the

stakeholders.

Table-2 indicates the prioritization of functions performed by the actors of the innovation system. The ranking of interventions made by each actor was done based on the responses of the actors. The table shows that for the farmers crop production related activities ranks first and got the highest RBQ value which is 80. The activities like livestock rearing (48.75) ranks as second most important one followed by Adoption of improved agricultural technologies like System of Rice Intensification, System of Wheat Intensification, hybrid varieties (22.4) and Zero-tillage rice, wheat and maize production (20.3). The RBQ values of interventions made by input dealers are Supply of local, hybrid and certified seeds (65.8); Providing organic and inorganic fertilizers, micronutrients (28.2); Supply of pesticides, insecticides, fungicides and herbicides (19.8); Provides agricultural machineries or implements on rent basis (19.2) and Provide information on agricultural management practices (11.2). The table also reveals that NGO mostly involves in Supply of inputs and machineries (60) followed by Formation and nurturing of farmer's club, women SHGs etc. (36); Link between farmer and government departments (32) and Organizes Farmer's Field School, Krishi Mela and training programmes. Financial institutions mainly providing KCC loans on rice, jute, potato and many other crops and RBQ value is 100. KVK is mostly engaged in conducting front line demonstrations and on farm trial. NABARD is the prime financial agency that provides financial support to various actors of the system and makes investments in agriculture system to generate and diffuse agricultural innovations to the farming community. Farmer's club makes greater contribution towards providing agricultural information (RBQ value=57) to farmers followed by supplementing extension services of State Department of Agriculture and other line departments (36), supplying inputs from various public and private agencies (12.5). Lastly, state extension professionals are more concerned with Dissemination of information on modern agricultural practices through publications and handouts for the benefit of literate farmers as well as through mass media (RBQ value=50.57).

Table-3 presents various developmental programs and policies that influence the behavior or patterns of interaction of each actor in shaping the innovation system's performance. National Agriculture Insurance Scheme (NAIS) is associated with recovering crop loss in case of natural calamities. West Bengal Accelerated Development of Minor Irrigation Project (WBADMIP) focusing on water manage-

ment and agricultural support services. Rashtriya Krishi Vikash Yojana focuses on preparing and executing the state agricultural plan. National Food Security Mission is related with productivity enhancement. Sub-Mission on Agricultural Mechanization scheme is providing assistance of farm power to the farmers. National Mission for Sustainable Agriculture focuses on interventions to make agriculture sustainable.

Table-4 depicts how an agricultural product or information flows from the source to the end user. In this table flow of agricultural products like rice, wheat, maize, vegetables, tobacco, jute, mustard etc. are presented. The study also revealed that women were engaged in marketing, processing of agricultural produces.

Conclusion:

As an aftermath of empowering the rural people with the help of some genuine strategies of the gender based agricultural innovation system is a resilient concept to equivocally empower the rural men and women by increasing their access to locally available resources in a nutshell. The present study helps in identifying the women stakeholders who led the Agricultural Innovation System (AIS) in local area. Not only that but also the habits of the women stakeholders and their linkages with different locally available organizations are identified to get a holistic idea about the women led production and marketing system within an Agricultural Innovation System (AIS). The only stakeholder identification, their linkage and delineation are not the potential enhancer of the capacity in AIS. Here, the enabling environment is including the developmental program and policies plays pivotal role in case of delineating the factors relating to capacity of Agricultural Innovation System (AIS). So the present study shows the clear penchant towards diagnosing the women stakeholder's nature, habit, linkage and enabling environment within rural Agricultural Innovation System (AIS). The whole study implies the resilient fulfillment of building a conceptual framework in deriving the epitome of knowledge associated with women led Agricultural Innovation System (AIS) in rural social system.

Acknowledgement: I sincerely acknowledge the Department of Science and Technology (DST), Govt. of India, for their continuous motivation and providing financial assistance under the 'Inspire Fellowship Scheme' to carry out the research work. The paper should be included under the subject namely "Agriculture".

Table-1. Diagnosis of Agricultural Innovation System

Sl. No	Name of the Stakeholder	Role	Activity	Institutional Linkages
1.	Women farmers	Producer	<ul style="list-style-type: none"> Adoption of improved agricultural technologies like SRI, SWI, hybrid varieties etc. Crop production related activities Livestock rearing and fishery related activities Selling of produces in the local hats or market. Zero-tillage is practiced in case of producing rice, wheat and maize. 	Farmer's club, Input dealers, Bank, Cooperatives, SHGs and micro-finance institution like Bandhan.
2.	Input dealers	Input Supply	<ul style="list-style-type: none"> Provides organic and inorganic fertilizers, micronutrients. Supply of pesticides, insecticides, fungicides and herbicides Supply of local, hybrid and certified seeds of different crops Provides agricultural machineries or implements on rent basis 	Fertilizer companies. Seed companies, Agrochemical companies (Private sector), Bank.
3.	Women staff of the NGO	Service Provider	<ul style="list-style-type: none"> Supply of inputs and machineries Provides banking facilities through business correspondence. Link between farmer and government departments. Organizes Farmer's Field School, Krishi Mela and training programmes. Formation and nurturing of farmer's club, women SHGs etc. 	Farmer's club, Banks, Department of Agriculture, Department of Horticulture, State Agricultural University, KVK, NABARD, Input dealer

4.	Women employees of financial institutions	Financial Assistance	<ul style="list-style-type: none"> Provides KCC loan on rice, jute, potato and many other crops according to Scale of Finance at 7% rate of interest Provides Agricultural loan for Machineries Bank also provides LIC facilities for the loan availers Strong linkage with women SHGs Aware women SHG members regarding management of bank accounts 	Gram panchayats and Blocks, State Department of Agriculture
5.	Satmile Satish Club of Pathagar (Village Resource Centre)	Agricultural Service Provider	<ul style="list-style-type: none"> Certified seed production through Seed Village program Transfer of improved technology Regular Farmer's Training Program Provides soil testing facility Formation of SHGs, farmer's clubs and producer's organizations and providing guidance Arranges Consumer Protection Awareness Program 	NABARD, CASA, SAU, Coochbehar Krishi Vigyan Kendra, Nehru Yuva Kendra, Department of Agriculture and Department of Horticulture at district level, DRDC (COOCHBEHAR), Block Development Office, Coochbehar Zilla Parishad, Soil Testing Department, Bank, Private Companies, NGOs, Farmer's Club etc.
6	Women professionals of Krishi Vigyan Kendra	Facilitator	<ul style="list-style-type: none"> Dissemination of improved agricultural information. Vocational training to farmers based on learning through work experience. Conduct Front line demonstrations and on farm trial. Link between researcher and farmers 	ICAR, SAUs, NGOs
7	NABARD	Funding Agency	<ul style="list-style-type: none"> Providing financial assistance to various actors of the system It has devised a scheme known as Capacity building for Adoption of Technology (CAT) through exposure visits and training the farmers. The objective of the scheme is to sensitize farmers - preferably marginal, small and tribals - to enable them to adopt proven technologies in agricultural developments made by research institutes, corporate houses, NGOs, progressive farmers/entrepreneurs. The entire cost towards such visits / programmes is supported by NABARD. Implementing several developmental programmes like watershed development which involves adoption of soil and water conservation measures and resource based crop development that involve transfer of tested and replicable technologies. 	NGOs, Private Companies, SHGs
8	Women farmers' club members	Service provider	<ul style="list-style-type: none"> Engaged in supplementing extension services of State Department of Agriculture and other line departments Actively involved in developing awareness/imparting training to farmers regarding adoption of more scientific cropping practices. Input supply 	Block Office, Krishi Vigyan Kendra, SAUs, Department of Agriculture & Department of Horticulture at district level
9	State Extension Professionals (Krishi Prayukti Sahayak)	Provide extension services	<ul style="list-style-type: none"> Promote informal extension channels like Farmers' Clubs, Farmers' Interest Groups and educated/ progressive youth and training them as technology transfer agents. Dissemination of information on modern agricultural practices through publications and handouts for the benefit of literate farmers as well as through mass media. Organizing exhibitions, field demonstrations, seminars, group meetings etc. Training and capacity building of farmers through Agricultural Training Centers (ATC) functioning in the State. Production and supply of quality agricultural inputs especially seeds, fertilizers and pesticides; Pest and disease surveillance and on-site advisory work. 	NGOs, input dealers, farmer's organizations, research institutes, SAUs, KVK etc.

Table-2: Prioritization of Functions performed by the actors in the Innovation System

Actors	Activities	Mean rank	frequency	RBQ value	Rank
Farmers (N=40)	Adoption of improved agricultural technologies like SRI, SWI, hybrid varieties etc.	3.2	16	22.4	III
	Crop production related activities.	1	32	80	I
	Livestock rearing and fishery related activities.	2.1	25	48.75	II
	Selling of produces in the local hats or market.	4.2	21	18.9	V
	Zero-tillage is practiced in case of producing rice, wheat and maize.	3.1	14	20.3	IV

Input dealers (N=10)	Provides organic and inorganic fertilizers, micronutrients.	1.3	3	28.2	II
	Supply of pesticides, insecticides, fungicides and herbicides.	2.7	3	19.8	III
	Supply of local, hybrid and certified seeds of different crops	1.3	7	65.8	I
	Provides agricultural machineries or implements on rent basis	4.4	6	19.2	IV
	Provide information on agricultural management practices	4.6	4	11.2	V
NGO Staff (N=5)	Supply of inputs and machineries	1	3	60	I
	Provides banking facilities through business correspondence.	5	5	20	V
	Link between farmer and government departments.	2	2	32	III
	Organizes Farmer's Field School, Krishi Mela and training programmes.	3	2	24	IV
	Formation and nurturing of farmer's club, women SHGs etc.	3	3	36	II
Credit and Financial organizations (N=5)	Provides KCC loan on rice, jute, potato and many other crops according to Scale of Finance at 7% rate of interest.	1	5	100	I
	Provides Agricultural loan for Machineries	2.4	3	43.2	II
	Bank also provides LIC facilities for the loan availers.	4.8	1	4.8	V
	Strong linkage with women SHGs	2.6	2	27.2	IV
	Aware women SHG members regarding management of bank accounts	4.2	4	28.8	III
Satmile Satish Club o Pathagar (Village Resource Centre) (N=10)	Certified seed production through Seed Village program	4.5	2	8.33	VI
	Transfer of improved technology	1	8	80	I
	Regular Farmer's Training Program	1.8	2	17.33	IV
	Provides soil testing facility	3.1	6	39	II
	Formation of SHGs, farmer's clubs and producer's organizations and providing guidance	2.8	2	14	V
Arranges Consumer Protection Awareness Program	4.1	4	19.33	III	
Krishi Vigyan Kendra (N=5)	Dissemination of improved agricultural information.	3.25	2	17.5	II
	Vocational training to farmers based on learning through work experience	2	1	15	III
	Conduct Front line demonstrations and on farm trial.	2.5	3	37.5	I
	Link between researcher and farmers	4.75	4	5	IV
NABARD officials (N=5)	Providing financial support to various actors of the system	1.1	3	58	I
	Cost towards exposure visits / training programmes for farmers are supported by NABARD.	1.3	1	18	III
	Implementing several developmental programmes like watershed development which involves adoption of soil and water conservation measures and resource based crop development that involve transfer of tested and replicable technologies.	1.2	1	18.7	II
Farmers' Club (FC) members (N=10)	Engaged in supplementing extension services of State Government Line Departments in the field of Agriculture, Horticulture and Animal Husbandry	1.4	4	36	II
	Actively involved in developing awareness/imparting training to farmers regarding adoption of more scientific cropping practices.	4.6	7	7	IV
	Input supply	2.5	2	12.5	III
	Provide agricultural information	1.2	6	57	I
State Extension Professionals (N=10)	Promote informal extension channels like Farmers' Clubs, Farmers' Interest Groups and educated/ progressive youth and training them as technology transfer agents.	4.6	8	27.43	VI
	Dissemination of information on modern agricultural practices through publications and handouts for the benefit of literate farmers as well as through mass media.	1.1	6	50.57	I
	Organizing exhibitions, field demonstrations, seminars, group meetings etc.	4	8	34.28	III
	Training and capacity building of farmers through Agricultural Training Centers (ATC) functioning in the State.	4.1	6	24.86	V
	Production and supply of quality agricultural inputs especially seeds, fertilizers and pesticides.	1.6	4	30.86	IV
	Pest and disease surveillance and on-site advisory work.	3.1	8	44.57	II

Table-3. Enabling Environment and Policy Support

Name of the program/ scheme	Features
National Agriculture Insurance Scheme (NAIS)	<ul style="list-style-type: none"> To provide financial support to the farmers in the event of notified crop loss due to all-preventable production risks. All farmers, including tenant share cropper growing notified crops are eligible. Unit area wise average crop yield guarantee scheme.
Modified National Agricultural Insurance Scheme (MNAIS)	<ul style="list-style-type: none"> To provide insurance coverage and financial support to the farmers in the event of prevented sowing and failure of any of the notified crop as a result of natural calamities, Pests & diseases To encourage the farmers to adopt progressive farming practices, high value inputs and better technology in Agriculture. Decide to cover 6 crops (Rice, Maize, Black gram, Groundnut and Jute) in Kharif season during 2014.
Weather Based Crop Insurance Scheme (WBCIS)	<ul style="list-style-type: none"> To mitigate hardships of insured framers against likelihood of financial loss on account of anticipated crop loss resulting from incidence of adverse conditions of weather parameters like deficit & excess rainfall, frost, heat (temperature), relative humidity, etc. Applicable to major cereals millets, pulses, oilseeds and commercial/ horticultural crops grown during Kharif and Rabi seasons.
Bringing Green Revolution in Eastern India (BGREI)	<ul style="list-style-type: none"> Cluster demonstration on Rice in different ecosystem such as upland rice, deep water rice, shallow water rice, medium water rice etc. Asset Building Marketing support Promotion/ Creation of Primary Processing Facilities including Farm Level Storage, Drying, Grading, Par-boiling of Paddy, Bagging etc. Promotion of SHG, Institution building/linkage for procurement operation.
West Bengal Accelerated Development of Minor Irrigation Project (WBADMIP)	<ul style="list-style-type: none"> Strengthening community-based irrigation management. (Water User Association -WUA) Development of Minor Irrigation (MI) schemes. Capacity building and skill development of stakeholders Dissemination through on farm demonstration of innovative models and practices through pilots and action research Facilitating market linkage
Rastriya Krishi Vikas Yojana (RKVY)	<ul style="list-style-type: none"> Preparation of agriculture plans for the districts and the States based on agro-climatic conditions, availability of technology and natural resources. Emphasizes on the local needs/crops/priorities in the agricultural plans of the States. To achieve the goal of reducing the yield gaps in important crops, through focused interventions. Bring about quantifiable changes in the production and productivity of various components of Agriculture and allied sectors by addressing them in a holistic manner. Maximizing returns to the farmers in Agriculture and allied sectors.
National Food Security Mission (NFSM)	<ul style="list-style-type: none"> Cluster Demonstration on Rice-100 ha each Seed Distribution, nutrient Management/ Soil Ameliorants, plant protection measure for IPM Farm Mechanization Sprayer & other implements Training Cluster Demonstration on Pulse -100 ha each. Cluster Demonstration on Wheat-100 ha each.
Sub- Mission on Agricultural Mechanization	<ul style="list-style-type: none"> Increasing the reach of farm mechanization to small and marginal farmers and to the regions where availability of farm power is low Promoting 'Custom Hiring Centres' to offset the adverse economies of scale arising due to small landholding and high cost of individual ownership. Creating hubs for hi-tech & high value farm equipments. Creating awareness among stakeholders through demonstration and capacity building activities.
National Mission For Sustainable Agriculture (NMSA)	<ul style="list-style-type: none"> Make agriculture more productive, remunerative, and sustainable and climate resilient. Conserve natural resources through appropriate soil and moisture conservation measures. Adopt comprehensive soil health management practices. Optimize utilization of water resources through efficient on farm water management. Develop capacity of farmers & stakeholders, in conjunction with other on-going Missions.

Table-4. Identified Supply Chains within the Location

Sl.no	Name of the Crop	Identified Marketing channels
1.	Wheat	Farmer → Wholesaler → Retailer → Consumer Farmer → Wholesaler → Flour MILL → Wholesaler → Retailer → Consumer Farmer → Retailer → Consumer
2.	Maize	Farmer → Wholesaler → Flour MILL → Wholesaler → Retailer → Consumer Farmer → Wholesaler → Retailer → Consumer Farmer → Retailer → Consumer
3.	Vegetables	Farmer → Consumer Farmer → Retailer → Consumer Farmer → Wholesaler → Retailer → Consumer
4.	Tobacco	Farmer → Stocker → Tobacco factory → Retailer → Consumer Farmer → Stocker → Tobacco factory → Tobacco Companies → Retailer → Consumer
5.	Jute	Farmer → Local Stocker → Jute Mill → Wholesaler → Retailer → Consumer
6.	Rice	Farmer → Wholesaler → Rice mill → Wholesaler → Retailer → Consumer Farmer → Rice mill → Wholesaler → Retailer Consumer Farmer → Rice mill → Wholesaler → Consumer

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