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Public Engagement in Agricultural Extension Activities: Issues and Challenges in Science Communication for Rural Development

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Abstract: **The most notable shift that has occurred in the connection between science and society during the past three decades is the rise in the amount of financial support provided by private organizations for scientific investigation. Private funding of science is not a new phenomenon; prior to World War II, it was likely the norm. Enlightenment-era (eighteen century) ideals about science as a 'common good' were revived after World War II by extensive state funding that concentrated research operations at public research universities in developed countries. It is no longer accepted as a given that advances in science and technology would invariably result in benefits for society progress. Science and technology (S&T) are equated with 'progress' in modernism. The expectation that science and technology (S&T) will provide solutions to all of the world's problems promotes a form of messianism. The unrestricted application of science to enhance food production, boost productivity to address food insecurity, expand communication technologies, will erase all of the world's problems, including starvation, suffering, inequality, and moral conflict. This will make the world a better place for everyone.**

***Keywords*— Public Engagement, Agricultural Extension Activities, Science Communication, Rural Development**

I. INTRODUCTION

Public engagement in science has evolved steadily during the past few decades. Early public engagement programs were frequently didactic and one-sided in their information delivery, partly in the hope that by simply informing the public about science, misconceptions would be addressed and public support for agriculture research funding would increase (Royal Society 1985). Public engagement in terms of extension activities has evolved into a more interactive medium over time. Which promotes the mutually beneficial objective of fostering farming practices that is more technologically and scientifically sound (Kumar 2020). It is carried out by presenting science as an accessible and transparent field that can meet societal requirements (Davis 2013) (PoST 2003). Indeed, as a result of the expansion in the skilled researchers and engagement of interdisciplinary disciplines each influenced by a distinct branch of research, kind of institution, purpose of the activity, and target audience (DBIS 2010) it is now simpler to classify public engagement based on the declared purpose rather than the specific activity (Davis 2013). In most cases, just a small number of researchers are responsible for carrying out the majority of the activities. Many of these researchers regard public engagement to be both a moral and a scientific necessity (Marincola 2003). It is estimated that only 5% of university scientists conduct 50% of all agriculturally related public engagement programs (Ecklund, James & Lincoln 2012). The change within the agricultural communities and level of trust gained by the agricultural scientists of farmers in their jurisdiction area remains a challenge.

Nonetheless, it looks that this skewed distribution will shift in the future. However, the agricultural universities in order to apply for funding from government agencies or ICAR, the project detail and the public engagement initiatives to convey the research findings among farmer's community becomes a necessary input from nodal agency (Lok 2010). The vast benefits of public engagement for both society and scientists are also being recognized by agricultural education institutions (AAAS 2011). In response, agriculture universities, particularly in Gujarat, have started various programs and initiatives to share the technical know-how to the lay man/farmers through diagnostic visits, kisan ghosthis, celebration of important days, farmers visit the KVK, telephonic/postal guidance, farmer scientist interaction, crop demonstration, farm magazine, radio talks, TV programmes to make a commitment for sharing information, resources, and skills with all facets of society (NCPE 2010).

However, it is not always obvious whether the efforts taken to organize public engagement events are actually valued by agricultural research institution when placed beside the priority of teaching and research. Although the inclusion of deprived farmers in any sense remains the mandate followed by recommendations by government of Gujarat and initiatives by directorate of extension. (NCPE 2010). Such collaborations have unavoidably boosted awareness of what public engagement can accomplish, it is important to note that while this knowledge has been raised, it does not mean that it is widespread (Devonshire and Hathway 2014). Given the pressures imposed on agricultural universities, such as following of financing institutions for research grants, it is not unexpected that time constraints is one of the most significant challenges to increased participation in public engagement (Abrahamsen 2004). Although recommendations for improved coordinating between funding establishments and agricultural universities to create a structure for more effective public engagement have been made (Royal Society 2006), there hasn't been much done to solve this issue. Alongside programs and incentives for public

engagement, practical assistance must be provided to help and encourage academics to participate in the type of interaction that is becoming increasingly required of farming community (Royal Society 2006).

II. Agricultural Extension Reforms Through Public Engagement

Adding an experimental component to extension activities held in krishi melas, farmer scientist interaction, crop demonstration, etc. which enables the collection of high-quality data and may ultimately help to support a variety of academic publications, is another strategy to attract academics to participate in public engagement initiatives (Devonshire et al. 2013). Academia with a pedagogy focus may be particularly interested in research undertaken under such circumstances since it might, for example, assess the impact of various extension measures in a particular discipline (Irwin 1999). Such studies can enable academia to address a variety of contemporary concerns in developing domains like handling pest control, irrigation facilities, post-harvest loss (Devonshire & Dommett 2010) as well as to address productivity and food security issues more broadly (Hines et al. 2013).

In order to determine whether goals were met, it is also crucial to gather feedback from farmers groups, especially to female farmers, and krishi vigyan kendras agents following public engagement. Such feedback can be gathered through brief, simple quantitative and/or qualitative evaluations (Gregory & Lock 2008). This data can be utilised to strengthen the activity or support continued or expanded public engagement participation. The Brain Lab model of public engagement also facilitates coordination or data exchange with Indian Council of Agricultural Research institutions and social science/extension departments through state agricultural universities (Laursen, Liston & Graf 2007). This might make it easier to conduct studies on how public engagement effects engagement of diverse farmers from different locations in view that why fewer farmers from disadvantaged families but with comparable farming practices wishes to opt for university training programs (DoES 2003). Regardless of how admirable the objectives of research done in conjunction with public engagement may be, researchers must take care not to take advantage of participants by, for instance, making participation a requirement for time-consuming and disruptive data collecting. In addition, any research, regardless of its importance, should be approved by ethical review committees(House of Lords 2003).

III. Public communication of Science and Technology

The public's knowledge of science, science communication, and the dialogue between science and society are today's key issues. According to "gradient model" proposed by Hans-Peter, science communicators now considered as a major actors of research institutions as agricultural scientists and extension agents, required to fill the divide among the scientific community and the general audience. The gradient model, however, suggests that enhancing both scientists' communication abilities and the general public's scientific literacy should facilitate a more effective dialogue between science and society(Friedman 2008).

The relationship between science and society has been significantly influenced by campaigns for public understanding of science (PUS) and scientific education reform. Two key texts published in the middle of the 1980s shed light on the connections between science communication and science education (NAS 2007). The Royal Society released a book in 1985 whereas in 1986, the American Association for the Advancement of Scientific (AAAS) published Science for all Americans, indicating the orientation of a new wave of science education restructuring and launching the Project initiative (Joseph 2012). In the subsequent years, the number, scope, and sophistication of activity in the two areas increased significantly. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) launched a campaign for science communication in 1990 (UNESCO 1990) and intensified it in the Declaration on science and the use of scientific knowledge in 1999 (UNESCO 1999). The scientific community took the lead in a re-examination of the scope of science communication, putting special emphasis to the public's level of scientific literacy, in response to the severe social issues that accompanied the advancement of S&T and society at large (Foster et.al 2010). To prepare their population for a knowledge-based society, national governments and ICAR began taking initiatives to educate farmers on S&T communication and extension education(Beck, et.al 2006).

Public scientific communication gained prominence in this quickly shifting social environment. While the science content of communication techniques broadened and methodologies diversified, the activities in many states spread through agricultural upliftment programmes regardless of cities to remote rural areas and marginalized farmers, such as women and cultural minorities (Duncan & Spicer 2010). The building of new infrastructure and institutions took off in a great number considering geographical locations and agro-climatic conditions. Museums and agricultural science facilities dedicated to use of science and technology on farms were founded. Universities have established academic specialties and appointed professors to teach science communication (Devonshire and Hathway 2014). Coverage of science increased significantly, and the internet emerged as a key medium for sharing science and technology. Government agencies developed strategies for science communication and were supported by coordinated programmes and substantial financial allocations. Theories and practices alike now emphasize the importance of involving the general public (Della & Anderson 2012). 'Bottom-up' approaches that prioritised hearing the public's opinions and having a conversation with them have replaced the instructional 'top-down' concept (Nature 2009).

Since 2000, the importance of science communication for advancing society, science, and technology has become more widely acknowledged. From a governmental standpoint, social governance emphasized public participation in the application of scientific knowledge (Royal Society 2006). It was extensively included in state S&T governance structures and viewed as having strong ties to a nation's overall competitiveness, inventiveness, and sustained growth in agricultural knowledge dissemination. From a societal standpoint, the dynamic role of scientific communication in enhancing the public's awareness of agricultural upliftment to participate in extension activities is now widely acknowledged(Ashby 2010). Since agricultural universities and farming communities are at different levels when it comes to understanding the concept of public involvement in understanding science. It becomes problematic for the farmers to gain insights related to the utilization of

innovative agricultural practices to meet their specific needs in regard to productivity issues (Devonshire and Hathway 2014).

Thus, science communication has evolved into a dynamic, diverse set of patterns and goals. Increasingly scientists of agricultural institutions are now extending out to the public through several extension measures, policies relating to the dissemination of agricultural technologies, judicious use of pesticides and insecticides followed by reducing post-harvest loss, it became possible because of the assistance provided by government agencies (Kumar 2022). One of the agricultural scientist and policy implementation goals is to engage the public in decision-making through farmer's participation in kishan mela, kishan seminar, krishi mahotsav, farmer scientist discussion in regard to different on farm issues, risk relating to crop failure and input measures, and uncertainty in productivity (Kumar 2019) . Science literacy is the primary goal of all efforts made by the science communication community because it is essential for the public to be literate in science in order to function properly in contemporary cultures (Klahr, Zimmerman & Jirout 2011).

IV. Present Challenges & Discussions

Today, the predominant approach of agricultural education is to improve farmers scientific understanding by providing technical trainings which allows them to think critically and analytically about issues in farms (Briggs 2003). However, this has not been accomplished because of several constraints such as lack of excellent training facilities, the shortage of trained experts in agricultural universities, and decreasing motivation in technology among farmer community. The necessity to create innovative training methodologies which is bidirectional in nature for broad scientific knowledge sharing becomes crucial for locating key issues that farmers face more often on farms (British Council 2001).

The connection that exists within the programs of extension education and science communication (Broks 2006). The two aspects that strike out as particularly important are the alignment across the goals of the two areas, and the interdependence of the remedies in both domains (Friedman 1995). Although scientific interaction and extension education are under separate social spheres, they can undoubtedly help and benefit one another by cooperating on projects, sharing resources, and exchanging knowledge because they have an identical intended audience (Gregory & Miller, 1998). One of the fundamental objectives of science communication initiatives is to increase the public's scientific awareness, and social science departments in agricultural universities is typically seen as the foundation route to achieve objectives (Potoc˘nik 2007). In order to meet the food demands in the near future use of innovative farm technologies become crucial, advanced technological awareness will be the key e to meet the challenges of contemporary society (Koppal 1999). To increase the technological awareness among farming communities it requires a sufficient number of highly qualified scientists and extension workers on each awareness program conducted by the government agency or the agricultural university (Kumar 2022). Extension education needs an immediate update in its instructional resources and infrastructure in order to meet their objectives particularly (OECD 1997). However, the present quality of employees and infrastructures make it difficult to implement such significant transformation. Consequently, there is an urgent need for a significant number of S&T specialists and policy measures having an empirical orientation towards shaping an innovative mechanisms in reforming their curriculum (Lewenstein 1994). This could mean making significant financial investments in the agricultural educational systems, and it will take some time (Kett 1994).

V. Conclusion & Way Forward

The need to address modern societal issues gave rise to the new academic discipline of public science and technology communication. It advanced by first raising the level of accountability among its practitioners and later by considering its own societal accountability (Felt 2003). Scientists and government organisations should simultaneously assume their social responsibilities to promote awareness relating to improved farm technologies, through their participation in science communication and policy formulations (Cheng et al. 2006). Witnessing the vulnerabilities of the farmers, especially in the remote areas where the farmers lack basic education but carry significant agricultural experience fosters the involvement of the scientific fraternity in non-formal and informal means(Kumar 2022). Such innovative approaches are already going through a process of "regularisation" and "professionalisation," and it requires innovative and inclusive approaches to communicate technological advancement among the farming community. To meet the shared aims, the scientific community should become more involved in the circulation of scientific agricultural knowledge at the grassroots level (European Commission 2002).

Agricultural scientists should provide a far broader and much greater commitment by narrowing the divide between scientists, extension training personnel, and farmers. Agricultural scientists should also take leadership for coordinating scientific expertise and services for the upliftment of farmers' socio-economic status in their respective jurisdictions (Bruce 1987). Supporting comprehensive change in agricultural productivity through integration of policy and programs carried by the government agencies and agricultural universities. (Kumar 2018) The demonstration of best agricultural practices in the rural areas will enhance the trust among farmers and serve science communication agenda through learning by doing. The impact can become strong if agricultural universities during demonstration of agricultural tools and technique engages the university students perusing agriculture course for their masters and bachelors program. Modern science will play an important part in human civilization, and our fate and the fate of society are interconnected with this role. Scientists need to increase their efforts and reach out to the farming community, as a whole. Additionally, it will contribute to the growth of farmers socio-economic status (Donghonga and Shunke 2008).

Science outreach have never been more active than they are right now, yet they are still in their developmental stage. To increase their effectiveness, they must be modified, explained, and improved. According to this approach, technology uses the principles of nature discovered by science for practical purposes, while social sciences ensure that these solutions are adopted and eventually replace the earlier ones. While sharing information about their work with farmers is encouraged or even required, scientists must also listen. Researchers today need to be aware of the social context in which they work, including people's concerns, needs and expectations for research. Building trust and legitimacy for initiatives heavily subsidised by the public

requires effective communication, which is a democratic necessity (Bauer 2008). There are many interesting technological innovations, and the farming community ought to be updated about them.

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