FUNCTIONAL CAPACITY NEEDS ASSESSMENT FOR THE AGROFORESTRY RESEARCHERS IN AGRICULTURAL INNOVATION SYSTEM

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ABSTRACT

Capacity needs assessment (CNA) is a procedure of assessing genuine existing capacity gaps within group members concerning knowledge, skills, strengths, weaknesses, opportunities, threats, assets, and supplementary elements obligatory for them to accomplish the pre-specified objectives. This study was undertaken to evaluate the existing capacity gaps among agroforestry researchers' group through a closed and structured questionnaire with the six different topics consisting 24 different indicators to evaluate the existing capacity gaps among 30 participants involved with agroforestry research from different universities and the National Agricultural Research Institutes using MS Excel data schoring sheets during November 2018 to February 2019. The study focuses different functional capacity, like, capacity to navigate the complexity, collaboration, learning and reflection, engage in strategic and political processes. Age, sex, education, and occupation were the independent variables used for functional capacities. Among all the age groups, above 55 years old agroforestry researchers secured the highest score in most of the topics. Based on the analysis of the scores, the existence of opportunities to better know each other and improve collaboration recorded the highest score (2.59) which considered the major capacity strengths, and understanding of knowledge flows recorded the lowest score (1.65), which was major capacity weaknesses of the niche, individually. Within them, females participant reported greater responsible leadership and more cooperative among each other. This research concluded that agroforestry researchers need strong collaboration and well known to each other for minimize the capacity gaps in agroforestry research. The tudy suggested to estabilish "National agroforestry research and development Institute" for effective and efficient agroforestry research and development by the government of Bangladesh and the concern ministry.

Keywords: CoxComb plot; Leadership; Agroforestry researcher, Multi-stakeholder, Functional capacity.

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INTRODUCTION

Capacity needs assessment (CNA) is recognized as an important part of the capacity development process wihich is essential for a country's successful development and requires adequate and long-term resources. The Organization for Economic Co-operation and Development (OECD) defines Capacity as "the ability of people, organizations, and society as a whole to manage their affairs successfully" (OECD, 2006). Agricultural research and development strategy aspires to reduce poverty, promote economic growth, food and nutrition security, and sustainable management of natural resources in an emerging economy and mounting the livelihood of rural people.

Over the last couple of decades' agricultural research has evolved from on-farm research like farming systems research, investigation on sustainable livelihoods and more client-oriented research like action research, value-chain analysis, and innovation systems. This is due to the intervention of new technologies and practices in the process of innovation. Agricultural research is one of the mechanisms in the wider context of innovation systems of the public sector because the private sector and civil society also play essential roles in innovation (Ludemann et al., 2012). Capacity development must be well designed and executed to produce sustainable effects. It is a process that is only successful when built on a clear vision, a broad-based commitment, and active stakeholder participation. People engage in an innovation process if they can adapt and respond to opportunities using 'functional capacities'. These include the ability to navigate complexities, collaborate, learn, and reflect, and engage in the strategic and political process (CDAIS Global Overview, 2016).

Agroforestry in Bangladesh is an integrated form of both traditional and modern land-use systems, where trees are managed together with crops and/or animal production systems in agriculture. The total country area of Bangladesh is around 144,000 km^2 and a higher population density of about 1103/km^2 in 2017 (BBS, 2020). Over 57.41% (8.52 million ha) of this area is currently used for agricultural purposes (BBS, 2011). A decade ago, the total arable land area was estimated to be 83,000 km^2, which indicates that loss of arable land is a continuous threat for Bangladesh agriculture that needs to be addressed timely (IDBG, 2013). According to Banglades Economic Review 2019 stated clearly that 21.8% of the households were absolute poor and 11.3% were extremely poor in rural Bangladesh (BER, 2019). Though Bangladesh is ahead of many developing countries in poverty alleviation, still an approximately one-fifth portion of the total population of the country lives below the poverty line (BER, 2019). The major causes of rural poverty in Bangladesh are population explosion, unemployment, illiteracy, low rate of production, low income, malnutrition, landlessness, indebtedness, gender inequality, degradation of natural resources, poor sanitation, insufficient organization, lack of coordination, natural calamities, exploitation, and other social problems. These causes are directly

affects the livelihood of rural people. Many rural people living adjacent to forest areas maintain their livelihood on forest resources, particularly on the daily collection, consumption, processing, and selling of non-timber forest products. Forest degradation creates scarcity of these resources and accelerates poverty and hunger in Bangladesh. The rapid degradation of the natural resource base of the country is further worsening rural poverty. Unless the natural resources like forest, soil, and water of the country are maintained and enhanced, poverty, malnutrition, and hunger will grow continuously.

However, the success of agroforestry depends on the efficiency and capacity of researchers to purposive designing of agroforestry models at the field level. With these ideas, the principal objective of the study was to evaluate the potential gaps of functional capacities as well as suggestions on capacity improvement of the agroforestry resrarchers.

MATERIALS AND METHODS

The quantitative analysis was done through a closed-form of a structured questionnaire to assess the existing capacities (functional, structural, and technical) gaps of agroforestry researchers' group as well as suggestions on capacity requirements. The three groups (scientist group, academia groups, and data enumerator's group) of participants were instructed to evaluate the niche (agroforestry researchers) level as a whole and not their capacity, based on their knowledge and understanding of the functional capacities that exist within the partnership. The capacity needs assessment (CNA) was conducted to agroforestry researchers from Bangladesh Agricultural Research Institute (BARI), Bangladesh Forest Research Institute (BFRI), Bangladesh Tea Research Institute (BTRI) and Bangladesh Sugarcrop Research Institute (BSRI), academia from Bangladesh Agricultural University (BAU), and Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) and some data Enumerator's (learner group) those who have collected agroforestry research information according to "CD Tools" (CD Tools, 2020) which is considered as "Agricultural Innovation Systems (AIS)". A total of thirty stakeholders were engaged to evolve the CNA through a structured individual questionnaire (FAO, 2017) prepared by the Capacity Development in Agricultural Innovation Systems (CDAIS) project implemented by FAO-Agrinatura based on a common approach developed under the Tropical Agricultural Platform (TAP). Three types of stakeholders (33.3% of scientists, 33.3% of academia, and 33.3% of data enumerators) with a balanced proportion of male and female (1:1) were involved in the CNA process.

Capacity assessment questionnaire

According to TAP (2016), individual participants were asked according to the concept of TAP common framework within six topics including 24 indicators to score from 0 to 3 with the following ratings: 0 = Very Little or None; 1 =Partially;

2=Mainly; 3 = Very Much or Fully. There was also a blank space that represented not applicable. Each topic had several indicators and each indicator was determined by two/ three questions (TAP, 2016). The topics have been shown in Table 1.

Table 1. The topic-wise indicators to assessing capacities perfectly used in the capacity scoring questionnaire

TOPIC 1: Capacity to navigate the complexity	
Indicator 1.1	Access to and mobilization of resources (understand and solve problems)
Indicator 1.2	Access to and mobilization of skills to lead collective work (Management skills)
Indicator 1.3	Access to and mobilization of financial resources by the partnership
Indicator 1.4a	Sharing of information within the partnership
Indicator 1.4b	Sharing of information with outside actors
Indicator 1.5	The extent of decision-making based on past experiences in the partnership
Indicator 1.6	Development and identification of a collective strategy to achieve the innovation
TOPIC 2: Capacity to collaborate	
Indicator 2.1	Collaboration among actors in the partnership
Indicator 2.2	Opportunities to better know each other and improve collaboration
Indicator 2.3	Incentives for networking and partnership
TOPIC 3: Capacity to reflect and learn	
Indicator 3.1	Joint learning and experimentation
Indicator 3.2	Training covering multi-stakeholder innovation processes
Indicator 3.3	Understanding of knowledge flows
Indicator 3.4	Documentation and monitoring processes
TOPIC 4: Capacity to engage in strategic and political processes	
Indicator 4.1	Role and responsibilities of the leader
Indicator 4.2a	Degree of awareness of agricultural development priorities among stakeholders
Indicator 4.2b	Awareness of innovation priorities and innovation support mechanisms at the national level
Indicator 4.3	Awareness of opportunities for policy change
Indicator 4.4	Influence on decision/policy-making processes
Indicator 4.5	Effectiveness of communication channels

TOPIC 5: Technical skills	
Indicator 5.1	Availability of required technical skills
TOPIC 6: Enabling environment	
Indicator 6.1	Favorable socioeconomic circumstances for linking agroforestry researchers
Indicator 6.2	Favorable political and socio-economic circumstances to develop new value chains
Indicator 6.3	Existing investments funds for innovation
Indicator 6.4	Existing mechanisms for registration of patents

For the capacity profile, a CoxComb plot was used, which succinctly illustrates the scores for the 20 capacity indicators (except TOPIC 6, for the four indicators of enabling environment), with each color representing one of the topics, like, TOPIC 1 represents ash color, TOPIC 2 represents blue color, TOPIC 3 represents green color, TOPIC 4 represents yellow color, and TOPIC 5 represents orange color.

RESULTS AND DISCUSSION

Capacity profile by gender

From the given steatement of self-ranking of the agroforestry reserchrers and academia, Figure 1, showed that the overall functional capacity of female agroforestry researchers was higher than male except for management skills (indicator 1.2) and financial management resources (indicator 1.3). Females were very much active in making cooperation among them (indicator 2.1) and act as a responsible leader (indicator 4.1). Eagly and Johnson (2001) conclude that women leaders tend to adopt a more democratic and collaborative style than do men. This statement was later supplemented by Meinhard and Foster (2003) also observed similar women characteristics in not-for-profit institutions.

Capacity profile by age group

Figure 2, illustrated the capacity profile by four different age groups, e.g., less than 25 years, 25 to 39 years, 40 to 55 years, and above 55 years. Figure 2 showed that the overall functional capacity of the above 55 years old agroforestry researchers was higher than the rest of the three categories of age groups. The age group "above 55" scored the highest score in most of the topics, except the joint learning and experimentation category (3.1) which have the lowest position in the entire indicators. Katherine (2009) found that age and previous experience of higher education influenced professionals' attitudes negatively: mature individuals may require more support when entering the workforce. But, Hyo and Tomas (2007)

found that the participants who perceived high levels of collaborative learning tended to be more satisfied with their distance course than those who perceived low levels of collaborative learning. It can be concluded that age and experience is a vital factor for functional capacity development.
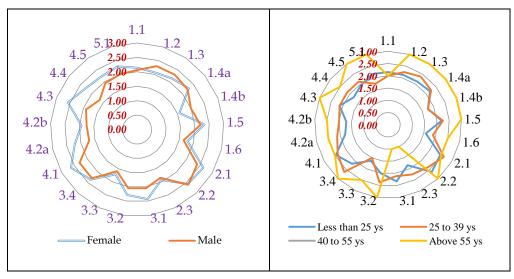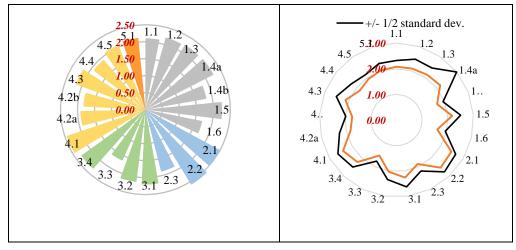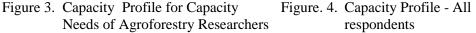

Figure 1. Capacity Profile by Gender   Figure 2. Capacity Profile by Age Group

Note: Capacity score indicated by 0.00 to 3.00 in Figure 1 and 2.

Individual scoring

The participants were subjected to respond to the list of questions based on their knowledge and understanding. The responses from the individual scoring (Figure 3) questionnaire indicated that the capacities were mostly above 'partially'. The highest score from the questionnaire was above 2.59 point against indicator 2.2 meaning "the existence of opportunities to better know each other and improve collaboration" and the lowest score around 1.65 against indicator 3.3 'understanding of knowledge flows (understanding origin and transfer of knowledge)' (Table 1). All the other scores ranged from 1.53 to 2.52 representing 'partially' to 'mainly' score on all six topics (Figure 3).

Figure 3. Capacity Profile for Capacity Needs of Agroforestry Researchers

Figure. 4. Capacity Profile - All respondents

Note: Capacity score indicated by 0.00 to 3.00 in Figure 3 and 4.

Based on the analysis of the scores, the "Sharing of information within the partnership (no. 1.4a)" and "Opportunities to better know each other and improve collaboration (no. 2.2)" were major capacity strengths, and the "Understanding of knowledge flows (no. 3.3)" and "Sharing of information with outside actors (no. 1.4b)" were the major capacity weaknesses of the niche (Figure 4).

Enabling environment

From Figure 5, the highest score from the questionnaire was around 2.5 point by the researchers in the topic of 6 against indicator 6.1 meaning favorable socio-economic circumstances for linking producers to markets (Table 1). Enabling environment is a simple bar graph with four indicators that are not a part of capacity profiles (FAO, 2017). It's very important to make a favorable environment for agroforestry research oppertunity in the different NARS and Universities.

Capacity by topic

According to Figure 6, the highest score was around 2.3 point TOPIC 2 by the researchers among the different six topics from the questionnaire. The meaning of TOPIC 2 was the capacity to collaborate with the existence of opportunities to better know each other and improve collaboration among actors in the partnership for incentives to work together.
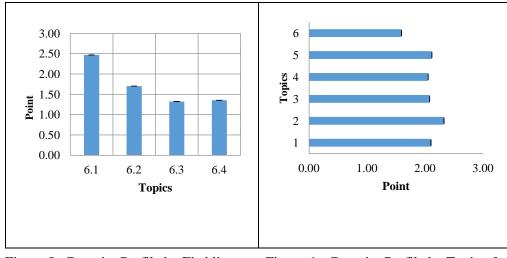
Figure 5. Capacity Profile by Ebabling
          Environment

Figure 6. Capacity Profile by Topic of
          the questionnaire

Actions to improve the situation

Based on the findings from the individual questionnaire, the key actions to improve the situation may be taken by improving the functional capacity of the "Capacity to navigate complexity" (TOPIC 1), training among agroforestry stakeholders, e.g., data enumerators, researchers, and academics. Besides, sharing information and networking, understanding relationships and interactions among each other, training on the mobilization of financial resources, support to the development and identification of a collective strategy to achieve innovation, and establishing rewarding mechanisms within the agroforestry researchers should be considered also. However, actions to improve the "Capacity to collaborate" (TOPIC 2), develop/strengthen multi-stakeholders platform, e.g., National Agroforestry Working Group, Bangladesh (NAWGB) for agroforestry at the policy level, and identify the collective strategy to achieve innovation are also much more imperative for development. Agroforestry researchers, agroforestry academia, representative(s) of DAE, Forest Department, and representative of Ministry of Agriculture (MoA) and Ministry of Environment, Forest and Climate Change (MoEF) should develop mechanisms to provide incentives (financial, access to information, visibility, etc.) to work in partnerships in the niche.

However, the authority should also be concerned about organizing regular meetings to improve communication among stakeholders; training for understanding technical (including indigenous knowledge), organizational issues (including leadership, management of the organization, and management of innovation process) along with the improvement of the "Capacity to learn and reflect" (TOPIC 2). More actions can be

taken to organize meetings among all agroforestry stakeholders that enable joint learning and reflection. Introducing the documentation and monitoring processes within the platform designed to share information is required. Distributing scientifically established local knowledge in the innovation process among the farmers is also a key concern. Establishing an administration of the agroforestry stakeholders (all stakeholders need to be represented) including internal rules of partnership. For TOPIC 3 "Capacity to engage in strategic and political processes", action should be taken to support the partnership by establishing effective communication channels with the government and development partners. Specifying the roles and responsibilities of different actors to achieve the vision, increasing awareness of opportunities for policy dialogue and linking the partnership with political influencers, and providing training on influencing decision/policy-making processed by the stakeholders are the key points. Nevertheless, organizing policy level market place for agroforestry, developing awareness of agricultural development priorities are also mandatory. In the case of "Technical skills" (TOPIC 4), it is very essential to describe the orientation of training on good agricultural practices with agroforestry, organize training on climate smart agricultural concerning agroforestry, post-harvest management, processing, packaging, and marketing of agroforestry products, and introduce good governance in the multi-stakeholder platform. In the end, to improve TOPIC 6, "Enabling environment", it is necessary to establish different divisions/unite for agroforestry research in NARS, especially in BARI, BFRI, BTRI, BSRI, and Cotton Development Board (CDB). Banladesh Agriculturall Research Councuil (BARC) may coordinate the agroforestry research by establishing, "National agroforestry research and development Institute." Introducing favorable policies for backward and forward linkage in the partnership to develop of the policy for agroforestry, GIS platform for agroforestry application, providing information and training for access to investment funds for innovation in partnership (i.e., training on how to write a project proposal for agroforestry research and development), and providing information on patent registration are significantly essential.

CONCLUSION

Females have responsible leadership and cooperation among each other through the higher aged and the higher educated with previously experienced person inclined higher professionals' attitudes. National Agroforestry Working Group, Bangladesh (NAWGB) should work for the legislation of agroforestry at policy level, and identify the collective strategy to achieve innovation for it's development. Legislatives should develop mechanisms to provide incentives (technical, functional and financial, etc.) to work in partnerships in the agroforestry niche. The agroforestry researchers showed greater needs of opportunities to better know each other and improve collaboration among them. Finally, agroforestry practices need strong collaboration to minimize the capacity gap in agroforestry practices by stablishing "National agroforestry research and development Institute".

ACKNOWLEDGEMENTS

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Bangladesh Economic Review. (2019). Ministry of Finance, Government of the People's Republic of Bangladesh. Pp: 219-243.

BBS. (2011). Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS. (2020). Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka. Statistical Yearbook of Bangladesh 2019, 39th Edition.

BER. (2019). Bangladesh Economic Review, Finance Division, Ministry of Finance, Government of the People's Republic of Bangladesh.

BBS. (2016). Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

CD Tools. (2020). Capacity Development Tools. "Capacity development for agricultural innovation systems (CDAIS)", Tropical agriculture platform (TAP), TAPipedia: Exchanging knowledge and supporting capacity development for agricultural innovation systems. https://tapipedia.org/framework/cd-tools. Accessed 13th August, 2020.

CDAIS global overview. (2016). Annual report 2016. Innovation processes beginning to take root. https://cdais.net/wp-content/uploads/2019/07/2016-CDAIS-global-overview.pdf

Eagly, A.H. and Johannesen, S.M.C. (2001). The leadership styles of women and men. *Journal of Social Issues*, 57(4): 1540-1560.

FAO. (2017). Assessment of innovation capacities: A scoring tool, occasional paper on innovation in family farming, research and extension unit, Food and Agriculture Organization of the United Nations, Rome, Italy. http://www.fao.org/3/a-i7014e.pdf

Hai, M.A., Mahiuddin, M., Howlider, M.A.R. and Yeasmin, T. (2008). Pattern and problem of poultry consumption by the rural and urban families of Fulbaria upazila. *Journal of the Bangladesh Agricultural University*, 6(2): 307 - 313.

Hyo, J. and Thomas, A.B. (2007). Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors. *Computers and Education*, 51(1): 318-336.

IDBG (2013). Islamic Development Bank Group. Country economic work, diagnostic analysis of Bangladesh economy: foundation for member country partnership strategy, In: Diagnostic analysis of agriculture and rural development. Pp. 53-67.

Katherine, C.P. (2009). From students to professionals: Results of a longitudinal study of attitudes to pre-qualifying collaborative learning and working in health and social care in the United Kingdom. *Journal of Interprofessional Care*, 22(4): 399-416.

Kibria, M.G., Sarkar, D.C., Hossain, M.A.T., Mannan, M.A., Motaleb, M.A. and Islam, S.S. (2000). *Forest statistics of Bangladesh*. Bulletin No. 4. Chittagong, Bangladesh, Forest Economics Division, Bangladesh Forest Research Institute. Pp 119

Ludemann, R., Marianne, D.A., Kormelinck, G. and Chancellor, T. (2012). Capacity development in agricultural research for development, The European alliance on agricultural knowledge for development, Agrinatura-EEIG Secretariat, 42 rue Scheffer, F-75116 Paris, France.

Meinhard, A.G. and Foster, M.K. (2003). Differences in the response of women's voluntary organizations to shifts in Canadian public policy. *Nonprofit and Voluntary Sector Quarterly*, 32(3): 366-396.

OECD. (2006). The challenge of capacity development: Working towards good practice. Paris, France.http://www.fao.org/fileadmin/templates/capacitybuilding/pdf/DAC_ paper_final.pdf

TAP. (2016). Tropical Agricultural Platform. Common framework on capacity development for agricultural innovation systems: Conceptual background, CAB International, wallingford. https://www.tapipedia.org/sites/default/files/capacityscoringquestionnaire _version_2.pdf