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Measuring Women Empowerment in Aquaculture – An Empirical Study

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ABSTRACT

Development of index or tool for measuring social parameters has been a key area of research. This research was carried out during the year 2021 for the measurement and quantification of several variables warrants availability of valid tools. In aquaculture sector, gender mainstreaming efforts has been undertaken by several stakeholders. However, measuring the level of empowerment as a consequence of interventions could not be done in absence of such tools. The article describes the process of development of Women Empowerment in Aquaculture Index (WEAI) - selection of domains, assessing content validity through expert rating, screening of the domains using 't' value and assigning relative weights. The instrument, so developed, has 30 items under 6 domains (access to and control over resources and services, ability to decide independently, attitude towards aquaculture, control over use of income, knowledge on aquaculture, participation in social and economic activities). Using the index, comparison was made between three women SHGs from Odisha with level of empowerment varying between 69-80 per cent.

INTRODUCTION

Women's empowerment in all spheres of development is one of the most discussed subjects. When women are truly empowered, they may pursue their goals, make decisions, and have access to national resources. Economic progress can result from the empowerment of women, and this link can go both ways. When women are empowered, they have access to other components of development, such as health and education, as well as equitable employment possibilities and political engagement (Duflo, 2011). Bhattacharya et al., (2013) assessed women's empowerment and provided a framework exposition in which 'empowerment' was defined as enhancement of capability in health, knowledge, and autonomy. Sum score of these dimensions provide a quantitative measure of empowerment. In any society, redistribution of social power and change in resource control in favour of women is not possible unless they are healthy, educated, and given some gainful employment opportunities (Goswami, 2013). Working in Farmers Producer Company has resulted in enhanced women empowerment of hill farm women (Mukherjee et al., 2020). According to Bhattacharya & Banerjee (2012) the degree of active participation in matters that promote her own well-being would be a clear indicator. For increasing agricultural productivity and reducing poverty, women's empowerment is recognised as an important tool by policymakers and practitioners Quisumbing et al., (2022). OPHI (Oxford Poverty and Human Development Index) and USAID (United States Agency for International Development) launched the Women's Empowerment in Agriculture Index, which tracks women's engagement in agriculture across five domains viz., production, resources, income, leadership, and time-use. It assesses women's empowerment in relation to men within households, allowing for a more thorough examination of gender dynamics. According to Mukherjee (2018) women's empowerment has six dimensions: social empowerment, political empowerment, economic empowerment, personal empowerment, psychological empowerment, and health and security empowerment. Every dimension must be addressed in order to reach one's full potential. Rural women gained significant empowerment in all five dimensions

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through participation in aquaculture activities. They achieved a significant level of empowerment in aspects of 'family decision-making' and 'ability to spend money' across the five dimensions. Although the changes were positive, progress in the areas of 'social participation,' 'access to assets and resources' and 'cosmopoliteness' was slow (Rahman, 2005). Gupta et al., (2017) observed that women are disempowered in two major agricultural domains: resources (access and decision-making) and leadership (group membership). The development of this WEAI has opened up the possibility of computing sector-specific Women Empowerment Indexes in a variety of areas, incorporating sector-specific domains associated with empowering women in light of varying socioeconomic profile. The Women's Empowerment in Aquaculture Index (WEAI) assesses women's empowerment and their involvement in aquaculture contexts in order to identify ways to overcome obstacles and constraints. Additionally, the WEAI also enables projects to track the outcomes of Reach-Benefit-Empower-Transform (RBET) projects for women in fisheries and aquaculture McDougall et al., (2021). No such index is available to measure empowerment of women in aquaculture. The present study has made an attempt to develop Women Empowerment in Aquaculture Index (WEAI) and to assess the level of empowerment of women involved in aquaculture in Odisha, India.

METHODOLOGY

The Likert scale construction technique was used and a group of subjects is given the possible domains that may define or measure a variable. Respondents were asked to indicate whether they agreed or disagreed with the domains, for which responses of "strongly agree," "agree," "undecided," "disagree," and "strongly disagree" were given numerical scores of 5, 4, 3, 2, and 1, respectively. A total score is calculated for each respondent by adding his or her individual item scores. The summed rating method - also known as the frequency distribution method - is a way of scale construction that's based on responses to domains. In this method, ratings for each domain are summed across all items. This is done in order to reject any domains or criteria that are irrelevant to the rating. To do this, the scores for each subject are compiled and then divided into a high group and a low group based on the total score. The t-ratio is calculated by comparing the responses of the high and low groups to the single item.

$$t= (X_H - X_L)/ (S^2_H / n_H + S^2_L / n_L)^{1/2}$$

Where, X_H =the mean score on a given domain for the high group, X_L =the mean score on the same domain for the low group, S^2_H =the variance of the responses of the high group, S^2_L =the variance of the responses of the low group, n_H =the no. of respondents of the high group, n_L =the no. of respondents of the low group

The development of the WEAI began with a selection of 12 domains that may influence women's empowerment, followed by domain analysis using Likert's summed rating method and indexing the domains based on weighting defined by the scale product method (Ghosh et al., 2010). In order to compile data for domain analysis, an online survey was carried out in 2021-22 involving 200 experts in the field of extension education. The survey contained 12 different domains which the respondents could rate on a scale from 1 to 5 in terms of agreement or disagreement. In total, there were 46 responses. The respondents were split into two groups - those with high scores (23 respondents) and those with lower scores (the remaining 23). Using the above formula, the t-value for each selected domain was calculated, and domains were screened by ranking them in decreasing order based on significant t-values at the 0.05 level of probability. The WEAI proposed six domains, viz., (i) access to and Control over resources and services, (ii) ability to decide independently, (iii) attitude towards aquaculture, (iv) control over the use of income, (v) knowledge on aquaculture and (vi) participation in social and economic activities. The t-values are presented in Table 1.

The WEAI's six domains were subjected to the scale-product methodology in order to determine their importance for measuring women's empowerment in aquaculture. Respondents were asked to assign a weightage to each domain in the range 0-100, based on the importance of the specific domain for measuring women's empowerment in aquaculture, so that a total of 100 were obtained for all relevant domains identified. This process helped to identify the critical domains that are most significant in measuring women's empowerment in aquaculture. The domain weighting clearly ranged from 10 to 25 per cent. The most important items in the WEAI were access to and control over resources and services, as well as control over the use of income, each with a weight of 25 per cent, followed by participation in social and economic activities and the ability to decide independently, both with a weight of 15 per cent, and knowledge of aquaculture and attitude toward aquaculture, both with a weight of 10 per cent. To assess each domain of the WEAI, a total of 46 experts were asked to rate the relevancy of nine items for domain 1; 11 items for domain 2; 12 items for domain 3; 9 items for domain 4; 13 items for domain 5; and 12 items for domain six on a 3-point continuum (2=most relevant, 1=relevant, 0=not relevant). The five items from each domain with the highest mean scores were chosen as being most relevant to the domain.

Access was referred to as women's ability or opportunity to use and get benefit from using aquaculture resources in an effective and adequate manner, whereas Control means the ability to take

Table 1. Domains with their respective Mean, SD, and 't' values

S.No.	Domains of empowerment	Mean	SD	't' value
1	Access to and control over resources and services	4.77	0.42	5.99
2	Ability to decide independently	4.45	0.85	5.26
3	Attitude towards aquaculture	4.5	0.51	5.14
4	Control over use of income	4.45	0.67	5.03
5	Knowledge on aquaculture	4.5	0.51	4.75
6	Participation in social and economic activities	4.6	0.47	4.48

time-bound decisions over the specific use of aquaculture products and services. Both these domains act as key elements of women empowerment and accomplishment of gender equality. This domain is measured based on 5 items that specifically address the ability to effectively utilize the existing resource for fish production. Participation was referred to as women being actively involved in different types of socio-economic activities such as attending meetings, workshops, and seminars, as well as in buying inputs and selling produce. This domain is measured based on five items that address an individual women farmer's participation in meetings, discussions as well as engagement in the activity of buying and selling commodities, and goods to satisfy their household needs.

Ability to decide independently was defined as the wise decision to engage in various aquaculture activities. Before finalising any decision on carrying out activities related to fish farming, the responses of experts in this domain were taken on items to determine the level of judgement and decision-making power of women farmers among themselves by inviting other members' suggestions and decisions resulting in consensus and recognising the views of each individual. Control over the use of income was referred to the financial stability of the women farmer to withstand facing adverse situations in her life. Increased Control of their income helps the women to get a solid foundation for their lives and their children. This domain is assessed based on five items that reveal the existing status of their finances, exposing the strengths needed for their growth and survival.

Knowledge refers to the level of understanding gained through learning and experience. It also indicates the level of awareness about the different activities and practices involved in aquaculture, adding to the knowledge base of women farmers. This domain has been checked with five items enquiring about the existing knowledge required to carry out scientific fish farming by women farmers. Attitude implies a way of feeling and belief that affects women's behavior and conduct towards practicing different components of aquaculture and its practices. It shows the anticipated level of involvement of women farmers in growing fish by adopting scientific fish farming practices. Five items were taken to measure the various characteristics of women farmers that influence their attitude toward practicing aquaculture.

The level of agreement among women farmer-respondents on five related items was recorded for each domain. Responses for domains 1, 2, 3, and 5 are recorded in Yes/No format, with 1 for Yes and 0 for No. For domains 4 and 6, responses are recorded on a 5-point scale (Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree), with numerical scores of 5, 4, 3, 2, 1 assigned respectively. Each domain's mean value is calculated by averaging the scores of five items. Similarly, Kumari et al., (2021) used five domains of empowerment (agricultural production, asset creation, education, health-related decisions, and leadership quality) to estimate WEI (2021). Bhattacharya et al., (2013) selected a few indicators to estimate three domains of capability enhancement: health, knowledge, and autonomy. Food intake, anaemia, and body mass index (BMI) are chosen as health indicators. Educational attainment, functional literacy, and application of knowledge of family planning have been chosen as knowledge indicators, and the autonomy indicators include actual decision-making, perceived freedom, and mobility permission (negative indicator). Ana Raj et al., (2022) measured empowerment in cassava cultivation using five domains: agricultural production decision-making, access to productive resources, control over the use of income, community leadership, and time allocation. Slathia et al., (2015) chosen the decision making capacity, social involvement, communication behaviour, psychological aspects and economic independence dimensions as measures of empowerment. Roy et al., (2022) created an index that uses seven dimensions and 47 indicators to assess the role performance of Farmer Producer Companies.

The mean value was used to calculate the aggregate of women's responses, and standard deviation values were used to determine differences in their opinions. As a first step, mean and standard deviation values for each domain were calculated, and then the overall women empowerment index (WEAI) was calculated using different weights for six different domains. Overall, women empowerment was calculated and expressed as a percentage using the formula shown below.

$$\text{Overall WEAI} = W1*D1 + W2*D2 + \ldots\ldots\ldots + Wn*Dn$$

Where, W1, W2…….Wn represents the respective weights of domains; D1, D2…..Dn represents the mean score of each domain.

A semi-structured interview schedule was created for the study. The interview schedule included a slew of socio-personal and socio-economic variables, as well as an index to assess the level of empowerment of aquaculture women. The women empowerment in aquaculture index (WEAI) includes six domains: Access to and control over resources and services, Participation in social and economic activities, Ability to decide independently, Control over the use of income, Knowledge on aquaculture, and Attitude towards aquaculture. Data were collected during 2021-22 by randomly selecting three women SHGs from three districts of Odisha, namely Puri, Khordha, and Kendrapara. Subhashree SHG, Purohitpur, Khordha; Maa Harachandi SHG, Dahanigadia, Puri and Maa Durga SHG, Derabish, Kendrapara who were provided support under aquaculture development programs are selected. All the members of the selected SHGs were interviewed. Weighted mean and standard deviation were worked out, and overall WEAI was expressed as a percent.

The following equation calculated the index, prepared on the parameters mentioned above:

$$WEAI = W1*D1 + W2*D2 + \ldots\ldots\ldots + Wn*Dn$$

Where, W1, W2…….Wn represents the respective weights of domains; D1, D2…..Dn represents the mean score of each domain.

RESULTS AND DISCUSSION

Using the index (WEAI) developed in this study, the level of empowerment of three women SHGs was calculated. All the SHGs were assisted under aquaculture development programs and are currently engaged in practicing aquaculture-related activities. Among the three SHGs studied, Khordha reported the highest overall empowerment (79.8%), followed by Puri (74%) and Kendrapara (69.2%). Abebe et al., (2016) worked out the overall gender parity index (GPI) in Ethiopia. GPI was 68 per cent, and the

Table 2. The final Women Empowerment in Aquaculture Index (WEAI) having 30 items

S.No.	Items
1	Access to and control over resources and services
i	Do you have a pond (s) of your own for fish farming?
ii	Are you able to get quality fish seed, fertilizer and other inputs for fish farming?
iii	Are you able to sell fish at reasonable price in the market?
iv	Have you attended skill development trainings on aquaculture?
v	Do you receive latest information on fish farming *viz.,* new varieties, new technologies etc.?
2	Participation in social and economic activities
i	Are you a member in any agricultural institution/groups like Self Help Group, Farmer Producer Organisation and/or Cooperative, etc.?
ii	Do you attend community/ village meetings related to social issues?
iii	Do you take part in performing different farm activities (preparation of pond, clearing of weed and insects, manuring and fertilization, stocking of fish, feed preparation and feeding, monitoring of water quality, sampling, harvesting, post-harvest processing, and marketing)?
iv	Are you beneficiary of any fishery developmental schemes?
v	Are you aware about the Govt. schemes on fisheries that benefit small scale fish farmers?
3	Ability to decide independently
i	Do you take decisions on stocking, feeding and purchase of farm inputs?
ii	Do you take decisions regarding availing institutional credit for fish farming?
iii	Are you able to take decisions on how much produce to retain for home consumption or sell?
iv	Do you take decisions about disposing the surplus produce?
v	Are you able to decide how to spend money earned from fish farming?
4	Knowledge on aquaculture
i	Predatory and weed fishes are to be removed before stocking of fish seed
ii	Pond preparation is to be done for every crop cycle
iii	pH level of pond water is to be adjusted by liming
iv	Water inlet and outlet are to be provided with filters
v	Water exchange and aeration is required for maintaining water quality
5	Control over use of income
i	I have a say over income generated from fish farming
ii	I have the liberty to decide about investing on pond improvement?
iii	My opinion is important in decisions regarding the use of income generated by productive activities.
iv	I am able to participate in decisions regarding family business, crop and livestock raising activities
v	Additional money earned from fish farming is spent with my consent
6	Attitude towards aquaculture
i	Fish farming is a profitable venture
ii	Fish farming will secure household nutrition security
iii	Fish farming fetches additional income to the family
iv	Fish farming aids in gainful employment
v	Fish farming can secure livelihood

empowerment gap was 32 per cent. They also quantified the women's empowerment index in agriculture (WEAI) as 73 per cent. Israr et al., (2020) has estimated an overall empowerment index of 0.64 for women in Pakistan. Roy et al., (2022) had constructed an empowerment index for SHG women and applied the same on 290 SHG members of North 24 Praganas, West-Bengal and worked out the empowerment score that ranges from 0.6 to 0.8. SHG group leaders in rural West Bengal are true examples of empowerment. With access to financial resources, they are standing up to society's evils and have a say in family matters, such as deciding on their children's marriage or education. This has resulted in positive changes for the women and their families.

Table 3 indicates that in terms of domain-wise scores, Khordha SHG tops in 'access to and control over income' (4.58), indicating a greater control over their income earned as compared to the counterparts in Puri and Kendrapara. SHG Puri scored high in terms of 'ability to decide' and 'participation in social and economic activities; however, in other domains, they scored less than Khordha.

CONCLUSION

The study has developed an index for measuring the empowerment of women in aquaculture, which is the first-ever attempt in the field of aquaculture. It followed the detailed procedure of scale construction and established the validity of the instrument. It is simple to administer and interpret. Further, using the index, the level of empowerment of three women SHGs who are engaged in aquaculture production was quantified and compared. It would help monitor the progress of developmental endeavors in terms of achieving women empowerment in aquaculture. It has the potential to be used for assessing the success of development

Table 3. Comparison of empowerment levels of three women SHGs

Domains	Subhashree SHG, Khordha (n=12)		Maa Harachandi SHG, Puri (n=14)		Maa Durga SHG, Kendrapara (n=12)	
	Mean	SD	Mean	SD	Mean	SD
Access to and control over resources and services	4.18	0.75	3.67	0.46	3.92	0.5
Ability to decide independently	3.56	0.46	4.27	0.46	3.54	0.82
Attitude towards aquaculture	3.20	0.70	2.9	0.83	2.63	0.92
Control over the use of income	4.58	0.78	3.82	0.64	3.54	0.83
Knowledge on aquaculture	3.12	0.40	2.86	0.50	2.36	0.50
Participation in social and economic activities	4.36	0.82	4.23	0.67	3.72	0.78
Overall WEAI (%)	79.8		74.0		69.2	

interventions aimed at mainstreaming women in aquaculture. This would be very useful for policymakers, research and academic institutions and donor agencies who want to measure and increase women's empowerment in the context of fisheries and aquaculture.

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