Original Research Article

Development of an Index for Assessing Farm Women's Access to Resources

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A B S T R A C T

The status of farm women's access to resources is considered to be critical as a determinant and necessary precondition for their progress. Access to Resource Index is designed for assessing the status of farm women's access to resources. It constitutes five dimensions and 40 indicators. The specific weightage of each dimension in an index is calculated using Normalised Rank Order Method. Indicators had at least 80% expert's agreement are retained in the final index. Index content is standardised by evaluating the content validity and expert opinions. It assesses the status of access to resources in terms of availability, affordability, suitability and capability to use resources. It emphasises the dimensions of resources which required immediate attention and needs to target in the policy initiatives for sustaining the livelihood of farm women. It can be used to measure and compare the status of farm women's access to resources in different regions of India with suitable modifications and validation.

Introduction

Since birth of farming, women are backbone of the agricultural workforce. Today, they represent 43% of the global agricultural labour force. The percentage of women who depend on agriculture for their livelihood is as high as 84% in India. About 79% of women continue to be engaged in agriculture and allied activities as against only 63% of men. Women cultivators and agriculture labourers perform 70% of all the agriculture activities. About 12% of all rural households in India are now female headed with small holdings. The increasing number of farmer suicides, 40% male farmers want to quit farming and rural youth migration towards non-farm employment are forcing women's to shoulder

household as well as farm responsibilities (NSSO, 2010). Even though women are major contributors to food production, they lag well behind men in access to productive resources and income from them. If women had provided the same access to productive resources as men, they could boost yield by 20-30% (FAO, 2011).

Farm women are mostly dependent on the natural resources for their livelihood. Hence, their livelihood is directly impacted by scarcity of natural resources. Inadequate access to productive resources limits women's livelihood options and exacerbates financial strain on women. By improving farm women's access to productive resources, their potential could be unlocked, thereby enhancing their

efficiency and productivity. Therefore, the status of farm women's access to resources in different regions is need to assessed for designing suitable strategies to improve their access to resources. But, there is no such standardized tool/index available for assessing the same. Indices of socio-economic security are composite indicators of the socio-economic wellbeing at the individual, community, state, national and international levels (Estes, 1997; Klein, 2003 and Sharpe, 1999).

These socio-economic indicators are used to help in the identification of problem-areas that need policy planning and require intervention to alter the course of action. On the basis of these well-known composite indexes of socio-economic wellbeing are Livelihood Index by Anil *et al.,* (2008), Human Development Index by UNDP (1989), Gender-related Development Index, Gender Empowerment Measure, Quality of Life Index by Diener (1995) and Access to Seed Index by Verhagen (2015), an attempt was made to develop Access to Resource Index (ARI) for assessing the status of farm women's access to resources coupled with meeting the basic resource needs of farm women.

It will be the standardised tool to measure and compare the status of farm women's access to resources in different regions of India. It emphasises the dimensions of resources which required immediate attention and needs to target in the policy initiatives for sustaining the livelihood of farm women.

Conceptual framework

Access is defined as the opportunity to make optimum use of available resources. A resource is a source or supply of goods and services which is used to get better output. Access to resources is consists of following four components;

Availability

Are resources available as per the needs of farm women? This refers to whether sufficient resources are available within proximity, in time and in reliable supply.

Affordability

Can farm women afford to use quality resources? This refers to whether farm women having the means to purchase or avail the resources.

Suitability

Are the resources tailored to the needs of farm women? This refers to whether available resources are suitable for the needs and local condition of farm women.

Capability

Arefarm women having the ability and skill to make use of resources? This refers to whether farm women have capacity and favourable social climate to make effective use of available resources.

Development of Access to Resource Index (ARI)

Selection of dimensions

The resource has multidimensional aspects. Therefore, it is imperative to select representative dimensions of resources. These dimensions are selected from available literature and threadbare discussion with experts in field of agriculture. Broadly, these dimensions are operationalised as;

Human resource

It represents the skills, knowledge, nutrition and good health that together enable people to

produce goods or render services like training, extension, information, banking, etc. Human resources are the people needed to provide services to farm women.

Physical resource

It is basic infrastructural asset and producer good needed to meet basic needs and to be more productive. These are water supply, sanitation, gender friendly farm technologies, means of transportation, market, farm inputs, shelter, electricity, ICTs, etc.

Natural resource

It is resource or asset from nature useful for livelihood. These are land, livestock, air, water, forest, etc.

Social resource

It is defined as the social asset which forms social safety networks for creating women friendly environment. These are management skills, decision making, communication skills, social protection services, trust and solidarity among members of the society, effective means to utilise leisure time, equal social status, etc.

Financial resource

It is financial asset flows as well as stocks and contributes to consumption as well as production. It enables people to adopt different livelihood strategies. These are farm income, savings, farm subsidies, credit, microfinance, insurance, employment, property/land rights, etc.

Selection of indicators

The selection of relevant indicators for measuring any dimension is an important step of index methodology. Hence, all the relevant

indicators under each dimension were collected from available literature and consultation with researchers, extension workers and innovative farm women. Total 70 indicators were collected edited as per 14 informal criteria suggested by *Edwards (1957)* as result 10 indicators were eliminated. Finally, 60 indicators were retained after editing and considered for expert's evaluation.

Expert's response to dimensions and respective indicators

The perform a containing five dimensions and their respective indicators was sent through e-mail as well as handed over personally to more than 50 experts who were renowned persons in the field of social science, agricultural extension, gender studies and rural development. Experts were asked to rank five dimensions (1 to 5) according to their importance to farm women. Expert's were also asked to give response to each indicator on three point continuums i.e. Most relevant, Relevant and Least relevant. They were requested to make necessary modifications, additions and deletions in listed indicators, if they desired so. About 35experts had given their response in a stipulated span of one month. After careful examination of responses, 5 responses were found unsuitable for further item analysis and eliminated. The remaining 30 responses were considered for the determination of scale values of dimensions and relevancy of indicators.

Determination of scale values for each dimension

The Normalized Rank Order Method suggested by Guilford (1954) was used for determining the scale values to each dimension based on their perceived significance to farm women's development. The method has got a unique advantage that it can be used with any number of variables and

does not require a large number of experts. The rankings given by all 30 experts were summarised and presented in Table 1. Further, the proportion (p) were worked out for the ranks. The p value is centile value which indicated the area of the dimensions in the normal distribution. Thus, the p values for the ranks ranged from the lowest 10 to the highest 90 (Table 1). The C values were obtained for each rank from the Table-M (Guilford, 1954) and represented in Table 1 under the column C.

The next step was to find out the $\sum f_{ji}C$ value for all the dimensions. This was obtained by multiplying the rank frequencies of respective dimension by the C values of respective rank (r_i) and summing up the products for each dimension. Then, $\sum f_{ji}C$ values of each dimension was divided by total number of experts (30), which resulted in obtaining the scale values (R_c) for each dimension.

The obtained scale values for human resource, physical resource, natural resource, social resource and financial resource are 6.6, 6.1, 6.9, 5.9 and 6.5 respectively. The cross check for this method is that the sum of obtained scale values and sum of C values should be same. The sum of obtained scale values and sum of C values was same i.e. 32. This proves the reliability of procedure followed for calculation of scale values. The mean and standard deviation of scale values are 6.4 and 0.4, respectively. The standard error for scale values is only 0.07 which shows the accuracy of the method followed for obtaining scale values.

Relevancy test for each indicator

Item analysis is an important step while constructing valid and reliable index. It is possible that all the indicators collected may not be relevant equally in measuring access to resources. Hence, these indicators were

subjected to scrutiny and their subsequent screening for inclusion in the final index. Experts were asked to indicate degree of relevancy on each indicator with three point continuums i.e. *Most relevant, Relevant* and *Least relevant* with scoring 3, 2, and 1, respectively. The Relevancy Weightage (RW) and Mean Relevancy Score (MRS) were worked out for all the selected indicators individually (Table 2) by using the following formulas;

$$RW = \frac{\text{More relevant response} * 3 + \text{Relevant response} * 2 + \text{Not relevant response} * 1}{\text{Maximum possible score}}$$

$$MRS = \frac{\text{More relevant response} * 3 + \text{Relevant response} * 2 + \text{Not relevant response} * 1}{\text{Number of experts}}$$

The obtained average values of RW and MRS were 0.80 and 2.50, respectively. By using these two values, the indicators having RW >0.80 and MRS >2.50were considered for including in the final index. As a result out of 60 indicators, 40 indicators were selected to include in final index (Table 2). The selected indicators are modified and rewritten as per the comments of experts.

How the index works

The various set of items/statements should be prepared under each indicator for final data collection from the respondents. The prepared set of items/statements should consider the availability of resources, affordability of farm women, suitability of resources and capability of farm women to use resources.

Further, the response of farm women on prepared items/statements should be reported on three point or five point continuums. Then, the relevant scores should be assigned to each response for quantification of collected data. Finally, the sum of score obtained under each dimension of the index can be used for the computation of the composite index.

Table.1 The frequencies of ranks as given by 30 experts, proportions (p), C values and R_c values for five dimensions of access to resource index

r_i	R_i	Five dimensions of resources					Sum (Σ)	Proportion(p) $\dfrac{(R_i - 0.5)100}{n}$	C values of respective ranks (C)
		Human Resource	Physical Resource	Natural Resource	Social Resource	Financial Resource			
1	5	7	4	12	3	4	30	90	8
2	4	8	3	6	5	11	30	70	7
3	3	8	9	4	5	4	30	50	6
4	2	3	7	6	5	7	30	30	6
5	1	4	7	2	12	4	30	10	5
Σf_{ji}		30	30	30	30	30	150		**32** **(Sum of C values)**
$\Sigma f_{ji}C$		198	184	208	179	195	964		
R_c ($\Sigma f_{ji}C/N$)		6.6	6.1	6.9	5.9	6.5	**32**		Mean of R_c(M_c) = 6.4 Standard Deviation of R_c (σ) = 0.4

r_i= Correct rank order, R_i = Reverse rank order, n = Number of dimensions (5), f_{ji}= Rank frequency, R_c = Scale value and N = Number of experts (30)

$$\text{Standard error for } R_c = \frac{\sigma}{\sqrt{N}} = \frac{0.4}{\sqrt{30}} = \frac{0.89}{5.48} = 0.07$$

Table.2 Dimensions and respective indicators of ARI with their relevancy
weightage and mean relevancy score

Resource dimensions and respective indicators	Relevancy weightage	Mean relevancy score
A) Human Resource		
1) Access to sufficient food	0.97	2.90
2) Access to health services	0.96	2.87
3) Access to natural calamity protection services	0.91	2.73
4) Access to nutritional diet	0.90	2.70
5) Access to banking services	0.90	2.70
6) Access to social protection services	0.84	2.53
7) Access to training services	0.82	2.52
8) Access to veterinary services	0.81	2.51
9) Access to extension services	0.81	2.51
10) *Access to family labour	0.76	2.27
11) *Access to government officials	0.74	2.23
12) *Access to hired labour	0.69	2.07
B) Physical Resource		
13) Access to water supply and sanitation	0.94	2.83
14) Access to women friendly farm technologies	0.92	2.77
15) Access to means of transportation	0.89	2.67
16) Access to market	0.89	2.67
17) Access to critical crop & livestock inputs	0.88	2.63
18) Access to agricultural information	0.88	2.63
19) Access to pucca house	0.86	2.57
20) Access to basic household amenities	0.84	2.53
21) Access to electricity	0.82	2.52
22) Access to modern ICTs	0.82	2.52
23) *Access to animal housing	0.79	2.37
24) *Access to traditional ICTs	0.77	2.30
25) *Access to mechanised farm equipments	0.73	2.20
26) *Access to non-mechanised farm equipments	0.70	2.10
C) Natural Resource		
27) Access to agricultural land	0.94	2.83
28) Access to small livestock rearing	0.91	2.73
29) Access to healthy environment	0.83	2.52
30) Access to irrigation	0.81	2.51
31) Access to fuel sources	0.81	2.51
32) *Access to grazing land	0.77	2.30
33) *Access to large livestock rearing	0.74	2.23
34) *Access to waste assimilation facilities	0.74	2.23
35) *Access to non-agricultural land	0.73	2.20

36)	*Access to erosion protection methods	0.69	2.07
37)	*Access to non timber forest products	0.66	1.97
D)	**Social Resource**		
38)	**Access to develop management skills**	0.87	2.60
39)	**Access to trust and solidarity**	0.87	2.60
40)	**Access to decision making**	0.87	2.60
41)	**Access to equal intra-house communication**	0.84	2.53
42)	**Access to equal intra-house status**	0.82	2.52
43)	**Access to utilise leisure time**	0.81	2.51
44)	*Access to leadership development	0.77	2.30
45)	*Access to socio-political participation	0.71	2.13
E)	**Financial Resource**		
46)	**Access to farm income**	0.93	2.80
47)	**Access to savings**	0.90	2.70
48)	**Access to farm subsidies**	0.90	2.70
49)	**Access to credit facilities**	0.89	2.67
50)	**Access to microfinance**	0.88	2.63
51)	**Access to Self Help Groups**	0.88	2.63
52)	**Access to insurance**	0.87	2.60
53)	**Access to farm employment**	0.86	2.57
54)	**Access to remunerative prices for farm produce**	0.86	2.57
55)	**Access to property rights**	0.84	2.53
56)	*Access to remittance transfers	0.78	2.33
57)	*Access to non- farm income	0.77	2.30
58)	*Access to non-farm employment	0.77	2.30
59)	*Access to cash in hand	0.60	1.77
60)	*Access to jewellery	0.58	1.73
	Mean	**0.80**	**2.50**

* Eliminated indicators from the final index

Computation of the composite index

Each dimension consists of different number of indicators. Hence, the range of total score is different for each dimension. Therefore, the obtained total score of each dimension is necessary to convert into unit score for bringing uniformity in the score of all dimensions. This is calculated by using the following formula;

$$U_{ij} = \frac{Y_{ij} - MinY_{ij}}{MaxY_j - MinY_j}$$

Where,

U_{ij} = Unit score of the ith respondents on j^{th} dimension

Y_{ij} = Value of the ith respondent on the jth dimension

Max Y_j = Maximum score on the jth dimension

Min Y_j = Minimum score on the jth dimension

Thus, the unit score of each dimension ranges

from 0 to 1. Further, the composite index value for each respondent is calculated by the following formula;

$$ARI_i = \frac{\sum U_{ij} * S_j}{Sum\ of\ scale\ values}$$

Where,

ARI_i = Access to Resource Index of ith respondent

U_{ij} = Unit score of the ith respondent on j[th] dimension

S_j = Scale value of the jth dimension

$\sum$ = Sum

The composite index value ranges from 0 to 1. When it is minimum, the value is 0 and when it is maximum the value is 1. Based on composite index value of respondents, the respondents can be categorised into different categories of low, medium and high level of access to resources by cumulative square root of frequency method.

Standardisation of an index

The validity was ascertained for standardisation of the index. It is the property that ensures the obtained test scores as valid, if and only if it measure what it is supposed to measure. The validity of an index is measured by content validity. The content validity is the representative or sampling adequacy of the content of a measuring instrument.

The content of an index was covered through available literature scan and expert opinions. The indicators had at least 80% expert's agreement are retained in the final index. As the scale values of dimensions and, relevancy weightage and mean relevancy score of indicators had discriminating values, it

seemed reasonable to accept the index as valid measure of the desired variable.

ARI as a composite index of its five dimensions of human resource, physical resource, natural resource, social resource and financial resource works as a standardised tool for assessing the status of farm women's access to resources which is priceless resource to policy makers for designing innovative strategies. A developed index can measure the extent to which the farm women's have access to resources and which kind of resources can be provided to benefit farm women. It analyses access to resources in terms of availability, affordability, suitability and capability. The content validity of an index indicates the precision and consistency of the results. This index can be used to assess the status of farm women's access to resources in different regions of India with suitable modifications and evaluation of validity of an index.

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