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Development of an Index for Assessing the Livelihood Security Status of Farmers

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ABSTRACT: *An integrated rural livelihood security index has been developed for assessing the livelihood security status among small and marginal farmers. Seven different dimensions of livelihood security i. e. Food Security, Economic Security, Agricultural Security, Health Security, Social Security, Infrastructure Security and Environmental Security were collected through relevant literature scan and consultation with experts. A total of 50 indicators have been considered for this index development. The different dimensions of livelihood security were sent to 40 judges who were experts of relevant field for their ranking according to their importance in the livelihood security of small and marginal farmers. The scale values were calculated for different dimensions of livelihood security by normalised rank order method suggested by* Guilford (1954). *The relevant indicators of each dimension of livelihood security were selected according to their respective relevancy weightage and mean relevancy score. Finally, a composite integrated rural livelihood security index has been developed which help to assess the livelihood security status among small and marginal farmers. This index can be used to assess the status of livelihood security of farmers beyond the study area with suitable modifications and evaluation of validity of an index.*

Key words: *Farmer, Index, Livelihood security.*

INTRODUCTION

Indices for economic and social security are composite indicators of the economic and social well-being at the individual, community, state, national and international levels. These social indicators are used to monitor the social system and help in the identification of problem-areas that need policy planning and require intervention to alter the course of social change. In the absence of standardized index for measuring livelihood security status of small and marginal farmers, an attempt was made to develop integrated rural livelihood security index.

The best known composite index of social and economic wellbeing is Human Development Index (HDI), developed by *United Nations Development Program (UNDP) (1989)*. The basic aim of this index was a cross-national comparison. UNDP has also developed sever other indices like Gender-related Development Index (GDI), which indicates the average achievement of each country in life expectancy, and educational attainments of men and women, Gender Empowerment Measure (GEM) to evaluate the relative empowerment of women and men in political and economic spheres of activity, and Human Poverty Index (HPI). A comprehensive survey of different indicators of economic and social well-being has been provided by Sharpe (1999). The Quality of Life Index (QLI) developed by *Diener (1995)* is based on universal set of values. *Estes (1997)* has developed an Index of Social Progress (ISP) for identifying significant changes in "adequacy of social provision" and to assess the progress in providing more adequately the basic social and material needs of the world's population. *Klein and Ozmucur (2003)* have estimated the economic growth of China using social indicators. *Haberman (1978)* has provided statistical methods for analyzing qualitative data. The development of integrated rural livelihood security index is one of the most important social indicators for assessing the status of livelihood security, coupled with meeting the basic needs of small and marginal farmers.

Under the above discussed circumstances, it arises a need for a study which will focus on assessment of

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the status of livelihood security of farmers in backward regions. The backward regions with respect to livelihood status have clearly shown that the need of special attention of policy planners. But there is no standardized index available for assessing the same. Hence, the present study was conducted to develop an Integrated Rural Livelihood Security Index (IRLSI). This was the part of doctoral research on Integrated farming systems for sustainable rural livelihood security of small and marginal farmers in backward districts of Maharashtra (India).

CONCEPTUAL FRAMEWORK

Livelihood security, according to Food and Agriculture Organization (FAO) is 'adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, time for community participation and social integration)'. Livelihoods can be derived from a range of on-farm and off-farm activities, which together provide a variety of procurement strategies for food and cash. Thus, each household can have several possible sources of entitlement, which constitute its livelihood. These entitlements are based on the household's endowments and its position in the legal, political and social fabric of society. The risk of livelihood failure determines the level of vulnerability of a household to income, food, health and nutritional insecurity. Therefore, livelihoods are secure when households have secure ownership of, or access to, resources and income-earning activities, including reserves and assets, to offset risks, ease shocks and meet contingencies (Chambers, 1989).

Conceptually 'livelihood' denotes the means, activities, entitlements and assets by which people make a living. Assets are defined as natural/biological (*i.e.* land, water, common-property resources, flora and fauna), social (*i.e.* community, family and social networks), political (*i.e.* participation, empowerment-sometimes included in the social category), human (*i.e.* education, labour, health and nutrition), physical (*i.e.* roads, clinics, markets, schools and bridges) and economic (*i.e.* jobs, saving and credit).

DEVELOPMENT OF INTEGRATED RURAL LIVELIHOOD SECURITY INDEX (IRLSI)

(a) Selection of dimensions: The livelihood security has multidimensional aspects. It includes economic security, nutritional security, health security, food security, educational security, habitat security, infrastructure security, community participation, environmental security, etc. Therefore, it was important to select dimensions, which were representative indicators of all these sectors of human-life. The availability of authenticated literature and through discussion with experts in relevant field played an important role in the identification of these dimensions. Broadly, these dimensions were grouped into seven categories: (i) Food Security, (ii) Economic Security, (iii) Agricultural Security, (iv) Health Security, (v) Social Security, (vi) Infrastructure Security and (vii) Environmental Security. The identified dimensions of IRLSI were operationalised as given below:

(i) Food security: It is operationalised as the extent of food availability, accessibility, affordability and quality at household level. Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

(ii) Economic security: It is operationally defined as the availability and access to financial sources and accumulation of the financial capital. It can be measured in terms of savings, insurance, indebtedness, employment status, livestock composition and total annual income of the household.

(iii) Agricultural security: It is operationally defined as the availability and access to the resources for agricultural production optimisation i.e. extent to which agricultural production of farm is sufficient for small and marginal farmer's sustained living.

(iv) Health security: It is operationalised as the extent of availability, accessibility, affordability and quality of health facilities at village level. It refers to the health status and capacity of respondents to afford health facilities as per the requirement.

(v) Social security: It is operationally defined as the social status of the respondent at home and outside in terms of respondent's family education status, farming experience, training received, social participation and trust & solidarity among the members of the society which forms an effective social safety networks for improving their livelihoods.

(**vi**) **Infrastructure security:** It is operationally defined as the availability and access to basic infrastructure and producer goods needed to support livelihoods at both individual and society level. Infrastructure consists of physical environment that help the people to meet their basic needs and to be more productive. Producer goods are the tools and equipments that farmers use to function more productively.

(**vii**) **Environmental security:** Environmental security is environmental viability for life support. It is measured in terms of extent of pollution free environment, Ground water access, adoption of eco-friendly farm management practices and protection from flood or drought conditions.

(b) Determination of scale values: It has decided to give specific weights (Scale Values) to each dimension of the IRLSI based on their perceived significance. The Normalized Rank Order Method suggested by *Guilford (1954)* was used for determining the scale values. 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 judges. As per the method, seven different dimensions of IRLSI were ranked by the group of judges according to their perceived significance in determining the status of livelihood security of small and marginal farmers. Ranking was obtained from judges who involved experts in the field of Social Science, Extension Education Rural Development and Farming Systems. The performa containing dimensions of IRLSI was sent by post, through e-mail and also handed over personally to the total 40 judges for ranking (1 to 7) dimensions according to their relevance in the livelihood security of small and marginal farmers. Out of 40 judges 35 judges had returned the same set of indicators after duly recording their judgements in a stipulated span of 2 months. Out of 35 responses, 5 responses were found unsuitable for item analysis and eliminated after careful examination of responses. The remaining 30 responses were considered for the item analysis. The rankings given by all 30 judges were summarised and presented in Table 1.

In the next step, the proportions were worked out for the ranks assigned by all the judges. The formula is $p = \frac{(R_i - 0.5)100}{n}$, Where R_i stands for the rank value of the dimension i in the reverse order as 7 to 1 and n indicates the number of dimensions ranked by the judges. Here we needed the middle area of the dimensions ranked. The *p* is the centile value which indicated the area of the dimensions in the normal distribution. The *p* values were worked out for all the ranks shown in Table 1. Thus, the *p* values for the ranks ranged from the lowest 7.14 to 92.86.

The next step is to find out the C values for all the ranks. The correct rank order (1 to 7) is given in the column under r_i in Table 1. The second column R_i in Table 1 is the reverse rank order (7 to 1). The C values were determined for each rank from the Table-M (Guilford 1954, p. 577). These values can be traced by putting the finger on the column extreme left of the Table-M, on the number which indicates the number of stimuli used in the experiment. In the case of this experiment the numbers of stimuli (Dimensions) were 7, and also the number of stimuli to be ranked. While moving the finger from this number 7 towards right, stop at the number which indicates the rank number (r_i, 7). Above the rank number you can find the respective C value 4 for the rank 7 and this can be entered in the Table 1 under the letter C. The C values are from 1 to 9 only. The same procedure may be adapted in finding out the C values for all the ranks (r_i) from the Table-M.

The next step is to find out the Σ*fji* C value for all the dimensions. This value for every dimension was obtained by multiplying the frequencies found in the columns of the respective dimension by the C values of the rank (ri), and summing up the products for each dimension and entering the same in the row against Σ*fji* C. The mean of the total frequencies, that is for the whole data of the matrix was (1230/210= 5.86) 5.86, and the mean of the C values was (41/7= 5.86) also 5.86. Then the Σ*fji* C values for each dimension was divided by the total number of judges 30, which resulted in obtaining the Mc= Rj value for each dimension. This was the mean value (Mc) and also the response value (Rj) for each dimension. The mean values were shown in the row against Mc = Rj. The treatment of data can be stopped at this stage and the Mc values can be accepted and treated as the Scale Values. The total value was 41 which was also the total sum of the C values, and the mean of the Mc or Rj or Rc values was 5.86. The standard deviation and standard error of the Mc values was 0.89 and 0.16, respectively. The obtained Scale Values (Rc) were shown in Table 1 against row Mc or Rj or Rc.

(c) Selection of indicators: Indicators under each dimension of IRLSI were selected through expert

Table 1
The Frequencies of Ranks as given by 30 Judges, Proportions (*p*), C Values and R_c Values for Seven Dimensions of IRLSI by using Normalised Rank Order Method Suggested by *Guilford (1954)*

r_i	R_i	*Seven Dimensions of Integrated Rural Livelihood Security Index (IRLSI)*							Σ	*p*	*C*
		Agricultural Security	*Economic Security*	*Food Security*	*Health Security*	*Infrastructure Security*	*Social Security*	*Environmental Security*			
1	7	8	6	12	2	1	0	1	30	92.86	8
2	6	7	9	8	5	1	0	0	30	78.57	7
3	5	2	9	8	8	0	2	1	30	64.29	6
4	4	5	4	0	7	3	9	2	30	50.00	6
5	3	2	2	0	6	8	6	6	30	35.71	5
6	2	6	0	0	2	5	11	6	30	21.43	5
7	1	0	0	2	0	12	2	14	30	7.14	4
Σf_{ji}		30	30	30	30	30	30	30	210	350	**41**
$\Sigma f_{ji} C$		195	199	208	181	146	159	142	1230		
M_c or R_j or R_c ($\Sigma f_{ji} C / \Sigma f_{ji}$)		**6.50**	**6.63**	**6.93**	**6.03**	**4.87**	**5.30**	**4.74**	**41**	M = 5.86 σ = 0.89	

r_i = Correct rank order, R_i = Reverse rank order, Σ = Sum, *p*= Proportion, C = C values of respective ranks, M_c = Mean value, R_j = Response value, R_c = Scale Value, σ = Standard Deviation

$$Standard\ Error\ for\ M_c = \frac{\sigma}{\sqrt{N}} = \frac{0.89}{\sqrt{30}} = \frac{0.89}{5.48} = 0.16$$

consultation and literature scan. Special care was taken to include all relevant items. The procedure involved could ensure the efficiency of the instrument to measure the household livelihood security by ascertaining content validity. The following steps were followed for selecting relevant indicators under each dimension of IRLSI.

(1) Collection and editing of indicators: By referring the available literature on relevant subject, a total 60 indicators were collected covering the almost entire universe of content. The researchers, farmers and extension experts were also consulted for selecting indicators. The indicators were edited as per 14 informal criteria suggested by *Edwards (1957)* as outcome 10 indicators were eliminated. Finally, 50 indicators were retained after editing and considered for judge's rating.

(2) Response to indicators: The performa containing 50 indicators on three point continuums i.e. Most Relevant, Relevant and Not Relevant was sent by post, through e-mail and also handed over personally to the total 40 judges. These judges were experts in the field of Extension Education, Social Science, Rural Development and Integrated Farming Systems, etc. The judges were requested to indicate their response by tick mark in suitable continuum in front of each indicator. Also the judges were requested to make necessary modifications and additions or deletions, if they desired so. Out of 40 judges 35 judges had returned the same set of indicators after duly recording their judgements in a stipulated span of one month. Out of 35 responses, 5 responses were found unsuitable for item analysis and eliminated after careful examination of responses. The remaining 30 responses were considered for the item analysis.

(3) Relevancy test: 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 the status of livelihood security of farmers. Hence, these indicators were subjected to scrutiny and their subsequent screening for inclusion in the final index. The judges were asked to indicate degree of relevancy on each indicator with three point continuums 'Most Relevant, Relevant and Not 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 by using the following formula;

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

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

By using these two criteria the indicators having Relevancy Weightage (RW) > 0.70 and Mean Relevancy Score (MRS) > 2.25 were considered for including in the Integrated Rural Livelihood Security Index (IRLSI). By this procedure, final indicators of respective dimensions of IRLSI were selected, modified and rewritten as per the comments of judges. The various set of items/ statements was prepared under each indicator for final data collection from the respondents. The finally selected dimensions of IRLSI and their respective indicators with respective relevancy weightage and mean relevancy score were shown in Table 2.

(**d) Computation of the composite index:** Each dimension of IRLSI consists of number of indicators and hence, their range of total scores was different. Therefore, the total score of each dimension was converted into unit score by using simple range and variance as given below,

$$U_{ij} = \frac{Y_{ij} - Min\,Y_{ij}}{Max\,Y_j - Min\,Y_j}$$

Where,

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

Y_{ij} = Value of the i^{th} respondent on the j^{th} dimension

Max Y_j = Maximum score on the j^{th} dimension

Min Y_j = Minimum score on the j^{th} dimension

Thus, the score of each dimension range from 0 to 1 i.e. when Y_{ij} is minimum, the score is 0 and when Y_{ij} is maximum the score is 1. Then, the unit scores of each respondent was multiplied by respective scale value of the each dimension and summed up. Thus, the score obtained was divided by the sum of scale values in order to get the IRLSI for each respondent.

$$IRLSI_i = \frac{\Sigma U_{ij} * S_j}{Sum\,of\ scale\,values}$$

Where,

$IRLSI_i$ = Integrated Rural Livelihood Security Index of i^{th} respondent

U_{ij} = Unit score of the i^{th} respondent on j^{th} component

S_j = Scale value of the j^{th} component

Σ = Sum

Table 2
The Selected Indicators of Respective Dimensions of Integrated Rural Livelihood Security Index with their Relevancy Weightage and Mean Relevancy Score

Sl. No.	*Dimensions and their Indicators*	*Relevancy Weightage*	*Mean Relevancy Score*
1	Food Security		
a	Extent of food availability	1	3
b	Extent of food affordability	1	3
c	Extent of food quality	0.88	2.67
d	Extent of food accessibility	0.83	2.50
2	Economic Security		
a	Employment status	0.97	2.91
b	Total annual income and sources	0.94	2.83
c	Savings	0.92	2.75
d	Indebtedness	0.83	2.50
e	Insurance	0.81	2.47
f	Livestock holding	0.78	2.33
3	Agricultural Security		
a	Land holding	0.97	2.91
b	Agricultural production optimisation	0.97	2.91
c	Market access	0.97	2.91
d	Irrigation source	0.94	2.83
e	Cropping intensity	0.92	2.75
f	Cropping system	0.86	2.58
g	Labour availability	0.83	2.50
h	Farming system	0.81	2.47
i	Type of cultivation	0.78	2.33
4	Health Security		
a	Extent of availability of health facilities	0.94	2.83
b	Extent of affordability of health facilities	0.92	2.75
c	Health status of family	0.88	2.67
d	Extent of accessibility of health facilities	0.83	2.50
5	Social Security		
a	Trust and solidarity	0.94	2.83
b	Social participation	0.88	2.67
c	Family education status	0.86	2.58
d	Trainings received	0.81	2.47
6	Infrastructure Security		
a	Institutional Infrastructure utilisation	0.94	2.83
b	Extent of local infrastructure	0.92	2.75
c	Water supply and sanitation	0.88	2.67
d	Type of house	0.86	2.58
e	Extent of material possession	0.81	2.47
f	Source of energy	0.78	2.33
7	Environmental Security		
a	Adoption of eco-friendly farming practices	0.94	2.83
b	Environmental awareness	0.86	2.58
c	Extent of environmental hazards	0.78	2.33

The status of respondent's livelihood security was calculated based on the total index score of all the indicators. The classification of respondents into the categories of very low, low, medium, high and very high livelihood security status was based on the range of total livelihood security index scores.

(**e) 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. An index is said to be valid if it stands for one's reasoning. The validity was measured by content validity. The content validity of the index was tested by experts' judgement. The content validity is the representative or sampling adequacy of the content, the substance, the matter and the topics of a measuring instrument. This method was used in the present index to determine the content validity of the index. The content of the index was thoroughly covered through literature scan and expert opinions. The indicators had at least 80 per cent judges' agreement were retained. This indicated validity of the index content. As the scale values, relevancy weightages and mean relevancy scores of all the dimensions and indicators had discriminating values, it seemed reasonable to accept the index as valid measure of the desired dimension.

CONCLUSION

The reliability and validity of the index indicate the precision and consistency of the results. Farmer's perception about any developmental activity is priceless resource to policy makers for designing policies for balanced growth. The developed index will be revealed the livelihood security status of small and marginal farmers of the backward districts of Maharashtra through Food Security, Economic Security, Agricultural Security, Health Security, Social Security, Infrastructure Security and Environmental Security. It has been found in the backward regions of the country that the development of the farming and farmers have been neglected and left far behind. The backward regions with respect to livelihood status have clearly shown that the need of special attention of policy planners. This index can be used to assess the status of livelihood security of farmers beyond the study area with suitable modifications and evaluation of validity of an index.

REFERENCES

Anil R., Sharma, S. D., Prachi, M. S. and Malhotra, P. K. (2008), Development of livelihood index for different agro-climatic zones of India. *Agricultural Economics Research Review,* 21, 173-182.

Chambers, R. (1989), Editorial introduction: Vulnerability, coping and policy. *IDS Bulletine,* 2(2), 1-7.

Diener, E. D. (1995), A value-based index for measuring national quality of life. *Social Indicators Research,* 36, 107-127.

Edwards, A. L. (1957), Techniques of attitude scale construction. Vakils, Feffer and Simons Private Ltd., Bombay.

Estes, R. J. (1997), Social development trends in Europe: 1970-1994 Development prospects for New Europe. *Social Indicators Research,* 42, 1-19.

Guilford, J. P. (1954), Psychological methods. Tata McGraw Hill Publishing Co. Ltd.

Haberman, S. J. (1978), The analysis of qualitative data. New York: Academic press.

Klein, L. R. and Ozmucur, S. (2003), The estimation of China's economic growth. *Journal of Economic and Social Measurements*, 62(8), 187-202.

Sharpe, A. (1999), A Survey of Indicators of economic and social well-being, Canada: Center for study of living standard.

United Nations Development Program. (1989), Human development report. New York: Oxford university press.