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Determinants of Farmers' Welfare : A Special Reference to Kerala State

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ABSTRACT

The present study was conducted in Palakkad district of Kerala state during 2017-18 to analyse the welfare of farmers practicing rice, coconut and vegetables crops in combinations. Equal number of farmers growing rice-coconut, rice-vegetable and coconut-vegetable combinations were selected. Thirty two indicators to represent the welfare were identified and subjected to categorical principal component analysis (CATPCA) to extract the factors. Eighteen indicators were grouped into eight factors based on eigen values of more than 1.00. These factors contributed for 69.16 per cent of total variation in the farmer's welfare. The factor with highest contribution (16.12%) was named as optimistic factor with four indicators *viz.*, household annual income, farm income per acre, food security and social participation. Behavioural factor with the single indicator self acceptance had the minimum contribution (4.29 %) to farmer's welfare. Overall farmer welfare index for 90 respondents ranged in between 0.35 and 0.83. Among the three combination, maximum frequency of rice-vegetable farmers (36.67 %) retained high level of farmer welfare index.

Keywords : Farmer welfare, categorical principal component analysis

AGRICULTURE plays a vital role in Indian economy. The sector continues to be the single largest contributor to the economy, though its contribution to Gross Domestic Product (GDP) has declined from 28.30 per cent in 1993-94 to 17.30 per cent in 2015-16 (Anon., 2017). Even though half of the work force in the country depends on agriculture, cultivator number had declined in the decade from 2001 to 2011 (Gupta, 2016). Survey conducted by Centre for study of Developing Societies (Anon., 2014) in 18 Indian states reported that 60 per cent of farmers like the farming profession, though 32 per cent of them had to work other than farming for additional household income. Nearly half of the sample (47.00%) perceived that overall condition of farmers in the country is miserable. Thus thrust remains on agriculture to improve the conditions of the farmers.

The agricultural scenario in Kerala is somewhat unique and distinct from many other states in India in terms of land utilization pattern and the cropping pattern. Agriculture in state is mostly performed by small farmers and practices homestead or mixed farming. The state which had been highly acclaimed for its high social and economic indicators, witnessed a significant decline in agricultural production in the last few decades. National Statistical Survey of India has reported that Kerala had a least percentage share of households in the country *i.e.*, 27.30 per cent (Anon., 2013). The State depends on other states for meeting the food needs of population. The critical scenario of agriculture sector in the state was taken into account by Kerala State Planning Board in projecting a prosperitive plan for 2030. The focus will be on increasing competativeness and productivity in agriculture, so as to raise the income and well being of farmers, not only for this generation, but for future generation too. In this scenario, a study is relevant to assess the existing condition of farmer which could be quantified in dimensions of welfare. An attempt is made to find the determinants of welfare that would sufficiently explain the present conditions of farmers in the Kerala State.

METHODOLOGY

A study was conducted with an ex-post facto research design in the Palakkad district of Kerala state. The district ranks first in total cropped area and second in cultivator population status in the state (Anon., 2013). Among the 13 blocks in the district, Chittoor and Kuzhalmannam blocks were selected based on cultivator population to total population ratio. The sample comprised of 90 respondents (45 from each

two blocks), consisting 30 farmers in each combinations *viz.,* rice-coconut, rice-vegetable and coconut-vegetable combinations.

Identification and prioritisation of indicators

Welfare in the study was operationally defined as the actual living condition of farmer at the given point of time. Based on review of literature and discussions with experts welfare indicators from physical, financial, social, human, natural and farm dimensions were identified. The selected 50 indictors were given for expert opinion in three point continuum (most relevant, relevant and not relevant). Indicators with relevancy weightage of more than 0.75, relevancy percentage of more than 75 per cent and mean relevancy score of more than 2.25 were considered further. Thus 32 welfare indicators were retained in the schedule for data collection.

Relative weightage of 32 indicators was assessed to classify them into five groups. This was accounted to understand the relative importance of selected indicators. Further the indicators were categorized in to five groups with cumulative square root frequency method.

The study operationalised determinant as the factors that affect the welfare of the farmer at the given point of time. As welfare indicators were measured in different levels of measurement, interval and ratio scales were converted to categorical (nominal and ordinal levels) data. Factor identification and prioritization was done with non-linear categorical Principal component analysis (CATPCA) technique. SPSS software was used to operate CATPCA for the dataset. The technique uses optimal scaling to accommodate variables of mixed measurement levels and to generalize the principal components analysis procedures. The CATPCA with varimax rotation extracted the principal components of farmer's welfare. Further the factor analysis technique differentiated and quantified the factors of farmer's welfare. Max-min normalisation procedure and assignment of weights for indicators, followed by Feroze *et al.* (2010) was adopted for the study.

Determinants of farmer's welfare

The factor analysis of indicators using categorical principal component analysis identified the factors contributing the farmers' welfare. The underlying components of the 32 relatively important indicators were extracted through principal component analysis. As the mean communality value of the 32 variables after extraction was > 0.7, Kaiser's criterion followed by Maiti (2013) was used to retain only those factors with Eigen values >1.00, hence a total of eight factors all having Eigen values >1.00 have been reported. Only factor loadings of 0.3 or more were considered as significant for the study.

Farmer's welfare index

Indicators retained by the selected factors were considered in the development of welfare index. The formulae used to determine the index was

$$\text{Farmer's Welfare Index (FWI)} = \frac{\sum_{i=1}^{n} X_i \left[\sum_{j=1}^{n} |Lij|\, Ej\right]}{\sum_{i=1}^{n} \left[\sum_{y=1}^{n} |Lij|\, Ej\right]}$$

Where, X_i is the normalised value of i^{th} indicator, L_{ij} is the factor loading of the i^{th} variable on j^{th} factor, E_j is the eigen value of j^{th} factor.

Results and Discussions

The Table I would account the relative importance of selected indicators. The variables like household annual income, farm credit, cultivated farm land, access to basic services and food security were found to be more important to indicate the welfare of farmers. The index score range of the group was in between 0.61 to 0.75. Increase or decrease in annual income found to make fluctuations in overall welfare index. Use of credit in farming practices was commonly observed among the respondents. Growing of more than one crop had contributed for high index scores of cultivated land indicator. Food security and access to basic services indicated their better living conditions. Highly important (0.51 to 0.60) and very important (0.46 to 0.50) groups together counted higher number of indicators. Highly important indicators were household annual expenditure, farm inputs, farm expenditure per acre, farm income per acre, access to natural resources, climate variability, life satisfaction and farm labour. Farm infrastructure, technology adoption, social contribution, household

TABLE I

Relative important variables to determine Farmer's Welfare (n=90)

Degree of importance	Index Score Range	No. of indicators	Indicators
Most important	0.61 - 0.75	5	Household annual income, farm credit, cultivated farm land, access to basic services, food security
Highly important	0.51 - 0.60	8	Household annual expenditure, farm inputs, farm expenditure per acre, farm income per acre, access to natural resources, climate variability, life satisfaction, farm labour
Very important	0.46 - 0.50	9	Farm infrastructure, technology adoption, social contribution, household education, self-acceptance,personal growth, marketing pattern, social participation, resource utilization
Less important	0.41 - 0.45	4	Savings habit, health concern, farm practices, housing pattern
Least important	0.21 - 0.40	6	Livestock management, household credit, household asset, resource conservation, social networks, social acceptance

education, self-acceptance, personal growth, marketing pattern, social participation and resource utilization were grouped as very important indicator. Farmer considered savings habit, health concern, farm practices and housing pattern as less important welfare indicators. It was perceived that livestock management, household credit, household asset, resource conservation, social network and social acceptance as least important indicators (0.21-0.40). Even though livestock was a component of most of the household in the study area, minimum consideration was given to it as an additional source of income. Farmers had lack of interest and negligence towards natural resource conservation activities. It was quite interesting to observe that household credit use for various needs and ownership to household assets had a minimum influence to welfare.

Determinants of farmer's welfare

Table II reveals that the eight factors contributed 69.16 per cent of variation in the welfare of farmer, which in social sciences is generally regarded as satisfactory. It was found that, the first factor accounted for the most variance (and hence had the highest eigen value as 5.161) and the next factor accounted for as much of the left over variance as it could, and so on. Hence, each successive factor accounted for less and less variance. The remaining 30.84 per cent was considered as the expected contributions of some extraneous factors but their related aspects were not considered in the present research. Names were given for each factor based on the indicators retained in the factor.

TABLE II

Eigen value and total variance of principle components (n=90)

Factor	Factor name	Eigen value	Percentage of variance	Cumulative percentage of variance
F-I	Optimistic factor	5.161	16.12	16.12
F-II	Structural factor	4.451	13.91	30.03
F-III	Technical factor	3.148	9.84	39.87
F-IV	Pessimistic factor	2.767	8.65	48.52
F-V	Achievement factor	2.092	6.54	55.06
F-VI	Conservational factor	1.655	5.17	60.23
F-VII	Functional factor	1.487	4.64	64.87
F-VIII	Behavioural factor	1.374	4.29	69.16

Factor I - Optimistic factor

The first factor could be explained by four indicators, *viz.*, household annual income, farm income per acre, food security and social participation as indicated in Table III by the communality values of 0.813, 0.728, 0.865 and 0.697 with factor loadings of 0.704, 0.613, 0.745 and 0.715, respectively. The factor I has been identified as the prime factor as it explained 16.12 per cent of total variation (69.16%) in farmer's welfare (Table II). The indicators in the factor I would have a positive arena towards farmer's welfare. Increase in annual income and per acre farm income could be directly related to higher economic conditions of the farmer. Physical and social position of farmer could be accounted with food security and social participation factors. As all the indicators in the factor have positive and hopeful sign, the factor was named as optimistic factor. Similar results of strong link between financial circumstances and wellbeing of irrigated and dryland farmers were earlier reported by Peel *et al*. (2015).

TABLE III

Factor loading and communality values of contributing indicators

Factor	Contributing indicators	Factor loading	Communality values
F-I Optimistic factor	Household annual income	0.704	0.813
	Farm income per acre	0.613	0.728
	Food security	0.745	0.865
	Social participation	0.715	0.697
F-II Operational factor	Farm infrastructure	0.619	0.716
	Access to basic services	0.511	0.640
	Access to natural assets	0.592	0.768
	Total land holding	0.692	0.633
F-III Technical factor	Technology adoption	0.541	0.652
F-IV Pessimistic factor	Farm credit	0.595	0.821
	Climate variability	0.521	0.696
F-V Achievement factor	Household Education	0.614	0.684
	Life satisfaction	0.558	0.661
	Personal growth	0.510	0.575
F-VI Conservational factor	Resource utilization	0.592	0.668
	Farm practices	0.510	0.638
F-VII Production factor	Marketing pattern	0.517	0.750
	Farm labour	0.634	0.565
	Farm expenditure per acre	0.531	0.883
F-VIII Behavioural factor	Self acceptance	0.736	0.629

Factor II- Operational factor

Farm infrastructure, access to basic services, access to natural assets and total land holding were grouped in factor II. As the presence of these indicators would trigger the farm and household work parameters, the factor was named as operational factor. Availability of land and adequacy in farm infrastructures like irrigation and machineries might influence the farm operations. Access to natural resources like air and water along with basic facilities (communication, sanitation, electricity and transportation) would impact on household operations. The communality values of these four variables were 0.716, 0.640, 0.768 and 0.633, respectively (Table III). This factor contributed 13.91 per cent of the total variability of data (Table II). Similar results were reported by Llanto (2012) that rural areas having good road infrastructure and accessibility to electricity will experience higher rates of growth of agricultural productivity and improved household livelihood status.

Factor III-Technical factor

Technical factor with single indicator technology adoption was extracted as third factor with communality value 0.652 and factor loading of 0.541 (Table III). Technical factor explained 9.84 per cent of total variance (Table II). Farmers in the study area were interested in new technologies and were found to adopt recent technologies in their field. Sharma and Singh (2015) found a significant positive impact of technologies on the welfare indicator consumption expenditure in rural India.

Factor IV- Pessimistic factor

The factor IV included two indicators farm credit and climate variability. Factor loadings of farm credit and climate variability were 0.595 and 0.521, respectively with communalities of 0.821 and 0.696 (Table III). Farmer's difficulty in inadequate credit accessibility and inability for prompt repayment were

observed in the study area. Reallocation of agricultural loans for household purposes also viewed at the period of data collection. This would give evidence for the financial constraints experienced by the farmers. Drought conditions occured in the district for last few years, caused decreased in yield and continuous crop losses. This indicated the adverse effect of natural calamities in agricultural production and farmer's income. As both the factors were perceived with negative impact, the name pessimistic was given.

Factor V- Achievement factor

Variance explained in the factor V was indicated by education, life satisfaction and personal growth. Access to school, literacy status, and education status of head were assessed in education index. Subjective questions on life satisfaction and personal growth also captured the variability in welfare. Higher score ranges (Table I) in life satisfaction and personal growth explained the relative importance of indicators to the farmers. Thus the three indicators were together grouped as achievement factor. Communalities were found to be 0.684, 0.661 and 0.575 (Table III) for education, life satisfaction and personnel growth, respectively. Positive relation of education to life satisfaction was reported in study conducted by Coughenour and Swanson (2008) for farmers in Alabama.

Factor VI- Conservational factor

Conservational factor had two indicators resource utilization and farm practices. Factor loading and communality values of indicators were 0.592 and 0.668 for resource utilization and 0.510 and 0.638 for farm practices (Table III). Farm practices like intercropping, mixed farming and crop rotation were common among the farmers in study area. Methods like rainwater harvesting and farm waste recycling were also very effective. These practices would highlight the efficient resource utilization pattern of farmers through farm practices.

Factor VII- Production factor

The present study analysed that the labour, marketing and farm expenditure impacted the farm production in factor VII. The factor was named as production factor. Marketing pattern, farm labour and farm expenditure were included with factor loadings of 0.517, 0.634 and 0.531 and communality values of 0.75, 0.565 and 0.883 (Table III) respectively. Natural and soil conditions tremendously increased the use of inputs and thus raise in expenditure was expressed by the farmers. Lack of regular markets and intermediary manipulations discouraged the farming activities. Labour shortage and poor quality of agriculture labourers made the rice farmers to lend their land for lease. Always, farmer expect for a moderate level of farm expenditure, sufficient farm labour at required time and adequate availability of marketing facilities with minimum price fluctuations. Therefore, all the three indicators should be taken into account and their positive interventions would surely impact on overall farm production. Pradhan and Mukherjee (2017) studied the technical efficiency of agricultural production in India and found that the coefficients of the labour inputs were larger than other inputs and thus indicating the labour intensive nature of Indian agriculture.

Factor VIII- Behavioural factor

Behavioural factor extracted with single indicator self-acceptance. Communality of the indicator is 0.629 with 0.736 as factor loading (Table III). Farmers' growing crop combinations was found to be ready for all sorts of innovative activities. They found to be opened to the changes in life and farming. Their willingness to take challenges in farming might have also influenced the self-acceptance indicator.

Farmer welfare index of crop combinations

Table IV depicted the mean index scores of 20 indicators for the rice-coconut, rice-vegetable and coconut-vegetable combination. Among the indicators farm expenditure per acre retained the highest index value in case of both rice-coconut (0.84) and rice vegetable (0.81). For coconut-vegetable combination access to natural resources (0.69) had the highest index. Rice being labour intensive farming incurs high labour cost due to shortage in the peak seasons. Use of plant protection measures and fertilizers were found to be more in vegetables and would be the reason for higher expenditure. Availability of own land would made the coconut farmers for their higher score in natural resource.

TABLE IV

Mean Indicator scores of selected crop combination (n=90)

Indicator	Symbol	RC (n=30)		RV (n=30)		CV (n=30)	
		FWI	SD	FWI	SD	FWI	SD
Household annual income	ANI	0.71	0.04	0.78	0.03	0.61	0.02
Farm income per acre	IPA	0.67	0.31	0.72	0.08	0.67	0.04
Food security	FOD	0.64	0.03	0.72	0.04	0.69	0.43
Social participation	PAR	0.49	0.13	0.58	0.03	0.39	0.21
Farm infrastructure	INF	0.36	0.29	0.68	0.15	0.51	0.23
Access to basic services	SER	0.65	0.36	0.63	0.12	0.63	0.02
Access to natural assets	NAT	0.66	0.14	0.71	0.10	0.68	0.08
Cultivated farm land	LAN	0.53	0.43	0.70	0.15	0.51	0.11
Technology adoption	TEC	0.25	0.11	0.33	0.03	0.19	0.11
Climate variability	VAR	0.27	0.31	0.39	0.15	0.31	0.22
Household education	EDU	0.56	0.17	0.56	0.16	0.60	0.87
Life satisfaction	SAT	0.52	0.28	0.64	0.24	0.45	0.24
Personal growth	GRO	0.58	0.30	0.56	0.82	0.61	0.16
Resource utilization	UTI	0.46	0.29	0.33	0.65	0.12	0.21
Farm practices	PRC	0.35	0.77	0.55	0.49	0.29	0.30
Marketing pattern	MAR	0.57	0.10	0.64	0.41	0.49	0.42
Farm labour	LAN	0.43	0.50	0.49	0.15	0.21	0.11
Farm expenditure per acre	EPA	0.84	0.35	0.81	0.17	0.64	0.04
Self acceptance	SAC	0.55	0.33	0.63	0.79	0.60	0.49

(RC: Rice-coconut, RV: Rice-vegetable, CV: Coconut-vegetable, FWI: Farmer Welfare Index, SD: Standard deviation)

Table IV also emphasized that technology adoption (0.25) scored minimum for rice-coconut combination (0.25) and rice-vegetable combination (0.33) and for coconut – vegetable resource utilization obtained the low index (0.12). Having experienced in farming for long years, farmers had specific practices in the field, which they were not willing to change. More than that farmers' difficulty in taking risk to try new technologies might have also been the reason for poor technology adoption of rice-coconut combination. Inability of various developmental agencies to try the technology and refine the technology based on location specific needs would have also impacted the situation. Though coconut-vegetable combination had high resource access their poor management of resources was observed with low index in resource utilization. Though farm waste recycling and water harvesting practices could be effectively practiced in coconut gardens, no such practices were observed in the study area.

Table V accounts the range of score of farmer welfare index for the three different crop combinations. The index range for rice-coconut combination was found to be 0.35 to 0.79. Farmers of rice-vegetable had the range of 0.44 to 0.83 and coconut- vegetable combination in the range 0.36 to 0.74. The table would highlight the maximum welfare index for the

TABLE V

Range of farmer welfare index (n=90)

Combination	Sample size (n)	Index range
Rice - Coconut	30	0.35 - 0.79
Rice - Vegetable	30	0.44 - 0.83
Coconut - Vegetable	30	0.36 - 0.74
Total	90	0.35 - 0.83

combination was 0.83 and the minimum was 0.35. Minimum and maximum range of rice- vegetable combination was found to be the highest. Farmers in this combination, found to grow vegetable in the rice field along with rice after the rice season. Thus maximum utilization of land was practiced. Growing the crop continuously would help to get the regular income from the field. Higher mean index scores of household annual income, farm income per acre, farm infrastructure, cultivated farm land and life satisfaction would have contributed for their better range of overall farmer welfare index.

Overall farmer welfare Index

Overall farmer welfare index of 90 farmers practicing two crop combinations in Kerala ranged from 0.35 to 0.83. Farmers were categorised in to five groups with cumulative square root frequency method (Table VI). From the Table VI, it is evident that nearly one third of the farmers (28.89 %) belonged to medium level (0.57-0.67) of welfare, followed by low (0.46-0.56) and high (0.68-0.78) level of welfare, respectively. Only 14.44 per cent of farmers were in very low welfare level (0.35-0.45) and 15.56 per cent occupied very high level (0.79-0.83) of farmer welfare index. Thus we could conclude that maximum number of farmers experienced a medium level of welfare. The indicators of welfare would have highly contributive for the welfare index.

TABLE VI

Overall Farmer Welfare Index (FWI) of farmers growing selected crop combinations (n=90)

Category	Range	Frequency	Percentage
Very low	0.35 - 0.45	13	14.44
Low	0.46 - 0.56	20	22.22
Medium	0.57 - 0.67	26	28.89
High	0.68 - 0.78	17	18.89
Very High	0.79 - 0.83	14	15.56
Total		90	100.00

Table VII have further distributed the farmers' growing different crop combinations based on their levels of farmer welfare index. The data found that in rice-coconut combination, maximum frequency was retained in medium level (33.33 %) followed by high levels (20.00 %) of welfare. In case of rice- vegetable high constituted 36.67 per cent and medium constituted 23.33 per cent. For coconut-vegetable combination, low had 33.33 per cent and medium had 30.00 per cent of farmers. This would clearly state that rice-vegetable farmers remained in the higher levels of farmers' welfare. Higher farm income per acre, social participation, cultivated farm land and life satisfaction might have contributed the condition. Higher frequency of farmers in coconut-vegetable combination were in low index scores, it could be attributed to their low index values in the indicators as technology adoption, social participation, resource utilization and farm practices.

The study has identified the present living conditions of farmer, which is nothing but welfare.

TABLE VII

Distribution of farmers' growing different crop combinations based on levels of Farmer Welfare Index FWI (n=90)

Category	Range	Rice - Coconut		Rice - Vegetable		Coconut - Vegetable	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Very low	0.35 - 0.45	4	13.33	3	10.00	6	20
Low	0.46 - 0.56	5	16.66	5	16.66	10	33.33
Medium	0.57 - 0.67	10	33.33	7	23.33	9	30.00
High	0.68 - 0.78	6	20.00	11	36.67	2	6.67
Very High	0.79 - 0.83	5	16.67	6	20.00	3	10.00
	Total	30	100.00	30	100.00	30	100.00

The 20 indicators are able to quantify the welfare through the composite Farmer Welfare Index (FWI). The results would highlight the welfare concern of farmers growing two crop combinations in the study area. The indicators identified and used in the study to bring out the Farmers' Welfare Index would serve as the reference material to decide the objectives of the development agencies for planning and implementing various development programmes for the better welfare of the farming community.

REFERENCES

ANONYMOUS, 2013, Facts and figures of agriculture in Kerala. Department of Agriculture, GoK, Thiruvananthapuram.

ANONYMOUS, 2014, State of indian farmer : a report. Centre for the study of developing societies, New Delhi.

ANONYMOUS, 2017, Economic survey 2015-16. Ministry of Finance, Government of India, New Delhi.

COUGHENOUR, C.M. AND SWANSON, L., 2008, Determinants of farmers' satisfactions with farming and with life : a replication and extension. *Southern Rural Sociology*, **9** (1) : 45 - 70.

FEROZE, S. M. AND CHOUHAN, A. K., 2010, Performance of dairy self help groups in India: principal component analysis approach. *Indian J. Agric. Econ.*, **65** (2) : 308 - 18.

GUPTA, N., 2016, Decline of cultivators and growth of agricultural labourers in India from 2001 to 2011. *Intern. J. Rural Manag.*, **12** (2) : 179 - 198.

LLANTO, G. M., 2012, The impact of infrastructure on agricultural productivity. *Proc. PIDS Discussion Paper Series*, XII, Makati city, Philippines.

MAITI, S., 2013, Vulnerability and adaptation strategies on climate change among livestock rearers in coastal and Alpine regions of India. *Ph. D. Thesis,* (Unpub.), NDRI, Karnal.

PEEL, D., GRADDIP, B. A., HELEN, L. B. AND JACKI, S., 2015, Perceived profitability and well-being in Australian dryland farmers and irrigators.*Aust. J. Rur. Hlth.*, **23** : 207 - 214.

PRADHAN, K.C. AND MUKHERJEE, S., 2017, Technical efficiency of agricultural production in India: evidence from REDS survey. *Working paper,*161, Madras School of Economics, Chennai.

SHARMA, R. AND SINGH, G., 2015, Access to modern agricultural technologies and farmer household welfare: evidence from India. *Millennial Asia*, **6** (1) : 19 - 43.

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