

## Impact of Covid-19 on the Livelihood Status of Rural Households in Villupuram District of Tamil Nadu

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### Abstract

Despite the fact that the Covid-19 is a global phenomenon that affected the lives, livelihoods and well-being of the entire population, the extent and severity of its effects are different among the population and sectors of the economy. This study aims to analyse the impact of Covid-19 on the livelihood status of rural households and its relationship to various factors using logit analysis. For the collection of required primary data multistage stratified random sampling technique was employed considering Tamilnadu as the universe of the study. Villupuram district was purposively selected as the sample district since this district has the highest rural population in Tamil Nadu as per latest population census. The results revealed that the non-farm sector households were affected more than farm sector households since the farm sector had the privilege of utilizing several exemptions during Covid lockdown. Also, it was observed that the rural households with, diversified sources of income reasonable possession of current assets, less borrowed funds for business/agriculture, less expense on permanent labourers were affected less than other households. Further, among farm households, the farmers who cultivated non-perishables were affected less than who cultivated perishables like vegetables and fruits. The study has highlighted the lessons learnt during Covid-19 and the relevant policy suggestions that could be evolved to get prepared for such future emergencies.

**Key words :** Covid-19 lockdown, Livelihood, Logit regression.

**A**fter World War-II, the Covid-19 catastrophe brought on by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) pandemic had profound effects on mankind. A serious worldwide health

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human lives. On January 30<sup>th</sup>, 2020, the World Health Organization declared the Covid-19 outbreak as a global health emergency<sup>10</sup> and on March 11<sup>th</sup>, 2020, as a global pandemic. Since the initial outbreak, Covid virus had spread to 216 countries around the world. In India, the sudden nationwide lockdown imposition by the national government<sup>18</sup> from March 24<sup>th</sup>, 2020 was one of the most extensive and stringent Covid-19 lockdowns in the world. In this clamping down, the government focused on saving the human lives, not livelihoods. The lockdown froze economic activity across the country and economy experienced a significant aggregate supply and demand shock. The Covid-19 induced lockdown in India had impacted all sectors including agriculture and allied activities, small scale businesses, manufacturing industries, service sector, education, transport etc. India's agriculture, a significant contributor to the country's economy and a source of livelihood for many households, was not exempted to its effects. The pandemic brought about unprecedented challenges for farmers, including disruption of supply chains that led to crop losses and distressed sales which reduced farmers earnings and also posed threats to food security. Due to income reduction many farmers felt tough with the burden of repaying loans and debts during the lockdown, which impacted their cash flow and compelled to seek high interest loans from the non-institutional sources.

The lockdown measures had an adverse effect on the vulnerable rural non-farm sector also, forcing many small businesses and enterprises to shut down due to lack of demand and budgetary constraints. According to the Centre for Monitoring Indian Economy

(CMIE)<sup>2</sup>, over 122 million people lost their jobs in April 2020, majority of them being small traders, rural artisans and daily wage labourers. The nationwide lockdown resulted in decreased earnings due to employment losses, making them too difficult to repay loans and to spend for even essentials like food, health care and children's education. The overall standard of living of rural non-farm sector was understood to be at its all time low, during the pandemic.

Based on this perspective, the study was carried out to analyse the different factors whichever influenced and affected the livelihood status of rural farm and non-farm sector households during Covid-19 impacted period. For the preparation of the manuscript relevant literature<sup>1-15</sup> has been consulted.

#### *Objectives of the study :*

1. To analyse the degree and direction of influence of various factors which affected the livelihood status of rural households during the Covid-19 impacted period.
2. To frame alternative futuristic strategies from the lessons learnt from Covid-19.

The study relied solely on primary data. The multistage stratified random sampling technique was adopted to choose sample respondents. The Tamil Nadu state was considered as the universe of the study. As the first stage of sampling, Villupuram district was purposively selected as the sample district, since this district has the highest rural population in the state as per 2011 population census. As the second stage of sampling two blocks viz., Mugaiyur and Vanur block were

purposively selected, since these two blocks had the highest rural population in this district. As the third stage of sampling, from each sample block, four largest villages were purposively selected considering their population size. Totally eight villages were selected for the study. As the fourth stage of sampling, from each village twenty farm sector and twenty non-farm sector households were selected at random. The ultimate sample size in total was 320.

The collected primary data pertained to the financial year between April 2020 and March 2021, the first phase of lockdown, during which both farm and non-farm sector experienced a severe setback.

*Analytical Tools :*

*Logistic Regression Model :*

This study utilized a logistic regression model to empirically quantify the relative influence of various factors affecting the livelihood status of farm and non-farm sector rural households during Covid-19 impacted period.

The logit model in this study postulates that  $P_i$ , the probability of the  $i^{\text{th}}$  respondent's livelihood status being affected by Covid-19 lockdown is a function of an index variable  $Z_i$ , summarizing a set of the individual attributes. Hence, the following equation (1) represents the probability of being affected by Covid-19 lockdown.

$$P_i = E(Y = 1/X_i) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}} \quad (1)$$

where,  $e$  is the familiar base of the natural logarithm. Now, let equation (1) be rewritten as

$$P_i = \frac{1}{1 + e^{-Z_i}} \quad (2)$$

where,  $Z_i = \beta_1 + \beta_2 X_i$

Equation (2) represents the (cumulative) logistic distribution function (Gujarati, 1998)

It could be verified that as  $Z_i$  ranges from  $-\infty$  to  $+\infty$ ,  $P_i$  ranges between 0 and 1 and that  $P_i$  is nonlinearly related to  $Z_i$  (i.e.,  $X_i$ ). However, we would encounter an estimation problem, because  $P_i$  is not only nonlinear in  $X$  but in the  $\beta$ 's as well, as can be seen clearly from (1). This means that the familiar OLS procedure could not be made to estimate the parameters. But this problem is more apparent than real because equation (1) is intrinsically linear, which can be shown as follows:

If  $P_i$ , the probability of the livelihood status being affected, during Covid-19 impacted period is as given by equation (3), then,  $(1 - P_i)$ , the probability of being not affected is represented by equation (4)

$$1 - P_i = \frac{1}{1 + e^{Z_i}} \quad (3)$$

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i} \quad (4)$$

Now,  $\frac{P_i}{1 - P_i}$  is simply the odds ratio of the livelihood been affected by Covid-19 lockdown.

Now, by taking the natural log of (4), we would obtain:

$$L_i = \ln \left( \frac{\hat{P}_i}{1 - \hat{P}_i} \right) = Z_i = \beta_1 + \beta_2 X_i \quad (5)$$

That is,  $L$ , the log of the odds ratio, is

not linear in X, but (from the estimation view point) linear in the parameters. It might be noted that the linearity assumption of OLS does not require that the X variables be necessarily linear. So we can have  $X^2$ ,  $X^3$ , etc., as regressors in the model. For our purpose, it is the linearity in the parameters that is crucial. L is called the logit, and hence the name logit model for equation (5).

*Features of the Logit model :*

1. As P goes from 0 to 1 (*i.e.*, as Z varies from  $-\infty$  to  $+\infty$ ), the logit L goes from  $-\infty$  to  $+\infty$ . That is, although the probabilities (of necessity) lie between 0 and 1, the logits was not so bounded.
2. Although L is linear in X, the probabilities themselves are not.
3. The interpretation of the logit model is as follows:  $\beta_2$ , the slope, measures the change in L for a unit change in X.

*Estimation of the Logit Model :*

For estimation purposes, equation (5) can be written as follows:

$$L_i = \ln \left[ \frac{P_i}{1-P_i} \right] = \beta_1 + \beta_2 X_i + u_i \quad (6)$$

To estimate the model, we need, apart from  $X_i$ , the values of the logit  $L_i$ , but now we run into some difficulties. If we have data on individual respondents,  $P_i = 1$  if the respondent's livelihood was affected, and  $P_i = 0$ , if the respondent's livelihood was not affected. But, if we put these values directly into the logit  $L_i$ , we obtain:

$$L_i = \ln \left( \frac{1}{0} \right) \text{ if the livelihood status of}$$

respondent was affected

$$L_i = \ln \left( \frac{0}{1} \right) \text{ if the livelihood status of}$$

respondent was not affected

Obviously, these expressions were meaningless. Therefore, if we had data at the micro or individual level, we cannot estimate equation (6) by the standard OLS routine. In this situation, one may have to resort to the maximum likelihood method to estimate the parameters.

With the Logit framework discussed above, the analysis was undertaken separately for farm sector and non-farm sector households since the prime regressors varied widely between the two scenarios. With regard to farm sector household, the study has postulated that the probability of livelihood status ( $L_i$ ) being affected by Covid-19 depended upon the attributes *viz.*, size of farm, proportion of farm income to non-farm income, proportion of crop coverage under perishable to less perishable, labour shortage, value of current asset at the beginning of Covid-19, proportion of own fund to borrowed fund for cultivation and expenses on permanent labour during Covid-19. The attributes for a non-farm sector were *viz.*, average annual income, number of earning members, value of current asset at the beginning of Covid-19, expenses incurred on permanent labour and contractual rent and proportion of own fund to borrowed fund. The dependant variable is a binary qualitative variable indicating whether the respondent was affected or not affected by Covid-19 lockdown. The respondents who felt that the financial impacts of Covid-19 was manageable were considered as "respondents being not affected by Covid-19" and the otherwise as "respondents being

affected by Covid-19". With regard to selection of explanatory variables, those were decided based on the information obtained during pilot survey. Also, the variables were decided and accommodated finally in the model by considering the degree of multicollinearity between the variables by examining the correlation co-efficient.

The index variable  $P_i$ , indicating whether the respondent is affected or not, has been expressed as a linear function of the independent variables. Thus the logistic regression model for farm sector has been specified as follows.

$$L_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \mu - (7)$$

Where,

$X_1$  = Size of farm (Acre)

$X_2$  = Proportion of farm income to non-farm income (per cent)

$X_3$  = Proportion of crop coverage under perishable to less perishable (per cent)

$X_4$  = Labour shortage (Yes/No)

$X_5$  = Proportion of own fund to borrowed fund (per cent)

$X_6$  = Value of current asset at the beginning of Covid-19 (In '000 Rs)

$X_7$  = Expenses on permanent labour during Covid-19 (In '000 Rs)

$\beta_i$ 's = Parameters to be estimated

$\mu$  = error term

$\alpha$  = Constant

The logistic regression model for rural non-farm sector has been specified as follows :

$$L_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \mu - (8)$$

Where,

$X_1$  = Average annual income (In '000 Rs)

$X_2$  = Number of earning members (In number)

$X_3$  = Value of current asset at the beginning of Covid-19 (In '000 Rs)

$X_4$  = Expenses incurred on permanent labour and contractual rent (In '000 Rs)

$X_5$  = Proportion of own fund to borrowed fund (per cent)

$\beta_i$ 's = Parameters to be estimated

$\mu$  = error term

$\alpha$  = Constant

*Factors which affected the Livelihood status of Farm sector Households during Covid-19 impacted period :*

The logit estimates on the various factors which affected the livelihood status of farm sector households during the Covid-19 impacted period is presented in Table-1. A lower log likelihood value of 83.03 indicated that the logit model had a better fit with the data. The estimated value of Nagelkerke  $R^2$  was 0.7731, which indicated that a reasonable amount of variation in the dependent variables are accounted by the all included independent variables.

Among the explanatory variables used in this model, five variables were statistically significant either at 5 per cent or 10 per cent probability level and are discussed below.

With regard to the variable 'Proportion of farm income to non-farm income', the estimated MLE co-efficient was negative and the odds ratio was 1.312. It could be interpreted that, when the 'proportion of farm income to non-farm income', decreased by one

per cent, the odds of livelihood status being affected by Covid-19 increased by 1.312 times. This gives an impression that the rural households which were engaged more on agricultural activities were affected less than other households which depended on non-agricultural activities. This might be due to the fact that agricultural sector was exempted from many of the Covid restrictions understanding its inevitability.

The MLE co-efficient for the variable 'Proportion of crop coverage under perishable to less perishable', was positive and the odds ratio was 0.956. It could be inferred that, with every one percent increase in the 'proportion of crop coverage under perishable to less

perishable', the odds of livelihood status being affected during Covid-19 impacted period increased by 0.956 times. This might be due to the fact that, although Covid-19 restriction guidelines exempted agricultural activities, the general lockdown norms in one or the other way disrupted the marketing network and consumers' purchase frequencies. Because of this untoward scenario, the farmers who happened to cultivate perishables like vegetables and flower crops were unable to sell their produces for a profitable price. The farmers who cultivated less perishable commodities like cereals, coconut and dhals were able to manage the situation without a loss at least, since the shelf life of such commodities are comparatively more.

Table-1 Factors which affected the livelihood status of farm sector Households during Covid-19 impacted period

S. No	List of factors	MLE Co-efficient	Odds Ratio	P Values
1	Size of farm (Acre)	0.2077	1.230	0.304
2	Proportion of farm income to non-farm income (per cent)	-0.0021**	1.312	0.024
3	Proportion of crop coverage under perishable to less perishable (per cent)	0.6237**	0.956	0.039
4	Labour shortage (Yes/No)	0.5375**	1.011	0.014
5	Proportion of own fund to borrowed fund (per cent)	-0.0257***	1.026	0.069
6	Value of current asset at the beginning of Covid-19 (In '000 Rs)	-0.0162**	0.627	0.047
7	Expenses on permanent labour during Covid-19 (In '000 Rs)	-0.0617	1.020	0.129
	Constant	1.7188	20.54	0.043
	Negelkerke R <sup>2</sup>	0.7731		
	<b>-2 log likelihood</b>	<b>83.03</b>		

Note: \*\* Significant at 5 per cent, \*\*\* Significant at 10 per cent

With regard to the variable 'Labour shortage', the estimated MLE co-efficient was positive and the odds ratio was 1.011. A unit increase in 'labour shortage', increased the odds of livelihood status being affected by Covid-19 by 1.011 times. This could be attributed to the movement restrictions imposed to prevent the spread of the virus, making it challenging for labourers to travel to their workplaces. The difficulties faced by labourers during the lockdown delayed crop harvesting and post-harvest operations. Also, many crops were left unharvested in the field itself and couldn't reach the markets, creating significant hardships to farm sector.

In case of variable 'Proportion of own fund to borrowed fund', the MLE co-efficient was negative and the odds ratio was 1.026. It could be interpreted that, one per cent decrease in the 'proportion of own fund to borrowed fund', would increase the odds of livelihood status being affected during Covid-19 impacted period by 1.026 times. The farmers who were able to use their own funds were free from the burden of immediate repayment issues, and were able to cope up with the situation better than the farmers who depended on borrowed funds.

With regard to the variable 'Value of current asset at the beginning of Covid-19', the MLE co-efficient was negative and the odds ratio was 0.627. It could be interpreted that, when 'value of current asset at the beginning of Covid-19', decreased by one unit, the odds of livelihood status being affected increased by 0.627 times during Covid-19 impacted period. It could be inferred that the

farmers who were having a reasonable possession of current assets like jewels and savings had a better financial stability. Those farmers were able to manage the Covid-19 disturbances in a better manner than others who had no current assets under possession.

*Factors which affected the Livelihood status of Rural Non-farm sector Households during Covid-19 impacted period :*

The logit estimates for the factors which influenced the livelihood status of rural non-farm sector households, during Covid-19 impacted period were assessed separately and presented in Table-2. The estimated lower log likelihood value of 78.27 indicated that the model had a better fit. The estimated Nagalkerke  $R^2$  was 0.7317, which indicated that 73.17 per cent of variations in the dependent variable could be accounted by the independent variables included in the model.

The estimated MLE co-efficients of all the explanatory variables used in this model were found to be statistically significant either at 5 per cent or 10 per cent probability level and are discussed below.

With regard to the variable 'Average annual income', the estimated MLE co-efficient was negative and significant at 5 per cent level. This implies that, when the 'average annual income', increased by one unit the odds of livelihood status being affected by Covid-19 decreased by 1.216 times. This trend reiterated the fact that rural families with a higher income comparatively, were able to manage the Covid-19 hardships in a better way than the families with lower income.

Table-2 Factors which affected the livelihood status of Rural non-farm sector Households during Covid-19 impacted period

S. No	List of Factors	MLE Co-efficient	Odds Ratio	P Values
1	Average annual income (In '000 Rs)	-0.7546**	1.216	0.045
2	No. of earning members (In number)	-0.2618**	1.305	0.026
3	Value of current asset at the beginning of Covid-19 (In '000 Rs)	-0.0102**	0.735	0.040
4	Expenses incurred on permanent labour and contractual rent (In '000 Rs)	0.1684***	0.352	0.067
5	Proportion of own fund to borrowed fund (per cent)	-0.0146**	0.847	0.033
	Constant	2.8956	10.64	0.048
	Negelkerke R <sup>2</sup>	0.7317		
	<b>-2 log likelihood</b>	<b>78.27</b>		

Note: \*\* Significant at 5 per cent and \*\*\* significant at 10 per cent

The estimated MLE co-efficient for the variable 'Number of earning members', in the non-farm sector households was negative with an odds ratio of 1.305. It could be interpreted that, with one unit decrease in the 'Number of earning members', the odds of livelihood status being affected during Covid-19 impacted period increased by 1.305 times. Obviously when the number of earning members increases in the family, the alternative sources of income available would support the family with much greater resilience.

The MLE co-efficient for variable 'Value of current asset at the beginning of Covid-19', was negative with an odds ratio of 0.735. With every one unit increase in the 'Value of current asset at the beginning of Covid-19', the odds of livelihood status being affected decreased by 0.735 times. This might be due to the fact that, the households who were having a good amount of jewels, savings

and other liquid assets were able to manage the Covid-19 disturbances in a better way than others who had no possession of any liquid assets. Similar trend was observed in farm sector households also.

With regard to the variable 'Expenses incurred on permanent labour and contractual rent', the estimated MLE co-efficient was positive with an odds ratio of 0.352. It could be interpreted that, when 'Expenses incurred on permanent labour and contractual rent', increased by one unit, the odds of livelihood status being affected during Covid-19 impacted period increased by 0.352 times. During Covid-19 period the business firms which had more permanent labourers suffered a lot, since the owners had to pay out atleast 50 per cent of their staff salary eventhough there was no production. Corona period witnessed many such disputes between the owner of business and permanent labourers. This commitment



added more burden to the rural firms. Like wise rural firms which were run in rental buildings/places also met with similar hardships because of the rent related financial over burdens.

The estimated MLE co-efficient for variable 'Proportion of own fund to borrowed fund', was negative with an odds ratio of 0.847. It could be inferred that, when 'Proportion of own fund to borrowed fund', decreased by one per cent, the odds of livelihood status being affected during Covid-19 impacted period increased by 0.847 times. It could be inferred that, the households who were having their own funds were able to manage the Covid-19 difficulties in a better manner than those who relied on borrowed funds, since those households were free from the burden of repayment commitments and interest rates associated with borrowed funds.

*Lessons learnt and policies suggested :*

- ❖ The farm sector households were less affected by Covid-19 than non-farm sector households since farm sector had the privilege of utilizing several exemptions during Covid-19 lockdown. Also, in general, the rural households which generated income from both agricultural and non-agricultural activities seemed to have managed the Covid-19 pandemic-driven financial set backs in a better way than the households which relied on a single source. Hence it is suggested that the relevant institutional authorities engaged in rural development may take needed steps to create awareness among rural households on the advantages of 'Income diversification' as a tool for risk mitigation.

Rural households may be encouraged to get involved in farming as well as non-farming activities for income generation, so that it could enhance the resilience of rural households during such corona like havocs.

- ❖ The farmers who cultivated less perishable commodities like cereals, pulses and coconut were able to sell their produces for reasonably better prices than farmers who cultivated perishable commodities like fruits and vegetables during Covid-19. Hence, encouraging 'Crop diversification' with perishables and less perishable crops can help to prevent losses by minimizing the chances of distress sales during such market uncertainties. Enhancing the infrastructural facilities for scientific storage of agricultural produces can also support the farmer to prevent losses.
- ❖ The households with consistent savings were able to manage the Covid-19 disruptions better than others with no liquid assets. Hence the savings and thrift habit of households need to be encouraged so as to tide over such epidemics, if happens to occur in future.

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