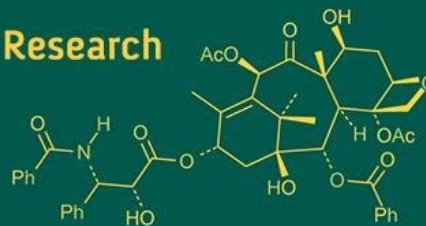


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## Determine the supply curve and price elasticity of supply of Oyster mushroom (*Pleurotus* spp.) in the markets of Raipur, Durg and Dhamtari districts of Chhattisgarh

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### Abstract

Since its founding, Chhattisgarh has been an agricultural state. The main crop of Chhattisgarh, whose central plains are referred to as the "Rice Bowl of central India," is paddy. Mushrooms, which are essentially meaty, spore-bearing fungus creatures, are another interesting crop farmed in Chhattisgarh. It is a waste-to-wealth crop with great therapeutic qualities that farmers can readily cultivate with little infrastructure. Based on primary data and statistical models, this study examines the supply curve and price elasticity of supply for oyster mushrooms (*Pleurotus* spp.) in several districts of Chhattisgarh, including Raipur, Durg, and Dhamtari.

The supply of oyster mushrooms (*Pleurotus* spp.) was found to be relatively inelastic in the markets of Raipur, Durg, and Dhamtari; in other words, the supply was found to be rather inflexible in these markets. The basic principles of the theory of supply for any commodity were applied to analyze the supply curve and determine the price elasticity of supply in the chosen three districts of Chhattisgarh. Five weeks of time series data were collected from each of the major mushroom markets in Raipur, Durg, and Dhamtari districts.

**Keywords:** Supply curve, price elasticity of supply, statistical methods, linear mixed effect models, relatively inelastic, mushroom

### Introduction

Since its establishment, Chhattisgarh has been an agricultural state. The main crop in Chhattisgarh, whose central plains are referred to as the "Rice Bowl of central India," is paddy. Mushrooms, which are really fleshy, spore-bearing fungus creatures that typically arise above the ground surface or their source of food and belong to the botanical class Agaricomycetes and order Agaricales, are another interesting crop produced in Chhattisgarh. It is a waste-to-wealth crop with great therapeutic qualities that farmers can readily cultivate with little infrastructure. The term "mushroom" can mean different things to different individuals in different nations. They were considered "food of gods" by the Romans and a source of strength for warriors by the Greeks. Growing mushrooms requires less water and vertical space than other crops. It's a crop that turns trash into profit. Mushroom growing further supports farmers' livelihoods by offering steady farm income and employment opportunities. It is an indoor crop that doesn't require fertile land and may be grown without sunshine. Because it doesn't require a significant amount of cash, it may also be farmed on a small scale. This study focuses on the supply of the mushroom, for which primary data were collected from the mushroom growers and the markets of wholesalers belonging to the same districts. The primary data on supply was mostly collected from wholesalers except the disposable income, which was collected from some of the randomly selected consumers of oyster mushrooms (*Pleurotus* spp.) from the same markets.

### Data & Methodology

There are around 2000 edible fungus species documented around the world, with 200 species available in India. Only six of these species are used in the growing process for commercial reasons in the Country, and they are: *Pleurotus* spp. (Oyster or Tropical mushroom),

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*Volvariella* spp. (Paddy straw or Chinese mushroom), *Agricus bisporus* (European or White-Button mushroom), *Calocybe indica* (Milky mushroom), *Flammulina velutipes* (Enokitake mushroom)

And *Lentinus edodes* (Shiitake mushroom). The species *Pleurotus florida* is very much liked by the people of Chhattisgarh and grown in a wider area than other species of mushroom.

**Table:** Some common mushrooms, their genus and species found in Chhattisgarh

| S. No.                                                                                                                                                                          | Common Mushroom Name | Genus       | Species                        | Parameter's rank scores<br>(4-highest rank)               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|--------------------------------|-----------------------------------------------------------|
| 1.                                                                                                                                                                              | Oyster mushroom      | Pleurotus   | florida, sajor-caju, ostreatus | *PP: 4, CC: 4, P: 4, A: 4, N: 4, AS: 4, EC: 4 = <b>28</b> |
| 2.                                                                                                                                                                              | Paddy straw mushroom | Volvariella | volvacea                       | *PP: 3, CC: 3, P: 3, A: 2, N: 4, AS: 2, EC: 2 = <b>19</b> |
| 3.                                                                                                                                                                              | Milky mushroom       | Calocybe    | indica                         | *PP: 2, CC: 3, P: 1, A: 3, N: 3, AS: 4, EC: 2 = <b>18</b> |
| 4.                                                                                                                                                                              | Button mushroom      | Agricus     | bisporus                       | *PP: 1, CC: 1, P: 4, A: 3, N: 4, AS: 2, EC: 1 = <b>16</b> |
| <b>Note:</b> * PP= production process, CC= cost of cultivation, P= popularity, A= affordability, N= nutritiousness, AS= availability of substrate, EC= environmental condition. |                      |             |                                |                                                           |

Out of all above types of mushrooms, this study focuses on the oyster mushroom (*Pleurotus* spp.) on the grounds of highest rank score achieved by it, based on seven parameters namely production process (PP), cost of cultivation (CC), popularity (P), affordability (A), nutritiousness (N), availability of substrate (AS) and environmental condition (EC) as shown in above Table.

### Collection of Data

The producers were selected from the list of producers, who were associated and trained by the Mushroom Research Laboratory, Department of Plant Pathology, College of Agriculture and Research Station, Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, C.G., mostly belonging to Raipur, Durg and Dhamtari districts of Chhattisgarh. Along with the producers, data were also collected from some randomly selected consumers of some markets where the products of above-mentioned producers were being sold. The primary data were collected through interview method by personally visiting the mushroom growers and the markets of wholesalers belonging to the same districts or by telephonic interview method. Three questionnaires were prepared for the interviews from the respondents of Raipur, Durg and Dhamtari.

### Method

A simple model of demand and supply

#### Demand

$$Q = \alpha_1 P + \alpha_2 X + e_d \quad (1)$$

#### Supply

$$Q = \beta_1 P + e_s \quad (2)$$

Where, P and Q are endogenous variables, and X is exogenous variables.

### The Identification

In a system of M simultaneous equations, which jointly determine the values of M endogenous variables, at least M - 1 variable must be absent from an equation for estimation of its parameters to be possible. In other words, we can say that the identification of the simultaneous equations is most important process for making their parameters estimable. When estimation of an equation's parameters is possible consistently, then the equation is said to be *identified*. If fewer than M-1 variable is omitted from an equation, then it

is said to be *unidentified*, and its parameters cannot be consistently estimated.

In our supply and demand model, there are M=2 equations, so we require at least M-1=1 variable to be omitted from an equation to identify it. There is a total of three variables: P, Q, and X in simultaneous Equations (1-2).

In the demand Equation (1), none of the variables are omitted; thus, it is *unidentified* and its parameters cannot be estimated consistently. In the supply Equation (2), one variable, i.e., income (X), is omitted; thus, the supply curve is *identified*, and its parameter can be estimated.

The identification condition must be checked before trying to estimate an Equation. If an Equation is not identified, then changing the model must be considered before it is estimated. However, changing the model should not be done in a haphazard way; no important variable should be omitted from an Equation just to identify it.

### The Reduced-Form Equations

The two structural simultaneous Equations (1) and (2) can be solved to express the endogenous variables P and Q as functions of the exogenous variable X and this reformulation of the model is called their reduced form given below as Equations (5) and (8).

This reduced form is very important in its own right, which helps in understanding the structural Equation system. To find the reduced form, we solve (1) and (2) simultaneously for P and Q.

To solve for P, we equate the equations corresponding to the equilibrium quantity, Q, of both the demand and supply, as in Equation (3):

$$\beta_1 P + e_s = \alpha_1 P + \alpha_2 X + e_d \quad (3)$$

$$P = \frac{\alpha_2}{\beta_1 - \alpha_1} X + \frac{e_d - e_s}{\beta_1 - \alpha_1} \quad (4)$$

$$= \pi_1 X + v_1 \quad (5)$$

To solve for Q, substituting the value of P from (4) into the supply Equation (2):

$$Q = \beta_1 P + e_s$$

$$= \beta_1 \frac{\alpha_2}{(\beta_1 - \alpha_1)} X + \frac{\beta_1 (e_d - e_s)}{(\beta_1 - \alpha_1)} + e_s \quad (6)$$

$$= \frac{\beta_1 \alpha_2}{(\beta_1 - \alpha_1)} X + \frac{\beta_1 e_d - \alpha_1 e_s}{(\beta_1 - \alpha_1)} \quad (7)$$

$$= \pi_2 X + v_2 \quad (8)$$

The parameters  $\pi_1$  and  $\pi_2$  in (5) and (8) are called reduced-form parameters. The error terms  $v_1$  and  $v_2$  are called reduced-form errors.

### Two-Stage Least Squares Estimation (2SLS):

- Least squares estimation of the reduced-form Equation for P and the calculation of its predicted value  $\hat{P}$ .
- Least squares estimation of the structural Equation in which the right-hand-side endogenous variable P is replaced by its predicted value  $\hat{P}$ .

### Result and Discussion

Since supply and demand work together to establish the amount and price of items in the market and achieve some equilibrium, they do so at specific price and quantity coordinates for the target markets, such as Raipur, Durg, and Dhamtari in the current context.

Equations (1) and (2) already provide the supply and demand forces as simultaneous econometric models. These models are modified to meet the needs of the current study and are produced below in Equations (9) and (10), which explain the quantity and price behaviors of oyster mushrooms in the Raipur, Durg, and Dhamtari markets according to the equilibrium reached in each market.

$$\text{Demand: } Q = \text{Int.} + P + PS + DI \quad (9)$$

$$\text{Supply: } Q = \text{Int.} + P + PF \quad (10)$$

In order to solve the simultaneous equations model Equations (9) and (10), the market dictated two substitute commodities of oyster mushroom, namely, soybean and chicken. Therefore, three simultaneous equations have been solved, each-consisting of substitute's soybean, chicken and chicken + soybean combine together.

### Identification

In M simultaneous equations, which jointly determine the values of M endogenous variables, at least M-1 variable must be absent from an equation for estimation of its parameters to be possible. Here in supply and demand model there are M = 2 equations, so require at least M-1=1 variable to be omitted from an equation to identify it. There is a total of three variables: P, Q, and DI. In the demand Equation none of the variables are omitted; thus, it is *unidentified* and its parameters cannot be estimated consistently. In the supply Equation, one variable, income (DI), is omitted; the supply curve is *identified*, and its

parameter can be estimated.

### Derived reduce form for the Equation (9) and (10):

Derived reduced form Equation for the simultaneous equations model with soybean substitute commodity are as follows:

#### Quantity:

$$25.7925^* - 0.0154PSCH + 1.2743DI^{***} - 0.3157PF^* \quad (11)$$

#### Price:

$$-23.6508 + 2.3723PS^{***} - 3.6457 DI^{***} + 2.2103PF^{***} \quad (12)$$

Derived reduced form Equation for the simultaneous equations model with chicken substitute commodity are as follows:

#### Quantity:

$$10.3117^* + 0.7774PS^{***} + 0.5248DI^{**} - 0.3510PF^{**} \quad (13)$$

#### Price:

$$37.4930 - 0.1331PSCH - 1.3606DI^* + 2.2958PF^{***} \quad (14)$$

Derived reduced form Equation for the simultaneous equations model with soybean + chicken substitute commodity are as follows:

#### Quantity:

$$9.5583 + 0.7793PS^{***} + 0.0045PSCH + 0.5231DI^{**} - 0.3500PF^{**} \quad (15)$$

#### Price:

$$-11.2774 + 2.3411PS^{***} - 0.0734PSCH - 3.6172DI^{***} + 2.1928PF^{***} \quad (16)$$

### Determination of supply curve and price elasticity of supply for oyster mushroom (*Pleurotus spp.*) for the Raipur market.

For the analyses of price elasticity of supply of oyster mushroom in the Raipur market, the statistical methods of linear mixed effect model, has been applied because the supply data were collected for a random number of 5 weeks, neither for the whole year nor for any given season, therefore week may affect the supply of oyster mushroom in a random way. Hence statistically speaking, for fitting the supply curves it is more befitting to consider week as a random effect instead of being a simple fixed effect. Thus, the results of fitting the linear mixed effect model are given in the Table-4.5.1 followed by subsequent discussion

**Table:** Results of analyses of price elasticity of oyster mushroom supply in the market of Raipur: lmer () linear mixed effect model using R

| Estimation of parameters of the model:                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $(\log f) = (\log c) - \eta_0(\log p)$<br>> summary(supply.lmer, cor=T)<br>Linear mixed model fit by REML. t-tests use Satterthwaite's method [ lmerModLmerTest]<br>Formula: log(quantity.s) ~ (1   week) + log(price.s)<br>Data: RPR<br><br>REML criterion at convergence: -12.3 |

|                                                                 |                                                |
|-----------------------------------------------------------------|------------------------------------------------|
| Scaled residuals:                                               |                                                |
| Min                                                             | 1Q Median 3Q Max                               |
| -1.66313                                                        | -0.79334 0.06557 0.82887 1.69159               |
| Random effects:                                                 |                                                |
| Groups Name                                                     | Variance Std.Dev.                              |
| week (Intercept)                                                | 0.00000 0.0000                                 |
| Residual                                                        | 0.03587 0.1894                                 |
| Number of obs: 35, groups: week, 5                              |                                                |
| Fixed effects:                                                  |                                                |
| Estimate Std. Error df t value Pr(> t )                         |                                                |
| Int.(log c)                                                     | 0.1450 0.8081 33.0000 0.179 0.858693           |
| log(price.s)                                                    | 0.6513 0.1631 33.0000 3.993 0.000343 ***       |
| ---                                                             |                                                |
| Signi.codes:                                                    | 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 |
| Correlation of Fixed Effects:                                   |                                                |
| (Intr)                                                          |                                                |
| log(pric.s)                                                     | -0.999                                         |
| optimizer (nloptwrap)                                           | convergence code: 0 (OK)                       |
| boundary (singular)                                             | fit: see ?isSingular                           |
| ANOVA                                                           |                                                |
| > anova(supply.lmer)                                            |                                                |
| Type III Analysis of Variance Table with Satterthwaite's method |                                                |
| Sum Sq Mean Sq NumDF DenDF F value Pr(>F)                       |                                                |
| log(price.s)                                                    | 0.572 0.572 1 33 15.945 0.0003431 ***          |
| ---                                                             |                                                |
| Signi.codes:                                                    | 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 |

From Table- 4.5.1 the linear mixed effect model for the supply curve has been estimated using R as in Equations 4.7-4.8, where both the constant coefficient and the price elasticity coefficient of supply were found to be highly significant:

$$\log \phi(p) = 0.1450 + 0.6513^{***}(\log p) \quad (4.7)$$

$$\phi(p) = 1.15604 p^{0.6513} \quad (4.8)$$

The expected values of supply as per the model Equation 4.7-4.8 were computed and then the average raw observed data of supply and price along with these expected values have been plotted in a graph, see Fig., to assess the behavior of supply curve of oyster mushroom in the market of Raipur.

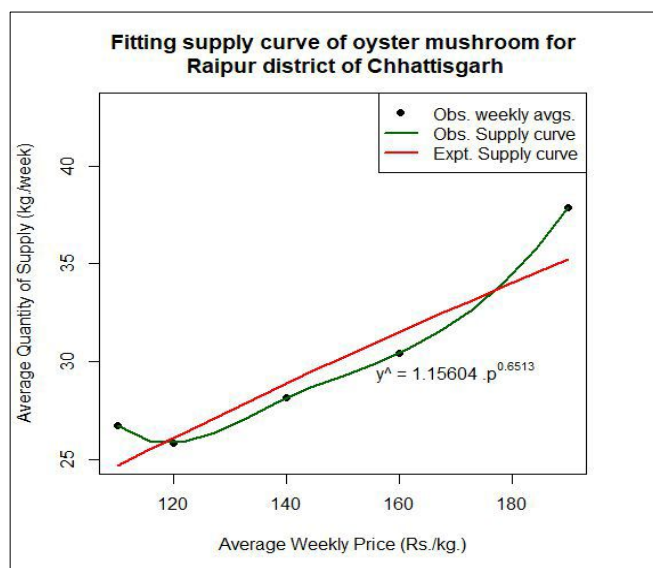


**Fig.** Supply curve of oyster mushroom (*Pleurotus* spp.) for Raipur district of Chhattisgarh

Some of the following observations on the above supply-price analysis for the market of Raipur are as follows:

- The weekly average maximum supply of oyster mushroom (*Pleurotus* spp.) in Raipur was estimated is 37.85714 kg/week with weekly average maximum price to be Rs. 190 per kg.
- The weekly average minimum supply of oyster mushroom (*Pleurotus* spp.) in Raipur was estimated is 25.85714 kg/week with weekly average maximum price to be Rs. 120 per kg.
- The price elasticity of oyster mushroom  $\phi(p)$  has been estimated to be 0.651, whose absolute value is less than one, which indicates that the price elasticity of supply of oyster mushroom is highly significant and relatively inelastic. It means that the changes in the supply of oyster mushroom is significantly less affected by the changes in its price.
- The average supply of oyster mushroom (*Pleurotus* spp.) increases in general in Raipur as its average price increases.
- One point of inflexion of the supply curve of oyster mushroom (*Pleurotus* spp.) for Raipur is being observed the minimum point of inflexion is observed corresponding to 26 kg/week with price Rs. 120 per kg.
- The curve of price elasticity of supply is concave in nature.

#### Determination of supply curve and price elasticity of supply for oyster mushroom (*Pleurotus* spp.) for the Durg market.

For the analyses of price elasticity of supply of oyster mushroom in the Durg market, the statistical methods of linear mixed effect model, has applied because the supply data were collected for a random number of 5 weeks, neither for the whole year nor for any given season, therefore week may affect the supply of oyster mushroom in a random way. Hence statistically speaking, for fitting the supply curves it

is more befitting to consider week as a random effect instead of being a simple fixed effect. Thus, the results of fitting the

linear mixed effect model are given in the Table-4.5.2 followed by subsequent discussion.

**Table:** Results of analyses of price elasticity of oyster mushroom supply in the market of Durg: lmer() linear mixed effect model using R

| Estimation of parameters of the model:<br>(log f) = (log c) - $\eta_0$ (log p)       |  |
|--------------------------------------------------------------------------------------|--|
| <pre>&gt; summary(supply.lmer, cor=T)</pre>                                          |  |
| Linear mixed model fit by REML. t-tests use Satterthwaite's method [lmerModLmerTest] |  |
| Formula: log(quantity.s) ~ (1   week) + log(price.s)                                 |  |
| Data: Durg                                                                           |  |
| REML criterion at convergence: -7                                                    |  |
| Scaled residuals:                                                                    |  |
| Min 1Q Median 3Q Max                                                                 |  |
| -2.2741 -0.7549 -0.2109 0.6003 2.2512                                                |  |
| Random effects:                                                                      |  |
| Groups Name Variance Std.Dev.                                                        |  |
| week (Intercept) 0.00000 0.0000                                                      |  |
| Residual 0.04356 0.2087                                                              |  |
| Number of obs: 35, groups: week, 5                                                   |  |
| Fixed effects:                                                                       |  |
| Estimate Std. Error df t value Pr(> t )                                              |  |
| Int.(log c) -0.005225 1.508262 33.000000 -0.003 0.9973                               |  |
| Log (price.s) 0.640756 0.315360 33.000000 2.032 0.0503.                              |  |
| ---                                                                                  |  |
| Signi.codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1                       |  |
| Correlation of Fixed Effects:                                                        |  |
| (Intr)                                                                               |  |
| log(pric.s) -1.000                                                                   |  |
| optimizer (nloptwrap) convergence code: 0 (OK)                                       |  |
| boundary (singular) fit: see ?isSingular                                             |  |
| ANOVA                                                                                |  |
| > anova(supply.lmer)                                                                 |  |
| Type III Analysis of Variance Table with Satterthwaite's method                      |  |
| Sum Sq Mean Sq NumDF DenDF F value Pr(>F)                                            |  |
| Log (price.s) 0.17983 0.17983 1 33 4.1283 0.05029.                                   |  |
| ---                                                                                  |  |
| Signi.codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1                       |  |

From Table- 4.5.2 the linear mixed effect model for the supply curve has been estimated using R as in Equations 4.9-4.10, where both the constant coefficient and the price elasticity coefficient of supply were found to be significant:

$$\log \phi(p) = -0.005225 + 0.640756(\log p) \quad (4.9)$$

$$(p) = 0.9947886 p^{0.640756} \quad (4.10)$$

The expected values of supply as per the model Equation 4.9-4.10 were computed and then the average raw observed data of supply and price along with these expected values have been plotted in a graph, see Fig., to assess the behavior of supply curve of oyster mushroom in the market of Durg.

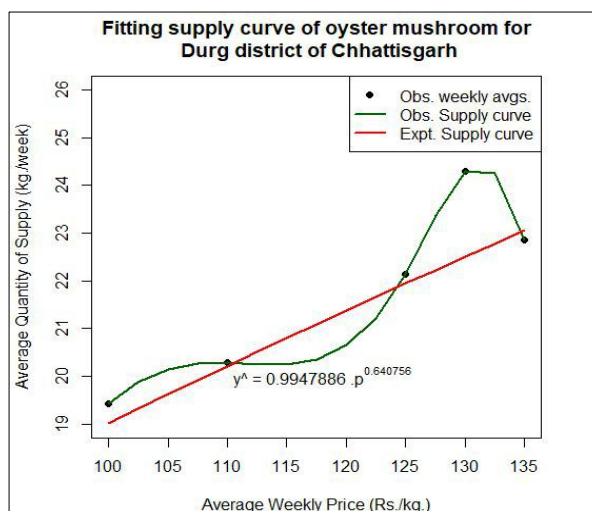


**Fig.** Supply curve of oyster mushroom (*Pleurotus* spp.) for Durg district of Chhattisgarh  
~ 424 ~

Some of the following observations on the above supply-price analysis for the market of Durg are as follows:

- The weekly average maximum supply of oyster mushroom (*Pleurotus* spp.) in Durg was estimated is 24.28571 kg/week with weekly average maximum price to be Rs. 130 per kg.
- The weekly average minimum supply of oyster mushroom (*Pleurotus* spp.) in Durg was estimated is 19.42857 kg/week with weekly average maximum price to be Rs. 100 per kg.
- The price elasticity of oyster mushroom  $\emptyset(p)$  has been estimated to be 0.640, whose absolute value is less than one, which indicates that the price elasticity of supply of oyster mushroom is significant and relatively inelastic. It means that the changes in the supply of oyster mushroom are significantly less affected by the changes in its price.
- The average supply of oyster mushroom (*Pleurotus* spp.) increases in general in Durg as its average price increases.
- Three points of inflexion of the supply curve of oyster mushroom (*Pleurotus* spp.) for Durg are being observed the first point of inflexion is observed corresponding to

20.5 kg/week with price Rs. 106.5 per kg, second is 20.7 kg/week at the price of Rs. 117 per kg. And third point of inflexion is 24 kg/week with the price of Rs. 130 per kg.

- The curve of price elasticity of supply is concave in nature.

#### Determination of supply curve and price elasticity of supply for oyster mushroom (*Pleurotus* spp.) for the Dhamtari market.

For the analyses of price elasticity of supply of oyster mushroom in the Dhamtari market, the statistical methods of linear mixed effect model, has been applied because the supply data were collected for a random number of 5 weeks, neither for the whole year nor for any given season, therefore week may affect the demand and supply of oyster mushroom in a random way. Hence statistically speaking, for fitting the supply curves it is more befitting to consider week as a random effect instead of being a simple fixed effect. Thus, the results of fitting the linear mixed effect model are given in the Table-4.5.3 followed by subsequent discussion.

**Table:** Results of analyses of price elasticity of oyster mushroom supply in the market of Dhamtari: lmer() linear mixed effect model using R

| Estimation of parameters of the model:<br>(log f) = (log c) - $\eta_0$ (log p)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre>&gt; summary(supply.lmer, cor=T) Linear mixed model fit by REML. t-tests use Satterthwaite's method [   lmerModLmerTest] Formula: log(quantity.s) ~ (1   week) + log(price.s) Data: DMT  REML criterion at convergence: -7.7  Scaled residuals:    Min    1Q  Median    3Q   Max -1.7892 -0.7039  0.0375  0.7929  1.4896  Random effects:  Groups Name Variance Std.Dev. week   (Intercept) 0.00000 0.0000 Residual    0.04271 0.2067 Number of obs: 35, groups: week, 5  Fixed effects: Estimate Std. Error df t value Pr(&gt; t ) Int.(log c) -0.3152   1.4840 33.0000 -0.212 0.8331 log(price.s) 0.7027   0.3131 33.0000  2.245 0.0316 * --- Signi.codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1  Correlation of Fixed Effects:       (Intr) log(pric.s) -1.000 optimizer (nloptwrap) convergence code: 0 (OK) boundary (singular) fit: see ?isSingular</pre> |  |
| ANOVA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <pre>&gt; anova(supply.lmer) Type III Analysis of Variance Table with Satterthwaite's method Sum Sq Mean Sq NumDF DenDF F value Pr(&gt;F) log(price.s) 0.21519 0.21519  1 33  5.0383 0.03162 * --- Signi.codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |

From Table- 4.5.3 the linear mixed effect model for the supply curve has been estimated using R as in Equations

4.11-4.12, where both the constant coefficient and the price elasticity coefficient of supply were found to be significant:

$$\log \phi(p) = -0.3152 + 0.7027(\log p) \quad (4.11)$$

$$\phi(p) = 0.7296429 p^{0.7027} \quad (4.12)$$

The expected values of supply as per the model Equation 4.11-4.12 were computed and then the average raw observed data of supply and price along with these expected values have been plotted in a graph, see Fig., to assess the behavior of supply curve of oyster mushroom in the market of Dhamtari.

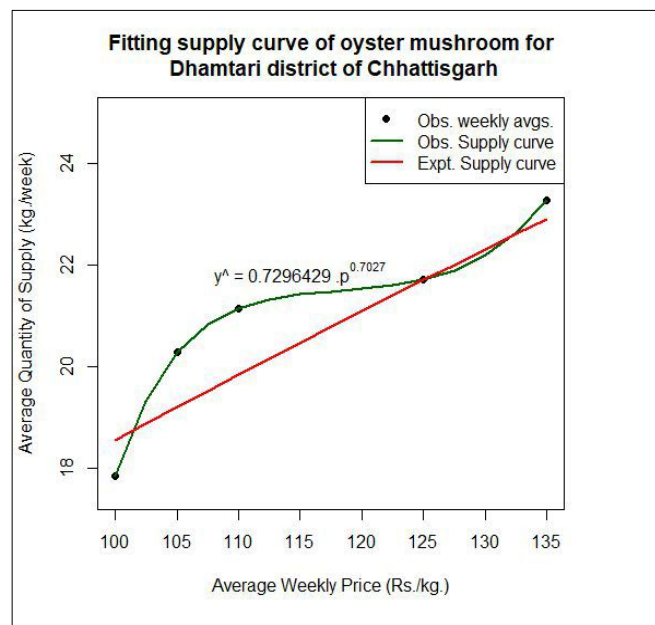


**Fig.** Supply curve of oyster mushroom (*Pleurotus* spp.) for Dhamtari district of Chhattisgarh

Some of the following observations on the above supply-price analysis for the market of Dhamtari are as follows:

- The weekly average maximum supply of oyster mushroom (*Pleurotus* spp.) in Dhamtari was estimated is 23.28571 kg/week with weekly average maximum price to be Rs. 135 per kg.
- The weekly average minimum supply of oyster mushroom (*Pleurotus* spp.) in Dhamtari was estimated is 17.85714 kg/week with weekly average maximum price to be Rs. 100 per kg.
- The price elasticity of oyster mushroom  $\phi(p)$  has been estimated to be 0.702, whose absolute value is less than one, which indicates that the price elasticity of supply of oyster mushroom is significant and relatively inelastic. It means that the changes in the supply of oyster mushroom are significantly less affected by the changes in its price.
- The average supply of oyster mushroom (*Pleurotus* spp.) increases in general in Dhamtari as its average price increases.
- Two points of inflexion of the supply curve of oyster mushroom (*Pleurotus* spp.) for Dhamtari are being observed the first point of inflexion is observed corresponding to 20.7 kg/week with price Rs. 108 per kg and another point of inflexion is observed at 22 kg/week with the price of Rs. 128 per kg.
- The curve of price elasticity of supply is concave in nature.

## Summary & Conclusion

This research is a case study of oyster mushroom (*Pleurotus* spp.) with the objective of determining its supply along with its respective price elasticities in the markets of Raipur, Durg and Dhamtari.

From the analyses of supply curves, the salient point is as follows: the supply of the oyster mushroom (*Pleurotus* spp.) in the markets were relatively inelastic, i.e., the price fluctuations least affected the supply as well.

Putting together all the relevant variables and the sampled responses in the three districts of Raipur, Durg and Dhamtari two relevant simultaneous equations models, out of three estimated for oyster mushroom (*Pleurotus* spp.) are reproduced below:

### Model I

#### Demand:

$$Q = 6.5555 - 0.1588 P^* + 1.1541 PS^{***} - 0.0541 DI \quad (5.1)$$

#### Supply:

$$Q = 10.944682 - 0.1280 P + 1.0045 PF^{**} \quad (5.2)$$

### Model II

#### Demand:

$$Q = 30.9480 - 0.1375 P - 0.0337 PSCH + 1.0871 DI^{***} \quad (5.3)$$

#### Supply:

$$Q = 35.2781 - 0.8487 P + 1.7791 PF^{**} \quad (5.4)$$

Model I was found to be best among the three models estimated where the substitute commodity to oyster mushroom (*Pleurotus* spp.) was preferred as soybean among the general consumers, whereas Model II was found to be suitable for only those consumers who had their disposable income more than those of the general consumers and who preferred chicken as their substitute to oyster mushroom (*Pleurotus* spp.).

The present investigation focuses on the study of oyster mushroom (*Pleurotus* spp.). The supply of oyster mushroom (*Pleurotus* spp.) was found to be relatively inelastic in the markets of Raipur, Durg and Dhamtari. In other words, the supply was found to be rather inflexible in these markets.

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