

## **Factors Determining Female Agricultural Wages : A Case Study in Chittoor District (Andhra Pradesh)**

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**ABSTRACT:** Wage differentials in agriculture depends on personal factors, occupation, region and length, of period of employment. Wages of women and children are lower partly because work done is less strenuous, partly because their earnings are supplementary in nature and partly because of social factors (lower status of women.). Skilled workers generally get higher wages which vary according to the nature of work. Regional variations in wages reflect differences in soil-fertility, crops and availability of workers and also customs and traditions. Seasonal variations may be very marked in some cases and are due to causes inherent in the nature of agricultural production. This paper aims to identify and analyse the factors influencing the female agricultural wages in three revenue divisions of Chittoor district, Andhra Pradesh. The following variables are indentified to determine the female agricultural wagherate – the percentage of irrigated area, intensity of cropping, average size of operational holding, the percentage of agricultural labour households to the rural households, land concentration ratio, availability of female agricultural labour per acre and availability of male agriculture labour per acre. The effect of the selected factors on female agricultural wages is analysed by the multiple regression analysis. The present study is concerned with the analysis of variations in female agricultural wagherates in 33 villages of 11 selected mandals present in three revenue divisions of Chittoor district for the period 1998-99. The relevant secondary data for explanatory and explained variables is collected from the Census of India 1991 : Population Census and also from handbook of statistics and other unpublished official records of the Chief Planning Officer, Chittoor. The primary data required is collected through field survey : 1998-99. In case of Chittoor district as a whole, a positive significant relationship is observed by the three variables – irrigated area, cropping intensity and average size of operational holding independently, with female agricultural wagherate. Similary, the three variables – percentage of agricultural labour households to the rural households, availability of female agricultural labour and availability of male agricultural labour establishes significant negative relationship with female agricultural wagherate. The variable 'land concentration ratio' establishes a positive and significant relationship with female agricultural wagherate. This positive relationship is contradictory to the expected relationship.

**KEY WORDS:** Female Agricultural Labour, Female Agricultural Wagherate, Intensity of Cropping, Percentage of Irrigated Area, Percentage of Variation, Regression Co-efficients.

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### **I. INTRODUCTION**

The poverty of the landless labourers, as a part of the poverty of the people of India, is all too known. The trends in agricultural wage rates during the post-Independence period, and analysis of the factors nfluencing the trend have generated considerable discussion among economists since the late 1960s. Agricultural labour get unusually low wages for the work done under the worst conditions put in excessively burdens on hard work. The opportunity to work is extremely irregular; hence their income is also low. Since, they possess no skill or training, they have no alternative employment opportunities either. Socially, a large number of agricultural labourers belong to scheduled castes and scheduled tribes. Hence, they are an oppressed class. They are not organized and cannot fight for their rights. Because of all these reasons, their economic lot has failed to improve even after four decades of developmental efforts. Low agricultural wage is a key determinant of the rural poverty in Indian masses. Wages are defined as “sum of money paid under contract by an employer to a worker for services rendered”. The predominance of land lordism, low yield subdivided and fragmented holding, absence of scientific methods of cultivation, prevalence of burdensome agricultural debt and possibility of employment of women and children and drawn of ability from the villages to the towns have been some of the factors that influenced the wage levels of agricultural workers in the country. Wages are also affected by social factors like customs and traditions. Again, there have been variations in wage levels depending on personal, regional and seasonal factors. Wage differentials in agriculture depends on personal factors, occupation, region and length, of period of employment.

Wages of women and children are lower partly because work done is less strenuous, partly because their earnings are supplementary in nature and partly because of social factors (lower status of women.). Skilled workers generally get higher wages which vary according to the nature of work. Regional variations in wages reflect differences in soil-fertility, crops and availability of workers and also customs and traditions. Seasonal variations may be very marked in some cases and are due to causes inherent in the nature of agricultural production. There are number of studies on the agricultural sector in Chittoor district. Among these studies, the research on agricultural labour is very limited. The empirical investigations are needed to study the agricultural labour problems. Hence the empirical, scientific, inductive, factor-finding investigational study of female agricultural wages in the rural economy of Chittoor district is an important phenomena. Hence in the present study the attempt is made to identify and analyse the factors influencing the female agricultural wages in three revenue divisions of Chittoor district, Andhra Pradesh.

## II. OBJECTIVE

The following is the objective of the study:

- To identify and analyse the important factors determining the female agricultural wage rate in three revenue divisions of Chittoor District, Andhra Pradesh.

## III. METHODOLOGY

The following methodology is proposed to study the important factors determining the female agricultural wage rate in three revenue divisions of Chittoor District. The effect of the selected factors on female agricultural wages is analysed by the multiple regression analysis. Female agricultural wages are high in some villages and low in some other villages. These differences are associated with a number of factors. The present study is concerned with the analysis of variations in female agricultural wage rates in 33 villages of 11 selected mandals present in three revenue divisions of Chittoor district for the period 1998-99. There are number of factors which are affecting the female agricultural wage rate. Some of the studies reveal that, some factors are positively affected and some other shows negative impact on the female agricultural wage rate. Among the numerous independent factors, the present study proposed the following variables that are influencing the female agricultural wages in the study area. These factors may be on both sides of the demand and supply, some factors can raise the demand for labour and the wage rate may be pushed up. Similarly, some other factors can raise the supply of labour and the wage rate may be depressed. Both these variables are influencing the dependent variable. The following variables are identified to determine the female agricultural wage rate – the percentage of irrigated area, intensity of cropping, average size of operational holding, the percentage of agricultural labour households to the rural households, land concentration ratio, availability of female agricultural labour per acre and availability of male agricultural labour per acre. The functional relationship can be established as

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$$

Where,

$Y$	= Female agricultural wage rate
$X_1$	= The percentage of irrigated area
$X_2$	= Cropping Intensity
$X_3$	= Average size of operational holding
$X_4$	= The percentage of agricultural labour Households to the rural households
$X_5$	= Land concentration ratio
$X_6$	= Availability of female agricultural labour per acre
$X_7$	= Availability of male agricultural labour per acre

The specification of the variables are given below.

### 3.1. Female agricultural wage rate (Y) :

The wage rate has been referred in terms of the average wage in rupees per day per female labour.

### 3.2. The percentage of irrigated area ( $X_1$ ) :

Labour use per acre is greater in irrigated area than the unirrigated area. The availability of irrigation in an area is expected to increase the demand for labour and the wage rate may be increased. It is expected that there is positive association between irrigated area and the wage rate.

$$X_1 = \frac{\text{Net area irrigated}}{\text{Net area sown}} \times 100$$

### 3.3. Cropping Intensity ( $X_2$ ) :

Availability of irrigation facilities inducing the higher cropping intensity. A higher percentage of cultivable area leads to higher usage of labour. The labour demand may likely to increase and hence the wage rate. It may be expected that there is positive relation between cropping intensity and the female agricultural wage rate.

$$X_2 = \frac{\text{Gross area sown}}{\text{Net area sown}} \times 100$$

### 3.4. Average size of operational holding ( $X_3$ ) :

It is one of the factor which is also affecting the female wage rate. Larger is the size of holding the higher will be the demand for labour and higher wage rate. It may be expected that there exist positive relation between the size of operational holding and the dependent variable female agricultural wage rate.

$$X_3 = \frac{\text{Total area of operational holdings}}{\text{Number of households}} \times 100$$

### 3.5. The percentage of agricultural labour households to the rural households ( $X_4$ ) :

As the variable  $X_4$  increases the female agricultural wage rate may be decreased and vice-versa. Therefore, the negative relationship is expected between the  $X_4$  and Y variables

$$X_4 = \frac{\text{Agricultural labour households}}{\text{Total rural households}} \times 100$$

### 3.6. Land concentration ratio ( $X_5$ ) :

The variable  $X_5$  having negative association with the dependent variable female agricultural wage rate. Since, the area where the land concentration ratio is high, the level of wages may be low.

$$X_5 = \frac{\text{Total land of the household}}{\text{Total members in the family}} \times 100$$

The variables  $X_6$  and  $X_7$  represents the availability of female and male agricultural labour per acre. As the number of agricultural labour is high, the wage level would be low. This results a negative association with the dependent variable.

With these expected relationships to the female agricultural wage rate, the study is proposed to estimate the functional relationship like,

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7$$

Where,  $a_1, a_2, a_3, a_4, a_5, a_6$  and  $a_7$  are the co-efficients of independent variables,  $a_0$  is the constant or intercept. To test the significance of each independent variable, t-test statistic is adopted. To determine the collective effect of all independent variables on dependent variable Y, the multiple correlation co-efficient ( $R^2$ ) is calculated. For the significance of  $R^2$ , F-test statistic is carried out. The estimated co-efficients along with their signs is analysed and the results were drawn accordingly. In the present study, the relevant secondary data for explanatory and explained variables is collected from the Census of India 1991 : Population Census and also from handbook of statistics and other unpublished official records of the Chief Planning Officer, Chittoor. The primary data required is collected through field survey : 1998-99.

## IV. FINDINGS

Female agricultural wages are affected by number of factors; some important variables are considered in the present study. They are percentage of irrigated area, cropping intensity, average size of operational holding, percentage of agricultural labour availability of female agricultural labour per acre and availability of male agricultural labour per acre.

**TABLE – 1 : TYPE OF THE VARIABLE AND EXPECTED RELATION**

Variables	Description of variables	Type of variable	Expected relationship with wagherate
Y	Female agricultural wagherate	Explained	-
X <sub>1</sub>	Percentage of irrigated area	Explanatory	Positive
X <sub>2</sub>	Cropping intensity	Explanatory	Positive
X <sub>3</sub>	Average size of operational holding	Explanatory	Positive
X <sub>4</sub>	Percentage of agricultural labour households to the rural households	Explanatory	Negative
X <sub>5</sub>	Land concentration ratio	Explanatory	Negative
X <sub>6</sub>	Availability of female agricultural labour per acre	Explanatory	Negative
X <sub>7</sub>	Availability of male agricultural labour per acre	Explanatory	Negative

The division-wise female agricultural wage determinants are analysed with the estimated multiple regression equations.

**4.1.Chittoor Division :**

The estimated regression equation of Chittoor division is

$$Y = 0.6452 - 0.0708 * X_1 + 0.0189 * X_2 + 0.0447 * X_3 - 0.0586 * X_4 - 1.1835 * X_5 - 0.2137 * X_6 - 0.1768 * X_7$$

(0.0006)      (0.0004)      (0.0019)      (0.0004)      (0.0115)      (0.0011)      (0.0010)

$$R^2 = 0.4375, F = 1.353$$

\* Significant at 5 percent probability level

Figures in the parentheses are the standard errors of the estimates

The estimated regression co-efficient of the percentage of irrigated area (X<sub>1</sub>) is negative. Therefore, the negative relation is observed between the percentage of irrigated area and the female agricultural wagherate. It reveals that an increase in one unit of X<sub>1</sub> variable will decrease the female agricultural wagherate by 0.07 units. By t-test statistic this estimated co-efficient is significant at 5 percent probability level. This decrease is significant. The negative and significant co-efficient reveals that there is some scope to raise the female agricultural wagherate by providing irrigation facilities. Hence, the female agricultural wagherate will be raised by providing additional irrigation facilities. It reveals that the irrigated area in Chittoor division is comparatively less.

Te co-efficients of intensity of cropping (X<sub>2</sub>) and the average size of operational holding (X<sub>3</sub>) are positive and significant at 5 percent probability level. Therefore, the positive relation is observed between the independent variables - X<sub>2</sub> and X<sub>3</sub> with the dependent variable female agricultural wagherate individually. An increase in one unit of X<sub>2</sub> and X<sub>3</sub> variables will increase the female agricultural wagherate by 0.02 units and 0.045 units respectively. This increase in Y variable due to X<sub>2</sub> and X<sub>3</sub> variables is significant. The co-efficient of the variable ‘percentage of agricultural labour households to the rural households (X<sub>4</sub>)’ is negative and significant. Therefore, the negative relation is observed between independent variable (X<sub>4</sub>) and the dependent variable (Y). It reveals that an increase in one unit of X<sub>4</sub> variable will reduce the female agricultural wagherate by 0.06 units. This decrease is significant.

The co-efficient of land concentration ratio (X<sub>5</sub>) is negative and significant. Therefore, the negative relation is observed between X<sub>5</sub> and Y variables. It reveals that an increase in one unit of X<sub>5</sub> variable will decrease the female agricultural wagherate by 1.18 units. This decrease is significant. The negative and significant co-efficient reveals that there is some chance to raise the female agricultural wagherate by more land concentration ratio. Hence, female agricultural wagherate will be raised by raising the units of X<sub>5</sub> variable. It also reveals that land concentration ratio in Chittoor division is low.

The co-efficients of availability of female agricultural labour per acre (X<sub>6</sub>) and availability of male agricultural labour per acre (X<sub>7</sub>) are negative and significant. Therefore, the availability of female and male agricultural labour per acre are negatively related to the female agricultural wagherate. It reveals that an increase

in one unit of  $X_6$  and  $X_7$  variables will decrease the female agricultural wage rate by 0.21 units and 0.18 units respectively. This decrease is significant. The negative and significant co-efficient reveals that there is a chance to increase the female agricultural wage rate by decreasing the availability of female and male agricultural labour. It may be concluded that the female agricultural wage rate will be raised by reducing the units of  $X_6$  and  $X_7$  variables. It also reveals that the availability of female and male agricultural labour in Chittoor division is high.

The value of multiple correlation ( $R^2$ ) is the collective effect of all independent variables on dependent variable. From the data related to the Chittoor division, the computed value of  $R^2$  is 0.4375. It means 43.75 percent of variation is observed in female agricultural wage rate. From F-test statistic this percentage of variation is not significant.

#### 4.2. Tirupati Division:

The estimated regression equation, i.e., female wage rate is a function of seven selected variables of Tirupati division is

$$Y = 0.4703 + 0.2162 * X_1 - 0.0327 * X_2 + 0.0932 * X_3 - 0.0633 * X_4 + 3.7588 * X_5 - 0.1584 * X_6 - 0.1643 * X_7$$

(0.0003)      (0.0004)      (0.0026)      (0.0007)      (0.0143)      (0.0011)      (0.0011)

$$R^2 = 0.8717, F = 12.656^*$$

\* Significant at 5 percent probability level

Figures in the parentheses are the standard errors of the estimates. The estimated regression co-efficient of the percentage of irrigated area ( $X_1$ ) is positive and significant. Therefore, the positive relation is observed between the percentage of irrigated area and the female agricultural wage rate. An increase in one unit of  $X_1$  variable will increase the female agricultural wage rate by 0.22 units. This increase in female agricultural wage rate due to  $X_1$  variable is significant. The co-efficient of intensity of cropping ( $X_2$ ) is negative. Therefore, the negative relation is observed between the intensity of cropping and the female agricultural wage rate. It reveals that an increase in one unit of  $X_2$  variable will decrease the female agricultural wage rate by 0.03 units. By t-test statistic, this estimated co-efficient is significant at 5 percent probability level. This decrease is significant. The negative and significant co-efficient reveals that there is possibility to raise the female wage rate by increase the intensity of cropping. Hence, the female wage rate will be raised by high intensity of cropping. It also reveals that the intensity of cropping in Tirupati division is low. The co-efficient of the average size of operational holding ( $X_3$ ) is positive and significant at 5 percent probability level. Therefore, the positive relation is observed between  $X_3$  variable and the dependent variable 'female agricultural wage rate (Y)'. An increase in one unit of  $X_3$  variable will increase the female agricultural wage rate by 0.09 units. This increase in female agricultural wage rate is significant. The co-efficient of the percentage of agricultural labour households to the rural households ( $X_4$ ) is negative and significant. The negative relationship is established between the  $X_4$  variable and the dependent variable 'Y'. It reveals that an increase in one unit of  $X_4$  variable will decrease the female agricultural wage rate by 0.06 units. This decrease is significant. The negative and significant co-efficient reveals that there is some scope to raise the female agricultural wage rate by increasing the percentage of agricultural labour households. The agricultural labour households includes both the farmers as well as the agricultural workers. In general, in the agricultural farmers category, male labour is available whereas female labour is totally absent. It expresses that, as the  $X_4$  variable increases, the percentage of male workers participation also increases and there is a proportionate decrease in female participation. Hence, the demand for female labour will be raised. It may be concluded that the female agricultural wage rate will be raised by raising the agricultural labour households in Tirupati division. It also reveals that the units of  $X_4$  variable in this division is not sufficient. The co-efficient of land concentration ratio ( $X_5$ ) is positive and significant. Therefore, the positive relation is observed between the land concentration ratio and the female agricultural wage rate. An increase in one unit of  $X_5$  variable will increase the female agricultural wage rate by 3.76 units. This increase in dependent variable Y due to  $X_5$  variable is significant.

The co-efficient of the availability of female agricultural labour per acre ( $X_6$ ) and the availability of male agricultural labour per acre ( $X_7$ ) are negative and significant. Therefore, the availability of female and male agricultural labour per acre are negatively related to female agricultural wage rate. It reveals that an increase in one unit of  $X_6$  and  $X_7$  variables will decrease the female agricultural wage rate by 0.16 units and 0.16 units respectively. This decrease is significant. The negative and significant co-efficient reveals that there is a chance to increase the female agricultural wage rate by decreasing the availability of female and male agricultural labour. It may be concluded that the female agricultural wage rate will be raised by reducing the units of  $X_6$  and

X<sub>7</sub> variables. It also reveals that the availability of female and male agricultural labour in Tirupati division is high.

The multiple correlation (R<sup>2</sup>) is the collective effect of all independent variables on dependent variable. The estimated value of R<sup>2</sup> is 0.8717. It means 87.17 percent of variation is observed in female agricultural wage rate. From F-test statistic this percentage of variation is significant. Therefore, the combined effect of all independent variables on the dependent variable is 87.17 percent.

#### **4.3. Madanapalle Division :**

The estimated regression equation of Madanapalle division is

$$Y = 0.1770 - 0.0223 * X_1 + 0.0245 * X_2 + 0.2815 * X_3 + 0.0315 * X_4 - 0.2679 * X_5 + 0.0399 * X_6 - 0.0212 * X_7$$

(0.0004)      (0.0004)      (0.0011)      (0.0004)      (0.0071)      (0.0005)      (0.0004)

$$R^2 = 0.5469, F = 2.5439^{**}$$

\* Significant at 5 percent probability level

\*\* Significant at 10 percent probability level

*Figures in the parentheses are the standard errors of the estimates.*

The estimated regression co-efficient of the percentage of irrigated area (X<sub>1</sub>) is negative. Therefore, the negative relation is observed between the percentage of irrigated area and the female agricultural wage rate. It reveals that an increase in one unit of X<sub>1</sub> variable will decrease the female wage rate by 0.02 units. By t-test statistic this estimated co-efficient is significant at 5 percent probability level, i.e., the decrease is significant. The negative and significant co-efficient reveals that there is a little scope to raise the female agricultural wage rate by providing irrigation facilities. It may be concluded that the female agricultural wage rate will be raised by increasing additional irrigation facilities. It also reveals that the percentage of irrigated area in Madanapalle division is low. The co-efficients of intensity of cropping (X<sub>2</sub>), the average size of operational holding (X<sub>3</sub>), and the percentage of agricultural labour households to the rural households (X<sub>4</sub>) are positive and significant at 5 percent probability level. Therefore, the positive relation is observed between each of the independent variables-X<sub>2</sub>, X<sub>3</sub> and X<sub>4</sub> with the dependent variable 'female agricultural wage rate'. An increase in one unit of X<sub>2</sub>, X<sub>3</sub> and X<sub>4</sub> variables will increase the female agricultural wage rate by 0.02, 0.28 and 0.03 units respectively. This increase in female agricultural wage rate due to X<sub>2</sub>, X<sub>3</sub> and X<sub>4</sub> variables is significant. The co-efficient of land concentration ratio (X<sub>5</sub>) is negative and significant. Therefore, the negative relation is observed between independent variable (X<sub>5</sub>) and the dependent variable (Y). It reveals that an increase in one unit of X<sub>5</sub> variable will decrease the female agricultural wage rate by 0.27 units. This decrease is significant. The negative and significant co-efficient reveals that there is a chance to increase the female agricultural wage rate by raising the land concentration ratio. Hence, female agricultural wage rate will be raised by raising the units of X<sub>5</sub> variable. It also reveals that land concentration ratio in Madanapalle division is low. The co-efficient of availability of female agricultural labour per acre (X<sub>6</sub>) is positive and significant. Therefore, the positive relation is observed between the X<sub>6</sub> variable and the dependent variable. An increase in one unit of X<sub>6</sub> variable will increase the female agricultural wage rate by 0.04 units. This increase in female agricultural wage rate due to the X<sub>6</sub> variable is significant. The co-efficient of availability of male agricultural labour per acre (X<sub>7</sub>) is negative and significant. Therefore, the negative relation is observed between the independent variable (X<sub>7</sub>) and the dependent variable (Y). It reveals that an increase in one unit of X<sub>7</sub> variable will decrease the female agricultural wage rate by 0.02 units. This decrease is significant. The negative and significant co-efficient reveals that there is a possibility to increase the female agricultural wage rate by increasing the availability of male agricultural labour. It may be concluded that the female agricultural wage rate will be raised by raising the units of X<sub>7</sub> variable. It also reveals that the availability of male agricultural labour in Madanapalle division is less.

The multiple correlation (R<sup>2</sup>) is the collective effect of all independent variables on dependent variable. The value of R<sup>2</sup> is 0.5469. It means 54.69 percent of variation is observed in female agricultural wage rate. From F-test statistic this percentage of variation is significant. Therefore, the combined effect of all independent variables on the dependent variable is 54.69 percent.

#### 4.4. Chittoor District:

The fitted regression equation for Chittoor district is

$$Y = 0.3579 + 0.1572 * X_1 + 0.0253 * X_2 + 0.1923 * X_3 - 0.0591 * X_4 + 0.4792 * X_5 - 0.0381 * X_6 - 0.1842 * X_7$$

(0.0003)      (0.0003)      (0.0012)      (0.0003)      (0.0076)      (0.0005)      (0.0006)

$$R^2 = 0.6213, F = 11.139^*$$

\* Significant at 5 percent probability level

Figures in the parentheses are the standard errors of the estimates.

The estimated regression co-efficients of the percentage of irrigated area ( $X_1$ ), intensity of cropping ( $X_2$ ) and the average size of operational holding ( $X_3$ ) are positive and significant at 5 percent probability level. Therefore, the positive relation is observed between the each independent variable –  $X_1$ ,  $X_2$  and  $X_3$  with the dependent variable ‘female agricultural wage rate’. An increase in one unit of  $X_1$ ,  $X_2$  and  $X_3$  variables will raise the female agricultural wage rate by 0.16, 0.03 and 0.19 units respectively. This increase in Y variable due to  $X_1$ ,  $X_2$  and  $X_3$  variables is significant. The co-efficient of the percentage of agricultural labour households to the rural households ( $X_4$ ) is negative and significant. Therefore, the negative relation is observed between  $X_4$  variable and the female agricultural wage rate. It reveals that an increase in one unit of  $X_4$  variable will reduce the female agricultural wage rate by 0.06 units.

This decrease is significant. The negative and significant co-efficient reveals that there is a possibility to raise the female agricultural wage rate by decreasing the units of  $X_4$  variable. Decreasing the agricultural labour households means, the diversion of agricultural labour into other activities. It may be concluded that the female agricultural wage rate will be raised by decreasing the agricultural labour households in Chittoor district. It also reveals that the percentage of agricultural labour households in the district is low. The co-efficient of land concentration ratio ( $X_5$ ) is positive and significant. Therefore, the positive relation is observed between the land concentration ratio and the female agricultural wage rate. An increase in one unit of  $X_5$  variable will increase the female agricultural wage rate by 0.48 units. This increase in Y variable due to  $X_5$  variable is significant. The co-efficients of the availability of female agricultural labour per acre ( $X_6$ ) and the availability of male agricultural labour per acre ( $X_7$ ) are negative and significant.

Therefore, the availability of female and male agricultural labour per acre are negatively related to the female agricultural wage rate. It reveals that an increase in one unit of  $X_6$  and  $X_7$  variables will decrease the female agricultural wage rate by 0.04 and 0.18 units respectively. This decrease is significant. The negative and significant co-efficient reveals that there is a chance to increase the female agricultural wage rate by decreasing the availability of female and male agricultural labour per acre. It may be concluded that the female agricultural wage rate will be raised by reducing the units of  $X_6$  and  $X_7$  variables. It also reveals that the availability of female and male agricultural labour per acre in Chittoor district is high. The collective effect of all independent variables on dependent variable is expressed in terms of  $R^2$ , the value of  $R^2$  is 0.6213. It means 62.13 percent of variation is observed in female agricultural wage rate in Chittoor district as a whole. From F-test statistic, this variation is significant.

Therefore, the combined effect of all independent variables on the dependent variable is 62.13 percent. The estimated co-efficient of percentage of irrigated area ( $X_1$ ) is positive and significant in Tirupati division as well as in Chittoor district as a whole. But in the case of remaining two divisions namely Chittoor and Madanapalle, they are negative and significant. It is observed that the expected relationship of the irrigated area with the dependent variable is coinciding with Tirupati division and also with the district as a whole. Whereas the relationship between the variables ‘ $X_1$ ’ and ‘Y’ is in opposite direction in Chittoor and Madanapalle divisions. But this negative relationship is significant in these two divisions. It shows that the irrigation having negative relationship with the agricultural female wage rate.

It is also observed that the insufficient irrigation facilities will decrease the female agricultural wage rate in Chittoor and Madanapalle divisions. Finally, it is concluded that, by enhancing the irrigation facilities it is possible to raise the female agricultural wage rate in Chittoor and Madanapalle divisions. The estimated co-efficient of intensity of cropping ( $X_2$ ) is positive and significant in Chittoor and Madanapalle divisions, as well as in the district as a whole. But it is negative and significant in Tirupati division. The expected relationship between dependent and independent variables is positive. i.e., the female agricultural

wagerate may be increase by the increase in intensity of cropping. It is observed that the expected relationship is contradictory in Tirupati division only. It means the intensity of cropping is comparatively low in Tirupati division than the remaining two divisions Chittoor and Madanapalle. One of the reason for less intensity of cropping in Tirupati division is the cultivator activities are diverted from agricultural activities. Cultivable area near and around the urban is converted to urbanization. By enhancing the intensity of cropping in Tirupati division, the female agricultural wagerate may be increased.

The estimated co-efficient of the average size of operational holding ( $X_3$ ) is positive and significant in all three divisions as well as in the district as a whole. The expected relationship between dependent variable female agricultural wagerate (Y) and independent variable ( $X_3$ ) is positive i.e., as the average size of operational holding increases, the female agricultural wagerate may be increased. It is observed that the expected relationship between these two variables are coinciding with the estimated relationship in all divisions as well as in the district as a whole. The estimated co-efficient of the percentage of agricultural labour households to the rural households ( $X_4$ ) is positive and significant in Madanapalle division. But it is negative and significant in remaining two divisions, namely, Chittoor and Tirupati and the Chittoor district as a whole. The expected relationship between dependent variable (Y) and independent variable ( $X_4$ ) is negative. It means, the female agricultural wagerate may be decreased as the ratio of agricultural labour households to the rural households is increased. It is observed that the expected relationship of the  $X_4$  variable with the dependent variable (Y) is coinciding in Chittoor and Tirupati divisions and in the entire Chittoor district. Whereas the relationship between  $X_4$  and Y variables is in opposite direction to expected relationship in Madanapalle division. It means that, there is an increase in female agricultural wagerate even though the  $X_4$  variable is increased. This is due to most of the agricultural labour households are not depending on agricultural sector, they are depending on non-agricultural activities. Owing to this reason the total agricultural labour households are not depending on agricultural sector. Therefore, the female agricultural wagerate may increase in Madanapalle division.

The estimated co-efficient of land concentration ratio ( $X_5$ ) is positive and significant in Tirupati division and in the Chittoor district as a whole. But in the case of Chittoor and Madanapalle divisions it is negative and significant. It is observed that the expected relationship of land concentration ratio with the dependent variable is coinciding in Chittoor and Madanapalle divisions. This is due to existence of a good number of big / large farmers and they may exercise their monopsonistic pressures on the labourers, ultimately they may decrease the female agricultural wagerate. The availability of labour is more in these divisions due to dominance of small farmers whose family labour may not be absorbed in their own cultivation. The relationship between  $X_5$  and Y in contradictory in Tirupati division and in the entire Chittoor district. The difference in average size of holding between small and big farmers would be relatively low in the area of low land concentration ratio. It is expected that there would be enough demand for labour from all sizes of farmers. This demand will push up to wage level.

The estimated co-efficient of the availability of female agricultural labour per acre ( $X_6$ ) is positive and significant in Madanapalle division. But it is negative and significant in remaining two divisions Chittoor and Tirupati and in the Chittoor district as a whole. In availability of labour is low, as the available family labour to the small farms would be absorbed in their own cultivation. This may enhance the wage level. The expected relationship between dependent and independent variables is negative. It is observed that the expected relationship of the availability of female agricultural labour ( $X_6$ ) with the female agricultural wagerate (Y) is coinciding in the Chittoor and Tirupati divisions and also in the entire Chittoor district. Whereas in Madanapalle division the relationship between  $X_6$  and Y is in opposite direction. The estimated co-efficient of availability of male agricultural labour per acre ( $X_7$ ) is negative and significant in all the three divisions as well as the district as a whole. The expected relationship between dependent variable female agricultural wagerate and the  $X_7$  variable is negative. It is observed that the expected relationship between the  $X_7$  variable and the Y variable is coinciding in all the three divisions namely, Chittoor, Tirupati and Madanapalle and also in the Chittoor district as a whole. This negative relation expresses that, an increase in male agricultural labour will decrease the female wagerate due to the substitution of female labour by the male labour. It is observed that, the positive association between  $X_7$  and Y is due to diversion of female agricultural labour from agricultural to non-agricultural activities.

## V. CONCLUSION

In case of Chittoor revenue division, both the variables – cropping intensity and average size of operational holding are bearing significantly positive relation with the female agricultural wagerate. The observed relationship of these two variables with the female agricultural wagerate is coinciding with the expected relationship. It reveals that every one unit increase in each of these variables will increase the female agricultural wagerate significantly. Similarly, the variables – percentage of agricultural labour households to the



rural households, land concentration ratio, availability of female agricultural labour per acre and availability of male agricultural labour per acre are having significantly negative relationship with the female agricultural wagerate. This observed negative relationships coincide with the expected negative relationships. It is observed that the increase in each of these variables individually will decrease the female agricultural wagerate. Percentage of irrigated area shows significantly negative effect on female agricultural wagerate. This negative relation is contradictory to the expected positive relationship. About 43.75 percent of variation in female agricultural wagerate is observed by these selected variables in the model.

In case of Tirupati revenue division, the estimated co-efficients of the variables – percentage of irrigated area and average size of operational holding show a positive and significant effect on female agricultural wagerate. The observed relationship is coinciding with the expected relationship. It means every increase in each of these two variables will increase the female agricultural wagerate. The impact of the variables – percentage of agricultural labour households to the rural households, availability of female agricultural labour and availability of male agricultural labour on female agricultural wagerate is negative and significant and is coinciding with the expected relationship. The female wagerate may decrease significantly by a small increase in any one of these variables. Negative and significant relationship is observed between cropping intensity and female agricultural wagerate and is contradictory to the expected positive relationship. It may be inferred that there is some scope to raise the female agricultural wagerate by increasing the variable ‘cropping intensity’. Positive and significant relationship is observed between the variable ‘land concentration ratio’ and female agricultural wagerate. This observed positive relationship is contradictory to the expected negative relationship. This is due to the fact that in the area of low land concentration ratio, there would be enough demand for labour from all sizes of the farmers. This demand will enhance the wage level. All the selected independent variables considered in the equation collectively recorded a significant variation of 87.17 percent in female agricultural wagerate.

In case of Madanapalle revenue division, the observed relationships of the variables – cropping intensity, average size of operational holding, land concentration ratio and availability of male agricultural labour per acre are coinciding with their corresponding expected relationships. A contradictory relationship is observed between female agricultural wagerate and percentage of irrigated area. This is due to inadequate or less irrigation facilities in this Madanapalle division. The observed significant negative relationship expresses the possibility of raising the female agricultural wagerate by increasing the irrigated area. The variables – percentage of agricultural labour households to the rural households and availability of female agricultural labour per acre reveal a positive significant effect on female agricultural wagerate. This observed relationships are contradictory to the expected relationships. An insight to the variable ‘percentage of agricultural labour households to the rural households’ reveals that most of the agricultural labourers are not depending on agricultural sector for their employment. Hence, there is possibility for increasing the female agricultural wagerate in this division. With respect to the variable ‘availability of female agricultural labour’, it may be inferred that the female wagerate may increase by increasing the independent variable. This is due to the shortage of female labour in Madanapalle division. This shortage may be due to the absorption of female labour in their own cultivation. All the explanatory variables in the model explain nearly 54.7 percent of variation in female agricultural wagerate. This variation is significant.

In case of Chittoor district as a whole, a positive significant relationship is observed by the three variables – irrigated area, cropping intensity and average size of operational holding independently, with female agricultural wagerate. Every increase in each of these three variables will increase the female agricultural wagerate significantly. Similarly, the three variables – percentage of agricultural labour households to the rural households, availability of female agricultural labour and availability of male agricultural labour establishes significant negative relationship with female agricultural wagerate. Every increase in each of these three variables will decrease the female agricultural wagerate. It is observed that the relationships of each of the above six variables with females agricultural wagerate coincides with the expected relationships. The variable ‘land concentration ratio’ establishes a positive and significant relationship with female agricultural wagerate. This positive relationship is contradictory to the expected relationship. The difference in average size of holding between small and big farmers would be relatively low in the area of low land concentration ratio. It is expected that there would be enough demand for labour from all sizes of farmers in the area of low land concentration ratio due to which the wage level is increased. The total effect of explanatory variables on explained variable is 62.13 percent. This variation in female agricultural wagerate is significant.

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