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Predication of Labour Demand in Agriculture Based On Comparative Study of Different Data Using Data Mining and Stochastic Approach

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Abstract: *Data mining is defined as extracting adhocracy information from giant sets of data. In ancillary, the data mining is the route of mining knowledge from data and the analytic process designed to explore large amounts of data typically agriculture. India is a predominantly agrarian economy with the majority of its population depending on agriculture for livelihood. As agriculture is the backbone of Indian economy, its income plays a leading role in the national income. India has attained self-sufficiently in food production after 67 years of independence, the credit for this, no doubt goes to agricultural workers who spend most of their time in slush and muck but with unappeasable hunger. As a result, the exodus from agricultural workforce is expected to slow down in the coming years till 2019-20 compared to the earlier periods in consideration. In this paper, compare the various types of agriculture workers and other important applicable details. Observation of different years of government organisation datasets is to be declared most of the agriculture related labours percentages are decreased year by year. Predicting the data and how to increase the agriculture labours involvement in future events using stochastic model based on several numerical illustrations.*

Keywords: *Agriculture Labours, Data Mining, Normalization, Stochsatic Model, Time Series Data.*

I. Introduction

Data mining, the origin of concealed projecting information from large amount of data sets, is a powerful novel technology with great potential to help agricultures focus on the most vital information in their data warehouses. Data mining gear predict future trends and behaviors, allowing businesses to make upbeat, knowledge-driven decisions. The automated, prospective analyses offered by data mining move beyond the analyses of past events provided by retrospective tools typical of decision support systems. A stochastic model is a tool for estimating probability distributions of potential outcomes by allowing for random variation in one or more inputs over the time. The random variation is usually based on fluctuations observed in historical data for a selected period using standard time-series techniques. In probability theory, a stochastic process or sometimes random process is a collection of random variables; this is often used to represent the evolution of some random value, or system, over time. This is the probabilistic counterpart to a deterministic process. The word "stochastic" means "pertaining to chance" (Greek roots), and is used to describe subjects that contain some element of random or stochastic behavior. For a system to be stochastic, one or more parts of the system have randomness associated with it.Agriculture labor may be defined as labor who works in agriculture or allied activities for the whole or part of the year in return for full-time or part time work. The agriculture laborer has no risk in the cultivation, and no right of lease or contract on land but merely works on another person's land for wages. The definition includes workers who are engaged in other agri-based occupation such as dairy farming, horticulture, poultry etc. It also includes the people who don't work throughout the year but only for part of the year. The distinguishing feature of rural economy of India has been the growth of agriculture labor in the crop production. The phenomena of under-employment, under-development and surplus population are visible amongst agricultural labourers. The income level of these workers is quite low and employment is quite irregular. Further, these workers lack alternative employment due to lack of training and skills.Today labours do not get regular income due to the inconsistencies in the agricultural ativities through out of the year and do not develop any other skill to diversity their labour. Agricultural labours are known for taking up agricultural activities as well as agricultural related activities such as livestock, forestry, fishing etc. Thus, agriculture has been the major source of livelihood for majority of the labour force in India. The agriculture operations are generally seasonal in nature and as such demand for agriculture labour is also seasonal. During the sowing and harvesting seasons, almost all the labours, are fully employed. In many areas where cultivation is primarily dependent on rains, employment of landless agriculture labour confined only to a short period and most of them stay unemployed.According to 2001 census, India having more than 68.8 percent of total population depending upon agriculture for their livelihood. This sector continues to support more than half a billion people providing

employment to 52.8 percent of the workforce. As per the census of India 2011, 263 million people are engaged in the agriculture sector and over half of them are now agricultural labours. Job creation in the primary and secondary sector is likely to slow down as a result of lower growth expectations in the sectors.

A. Main Workers

Those workers who had worked for the major part of 6 months or more reference period are termed as main workers.

B. Marginal Workers

Those workers who had not worked for the major part of less than 6 months reference period are termed as marginal workers.

C. Cultivator

The very small cultivators whose main source of earnings due to their small and marginal holdings is wage employment. These laborers can again be divided into three subgroups. (1) cultivators are small farmers, who possess very little land and therefore, have to devote most of their time working on the lands of others as labourers (2) share croppers are those who, while sharing the produce of the land for their work, also work as labourers, and (3) lease holders are the tenants who not only work on the leased land but also work as labourers. For purposes of the census a person is classified as cultivator if he or she is engaged in cultivation of land owned or held from Government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation.

D. Agricultural Labours

A person who works on another person's land for wages in money or kind or share is regarded as an agricultural labourer. She or he has no risk in the cultivation, but merely works on another person's land for wages. An agricultural labourer has no right of lease or contract on land on which she/he works.

E. Household Industry Workers

Household Industry is defined as an industry conducted by one or more members of the household at home or within the village in rural areas and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory which would qualify or has to be registered under the Indian Factories.

F. Other Workers

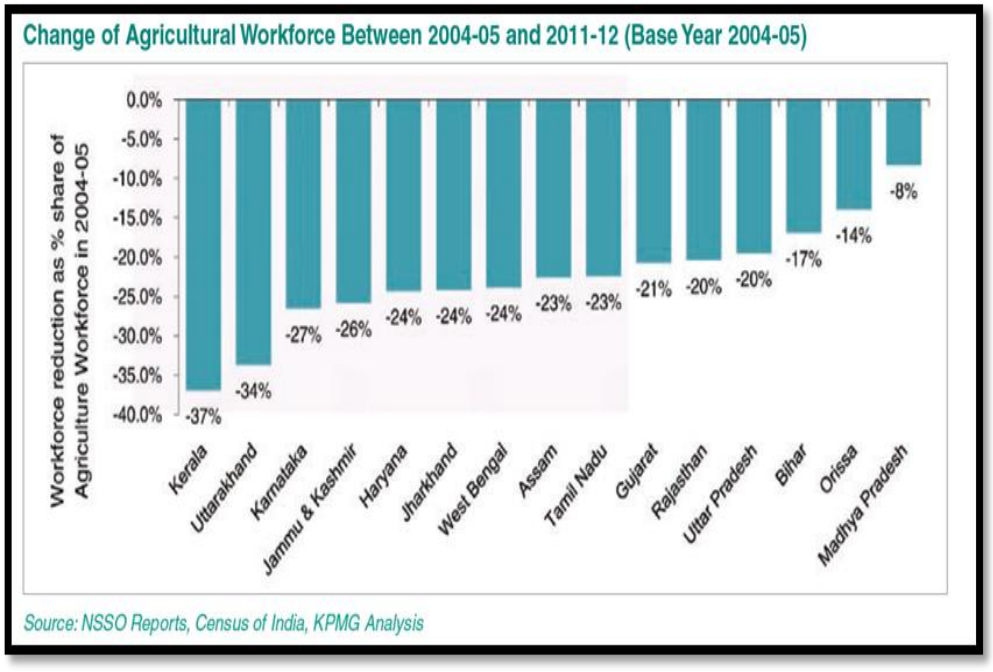
All workers, i.e., those who have been engaged in some economic activity during the last one year, but are not cultivators or agricultural labours or in Household Industry, are 'Other Workers (OW). The type of workers that come under this category of 'OW' include all government servants, municipal employees, teachers, factory workers, plantation workers, those engaged in trade, commerce, business, transport banking, mining, construction, political or social work, priests, entertainment artists, etc. In effect, all those workers other than cultivators or agricultural labours or household industry workers are 'Other Workers'.

G. Non Workers

A person who did not at all work during the reference period was treated as non-worker. The non-workers broadly constitute students who did not participate in any economic activity paid or unpaid, household duties who were attending to daily household chores like cooking, cleaning utensils, looking after children, fetching water etc. and are not even helping in the unpaid work in the family form or cultivation or milching, dependant such as infants or very elderly people not included in the category of worker, pensioners those who are drawing pension after retirement and are not engaged in any economic activity. In this paper a Stochastic model is developed and discussed to study the method of finding agriculture labours demands based on different parameters and predicting the strategies to increases the agriculture and increasing labours involvement using stochastic approach. Numerical examples are also provided.The paper is organized as follows. In section 1, we briefly introduction of data mining, agriculture activities, different types of labours and stochastic model. In section 2, indicate related review of literature work for data mining and stochastic process. Explain different time series data and stochastic model development in section 3. Various result shows in numerical illustration are also highlighted in section 4. Finally, delivered the conclusion and future scope is highlighted in section 5.

II. Related Work

Data mining is the process of analyzing data from unusual aspects and abbreviation it into useful information. Information that can be used to increase revenue, cut costs, or both. Data mining software consists of a number of analytical tools for analyzing data. It allows users to analyze data from many different angles and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among a lot of fields in large relational databases are discussed in Rajesh and Karthikeyan [1]. Stilianakis et al. [2] have discussed a Stochastic model on the antigenic diversity threshold for AIDS. Jaisankar and Sathiyamoorthi [3] have discussed a Stochastic model in which the expected time for the antigenic diversity to cross the antigenic diversity threshold is found out. Elangovan et al. [4] have discussed a Stochastic model in which the expected time for the antigenic diversity to cross the threshold has been obtained. The results obtained were satisfactory, giving motivation in applying the model for generating future rainfall series under different climate change scenarios (Fadhil et al., [5]). The interpretations of trend behaviour for dry and wet events are analysed in order to verify the dryness and wetness episodes. The fitting distribution of rainfall is computed to classify the dry and wet events by applying the standardised precipitation index (SPI). The rainfall amount for each station is categorised into seven categories, namely extremely wet, severely wet, moderately wet, near normal, moderately dry, severely dry and extremely dry (Yusof et al. [6]). The exit of personnel in agriculture sectors is very frequent, especially when policies regarding growth, targets etc. are revised. Wastage occurred in agriculture fields due to insufficient rainfall, loss of agriculture manpower, and other reasons. A number of models are discussed in (Bartholomew [7], Bartholomew and Forbes [8], McClean [9], [10], [11]). In stochastic manpower planning an important aspect of study is to find out the rate of attrition or wastage so that necessary precautions and preventive strategies can be used to reduce the level of wastage. Frequent improvement in agriculture trends may also be expensive due to the improvement of agriculture growth. A. Estimation of Labour Force Reduction in Agriculture by 2019-2020An analysis across states shows in figure 1, In the period 2004-05 to 2011-12, robust growth in the secondary and tertiary sectors led to significant job creation in these sectors. As a result, a large share of the agricultural labour force moved to these professions which offered better remuneration.



Source: NSSO, FICCI Research, 2015

Fig. 1: Agricultural Workforce Reduction

Job creation in the primary and secondary sector is likely to slow down as a result of lower growth expectations in the sectors. As a result, the exodus from agricultural workforce is expected to slow down in the coming years till 2019-20 compared to the earlier six year period in consideration. Nevertheless, the size of the workforce in this sector is expected to shrink by another 23 million in the next eight years till 2019-20 and form only 41% of the total workforce and this trend calls for immediate steps to improve labour productivity in the sector.

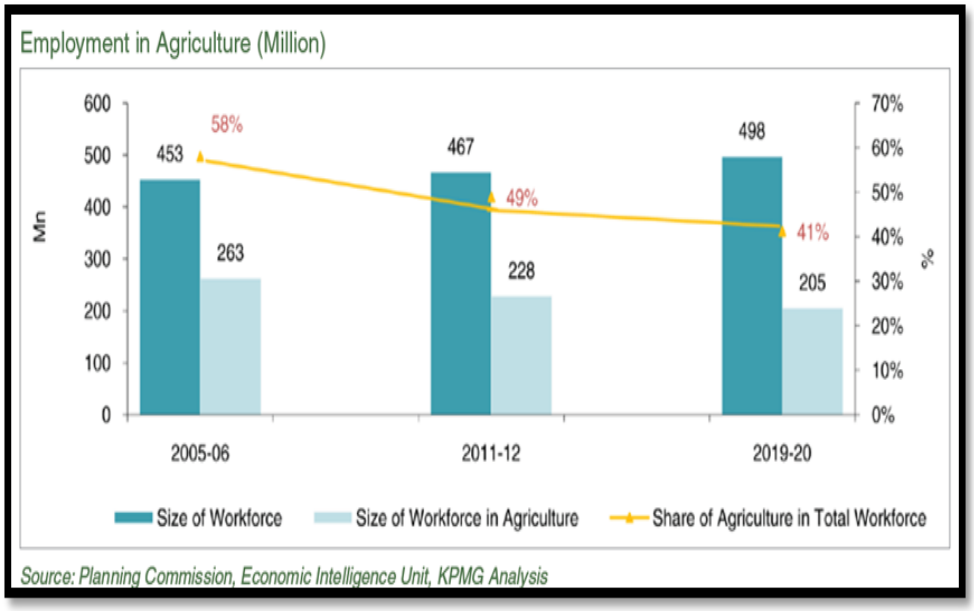


Fig. 2: Estimation of Labour Force Reduction in Agriculture

III. Results And Discussion

In this study, the secondary data analysis and review involves collecting and analyzing a vast array of information. Data taken from Census of India 2001 and 2011, District Hand Book and Block Hand Book of Department of Economics and Statistics, NSSO, FICCI Research 2015 and Report of various Division Executive Engineer of agriculture. The report on special study with reference to the period 2001-2011 census and data collected from various department and agencies. To study the scarcity of labours in the area of agriculture causes due to mechanization, migration and literacy.

Table 1: Categories of workers in percentage

S. No.	Categories of workers	Census 2001 Workers (%)	Census 2011 Workers (%)
1	Main	78.80	76.40
2	Marginal	21.20	23.60
3	Cultivators	14.20	12.90
4	Agriculture labours	57.80	54.60
5	Household industry	01.90	01.90
6	Other type workers	26.10	30.50

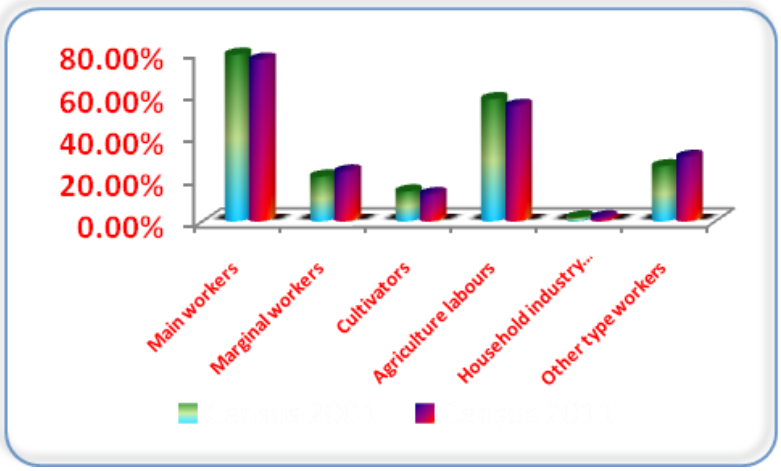


Fig. 3: Categories of workers in percentage

A. Problem of Agriculture Labours in Thiruvarur

The major source of employment generation in this district is agriculture. The people of the district carry out agriculture and allied activities. The irrigation is major problem in cauvery delta region. In comparison with other occupations, the income from Agriculture in thiruvarur district is low. The wages for Agriculture labor is less and so the labours went to cities and towns for other jobs for earning more. 10 years ago agricultural labours in thiruvarur district were opposed to engaging machineries for farm works. After few years back farm works to be mechanized and aid of agricultural mechanization.

B. Irrigation

Agriculture income is a source of livelihood for many farmers and agriculture labours. Whenever monsoon fails and lack of water in the tank, there come the problem to the agriculture and agricultural labours. Farmers who have bore well facility carry out agricultural practices smoothly. The ground water level has also gone down due to overall fall of water table in the region. Now the agrarian community find difficult to cultivate crops through the year. So, the agriculture labours are in need to find an alternative employment for their livelihood.

C. Agriculture Mechanization

Mechanization of farm operation is one of the critical factors contributing in cropping intensity. The share of animal power in agricultural operations in the country had come down from 45.3% during 1971-1972 to 9.5% during 2001-2002, while share of mechanical and electrical power has increased from 45% in 1971-1972 to 84% in 2003-2004, as a result of increased use of tractors, power tillers, combined harvesters, irrigation pumps and other power-operated machines. This causes participation of agriculture labour in agriculture works gradually decreased in future.

D. Migrate Agricultural to Non-agricultural

The agricultural sector in India has been characterized with high supply of labours than demand, low wages, skewed distribution of land, and limited options of earning livelihood. This sector has undergone a vast change in recent past, mainly due to the increased rural-to-urban migration and partly due to the inception of other public works. MGNREGA is also slight reason for not interested in agricultural works. Ministry of agriculture and farmers welfare department, the daily wages for men increased gradually, but women daily wages remains the same wages for last three years. Based on above data is one of the main reasons for women labours migrate to non agriculture works as shown in table 2 and fig. 4.

Table 2: Thiruvarur District Average Daily Agricultural Wages (in Rs**.)**

Sl. No.	Years	Men	Women
1.	2010-2011	167.65	88.88
2.	2011-2012	198.75	118.00
3.	2012-2013	228.00	100.00
4.	2013-2014	265.93	100.00
5	2014-2015	300.00	100.00

Source: Ministry of Agriculture & Farmers Welfare, Govt. of India

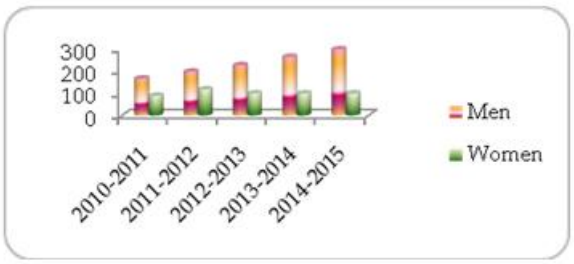


Fig. 4: Average Daily Agricultural Wages (in **Rs.)**

E. Agricultural Mechanization

In thiruvarur district about 1.45 lakh ha. are under paddy cultivation in seasons viz., kuruvai, samba and thaladi followed by rice fallow pulses. Nowadays, the major problems for agriculture labours are, they introduced newly developed agricultural machineries and farm implements are the main reason for lack of participation in agricultural works.

F. Framers thoughts about Mechanization

Harvesting by a reaper is much quicker than manual harvesting. Quick harvesting by reaper can save money which is otherwise spent for expensive manual labours. The size of bundles should be optimum to avoid physical stress of the labours and the number of labours employed for carrying should be properly planned to minimize the cost. Hand beating is a tedious job causing high physical stress to the worker. In addition this method requires more labours than any other method of threshing involving higher cost. Animal treading is time consuming and dependent on the availability of drought animals.

Table 3: Target and Achievement details for Land Development Machineries in Thiruvarur District

Sl. No.	Years	Tractor		Harvester	
		Target (in Hours)	Achievement (in Hours)	Target (in Hours)	Achievement (in Hours)
2	2010-11	16600	14771	2600	2603
3	2011-12	16600	17061	4180	3807
4	2012-13	19000	19952	5500	2400
5	2013-14	23800	17627	5720	1808
6	2014-15	21800	15710	6600	1492

Source: Division of Executive Engineer (AE), Thiruvarur

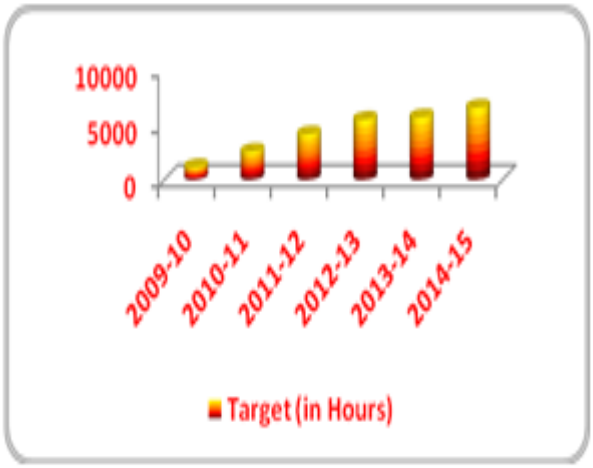


Fig. 5a. Target details for Land Development Machineries (Tractor)

Fig. 5b. Target details for Land Development Machineries (Harvester)

Table 4: Total area irrigated data in Thiruvarur District

Years	Gross Area (in ha)	% of Gross irrigated Area	Net Area (in ha)	% of Net Irrigated Area
2010-2011	178716	67.99	147091	95.17
2011-2012	206192	78.44	148602	96.15
2012-2013	170759	87.03	144985	96.55
2013-2014	192411	63.98	146666	96.54
2014-2015	215083	65.73	151750	96.55

Source: Season and Crop Report, Tamil Nadu

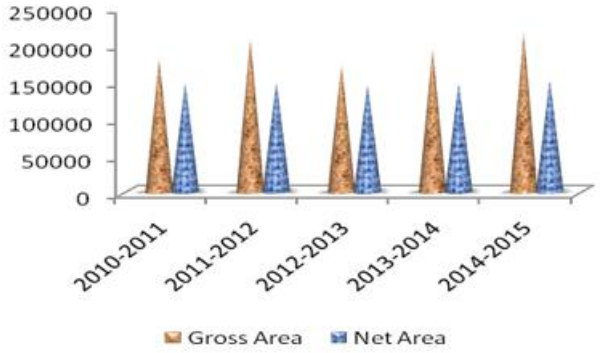


Fig. 6a: Total area irrigated in Thiruvarur District

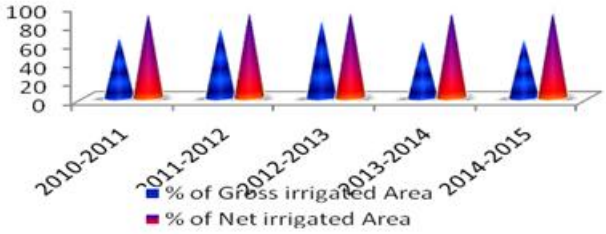


Fig. 6b: Net and Gross area irrigated in Thiruvarur District

G. Literacy

To compare the literacy rate of 2001 and 2011 census in Thiruvarur district. There is gradual increase in literacy rate in urban and rural area. In Thiruvarur district 2001 census total literate percentage is 76.58 and last census literate percentage increased as 82.90. We find that the Literacy rate in the district is increased as indicated in Table 5 and Fig. 5.3.

Table 5: Literate (%) in Thiruvarur District

Year	Total Literate (%)		
	Total	Male	Female
2001	76.58	85.43	67.90
2011	82.90	89.10	76.70

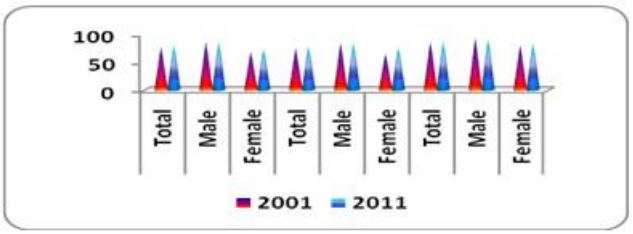


Fig. 7: Literate (%) in Thiruvarur District

H. Population Vs. Agriculture Labours

Comparison is made between population and agriculture labours of Thiruvarur district based on 2001 and 2011 census report. It is clearly observed that, 24.54% of total populations were in 2001, meanwhile 15.82% of total population were agriculture labours in 2011. There is a considerable decrease of agriculture labours over a decade as shown in the Table 5.4 and Fig. 5.4 (a,b).

Table 6: Comparison between Population and Agri. Labours in 2001 and 2011 census

Year	Population	Agri. Labours	%
2001	1165213	286033	24.54
2011	1264277	200126	15.82

Source: Block Statistical Hand Book, Thiruvarur Dist

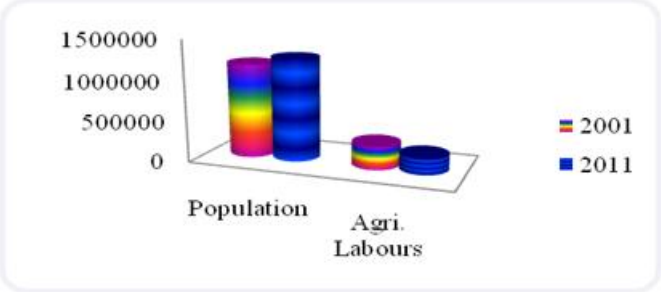


Fig. 8: Comparison between Population and Agri. Labours in 2001 and 2011 census

I. Stochastic Model

$$S(t) = P\,[\,T > t\,]$$

Hence $S(t) = P[\sum_{i=1}^{k} xi < Z_1 \cap \sum_{i=1}^{k} yi < Z_2]$

$= P[\sum_{i=1}^{k} xi < Z_1\,].P[\sum_{i=1}^{k} yi < Z_2]$

where $H(x) = 1 - \overline{H(x)}$ and $M(y) = 1 - \overline{M(y)}$

It is assumed that,

$Z_1 \sim \exp(\theta)$ *and* $H(x) = 1 - e^{-\theta x}$

$Z_2 \sim \exp(\lambda)$ *and* $M(y) = 1 - e^{-\lambda y}$

$\overline{H(x)} = e^{-\theta x}$ and $\overline{M(y)} = e^{-\lambda y}$

Hence $S(t) = \sum_{k=0}^{\infty}[F_k(t) - F_{k+1}(t)]\,[\int_0^{\infty} g_k(x) e^{-\theta x} dx][\int_0^{\infty} q_k(y) e^{-\lambda y} dy]$

$$S(t) = \sum_{k=0}^{\infty}[F_k(t) - F_{k+1}(t)]\,[g^*(\theta)\,q^*(\lambda)]^k$$

$= 1 - [1 - g^*(\theta)q^*(\lambda)\,]\sum_{k=1}^{\infty} F_k(t)\,[g^*(\theta)\,q^*(\lambda)]^{k-1}$ … (1)

$L(t) = 1 - S(t)$

$$= [1 - g^*(\theta)\,q^*(\lambda)\,]\sum_{k=1}^{\infty} F_k(t)\,[g^*(\theta)q^*(\lambda)]^{k-1}$$

Taking Laplace transform of both sides

$l^*(s) = [1 - g^*(\theta)q^*(\lambda)\,]f^*(s)\sum_{k=1}^{\infty}[f^*(s)\,g^*(\theta)q^*(\lambda)]^{k-1}$

$= \frac{[1-g^*(\theta)q^*(\lambda)\,]f^*(s)}{[1-f^*(s)g^*(\theta)q^*(\lambda)]}$ … (2)

To find the $E(T)$ *and* $V(T)$,

we have $E(T) = \frac{-d\,l^*(s)}{ds}_{s=0}$

$V(T) = E(T^2) - [E(T)]^2$

where $E(T^2) = \frac{d^2 l^*(s)}{ds^2}_{s=0}$

we assume that $f(.) \sim \exp(\eta)$ and $f^*(s) = \frac{\eta}{\eta+s}$

$g(.) \sim \exp(\beta)$ and $g^*(\theta) = \frac{\beta}{\theta+\beta}$

$q(.) \sim \exp(c)$ and $q^*(\lambda) = \frac{c}{\lambda+c}$

$[1 - g^*(\theta)q^*(\lambda)]f^*(s) = \left[1 - \frac{\beta}{\theta+\beta}\cdot\frac{c}{\lambda+c}\right].\frac{\eta}{\eta+s}$

$[1 - f^*(s)g^*(\theta)q^*(\lambda)] = \left[1 - \frac{\beta}{\theta+\beta}\cdot\frac{c}{\lambda+c}\cdot\frac{\eta}{\eta+s}\right]$

$l^*(s) = \frac{\left[1-\frac{\beta}{\theta+\beta}\cdot\frac{c}{\lambda+c}\right]\frac{\eta}{\eta+s}}{\left[1-\frac{\beta}{\theta+\beta}\cdot\frac{c}{\lambda+c}\cdot\frac{\eta}{\eta+s}\right]}$ (3)

$$l^*(s) = [\eta(\beta+\theta)(c+\lambda) - \eta\beta c][(\beta+\theta)(c+\lambda)(\eta+s) - \eta\beta c]^{-1}$$ (4)

$$= \frac{(\beta+\theta)(c+\lambda)[\eta(\beta+\theta)(c+\lambda)-\eta\beta c]}{[(\beta+\theta)(c+\lambda)(\eta)-\eta\beta c]^2}$$

Therefore $\frac{-dl^*(s)}{ds}_{s=0}$

$= \frac{(\beta+\theta)(c+\lambda)[\eta(\beta+\theta)(c+\lambda)-\eta\beta c]}{[(\beta+\theta)(c+\lambda)(\eta)-\eta\beta c]^2}$.

$$E(T) = \frac{(\beta+\theta)(c+\lambda)}{(\beta+\theta)(c+\lambda)(\eta)-\eta\beta c} \quad .(5)$$

From equ. (4)

$$\frac{dl^*(s)}{ds} = \big((\beta+\theta)(c+\lambda)(\eta)-\eta\beta c\big)(-1)[(\beta+\theta)(c+\lambda)(\eta+s)-\eta\beta c]^{-2}[(\beta+\theta)(c+\lambda)]$$

$$\frac{d^2l^*(s)}{ds^2}_{s=0} = \frac{2[(\beta+\theta)(c+\lambda)]^2}{[\eta(\beta+\theta)(c+\lambda)-\eta\beta c]^2} \quad (6)$$

$$E(T^2) = 2\left[\frac{(\beta+\theta)(c+\lambda)}{\eta(\beta+\theta)(c+\lambda)-\eta\beta c}\right]^2$$

$$V(T) = E(T^2) - [E(T)]^2$$

$$V(T) = 2\left[\frac{(\beta+\theta)(c+\lambda)}{\eta(\beta+\theta)(c+\lambda)-\eta\beta c}\right]^2 - \left[\frac{(\beta+\theta)(c+\lambda)}{\eta(\beta+\theta)(c+\lambda)-\eta\beta c}\right]^2 \quad (7)$$

IV. Numerical Illustrations

Data preprocessing plays a crucial role. One of the best steps concerns the normalization of the data. This step is very important when dealing with parameters of different units and scales. For example, some data mining techniques use the Euclidean distance. Therefore, all parameters should have the same scale for a fair comparison between them. The methods are usually well known for rescaling data. Normalization, which scales all numeric variables in the range [0,1]. The changes in expected agriculture tends E(T) and variance of corresponding trends V(T) are indicated by taking the following numerical example with different inputted data values in equation 5 and 7. The parameter of the mixed exponential distribution β, θ, c, λ, and η which is assumed area, wages of labour, machineries achievements, employment details and companies registration. Take different values, given in the following tables and figure respectivelyFigure captions appear below the figure, are flush left, and are in lower case letters. When referring to a figure in the body of the text, the abbreviation "Fig." is used. Figures should be numbered in the order they appear in the text.

Table 7: Agriculture Area, Wages, Machineries, Employment and Companies in Thiruvarur District

Sl. No.	Years	Net Area (in ha)	Agricultural Wages (in Rs.)		Achievement (in Hours)		Employment Office (in Nos.)		Reg. Companies (in Nos.)
			Men	Women	Tractor	Harvester	Registration	Placement	
1.	2010-2011	147091	167.65	88.88	14771	2603	147355	511	335
2.	2011-2012	148602	198.75	118.00	17061	3807	162667	432	316
3.	2012-2013	144985	228.00	100.00	19952	2400	187691	576	364
4.	2013-2014	146666	265.93	100.00	17627	1808	204182	433	556
5	2014-2015	151750	300.00	100.00	15710	1492	152828	472	606

Table 8: Normalizations of Agriculture Area, Wages, Machineries, Employment and Companies in Thiruvarur District

Sl. No.	Years	Net Area (β in ha)	Agricultural Wages (□ in Rs.)		Achievement (c in Hours)		Employment Office (□ in Nos.)		Reg. Companies (η in Nos.)
			Men	Women	Tractor	Harvester	Registration	Placement	
1.	2010-2011	0.4449	0.3166	0.3904	0.3859	0.4564	0.3824	0.4684	0.3315
2.	2011-2012	0.4493	0.3753	0.5183	0.4457	0.6675	0.4221	0.3960	0.3127
3.	2012-2013	0.4385	0.4306	0.4392	0.5213	0.4208	0.4871	0.5280	0.3602
4.	2013-2014	0.4436	0.5022	0.4392	0.4605	0.3170	0.5299	0.3969	0.5502
5	2014-2015	0.4590	0.5666	0.4392	0.4104	0.2616	0.3966	0.4327	0.5997

Table 9. Expected agriculture labours involvement E(T) and variations in V(T) with c = 0.1, λ = 0.1, η=0.1

β	θ = 0.4		θ = 0.5		θ = 0.6		θ = 0.8	
	E(T)	**V(T)**	**E(T)**	**V(T)**	**E(T)**	**V(T)**	**E(T)**	**V(T)**
0.4	13.3333	177.7780	12.8571	165.3060	12.5000	156.2500	12.0000	144.0000
0.5	13.8462	191.7160	13.3333	177.7780	12.9412	167.4740	12.3810	153.2880
0.6	14.2857	204.0820	13.7500	189.0620	13.3333	177.7780	12.7273	161.9830
0.7	14.6667	215.1110	14.1176	199.3080	13.6842	187.2580	13.0435	170.1320
0.8	15.0000	225.0000	14.4444	208.6420	14.0000	196.0000	13.3333	177.7780

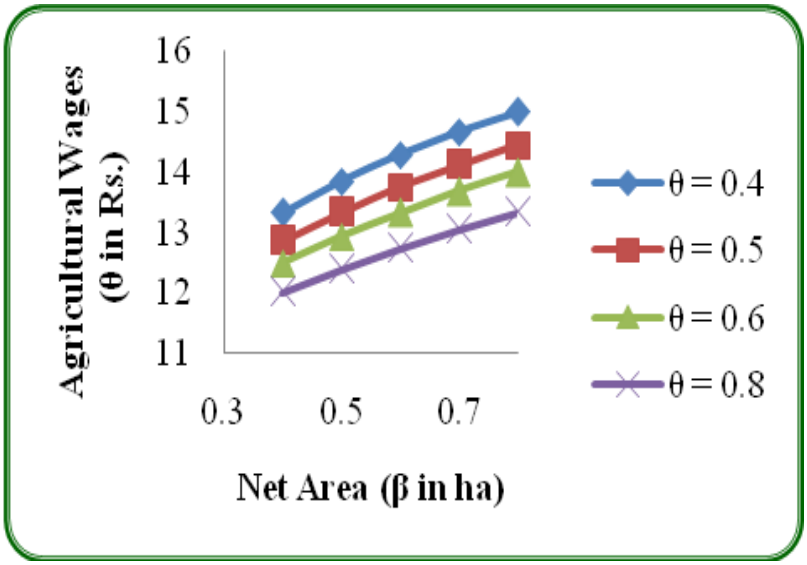


Fig. 9a: Expected Agriculture Labour Involvement E(T)

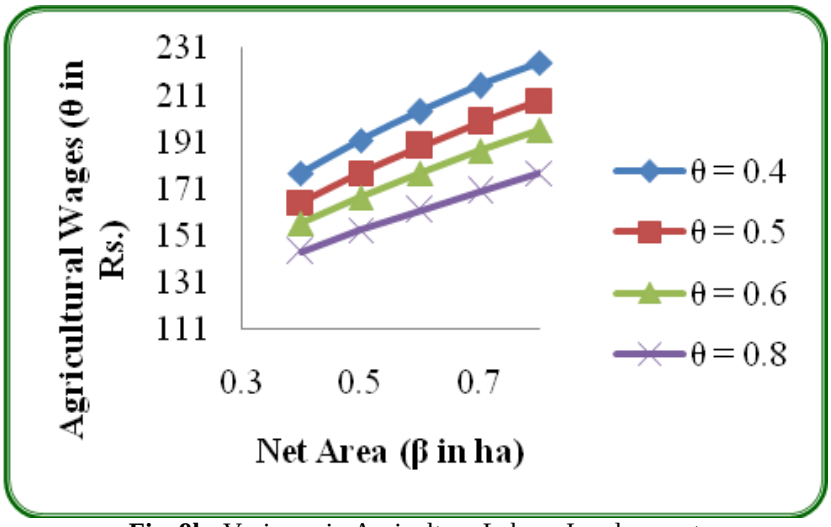


Fig. 9b: Variance in Agriculture Labour Involvement

V. Conclusions And Future Scope

The above data mining and stochastic approaches made some definition of the following conclusions. An analysis of various reports of NSSO and census of India shows that clearly in Fig. 1 and Fig. 2, the highlights that, between 2004-05 and 2011-12, a large percentage of the agricultural workforce across states moved away from agriculture. Nevertheless, the size of the workforce in this sector is expected to shrink by another 23 million in the next eight years till 2019-20 and form only 41% of the total workforce and this trend calls for immediate steps to improve labour productivity in the sector.In Table 1 and Fig. 3, compare the various types of workers such as main workers, marginal workers, cultivators, agriculture labours, household industry workers and other type of workers. Observation of different years of data, most of the agriculture related labours percentages are decreased year by year. The main workers reduced by 2.4%, marginal workers increased by

2.4%, cultivators percentage decreased by 1.3%, agriculture labours reduced by 3.2% and other type of workers increased highly in a percentage 4.4%. Based on the above percentages clearly seen that most of the agriculture related workers are shifted to other types of works. The daily wages for men increased gradually year by year at the same time labours shortage also occur, because labours not interested due to high physical stress, seasonal work and not enough for them to support their family. But women daily wages remains the same wages or not increased for last three years. Based on the Table 2 and Fig.4, wages is one of the main reasons for women labours migrate to non agriculture works. Due to the huge development of self help groups in women labours were diverted to other works and for handicrafts production. The target of agriculture mechanization activities increased year by year, as indicated in Table 3 and Fig. 5a and Fig. 5b. It is observed that, the utilization of machineries such as tractors and harvesters increased. In this observations the agriculture labours participation in agriculture related work is gradually decreased. The gross irrigated area increases yearly shown in Table 4 and Fig 6a and Fig. 6b although participation of labours decreased because farmers utilize mechanization.

Based on Table 5 and Fig. 7, the growth of literacy rate is 6.32%, compare with 2001 and 2011 census data in Thiruvarur district. The literacy rate increases yearly cause's awareness about the job with job security and more pay. The parents also not interested to do the same works as they do. This is another reason for decreased participation of agriculture labours in next generations. In Table 6 and Fig. 8 represents two decades of male and female population is increased, at the same time agriculture labours are decreased. It is clearly seen that participation of agriculture labours is decline. In Table 7 and Table 8, shows the times series and normalized data format of agriculture and other activities in Thiruvarur district. The name of the parameter and assumption of different mathematical terms such as irrigated area (in ha) mentioned as 'β'. The parameter 'θ' assume that agriculture wages (in Rs.), agriculture machineries achievements denoted as 'c' such as tractors and harvesters (in hours). 'λ' denoted as a details of employment registration and placement details (in nos.) and registered company details indicated in 'η'. Based on the above conclusions and the same to be prove that, the data mining using stochastic model, the parameter of irrigated area (β) increases year by year, then the expected agriculture labours involvement in agriculture works in E(T) and variance in V(T) also increased. The parameter 'θ' namely agriculture wages (in Rs.) of both male and female increased gradually, the expected agriculture labours involvement in agriculture activities in E(T) and variance in V(T) also increased in another way to increase the growth of agriculture labours as shows in result of Table 9 and Fig. 9a and Fig. 9b. Similarly the other parameters such as c, λ and η are involved in this model as the results are expected as to grow the agriculture labours. The field of agriculture is the majority predominantly in the developing countries like India. Use of different data mining approaches in agriculture and agriculture labours can revolutionize the situation of decision making and farmers can yield in better way. From the above results and discussion based on the stochastic approach of numerical illustrations, it can be seen that, the expected agriculture labours involvement in agriculture works performance increased. However it is a matter of importance that the proper and appropriate type of stochastic modeling for the concerned variables should be formulated theoretically only after the scrutiny of data set. In future scope to develop new stochastic model for predict the growth. In this model is not only applicable to agriculture but also in a wider context to use other social impact areas.

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