CHALLENGES IN PADDY CULTIVATION IN GODAVARI DISTRICTS OF ANDHRA PRADESH, INDIA: AN ASSESSMENT LITERATURE

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ABSTRACT

India is largely an agricultural dependent country and Agriculture is still contributing more than half of employment to Indian population and around 14% of its GDP. In recent times there is a growing distress among paddy farming community and it is evident from the decreasing land under paddy cultivation in India. What is more concerning in regard is the land under paddy cultivation is declining in the areas like Godavari districts of Andhra Pradesh, where the conditions are very much favorable to the paddy cultivation. The present paper tries to analyze different issues relating to paddy cultivation in these districts of Andhra Pradesh which are causing distress among paddy farmers and eventually leading to decrease in land under paddy cultivation. The present paper broadly concentrates on problems pertaining to the growing labour scarcity in agricultural sector due to structural transition in the labour markets and also to understand how prevailing conditions are not conducive for the farmers to mechanize their agricultural operations due to their low financial capacities and small land holdings. The present paper is based on review of literature as par as the problems involved in the paddy cultivation, the data is taken from the secondary sources and used simple statistical comparisons like percentages. In the present attempt it is understood that the profitability of farmers in paddy cultivation is decreasing due increasing cost of cultivation. The increasing cost of cultivation can be mainly attributed to raising labour cost year by year due increasing wages in agricultural sector and incapability of farmers in substituting labour with machine labour due small size of land holding and low financial capacities. In this regard certain suggestions are made; the first one is integrating the MGNREGS to agriculture, empowering the PACs to by machines to provide them on rental basis to the farmers and adopting group cultivation to overcome the labour problems and to improve the financial capacities of the farmers.

Key Words

Agriculture, paddy cultivation, agricultural distress, agricultural costs, agricultural mechanization, labour scarcity

1. Introduction

Agriculture plays a crucial role in the Indian economy both in terms of income and employment generation. As per the provisional estimates, Agriculture and allied activities contribute 17.1% and 14.8% of Gross value added (GVA) method at current prices and constant prices (2011-12) in 2017-18 respectively. According to report published by Federation of Indian chambers of commerce (FICCI) and industry in 2015 Agriculture is providing 49% of total employment of India in 2011-12.

Among the food crops, paddy occupies very important place in the Indian economy due to its share in total food grains production and land under cultivation. As per the pocket book of Agricultural Statistics 2017, 22.3% of total gross cropped area was under paddy cultivation in 2014-15, though it was down from 23.5% (1951), but still it was the highest among all the food crops in India. As per 4th advanced estimates, the expected production of food grains is 275.68 million tonnes in India. Out of total food grains production, rice is expected to be 110.15 million tonnes. Rice plays vital role in food security of the India, as it feeds more than half the population. It is projected that cereal requirement of India by 2020 will be in between 257 and 296 Million tonnes depending on income growth. The demand of rice and wheat are expected to increase to 122 and 103 million tonnes respectively by 2020 assuming a medium income growth (Kumar, P., 1998).

Decreasing land under paddy cultivation will become a real apprehension for India regarding its food security in near future. It is not only the case with India as a whole but also a state like Andhra Pradesh which is considered to be one of the agriculturally developed states. But what is more concerning in this regard is the decrease in land under paddy cultivation in Godavari districts of Andhra Pradesh even after having most favorable conditions for paddy. These districts has very fertile soils due to Godavari delta with proper canal irrigation facilities resulting in highest yields (6300 Kg/Ha on an average for Godavari districts) in paddy cultivation which is higher than the highest yielded state average of Punjab with 4360Kg/Ha in 2016-17.

The present paper attempts to look into the reasons for the decreasing land under paddy cultivation in Godavari districts of Andhra Pradesh despite above mentioned advantages. The paper is based on existing literature pertaining to the problems in Paddy cultivation of India in general and Godavari districts in particular. The paper used mostly secondary sources of data from

the existing literature published in different Journals and in government publications. Mainly simple statistical tools like percentages are used to compare costs and revenues in this paper.

2. Land under rice cultivation in India, Andhra Pradesh and Godavari Districts

The land under paddy cultivation in India, in the state of Andhra Pradesh and also in Godavari districts is gradually decreasing due to distress in the agriculture sector. From 2013-14 to 2016-17 the land under paddy cultivation was decreased by 2.15% in India, decreased by 18.50% in Andhra Pradesh and 5.13% decrease in Godavari districts.

2.1 Land under paddy cultivation in India

India has been witnessing a gradual decrease in land under paddy cultivation over the years, especially after 2000-2001. Since 1951 the area under paddy has been increased from 30.81 million hectares to 44.71 million hectares in 2000-01, but thereafter it has fallen to 43.19 million hectares in 2016-17.

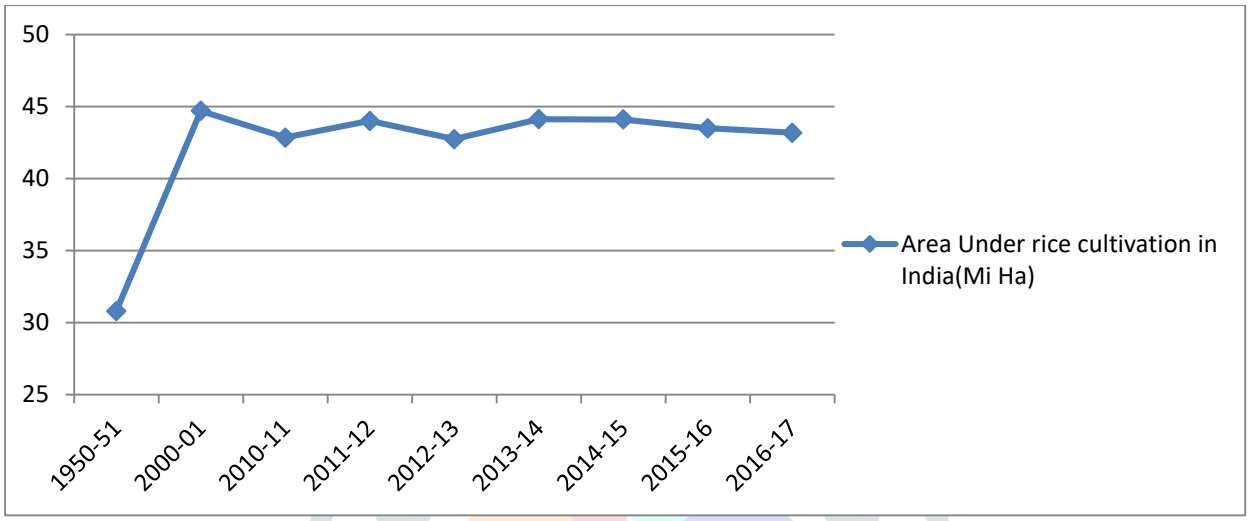

Fig. 1: Area under Paddy cultivation in India (1950-51 to 2016-17)

Source: Department of Agriculture, Cooperation & Farmers welfare

With the Fig.1, we can visualize that the land under paddy cultivation has been increasing since 1950-51. It is 30.81 million hectares in 1950-51 and was raised to 44.71Mi Ha in 2000-01 with 45.11% growth over 50 years, thereafter some fluctuations can be observed in the land under paddy cultivation. From 44.71 Mi Ha in 2000-01 it was declined to 42.86 Mi Ha in 2010-11, again rose to 44.14 Mi Ha in 2013-14 from thereafter there was a gradual decrease i.e. 44.11 Mi Ha in 2014-15, 43.5Mi Ha in 2015-16 and 43.19Mi Ha in 2016-17. The land under paddy cultivation in between 2013-14 and 20116-17 has decreased by 2.15%.

2.2. Declining land under paddy cultivation in Andhra Pradesh

Andhra Pradesh is one of the agriculturally developed states in India, with nearly 34.37% of its GSDP contributed by agriculture and employing nearly 60% of its population. Paddy is the major food crop in Andhra Pradesh with 14.77 Lakh hectares of 20.65 Lakh hectares under the total food grains production which constitutes 71.52% of land under total food grains in the state. Paddy cultivation is very important for the Andhra Pradesh due to its potential in providing employment and food security to the growing population. But in recent times Andhra Pradesh agriculture is also showing signs of distress and dissatisfaction due to unsatisfactory profits in the cultivation, especially the paddy cultivation has been under severe stress and eventually leading the farmers to slowly move away from the paddy cultivation. In the case of India as a whole there is 2.15% decrease in the land under paddy cultivation between 2013-14 and 2016-17, where in the case of Andhra Pradesh the decline is sharper with 10.73% decrease in the land under paddy cultivation during the same period.

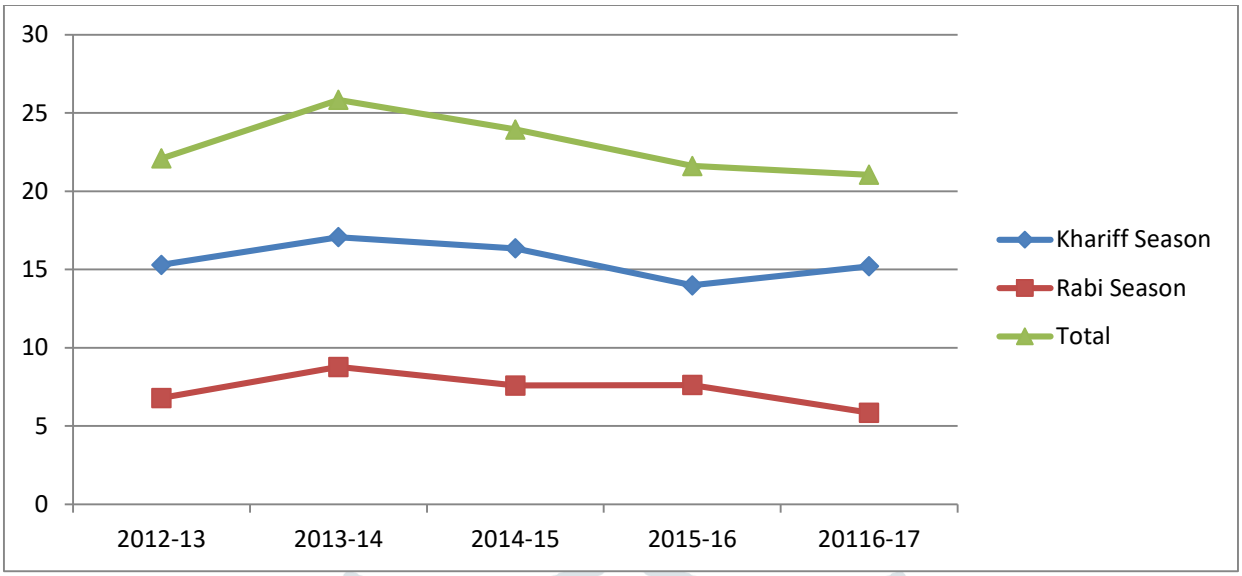

Fig. 2: Area under Paddy Cultivation in Andhra Pradesh

Source: AP Agriculture at glance 2016-17, Directorate of Economic and Statistics, Government of Andhra Pradesh.

Fig. 2 shows recent trend of land under paddy cultivation in Andhra Pradesh, where we can find that there is a gradual decrease in the land under paddy cultivation, especially since 2013-14. In 2013-14 the total land under paddy cultivation was 25.83 Lakh hectares which is come down to 21.05 Lakh hectares in 2016-17. This trend is mainly due to the decrease in the land under paddy cultivation in Rabi season where the decline is sharper than that of in the Khariff season. The land under Khariff season was declined from 17.06 Lakh hectares in 2013-14 to 15.02 Lakh hectares in 2016-17 with 10.9% decrease, whereas in the Rabi season it is declined from 8.77 Lakh hectares in 2013-14 to 5.85 Lakh hectares in 2016-17 at the rate of 33.29%.

2.3 Land under paddy cultivation in Godavari districts of Andhra Pradesh

East Godavari and West Godavari districts of Andhra Pradesh are generally called as Godavari districts which are adjacent to the delta region of river Godavari and they are known as rice bowl of Andhra Pradesh due their high share in the total land under paddy and total paddy production of state. In 2016-17 the total land under paddy cultivation in Andhra Pradesh was 21.05 Lakh hectares, out of which 7.83 Lakh hectares was cultivated in these two districts which constitutes 37.20% of total land under paddy cultivation of the state. As far as the production is concerned in the state, total paddy production in Andhra Pradesh for the year 2016-17 was 120.03 Lakh tonnes, of which 49.29 Lakh tones was produced in these districts which constitutes 41.06% in the total production, i.e. 37.20% of land under paddy cultivation is producing 41.06% of total production.

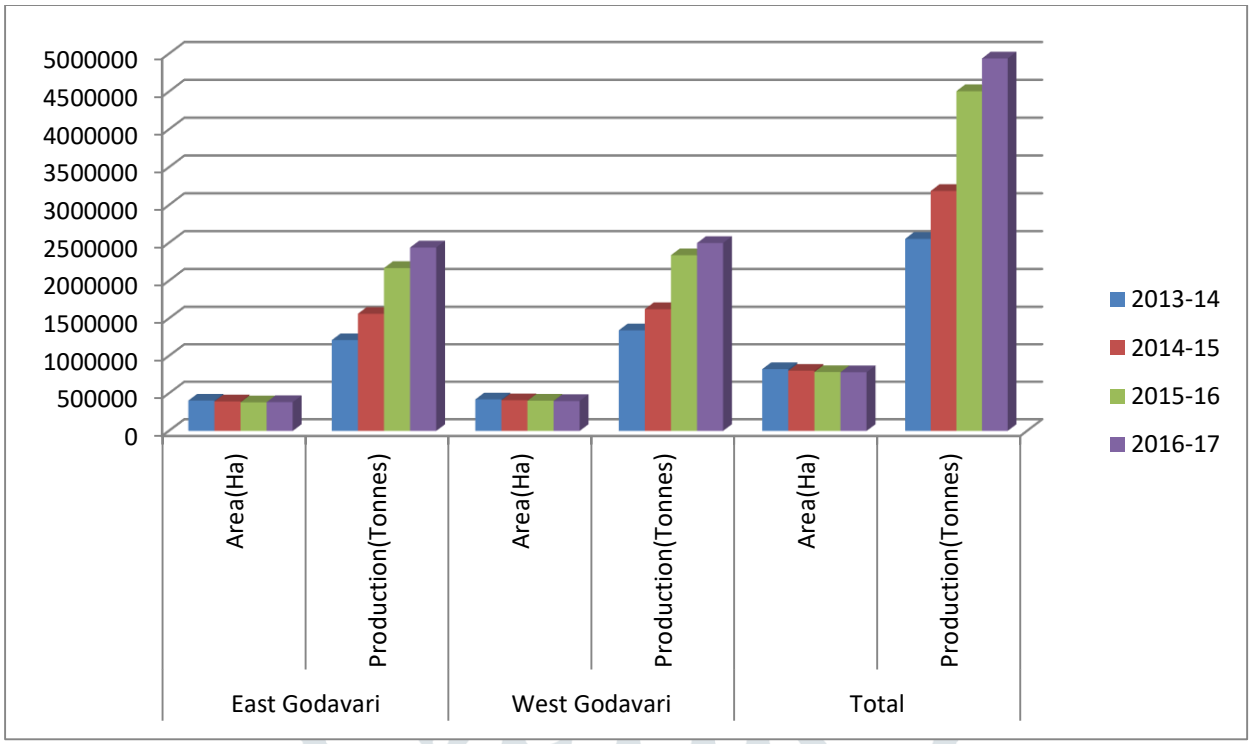

Fig. 3: Area under paddy cultivation in Godavari districts of Andhra Pradesh

Source: District report of East & West Godavari, Government of Andhra Pradesh 2016 and Agricultural statistics at glance, Directorate of Economics and statistics, government of Andhra Pradesh.

As shown in the Fig.3 the land under paddy cultivation in these districts has decreased from 825301Ha to 783000Ha since 2013-14 and 2016-17 at 5.13% decrease. What is concerning about the decrease in the land under paddy cultivation in Godavari districts is, despite having most favorable geographical conditions for the paddy cultivation, land under cultivation is decreasing year by year in these districts. The location advantage of these districts includes very fertile soil due to Godavari delta and located in the tropical climate zone which is most suitable for paddy cultivation and these districts also have an advantage of having proper irrigation facilities through canals from Sir Arthur Cotton barrage located at Dawaleswaram in East Godavari District. According district report of East Godavari and West Godavari out of 7,85,542 hectares of land under the Paddy cultivation 7,71,379 hectares was under irrigation i.e. 98% of the land under paddy cultivation is under the irrigated area. The other very important advantage of paddy cultivation in these districts is having very high yields when compared to the national average and state average due to above mentioned advantages.

According to the Fig. 4, the productivity of paddy cultivation in Andhra Pradesh (5702 Kg/Ha) in 2016-17 is 123% higher than the National average of 2550 Kg/Ha. When it comes to the case of Godavari districts of Andhra Pradesh the yield for the year 2016-17 stood at 6356 Kg/Ha and 6257 Kg/Ha for East Godavari and West Godavari districts respectively. The yield in East Godavari district is 149.25% higher than the National Average and 11.46% higher than the average yield of Andhra Pradesh, whereas the yield in West Godavari District is 145.37% higher than the national average and 9.73% higher than the average yield of Andhra Pradesh, Despite having the advantage of higher yields than state and national average, the farmers in these districts are not having remunerative profits which can induce them to continue with farming, hence we are witnessing decline in land under paddy cultivation. In support of this situation farmers expressed their distress by announcing crop holiday in delta regions of Godavari districts in 2011 to pressurize the government for the better policy towards the agricultural sector. According to farmers, the reason for the crop holiday was mainly due to the fact that the cultivation of paddy has become unviable due to rising costs and low, unviable minimum support price (MSP).

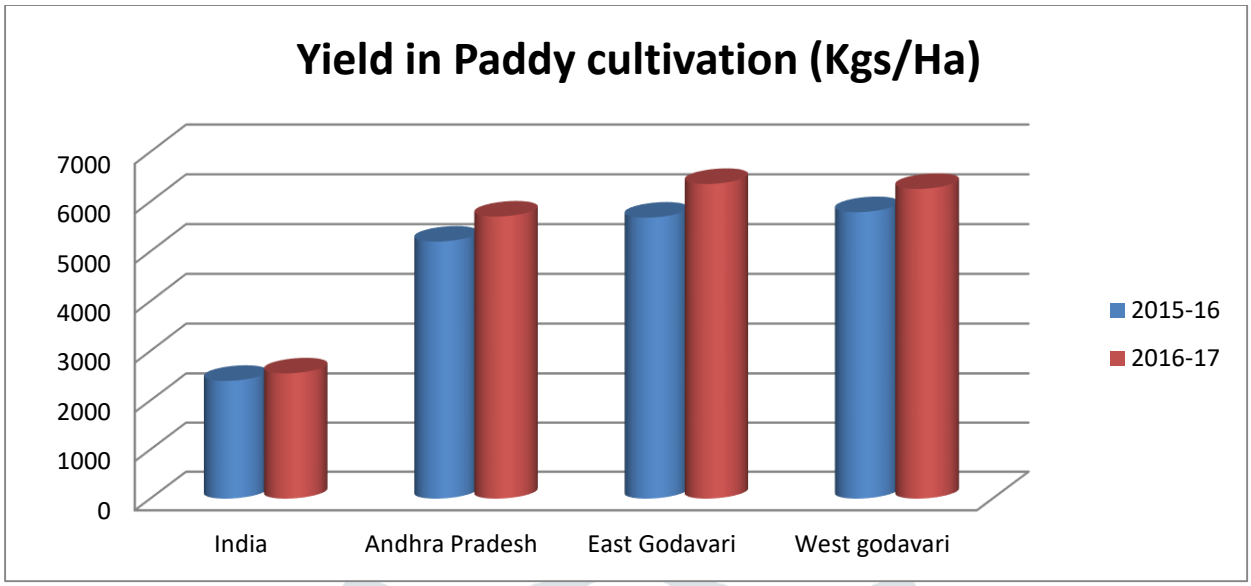

Fig.4: Comparison of yield in paddy cultivation

Source: Hand book of Agricultural statistics, Government of India 2017 and Agricultural statistics of Andhra Pradesh 2016-17, Directorate of Economics and Statistics, government of Andhra Pradesh

3. Analysis of Cost and returns in Paddy cultivation.

3.1. Details of cost and returns in paddy cultivation in India

Farmers in these districts are concerned about the profitability in the paddy cultivation as these profits are deteriorating year by year due to raising cost of paddy cultivation. By comparing the costs and revenues at national level and in these districts will give us a brief idea of differences in the profitability in paddy farming. By doing so, we can understand why the farmers in these districts are getting lower profits and eventually leading the farmer's displacement from paddy cultivation. Cultivation of paddy requires large quantities of inputs, particularly water, pesticides and fertilizers, contributing to high cost. Due to the disproportions in the cost of cultivation and returns are of the important reason for the dissatisfaction of the farmers.

Table 1: Cost of cultivation and Returns for paddy cultivation in India

Cost of cultivation for Paddy in India								
Year	**cost A2**	**Cost A2+FL (Rs/Ha)**	**Cost C2 (Rs/Ha)**	**GVO (Rs/Ha)**	**Gross Returns Over A2+FL (Rs/Ha)**	**Rate of Gross returns over A2+FL(%)**	**Net returns over C2 (Rs/Ha)**	**Net rate of returns Over C2 (%)**
2009-12		26604	37733	42282	15679	59	4550	12
2012-14	25179	33631	47547	53242	19611	58	5696	12
2014-15	28039	37451	53538	57803	20352	54	4265	8
2015-16	30247	40716		59144	18428	45		

Source: Commission for agricultural costs and Prices

According to the data published by the commission for the agricultural costs and prices as shown in the table 1, the cost of cultivation is on a rise in paddy cultivation in India. In 2009-12 the cost A2+FL for hectare was 26604 and was increased to 40716 in 2015-16. But returns from the paddy cultivation have grown from 42282 in 2009-12 to 59144 in 2015-16 at 39.87% as against 53.04% growth in cost of cultivation for the same period. The growth in the costs in the paddy cultivation have raised at greater pace than returns from paddy, Due to this difference in the growth rate between the cost of cultivation and returns from output, the rate of gross returns over A2+FL(%) have come down from the 59% in 2009-12 to 45% in 2015-16. It's not only the gross returns but the Net returns over C2 costs (Rs/Ha) has also decreased from 4550 to 4265 from 2009-12 to 2014-15, hence the net rate of returns over cost C2 (%) have come down from 12% in 2009-12 to 8% in 2014-15. The above data confirms the

decrease in the returns from the paddy cultivation is one of the important reasons for the decrease in the land under paddy cultivation in India.

3.2. Cost and returns of paddy Cultivation in Godavari Districts of Andhra Pradesh

East Godavari and West Godavari districts of Andhra Pradesh are witnessing the decline in the land under paddy cultivation in recent times due to declining profits from the paddy cultivation in these regions. The cost of cultivation in these districts is much higher than the All India average costs published by the commission for Agricultural costs and prices. According to the study conducted by the Samarpitha Athota and Korabandi Suhasini from Professor Jayasankar Telangana state agricultural university in 2013-14 in West Godavari District of Andhra Pradesh is confirming the above fact of higher costs in this region. Though the above study conducted in West Godavari district the same data is assumed to be relevant for the East Godavari district also due to the fact that these two districts are identical conditions in terms of all input prices including then labour wages and prices of the output.

Table 2: Costs and returns from the Paddy cultivation in West Godavari District of Andhra Pradesh (2013-14)

Farm Size	Cost A2+FL (Rs/Ha)	Cost C2 (Rs/Ha)	GVO (Rs/Ha)	Gross returns over A2+FL (Rs/Ha)	Rate of Gross Returns over A2+FL (%)	Net Returns over C2 (Rs/Ha)	Net Rate of returns over C2(%)
Marginal	54046.51	62845.02	65354.95	11308.44	20.92	2509.93	3.99
Small	54424.62	62618.06	65633.85	11209.23	20.59	3015.79	4.8
Semi Medium	57623.07	64618.06	67499.09	9876.02	17.13	2881.03	4.45
Medium	58256.69	66045.02	69171.88	10915.19	18.73	3126.86	4.73
Large	57388.74	68598.46	70658.33	13269.59	23.12	2059.87	3
All Farms	56347.93	64944.92	67663.62	11315.69	20.08	2718.7	4.18
All India Average*	33631	47547	53242	19611	58.31	5696	11.97

Source: Samarpitha A, et.al. (2017).

*All India Averages taken from the Commission for Agricultural costs and prices for the same period (2013-14)

Table 2 shows that the All India Average Cost A2+FL were Rs33631 which is much lower than the cost of cultivation for all categories of farmers in West Godavari District. Cost A2+FL (Rs/Ha) for the farmers in West Godavari were 54046.51 for marginal Farmers, Rs54424.62 for small farmers, 57623.07 for semi-medium farmers, 58256.69 for medium farmers, 57388.74 for the Large farmers and average of all farms was 56347.93. Due to this higher cost of cultivation in this region, the rate of Gross Returns over A2+FL (%) is much lower than the national average of 58.31%, in 2013-14 it was 20.92% and 20.59% respectively for the Marginal and Small farmers and 17.13%, 18.73% and 23.12% for the Semi medium, medium and large farmers respectively for farmers in West Godavari district. The average of all categories was 20.08%. So the rate of gross returns over A2+Fl (%) for all the categories of farmers and average of all categories are lower than the half of the national average. It is not only the case with the Rate of gross returns over A2+FL but also the Net rate of returns over Cost C2 (%) also much lower than the national average in these region. The national average net rate of return over C2 (%) was 11.97 in 2013-14 whereas for the same period it was 3.99% and 4.8% for marginal and small farmers respectively and 4.45%, 4.73% and 3% for the Semi-medium, medium and large farmers respectively for the farmers of West Godavari district.

4. Reasons for the Higher Costs in Godavari Districts

Higher costs in paddy cultivation in Godavari districts of Andhra Pradesh can be attributed to important reasons like raising labour wages when compared to the national average due to growing labour scarcity in agricultural sector and low level of mechanization in paddy cultivation in these regions despite the raising labour costs.

4.1. Higher wage rate, a reason for the higher cost of cultivation

An important reason for the higher costs in Godavari districts over All India Average costs as per the Commission for Agricultural costs and prices is that the wage rate taken for the calculation, where the commission has taken the wage rate published by the Directorate of economics and Statistics, Department of Agriculture, Cooperation and Farmers welfare was an average of wages in the country which are much lower than the ground reality of wages in these regions. As per my primary

observation in the study area reveals that the actual wage rate for men and women in these regions were Rs400 and Rs250 respectively in 2015-16, but according to the Directorate of economics and statistics the wage rates was Rs295.35 and Rs199.82 for men and women respectively in 2015-16. In 2017-18 the labour wages further increased Rs500 and Rs300 for men and women in agricultural sector. In the peak seasons like transplantation and harvesting, the wages are even more and reaching up to Rs600 and Rs 350 per Labour Day for men and women respectively as per the information furnished by the farmers. Due to this divergence in labour wages between the actual and data published by the directorate of Economics and Statistics, the cost of cultivation according to the CACP was much lower than the actual costs in these regions.

The role of raising wages in increasing cost of cultivation can be understood by having a glance at changing structure of cost of paddy cultivation over the period of time. From 2007-08 to 2014-15 the average cost inflation reached to the highest level of 13%, more than half of which was contributed by the rising labour cost alone (Shivendra kumar Srivastava, et. al. 2017). Due to the rapid increase in the cost from 2007-08 to 2014-15 the value of crop output deflated by the CPI_AL during the year 2014-15 was dropped to 2006-07 level. In real terms the net returns received by the farmers in 2014-15 were even less than the returns which they received ten years ago in 2005-06 (Shivendra kumar Srivastava, et. al. 2017).

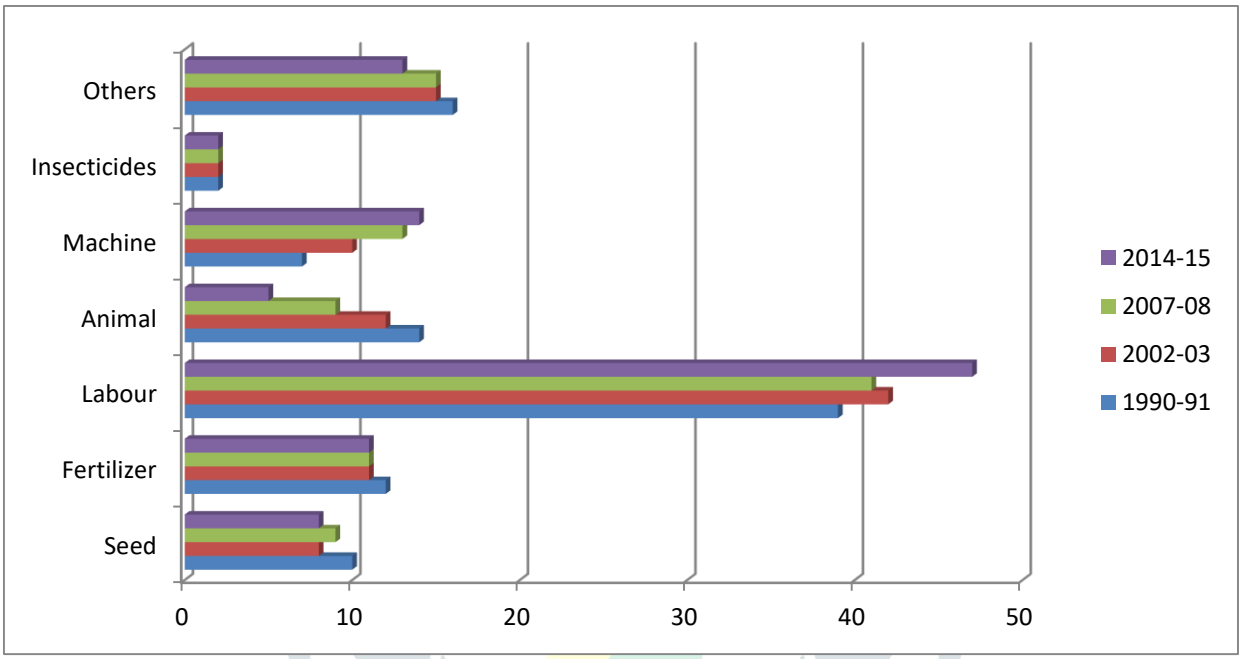

Diagram 5: Changing structure of cost of cultivation (1990-91 to 2014-15)

Source: Shivendra Kumar Srivastava, et.al. (2017); changing crop production cost in India: Input prices, Substitution and Technological effect; Agricultural Economic research review

A close look at the changing structure of cost of cultivation between 1990-91 to 2014-15 presented in Diagram 5 shows that cost share of all the variables except the labour and machine labour were decreased for the above mentioned period i.e. share of seed in total cost decreased from 10 to 8%, fertilizer share has decreased from 12 to 11%, Animal labour share decreased from 14 to 5%, others costs share was decreased from 16 to 13% in the total cost. Whereas the share of labour in the total cost increased from 39% to 47% and share of machine labour have increased from 7% to 14% in the total cost of cultivation. The reason for the increase in the share of machine labour cost in the total cost is mainly due to the increased use of machinery in the cultivation process by replacing animal labour with machinery. But the share of labour in the total cost of cultivation has increased not because increased use of lobour in the cultivation process but due to the increase in the wage rate of the agricultural labour. Empirical evidences show that increase in W/R ratio from 0.82 in 2001-02 to 1.03 in 2012-13 and this was accompanied by the increase in the ratio of the share of labour and machine in crop outlay from 2.6 to 3.5 during the same period (Shivendra kumar Srivastava, et al. 2017).

4b. Reasons for the rising wages in Godavari Districts

The Balassa-Samuelson effect holds good to explain the raising wages in agricultural sector, though the actual theory was advocated to explain the increase in wages of labour in non-tradable goods industry when there is increase in the wages of labour in tradable goods industry. According to their theory an increase in wages in the tradable goods sector of an emerging economy will also lead to higher wages in the non-tradable sector of the economy. The same reasoning can be applied to the organized and unorganized sector of an economy where the increased productivity in the organized sector will lead to increase in wages and inflation in the economy, which eventually leads to increase in the wages in unorganized sector where there is no proportionate increase in productivity or sometimes the productivity is constant or decreasing. The existence of labour unions in non-agriculture sectors like construction sector in rural areas is one important reason for the increase in the wages of farm labour.

These labour unions in these two districts are revising their wage rates year by year. Due to revision made by the labour unions in non-agricultural sector, the wages of labour in agriculture sector also following this rise in wages of labour non-agricultural sector.

Rural wages have been Growing by 17% on an average since 2006-07 and have outstripped urban wages (Goldman Sachs, 2014). The study found that share of households enrolled in Mahatma Gandhi national rural employment guarantee scheme (MGNREG) was indeed a significant explanatory factor for rural wage growth. Many other studies have also been concluded that the introduction of MGNREG has lead to the labour scarcity in the agricultural sector. In recent years it is being argued that the implementation of MGNREGS has increased the labour shortage and eventually leads to the wage rate hike in major food grains producing states which have forced to resort to mechanized farming (Reddy 2014). The launching of MGNREGS has been a response to provide safety net to agricultural labour, while the programme is believed to have affected an improvement in the livelihood security of a significant number of rural labour force, on the hand adverse effect of this programme is decreased labour availability in agricultural sector, notably during the peak agricultural seasons (Chand, et.al. 2014). The annual compound growth rate of wage rates from 2001-07 are negative for the many types of farm activities on both slack and peak seasons while growth rates are positive and much higher from 2007-12 for all farm activities (Reddy A A, et.al. 2014). Above claims were confirmed by another study conducted by A. Narayana moorthy, et.al (2014), according to them it is clear that labour cost in paddy cultivation has increased considerably after the introduction of MGNREGS in 10 out of 11 states considered for the analysis. The increase in machine labour cost is substantial in Andhra Pradesh (Rs 341/Ha) and Tamil Nadu (Rs322/Ha), this large increase in these two states could be due to increased labour scarcity after the introduction of MGNREGS.

The recent VDSA research at ICRISAT also confirmed the rising wages in Indian agriculture due to labour scarcity. According to the study, agricultural workforce reduced by 30.57 million with numbers dropping from 259 million in 2004-05 to 228 million in 2011-12. The drop is in large part due to increased opportunities with service and manufacturing sectors wooing the shrinking labour force with higher wages and more regular incomes. Study also revealed that farmers are struggling with higher wages to those laborers who are still working in agricultural sector. A study by an Abdul Jameel poverty Action lab (J-PAL) affiliate, conducted over randomly selected 250 sub-districts of Andhra Pradesh, found that an increase in public wages also lead to a consequent rise in the private wage by up to 24%. According to the study expansion of the multi-crore NREGS and growing construction sector, both in public and private sector has given labourers an alternative to farm labour jobs and has driven higher wage rates.

Another important reason for the growing labour scarcity in agriculture in these districts of East Godavari and West Godavari is due to large migrations to the Middle East countries. Many people who are migrating to Gulf Cooperation Countries (GCC) form these areas are largely unskilled and once they were agricultural labour. According to international labour organization report on Indian labour migration update 2018, a total of 8181319 Indian people are living in GCC countries of which 6224021 are male and 1957278 are female workers in 2015. From 2011 to 2017 India has granted 4704503 emigration clearances, out of which 7% (Approximately 330015) are from Andhra Pradesh. The Emigration from East Godavari and West Godavari is very much notable among all the districts of Andhra Pradesh is leading labour scarcity in the agricultural sector among these particular districts.

According to the report published by the FICCI in 2015 has also supported the above cited points about labour scarcity. As per this study, the six reasons for the labour scarcity in agriculture in the order of importance includes: the first one is Higher wages in other jobs available locally, the second one is Shifting to regular/permanent job since agriculture job is seasonal, the third one is that agricultural labour is presumed to be a esteemed job, the fourth one is migration to nearby city for higher wages, the fifth one includes migration due to improvement in educational status and last sixth reason is the migration to foreign countries.

5. Mechanization and cost of cultivation

Even after the increased share of labour in the total cost of production, farmers are not able to substitute the machine labour for human labour due to inelastic nature of substitution between labour and machine in Indian agriculture. The input elasticity of labour is 0.21, irrigation 0.25, seed 0.29, fertilizer 0.46 and machine 0.62 (Shivendra kumar Srivastava, et.al. 2017). The input elasticity of labour is 0.21 which is very inelastic in nature; this inelastic nature mainly arises due to non compatibility agricultural machinery which is imported from the developed countries. These machines are large and they were actually designed for the large farms, but in India majority of the farms are marginal and small. Another important reason for the non substitution machinery to the labour was, the Elasticity of substitution between the labour and machine in paddy cultivation was 0.73, tough the value is positive but less than one implies that labour and machine are inelastic substitutes to each other because 10% rise in W/R would result in 6.4% increase in ratio of K/L use (Shivendra kumar Srivastava, et.al. 2017).

Many farmers are not able to use machinery in most labour intensive activities of paddy cultivation (transplantation and harvesting) which are responsible for the major share of labour cost. The reason for not being able to use machinery is mainly due to the fact that the size of land holding is small. According to the Agricultural census 2010-11, at all India level 85% of the land holdings are marginal and small which are less than 2 hectares in size, comprising the 45% of land under cultivation. When it

comes to in case of Andhra Pradesh 86.08% of land holdings are marginal and small, which comprises of 54.89% of the total land under cultivation. When compared with national average both in terms of percentage of land holdings and percentage of area under cultivation under marginal and small holdings is higher in the state of Andhra Pradesh. As the size of land holdings are small and cost of farm machinery is very high, neither the farmers are capable of investing such huge investments nor it feasible for investing such huge investments in such small holdings.

Table 3: Size of Land holdings in India and Andhra Pradesh

Category of Holding	**Number of Holdings ('000 Number)**		**Area ('000 Hectares)**		**Average size of Holdings (Hectare)**	
	2010-2011		**2010-2011**		**2010-2011**	
	All India	**Andhra Pradesh**	**All India**	**Andhra Pradesh**	**All India**	**Andhra Pradesh**
Marginal (< 1 Ha)	92826(67.1)	8425(63.94)	35908(22.5)	3727(26.07)	0.39	0.44
Small (1-2 Ha)	24779(17.9)	2918(22.14)	35244(22.1)	4120(28.82)	1.42	1.41
Semi-Medium (2-4 Ha)	13896(10.0)	1399(10.61)	37705(23.6)	3685(25.78)	2.71	2.63
Medium (4-10 Ha)	5875(4.2)	397(3.01)	33828(21.2)	2209(15.45)	5.76	5.56
Large (>10 Ha)	973(0.7)	36(0.27)	16907(10.6)	552(3.86)	17.38	15.33
All Holdings	**138348(100)**	13175(100)	**159592(100)**	14293(100)	**1.15**	1.08

Source: Agricultural census 2010-11, Department of Agricultural & Cooperation, Ministry of agriculture, Government of India.

As discussed above many farmers are not able to buy their own machinery due to their financial weakness and small land holdings. If they have to use machine labour in the agriculture then they must depend on the hired machinery provided by individuals for the commercial purposes. Even though machinery is available on the rental basis, many farmers are reluctant to use them, as farmers are not benefiting much from the use of hired machinery. If we look at the three alternative approaches available in transplantation and harvesting i.e. the first one is doing it entirely by engaging daily labour, the second one is doing it by contract method where the farmer agrees to pay certain fixed amount for completing the given task and third one is using machinery. By looking at the costs involved in the three different methods we can come to a conclusion why the farmers are reluctant to use the machinery.

Table 4: Cost of Operation by different methods

	Transplantation(Rs/Ha)			**Harvesting(Rs/Ha)**		
	Manual	**Contract**	**Machine**	**Manual**	**Contract**	**Machine**
Manual Labour cost	10374	9880	0	18525	17290	0
Machine labour cost	7410	7410	15314	2470	2470	8645
Total	17784	17290	15314	20995	19760	8645

Table 4 shows the cost involved in the different operations by three methods. If we look at the transplantation per hectare, if it is done entirely by hiring labour it will cost the farmer Rs17784 of which Rs10374 for hiring labour and Rs7410 for hiring machine labour used for the preparation of the field for transplantation. If it is done through contract method it will costs the farmer Rs17290 per hectare where farmer is able to save Rs494 per hectare i.e. 2.78% lower than the manual method of transplanting. The third option for the farmer is hiring machine services for the transplantation which is costing him Rs15314 per hectare, where it costs less to the farmer by 13.89% and 11.43% when it is compared to manual and contract method respectively. Even after the knowing that farmer can save up to Rs2000 per hectare in transplantation, many farmers are reluctant to use the machinery because most of the farmers are in the myth that transplantation by machine will reduce the yield. On other hand, in these districts irrigation is done through canal system hence forth lands are low lying, also due to the Godavari delta soil in these regions are alluvial in nature, where the machines are not able to operate in many areas, hence many farmers are not able take the advantage of use of machinery even though they are interested.

When it comes to the case of harvesting, if farmer is harvesting by hiring manual labour it is costing Rs20995 (Per/Ha) and if he is harvesting by using contract method it is costing Rs19760 (Per/Ha) which is 5.89% less than the manual operation. But farmers have huge cost advantage by using hired machinery in harvesting, where it is costing him Rs8645 (Per/Ha), which is 58.83% and 56.25% lower cost than the manual and contract harvesting respectively. Even though there is a significant advantage of mechanized harvesting, still many farmers are not interested, Reasons for their reluctance includes, Primarily the variation in the price of output where the traders are paying Rs200 lesser for the paddy harvested through machines when compared to the paddy harvested by using the manual and contract methods. The important reason for the variation price lies in the fact that the paddy harvested by using manual and contract methods are more dry when it is compared to paddy harvested through machinery. Due to this divergence in the price of the output the farmers are losing by Rs12716 and Rs12514 as per the 2016-17 yields in the East Godavari and West Godavari district respectively. So whatever the cost that farmers are able to save by using machinery in the harvesting is nullified by the loss in the revenue due to the less price offered for the output. On the other hand if the farmer is harvesting through the machinery he is losing the income from the bye product like straw which is usually used as fodder for the cattle in rural areas, when the harvesting is done through the machinery the straw is cut in to the pieces hence the farmers are not able to sell it, whereas on the other hand if harvesting is done through the manual or contract method the farmers able to sell the straw, where they can earn up to Rs7410 (Per/Ha) which they are losing due to machine harvesting. Due to above discussed problems many farmers are not actually benefiting from the mechanization of farm activities in terms of reducing their cost of cultivation. This eventually becomes an obstacle for mechanization of farming in these regions. Scarcity of labour in these regions during peak agricultural seasons is forcing the farmers to engage machine labour, though it is not cost effective as discussed above.

6. Policy suggestions

A thorough analysis of existing literature and based on my primary observations, I would like to propose the following policy measures for the benefit of farmers in these particular discussed districts. A**s** per the many experts and chief ministers of different states are demanding, the integration of MGNREGS with agriculture will reduce the cost farming substantially and will eventually lead to the rise in farm incomes in India. To this existing demand I wanted to suggest the integration of MGNREGS to the agriculture and provide the labour support to the farmers from pre-showing to harvesting, which will ensure the reduction in cost of production to large extent as the cost of labour become the largest component in cost of cultivation of many crops in India.

The Second most important way in reducing the cost of cultivation is mechanization of farming. But it is very greedy to expect the Indian farming to be mechanized at this juncture as the cost of mechanization is very high when compare to the their size of land holdings and investing capacities. There are some governments providing the subsidies to buy the agricultural tools, but still many farmers are not affording to buy them because of their low financial status. To overcome these difficulties by farmers, here I would like to suggest the governments to think of linking the primary agricultural credit societies to farm mechanization. According to national federation of state cooperative banks Ltd, There are 93488 and 2807 primary agricultural credit societies in India and Andhra Pradesh respectively, which are primary touch points to the farmers with regard to agricultural credit. Government can empower these PACs to buy the required agricultural machinery according to the needs of crops grown in a particular area in which the PAC is located and provide them to farmers on rental basis by collecting minimum maintenance charges without profit motive, as these PACs are financially sound when compare to the individual farmers, with government support they can buy these machines. What the PACs can do is, instead of collecting the rent from the farmers, PACs can add rental amount in the farmer's agricultural loan and collect it in the end of the season after the harvesting, so that farmers debts from non-institutional finances at higher interest rates will be decreased. This step can benefit the farmers in two ways; first one is the timely availability of the machinery as it is available in the same village or nearby village instead of waiting for the private machinery which has to come from the different parts of the state and country. Most of the machinery which is used in the Godavari districts belongs to farmers in the states like Tamil Nadu who is hiring their machinery with help of some local meddle man. Second advantage from this measure will made the machinery available at lesser rents as cooperative societies are non-profit organizations.

Thirdly marginal and small farmers can look at the group farming as an alternative approach of farming. According to the study conducted and published by the Bina Agarawal in 2018 on group farming among the women groups in the states of Telangana and Kerala. The process of group farming involves all the small farmers voluntarily pool their resources (land, labour, capital and skills) to create a larger enterprise (but without forfeiting rights in any owned land), and create it jointly, sharing costs and benefits. According author, the resource pooling and joint farming will help the farmers to enhance their productivity and get favorable returns due to enlargement of farm size, Economies of scale, saving on hired labour and access to dependable labour especially in peak seasons, more funds for investing in machines and inputs, a large pool of skill and knowledge, greater bargaining power in input and output market and providing technical information and training. According to study it is observed that the women groups in the state of Kerala are getting better results when compare to the groups in the state of Telangana even though the cost of cultivation is high in Kerala, due to the greater productivity of land in Kerala. In Telangana women groups are not able to get the fertile land on lease as these groups are mainly consists of members from the scheduled castes and backward classes where the owners of the lands are afraid of leasing out to these groups due to the fear of losing their lands to these women in the form of pattas by the government. On the other hand in Kerala women groups are able to lease in fertile lands, due to this difference in the fertility of land there is large difference in terms of productivity which is leading to the higher returns to the Kerala women groups despite having higher costs. This concept of group cultivation can be used to the cultivation of paddy in the

Godavari districts and it may give positive results as the land available in these districts are very fertile and farmers are facing very serious problems with regards to the scarcity of labour.

7. Conclusions

Farmers of paddy cultivation in Godavari districts are under severe distress witnessed by decreased land under cultivation. The distress mainly attributed to the declining profits in paddy cultivation due to higher cost in this region when compare to the national average. The cost of cultivation in paddy is mainly increased due to the increase in labour wages and incomparability of mechanization. The agricultural labour wages are on a rise year by year on account of inadequate labour supply in the agricultural sector, which is mainly attributed to the structural transition in labour markets, where growing opportunities in non-farm sector and with improved educational status of young generations are not interested to join the agricultural labour force. The introduction of MGNREGS and migrations to the Middle East countries for the unskilled employment can be cited among other important reasons for the labour scarcity.

The problem of agricultural labour scarcity can be overcome with different policies like linking of MGNREGS with agriculture sector, improving level of farm mechanization by involving primary agricultural credit societies (PAC) as they are the primary touch point to the farmers in terms of credit needs also they are financially more empowered when compare to individual farmers who are largely small and marginal. Another way in which we can address the labour scarcity issue is by encouraging the group farming, where farmers can have more bargaining power in terms of buying inputs and selling their output, better labour availability and more financial resources at disbursal so that they can implement the farm mechanization as a group.

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