Profitability of Rice Production across Indian States

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Abstract

The aim of the study is to examine the pattern of profitability in case of rice production with respect to twelve major states of India over the period 1997-98 to 2014-15. Indian farmers are mostly marginal and small in many eastern States in India. This paper has tried to examine profitability according to farm size using cost of cultivation unit level data. It has been observed that with the increase of farm size the profitability increases. Another interesting observation is that as imputed costs of own factors of production namely wage cost family labour, rental value of own land and interest cost of own capital assets are taken into consideration the farmers profit becomes negative. For some states like Assam, Bihar, Orissa, West Bengal profitability is negative when their own factors of production cost are taken into consideration for the calculation of profit. The study will also help us to know determinants of profitability using aggregate state level panel data for twelve states over the period 1997 to 2014. It has been further observed that increase of seed cost share, fertiliser machine cost share enhance profitability but the enhancement of irrigation cost share reduces profitability.

Key Words: Profitability, Farm size, Agricultural growth, Panel Data, Cost of cultivation
JEL Classifications: Q 10, Q 11, Q 13, Q 18.

1. Introduction

Rice is the most important and fundamental food crop in India. It dominates the crop sector of Indian agriculture approximately more than 21 percent of gross cropped area in India and is treated as principal food to the people of India. Rice is believed to be the first cultivated crop in the world. Asia dominates in rice production accounting for over 90 percent of the total world's production in the world. Rice is majorly produced and consumed in South and East Asia which occupies almost 90 per cent share. It is the second largest cereal produced in the world after corn, where as India is in second position in terms of both production and consumption of rice. In 2013-14 India produced 106.65 million tones which declined marginally to 105.48 million tons in the year 2014-2015. The average share of rice production in India varied from 18 percent to 36 percent of the World production for the period 2000 to 2014-15. In 2001 – 2002 India produced 23.23 percent of the world production as in 2002-2003 the share came down to 18 percent. It increased to 22.25 percent in 2011- 2012 and further increased to 41 percent in 2014-15. Although India has large share in global rice production, productivity at 3 tons per hectare is lower than top rice producers in terms of per hectare productivity. In India we have observed growing distress among small and marginal farms across India as evidenced from the news media, by the growing number of farmer

suicides. The high incidence of farmer suicides among small farmers thus raises doubts about the historical inverse relationship between farm size and productivity. Over two lakh farmers committed suicides in India between 1990-91 and 2009-10 and the proportion is alarmingly high in States like Maharashtra, Andhra Pradesh and Karnataka (Sainath, 2010). Given this background in this paper we are trying to examine whether it is profitable to produce rice crop taking into consideration all the input cost. Why is this happening in India? What factors are responsible for it? What is the scenario of rice farmers in India across different states? Are they equally affected? Given this status of agriculture we have to know the profitability of rice production in India. Although India is a large producer the question arises is it profitable to produce rice across all states? What are the determinants of profitability of rice? How the profitability of rice varies across different types of farmers namely marginal, small, medium, large. Moreover if the cost of imputed value of the family labour, rental value of own land, imputed interest of the own capital assets are taken into account will the production be profitable? In this paper we have tried to answer these questions related to the profitability of rice considering the return from rice production and different costs incurred. Profitability is the result of the subtraction of cost from the value of production. We have examined how the value of rice production vis a vis cost of the production is performing. If the costs increase at higher rate than the enhancement of value of production the profitability will fall. In this case cost of cultivation has been taken into account for the calculation of profitability. Farmers incur two types of cost. Firstly the farmers incur actual cost. Secondly the farmers have imputed cost value of the own labour, rental value of own land and interest cost of own capital assets. Many times when actually calculating the profitability the imputed cost of own factors of production are not taken into account. So it seems that there is profitability but when imputed cost of own factors of production are taken into account the profitability falls. This feature represents disguised unemployment. In this paper we are trying to observe whether there exists profitability of the farmers even after incorporating costs of own factors of production. Moreover we will examine whether the profitability varies according to size class of the farms or not. Then lastly we will examine the determinants of profitability in terms of cost share of different inputs. We have examined the impact of relative share of increase of which input cost increases profitability and which reduces profitability.

In this paper Section-I is the introductory section. Section –II presents the literature survey. Section-III deals with data and methodology used. Section-IV represents Results and analysis. Section –V is the concluding section.

2. Literature Review

From mid nineties farmer's suicide became a serious problem so a large number of studies focused in this area. Some researchers like Deshpande (2002),Misra (2006), Reddy and Gulab(2006) stated that low productivity, insufficient supply of institutional credit and market imperfections are the main reasons responsible for this critical situation. According to National Commission on Farmers(NCF) the inadequate return from the crop cultivation ,meeting all types of cost is the main factor for this agrarian crisis and farmers suicides(NCF, 2006). Narayanamoorthy (2006) examined the agriculture income, mainly the farmer's income across major states in India and demonstrated that average farm income for India was only Rs 11,628 and the per day income of the farming household was just Rs 32 for the year 2002-2003 The pathetic situation of the farming household has also been divulged by the Expert Group on Agricultural Indebtedness under the Chairmanship of Prof. R. Radhakrishna (GOI, 2007).Chand et al(2015) have estimated farmer's income over the past thirty year. The income earned by the farmers from the agricultural activities has been calculated after paying for the input costs including wages for hired labour. According to him high growth rate of

wage in different periods may have reduced farmer's income sometime. Another set of literature has dealt with the issue of profitability with farm size. The small famers because of lack of financial resources are incapable of undertaking mechanization. So they have failed to keep pace with rising input prices including enhancement of wage labour cost and economies of scale. They have in many cases incurred higher losses than large farmers who are benefitting from economies of scale and mechanization. Farm size and profitability issue is very important in the context of improving the conditions of farmers in India where the majority of famers are marginal and small. Existing literature has not focused much on this issue. Some literature like Rahman(2003), Wadud & White, (2000) , Deb (1995), Thapa (2007), have tried to throw some light in this regard. The relationship between farm profitability and farm size in Bangaldesh has been studied by Rahaman(2003). Rice is cultivated on 75% of total cropped land in Bangladesh and it is the primary source of income for large section of people in Bangladesh. Moreover farmers in Bangladesh are predominantly small and marginal. For all these reasons Bangladesh has been chosen in order to find the relation between profitability and condition of small farmers in Bangladesh. There exists disparities across different states with respect to profitability although Bhalla and Singh(2012) have commented that the condition of marginal and small farmers are worse and severe than medium and large farmers specially in rainfed areas where even after investing in irrigation they have failed to get the result. This has driven them towards indebtedness especially for the cotton and paddy farmers in Telengana and Maharashtra (Kennedy and King, 2014). Researchers in large numbers have covered the distress of marginal and small farmers using micro level data covering mainly cash crops like cotton and sugarcane. According to some researchers Green Revolution is responsible for the pathetic situation of small and marginal farmers and they have not considered the benefits earned by India due to Green Revolution (Vasavi, 2010). There are not many studies which have examined detailed analysis of profitability of specific crops over a period of time using cost of cultivation data. According to some researchers like Kalamkar and Narayanamoorthy (2003), Narayanamoorthy (2006), Deshpande and Arora (2010), Sainath(2010), Bhatia(2006) the stagnation of real income of farmers is due to relatively higher prices of inputs than the prices of agricultural produce. Using CACP data it has been shown that income per hectare in the production of paddy at current prices did not show increase during the period from 1996-97 to 2002-2003 in Andhra Pradesh and it has declined in West Bengal. The farm income when deflated by Consumer Price Index of Agriculture labourers(CPIAL) has declined further in West Bengal. The profitability of cultivation of rice in major rice producing states like West Bengal and Andhra Pradesh declined during the period 1995 to 2002. According to Gulati hike in MSP is needed to get positive returns of the agricultural produce and also to propel agricultural GDP. But according to Bhalla(2012) increasing MSP of paddy is "dirty economics and dirtier politics". Dev and Rao (2010) have studied the profitability of paddy and wheat using cost of cultivation data from 1981-82 to 2007-2008 mainly focusing on impact of MSP on the farm income. They observed that the value of output has been more than the costs of wheat and paddy for the whole period of analysis at the all India level. Narayanamoorthy (2013) analyzing data on six crops for the period from 1975-76 to 2006-07 have observed that there is insignificant increase in profitability of production of food grain crops because of profound increase in cost of cultivation (cost C2). Reddy(2015) using cost of cultivation data has shown that there is gap in terms of yields , gross returns and profitability between bottom 25 percent and top 25 percent (based on farm size) of the farmers. The condition of tenant-small farmers is worse than others due to high land rents (50 per cent of total cost). In some of the states like Haryana, Andhra Pradesh , Punjab, Tamil nadu and Gujarat the farmers are getting reasonable returns and profits from agriculture, whereas in some states like Orissa, Bihar, Assam, Maharashtra , West Bengal the farmers are earning marginal returns. Singh et al (2021) has shown that although production of rice has increased due to technological changes most of the

states have registered negative profitability in case of rice cultivation. They have also stated that rice should not be preferred crop of production in many states of India because it is highly water consuming in nature and so the sustainability of ground water is threatened by paddy production in many dry parts of India. Ahmed et al (2019) have also tried to examine the growth rate and tried to determine the factors responsible for the growth rate. The study has revealed that use of use of modern variety of seeds and improved quality of fertilizers are responsible for the growth of food grains. The literature survey shows that most of the studies have focused on the estimation of the returns from the agriculture but in Indian context none of the studies have compared profitability across different types of farms over time across different states particularly for rice. There exists a research gap in terms of examining profitability of rice production across different states of India over time. Moreover none of the studies have tried to compare the profitability of marginal farmers overtime. Is the condition of small, marginal farmers deteriorating? Are the conditions of marginal farms in WB same as that of marginal farmers of AP, Punjab, Haryana? Moreover determinants of profitability have not been considered. Many studies have pointed out that growth has increased due to technological improvements but are they profitable? This study is an attempt to find out the trends in the profitability of major crop, rice in India i.e. paddy over twelve major rice producing states in India considering cost of cultivation data over the period from 1997 to 2014. The return on cultivation of rice has been considered by incorporating the actual costs paid by the farmers and also by taking into account imputed value cost of own factors of production.

3. Data Used and Methodology

The study is based on the secondary data collected from the publications of the Department of Agriculture and Department of Statistics, Govt. of India. This study utilizes the data on cost of cultivation survey compiled from the various reports of the CACP. It covers data starting from the period 1997-98 to 2014-15. This published data is available from CACP (Commission on Agriculture Cost and Prices). Our aim is to find out the profitability of paddy for twelve different states. These have been selected on the basis of states having major share either in area or production of the paddy. The costs and value are all in terms of per hectare of land.

V= Value of the output

CACP has been using different cost concepts. These are the followings:

Cost A1 = All actual expenses in cash and kind incurred in production by owner. Cost A2 = Cost A1 + rent paid for leased-in land.
Cost A2+ FL = Cost A2 + imputed value of family labour.

Cost B1 = Cost A1 + interest on value of owned capital assets (excluding land).
Cost B2 = Cost B1 + rental value of owned land (net of land revenue) and rent paid for leased-in land. Cost C1 = Cost B1 + imputed value of family labour.
Cost C2 = Cost B2 + imputed value of family labour.

Cost A2 has been used for calculating profit despite the fact that cost A2 does not cover interest on value of owned capital assets, rent for owned land, imputed cost of family labour which would form substantial share in modern agriculture today. So, in this study, we have worked with two cost concepts namely cost C2 and cost A2 to find out the profitability (returns over cost of cultivation) of different crops selected for the analysis. Both C2 and A2

costs have been considered for the calculation of profitability. In case of A2 "costs of different types of labour namely attached labour, casual labour, hired and owned animal labour along with other costs like seed cost, insecticides costs , manure cost , fertilizer cost , land revenue, depreciation, irrigation cost (own plus hired), machine(own and hired charges) and rent paid for leased in land are included". C2 costs include all A2 costs as well as interest on fixed cost, imputed rent on owned land, land revenue, imputed value of family labour. "The cost C2 was cost A2 + interest on fixed capital + imputed rent on owned land- land revenue+ imputed value of family labour. The main difference between A2 and C2 is that C2 includes imputed value of family labour and rental value of own land and interest of owned capital asset". This chapter 5 wants to examine how the profitability changes by incorporating A2 and C2 costs. Profitability has been calculated by deducting C2 and A2 costs from the value of the output (V). If the value of V-C2 is positive then the states are profitable even after including all the costs including the imputed value of the own factors of production. Alternatively V/C2 and V/ A2 have been calculated if this ratio is greater than one the farms are profitable and if this ratio is less than one then the farms are not profitable. The study is based on secondary data where twelve states were purposively chosen as the study area. Fixed effect panel data regression analysis has been used by examining the determinants of the profit variable. Whenever we refer to a fixed-effects model, we mean the conditional fixed-effects model. Here, using Stata we have got the factors which are most responsible for earning profit. In this research analysis V/C2, V/A2, V-C2, V-A2, (V-C2)/C2 and (V-A2)/A2 (for eliminating effect of price change) have been used as a measurement of profitability or return. For the panel data regression the study has utilized the aggregate data of each state over a period of 18 years. Panel data is also used to view the unobserved factors affecting the dependent variable as consisting of two types: those that are constant and those that vary over time. Letting i denote the cross-sectional unit and t the time period, we can write a model with a single observed explanatory variable as:

$$y_{it} = \alpha_i + \beta_1 x_{it} + u_{it}, \quad t=1,2$$

In the notation y_{it}, i denotes the factor affecting agricultural profitability, and t denotes the time period. The variable a_i captures all unobserved, time-constant factors that affect y_{it}, a_i is called an unobserved effect, sometimes also referred to as a fixed effect. a_i is fixed over time where as u_{it} is time varying error term. a_i *is also* termed as unobserved heterogeneity. This intercept term is correlated with the explanatory variables. Here, a simple fixed effect model has been applied to find out determinants of profitability. Both random and fixed models have been carried out but Hausman test has confirmed use of fixed effect in this case.

Objectives of the Study

The broad objective of this study is to analyze the profitability of the farms incorporating various cost concepts. Firstly we will try to show whether profitability exists even after incorporating imputed cost of the family labour, own rental value of land, and interest value of owned assets. The profitability of rice production has been calculated using A2 cost that is the actual incurred cost and also by incorporating C2 cost that is by incorporating imputed cost value of own factors of production namely family labour, own land and interest value own capital assets. Secondly we will examine whether the profitability varies according to size class. The relation between farm size and profitability for selected states i.e. how profitability varies with small-scale, large scale and marginal farmers according to different states is also a key objective of our study. We are trying to examine whether the profitability differs according to size class and across states that is the profitability of marginal farmers are

different in different states. Thirdly, we have tried to examine the factors affecting the profitability, so, the specific objective is, to examine which factor cost shares are responsible for high return or profitability for rice production in India. Our study is unique from the side of time span. In this paper our study period is 1997-98 to 2014- 15 which is the most current data compared with other profitability studies.

4. Data Analysis

4.1

Now we will discuss the relationship between farm size and profitability for major rice producing states in two different time points year 2000 and 2014. This study has been mainly based on cost of cultivation farm level data. Here, we have considered five categories of farm for example, Marginal (0-1 hectare), small (1-2 hectare), Semi-medium(2-4 hectare), Medium(4-10hectare) and Large(greater than 9). But the actual position of farms is different according to states, that is, the profitability of marginal farms in WB differs from marginal farms in Punjab. The reason behind this is either in AP and Punjab farm's revenue or profit level is higher than WB or in WB cost of farming is higher than other states. The profitability at the farm level has been calculated for the two respective years namely 2000 and 2014 for major rice producing states. We have considered farm level data available from the CACP provide the details of website address. In the appendix we have presented the sample of farms under each size class for the two years for all the states under consideration. The data used for our analysis consist of sample farms collected from each state. We have worked with farm level data collected from the cost of cultivation, of the Ministry of Agriculture and Farmer's welfare. For two respective years 2000 and 2014 we have sample of farms from each of the states. We have tried to classify the farms of this sample data into farms of different size classes. The table-A1(appendix) below contains the number of rice producing farms collected from each state. Table-A2(appendix) represents the percentage of each type of farms according to size classes.

The scenario of profit according to farm size has been discussed with the help of the following tables.

Table 1: Trend in Profitability (V-A2) for the year 2000 (value in terms of Rupees per hectare.)

	WB	*AP*	Punjab	Assam	Bihar	Haryana	MP	Kerala	Karnataka	TN	UP	Orissa
MARGINAL (01Hec)	*1934.31*	*5833.21*	8263.45	2013.62	1993.2	8839.26	3998.23	5139.21	6334.59	5334.42	5893.15	1301.52
SMALL ((1Hec-Hec)	*1447.709*	*20098.07*	24139.12	2315.91	2055.19	25134.33	18265.19	19089.72	20043.28	18084.27	10842.28	2049.31
SEMI-MEDIUM (2Hec-4Hec)	7927.8	*44150.13*	52139.71		2931.22	58224.63	41163.34	41139.23	43398.43	41443.19	41135.29	
MEDIUM (4Hec10He)		*73745.31*	101089.19			103948.2		78859.32	80456.51	79895.15		
LARGE (> 10 Hec.)		*179759.24*						180651.2	178795.42			

Source: Author's calculation based on CACP data.

From the table 1 it is observed that the profitabilities are positive for all states, but the eastern states like WB, ORISSA, BIHAR have much lower profitability per hectare compared to Punjab, Haryana, TN, AP.

Table 2: Trend in profitability (V/A2) for the year 2000

	WB	AP	PUNJAB	ASSAM	BIHAR	HARYANA	MP	KERELA	KARNATAKA	TN	UP	ORISSA
MARGINAL (0-1 HEC)	1.71	1.9	2.39	1.22	1.85	2.43	1.99	1.44	1.62	2.09	1.81	1.52
SMALL (1 HEC- 2 HEC)	1.57	2.24	2.7	1.62	2.02	2.71	2.2	2.19	2.22	2.2	1.98	1.32
SEMI MEDIUM (2 HEC – 4 HEC)		2.38	3.16		2.38	3.29	2.91	2.39	2.38	2.39	2.04	
MEDIUM (4HEC – 9 HEC)		2.17	3.43			3.62		2.48	2.36	2.58		
LARGE (> 10 HEC)		2.55						2.56	2.55			

Source: Author's calculation based on CACP data.

From the table 2 it is observed that the ratio value by cost A2 is greater than one for all states, but this ratio is much higher for states Punjab, Haryana, TN than the eastern states, WB, ORISSA, BIHAR.

Table 3: Trend in profitability (V-C2) for the year 2000

	WB	AP	PUN JAB	ASS AM	BIH AR	HARY ANA	MP	KER ALA	KARNA TAKA	TN	UP	ORI SSA
MARGINAL(0-1Hec)	-1409.06	-294.19	360.71	-1029.32	-431.29	3651.32	-550.43	-199.01	1153.51	1058.53	-439.22	-1425.21
SMALL((1Hec-2Hec)	-4466.573	6121.41	11910.9	-1326.31	1425.23	13915.15	2813.51	5218.18	6584.44	5338.27	1019.52	-1822.75
SEMI-MEDIUM(2Hec-4Hec)	-3068.62	17566.97	26015.3		17814.51	26813.21	11222.13	15580.82	12822.18	17121.23	9528.68	
MEDIUM(4Hec-9Hec)		27307.37	58202.95			60580.55		28312.13	30521.59	25570.17		
LARGE(>10Hec)		71830.22						72560.39	71228.28			

Source: Author's calculation using CACP data

From the table -3 it is observed that when C2 cost has been taken into consideration then small and marginal farms in eastern states are having negative profit.

Table 4: Trend in profitability (V/C2) for the year 2000

	WB	AP	PUNJ AB	ASS AM	BIH AR	HARY ANA	M P	KERA LA	KARNAT AKA	TN	UP	ORIS SA
MARGINA L(0-1Hec)	0.81	0.98	1.27	0.78	0.82	1.39	1.06	0.88	0.93	1	0.83	0.7
SMALL((1Hec-2Hec)	0.86	1.2	1.42	0.84	0.88	1.48	1.27	1.18	1.19	1.17	1.13	0.89
SEMI- MEDIUM(2Hec- 4Hec)	0.88	1.29	1.51		1.01	1.57	1.43	1.28	1.28	1.29	1.23	
MEDIUM(4Hec-9Hec)		1.25	1.63			1.64		1.25	1.32	1.31		
LARGE(> 10 Hectare)		1.32						1.34	1.4			

Source: Author's Calculation using Cost of Cultivation data, Ministry of Agriculture.

From the table 4 it is observed that the ratio of value V by C2 cost is less than one for eastern states like WB, Orissa, Bihar indicating there is no profitability for eastern states when C2 cost has been taken into consideration.

From the above tables 1, 2, 3, and Table 4 it is observed that there exists profitability for all the states when A2 costs are taken into account. But when C2 is considered then in case of WB and Orissa the marginal and small farms are having negative profit for the year 2000. But in Punjab, Haryana, Karnataka, TN the farms are profitable even when C2 cost are taken into consideration for the year 2000. Moreover another interesting feature of the study is that profitability of the farms increase as the farms increase in size for AP, Punjab, Haryana, Karnataka, MP, TN etc. i.e for maximum states except WB, Assam, and Orissa. The marginal farms in AP, Punjab, Haryana, Karnataka, Kerala ,TN, Bihar, MP are much more profitable than the marginal farms of WB, Assam and Orissa .

Table 5: Trend in profitability (V-A2) for the year 2014

	WB	AP	PUNJAB	ASSAM	BIHAR	HARYANA	MP	KERALA	KARNATAKA	TN	UP	ORISSA
MARGINAL (0-1Hec)	6756.56	22307.45	36930.24	6519.32	8575.29	35318.2	18127.21	26509.3	20121.31	18512.58	17191.82	5991.15
SMALL((1Hec-2Hec)	35581.53	59754.72	90097.71	33325.19	37121.45	87121.22	42281.39	63478.27	55118.58	48309.45	42526.17	31218.92
SEMI-MEDIUM(2Hec-4Hec)		115134.35	175225.76		95394.38	180128.4	110518.5	127111.1	116535.14	107812.49	104128.59	
MEDIUM(4Hec-9Hec)		225030.38	345515.65			317525.4		229515.3	217110.07	210619.15		
LARGE(> 10 Hectare)												

Source: Author's Calculation using Cost of Cultivation data, Ministry of Agriculture.

From the table 5 it is observed that profitability is positive for all states, but the profit levels are much higher for Punjab, Haryana, AP, Karnataka compared to eastern states WB, Orissa

Table 6: Trend in profitability (V/A2) for the year 2014

	WB	AP	PUNJAB	ASSAM	BIHAR	HARYANA	MP	KERALA	KARNATAKA	TN
MARGINAL(0-1Hec)	1.81	2.05	3.57	1.71	1.84	3.53	1.9	2.13	2.09	1.97
SMALL((1Hec-2Hec)	1.95	2.18	3.56	1.91	2.14	3.5	2.18	2.24	2.15	2.11
SEMI- MEDIUM(2Hec-4Hec)		2.26	3.81		2.26	3.82	2.18	2.32	2.24	2.23
MEDIUM(4Hec-9Hec)		2.44	3.87			3.93	2.35	2.46	2.41	2.39
LARGE(> 10 Hectare)										

Source: Author's Calculation using Cost of Cultivation data, Ministry of Agriculture.

From the table-6 it is observed that when the ratio V/A2 is being considered the ratio is greater than one for all states but the ratio is much higher for the states like Haryana, Punjab, Karnataka.

Table 7: Trend in profitability (V-C2) for the year 2014

	WB	AP	PUNJAB	ASSAM	BIHAR	HARYANA	MP	KERALA	KARNATAKA	TN	UP	ORISSA
MARGINAL (0-1Hec)	-1748.59	1134.44	21558.32	-1954.21	975.74	22571.21	-428.59	1528.23	998.19	1018.21	418.29	-2453.19
SMALL (1Hec-2Hec)	10006.9	16119.21	49706.57	9578.37	12522.39	49968.56	12535.91	20525.93	14521.54	14928.37	10109.08	9121.68
SEMI-MEDIUM (2Hec-4Hec)		39080.11	95739		30118.17	98512.28	29158.25	41122.59	32819.48	35119.84	25318.58	
MEDIUM (4Hec-9Hec)		94209.49	181601.03			190515.5		98515.62	81368.12	82778.19		
LARGE(> 10 Hectare)												

Source: Author's Calculation using Cost of Cultivation data, Ministry of Agriculture.

From the above table -7 it is being observed that marginal farms are earning negative profit for states like WB, Orissa, Assam. But another important result is that in states like Orissa ,

West Bengal and Assam the small farmers have improved their position in 2014 compared to 2000 as they are earning positive profit even when C2 cost have been considered.

Table 8: Trend in profitability (V/C2) for the year 2014

	W B	AP	PUN JAB	ASS AM	BIH AR	HARYA NA	M P	KERA LA	KARNAT AKA	T N	U P	ORIS SA
MARGIN AL(0-1Hec)	0.9	1.02	1.62	0.89	0.98	1.59	0.98	1.08	1	1.04	0.95	0.84
SMALL((1Hec-2Hec)	1.11	1.15	1.56	1.02	1.09	1.55	1.12	1.18	1.11	1.14	1.1	1.09
SEMI-MEDIU M(2Hec-4Hec)		1.22	1.6		1.12	1.62	1.21	1.29	1.21	1.22	1.21	
MEDIU M(4Hec-9Hec)		1.3	1.55			1.56		1.35	1.28	1.3		
LARGE(> 10 Hectare)												

Source: Author's Calculation using Cost of Cultivation data, Ministry of Agriculture.

From the table 8 it has been observed that if V/C2 is being considered then although the marginal farms in WB , BIHAR, ORISSA, Assam have ratios less than one but the position of small farms have improved in 2014 compared to 2014. From the tables 5 , 6 , 7 and Table 8 we find for the year 2014 , the farms are profitable when A2 costs have been considered but when C2 cost has been considered then marginal farms of WB, Assam, MP and Orissa are not profitable. But the small farms have become profitable. The profitability gets increased with size of the farms. Now, we have observed that in 2000 the profit value is lesser for all types of farms as compared to 2014.Moreover for the year 2000 the profitability varies differently across different states in India and secondly large farms are more profitable compared to that of marginal and small farms. Moreover the marginal farms of WB, Assam, MP and Orissa are less profitable compared to that of marginal farms of Punjab, AP, Bihar, Kerala, Karnataka, TN, Haryana and UP.

4.2

Next we have tried to examine the determinants of profitability. In this section we have tried to examine the determinants of profitability. The aggregate level data on the cost of cultivation and value of the product per hectare of production ,provided by CACP for each state for each year have been used for the purpose of analysis. In this case the farm level data has not been used. The aggregate data provided for each state for each crop for year has been utilized for the purpose of analysis. Here, we have selected twelve states and paddy for the period 1997 to 2014. Here, return or profitability is considered as V/C2 and V/A2 (including and excluding imputed labour) and also V-C2, V-A2, (V- C2)/C2 and (V-A2)/A2 (for eliminating effect of price change). Here, the period considered is from 1997- 98 to 2014-15 and the factors considered are the cost share of human labour, animal labour, machine labour, seed, fertilizer, and irrigation charges. All explanatory variables are interms of cost share of each input with respect to total cost. We have actually wanted to examine what will be the impact of cost share of respective inputs on the profitability. If the cost share of a particular type of input increases the will there be enhancement of the profit or not. The commonly used multivariate statistical data analysis technique for econometric, agriculture and social science researches is panel data analysis as it can recognize the unobservable heterogeneity which exist when the relationship between explanatory variables and the profitability variables are influenced by the unobserved factors. So in order to control this heterogeneity we have carried out panel data analysis on the profitability variables. The profitability variables depend on the cost share of respective inputs across different states. But there is unexplained heterogeneity

which is being captured by variable intercept across different states. The intercepts will vary across different states since all the states are at different stages of development and there is correlation between intercept term and the respective cost shares. The states are at various stages of technological development and at various stages of institutional reforms which get reflected in their state specific variable intercept term and moreover this intercept is very much related to the explanatory variables that is the cost shares of respective inputs. So we have applied Fixed effect model.

We have run fixed effect panel regression model to determine the determinants of profitability.

Next we have computed V/C2 and V/ A2 i.e the ratio of value of different cost have been computed. It this ratio is above one then we can comment that value is higher than costs. We have created dummy variables. If this ratio is greater than one then the respective state gets value 1 or zero otherwise.

Secondly we have computed V-C2 and V-A2 and if this value is positive then the states get value 1 or 0 otherwise. We have carried out panel data logit model analysis to identify the factors affecting the profitability of the farms. We have observed that if we consider A2 costs all the V/ A2 ratios are greater than one and (V-A2) are all positive . So we have carried out fixed effect logit model by considering V/C2 to be greater than one variable. In this context we have discussed how many times the different states experienced their profitability that is value for V/C2 , V/A2 and also V-C2, V-A2 are greater than one out of 19 years that is the period for our study. The following table -9 contains details of the results.

Table 9: Table represents the number of times over the period there is profitability

STATE	V/C2(>1)	V/A2(>1)	(V-C2) (+VE)	(V-A2) (+VE)
AP	18	19	18	19
ASSAM	5	19	5	19
BIHAR	9	19	9	19
KERALA	13	18	13	18
TN	13	17	13	17
WB	6	19	6	19
PUNJAB	19	19	19	19
UP	15	19	15	19
KARNATAKA	16	16	16	16
HARYANA	19	19	19	19
MP	7	19	7	19
ORISSA	6	18	6	18

Source: Author's calculation using cost of cultivation data, Ministry of Agriculture.

From the above table-9 it has been observed that only in case of AP, Punjab, Haryana even after taking into account C2 costs the farms are profitable. Out of 19 years Assam, Orissa ,WB and Bihar are having problem in earning a positive profit when C2 costs have been considered in most of the years. Here, C2 cost includes imputed rental value of owned land, imputed value of family labour, rate of interest on owned capital asset. When we have considered V/C2 and if we set V/C2 to be greater than one as an indicator of profitability and if V/C2 is less than one the states are not profitable. For some years this ratio is greater than one and for some years it is less than one. So if we take into account of cost of owned factors of production then the some of the states are not profitable. They are profitable only if the actual paid out costs are taken into consideration.

Only in the advanced states like Punjab, Karnataka, Haryana , AP even after incorporating C2 costs the profitability is greater than one. So, southern states or states like Punjab, Haryana which have experienced low disguised unemployment and have earned better return for all the

owned factors of production over all the years. Chand et al (2015) has shown that wage bill has drastically increased among all the costs. So may be if we incorporate the family labour cost at the market value the farms are falling in terms of profitability in the backward states namely WB, Bihar, Orissa and Assam. Whenever the productivity or the value of the product is low compared to cost of production the profitability is falling. The determinants of profitability have been examined. Here, for 12 states we have considered 6 factors cost share of seed, fertilizer, human labour, animal labour, machine and irrigation. We have used Stata to examine the impact of cost shares on the profitability variables. Profitability refers to V-C2, V-A2, (including and excluding imputed family labour) V/C2, V/A2, V-C2/C2 and V-A2/A2 (to avoid the effect of price change). So, we have tried to find out the result by paneldata analysis using the following equation is undertaken –

Y=f (HL, AL, ML, SD, FER, IRRI)
Where, Y= V-C2, V-A2, V/C2, V/A2, (V-C2)/C2, (V-A2)/A2

And HL= Share of human labour cost AL=share of animal labour cost ML=share of machine cost SD=share of seed cost FER=share of fertilizer cost
And IRRI= irrigation cost share.

Using Stata, we have applied fixed effect panel data analysis. The following tables represent the results.

Table 10: Fixed Effect Panel Data Regression Analysis Results

Dependent Variable	(V-C2)	(V-A2)	(V/C2)	V/A2	(V-C2)/C2	(V-A2)/A2
Explanatory VARIABLE						
SEED COST SHARE	56719.27***	69530.89	2.5607**	6.0743***	0.6524**	4.1659***
FERTILIZER COST SHARE	-1120.336	-55993.37	2.3792**	3.0132	1.199071	1.833
HUMAN LABOUR COST SHARE	-3694.95	21300.26	0.4429	0.769	-0.1935	0.1326
ANIMAL LABOUR COST SHARE	-223.3622	-2399.918	0.8311**	1.1959	-0.1137	0.2511
MACHINE COST SHARE	19263.9**	64140.39**	0.1428	0.388711	0.153148	0.3989829
IRRIGATION COST SHARE	-45104.82*	-43857.75	-0.5403**	-2.5275*	-0.8052199*	-2.7924*
Number of Observations	228					
Wald Chi 2 (6)=	5.2	4.51	8.41	14.01	3.86	15.01
Prob>Chi 2=	0.0001	0.0151	0.0014	0.0001	0.0254	0.0001

*Significant at 1 percent level, ** significant at 5 percent level,***significant at 10 percent level.
 Source: Author's Calculation using Cost of Cultivation data, Ministry of Agriculture.

From the above table-10 we have observed that seed share cost influences all the profitability variables positively. Machine labour share affects positively the V-C2 and V-A2 variables. Animal cost share is positively influencing the profit when we have considered profit as V/C2.Fertilizer cost share is positively affecting profit when we have considered profit as V/C2. But irrigation cost share is negatively affecting almost all the profit variables and its value is significant for almost all profit variables. This signifies the fact that if the share of irrigation increases the profitability will decline but if the share of machine cost increases then that is going to have positive impact on the profitability.

5. Conclusion

The paper has examined the state level trends in profitability of rice cultivation in India in two different time points 2000 and 2014 by using unit level data of cost of cultivation scheme, Government of India. The study examined that relation of farms size and profitability. The costs were computed based on Cost A2 and Cost C2. The profits are having positive association with farm size. In AP, WB and Punjab plot size having significant positive influence on the profitability for 2000 and 2014. Marginal farms in eastern states like WB, Orissa, Bihar have failed to achieve positive profit when imputed values of own factors of production are taken into consideration. Whenever the imputed value of the own factors of production are taken into account the profitability falls. Specially the eastern states are less profitable since the own factors of production cost if included then there is negative return after deduction all the costs from net value of production of rice. Eastern states are incapable of earning positive return for their own factors of production namely family labour, value of own land, own capital cost. Secondly aggregate data at state level for twelve states for a period of 18 years have been taken for panel data analysis to determine factors affecting profitability. The important observation is that if the share of the cost of seed and machine increases then profitability increases but if there is increase in share of irrigation cost the profitability deteriorates. It is economical to cultivate paddy in major states in India by using factors like fertilizer, machine labour and seed for the period 1997-98 to 2014-15. But the irrigation cost share has negative influence on the profitability.

Recommendations:

Marginal and small farms have low profitability. So, without proper incentives in the form of increased profitability, farmers may not be willing to adopt the recommended inputs at the right time to increase the productivity as well as profitability of crops. Pursuing the policy of doubling the flow of institutional credit to agricultural sector by itself may not accelerate the growth of agriculture. It is needed a strategy to make agriculture a profitable enterprise by adjusting the minimum support prices of various crops (mainly major crops) in consonance with their cost of cultivation. Unless the issue of profitability of crops is addressed immediately, we may not be able to rescue the agriculture from its current situation. Especially the eastern states are in pathetic condition so in order to increase their profitability their productivity and efficiency of production has to be increased. Moreover the irrigation cost share has negative impact on the profitability. So the government must initiate some policies so that irrigation cost must be under control and even small and marginal farmers must undertake irrigation.

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Appendix:

Table-A1:Number of Farms in the Cost of Cultivation Sample Survey in the Respective Years

States	Number of Farms in 2000	Number of Farms in 2014
WB	2520	2394
PUNJAB	462	545
ASSAM	1336	982
BIHAR	1409	1027
UP	1033	956
AP	948	926
KERALA	870	832
ORISSA	2125	1732
TN	1143	739
HARYANA	176	485
KARNATAKA	235	113
MP	421	146

TableA2: Distribution of sample according to size classes across different states.

	Margin al (0- 1Hec)		Smal l (1He c- 2Hec)		Semi-Medium(2H ec-4Hec)		Medium (4Hec-9Hec)		Large (> 10 Hectar e)	
States	2000	2014	2000	2014	2000	2014	2000	2014	2000	2014
AP	58.10%		28%		10.40%		3.40%		0.10%	
ASSAM	77.90%	80.50%	16.80%	16.80%	4.70%	2.50%	0.60%	0.10%		
BIHAR	68.30%	68.20%	27.30%	26.40%	4.30%	5.50%				
HARYAN A	35.20%	27.60%	30.70%	25.90%	23.30%	30.80%	10.20%	13.50%	0.60%	2.20%
KARNATKA	63.40%	49.60%	23.40%	30.10%	7.20%	14.20%	5.50%	6.20%		
KERALA	82.50%	73.30%	10.90%	14.90%	5.10%	8.25	1.50%	2.90%	0.70%	
MP	31.80%	39%	40.10%	48.60%	26.60%	12.30%	1.40%			
ORISSA	84.60%	89%	13.30%	10.20%	2.10%	0.80%	0.10%			
PUNJAB	37.90%	44.80%	31.40%	29%	23.40%	19.60%	7.40%	6.40%		0.20%
TN	73.80%	63.50%	17.80%	23.70%	6.90%	10%	1.50%	2.80%		
UP	79.80%	80.50%	16.70%	14.70%	3.40%	4.10%	0.20%	0.60%		
WB	97.20%	98.20%	2.20%	1.80%						

Source: Author's Calculation using Cost of Cultivation data, Ministry of Agricul