

Development of Agriculture Model to Measure Survival Income for Different Categories of Agriculture Land-Holding Farmers

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Abstract: *The rural population percentage decreased from 82.7% to 68.9% in 2011, even though there is an increase in the total rural population, which stands at 833.7 million, and the rural population were now more than three times compared to the population seven decades ago. Another observation is the decrease in cultivators percentage from 71.9% to 45.1 %, while agriculture labour increase from 28.1% to 54.9% during the same period. Despite the increase in irrigated land and net area sown, the average holdings' size under the farmers is continuously decreasing, and it requires a study to look into the reasons.*

The research probes the role of Minimum Support Price (MSP) in supporting farmers and measuring market price above MSP needed to help marginal and small farmers remain above the poverty level. It explains how different market rates above MSP have a different impact on different categories of agriculture landholding. The study works on developing a common model that relates the impact of MSP on different farmers categories. The model can be generalized to all crops and regions and useful in designing policies that focus on uplifting the income of agricultural farmers.

Key Words: *Small and Marginal farmers, Minimum Support Price (MSP), Agriculture, Economics, Poverty, Agriculture Land-holdings*

1. INTRODUCTION:

In the year 1951, when India's total population was 361.1 million, in which 298.6 million live in rural areas (82.7%), out of which 69.9 million are cultivators (71.9%), and 27.3 million are agricultural labourers (28.1). Since then, the rural population percentage decreased from 82.7% to 68.9% in 2011, even though there is an increase in the total population, which stands at 833.7 million, and the rural population were now more than three times compared to population seven decades ago. Another observation is the decrease in cultivators percentage from 71.9% to 45.1 %, while agriculture labour increase from 28.1% to 54.9% during the same period (Pocket Book of Agricultural Statistics, 2017).

The forest cover that was 40.48 million hectares in 1951 was increased to 69.84 million hectares in 2001, later in 2014-15, it was estimated 71.79 million hectares whereas net area sowed increase from 118.75 million hectares to 141.43 million hectares. The net irrigated area also increase from 20.85 million hectares to 68.38 million hectares.

Despite the increase in irrigated land and net area sown, the size of average holdings under the farmers are continuously decreasing 1.33 ha in 2000-01 reduce to 1.08 ha in 2015-16. In 2000-01 the number of less than 1-hectare holdings with the marginal farmers was 7,54,08,000 (62.9%), which increase to 10,02,51,000 (68.45%) in 2015-16 (Agriculture Census, 2015-16), in the same period small farmers (1-2 hectares) increase from 2,26,95,000 (18.9%) to 2,58,09,000 (17.62%), but saw decrease in semi-medium farmers holdings (2-4 hectare) from 1,40,21,000 to 1,39,93,000 (9.55%), medium farmers from 65,77,000 to 55,61,000 (3.80%), large scale (10 and above hectares) from 12,30,000 to 8,38,000 (0.57%).

In terms of area marginal farmers owned 29,814,000 hectares (18.7%) in 2000-01, it increase to 37,923,000 hectares (24.03%) while small farmers holdings increases to 36,151,000 hectares (22.91%) from 32,139,000 hectares (20.2%) in 2015-16. Decrease in area for the semi-medium, medium and large farmers. For semi-medium area decrease from 38,193,000 hectares (24%) to 37,619,000 hectares (23.84%), while medium (4-10 hectares) decrease from 38,217,000 hectares (24%) from 31,810,000 hectares (20.16%) and large farmers area decrease from 21,072,000 hectares (13.2%) to 14,314,000 hectares (9.07%).

Despite the increase in net irrigated area from 20.85 million hectares in 1951 to 68.38 million hectares in 2014-15, it remains a mere 49% of the total net area sown. The electricity available in the rural agriculture field is also a problem as the sector only consume 20.06% or 173185 GWh (2015-16).

According to the World Bank- India's Poverty profile, from the total 270 million poor, 80% of the poor population live in rural areas. (Mehta, 2019) in his article, he states more than 20% of farmers are living below the

poverty line (BPL), the majority of them belong to cultivators and agriculture labourers (144.3 million) and holders of marginal and small fields 11,76,05,000 (85%). The per capita availability of food grain is also 177.9 kgs per year (2016), and despite the food grain production increase almost five times from 50.8 million tonnes (1951) to 244.5 million tonnes (2011), the per capita availability also increases by 33.8 Kgs to 170.9 Kgs, from 144.1 Kgs per year in 1951.

2. LITERATURE REVIEW:

in her studies describe Indian food policies related to procurement, storage, distribution, and trade. She concludes that government involvement in food subsidy is responsible for price distortion, where government announcement of minimum support price (MSP) initiates the procedure to adjust the crop prices. (Lalit Kumar, 2019) also, elaborate on the same subject but suggest multiple strategies and the role of MSP in farmers income.

The research agrees with (Mehta, 2019) that the future of India rests with extending opportunities, especially to marginal and small farmers, and there is an urgent need to correct market mechanisms to help farmers in getting the just price for their produce.

(Gollin, 2018), work on farm size and productivity and its relationship with yield is in agreement with the current research, as research assumed yield does not depend solely on farm size. Even my earlier work (Ahmed, Inadequate Land Reforms Reason for Poverty and Social Unrest, 2014), (Ahmed, Multidimensional Poverty Index and Need to Revise the Methodology for Counting Poor, 2018) and (Ahmed, Poverty and Deprivation: Study of a most impoverished population for better management of resources, 2021) support the argument that land reforms are necessary as multidimensional poverty prevails in marginal and small farmers.

The research depends on government authenticate data for reliable statistics, government publication in different years like (Cost of Cultivation/Production & Related Data , 2017-18), (Pocket Book of Agricultural Statistics, 2017), (Agriculture Statistics at a Glance 2018, 2019), (All India Report on Number and Area of Operational Holdings, Agriculture Census 2015-16, 2019), (Rangarajan Report on Poverty, 2014) and (Economic Survey 2020-21) are used. Another source of data includes Government Press notifications for CPI-AI and MSP, besides consulting the FAO website for studying the latest development in the field.

3. The Masood's Input-Cost- Survival model:

The input-cost and Survival model is a simple exploration of the production cost associated with crop cultivation. Data for different states was taken from government sources (Cost of Cultivation/Production & Related Data , 2017-18), and for this research, rice crop and the State of Andhra Pradesh was chosen. It is second in terms of product value behind Haryana and Punjab state, but Haryana and Punjab are much smaller in comparison to the Andhra Pradesh population and rice cultivation area.

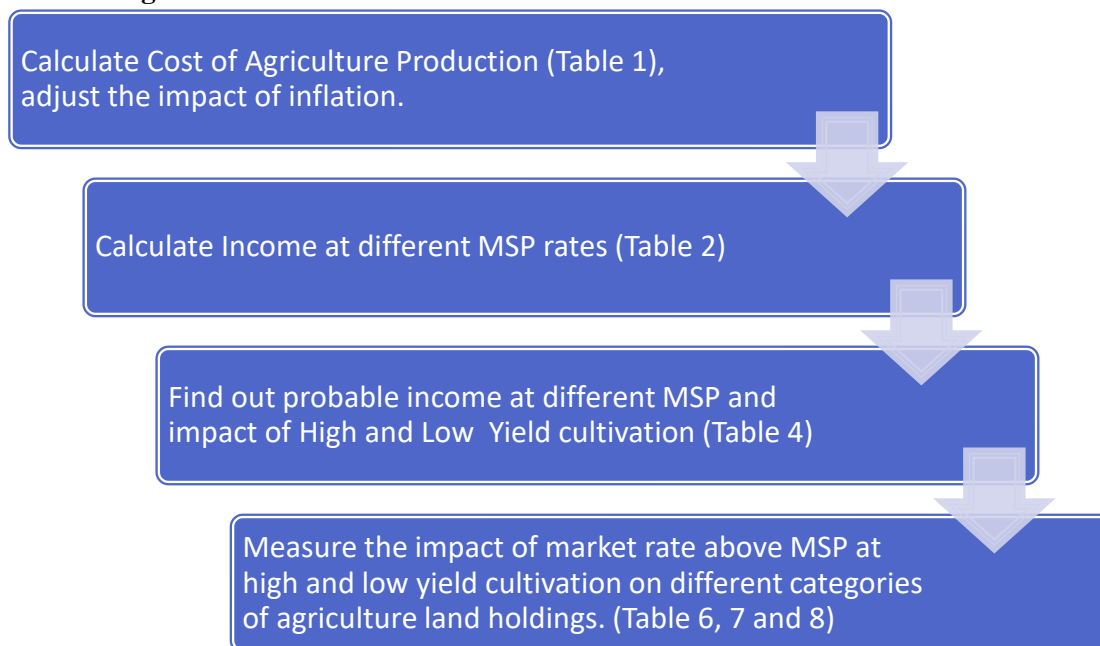
The data provide details on operational cost, which consist of Human Labour (Family, attached and casual), Animal and Machine Labour, purchase of seeds, insecticide, fertilizer and manures, irrigation charges, crop insurance, payment to contractor and interest paid on working capital along with any miscellaneous charges needed for agricultural purposes under variable expenses category. At the same time, fixed cost expenses include rent paid for leased land, tax-related to agricultural land, depreciation on fixed assets, and interest on fixed assets. The Minimum Support Price (MSP) 2021 is taken as the base for calculating income from the cultivation in Table 2, and the cost of production (2017-18) is adjusted for the current level of inflation.

(Gollin, 2018), from IFAD, research point out that yield is not affected much by farm size in India. The profitability depends on farm size due to the law of averages where labour productivity, use of technology, agriculture inputs give an advantage to farmers with the increase in farm size.

FAO statistics for productivity per hectare is preferred for uniformity, instead of taking a range of 2500-4366 Kgs/ha prevailing in different states and districts. However, the calculation based on the minimum and maximum yield provides the wide income gap between the rice farmers, who belong to different states, regions, and different quality, sizes, and are with or without irrigation facilities in their agricultural land-holdings.

Survival income denotes efforts by the farmer and his family, through which the family saves the amount they need to pay to outsiders during the process of agriculture production. It is the income that keeps a farmer to continue the occupation instead of moving to other areas. In the absence of survival income, if he sells the produce on MSP, the probability of loss is high.

3.1 Working of the model:



4. RESULTS:

- Marginal farmers (less than 1 hectare) remain in extreme poverty at the lower yield level (Table 6, 7 & 8), but even at a higher yield of cultivation, Marginal farmers are not earning enough, which can put them above the poverty level. They will remain in extreme poverty due to the unavailability of land and resources to cultivate it properly.
- The analysis represents 99.85 million agriculture holdings belonging to marginal farmers and why they are forced to sell their land and work as either farm labour or manual labour in the unorganized sector.
- In Andhra Pradesh, 5.94 million marginal farmers face extreme poverty and are subject to extreme hardship in the absence of just income from cultivation.
- In the case of small farmers (1 to 2 hectares), a higher yield and if they can sell at MSP, they fall in a safe category while at a lower yield, their income is not enough, and they face moderate poverty (Table 6,7 & 8). In Andhra 1.65 million, agriculture farmers belong to this category out of a total of 25.77 million in India.
- Farmers who have to semi-medium, medium and large are safe under high yield and if they can get MSP rate for their crop. But semi-medium farmers find themselves in the vulnerable category at lower yield and while the other two categories are safe even at the lower rate of yield.
- At the national level, holding agricultural land of an average size of 1.08 hectare higher side income means a farmer belong to the vulnerable category, while at the lower side, it falls straight into the extreme poverty category.

5. CONCLUSION:

When farmers able to get more than 20% over the listed MSP rate (Table 7), marginal farmers move up from the extreme poverty category to moderate poverty from high yield cultivation, while other categories move into the safe zone category. On low yield cultivation, marginal farmers remain in the extreme poverty category, but small and average farmers move up a category to the vulnerable and moderate poverty level.

If farmers can get a price 40% above MSP (Table 8) for their produce, then only marginal farmers remain moderately poor from high yield cultivation of rice variety. If they get a low yield for their cultivation, marginal farmers remain in extremely poor conditions while small and average holding farmers move to the vulnerable category.

The analytical data state that even a price above 40% of MSP is insufficient for marginal farmers cultivating rice, and very little relief is possible when they cultivate with a high yield variety. Data from (Agriculture Statistics at a Glance 2018, 2019) state that only 42% of marginal and 35% of small farmers has access to irrigation facilities. The agriculture land-holding pattern from the agriculture census shows that marginal, small and semi-medium categories

operational holdings increase in 2015-16 compared to 2010-11 (All India Report on Number and Area of Operational Holdings, Agriculture Census 2015-16, 2019), while medium and large decline.

(Rangarajan Report on Poverty, 2014) state that Rs. 4,860 per month will be the poverty line for a family of five residing in a rural area. After adjusting the inflation rate, the current income must be above Rs 5931.63 per month in rural areas. On relating it with the income of marginal and small farmers, at a lower yield, both categories remain in extreme poverty condition, while at a higher yield, only marginal farmers suffer.

The research concludes that marginal and small farmers need different market rates well above MSP along with subsidies for agriculture inputs to improve their living. In the absence of a government safety net, the marginal and small farmers will face hardship and slowly move to the manual labour category.

REFERENCES:

1. (2015-16). *Agriculture Census*. Agriculture Census Division , Government of India. Retrieved from http://agcensus.nic.in/document/agcen1516/T1_ac_2015_16.pdf
2. (2019). *Agriculture Statistics at a Glance 2018*. Government of India, Directorate of Economics and Statistics, Department of Agriculture, Cooperation & Farmers Welfare. Retrieved from <http://eands.dacnet.nic.in>
3. Ahmed, M. (2014). Inadequate Land Reforms Reason for Poverty and Social Unrest. *Annual World Bank Conference on Land and Poverty*. Washington DC: World Bank. doi:10.6084/m9.figshare.14522475
4. Ahmed, M. (2018). Multidimensional Poverty Index and Need to Revise the Methodology for Counting Poor. *Indian Journal of Sustainable Development*, 4(2), 16-28. doi:10.6084/m9.figshare.14522523
5. Ahmed, M. (2021). Poverty and Deprivation: Study of a most impoverished population for better management of resources. *International Journal of Innovative Science, Engineering & Technology*, 8(4), 246-269. doi:10.6084/m9.figshare.14511627
6. (2019). *All India Report on Number and Area of Operational Holdings, Agriculture Census 2015-16*. MINISTRY OF AGRICULTURE & FARMERS WELFARE, Government of India, DEPARTMENT OF AGRICULTURE, CO-OPERATION & FARMERS WELFARE. AGRICULTURE CENSUS DIVISION.
7. *Cost of Cultivation/Production & Related Data* . (2017-18). Retrieved from Directorate of Economics and Statistics, Government of India: https://eands.dacnet.nic.in/Cost_of_Cultivation.htm
8. (n.d.). *Economic Survey 2020-21*. Government of India. Retrieved from <https://www.indiabudget.gov.in/economicsurvey/>
9. Gollin, D. (2018). *Farm size and productivity*. Retrieved from International Fund for Agricultural Development (IFAD): <https://www.ifad.org/documents/38714170/40974017/Research+Series+34.pdf/64a10247-6fdd-e397-b75b-3d45767d956c>
10. Lalit Kumar, M. M. (2019, June 08). Doubling India's Farm Incomes : Paying Farmers for Ecosystem Services, Not Just Crops. *Economic and Political Weekly*, 54(23). Retrieved from <https://www.epw.in/journal/2019/23/special-articles/doubling-indias-farm-incomes.html>
11. Marta Kozicka, M. K. (2014). Modeling Indian Wheat and Rice Sector Policies. *2014 AAEE Annual Meeting, Minneapolis, MN, July 27-29, 2014*. Minneapolis,.
12. Mehta, P. (2019, June 12). *India's future prosperity depends on extending opportunities to farmers*. Retrieved from Hindustan Times: <https://www.hindustantimes.com/analysis/india-s-future-prosperity-depends-on-extending-opportunities-to-farmers/story-FaeCMo5iYlcceh3Wr4hX2N.html>
13. (2017). *Pocket Book of Agricultural Statistics*. Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare. Government of India.
14. (2014). *Rangarajan Report on Poverty*. Retrieved from <https://pib.gov.in/newsite/printrelease.aspx?relid=108291>

Table 1: Cost of Production			Prices: 2017-18 In Rs./ha	Inflation adjusted Cost of production Prices: 2020-21 Rs./ha.
1.1.1	Human Labour	Family	9797.35	10382.10
1.1.2		Attached	266.53	282.44
1.1.3		Casual	13124.70	13908.04
1.1.4		Total	23188.58	24572.58
1.2.1	Animal Labour	Hired	244.68	259.28
1.2.2		Owned	653.25	692.24
1.2.3		Total	897.93	951.52
1.3.1	Machine Labour	Hired	9731.30	10312.11
1.3.2		Owned	459.17	486.58
1.3.3		Total	10190.47	10798.68
1.4	Seed		2190.58	2321.32
1.5.1	Fertilizer & Manure	Fertilizer	7472.11	7918.08
1.5.2		Manure	750.85	795.66
1.5.3		Total	8222.96	8713.74
1.6	Insecticides		3645.33	3862.90
1.7	Irrigation Charges		1158.34	1227.48
1.8	Crop Insurance		0.00	0.00
1.9	Payment to Contractor		5275.86	5590.75
1.10	Miscellaneous		150.72	159.72
1.11	Interest on Working Capital		1410.09	1494.25
1	Operational Cost (Total)		56330.86	59692.95
2.1	Rental Value of Owned Land		27599.00	29246.24
2.2	Rent Paid For Leased-in-Land		4095.49	4339.93
2.3	Land Revenue, Taxes, Cesses		0.00	0.00
2.4	Depreciation on Implements & Farm Building		419.31	444.34
2.5	Interest on Fixed Capital		2800.15	2967.28
2	Fixed Costs (Total)		34913.95	36997.78
3	Total Cost [1+2]		91244.81	96690.73
Adopted from: DIRECTORATE OF ECONOMICS & STATISTICS, INDIA (2017-18)				
Average Per hectare production is between 2500 -4366 kgs in different Indian States				
Adjusting impact of inflation (5.16%) increase in agricultural production prices between 2018 to 2021				
Operational Cost = (1.1.4+1.2.3+1.3.3+1.4+1.5.3+1.6+1.7+1.8+1.9+1.10+1.11)				
Fixed Cost= 2.1+2.2+2.3+2.4+2.5				

Table 2: Calculation of Survival Income at different MSP

	Income	Income at MSP	20% increase in SP over MSP	40% increase in SP over MSP
a1	Total Cost from table 1	96690.73	96690.73	96690.73
a2	MSP per Quintal	1888	2265.6	2643.2
a3	MSP per kg	18.88	22.656	26.432
a4	Present Per hactor production in Kg (source FAO)	4057	4057	4057
a5	Income= (a3*a4)	76596.16	91915.392	107234.624
a6	by product value per ha.	4685.04	4685.04	4685.04
a7	Total Income Per Ha (a5+a6)	81281.20	96600.43	111919.66
a8	Farmer Profit/Loss (a7 - a1)	-15409.53	-90.30	15228.94
Survival Income & Savings				
b1	Human Labour	24572.58	24572.58	24572.58
b2	Payment to Contractor	5590.75	5590.75	5590.75
b3	Rental Value of Owned Land	29246.24	29246.24	29246.24
b4	Depreciation on Implements & Farm Building	444.34	444.34	444.34
b5	Interest on Fixed Capital	2967.28	2967.28	2967.28
b6	Total Suvival Savings (b1+b2+b3+b4+b5)	62821.18	62821.18	62821.18
Possible range of Income				
c1	Survival Income (a7+b6)	144102.38	159421.61	174740.85
d1	Disposable Income (c1 - a1)	47411.65	62730.89	78050.12

Table 3: International Poverty Criteria

Poverty (World Bank)		\$	\$1=Rs 73.6	Per month (Rs)
Extream Poverty	per day	1.9	139.84	4195.2
Moderate Poverty	per day	3.1	228.16	6844.8
less than \$5.5 vulenrable	per day	5.5	404.8	12144

Table 4: Income range (High and Low yield) and at different MSP

	Rice Cultivation 120-150 days (4-5 months)		
	Min. Support Price Net Income	20% increase in SP over MSP Net Income	40% increase in SP over MSP Net Income
Total income from cultivation (Rs.) from 4057 Yield (FAO_	47411.65	62730.89	78050.12
Per Month Income (Rs.)	9482.33	12546.18	15610.02
Total income from cultivation (Rs.) Min. Yield (2500)	18015.49	27455.49	36895.49
Per Month Income (Rs.)	3603.10	5491.10	7379.10

Table 5: Categories of Land-Holdings

	Year 2015-16	%	Area	Avg. Size	In Andhra Pradesh
Marginal (Less than 1 hectare)	99858000	68.52	37960	0.38	5904039
Small (1.0 to 2.0 hectares)	25777000	17.69	36435	1.41	1646246
Semi-Medium (2.0 to 4.0 hectares)	13776000	9.45	37168	2.7	769843
Medium (4.0 to 10.0 hectares)	5485000	3.76	31367	5.72	189034
Large (10.0 hectares and above)	831000	0.57	14212	17.1	14748
Total	145727000	100	157142	1.08	8523910

Adapted from: Department of Agriculture, Cooperation & Farmers Welfare (Agriculture Census 2015-16, Phase-I)
 Area Operated: ('000 Hectares)
 Average size: (Hectares)

Table 6: Income-based on MSP at High and Low Yield

	Avg. Size	Monthly Income at higher yield	Poverty Status (Higher Side)	Monthly Income at a Lower yield	Poverty Status (Lower Side)
Marginal (Less than 1 hectare)	0.38	3603.29	EP	1369.18	EP
Small (1.0 to 2.0 hectares)	1.41	13370.1	S	5080.37	MP
Semi-Medium (2.0 to 4.0 hectares)	2.7	25602.3	S	9728.37	V
Medium (4.0 to 10.0 hectares)	5.72	54238.9	S	20609.7	S
Large (10.0 hectares and above)	17.1	162148	S	61613	S
Average Holdings	1.08	9482.33	V	3891.35	EP

Extreme Poverty=EP, less than \$1.9 per day or Rs. 4195.02 per month
 Moderate Poverty=MP, less than \$3.1 per day or Rs.6844.8 per month
 Vulnerable =V, less than \$5.5 per day or Rs. 12144 per month
 Safe=S

Table 7: Income, when the market rate is 20% above MSP

	Avg. Size	Monthly Income at higher yield	Poverty Status (Higher Side)	Monthly Income at a Lower yield	Poverty Status (Lower Side)
Marginal (Less than 1 hectare)	0.38	4767.548	MP	2086.618	EP
Small (1.0 to 2.0 hectares)	1.41	17690.11	S	7742.449	V
Semi-Medium (2.0 to 4.0 hectares)	2.7	33874.68	S	14825.97	S
Medium (4.0 to 10.0 hectares)	5.72	71764.14	S	31409.08	S
Large (10.0 hectares and above)	17.1	214539.6	S	93897.79	S
Average Holdings	1.08	13549.87	S	5930.387	MP

Extreme Poverty=EP, less than \$1.9 per day or Rs. 4195.02 per month
 Moderate Poverty=MP, less than \$3.1 per day or Rs.6844.8 per month
 Vulnerable =V, less than \$5.5 per day or Rs. 12144 per month
 Safe=S

Table 8: Income, when the market rate is 40% above MSP

	Avg. Size	Monthly Income at higher yield	Poverty Status (Higher Side)	Monthly Income at a Lower yield	Poverty Status (Lower Side)
Marginal (Less than 1 hectare)	0.38	5931.808	MP	2804.057504	EP
Small (1.0 to 2.0 hectares)	1.41	22010.13	S	10404.52916	V
Semi-Medium (2.0 to 4.0 hectares)	2.7	42147.05	S	19923.56648	S
Medium (4.0 to 10.0 hectares)	5.72	89289.31	S	42208.44454	S
Large (10.0 hectares and above)	17.1	266931.3	S	126182.5877	S
Average Holdings	1.08	16858.82	S	7969.426592	V

Extreme Poverty=EP, less than \$1.9 per day or Rs. 4195.02 per month
 Moderate Poverty=MP, less than \$3.1 per day or Rs.6844.8 per month
 Vulnerable =V, less than \$5.5 per day or Rs. 12144 per month
 Safe=S