
**E-ISSN:** 2618-0618
**P-ISSN:** 2618-060X

www.agronomyjournals.com
2024; 7(3): 210-215
Received: 07-01-2024
Accepted: 13-02-2024

**M Chanakya**
Department of Agricultural Economics, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Mohanpur, West Bengal, India

**AK Nandi**
Professor, College of Agriculture, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Mohanpur, West Bengal, India

**Corresponding Author:**
**M Chanakya**
Department of Agricultural Economics, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Mohanpur, West Bengal, India

# Growth dynamics of cost of cultivation in major paddy growing states of India

**M Chanakya and AK Nandi**

**DOI:** https://doi.org/10.33545/2618060X.2024.v7.i3Sc.433

**Abstract**
In India's main paddy-growing regions, the cost of cultivation is a critical factor that forms the basis for marketing decisions. The present analysis was carried out using secondary data provided by The Commission on Agricultural Costs and Prices (CACP) for the years 2004–05 to 2021–22. In the study, changes in input intensity and input cost components were examined alongside the growth aspects of the cost of paddy cultivation in India's major paddy-growing states. The study reveals differences in the costs and levels of paddy input usage among the five selected states, namely Andhra Pradesh, Punjab, Tamil Nadu, Uttar Pradesh, and West Bengal. The cost of inputs for cost of cultivation factors is rising between 2004–05 and 2021–22. Aside from the cost of animal labour, the costs of other inputs like as manure, fertilizer, and machine labour have gone up over time. Along with a decline in the amount of labour used as an input over time, there has also been an increase in the cost of labour input. There was less use of human and animal labour in Punjab because of the region's high level of mechanization. In West Bengal, labour is still used more often for agricultural purposes.

**Keywords:** CACP, input intensity, input cost, growth, mechanization

## Introduction
India is a significant rice-growing country. The majority of India's land is used for rice cultivation. While the indica variety of rice is thought to have originated in the region that stretches through Burma, Thailand, Laos, and the foothills of the Eastern Himalayas, or northeastern India, historians. The japonica variety, which was brought to India, was domesticated from wild rice that was brought from southern China to Vietnam. Rice is a nutrient-dense staple food that gives you rapid energy because it mostly consists of carbohydrates, or starch. However, rice has a low concentration of nitrogenous components, with an average composition of just 8% and a minuscule 1% fat or lipid content. This is because for this reason, it's regarded as a complete meal. Rice flour is used to make a variety of culinary products since it is high in starch. Brewers occasionally utilize it to create alcoholic malt. Likewise, porcelain, glass, and pottery are made from rice straw combined with other materials. Additionally, rice is used to make paper pulp and bedding for animals. In addition to providing a wealth of rice-based products, the great diversity of rice germplasm is used to cure a wide range of medical conditions, including diabetes, indigestion, arthritis, paralysis, and epilepsy, and it also gives pregnant and nursing mothers more strength. Historical Ayurvedic texts attest to the therapeutic & therapeutic qualities of many varieties of rice farmed in India.
One of the most significant cereal food crops in India and other regions of the world is rice (*Oryza sativa*). Different eco-systems and soil types are used to raise rice, and the climatic and hydrological circumstances in which it is grown can range from wet and poorly drained to well drained. High humidity, continuous sunshine, and a reliable supply of water are ideal conditions for rice growing. Maximum temperature that the crop can withstand is between 40 °C and 42 °C. Of the crop is between 21 °C and 37 °C. The majority of early mature types are grown for 80 to 110 days, depending on the kind of soil and pattern of rainfall. Approximately 13.0 million hectares of rain-fed lowland rice are planted, primarily in eastern India, where soil moisture is present.

The state's rice output climbed from 24.07 lakh tons in 1990 to 135.76 metric tons in 2022-2023. In the eastern and southern regions of India, it is an absolutely necessary component of the daily meal. After China, India is the second-largest producer of rice worldwide. As of 2022–2023 India was contributing 21.50% of the global production. The states that produce the most rice in India include Tamil Nadu, West Bengal, Uttar Pradesh, Punjab, and Andhra Pradesh. Another important cereal crop that India exports in large quantities is rice. (The Indian Economic Survey; 2022–23).

Annual growth in paddy production was only 1.45% in the country during 1991-2013. The steam of paddy production growth seems to have exhausted during last two decades. The recent yield stagnation in paddy is not due to technology fatigue, but could be due to the sluggish input intensification. Despite slow growth in paddy productivity, the production reached to 106.54 million tonnes in 2013-14. Increase in input prices including human labour did not deter farmers from increasing investment on inputs which resulted in reducing profitability in paddy production, particularly in regions of low paddy productivity.

Marketing decisions are influenced by the cost of cultivation, which is a significant element. Over time, changes in the amount and quality of inputs brought about by advancements in technology, as well as changes in market prices, cause structural changes in costs. The relative shares of operational costs in the overall cost of rice production alter as a result.

The entire expense borne by the farmer to cultivate a crop in an acre or hectare is referred to as the "cost of cultivation." Cost of cultivation of paddy in the study is analysed based on the guide lines of Government of India. Estimation of cost has been done in the following manner:

1. Human labour, bullock labour and machine labour (hired) value at the actual rates paid by the farmer.
2. Family labour-valued at the rate of wages paid for hired labour for similar work.
3. Bullock labour and machine labour (owned) – valued at rates paid to hire the same.
4. Seeds (purchased), insecticides and pesticides, manure (purchased), fertilizers, irrigation charges –valued at rates actually paid by the farmers.
5. Seeds (farm produced), manure (owned) – valued at the prevailing market prices.
6. Depreciation on implements – values at 20 per cent and apportioned in proportion to the value of output of paddy to the total value of output of all the crops of the year.
7. Land revenue – actually paid by the farmer.
8. Interest on working capital – valued at 12 per cent of half of the crop growth period.
9. Imputed interest on owned fixed capital – valued at a rate of 10 per cent of the value of assets (excluding land) and apportioned in proportion to the value of output of paddy to the total value of output of all the crops of the year.

According to Final Estimates, the following important crops are expected to be produced in 2022–2023: 3296.87 lakh tonnes of food grains. 1357.55 lakh tonnes of rice. The future increase in rice production requires improvement in productivity and efficiency. There is a need not only to increase rice production but also the efficiency to sustain self-sufficiency and to maintain national food security. This has been due to a steep rise in the cost of cultivation not matched by commensurate increase in the paddy prices. When the market prices were below the MSP and the actual procurement by the millers was also at prices which were lower than the MSP. The cost of cultivation has risen in the recent times and on the other market price of rice has ruled at a level below the cost of cultivation as well as the minimum support price (MSP).

## Materials and Methods

The study area of the present work “Growth Dynamics of Cost of Cultivation in Major Paddy Growing States of India” was based on secondary data on area, production and productivity of rice of major five producing states in India like, West Bengal, Uttar Pradesh, Punjab, Tamil Nadu and Andhra Pradesh. Data provided by the Commission on Agricultural Costs and Prices (CACP) from 2004 -2005 to 2021 - 2022 collected for the analysis across the major paddy producing states in India West Bengal, Uttar Pradesh, Punjab, Andhra Pradesh and Tamil Nadu. CACP (Commission on Agricultural Costs and Prices) is a decentralized agency of the Government of India established in 1965 as the Agricultural Commission and changed as present name in1985. It is an attached office of the Ministry of Agriculture and Farmers Welfare, Government of India.

## Growth Model

The trends in growth in input prices, and input intensity were studied by estimating compound growth rates at nominal and real prices (Base year 2004-05).

The compound growth rates was estimated by using following log linear function,

$Y=ab^t$

Where,

Y=Price of input

a=Intercept constant

b=Coefficient

t=Time period

From the estimated compound growth rate was worked out as,

CGR = [Anti log (log b)-1] x 100

## Results and Discussion

The present study focuses mainly on the analysis of cost of cultivation factors over 2004-05 to 2021-22 (available at present in website of DES, GoI) in major paddy producing states.

### Change in intensity of inputs and item wise costs over time

The change in input costs and intensity over 2004-05 to 2021-22 As per the observation, Cost of Cultivation & Cost of Production per unit with different cost bases at 2004-05 to 2021-22 in all the five selected states (Andhra Pradesh, Punjab, Tamil Nadu, Uttar Pradesh, and West Bengal) For the analysis, the entire period has been divided into three periods (Period I, Period II & Period III) and the system of triennium average also been considered.

### Compound Growth Rate (CGR) for Input Intensity factors

Table 1 displays the compound growth rate of input intensity in the main paddy growing states. The state of Punjab had the highest compound growth rate (-18.76%) for the input usage of animal labour, while the state of Uttar Pradesh had the lowest compound growth rate (-29.09%). The state of Punjab had the highest compound growth rate for the input use of human labour (-1.79), while the state of Andhra Pradesh had the lowest (-5.50%). The state of West Bengal has the highest compound growth rate for fertilizer input utilization (2.79%), while the state of Punjab has the lowest compound growth rate (-0.52%). The state of Andhra Pradesh has the highest compound growth rate for the input use of manure, at -1.57%, while the state of Uttar Pradesh has the lowest, at -19.26%.

It is observed that compound growth rate of input intensity of animal labour, human labour and manure is negative in of all the five states. Compound growth rate of fertilizer use is negative in the state of Punjab and in all the other four states it is positive. As seed input value is not properly available on the CACP website which is released by government of India. Other than fertilizer input use in the states Andhra Pradesh, Tamil Nadu, Uttar Pradesh and West Bengal, all the other input use factors are expressing that usage of input use is decreasing manner.

Table 2 shows the compound growth rate for input costs in the main states where paddy is grown. With a compound growth rate of -8.28% for the input cost of animal labour, the state of Andhra Pradesh had the highest and the state of Uttar Pradesh the lowest. The state of Tamil Nadu had the lowest compound growth rate of 5.69%, while the state of Uttar Pradesh had the highest compound growth rate of 10.09% for the input cost of labour. The state of West Bengal has the greatest compound growth rate for fertilizers at 8.99%, while the state of Punjab has the lowest at 3.78%. The state of West Bengal had the greatest compound growth rate for machine labour costs (17.27%), while the state of Punjab had the lowest (8.31%).

The state of Punjab has the highest compound growth rate for the input cost of manure (8.41%), while the state of Uttar Pradesh has the lowest (-9.60%). The state of West Bengal has the greatest compound growth rate for seed costs at 10.71%, while the state of Andhra Pradesh has the lowest at 6.00%. The state of Tamil Nadu has the lowest compound growth rate of 7.06%, while the state of Uttar Pradesh has the highest compound growth rate of 8.85% for the total cost of cultivation (C2).

In all the five states compound growth rate of input cost of animal labour is negative. Compound growth rate of human labour, machine labour, fertilizer and seed input costs are positive in all the five states. Rest of Uttar Pradesh all other four states manure input cost is observed as positive. Compound growth rate of cost of cultivation is positive in all the five states.

**Change in Input Intensity over the period**

Figure 1 displays the input intensity of animal labour for each of the five states across the duration of time. Over the years 2004–05 to 2021–22, it decreased. Of the five states, West Bengal used animal labour the most, while Punjab used it least. Figure 2 depicted the intensity of human labour input. Over the course of the time, it too declined. In Punjab state, it was low, and in West Bengal, it was high. Fertilizer usage over the time is depicted in the picture as being low in the state of West Bengal and high in the state of Tamil Nadu (fig. 3). As shown in fig. 4.4, manure usage was lower in the state of Uttar Pradesh and varied in the other states in different years. Figure 4 shows that seed input intensity was higher in Andhra Pradesh and lower in West Bengal. While the amount of labour provided by humans and animals reduced throughout time, the amount of seed, fertilizer, and manure used increased and declined in different years.

**Change in Input Cost over the period**

The majority of input costs have increased between 2004–05 and 2021–22. As seen in fig. 7, the cost of animal labour is low in Punjab and high in the state of West Bengal. The cost of human labour input has gone up over time. As seen in fig. 8, it is lowest in Punjab and Uttar Pradesh and greatest in the state of West Bengal. As seen in fig. 9, machine labour costs also rose over time, with Tamil Nadu and West Bengal experiencing higher and lower increases, respectively. As seen in Fig. 10, the input cost of fertilizer grew during the course of the year. It was noted that West Bengal is extremely low in that state and varies in different states. As seen in Figure 11, the cost of the manure input grew over the course of the year. It was found to be low in the state of Uttar Pradesh and high in the state of Tamil Nadu.

In the state West Bengal input intensity as well as input cost of animal labour and human labour is high; on the other side machine labour cost is very low. The state Punjab less input intensity and input cost of animal and human labour cost. Input intensity and input cost of manure cost is very low in the state Uttar Pradesh and very high in Tamil Nadu comparatively in five states. Overall cost of cultivation is very low in the Uttar Pradesh and high in Tamil Nadu.

As seen in fig. 12, the cost of seed input also increased along the time. In Punjab, seed costs are minimal, but in Tamil Nadu, they are exorbitant. As seen in fig. 13, the total cost of agriculture grew over time as well. In the states of Uttar Pradesh and Andhra Pradesh, the total cost of cultivation is low and high, respectively. As shown in fig. 6, the compound growth rate for manure input intensity, animal labour, and human labour is negative in five states and positive for fertilizer consumption, with the exception of Punjab. The other side input cost components compound growth rate provided in fig-14. Except animal labour all the input cost elements compound growth rate observed as positive value.

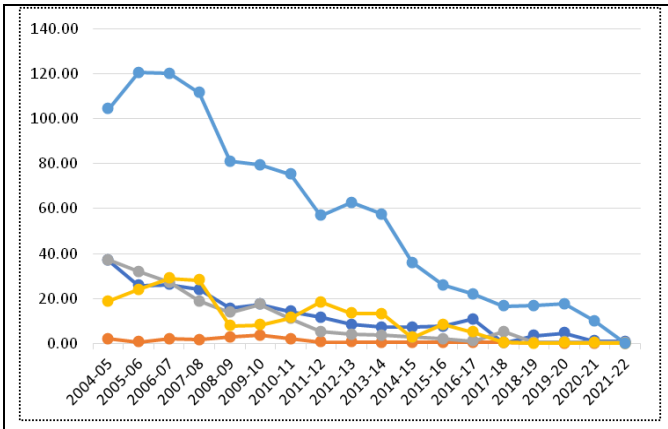



**Fig 1:** AL Input Intensity (Pair Days)

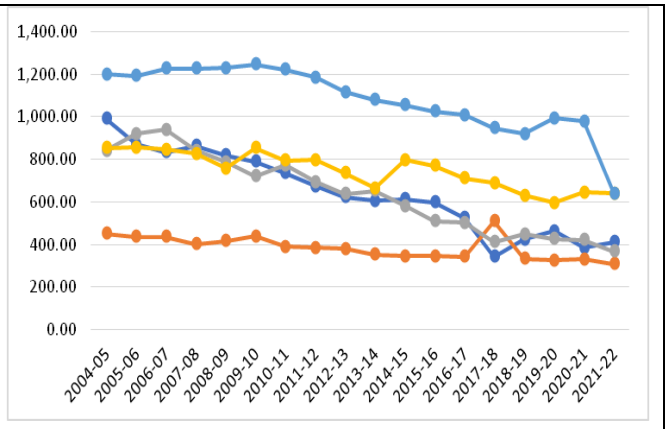



**Fig 2:** HL Input Intensity ( Man Hours)

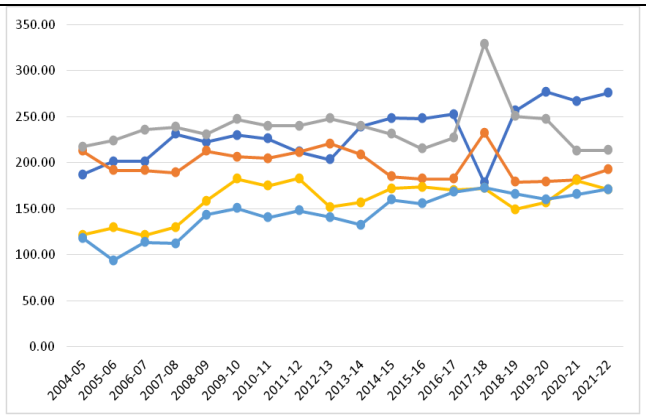



**Fig 3:** Fertilizer Input Intensity (Kg/Ha)

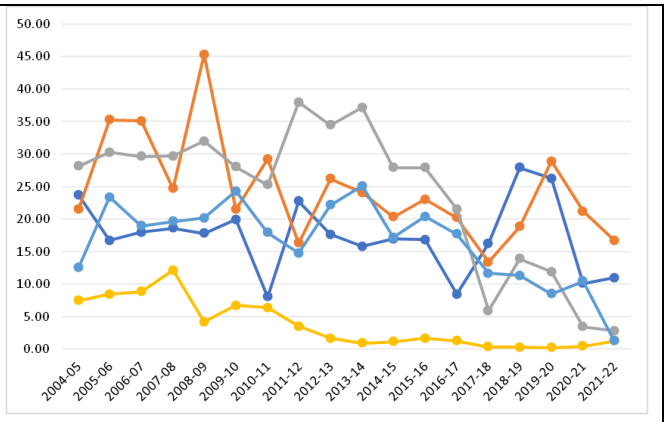



**Fig 4:** Manure Input Intensity (Kg/Ha)

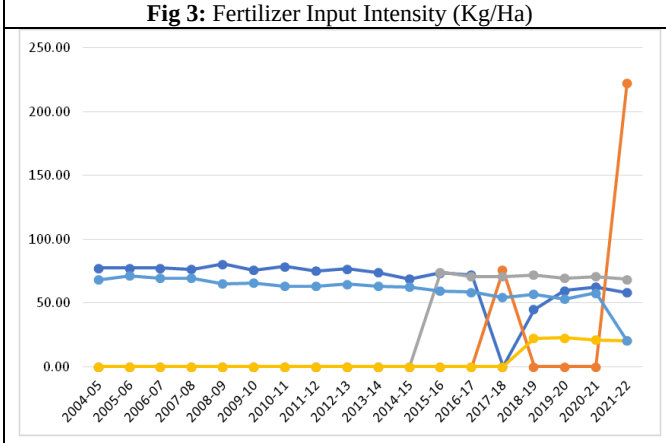



**Fig 5:** Seed Input Intensity (Kg/Ha)

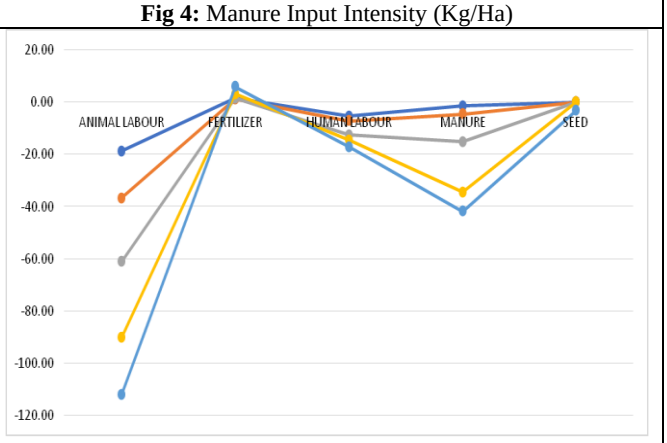
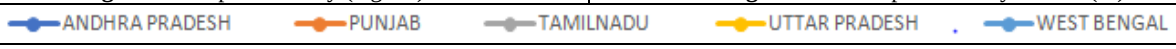



**Fig 6:** CGR of Input Intensity factors (%)



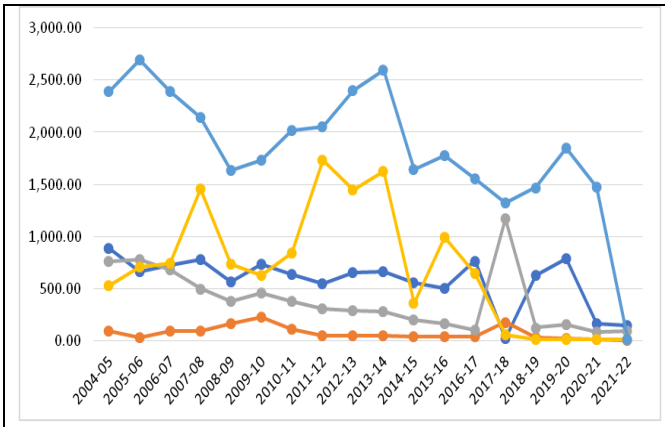




**Fig 7:** AL Input Cost (Rs/Ha)

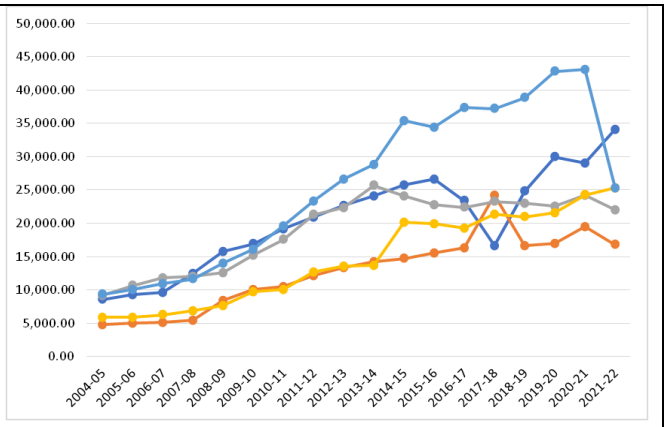



**Fig 8:** HL Input Cost (Rs/Ha)

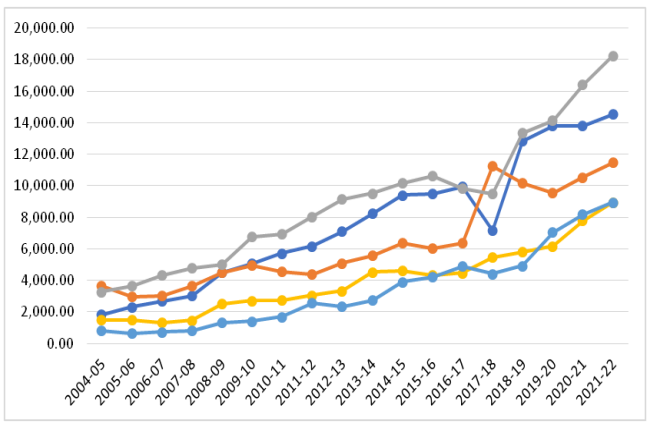



**Fig 9:** ML Input Cost (Rs/Ha)

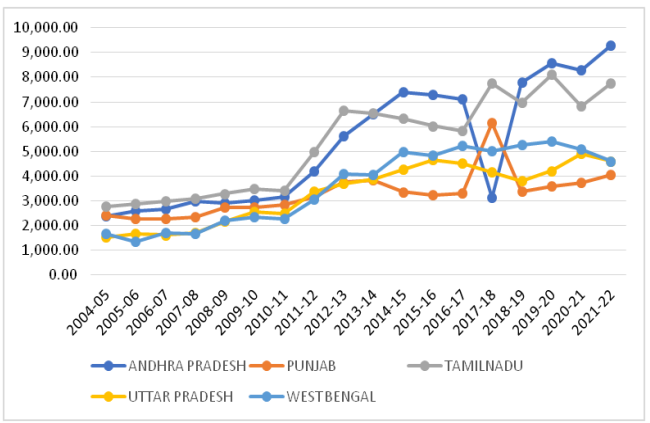



**Fig 10:** Fertilizer Input Cost (Rs/Ha)

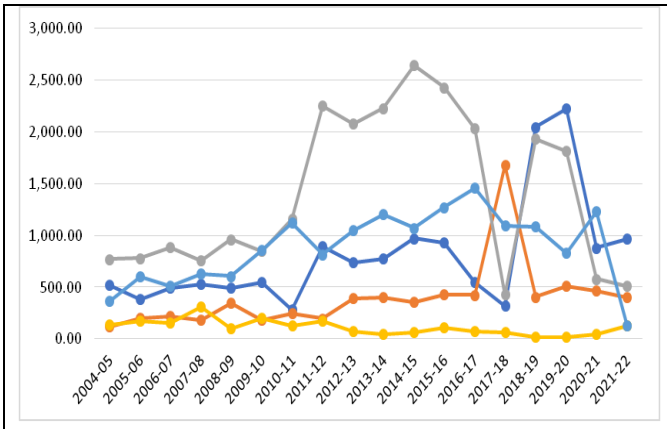



**Fig 11:** Manure Input Cost (Rs/Ha)

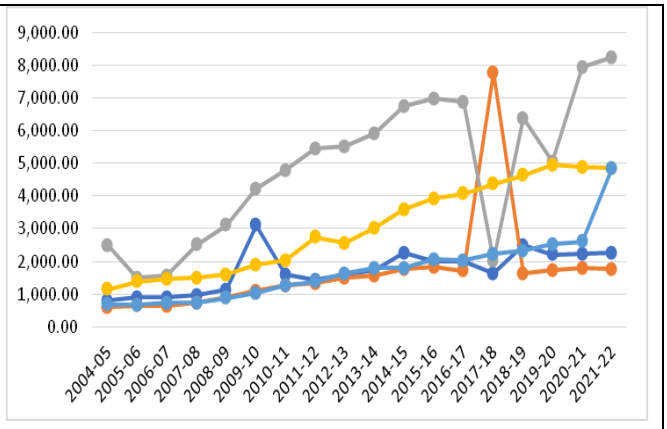



**Fig 12:** Seed Input Cost (Rs/Ha)

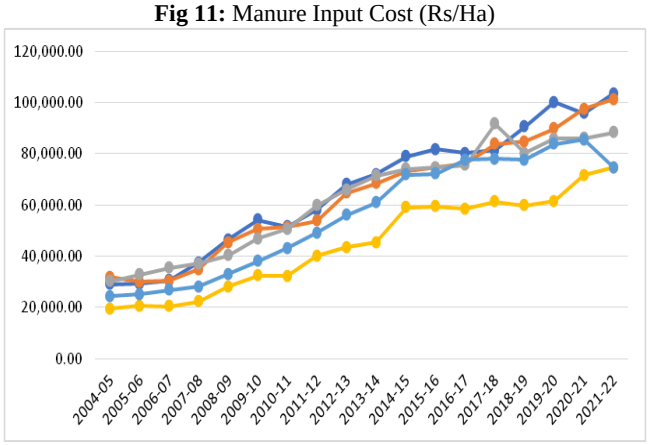



**Fig 13:** Cost of Cultivation (C2)

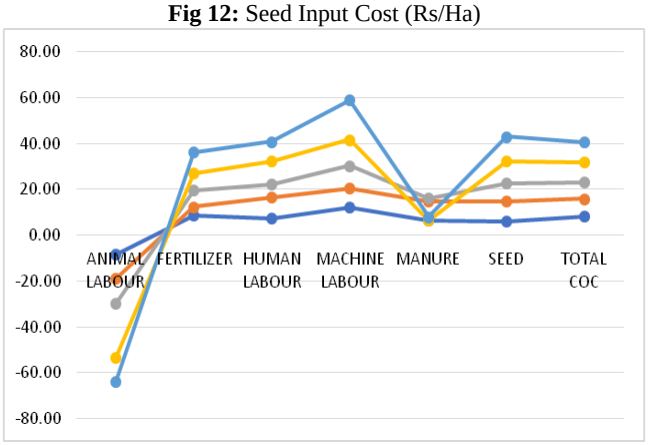



**Fig 14:** CGR of Input Cost (%)

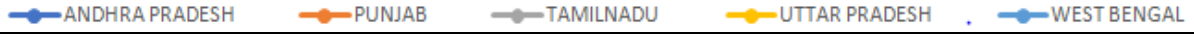



**Table 1:** Compound growth rate (CGR) of input intensity

| | Animal Labour | Fertilizer | Human Labour | Manure | Seed |
|---|---|---|---|---|---|
| Andhra Pradesh | -18.76 | 1.65 | -5.5 | -1.57 | 0 |
| Punjab | -18.06 | -0.52 | -1.79 | -2.99 | 0 |
| Tamil Nadu | -24.31 | 0.21 | -5.41 | -10.66 | 0 |
| Uttar Pradesh | -29.09 | 1.64 | -1.95 | -19.26 | 0 |
| West Bengal | -21.95 | 2.79 | -2.51 | -7.34 | -3.26 |

**Table 2:** Compound growth rate (CGR) of input Cost

| | Andhra Pradesh | Punjab | Tamil Nadu | Uttar Pradesh | West Bengal |
|---|---|---|---|---|---|
| Animal Labour | -8.28 | -10.77 | -10.73 | -23.6 | -10.55 |
| Fertilizer | 8.52 | 3.78 | 7.19 | 7.54 | 8.99 |
| Human Labour | 7.27 | 9.19 | 5.61 | 10.09 | 8.6 |
| Machine Labour | 12.25 | 8.31 | 9.7 | 11.37 | 17.27 |
| Manure | 6.4 | 8.41 | 1.16 | -9.6 | 1.61 |
| Seed | 6 | 8.66 | 7.81 | 9.73 | 10.71 |
| COC (C2) | 8.12 | 7.77 | 7.06 | 8.85 | 8.6 |

## Conclusion

The cost of inputs for components related to cultivation costs is rising between 2004–05 and 2021–22. Input costs for animal labour went up in Tamil Nadu, West Bengal, and Andhra Pradesh. Over time, the cost of manure input rose in the Uttar Pradesh but declined in all other states. With the exception of the Uttar Pradesh state, all other input cost factors—such as labour costs for machinery, labour costs for humans, and fertilizer and manure—have climbed over time. Excluding the input cost of animal labour for other considerations like With the exception of Punjab, all states saw an increase in the input intensity of fertilizer use over time. Over the course of the period, all other input intensity parameters, such as the use of manure, animal labour, and human labour, have declined. Over time, the price of seed input likewise went up. The price of seed is very high in Tamil Nadu, but it is very low in Punjab. Over time, the entire expense of agriculture also increased. The total cost of farming is high in Andhra Pradesh and cheap in Uttar Pradesh, respectively. Five states have negative compound growth rate s for manure input intensity, animal work, and human labour, whereas all states except Punjab have positive compound growth rates for fertilizer consumption. The opposing side's input cost components compound growth rate all showed positive values, with the exception of animal labour. It is very important to adopt mechanization in West Bengal and Uttar Pradesh like Punjab. Reducing the input use of chemical fertilizer is very advisable in the state Tamil Nadu.

**References**


1. Adsul T. The temporal and structural changes in Agricultural labour in Konkan region; c2016.
2. Aheeyar MMM, Henegedara GM, Rupasena LP. The cost of production of rice in Kegalle and Kurunegala Districts of Sri Lanka (No. 115). Colombo, Sri Lanka: Hector Kobbekaduwa Agrarian Research and Training Institute; c2005.
3. Basavaraja H, Mahajanashetti SB, Sivanagaraju P. Technological change in paddy production: A comparative analysis of traditional and SRI methods of cultivation. Indian Journal of Agricultural Economics. 2008, 63(4).
4. Basavaraja H, Mahajanashetti SB, Sivanagaraju P. Analysis of Traditional and SRI Methods of Cultivation. 2008;63(4):629-640.
5. Bhandari NB, Bhattarai D, Aryal M. Cost Production and price spread of Cereal Crops in Nepal: A Time series Analysis 2071/2072(2014/2015) Market Research & Statistics Management Program; c2014.
6. Guptha CB, Prabhakaran TR, Aditi N, Kalaiselvan NN, Arivudai NV. The Comparative trend analysis in cost of paddy cultivation and profitability across three states of India. European Scientific Journal: c2014.
7. Kumar A, Singh RKP, Singh KM, Mishra JS. Economics of paddy (*Oryza sativa*) production: A comparative study of Bihar and Punjab. Indian Journal of Agricultural Sciences. 2018;88(2):314-319.
8. Monga S, Sidana BK. Temporal Changes in Cost Structure and Profitability of Wheat and Paddy Crops in India. Journal of Agricultural Development and Policy. 2020;30(2):184-194.
9. More SS, Sanap DJ, Katkade JL. Structural change in cost of cultivation in sugarcane crop in Maharashtra state: reality from cost of cultivation data. International Journal of Tropical Agriculture. 2015;33(2 (Part IV)):1565-1569.
10. Navadkar DS, Amale AJ, Gulave CM, Nannaware VM. Economics of production and marketing of kharif maize in Ahmednagar district of Maharashtra State. Agricultural Situation in India. 2012;69(6):309-316.
11. Parshuramkar KH, Darekar AS, Datarkar SB, Dangore U. Economics of production of paddy in Gondia district of Maharastra. International Research Journal of Agricultural Economics and Statistics. 2014;5(2):249-252.
12. Prakash S, Singh B. Economics and constraints analysis of rice production in Jhansi district of Uttar Pradesh, India. Plant Archives. 2013;13(2):865-869.
13. Pegu NC, Hazarika C. Growth and Instability of rice production in Assam. International Research Journal of Interdisciplinary and Multidisciplinary studies II (IV). 2016:39-46.
14. Raghu PT, Aditi N, Kalaiselvan NN, Nambi A. Comparative trend analysis in cost of paddy cultivation and profitability across three States of India. In 2nd Annual International Interdisciplinary Conference, AIIC 2014. 2014:271.
15. Rahman MS, Mandal MAS, Kajisa, Bhandari, Humnath. Farm size and productivity in rice farming: recent empirical evidence from Bangladesh; c2013.
16. Sangeeta, K Bala. To Estimate the Trend Scenario of Selected Inputs and Outputs of Agricultural Sector in Haryana, India. Research Journal of Agriculture and Forestry Sciences. 2015;3(6):16-18.
17. Swaminathan MS. Ending the debt trap and attaining food security. The Hindu. 2008 Mar;3:12.
18. Thorat VA, Dhekale JS, Joshi RM, Bhosale JM, Talathi. The temporal and structural changes in cost of cultivation of rice in konkan region. AGROSCO Report, Dept. of Agricultural Economics; c2017.