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## Temporal changes in input-output prices and cost of cultivation of tur

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### Abstract

In this study an attempt has been made to study the temporal changes in input output prices and cost of cultivation of Tur in Vidarbha region of Maharashtra State. For the conduction of present study the data on input output prices and cost of cultivation of tur was collected from Agricultural Prices and Costs Scheme, Dr. Panjabral Deshmukh Krishi Vidyapeeth, Akola. Every year 50 farmers were selected for present study. Simple tabular analysis was used to analyze the temporal changes in the cost of cultivation of tur. Cost structure of tur was analyzed by working out the share of each item of cost in the total cost of cultivation. The changes in the structure of cost of cultivation of tur was assessed by comparing the cost structure of each crop during the latest years with that of early years. The share of total temporal change as assignable to individual cost components was also ascertained. The present study reveals that, at current prices in tur, all inputs showed an increasing trend during the period of study except bullock labour price and FYM price. The prices of seed, fertilizer and human labour was increased by 10.67, 8.61 and 6.89 per cent per annum respectively. While the output price of tur at current price was increased by 8.14 per cent per annum. It is also evident from the table that between 2010-11 to 2019-2020, the output-input price parity were decreased during year 2010-2011 to 2012-2013, 2014-15. And from 2017-18, to 2018-19, increased in the subsequent years, indicating there by in the year 2010-11, to 2012-13 and 2014-15, and from 2017-18 to 2018-19 the output price were lower than input price and term of trade was unfavourable for tur growers. However, the term of trade was favourable for the tur growers in the remaining years.

**Keywords:** temporal changes, input-output prices, cost, cultivation, tur

### Introduction

Agriculture is a most important sector of Indian Economy. It, being the largest economic activity, serves as an index of country's economic development. In spite of the fact that agriculture was given the top most priority in almost every 'Five year Plan', the first two decades after independence witnessed a slow pace in the growth of agricultural production. For a base of 50 million tones, the food grain production has risen only 75 million tons by mid sixties and the per capita net availability of food remained almost unchanged. The introduction of new technology during the fourth plan has changed the shape of Indian agriculture. From a stagnant stage. It had picked up a speed which accelerated day by day.

Pulses are one of the important food commodities in India where a large vegetarian and even non vegetarian population are highly dependent on pulses for protein source. Since pulses are cheaper than animal protein often referred to as 'poor man's meat' in developing countries like India. If we compare the percentage of protein in most of the pulses with that of superior cereals like wheat and rice then we find that gram, black gram and lentil contains 17.1, 24.0 and 25.1 percent respectively, whereas, wheat and rice have only 11.8 and 8.5 per cent of protein respectively. The major pulse crops grown in India are chickpea, pigeonpea, urdbean, mungbean, lathyrus, mothbean, horsegram, lentil and peas. The common pulses grown in Rabi season are chickpea, lentil, field pea, lathyrus (Khesari) and rajmash. The major pulses cultivated during Kharif season are arhar, moong and urd (black gram).

India has second rank in world tur production. In India area was 4.78 million hactor, production 3.50 million tones, productivity 751 (kg/ha) (DES-2019-20). In Maharashtra area production and productivity is 1319.1(000 hector), 1196.8(000 tonnes) and 907.3 (kg/ha) respectively in the year 2019-20. In Vidarbha it is grown in an area of 6613.31 (00, ha) with production of 6605.96 (00, t) of an average production and productivity is 2138.12 kg/ha.

### Materials and Methods

#### Selection of Samples

Data use for the present study was collected from Agricultural Price and Costs (APCs) scheme, Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV) Akola.

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Data on input use, their prices, cost of cultivation, output, output prices and Gross return was obtained for last 10 years i.e. from 2010-11 to 2019-20. Every years, number of the farmers was obtained as per the availability of farmers in APC cluster. The data for maximum 50 farmers for tur was obtained from APC cluster.

### Index of Input Prices

The input price indices are composite indices of prices of individual items of inputs. The indices was constructed using the cost of cultivation data for the period of last Ten years with average of first triennium ending as the base year. First, the price indices of inputs of seed, labour, bullock labour, fertilizer, farm yard manure, capital, pesticide, depreciation on implements and rental value of land was constructed. (Thakare and Shende (2012) [13], Shende and Shinde (2010) [8] also used this methodology for calculating indices of input prices).

The composite indices of input prices was constructed as

$$\text{Index of Input Price} = \sum_{i=1}^9 S_i \left( \frac{P_{it}}{P_{io}} \right)$$

Where,  $S_i$  = average share of  $i^{\text{th}}$  input in total input cost.  $P_{it}/P_{io}$  is the price index of  $i^{\text{th}}$  input in the  $t^{\text{th}}$  year using average of first triennium as the base year,  $i=1$  stands for Human wage index,  $i=2$  Bullock wage index,  $i=3$  Fertilizer price index,  $i=4$  FYM price index,  $i=5$  seed price index  $i=6$  Interest rate index,  $i=7$  Pesticide expenditure index,  $i=8$  Depreciation charges index, and  $i=9$  Rental value of land index.

After computing Input price indices and output price indices was calculated and after deflating output price indices by input price indices, we get parity indices.

$$\text{Parity index} = \frac{\text{Output price indices}}{\text{Input Price indices}} \times 100$$

### Temporal changes in input and output prices and cost of cultivation

The data is subjected to tabular analysis to study the changes in input and product prices, cost and returns for Tur. Simple tabular analysis was used to analyze the temporal changes in the cost of cultivation of tur. Cost structure of tur was analyzed by working out the share of each item of cost in the total cost of cultivation. The changes in the structure of cost of cultivation of tur was assessed by comparing the cost structure of each crop during the latest years with that of early years. The share of total temporal change as assignable to individual cost components was also ascertained.

The cost of production of the grain yield on per quintal basis was worked out after the apportionment of total cost of cultivation between the main product and the by-product in proportionate to their contribution to the gross value of output. The cost of production per quintal is obtained by dividing the cost of cultivation attributable to the main product by the grain yield on unit area basis. The compound growth rate of values between the initial year and the later year has also been worked out by using formula.

$$Y = ab^t$$

Where,

$Y$  = Quantity / prices of inputs / yield / prices of output / value of output / cost of production.

$a$  = Intercept

$b$  = Regression coefficient

$t$  = Time variable

From the estimated function the compound growth rate was worked out by –

$$\text{CGR (r)} = [\text{Antilog}(\log b) - 1] \times 100$$

Where,

$r$  = Compound growth rate

## Results and Discussion

### Changes in input and output prices

As stated above the study of input use and the changes there in over period of time is important it indicates the extent to which the farmers have adopted the new production technology. An attempt was therefore made in the present study to estimate the per hectare use of the key inputs for two points of time, namely, 2010-11 and 2019-20 and estimate the changes in the level of inputs used for these periods. Results obtained in this behalf are presented and discussed crop-wise in the following section. Transformation of agriculture from subsistence to profitable farm business is a techno-organizational process, the success of which largely depends on the relative prices of various inputs and outputs. Therefore, it would be interest to examine the changes in prices of inputs and outputs. The changes in input and output prices was analysed both at current as well as constant prices. To nullify the effect of inflation, the current prices were converted into constant prices.

**Table 1:** Compound growth rates of input and output prices at current prices and constant prices

Items	Current Prices	Constant Prices
<b>Input Prices</b>		
i) Wages rate (₹ /ha)	6.89***	6.50**
ii) Bullock labour price(₹ /ha)	-3.65	-4.84
iii) FYM price (₹ /ha)	-6.70	-7.85
iv) Fertilizer price (₹ /ha)	8.61***	7.25*
v) Seed price (₹ /ha)	10.67**	9.31**
2) Output Price (₹ /ha)	8.14*	6.81*

(\*\*\*, \*\*, \*denotes significant at 1%, 5% and 10% level of significance)

**Compound growth rates of input and output prices of tur at current and constant prices:** The rate of growth of average input and output prices of tur at current and constant prices is presented in Table 1.

Table 1 reveals that, at current prices, all inputs showed an increasing trend during the period of study except Bullock labour price and FYM price. The prices of seed, fertilizer and human labour was increased by 10.67, 8.61 and 6.89 per cent per annum respectively. While the output price of tur at current price was increased by 8.14 per cent per annum. (Hence the hypothesis is accepted). At the constant prices, the price of seed, fertilizer and human labour was increased by 9.31, 7.25 and 6.50 per cent per annum respectively. While prices of bullock labour and FYM showed negatively stagnant growth. The output price of tur at constant prices was also increased by 6.81 per cent per annum during the period of study.

### Parity between prices received for products and prices paid for inputs

Parity prices for farm products are those prices which would give the same purchasing power to the producer as prevailed in the base year. In order to examine the parity between the prices received for output and prices paid for agricultural inputs, parity indices were computed by deflating output price indices by the input price indices.

### Parity between output price index and input price index for tur

The input-output price indices for tur are presented in Table 2. It is evident from the table that between 2010-11 to 2019-20, the output-input price parity were decreased during year 2010-2011 to 2012-2013, 2014-15.

**Table 2:** Parity between output price index and input price index for tur (Base year- Average of triennium ending -2010-2011 to 2012-2013)

Years	Input price index	Output price index	Parity index
2010-11	103.42	100.83	97.49
2011-12	132.31	95.80	72.40
2012-13	182.62	103.35	56.59
2013-14	96.19	120.97	125.75
2014-15	161.61	151.54	93.76
2015-16	133.95	162.62	121.40
2016-17	114.52	131.14	114.51
2017-18	118.86	116.99	98.42
2018-19	146.14	137.79	94.28
2019-20	108.62	133.73	123.14

And from 2017-18, to 2018-19, increased in the subsequent years, indicating there by in the year 2010-11, to 2012-13 and 2014-15, and from 2017-18 to 2018-19 the output price were lower than input price and term of trade was unfavourable for

tur growers. However, the term of trade was favourable for the tur growers in the remaining years.

**Changes in cost of cultivation of tur:** The results in Table 3 shows the changes in the cost of cultivation of tur in Vidarbha. The total cost of tur has gone up from ₹ 49141.29 per hectare in 2010-11 to ₹ 110829 per hectare in 2019-20 depicting an increase by 2.25 times during a period of study. The increase has occurred in all major items of cost like hired human labour, family labour, bullock labour, machine labour, seed, fertilizer, farm yard manure, insecticide, rental value of owned land and interest on working capital, costs of interest on fixed capital and depreciation cost. The cost of human labour, machine labour, seeds, fertilizer and cost of human labour has increased at a faster rate. Among operational cost items, hired human labour (17.33) recorded the maximum share followed family labour (9.55) in the increase in cost of cultivation over time. Out of the total increase of ₹ 61687.74 in the total cost of cultivation per hectare the operational cost items contributed about 68.62 per cent and the remaining 31.38 per cent by fixed cost items. The increase in insecticide and fertilizer charges has been to the tune of 7.64 per cent and 3.15 per cent respectively of the total increase in cost of cultivation. The relative shares of different inputs in the cost of cultivation of tur at two points of time are also given in Table 5.3.2 the share of operational cost has remained around 70.43 per cent in 2019-20, which was lower than that in 2010-11. But within operational cost, the share of machine labour in the total cost increased from 8.43 per cent in 2010-11 to 14.81 per cent in 2019-20 and the share of bullock labour in the total cost decreased from 7.73 in 2010-11 to 3.10 in 2019-20. The decrease in the share of bullock labour is on account of substitution by machine labour the share of fertilizers in the total cost increase from 3.20 per cent in 2010-11 to 3.23 per cent in 2019-20, for tur. (Hence the hypothesis is accepted).

**Table 3:** Changes in cost of cultivation of tur

Sr. No	Particulars	Cost of cultivation				Change in 2019-2020 Over 2010-2011		Share in total change (%)
		2010-2011		2019-2020		₹ /ha	Per cent	
		₹ /ha	Per cent	₹ /ha	Per cent			
<b>A)</b>	<b>Operational costs</b>							
	Hired human labour	8951.12	18.00	19646.52	17.44	10695.40	119.48	17.33
	Family labour	6630.50	13.36	12522.05	11.18	5891.54	88.85	9.55
	Bullock labour	3813.19	7.73	3334.68	3.10	-478.50	-12.54	-0.77
	Machine labour	4163.05	8.43	16657.34	14.81	12494.29	300.12	20.25
	Seed	2678.27	5.47	4773.95	4.36	2095.67	78.24	3.39
	F. Y. M	655.38	1.43	350.53	0.47	-304.85	-46.51	-0.49
	Fertilizer	1541.66	3.20	3485.29	3.23	1943.63	126.07	3.15
	Insecticides	4445.46	9.00	9159.26	8.22	4713.80	106.03	7.64
	Incidental charges	764.50	1.64	3226.28	3.09	2561.77	335.08	4.15
	Repairs	310.64	0.74	857.50	0.92	546.86	176.04	0.88
	Interest on working capital	1693.71	3.50	3867.34	3.56	2173.62	128.33	3.52
	Sub-total(A)	35647.52	72.55	77980.78	70.43	42333.25	1399.22	68.62
<b>B)</b>	<b>Fixed Cost</b>							
	Land revenue and taxes	35.78	0.19	28.38	0.19	-7.39	-20.66	-0.02
	Depreciation	513.80	1.14	1860.86	1.80	1347.06	262.17	2.18
	Rental value of Land	11841.93	23.78	24882.41	22.05	13040.48	110.12	21.13
	Interest on fixed capital	1102.25	2.32	6076.60	5.51	4974.34	451.28	8.06
	Sub-total(B)	13493.77	27.45	32848.26	29.57	19354.49	802.91	31.38
<b>C)</b>	<b>Cost C (A+B)</b>	49141.29	100	110829	100	61687.74	2202.14	100

**Table 4:** The extent of changes in physical inputs, input prices, physical output, output prices and gross return for tur

Sr. No	Particular	2010-2011 (Base year)	2019-2020 (Current year)	Percent change in 2019-2020 over base year	Growth rate per annum (%)
A	Quantity of inputs				
1	Seed (Kg/ha)	33.85	46.52	37.43	3.56**
2	Fertilizer (Kg/ha)	195.67	86.81	-55.63	-4.09
3	Manure (qtl/ha)	6.68	2.57	-61.55	-12.05
4	Human labour (hrs/ha)	1239.75	1097.10	-11.50	-1.44
5	Bullock labour (hrs/ha)	116.08	37.57	-67.62	-15.40
B	Prices of inputs				
1	Seed (₹ /kg)	79.12	102.61	29.69	6.86*
2	Fertilizer (₹ /kg)	7.87	40.14	409.57	13.25**
3	Manure (₹ /qtl)	98.00	136.34	39.11	6.08
4	Human labour (₹ /hrs)	12.56	29.32	133.29	8.46***
5	Bullock labour (₹ /hrs)	32.84	88.73	170.13	12.08***
C	Yield (qtl/ha)				
1	Main product	19.40	30.83	58.88	4.08
2	By-product	10.00	20.00	99.86	5.98
D	Price of output (₹ /qtl)				
1	Main product	3523.02	4672.44	32.62	3.98
2	By-product	290.37	270.61	-6.80	-0.67
E	Value of output (₹ /ha)				
1	Main product	68360.42	144052.30	110.72	8.23**
2	By-product	2905.87	5412.52	86.26	5.97
3	Gross return	71266.29	149464.82	109.72	8.27**
F	Cost of production (₹ /qtl)	2429.71	3512.17	44.55	4.83**
G	Minimum Support Price	3000	5800	93.33	7.69***

(\*\*\*, \*\*, \*denotes significant at 1%, 5% and 10% level of significance)

The extent of change in physical inputs and their prices along with changes in physical output and their prices and gross return for tur over time is given in Table 4. It is remarkable to note that the physical quantity of bullock labour, human labour, manure and fertilizer has come down for tur due to increase in the wage rate of bullock labour and human labour and prices of manure and fertilizer, only physical quantity of seed is increase due to increase in the price of seed. The gross return for tur crop has recorded an increase of 109.72 per cent during the period study. The increase in gross return from tur is attributable to the increase in the main and by- product of tur as well as increase in their prices over the years. It worth mentioning that the rate of increase in the prices of main product and by- product of tur has much higher compared to the increase in the physical yield of main product and by-product. The cost of production of tur has increased from ₹ 2429.71 per quintal in 2010-11 ₹ 3512.17 per quintal in 2019-20. While the cost of production has recorded an increase of 44.55 per cent during the period being study.

### Conclusion

It is concluded from the study that, at current prices in tur, all inputs showed an increasing trend during the period of study except Bullock labour price and FYM price. The prices of seed, fertilizer and human labour was increased by 10.67, 8.61 and 6.89 per cent per annum respectively. While the output price of tur at current price was increased by 8.14 per cent per annum. The total cost of tur has gone up from ₹ 49141.29 per hectare in 2010-11 to ₹ 110829 per hectare in 2019-20 depicting an increase by 2.25 times during a period of study. The increase in gross return from tur is attributable to the increase in the main and by- product of tur as well as increase in their prices over the years. The cost of production of tur has increased from ₹ 2429.71 per quintal in 2010-11 ₹ 3512.17 per quintal in 2019-20. While the cost of production has recorded an increase of 44.55 per cent during the period being study.

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