

An Economic Analysis of Production, Marketing and Post Harvest Losses in Soybean in Kabirdham District, Chhattisgarh

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ABSTRACT

Chhattisgarh contributes a major share in the production of soybean and it is produced by thousands of farmers. A study on economic analysis of post harvest losses in soybean of Kabirdham district in Chhattisgarh plain was conducted during 2014-15. The study covered 12 villages of two blocks and data on cost-return, production, marketing, post harvest losses and constraints aspects of soybean cultivation were collected from 120 farmers. Total cost incurred in soybean cultivation amounted to be Rs.26565.34 per ha. Average net income of soybean cultivation was found to be 37703.66 Rs/ha. Average input-output ratio worked out to be 1:2.42 at soybean. The post harvest losses of soybean have been estimated to be 77.05 kg per hectare and 4.60 kg per quintal. The losses have been highest during drying (18.76 kg/ha) and (1.12 kg/q.) in soybean followed by threshing (16.25 kg/ha) and (0.97 kg/q), storage (16.08 kg/ha) and (0.96 kg/q), harvesting (15.08 kg/ha) and (0.90 kg/q), winnowing (5.70 kg/ha) and (0.34 kg/q) and transportation (5.19 kg/ha) and (0.31kg/q), respectively. Decreasing yield due to growing the crop regularly in same field, lack of availability of fund, labour shortage, insects/pests/disease, lack of improved varieties, lack of soil testing facilities and irrigation were the major constraints in soybean cultivation. The study suggested that there is an urgent need to increase the area under soybean by developing improved and high yielding varieties, irrigation at farm level, low cost mechanization, creation of storage facilities, processing units, implementation of MSP, credit and price support, marketing effective extension and dissemination of market information to soybean growers for enhancing production, marketing and minimizing post harvest losses in soybean.

Key words *Economic Analysis, Marketing and Post Harvest Losses, Soybean, Kabirdham District, Chhattisgarh*

India is the fourth largest oilseed producing country in the world, next only to USA, China and

Brazil, harvesting about 25 million tons of oilseeds against the world production of 250 million tons per annum. Since 1995, Indian share in world production of oilseeds has been around 10 per cent. The world annually produced 28.6 million metric tons of soybeans in 1961-65, and reached 217.6 million metric tons in 2005-07. The USA produced more than 50 percent of the world soybean production until the 1980s but that share has declined to 37.0 per cent in 2005-07. Brazil is the second largest producer with 53.9 million tons, or 24.8 per cent of world production. Argentina ranks third producing 41.4 million tons and 19.0 per cent of world output. The top five countries; United States, Brazil, Argentina, China, and India, produce more 92 per cent of the world's soybeans.

Soybean has turned out to be a major oilseed crop in India in recent decades. The growth in area and production has been unparalleled during last 40 years. The horizontal expansion from merely 30000 ha in 1970 to nearly 9.3 million ha in 2010-11 tells about the success story of soybean in India. On productivity front the growth has been nearly thrice; from 426 kg/ha to 1361 kg/ha during this period. The crop has been playing an important role in resolving the edible oil deficit situation in India. As on today it supplements about 25% of edible oil produced in the country. In addition, the crop has been fetching more than Rs.74000 million annually, from the export of de-oiled cake, a byproduct of oil extraction plants. This earning helps in offsetting the import bill of edible oils in the country. By introduction and subsequent rapid commercialization of soybean in India, the greater share of benefit goes to soybean growers positioning them at higher socio-economic status. In a country like India where more than 40% population suffers from energy-protein malnutrition, the crop can serve as an excellent source of high quality protein.

Total area under oilseeds cultivation is 306871 hectare while production is 178431 metric tons in

Table 1. Cropped and irrigated area of sample farms

		(ha/farm)				
S. No.	Particulars	Marginal	Small	Medium	Large	Average
1	Owned land	0.75 (97.40)	1.36 (98.55)	2.64 (96.35)	9.88 (99.49)	4.85 (99.18)
(i.)	Leased-in land	0.02 (2.66)	0.02 (1.47)	0.00 (0.00)	0.00 (0.00)	0.02 (0.41)
(ii.)	Leased-out land	0.00 (0.00)	0.00 (0.00)	0.10 (3.64)	0.05 (0.5)	0.02 (0.41)
2	Net cultivated area	0.77 (100.00)	1.38 (100.00)	2.74 (100.00)	9.93 (100.00)	4.89 (100.00)
3	Irrigated area	0.37 (48.05)	0.43 (31.15)	1.14 (41.60)	4.37 (44.00)	2.2 (44.99)
4	Un-irrigated area	0.40 (51.95)	0.95 (68.84)	1.6 (58.39)	5.56 (55.99)	2.69 (55.01)

Note: Figures in the parenthesis indicate the percentages to the total cropped area.

Chhattisgarh. The area under oilseeds in Chhattisgarh plain is 130.07 thousand ha. 23.08 per cent and production of 107.5 metric tons 16.00 per cent of total area and production in Chhattisgarh. Out of this soybean alone contributes 95758 ha of area while production is 112391 metric tons with an productivity of 1.07 kg/ha (Chhattisgarh Agriculture Department 2011)

Kabirdham district individually contributes more than 28.26 per cent of the total area and 30.01 per cent of production in the Chhattisgarh plain. (Source : Commission of Land Revenue, 2011). Looking to above facts, a study is essential to undertake through which a detailed insight can be obtained to identify the production, disposable pattern and post harvest losses of soybean in Chhattisgarh plain with the following specific objectives.

Objectives

1. To estimate the costs and returns of soybean in the sampled households.
2. To estimate the extent of post harvest losses in soybean at farm level.
3. To examine the disposable pattern of soybean in the study area.
4. To identify the major constraints in production and post harvest management of soybean and suggest suitable measures to overcome them.

MATERIALS AND METHODS

A multistage sampling was used to select the study area as Chhattisgarh plain was first stage, selection of district was second, thirdly selection of blocks followed by villages and finally respondents. The period of inquiry was 2014-15. The study based on intensive interview method of enquiry of 120 soybean growing respondents. Randomly selected ten respondents from twelve villages of two blocks of Kabirdham district in Chhattisgarh plain, Chhattisgarh. The required primary data selected from respondents and secondary information from reviews, literatures and various government sources. To work out the cost of cultivation of soybean, standard method of cost of cultivation was adopted. Tabular analysis, average and percentages were carried out to estimate cost and returns and the post harvest losses in soybean.

Information about post-harvest losses was obtained from the farmers during following operations: (a) harvesting, (b) transportation, (c) threshing, (d) winnowing, (e) drying and (f) storage. The information on following losses was collected from the farmer which was based on respondents memory recall. The total post harvest losses were estimated as a sum of all these losses for soybean crop.

Table 2. Cropping pattern followed by sample households**(In ha/farm)**

S. No.	Particular	Farm size				
		Marginal	Small	Medium	Large	Over all
A	Kharif					
	a. Paddy	0.27 (22.88)	0.50 (22.42)	1.01 (21.09)	3.53 (18.92)	2.31 (25.27)
	Soybean	0.15 (6.73)	0.25 (5.22)	0.65 (3.48)	2.50 (27.35)	0.77 (8.42)
	Groundnut	0.15 (12.71)	0.25 (11.21)	0.50 (10.44)	1.75 (9.38)	0.68 (7.44)
	Sugarcane	0.10 (8.47)	0.21 (9.42)	0.38 (7.93)	1.10 (5.89)	0.55 (6.02)
	Vegetables	0.10 (8.47)	0.17 (7.62)	0.20 (4.18)	1.05 (5.63)	0.58 (6.35)
	Total Kharif	0.77 (65.25)	1.38 (61.88)	2.74 (57.20)	9.93 (53.22)	4.89 (53.50)
B.	Rabi					
	Paddy	0.10 (8.47)	0.22 (9.87)	0.45 (9.39)	2.23 (11.95)	1.07 (11.71)
	Gram	0.05 (4.24)	0.12 (5.38)	0.39 (8.14)	1.10 (5.89)	0.49 (5.36)
	Mustard	0.09 (7.63)	0.11 (4.93)	0.25 (5.22)	1.00 (5.36)	0.40 (4.38)
	Linseed	0.07 (5.93)	0.10 (4.48)	0.21 (4.38)	0.90 (4.82)	0.41 (4.49)
	Wheat	0.05 (4.24)	0.21 (9.42)	0.20 (4.18)	1.70 (9.11)	0.54 (5.91)
	Sunflower	0.05 (4.24)	0.09 (4.04)	0.15 (3.13)	0.80 (4.29)	0.39 (4.27)
	Total Rabi	0.41 (34.75)	0.85 (38.12)	1.65 (34.45)	7.73 (41.43)	3.30 (36.11)
C	Zaid					
	Vegetables	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.50 (2.68)	0.50 (5.47)
	b. Other crop	0.00 (0.00)	0.00 (0.00)	0.40 (8.35)	0.50 (2.68)	0.45 (4.92)
	Total zaid	0.00 (0.00)	0.00 (0.00)	0.40 (8.35)	1.00 (5.36)	0.95 (10.39)
D.	Total cropped area (A+B+C)	1.18 (100.00)	2.23 (100.00)	4.79 (100.00)	18.66 (100.00)	9.14 (100.00)
E.	Area under oilseeds	0.51 (43.22)	0.8 (35.87)	1.76 (36.74)	6.95 (37.25)	2.65 (28.99)
F.	Net cultivated area	0.77 (65.25)	1.38 (61.88)	2.74 (57.20)	9.93 (53.22)	4.89 (53.50)
G.	Cropping intensity (%)	153.24	161.59	174.81	187.91	186.91

Note : Figures in parenthesis indicate percentage to total cropped area.

Table 3. Input cost of cultivation of soybean (Rs/ha.)

Sl. No.	Particulars	Marginal	Small	Medium	Large	Average
Input						
1	Human labour					
	Human labour	7434.94 (38.02)	8176.35 (39.88)	8712.65 (38.40)	9543.76 (39.09)	8466.93 (38.85)
	Power	3483.60 (17.81)	3689.80 (17.99)	4790.60 (21.11)	5230.60 (21.42)	4298.65 (19.73)
	Total labour cost	10918.54 (55.83)	11866.15 (57.87)	13503.25 (59.51)	14774.36 (60.51)	12765.58 (58.58)
4.	Seed	5600.00 (28.63)	5600.00 (27.31)	5650.00 (24.90)	5721.40 (23.43)	5642.85 (25.89)
5.	Manure & fertilizer	1323.20 (6.77)	1256.00 (6.13)	1525.00 (6.72)	1695 (6.94)	1449.80 (6.65)
7.	Plant protection chemicals	784.70 (4.01)	805.90 (3.93)	932.90 (4.11)	1062.90 (4.35)	896.60 (4.11)
8.	Interest on working capital@4%	931.32 (4.76)	976.40 (4.76)	1080.55 (4.76)	1162.68 (4.76)	1037.73 (4.76)
	Total Input cost	19557.72 (100.00)	20504.45 (100.00)	22691.70 (100.00)	24416.26 (100.00)	21792.53 (100.00)

RESULT AND DISCUSSION

Land use and cropping pattern

It reveals that net cultivated area per farm was observed to be 0.77, 1.38, 2.74 and 9.93 hectares of marginal, small, medium and large farms, respectively, (Table 1 & 2). Overall, 4.89 hectare area per farm was noted irrespectively to the farm size. The percentage of irrigation varied from 31.15 per cent at small farms to 48.05 per cent at marginal farms and overall, it was 44.99 per cent, respectively. It may be seen that the total kharif cropped area was observed to be 0.77, 1.38, 2.64, 9.93 and 4.89 hectares at marginal, small, medium, large and average farms, respectively (Table 2). The area under different crops in kharif was observed to be 53.50 per cent on average farms. The area under rabi season was observed to be 36.11 per cent on average farms, respectively. The area under soybean was observed to be 8.42 per cent. The cropping intensity was found to be 153.24, 161.59, 174.81 and 187.91 per cent at marginal, small, medium and large farms, respectively. The overall cropping intensity was observed at 186.91 per cent.

Cost of cultivation of soybean

Input and operation wise cost of cultivation of soybean

The input cost of cultivation of soybean per hectare was highest in case of large farms and lowest in case of small farms. It is due to the fact that large farmers could incur more expenditure on modern farm inputs like quality seed, fertilizers, plant protection chemicals, hired labour etc. The overall input cost of cultivation of soybean was observed as Rs. 21792.53 per hectare (Table 3). The major share of cost among different cost items were found in labour cost 58.58 per cent to the total cost of cultivation out of which 38.85 per cent contribution was of human labour and machine labour contribute 19.73 per cent, followed by seed cost 25.89 where as manure and fertilizer together contributes 6.65 per cent of the total cost of cultivation of soybean. The highest cost share was found in sowing operation which is 25.84 per cent to the total cost of cultivation (Table 4). Field preparation was found second most expensive operation with the percentage share of 10.95 to the total cost of cultivation. The overall cost of

Table 4. Operation wise cost of cultivation of soybean (Rs/ha.)

Particulars	Marginal	Small	Medium	Large	Overall
Variable cost					
Field preparation	2253.95 (9.94)	2401.15 (10.18)	3260.95 (12.71)	3728.95 (13.66)	2911.25 (10.95)
Manure & Fertilizers	1730.32 (7.63)	1690.79 (7.17)	2059.79 (8.03)	2269.90 (8.31)	1937.70 (7.29)
Seeds and sowing	6658.10 (29.36)	6825.10 (28.95)	6926.10 (26.99)	7057.50 (25.85)	6866.70 (25.84)
Intercultural operations	2123.76 (9.37)	2341.60 (9.93)	2641.70 (10.29)	2951.70 (10.81)	2514.69 (9.46)
Plant protection	1035.60 (4.57)	1156.80 (4.91)	1283.80 (5.00)	1413.80 (5.18)	1222.50 (4.06)
Harvesting	1843.30 (8.13)	1971.20 (8.36)	2051.40 (7.99)	2251.40 (8.25)	2029.32 (7.63)
Threshing	1150.50 (5.07)	1270.50 (5.39)	1470.50 (5.73)	1600.50 (5.86)	1373.00 (5.16)
Winnowing	700.12 (3.09)	640.12 (2.71)	686.12 (2.67)	699.12 (2.56)	681.37 (2.56)
Transportation	1130.79 (4.99)	1230.79 (5.22)	1230.79 (4.08)	1280.79 (4.69)	1218.29 (4.58)
Interest on working capital	931.32 (3.91)	976.40 (3.95)	1080.55 (3.86)	1162.68 (3.90)	1037.74 (3.91)
Sub total	19557.70 (82.27)	20504.50 (82.82)	22691.70 (84.22)	24416.30 (85.17)	21792.53 (82.03)
Fixed cost					
Land revenue	50 (0.22)	50 (0.21)	50 (0.19)	50 (0.18)	50 (0.18)
Rental value of land	4000 (17.64)	4000 (16.96)	4000 (15.59)	4000 (14.65)	4000 (15.05)
Interest on fixed capital	162 (0.68)	162 (0.66)	162 (0.58)	162 (0.54)	162 (0.61)
Sub total	4212 (17.86)	4212 (17.18)	4212 (15.78)	4212 (14.83)	4212 (16.41)
Total cost (A+B)	23769.70 (100.00)	24716.40 (100.00)	27984.30 (100.00)	29790.90 (100.00)	26565.34 (100.00)

cultivation of soybean was observed as Rs. 26565.34 per hectare. Total operational cost found was showing increasing trend from marginal to large farms due to higher availability of factors of production.

Profitability in soybean cultivation

It reveals that irrespective to the farms size, the net income earned by farmers was Rs/ha

37703.66. (Table 5). The input-output ratio was found to be 1:2.42 and benefit of Rs 1.42 in per rupee investment on soybean cultivation. The net income earned by farmers was found to be increasing with farm size of holding and ranging from Rs. 30144.36 to Rs. 43900.49 of marginal to large farm size of holdings (Table 5). The similar pattern of input-output and B:C ratio had also been noticed with respect to farm size of holding.

Table 5. Costs and returns of soybean under different sample farms

(Rs./ha)

S.No.	Particulars	Marginal	Farm size			
			Small	Medium	Large	Average
1.	Input cost	23769.7	24716.45	26903.7	28628.26	26565.34
2.	Output value	53914.06	55610.22	59354.10	72528.75	64269.00
3.	Net income	30144.36	30893.77	32450.40	43900.49	37703.66
4.	Input-Output ratio	1:2.27	1:2.25	1:2.21	1:2.53	1:2.42
5.	B:C ratio	1:1.27	1:1.25	1:1.21	1:1.53	1:1.42

Post harvest losses in soybean

The post harvest losses incurred by the sampled farmers of soybean is presented in Table 6. It depicts that on an overall basis 4.60 kg per quintal and 77.05 kg per hectare post harvest losses was incurred. It varied from 69.84 kg per hectare to 87.85 kg per hectare of marginal to large farmers. The stage of drying (24.35 per cent) resulted in maximum post harvest losses in (kg/ha) in soybean and the least loss was observed in case of transportation (6.74 per cent). Therefore, based on the findings of this study, improved low cost dryers or drying sheets for soybean may be provided to soybean growers as governmental support, to reduce post harvest losses in soybean.

Marketable surplus and disposal pattern of soybean

The overall marketable surplus of soybean was observed as 88.72 per cent (Table 7). It was higher in case of small farmers i.e. 88.99 per cent and lower in case marginal farmers i.e. 87.34 per cent. The soybean growers on an average sold 15.94 per cent to co-operative society, 21.46 per cent to village merchants and 62.58 per cent to wholesalers.

Constraints

Constraints in soybean production and marketing

The opinion of farmers with regards to soybean production on various aspects, namely,

Table 6. Post harvest losses of soybean

S. No.	Stage	MARGINAL		SMALL		MEDIUM		LARGE		OVERALL	
		Losses (Kg/ hectare)	Loss (kg/ quintal)	Losses (Kg. per hectare)	Loss (per quintal)	Losses (Kg. per hectare)	Loss (per quintal)	Losses (Kg. per hectare)	Loss (per quintal)	Losses (Kg. per hectare)	Loss (per quintal)
1	Harvesting	13.75 (19.69)	0.87 (19.68)	14.95 (19.26)	0.89 (19.26)	15.72 (19.70)	0.93 (19.70)	19.25 (21.91)	1.10 (21.91)	15.08 (19.57)	0.90 (19.57)
2	Transportation	3.95 (5.66)	0.25 (5.66)	5.21 (6.71)	0.31 (6.70)	5.75 (7.21)	0.34 (7.20)	5.78 (6.58)	0.33 (6.57)	5.19 (6.74)	0.31 (6.74)
3	Threshing	14.85 (21.26)	0.94 (21.27)	16.13 (20.78)	0.96 (20.78)	16.56 (20.76)	0.98 (20.76)	17.50 (19.92)	1.00 (19.92)	16.25 (21.09)	0.97 (21.09)
4	Winnowing	5.69 (8.15)	0.36 (8.14)	5.54 (7.14)	0.33 (7.14)	6.76 (8.47)	0.40 (8.47)	7.18 (8.17)	0.41 (8.17)	5.70 (7.40)	0.34 (7.39)
5	Drying	17.22 (24.66)	1.09 (24.66)	19.32 (24.89)	1.15 (24.89)	18.93 (23.73)	1.12 (23.73)	20.30 (23.11)	1.16 (23.11)	18.76 (24.35)	1.12 (24.35)
6	Storage	14.38 (20.59)	0.91 (20.59)	16.46 (21.51)	0.98 (21.21)	16.06 (20.13)	0.95 (20.13)	17.85 (20.32)	1.02 (20.32)	16.08 (20.87)	0.96 (20.87)
										77.05	
	Total	69.84 (100.00)	4.42 (100.00)	77.62 (100.00)	4.62 (100.00)	79.77 (100.00)	4.72 (100.00)	87.85 (100.00)	5.02 (100.00)	(100.00)	4.60 (100.00)

Table 7. Marketable surplus and disposal pattern of soybean

S.No	Crop	Marketable surplus	Size of farms				
			Marginal	Small	Medium	Large	Average
1	Soybean						
I	Total quantity produced Per family	16.8 (100.00)	17.8 (100.00)	18.5 (100.00)	18.9 (100.00)	18.00 (100.00)	
II	Total quantity utilized	2.00 (15.66)	1.85 (11.01)	2.00 (11.83)	2.00 (11.43)	1.89 (11.28)	
III	Marketable surplus	13.80 (87.34)	14.95 (88.99)	14.90 (88.17)	15.5 (88.57)	14.86 (88.72)	
	Disposal pattern						
I	Village merchant	4.57 (33.11)	3.51 (24.81)	3.30 (22.14)	1.36 (8.77)	3.19 (21.46)	
II	Wholesaler	6.63 (48.04)	8.64 (57.79)	9.68 (64.96)	12.14 (78.32)	9.30 (62.58)	
III	Co-operative society	2.60 (18.84)	2.80 (18.72)	1.92 (12.88)	2.00 (12.90)	2.37 (15.94)	
IV	Marketable surplus	13.80 (100.00)	14.95 (100.00)	14.90 (100.00)	15.5 (100.00)	14.86 (100.00)	

infestation of crop with insect/pest/disease, lack of irrigation, non-availability of labour in peak season /time etc. was elicited (Table 8 and 9). 88.33 per cent soybean growers incurred that production of soybean was decreasing due to cultivation of same crop since long period of time and was the most burning constraint for soybean cultivation.

The second most important constraint was lack of availability of fund in proper time (79.16 per cent) followed by scarcity of labour during peak season (75.83 per cent), infestation of insect/pest/disease (66.67 per cent) and lack of improved varieties (51.67 per cent).

Table 8. Constraints in soybean production**(n=120)**

S.No.	Problems	Number of Respondents	
		Yes	No
1	Problem of disease/insect/pest	80.00 (66.67)	40.00 (33.33)
2	Decreasing yield due to growing the crop regularly in same field	106.00 (88.33)	14.00 (11.67)
3	Lack of irrigation	40.00 (33.33)	80.00 (66.67)
4	Lack of improved varieties	62.00 (51.67)	58.00 (48.33)
5	Lack of availability of fund in proper in time	95.00 (79.16)	25.00 (20.83)
6	Scarcity of labour during peak season	91.00 (75.83)	29.00 (48.33)
7	Lack of micronutrients in soil along soil testing facilities	58.00 (48.33)	62.00 (51.66)
8	Lack of latest technical knowledge about the crop	42.00 (35.00)	78.00 (65.00)
9	Lack of recommended package of practices	36.00 (30.00)	84.00 (70.00)

Table 9. Constraints in soybean marketing**(n=120)**

S.No.	Problems	Number of Respondents	
		Yes	No
1	Lack of processing unit	100.00 (83.33)	20.00 (16.66)
2	Lack of storage facilities	120.00 (100.00)	0.00 (0.00)
3	Inefficient regulated and co-operative market	120.00 (100.00)	0.00 (0.00)
4	Lack of demand of produce in daily market	66.00 (55.00)	54.00 (45.00)
5	Low price of products	98.00 (81.66)	22.00 (18.33)
6	Lack of transportation facility from village to market	62.00 (51.67)	58.00 (48.33)
7	Lack of awareness about market Information	64.00 (53.33)	56.00 (46.67)
8	Heavy damage of produce at time of Transportation	50.00 (41.67)	70.00 (58.33)
9	low support price	108.00 (90.00)	12.00 (10.00)
10	High cost of transportation	61.00 (51.67)	59.00 (41.23)

The major constraints in marketing was lack of storage facilities for soybean and inefficient regulated and co-operative market which was reported by all the farmers. It was important to note that due to lack of adequate storage facilities the oilseed producers, had to sell their produce in the market. Though the farmers also sold their produce to the co-operative society, they were not satisfied with the handling and delaying tactics of the society personnel.

Looking to this, adequate storage facilities such as rural godowns or small scale storage structure should be constructed in the study area by the government and the same should be made available to the farmer at reasonable cost. The next major constraint was lacked of processing unit facility, which was reported by 83.33 per cent farmers. Due to this constraint farmers were forced to sell their produce to private intermediaries who exploited the farmers in one way or the other. About, 53.33 per cent farmers felt that lack of awareness of the market information was also a problem. So, it is being suggested that oilseeds growers should

come forward to get the market news about the prices and other aspects of oilseeds.

Looking to the importance of oilseeds in general, and that of soybean in particular, the study suggested that there is an urgent need to increase the area under soybean by developing improved and high yielding varieties, irrigation at farm level, low cost mechanization, creation of storage facilities, processing units, implementation of MSP, credit and price support, marketing effective extension and dissemination of market information to soybean growers for enhancing production, marketing and minimizing post harvest losses in soybean.

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