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RESEARCH ARTICLE

ECONOMICS OF ONION SEED PRODUCTION IN WESTERN RUKUM, NEPAL

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ABSTRACT

Onion seeds are a promising sub-sector for boosting productivity, poverty alleviation, food and nutrition security in Nepal although they are high-value and low-volume commodities. Our study is useful to estimate the economics of onion seed production in the Salyan District of Nepal. Sixty household respondents were randomly selected using cluster sampling for primary data collection through pre-tested semi-structured questionnaires, field surveys and verified by focus group discussion. Multiple linear regression and indexing techniques were used to analyze data on the SPSS program. Our study shows that the average cost of production of onion seed per kg NRs 622.83 with revenue NRs 400. The benefit-cost ratio was 0.64 for onion seed production indicating the loss caused by severe price fluctuations in recent years due to biotic stress, the influence of Indian seeds, an unhealthy chain of seed pricing and marketing. The cost of labor and plant protection is statistically significant with onion seed productivity. To boost onion seed production productivity and profitability, efficient and cost-effective resource management is required. Our study strongly suggests stakeholders and policymakers focus on price determination, integrated market linkage, input, and technical assistance to the farmer.

KEYWORDS

Economic, onion, seed, Production, Nepal

1. INTRODUCTION

Nepal is a country with diverse topography and a wide range of microclimates (Bhattacharjee *et al.*, 2017). Agriculture is the mainstay of the Nepalese economy, even though its topography contributes less than 20% (MoAD, 2016) of the total area suitable for cultivation(Bhattacharjee *et al.*, 2017). Agriculture employs 65.6 percent of Nepal's population and provides 28.89 percent of the country's GDP (Adhikari, 2015; AICC, 2018)Vegetables are one of the key subsectors of Nepalese agriculture, which generated around 14.92 percent of AGDP in 2012/13 (Shrestha and Chandra Dhakal, 2020). Vegetables, including potatoes and spices, contributed about 25.54 % of AGDP (MoAD, 2016). In Nepal, the vegetable sector keeps expanding in terms of both acreage and production (Timsina and Shivakoti, 2018). There has been a 203 % expansion in the area, a 608 percent increase in overall production, and a 153 percent rise in vegetable production in the past 38 years (1977/78 to 2014/15) (VDD, 2016). Area, production and productivity trend of vegetable in Nepal from 2010/11-2016/17 is shown in Figure 1.

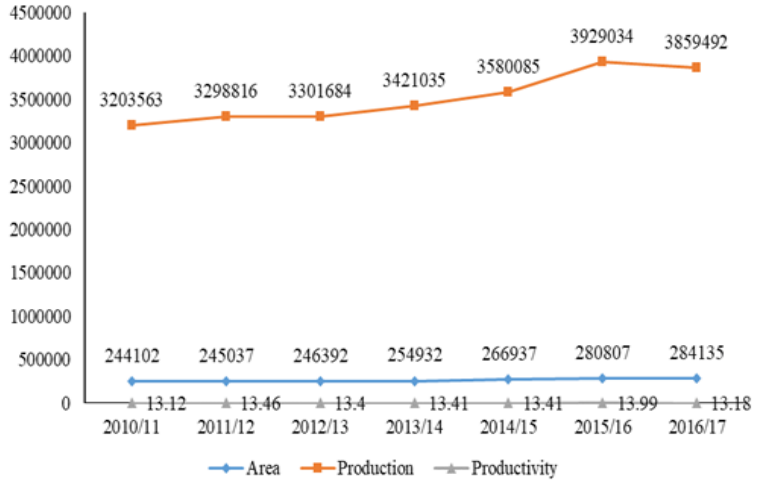

Figure 1: Trends of vegetable production in Nepal

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Vegetable seed is a high-value, low-volume, high-priced vital agricultural product with increasing domestic demand and export potential (Shrestha and Chandra Dhakal, 2020). The demand for improved seeds increases every year as the cultivation area in fresh veggies grows in both the main season and off-season (Sector and Strategy, 2013). It has a comparative and competitive benefit in the local market, as well as the potential to export (AEC, 2014). Moreover, it addresses issues such as food security and self-sufficiency, as well as rural economic development (MoAD, 2016; Dahal *et al.*, 2009). The use of improved, higher-quality seeds boost agricultural output by 20-30%, according to empirical research (Rahel and Noriega, 2018). The country's highest contributor of vegetable seed production is the Midwestern area, while Rukum is the highest producing district (MoAD, 2016). Kishankalagi Unnat Biu-Bijan Karyakram (KUBK) has initiated a seven-year initiative (2012-2019) in six districts to develop the formal seed sector by improving seed yield through market-driven demand for enhanced seeds (NACCFL, 2017).

Even though Rukum has enormous potential for onion seed production, the industry is fragmented and unable to satisfy shifting market demands (Shresth *et al.*, 2020). In contrast, imports from India, Japan, Korea, and Thailand cover a large portion of the country's seed demand (MoAD, 2011; NARDF Technical Paper Series Report', 2009). Because of the subsistence farming system, inability to appropriately allocate resources during production, lack of market information, and dire economic record-keeping, farmers are unable to benefit from onion seed production ('actahortic.1994.358.54.pdf', 2009; Pokhrel, 2010) In Rukum, the onion seed industry has a long history, but there has been little research on the economics of seed production (Rahel and Noriega, 2018; Shresth *et al.*, 2020). From the standpoint of boosting productivity, production economics are critical, particularly for marginal farmers, who are substantial contributors to the agricultural economy (Adhikari, 2015). As per PMAMP (Prime Minister Agriculture Modernization Program) vegetable/vegetable seed zone Rukum, prices have fluctuated significantly over the last four years. Farmers received 1000 rupees per kg of onion seed in the year 2071/2072, which increased to 1500 rupees in the year 2072/2073, subsequently 800 rupees in the year 2073/2074, and ultimately 400 rupees in the year 2074/2075 is shown in

Figure **2**. There are two sorts of seed systems in Nepal: informal and formal seed systems (Sulaiman and Andini, 2013). Farmers in the informal seed system produce and save their seeds for later planting, and they exchange modest amounts of seeds as gifts with others (Sulaiman and Andini, 2013; Samantha *et al.*, 2013). Formal seed systems are defined by vertically regulated production and distribution of tested and released varieties by public and commercial companies utilizing quality control mechanisms that are agreed upon (MoAD, 2016). Formal sources account for roughly 25-30% of overall vegetable seed demand, while informal sources account for 30-45%. (SQCC, 2017). In the fiscal year 2019/20, the country imported 106,834 tons of onion worth Rs. 4.21 billion, as per information from the Department of Customs. Because of the COVID-19 pandemic, onion imports fell in the preceding fiscal year compared to the previous fiscal year 2018/19 In the fiscal year 2018/19, 178,500 tons of onion worth Rs. 5.62 billion was imported, compared to 319,500 tons worth Rs. 4.84 billion in the fiscal year 2017/18.About 8,010 tonnes of onion worth Rs. 295 million were imported into the country in the first month of the current fiscal year 2020/21. Onion 14178 kg onion seed was imported in Nepal in 2017-18 (Kafle, 2022).

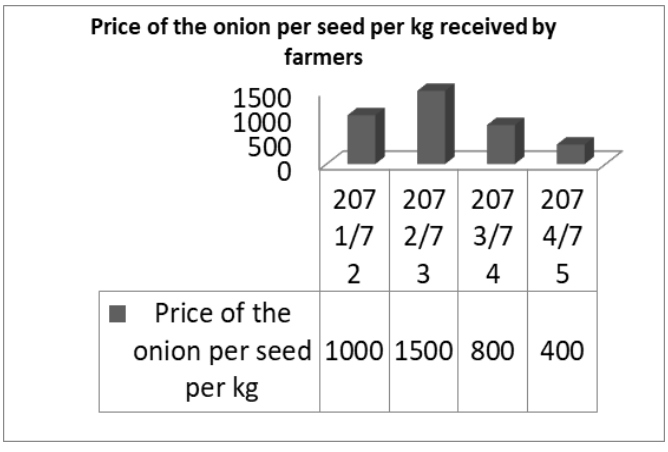

Figure 2: Price of onion seed received by Farmer

Previous Researchers talked about production opportunities and constraints of major vegetables of Nepal. Very few studies were conducted on spice and condiments crops for Nepal like Onion, garlic, etc. on the topic of management of diseases, offseason production techniques, National Seed Vision, integrated plant Nutrient management, etc (Sapkota and Pokhrel, 2013; Tiwari, 2014; Dhital *et al.*, 2015; Paneru, Adhikari and Tandan, 2020).

The objectives of our study is to analyze the cost, return and profitability of onion seed production, identify the determinants of onion seed productivity & marketing, identify the existing marketing system of onion seed sector. Our study visualized the Perspect, economics of onion seed production, and marketing strategy of different types of onion seed in salyan Nepal. The average onion seed production is much below the maximum yield. In 2015/16, onion seed demand was 223.9 Mt, while total onion seed output in the Rukum was 5.044 Mt, showing a significant need imbalance. This study was able to identify cost components and likely returns, which is essential in terms of raising output and determining farmer profitability competitiveness. Similarly, variables impacting onion seed productivity may be discovered, which will aid in improving seed productivity in general and encouraging farmers to increase their output in the near future. The prevalent market structure and restrictions connected to production, post-harvest, and marketing might be recognized in order to enhance the market system and close the demand gap, which would have a significant impact on onion seed growers' socio-economic position. Proper economic analysis should be used to create an efficient and sustainable agricultural system, which considers production costs, product returns, and whether the production process makes a profit or loses money. As a result, an effective and sustainable economic system in seed production may assist small farmers better their livelihoods while also benefiting consumers, making it an important component of agricultural development and poverty reduction efforts.

1.1 Statement of Problems

The average yield of onion seeds is far below the potential yield. Onion seed demand for 2015/16 was 223.9 Mt while the total onion seed production in the Rukum was 5.044 metric tons in the same year, indicating a huge demand gap. Because of the large amount of onion seeds imported at a low cost from neighboring countries, seed produced locally does not receive a fair price, significantly reducing the bargaining power of seed producing farmers.

2. Materials and Methods

In the present review, secondary data were exploited for the relevant information related to major weeds found in wheat, their effect on growth, and yield components with their management strategies. A thorough study of journal articles, research papers, related books, published reports was done to assess the impact of weeds in wheat crops and management strategies to combat the effect. The related articles have been downloaded from different sources like research gate, Google Scholar, Pubmed, Springer journals.

2.1 Site Selection

The research was carried out in Rukum(west) district's Chaurjahari municipality, which is one of Nepal's mid-hills districts with a strong potential for onion seed production. The municipality of Chaurjahari was chosen for the study because it is a priority vegetable/vegetable seed zone under PMAMP, and the bulk of commercial onion seed producers are based in and around Chaurjahari. The study area is shown in the following Figure 3.

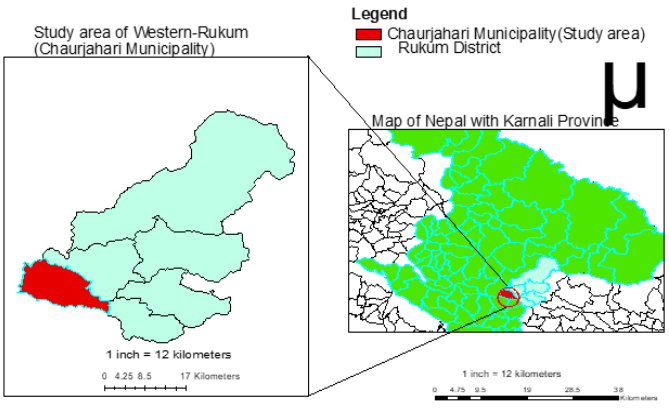

Figure 3: Study area of western Rukum. GIS map for onion survey on Chaurjhari municipality

All onion seed-producing farmers in the Chaurjahari municipality were included in the study's sample population, which included farmers in the onion seed-producing farmers group. During the preliminary study of the target population, the onion seed-producing farmers' sampling frame was chosen and constructed. Out of the entire onion seed-producing farmers in Chaurjahari municipality, sixty farmers were selected for this study. The essential information was collected from Chaurjahari municipality using a clustered sampling technique followed by simple random sampling. Three wards of Chaurjahari municipality were chosen for the survey, with 20 farmers from each ward. Data was collected from a wide range of sources, both primary and secondary, and the data were analyzed accordingly. Primary data was gathered using a participative approach including field visits and a semi-structured questionnaire. Two Focus group discussions, key informant surveys, direct observation, and individual interviews all corroborated the accuracy, reliability, and validity of the acquired data. Secondary data was gathered from a variety of sources, including journals, research publications, and DADO reports.

2.1 Methods and Techniques of Data Analysis

The essential data were collected, coded, and placed into a computer for analysis. The data was loaded into SPSS, Excel and the analysis were carried out. The inference needed was derived using the mean, standard deviations, frequency, percentage, percentage function, multiple regression, and the scaling approach. Both Qualitative data & Quantitative data were analyzed. Both descriptive and analytical statistics were used to analyze quantitative data. Family size, age, employment pattern, education level, landholding size, economically active population, and other socioeconomic and farm characteristics of respondents were characterized using descriptive statistics such as frequency, percentage, mean, and standard deviation.

2.2 Cost of Production

To evaluate production costs, all variable inputs such as human labor, bull for tillage, seeds, chemical fertilizers, herbicides, and organic manures were deemed key components of production and valued at current market values.

Total variable cost= Clabor+ Cseed+ Cferti.+ Cpesti.+ Cmanure

Clabor= Cost on human labor used (NRs/ha)

Cseed= Cost on seed (NRs/ha)

Cferti.= Cost on inorganic fertilizers (NRs/ha)

Cpesti.= Cost on pesticides (NRs/ha)

Cmanure= Cost on organic manures (NRs/ha)

Gross return=total seed produced* price per kg

Average gross margin (GM)= GFI-TVC

Gross Margin (NRs.) = Gross farm income (NRs.) - Total variable cost (NRs.)

Benefit cost analysis (B:C ratio) = (Gross return (NRs.))/(Total variable cost (NRs.))

2.3 Multiple Regression

A multiple regression analysis was also utilized to assess the causal link between the dependent variable (vegetable seed productivity) and the other factors.

Y= b0+b1X1+b2 X2+b3 X3+b4X4+..... + bpXp

Where,

Y= Productivity of onion seeds

b0= Value of Y when all of the independent variables (X1 through XP) are equal to zero

b1-bp= Regression coefficient that is marginal effect of X on Y

X1-Xp= Independent variables

3. RESULT

The goal of our research was to look at the value chain of onion seed production and marketing in Salyan, as well as the parameters that limit onion seed commercialization, so that people are exposed to seed both in season and out of season. To provide a more detailed explanation, we have taken the following factors into account.

3.1 Landholding of The Respondents

The respondent's total land holdings include both lowlands (khet) and uplands (bari). The total area covered by the khet and bari systems was 17.63 ha and 16.60 ha, respectively, with an average of 0.2938 ha and 0.2767 ha per family which is represent Table 1.

Table 1: Landholding of the respondents in the study area

Descriptions	Minimum	Maximum	Mean	S.D	Total
Khet land (ha)	0.10	0.60	0.2938	0.13129	17.63
Bari land (ha)	0.10	0.55	0.2767	0.11824	16.60

Source: Field survey, 2019

3.2 Organizational Participation

Farmers take part in a variety of programs put out by organizations such as KUBK, PMAMP, Agriculture Service Center, and Agriculture Knowledge Center. Recently, the Prime Minister's Agriculture Modernization Project arranged a modest irrigation project, as well as training in pricing chain development, enhanced technology, and marketing.

3.2.1 Trainings, Subsidies and Technical Support

In Rukum, almost every farmer has gotten onion seed growing instruction from various organizations (west). Farmers planting onion seed received tiny tillers from PMAP lately. Farmers have received technical assistance from the Agricultural Knowledge Center in partnership with the vegetable/vegetable seed zone.

3.2.2 Loan Provision

Only 25% of the total respondents had taken out a loan to cultivate onion seeds is present in Figure 4. They had taken credit from farmer cooperatives and a handful from banks, and they claimed that getting loans from cooperatives was pleasant while withdrawing loans from the cooperatives was satisfactory and withdrawing loans from the bank was hard

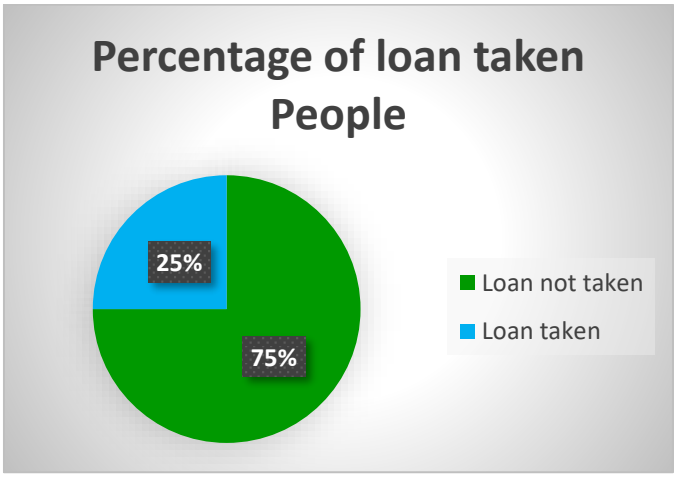

Figure 4: Loan pattern of study area

3.3 Cost of Production of Onion Seed

Land preparation, sowing, transplanting, weeding, harvesting, watering,

roughing) were all included in the cost of seed production, as were chemical fertilizers, organic manure, and plant protection. Labor was the most expensive input, accounting for 51.53 % cost of onion seed cultivation, followed by plant protection and foundation seed. According to a 2005 study by Regmi & Sharma, when the cost of labor is doubled, the cost of manufacturing rises by roughly 65-70 %. The cost of onion seed production is shown in Table 3.

Table 2: The average cost of onion seed production (NRs ha-1) in the study area

Items of cost	Mean	Percentage of the total cost
Human labor	215066.6	51.53
Organic manure	31666.6	7.58
Foundation seed	17000	4.07
Certification	3000	0.71
Inorganic fertilizers	26396.6	6.32
Plant Protection	124166.6	29.75
Total	417296.4	100

Source: Field Survey 2019

3.4 Returns from The Seed Production

Returns of the onion seed production, average gross revenue, and benefit-cost ratio of the onion seed production were calculated as per the information gathered from the study area as shown in Table 4.

Table 3: Returns from the onion seed production

Measuring criteria	Average value
Productivity (Mt/ha)	0.67
Gross revenue (NRs/ha)	2,68,000
Average revenue (NRs/kg)	4,00
Total cost (NRs/ha)	4,17,296.4
Average cost (NRs/kg)	622.83
Average gross margin (NRs/kg)	-222.83
Benefit cost ratio	0.64

3.5 Socio-economic factors determining onion seed productivity

At a 5% level of significance (p-value 0.000), onion seed productivity was shown to be statistically significant with the total landholding of the respondents, implying that productivity improves by 0.357 units for every unit increase in landholding. Also, at a 5% level of significance (p-value0.043), seed productivity was shown to be statistically significant with respondents' schooling, implying that for every unit increase in education, seed productivity improves by 0.007 units. The socioeconomic factor which limit the onion seed productivity is shown in ..

Table 4: Socio-economic factors affecting onion seed productivity

Variables	Coeff. (SE)	t-value	p-value
Age	0.001(-0.000059)	-0.117	0.907
Gender	0.009(0.006)	0.706	0.483
Schooling	0.003(0.007)	2.071	0.043*
Total land holding	0.020(0.357)	17.828	0.000***
R^2	0.849		

3.6 Resource Productivity on Onion Seed Production

At a 5% level of significance (p-value 0.000), labor cost for onion seed production was shown to be statistically significant with onion seed productivity, indicating that for each unit increase in labor cost, productivity improves by 0.0000091 units. Plant protection cost was also shown to be statistically significant with onion seed productivity at the 5% level of significance (p-value 0.000), indicating that productivity improves by 0.000021 units per unit increase in plant protection cost.

Table 5: Resource productivity on onion seed production

Variables	Coeff.(SE)	t-value	p-value
Urea Cost	0.000017(-0.000001)	-0.065	0.949
DAP Cost	0.000029(0.000043)	1.483	0.144
MOP Cost	0.000048(0.000025)	0.509	0.613
Plant Protection Cost	0.000005(0.000021)	4.205	0.000101***
Human Labor Cost	0.000022(0.000091)	4.065	0.000160***
Manure Cost	0.000007(0.000009)	1.350	0.183
R^2	0.950		

Source: (Field survey, 2019)

3.7 Description of Market Price and Market Margin

After purchasing onion seeds from seed firms, agro-vets sold them to onion bulb producers at a higher price. The market margin was the difference between the market price of onion seed and the farm gate price, as stated in Table 6.

Table 6: Description of market price and market margin

Descriptions	Farmgate price	Market price	Market margin
Onion seed	400	1000	600

Source: Field Survey, 2019

3.8 Major Problems Associated with Onion Seed Production and Marketing

Five key issues were identified Figure 5, and respondents were asked to score them on a scale of one to five, with one being the most serious and five being the least serious. The majority of farmers with an index score of 0.99 stated that their soil health had deteriorated, resulting in low onion seed output and that no organization had offered to test their soil. The appearance of unidentified weeds with an index value of 0.72 is the second most serious problem, and herbicides are ineffective against them, followed by the insect pest with an index value of 0.68, which was the third most serious problem, and farmers had complained that the disease had developed resistance to the same pesticides due to repeated use. The fourth problem was climate change with an index value of 0.31 followed by an irrigation problem with an index value of 0.29.

3.9 Problems / Constraints of Marketing

Five key issues were identified, and respondents were asked to score them on a scale of one to five, with one being the most serious issue and five being the least serious. Almost all of the farmers with an index value of 1 stated that the most serious problem was middlemen benefiting more, followed by the influence of Indian seeds with an index value of 0.74 and that consumers preferred to buy the low-cost Indian hybrid onion seeds, which suppressed the sale of their seeds. Price variations were the third most problematic issue, with an index value of 0.65 indicating that the average price they received in 2071, 2072, 2073, and 2074 was rupees 1008.33, 1500, 800, and 400, respectively. The fourth issue was transportation, which had an index value of 0.32, followed by having no clue what to do.

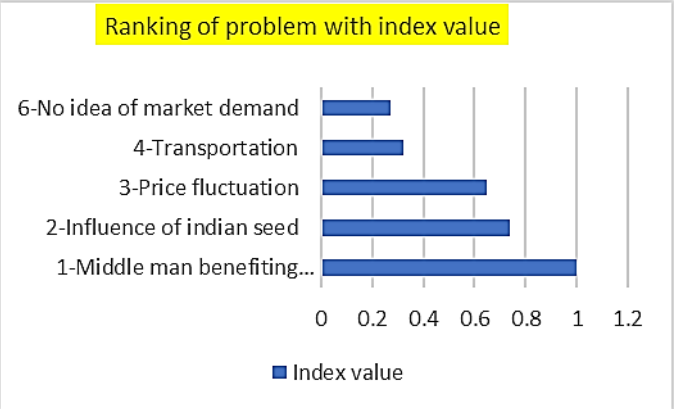

Figure 4: Ranking of marketing constraints with index value

4. Conclusion and Discussion

In the Rukum area, onion seed output was not up to par, with a benefit-cost ratio near 0.64 almost suggesting a loss in the seed sector due to recent price swings. In comparison to other research, the cost of onion seed production was shown to be greater, with human labor being the largest contributor. Onion seed growers' total landholding and schooling showed a strong link with seed output. The cost of labor and the cost of plant protection both have a substantial impact on onion seed output. The marketing channel's main players were middlemen and cooperatives/farmers' organizations. They gathered unprocessed onion seeds from farmers and delivered them to seed firms, who processed the seeds and distributed them to agro vets, who then delivered them to onion bulb producers. Due to a lack of soil testing in the study region for several years, soil health was the primary productivity issue. Farmers did not receive a satisfactory price despite satisfactory production because the intermediary profited more, suggesting the most significant marketing issue.

To boost the profitability of onion seed production, productivity could be raised and production costs might be reduced. Farmers must use input resources efficiently and affordably to achieve this. It is vital to improving the quality of locally produced onion seeds to keep favorable market conditions. Onion bulb farmers should be encouraged to use seeds grown in the district as an alternative for imported seeds. The government to stabilize the price of onion seeds so that farmers do not suffer significant losses as a result of price variations. So government should deploy new technologies connected to post-harvest processes such as grading, packing, and accurate labeling.

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