

Bantering the Socio-Economic Benefits Associated With the Irrigated Gardens Among the Communities of Namibia

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ABSTRACT: *This paper investigates the socio-economic benefits associated with the irrigated gardens among the communities of Namibia. The main theoretical aspect of this paper was centered on the practices of irrigated garden as a key contributor to socio-economic development and wellbeing of Namibia's rural communities. A quantitative method was used in a case study design. Data was gathered from grassroots the community's experiences and understanding towards the socio-economic benefits associated with the irrigated gardens among the communities.*

Informed by this investigation and based on the Kavango East Region case study, there are socio-economic benefits associated with the irrigated gardens among the communities of Namibia. The

barriers seem to be lack of markets and important inputs which discourages communities' willingness to use the irrigated garden. This is due to the fact that leadership of the Kavango East Region does not promote the establishment of irrigated gardens by communities alongside market development, in order to enhance food availability and socio-economic benefits.

The issue of using irrigated gardens to produce food and making market availability for irrigated garden produce to enhance the socio-economic situation of irrigated gardeners in Kavango East Region should be addressed in order to fight poverty in Namibia.

Keywords: *Irrigated garden, Markets availability, Socio-economic, rural community, poverty*

I. Introduction

There were 852 million chronically hungry people (chronically 90% and acutely 10% undernourished) in the developing countries including Namibia, this number includes 37 million people living in industrialized countries under extreme poverty conditions (Food and Agriculture Organization [FAO], 2013). The FAO has highlighted a rise in the total number of undernourished over the past years which raise doubt regarding the proudly pronounced Millennium Development Goal No: 1 to halve, between 1990 and 2015, the proportion of people who suffer from hunger. This does not include the 2 billion people who suffer from hidden hunger (micronutrient deficiencies), primarily women with anaemia and iron deficiency, as well as 250 million children affected by iodine deficiency, the most common cause for mental retardation, or 250 million children suffering from sub-clinical Vitamin A deficiency, which decreases their capacity to fight disease and can lead to blindness (FAO, 2013).

According to the Government of the Republic of Namibia (2013), the Kavango East region is facing insufficient food for most of its community, especially in the rural areas since 2012. The same

report indicates that this is attributed to climate change which induces in most cases drought and flood. The Government of the Republic of Namibia has been assisting climate change affected rural communities by distributing food consignment, to minimize the negative effects. This program is costly to the national budget and is done at the expense of other development priorities.

According to the Government of the Republic of Namibia (2015), food availability in Namibia is mostly affected by climate change. Farmers lack the resources to invest in irrigation or drought-resistant seeds. The lack of alternative income sources keeps the peasants in this risky activity. The lack of rain leads to harvest failure, which may result to food shortages. Some food assistance or other safety net measures were established, but these are often irregular and inadequate (Government of the Republic of Namibia, 2016).

Availability of food means the possibility of feeding oneself and one's family, this can be directly from productive land (agriculture, animal husbandry, horticulture, fruit growing) or other natural resources e.g. fishing, hunting, and food gathering; or from fresh or processed food obtained in markets and stores coming from sites both nearby and far from its production. Mendelsohn (2009), reports that results from the 1994 Income and Expenditure survey shows

that only 17% of all Kavango farmers relied entirely on food that they produced themselves under dryland farming. Consequently, the socio-economic benefits associated with the irrigated gardens among the communities of Namibia have become an issue of concern, which need to be understood, this has enthused this very important study. By way of making use of a case study of the Kavango East Region, this study probes and benchmarks issue of the socio-economic benefits associated with the irrigated gardens among the communities of Namibia. The aim is to establish a hidden reality in Kavango East Region, as to what extent does irrigated gardens is able to contribute to socio-economic development of Namibia.

II. Literature Review

Why having irrigated garden

According to Kawana (2016), rural communities of Kavango East Region have resorted to planting irrigated gardens along the Kavango River due to poor harvest experienced from their rain-fed crops for the past years. Some small villages such as Shighuru have established 10 irrigated gardens. However, the socio-economic benefits associated with the irrigated gardens among the communities of Namibia are not yet known.

The importance of irrigated gardens

FAO (2010) reported that a well-developed irrigated garden has the potential, when access to land and water is not a major limitation, to supply most of the non-staple foods that a family needs every day of the year, including roots and tubers, vegetables and fruit, legumes, herbs and spices, small animals and fish. Roots and tubers are rich in energy and legumes are important sources of protein, fat, iron and vitamins. Green leafy vegetables and yellow or orange-colored fruit provide essential vitamins and minerals, particularly folate, and vitamins A, E and C. Vegetables and fruit are a vital component of a healthy diet and should be eaten as part of every meal. Meat, chicken, and fish are good sources of protein, fat, and micronutrients, particularly iron and zinc (FAO, 2010).

Hussain and Clay (1999) said that the maintenance of this form of production, in the long run, is essential for its economic and nutritional merit. Again, the importance of gardens is further affirmed by the fact that in times of emergency, societies have had to return to the use of gardens to improve food security, as, for example, Irish potato gardens during the Great Depression (Hussain & Clay, 1999). Household food availability can be improved by engaging in food gardening like community gardening and irrigated gardening. Food gardening is an age-old tradition that is widely practiced although it is repeatedly undervalued and resisted by generations of public officials. Food gardening can provide a long-term solution to the dietary diversity of less privileged

communities (United Nations Development Program [UNDP], 1996). Irrigated gardening is an affordable, sustainable long-term strategy to complement supplementation and food fortification programmes and nutrition education (Faber *et al.*, 2007). Irrigated gardening produces crops for household consumption to improve the quality, diversity and nutrient content of diets (Faber *et al.*, 2007).

The vegetables provide immediately accessible sources of micronutrients as they can be cultivated throughout the year, providing vitamins, trace elements and other bioactive compounds (Chadha & Olouch, 2003). Vegetables are a vital dietary component, not just as a side dish to add flavor to meals, but they release and make available bound micronutrients in some staple crops for effective absorption and utilization (Chadha & Olouch, 2003). Seasonal malnutrition accentuates already existing malnutrition. Gardens can help overcome the seasonal fluctuations in the availability of nutrients by staggering the planting of a mixture of early, average and late-maturing varieties. Garden projects need to be complemented with other interventions such as nutrition education and promotion and other development initiatives and basic hygiene (Sikhakhane, 2007).

Irrigated gardens can create income and improve food availability for the poor, but only if participants are fit enough to farm. The surplus harvest can be sold for income to purchase other foods to supply multiple nutrients (Faber *et al.*, 2007). Chadha and Olouch (2003) added that irrigated gardens enable households to direct the savings towards other needs, such as health care, education, and housing. Pain and Pinero (1999) showed that irrigated gardening raises income among those with low income by 50 percent in rural and informal settlements in Southern Philippines. The impact of increased income on household consumption is important in estimating the benefits of increased income on consumption (Hendriks, 2003).

Irrigated gardens empower households to take ultimate responsibility for the nutritional quality of their diets by growing their own nutrient-rich food and making informed consumption choices (Faber *et al.*, 2007).

The role of irrigated gardens to socio-economic development

Irrigated gardening assists in lifting people out of poverty by improving their health and nutrition (Faber *et al.*, 2007). The process of households producing their own food empowers households and makes them self-reliant (Ruel & Levin, 2000). Hartvegsen and A'Bear, (2004), recommend irrigated garden interventions as they are independent of external financial support and, therefore, more sustainable. According to Hartvegsen and A'Bear, (2004), even to the poorest homestead, unutilized marginal land is often the only resource available to

the communities. Gardening can turn this land into a productive source of food and even provide economic security. Most irrigated garden systems are organic-based ensuring availability of fresh pesticides and chemical-free vegetables, mainly because they use a few purchased inputs as they are primarily for household consumption.

Irrigated gardening involves little risk because of the low capital investment in technology and the cultivation of a variety of crops. Marsh (1998) asserted that traditionally, gardeners would feed their families first and then sell, barter or give away surplus garden produce. In certain contexts, however, income generation may become the primary objective of the home garden. In any case, it is counterproductive to impose the nutrition objective to the exclusion of the income generation objective, since in most gardening contexts, they are linked and compatible. Hendriks and Msaki (2006) in a study in KwaZulu-Natal, South Africa found that involvement of smallholders, in agriculture yielded positive effects on food diversity, consumption patterns, and food intakes because an increase in income resulted in an increase in food expenditure. However, they concluded that it cannot be conclusively stated that smallholder commercialization can alleviate hunger or solve malnutrition. Furthermore irrigated gardens are a viable tool that links up directly with four of the major cornerstones of community development which are; health, education, training, economic development and job creation (Cothron, 2009).

Dube and Sigauke (2015) investigated the importance of rural irrigation schemes in addressing community and household food, socio-economic development and ensuring health nutrition uptake by irrigators and surrounding communities for irrigation gardens in Zimbabwe. They computed Body Mass Indices of irrigators and non-irrigators for checking whether food accessibility and availability had a bearing on the nutritional status of individuals. The study concluded that irrigation enables communities to have reliable access to health, safe and nutritious food and also affords farmers additional income through the sale of surplus produce. Irrigators were able to strengthen food security further through asset accumulation.

De Cock *et al.* (2013) investigated the food security status and determinants of food security in the rural areas of the Limpopo Province in South Africa using descriptive statistics and scores. Recommendations were that promotion of rural education could improve food security coupled with the creation of an enabling environment for the rural labor market with sustainable employment opportunities.

Tshuma (2012) reviewed evidence of the role that agriculture plays in addressing poverty and food security issues in South Africa and advocated for increasing agricultural profitability for smallholder farmers as a way out of poverty. Bacha *et al.* (2011)

applied descriptive statistics, the Foster, Greer and Tobeck poverty indices, and Heckman's selectivity model to understand the poverty reduction impact of irrigated gardens development in western Ethiopia in 2006. Results indicated that the incidence, depth, and severity of poverty were significantly lower among farm households with access to irrigation.

Australian City Farms and Community Gardens Network (ACFCGN) (2002) reported that in East Timor, women from 121 families worked in community gardens and produced mustard, tomato, and eggplant that provided food for household consumption; the excess was sold, consequently increasing purchasing power and effectively addressing household food insecurity. Community gardens in Lesotho established in the 1960s improved the nutrient welfare of the Basotho by providing fresh vegetables to combat chronic malnutrition and diseases like phalera and leprosy (Mashinini, 2001). Furthermore, these gardens promoted employment, income generation and the empowerment of women and landless households.

A success story behind two community gardens in Western Cape Province, (New Beginning Shelter and Kibbutz El-Shammah), showed that besides providing shelter for the homeless, community gardens produced enough food to sell and surpluses covered running costs for the next vegetable season (Anon, 2006). In the Gambia, women took loans to build new community vegetable gardens to generate incomes; the majority used these incomes to pay for school fees and teaching materials for their children (United Nations [UN], 2006). Community garden participants in Senegal formed Rural Enterprise Promotion (REP) projects, that added value to agricultural products that allowed parents to invest their added income in the education of their children (UN, 2006).

Faber *et al.* (2002) found that irrigated gardens have the potential to increase direct access to pro-vitamin A-rich foods for economically deprived households through the growing of yellow and dark green leafy vegetables. A study involving 83 households in Nduvakazi, a rural village of low socio-economic status in KwaZulu-Natal showed that 33% of the respondents indicated that they no longer bought vegetables, 21% associated home gardening programmes with poverty alleviation, while 8% were able to sell some of their home gardens produce for cash (Faber & Benade, 2002). In Bangladesh, strengthening home garden production systems for planned year-round production increased the availability, consumption, and sale of vegetables and fruit for poor rural households, resulting in improved nutritional status (Khan and Begum, 2006).

According to the International Food Policy Research Institute (2016), the world is moving toward more comprehensive or systems level thinking as we look at issues of poverty, hunger, and malnutrition and come to a greater understanding of their complexity.

The world's food system includes all of the activities and elements: the environment, people, inputs, processes, knowledge, infrastructure, and institutions involved in getting food from farms to consumers' plates. Just as important, it includes the outputs of these activities, such as socioeconomic and environmental outcomes. Due to the fact that the food system reaches into so many areas, it has a large part to play in people's prosperity, food security, and nutrition. Not only does the food system generate the calories and nutrients that people require for good health, but it is also the basis for the livelihoods of millions of the world's poorest people. Creating a world food system that operates for the well-being of people, as well as the planet on which we all depend, is a major challenge. We need a food system that can help us reach a whole range of SDGs by 2030. What would such a food system look like? How close have we come to achieving it? These questions remain unanswered until today.

III. Methodology

This quantitative paper oriented made use of the case study design to assess the socio-economic benefits associated with the irrigated gardens among the communities of Namibia. The study entailed a detailed and intensive analysis of a single case. The study was a single location (one Region) study. A quantitative method was used to assess the numeric part of the study. The data was collected in May 2019, which was just a few weeks after the community of Kavango East Region has completed harvesting from their rain-fed harvest.

Population

The population of this study consisted of 140 villages in the Kavango East Region.

Sample

The sample consisted of 20 randomly selected villages out of the 140 villages. Stratified random sampling was done to form two strata, one comprises of households without irrigated gardens while the other one comprises with irrigated gardens. For each village, there were five households of community member without manually irrigated gardens and five households with manually irrigated gardens i.e. 200 households, were selected and from which data were collected.

Research Instruments

The research made use of the Household Food Insecurity Access Scale (HFIAS) and Diet Diversity Score (DDS) which were developed by Food and Nutrition Technical Assistance (FANTA) (2005), in order to measure the food insecurity prevalence. This allowed the researchers to explore the factors that determine food security in the villages of Kavango East Region. The instrument is a structured

questionnaire as a research instrument for data collection.

Household Interviews

The researcher requested approval from Kavango Regional Council, informing Regional Leaders that he was in the region to conduct research. After that, a meeting was held with the village headmen to explain to them about the research and its processes was convened and then make appointments with selected households on different dates and time at the 20 randomly selected villages interviews; participants were asked questions concerning the role of gardens in filling the food gap in the Kavango East Region. The standardized open-ended and closed-ended questions had 16 sub-questions to answer the three research objectives.

Data analysis

After the households' interviews, the quantitative data were coded, on which the data dictionary was created to explain the meaning of each code. Then the Data was entered, using Statistical Packages for Social Scientist (SPSS). Bivariate and multivariate analysis were used to test associations and relationships. The analysis included both parametric and non-parametric techniques such as correlation, Chi-square Tests, Independent sample T-tests and Kruskal Wallis H-Tests. The parametric techniques such as Chi-square and T-Tests made a number of assumptions about the population from which the sample was drawn, such as normally distributed scores and an interval level scale or continuous data. While, non-parametric techniques like the Kruskal Wallis H-Test, do not have such stringent assumptions, and were more suitable techniques for the categorical data measured at the ordinal (ranked) level (Pallant, 2010).

Research ethics

Permission to conduct the study was sought from the Kavango Regional Council and the Ministry of Agriculture, Water and Forestry. The researcher applied for ethical clearance from the University of KwaZulu-Natal on which it was granted. The researcher ensured that all questionnaires were accompanied by a statement of intent, where the researcher assured the respondents that the information and data collected was to be used solely for the research and the respondents were accorded open access to results once published. Informed consent after the explanation from the respondents was finally sought before the necessary information was collected. During the entire investigation, anonymity and confidentiality was maintained by not recording any names and not disclosing any information between participants. The data is being stored in a locked cabinet and will be destroyed by shredding and burning after 5 years.

IV. Results and Discussions

Employment rate

Respondents were asked to indicate the number of employed people in their households. This question was raised based on the assumption that the number of employed people in a household influence a particular household’s ability to make food available, as well as making garden inputs available (FAO, 2003). If a household has a large number of employed people, their ability to purchase food is high, and therefore likely to be more food secure. The study revealed that for households without gardens, under category zero for a number of household members’ formal employed had 76%, while 16% of households had only one person employed, and 5% of households had at least two employed members of their households. An additional, 3% had at least three persons and above employed. For the households with gardens, 65% of households indicated not having a single employed person in their household, 21% of the households had at least one person employed, followed by 10% for households with at least two persons employed, while 4% was for households having at least three and above-employed persons.

The study also revealed that from all the groups, the level of unemployment in the Kavango East Region was very high especially in the rural areas. This also confirms the recorded symptoms of unemployment which already manifested itself by the manner in which the Kavango East Region is rated with 56% poverty according to the Government of the Republic of Namibia (2013).

Table 1: Household Employment level

Number of household members who are formally employed	Percentage of formally employed household	
	With garden	Without garden
0	21	76
1	65	16
2	10	5
3 and above	4	3

X², P level = 0.032

Findings in Table 1 indicated that the Chi-square test result had a significance level of P= 0.032. This shows an association between having a garden and a number of people in formal employment. Households which are not employed may find it difficult to start up a garden due to lack of capital. This is in line with Milburn and Vail, (2010), who stated that it is worth to note that, advantages of community gardening are usually countered by the constraints such as poor leadership; knowledge and skills, start-up capital, insecure land tenure, and poor water supply.

Monthly Income of households in the Kavango East Region

The study used the independent sample t-test to compare the different monthly incomes of the two sample groups, that is, those with gardens and those who do not have gardens. The results are presented in Table 2

Table 2 Difference in Monthly Income

Income	Group	N\$	Mean Difference	P-Value
Monthly Income Formal Employment	Without Gardens [A]	180	1585	0
	With Gardens [B]	1765		
Monthly Income Entrepreneurship	Without Gardens [A]	230	-110	0
	With Gardens [B]	120		
Monthly Income Casual/Part Time Employment	Without Gardens [A]	315	-155	0.271
	With Gardens [B]	160		
Monthly Income Family Remittances	Without Gardens [A]	250	15	0.599
	With Gardens [B]	265		
Monthly Income Social Grant	Without Gardens [A]	675	1155	0.7
	With Gardens [B]	1830		
Monthly Income Irrigated Garden	Without Gardens [A]	100	565	0
	With Gardens [B]	665		
Monthly Income Other -	Without Gardens [A]	100	5	0.045
	With Gardens [B]	105		
Total Average	Without	1850	2355	

Monthly Income	Gardens [A]			same across all Test		
	With Gardens [B]	4910	0.005	categories of the Monthly Income.	Kruskal Wallis H-Test	0.60 0.96
				Amount spent on other expenditure is the same across all categories of the Monthly Income.		

Table 2 shows that there was a significant statistical difference ($p < 0.05$) between the two groups' monthly income for those with formal employment (Mean difference (M.D) of 1.34, $p = 0.001$), in entrepreneurship (M.D = 0.15, $p = 0.001$), irrigated garden (M.D = 0.56, $p = 0.001$) and other income (M.D = 0.005, $p = 0.045$). Moreover, the findings show no significant difference ($p > 0.05$) between the two groups' monthly incomes for those in casual/Part time employment (M.D = 0.77, $p = 0.271$), or receiving Family remittances (M.D = 0.31, $p = 0.599$) and those receiving social grants (M.D = 0.56, $p = 0.700$). Overall, the findings in Table 4.3 indicated that there was a significant difference between the monthly incomes of the two groups (M.D = 4.025, $p = 0.005$) and that these differences emanated from incomes from formal employment, entrepreneurship, having an irrigated garden and other sources. These other sources exclude incomes from casual/Part time employment, family remittances, and social grants. These findings suggest that having an irrigated garden is inferentially comparable to having formal employment or entrepreneurship. Thus, implying that having an irrigated garden can be a source of livelihood at par with formal employment and entrepreneurship. Therefore, irrigated gardens can enhance the food security of the respondents by providing a sustainable monthly income.

Table 3: The Mean of the Effect of Total Income on Respondents' Expenditures between gardeners and non-gardeners

Variables of the effect of total income	Test	Mean	p-value
Amount spent on food for participants across all Monthly Income levels	Kruskal Wallis H-Test	582.07	0.00
The amount of spent on medical for participants across all Total Monthly Income levels	Kruskal Wallis H-Test	68.13	0.30
Amount spent on school is the same across all categories of the Monthly Income.	Kruskal Wallis H-Test	117.11	0.50
Amount spent on transport is the same across all categories of the Monthly Income.	Kruskal Wallis H-Test	88.30	0.55
Amount spent on garden inputs is the	Kruskal Wallis H-Test	71.65	0.00

Findings also shows the results for the exponent of the B values (Exp(B)) and represents the odds ratios (OR) for each of the independent variables. Tabachnick and Fidell (2007), notes that the odds ratio represents 'the change in odds of being in one of the categories of the outcome when the value of a predictor increases by one unit' (p. 461). As such, the odds of a farmer answering Yes, they have a garden is 40.495 times higher for those purchasing food for consumption than for a person who does not have a garden, all other factors being equal. Thus, food purchasing is a significant predictor ($p = .007$), with the odds ratio of 40.495, followed by Food from Harvest from Dry Land (odds ratio = 13.985) and Food Aid/Donations (odds ratio = 0.221).

The reason behind this is that household in the Kavango East Region, which are having gardens have food security and diversity, as they are able to sell their vegetables and use the money to buy other food to diversify their dietary intakes resulting in diverse sources of food, from purchasing,

Disposable income

The results under this section focused on objective 2 of the study, which is to determine socio-economic benefits associated with the irrigated gardens among the communities of the Kavango East Region. Table 4 presents the findings.

Table 4: Disposable income for households with and without gardens in the Kavango East Region

Variable	with/without gardens	N	Mean	Std. Deviation	t-test
Total monthly income	without gardens [a]	100	1890	2826.87	0.001
	with gardens [b]	100	4602.4	5686.01	
Total monthly income	without gardens [a]	100	3.13	1.79	0.005
	with gardens [b]	100	4.92	2.29	
Disposable Income	without gardens [a]	100	937.03	2789.26	0.001
	with gardens [b]	100	3724.647	5467.79	

Findings from Table 4.4 indicated T-test shows a significance of $P = 0.001$, for total income for HH without garden, which is less than 0.05. The mean of income HH without gardens is 1890.00, while the mean of income for HH with garden is 4602.40. which means that household with garden has more

disposable income, the difference is attributed to the fact the HH with garden derives extra income from the sale of the produce of their irrigated gardens. This indicates that if more households are empowered to have irrigated gardens, their level of income will improve and this will enhance their socio-economic status. This is supported by Prain and Pinierao (1999), whose findings were that irrigated gardening raises income among those with low income by 50 per cent in rural and informal settlements in Southern Philippines.

V. Conclusions and Recommendations

It is not known yet as to what extent these gardens contribute to the socio-economic of those families in the Kavango East Region. Since rain-fed harvests in the Kavango East Region have been falling over the past few years, irrigated gardens along the Kavango river could be used as alternative sources of food for the rural drought-affected communities. In order to examine the role of irrigated gardens in filling the food gap left by the rain-fed harvest in the Kavango East Region as a case study, the research pursued the following objectives:

- To determine socio-economic benefits associated with the irrigated gardens among the communities of the Kavango East Region. The researcher consulted the grassroots people in the villages of the Kavango East Region for interviews to obtain this information, information was obtained from government vulnerability assessment reports and food security status reports.

Many rural households in developing countries are often the victims of poor health due to poor nutrition and hunger. These households often consume staple-based diets, low in nutrients. Such staple-based diets can be rectified through household vegetable production (gardening). Irrigated gardening can directly enhance food availability, accessibility and utilisation of nutritious foods through the provision of a diverse range of fresh food. Irrigated gardening activities can also enhance the socio-economic condition of rural folks by bringing in income for households to buy other types of food which the households do not produce or use the income to create wealth. Irrigated gardening is an age-old tradition that has been passed on from generation to generation and throughout history, gardening has proved to be a reliable source of food for the impoverished.

It could be said that the constructivism approach, which obviously informs some theoretical assumptions for this study, shares an interesting point of commonalities with the conclusions of this study. Therefore, informed by the problem and objectives stated above, and based on the Kavango East Region

case study, this study arrived at the conclusions as covered in the next section.

Conclusions

The results also show that while the range of the monthly incomes for formal employment (<N\$100 to N\$20,000) were the same, those with gardens had a higher mean income (-1.36). Overall, those with gardens (N=100) received higher monthly total income than those without gardens (N=100), as shown from the statistically significant mean differences ($t = 6.24, p = 0.00$).

A decrease in the food expenditure was experienced by households with irrigated gardens as compared to households without gardens. This decrease in expenditure was due to an increase in the supply of affordable food through irrigated gardens.

Recommendations

On a socio-economic part, the leadership of the Kavango East Region should promote irrigated gardening and encourage its community to cultivate irrigated gardens at a larger scale for onward selling of the produce; this would assist them to create wealth. This could be done by the leaders creating markets for the inhabitants to sell their produce at a better price. It is further recommended that the leadership of the Kavango East Region needs to provide basic inputs such as fencing, training, pesticides and fertilizers to mention but a few.

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