

Developing Orange Fruit Value Chain in Tuyen Quang, Vietnam

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Abstract: Orange is one of the world's most important economic fruit crops. And in Tuyen Quang, Vietnam, orange is local tree that have been planted for many generations. The study analyzed the supply chain and the value chain of orange in Tuyen Quang, compared to the supply chain and the orange value chain in industrialized nations, and have seen that the orange value chain in the province has not developed yet. All products are consumed as fresh fruits, without processing of products from orange. Consumption of orange fruit is only in the domestic market, no export activities. The linkages between the actors in the chain have not been deep and inefficient. Harvest and transport fresh fruit was mostly done by hand. Preservation, packaging, refrigeration and processing activities have not been implemented. These lead to high post-harvest losses and selling of orange fruit is still difficult and seasonal. SWOT analysis was used too, and some strategic solutions were identified to develop the orange value chain.

Keywords: Developing, Orange Fruit, Value Chain, Tuyen Quang

1. Introduction

The sequence of steps and participants involved in the process from production to delivery of a product to market is called a value chain. Value chains are organized linkages between groups of producers, traders, processors, and service providers that join together to improve productivity and the value added of their activities. By joining together, the participants in a value chain increase competitiveness and are better able to maintain competitiveness through innovation [1]. The limitations of each single participant in the chain are overcome by establishing cooperation and governance rules aimed at producing higher value. The main advantages to stakeholders from being part of an effective value chain include being able to reduce the costs of production and business; increase revenues; increase bargaining power; improve access to technology, information, and capital; and, by doing so, innovate production and marketing processes to gain higher value and provide higher quality to customers. Value chain development for sustainable agriculture aims to improve the overall natural sustainability of the entire chain

by optimizing links between actors. At every stage efforts focus on rationalizing the natural inputs into the value chain and controlling the outputs affecting the natural environment. In relation to inputs, this includes improving efficiency and renewable capacity in terms of water, energy, material, building, land and tools. In relation to outputs, the approach focuses on wastage and pollution, drawing on methods of pollution control, cleaner production, eco-efficiency, life cycle assessment, closed loop production and industrial ecology.

Orange is one of the world's most important economic fruit crops. It belongs to the group of citrus fruits that includes orange, lemon, limes, grape fruits and tangerines. In the world, a third of orange fruit production goes for processing, the rest being eaten fresh. Also the most important processed citrus product is orange juice, representing about 80% of the total citrus juice production. In the orange processing industry, the raw juice constituting about 50% of the processed fruit, the peel residue and the seeds are the major products or by-products and from these sources a lot of industrial products are derivable. For example, natural orange juice, concentrated juice, orange

flour are some of the major industrial products derived from the raw juice. Also, the pressed peel, orange pulp and meal, peel oil, citric and lactic acids, brandy spirit, feed yeast, vinegar, marmalade and candied peel are products derivable from peel residue. Products derivable from the seeds are seed oil and meal [2]. The leaves, flowers, peels, fruits and dried bark of orange have important medicinal values. The dried bark of orange is a raw material for the production of insecticides. Orange has also found use in the pharmaceutical, cosmetic and soap industries. Farm inputs (nurseries, fertilizers and agro chemicals) are at the bottom of the orange value chain with end points in large processing and exporting companies and the domestic market [3]. Major actors in the value chain for industrialized nations include farmers and commercial orchard owners, citrus pickers, local fruit marketers and exporters, citrus processing factories, industries that engage in the utilization of by-products for the production of specialty products.

Tuyen Quang is a mountainous province in the Northwest of Vietnam, dominated by agro-forestry economy, with an area of 586,733ha, in which agricultural and forestry land accounted for 90.5%. The province has natural and social-economic conditions advantageous and suitable to produce some agriculture products, especially orange [4]. Orange are fruit with high nutritional value, beneficial to health. In addition to the common use as a food and beverage, orange have many healing effects. Orange are local trees that have been planted for many generations in Ham Yen and Chiem Hoa districts, and have many strengths for the province, with high economic value, bringing high and stable income for local people, helping reduce poverty, providing many jobs for rural workers and contributing to the development of Tuyen Quang's economy. By 2015, the province's orange cultivated areas reached 7,242 hectares, the area for harvesting is 3,715 hectares, the output reached 50,513 tons/year, with 4,215 orange growers [5]. Development of orange value chain for sustainable agriculture will bring great economic values for the province as it can bring high and stable income for local people, help reduce poverty, provide jobs for rural workers, supply good quality orange products to consumers, effectively use economic resources, protect the environment and preserve biodiversity. Based on the views and aims of development of product value chain for sustainable agriculture, the study assessed status of orange fruit production and marketing and propose solutions for development of orange fruit value chain in Tuyen Quang province, Vietnam.

2. Methods of the Study

This study uses descriptive statistics and value chain analysis methods to assess the orange value chain of the growers, and financial analysis is used to analyze the chain economy. Data for the study were collected using

questionnaires from stakeholders in the orange value chain in Tuyen Quang province. The data was also collected by the Participatory Rural Appraisal (PRA) interview method of many stakeholders. Agricultural production involves a number of actors at different stages. Identifying and evaluating the relationships as well as the impact of these actors is essential to build a strategy for developing the industry [6]. The information collected includes: Cost of production of orange; productivity, quantity and selling price of orange; market channels... The SWOT method was also used to analyze strengths, weaknesses, opportunities and challenges in the production and marketing of orange, thereby proposing strategic solutions to develop the orange value chain in Tuyen Quang province. There are different actors performing various functions in the fresh orange sub sector. On its way from soil to plate, the orange fruit passes through the hands of several actors [7]. This study employed a sample size of 208 respondents. A simple random sampling technique was used to select growers and consumers, and while purposive sampling technique was used to select key informants such as local officials, experts for this study. Key informants were selected base on their positions and ability to provide the required information from the district, commune, and village levels. Moreover, we employed purposive sampling technique because the study was interested in interviewing respondents who were knowledgeable and experienced and who could provide accurate information concerning this study.

Table 1. Stakeholders and method of collecting information.

No	Stakeholders	Number of samples	Method of collection
1	Suppliers	5	Questionnaires
2	Growers	120	Questionnaires
3	Collectors	10	Questionnaires
4	Wholesalers	10	Questionnaires
5	Retailers	20	Questionnaires
6	Consumers	30	Questionnaires
7	Local officials	5	Interview
8	Agricultural economists	3	Interview
	Total	208	

(Source: Survey data, 2016)

3. Results and Discussions

3.1. Technical Appraisal of Orange Value Chain

3.1.1. Orange Supply Chain

In the orange supply chain, harvested fruit may go to the fresh fruit market, in order to be consumed fresh, or squeezed freshly at home to be consumed as juice, or it may enter the processing industry, in order to obtain orange juice (mainly in the form of frozen concentrated orange juice, for ease of transport in international trade) and other by-products. Orange supply chain for industrialized nations is shown in figure 1 [8]:

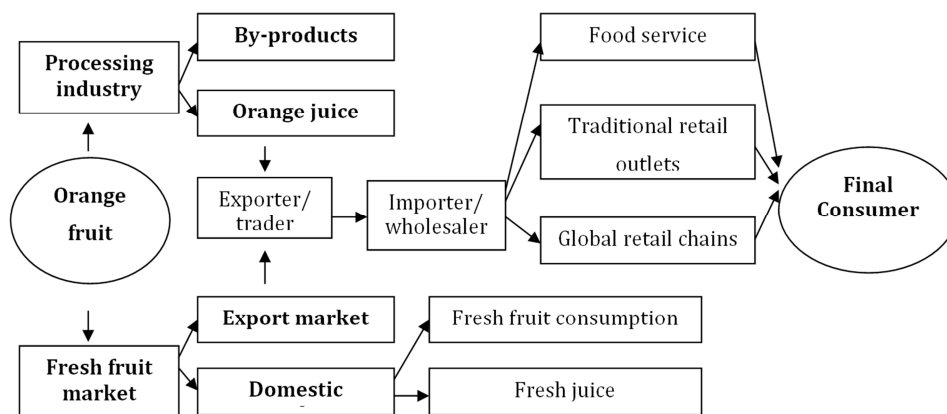
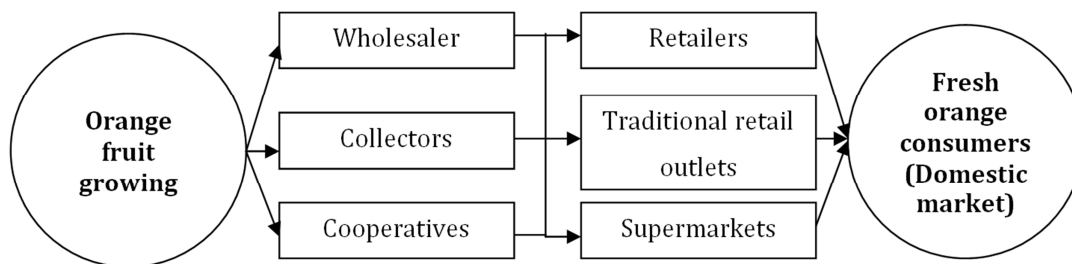


Figure 1. Orange Supply Chain in industrialized Nations.

In Tuyen Quang, however the supply chain is poorly developed and disorganized requiring improvement for investment opportunities to spin off. The results of the orange supply chain study in Tuyen Quang show that the stakeholders in the channel system include: farmers; collectors, traders and agricultural cooperatives; Retailers;

and Consumers. The sale of products has not yet signed sale contracts. There is no joint venture between producers and enterprises. The products of the supply chain mainly sell fresh fruit directly to domestic consumers without processing and exporting.



(Source: Synthesis from surveys, 2016)

Figure 2. Orange supply chain in Tuyen Quang, Vietnam.

3.1.2. Orange Value Chain

Farm inputs (nurseries, fertilizers and agro chemicals) are at the bottom of the citrus value chain with end points in large processing and exporting companies and the local domestic market (figure 3). Major actors in the value chain

for industrialized nations include farmers and commercial orchard owners, citrus pickers, local fruit marketers and exporters, citrus processing factories, industries that engage in the utilization of by-products for the production of specialty products [3].

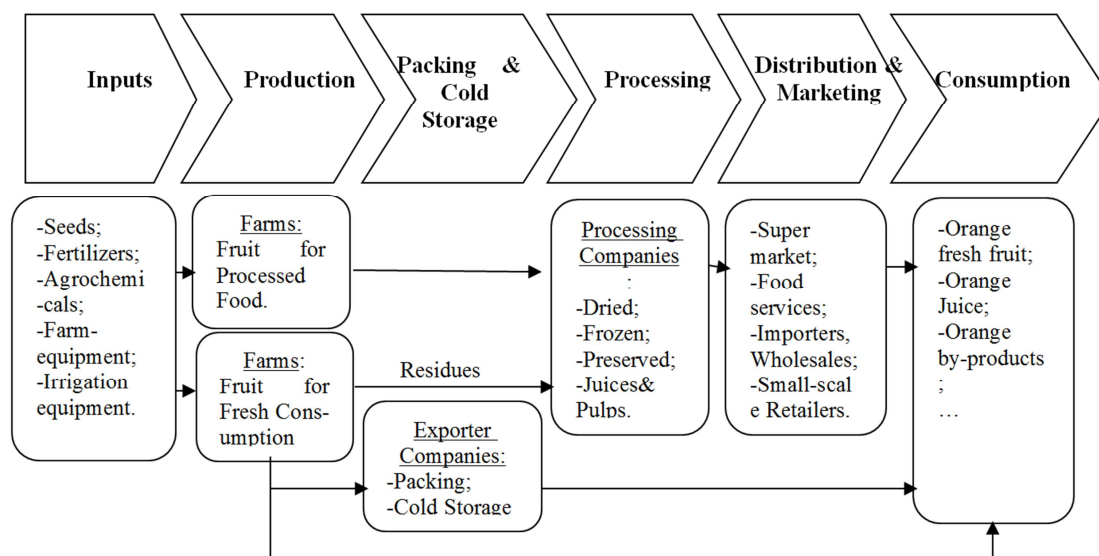
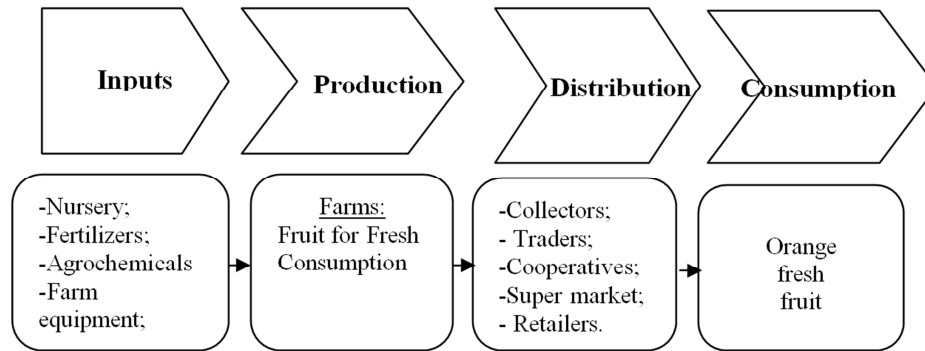


Figure 3. Citrus fruit value chain in industrialized nations.

But the orange value chain in Tuyen Quang is not developed (figure 4). Farm inputs are at the bottom of the value chain with end point in domestic fresh fruit market. Major actors include family orchard owners, local collectors, traders, retailers and domestic consumers. Concentrate production is not well developed in the province judging by

the fact that there isn't any concentrate plant. Investment of resources for production and business is small scale and scattered. Inadequate investment of infrastructure systems, machinery and equipment, including production, harvesting and processing technologies, which lead to low value of orange.



(Source: Synthesis from surveys, 2016)

Figure 4. Citrus Fruit Value Chain in Tuyen Quang, Vietnam.

There are no packing and cold storage facilities for fruits in Tuyen Quang. The transportation from farms to the market is crude. The availability of fruits is short-lived due to their seasonal and highly perishable nature. Almost of the orange are consumed directly as they came from the orchard. The production and harvesting of orange is still by hand, spontaneous and highly seasonal. Many stages of the production process are executed manually, with insufficient investment, and production significantly influenced by natural factors [9]. Therefore labor productivity is not high, with uneven performance and year-season or year- crop failure, leading to difficulty contracting with enterprises which process, transport, sell and export such agricultural products. The expansion of households' orange growing areas was spontaneous, so brought with it many risks. The harvest of fresh fruit has been seasonal (from October of one year to February the next year), while the preservation and processing of orange remains undeveloped. As a consequence, the consumption of the product is also highly seasonal.

3.1.3. Value Added of the Orange Value Chain in Tuyen Quang Province

Table 2. Cost of production of orange (Calculated for 1ha/year).

Calculated criteria	Value (1000VND)	% of Total
Cost of Materials	35,097	45.09
Organic fertilizer	7,706	9.90
Nitrogen	3,554	4.57
Potassium	2,379	3.06
Phosphorus	3,785	4.86
Insecticide	16,679	21.43
Herbicide	661	0.85
Fungicide	333	0.43
Cost of Labor	32,580	41.86
Spraying pesticides	16,480	21.17
Manure	1,033	1.33

Calculated criteria	Value (1000VND)	% of Total
Hand weeding	2,098	2.70
Spray herbicide	1,577	2.03
Pruning, creating canopy	893	1.15
Harvest -Pick & Haul	10,499	13.49
Cost of Depreciation	10,155	13.05
Orchard Establishment	9,022	11.59
Machineries and tools	1,133	1.46
Total Cost	77,832	100.00

(Source: Calculated from survey data in 2016)

Table 3. Economic indicators of the orange growers.

No	Calculators	Unit	Value
I	Production results		
1	Average productivity	Kg/ha	21,530
2	Average selling price	VND/kg	9,300
3	Gross of Output (GO)	VND	200,229,000
4	Intermediate Cost (IC)	VND	45,252,020
5	Labor Cost (LC)	VND	32,579,930
6	Total Cost (TC = IC + LC)	VND	77,831,950
7	Value Added (VA)	VND	154,976,980
8	Mixed Income (MI)	VND	77,145,030
II	Economic efficiency		
1	GO / IC	times	4.42
2	VA / IC	times	3.42
3	MI / IC	times	1.70

(Source: Calculated from survey data in 2016)

Based on the actual survey of orange consumption channels in Tuyen Quang province in 2016, 9.8% of the orange were consumed locally with the average retail price of 12,800 VND/kg. Compared to the orchards's average selling price of 9,300 VND/kg, the first channel (Orange grower -> Local retailer) generated added value of 3,500VND/kg. The output of orange consumed in Hanoi city and the Northern provinces was 27.3%, in the Central provinces 18.8%, and in Ho Chi Minh city and the Southern provinces was 44.1%. This indicates that the largest market for Tuyen Quang's

orange is Ho Chi Minh City and the Southern provinces, with the average retail price paid by consumers is 28,600 VND/kg.

Compared to the production cost, it generated by this distribution channel is 19,300 VND/kg.

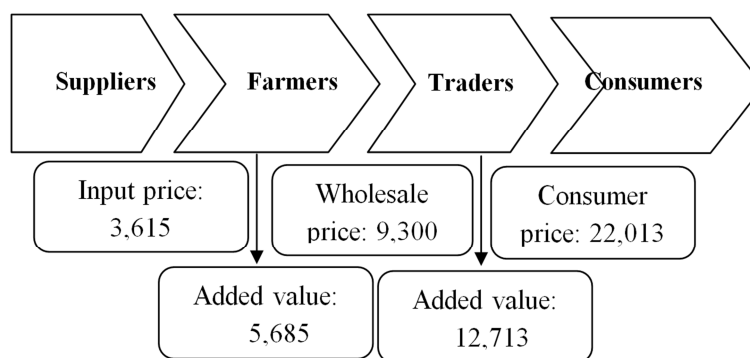
Table 4. Value added of the main market channels of the orange value chain.

Distribution channels	Distance (km)	Market share (%)	Average selling price	Added value
Growers (at the farm gate)	0	100	9,300	5,685
Growers -> Local retailer	55	9.8	12,800	3,500
Growers -> Wholesalers -> Retailers in Hanoi and Northern provinces	165	27.3	17,700	8,400
Growers -> Wholesalers -> Retailers in Central provinces	928	18.8	24,300	15,000
Growers -> Wholesalers -> Retailers in HCM city and Southern provinces	1875	44.1	28,600	19,300
Average	1052	x	22,013	12,713

(Source: Calculated from survey data in 2016)

Accounting the surveyed growers's cost of production shows that the average production cost was 3,615 VND/kg. The average selling price of the surveyed growers was 9,300 VND/kg, so the added value generated by the growers was 5,685 VND/kg, account for 25.8% of the average selling

price in the market. Table 4 shows that the average retail price in the market for final consumers was 22,013 VND/kg, thus the added value generated by the traders was 12,713 VND/kg, account for 58% of the selling price. Value added in the orange value chain is illustrated in Figure 5.



(Source: Calculated from collected data in 2016)

Figure 5. Value added in the fresh orange value chain (unit: VND/kg).

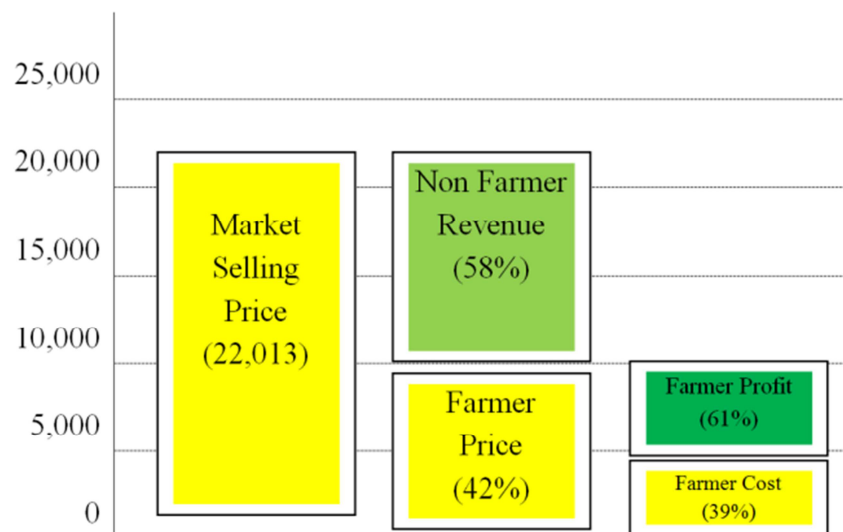


Figure 6. Farmer Profit for Orange fruit in Tuyen Quang (unit: VND/kg).

The production cost is 3,615 VND/kg, accounting for 39%, the grower's profit is 5,685 VND/kg, accounting for 61% of the selling price (9,300 VND/kg). This data shows that orange growers in Tuyen Quang province have achieved a high profit margin of 157%. The production cost for 1kg of orange in Tuyen Quang is low due to the availability of soil,

water, and climate. Therefore, although the investment cost is low, orange trees still produce high productivity and yield. On the other hand, Ham Yen Orange have good quality and well-known brand, so consumers are willing to pay high prices, sometimes at the end of seasons, the consumer price up to 50,000 VND/kg [10]. However, this data shows that the

traders's cost and profit are higher than the growers's production cost and profit ($3.615 + 5.685 = 9.300$ VND / kg). Consumers have paid much higher than production costs ($22,013 / 3,615 = 6.1$ times). This also shows weakness in circulation and distribution as high rate of rotten products and losses. The competition among subjects in intermediate stages is not high. And the linkage in the production and consumption of orange industry is inefficient.

3.2. SWOT Analysis and Strategic Solutions for Development the Orange Value Chain

By analyzing the market and value chain of Tuyen Quang's orange, the following table summarizes the strengths, weaknesses, opportunities and threats of the orange value chain and strategic solutions for upgrading the orange value chain in the coming time.

Table 5. SWOT Analysis of Orange Value Chain in Tuyen Quang, Vietnam.

SWOT	OPPORTUNITIES (O)	THREATS (T)
STRENGTHS (S)	O1. Increasing demand of orange products; O2. Expanding markets, exporting orange; O3. Increasing resources for investment in the production of orange O4. Policies are supportive and encouraging. SO Strategic Solutions: S _{1-2,4} O ₁₋₄ : Encouraging and supporting farmers to convert crops, expanding areas of orange; S _{1,3} O ₁₋₄ : Raising awareness for officials and local people about the potential and advantages, and role of orange value chain development for sustainable agriculture in Tuyen Quang.	T1. The competition is increasingly fierce; T2. Consumers require products of origin, quality and safety; T3. The risk of environmental pollution and disruption of ecosystems. ST Strategic Solutions: S _{1,4} T _{1,2} : Improving the quality and brand of products; S ₄ T ₃ : Development of the orange production area combined with environmental protection measures; S ₃ T _{1,2} : Enhance the understanding and responsibility of each actor in the supply chain for the benefit of the consumers.
WEAKNESSES (W)	WO Strategic Solutions: W ₁ O _{1,4} : Strengthening vertical-cross linkages between actors to upgrade the value chain; W ₂ O ₄ : Application of science and technology for the cultivation and care of orange trees that can be harvested year-round; W ₃ O _{2,4} : Attracting investors to join in the processing and export of orange products.	WT Strategic Solutions: W _{3,4} T _{1,2} : To ensure strict standards for products from orange, such as requirements of quality, brand, food safety, designs and models, origin, trademark, copyright, intellectual property rights, anti-dumping; W _{3,4} T ₃ : Strict management of the quality of products and environmental protection.

(Source: Synthesis from surveys, 2016)

4. Conclusions

The analysis shows that Tuyen Quang has many advantages for the development of orange production. The province has suitable land and climate conditions; the orange growing area is large (7,242ha); many households involved in orange production (4,215 growers); local people have experienced growing orange for many generations; productivity and orange fruit quality are good. However, the process of developing the orange value chain is inefficient and faces many difficulties, such as: the orange value chain in Tuyen Quang has not developed yet. The product is completely consumed in the form of fresh fruit, without processing of products from orange. Marketing of orange fruit is almost in the domestic market, no export activities. The linkages between the actors in the chain value has not been deep and ineffective. Harvesting and transportation of fresh fruit is handmade. Preservation, packaging, refrigeration and processing activities have not been implemented. These lead to high post-harvest losses and selling of orange fruit is still difficult and seasonal. The solutions to develop the orange value chain were identified, which are: Continuing to develop production of oranges; Planning projects for the development of orange value chain; Overcoming the seasonality of orange production; Increasing investment of resources for orange production; Strict

management of the quality of products and environmental protection; Diversification of products and expansion of the market for orange; Human resource training; Implementation of policies to support the orange growers; Capacity building of the orchard owners. The solutions should be implemented in a coordinated and effective way to develop the orange value chain in Tuyen Quang, Vietnam.

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