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## PRESENT STATUS OF SHRIMP FARMING IN SATKHIRA, A SOUTHWESTERN DISTRICT OF BANGLADESH

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### ABSTRACT

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Shrimp has become one of the most important export products in recent decades due to increasing international demand. Shrimp farming is performing significant role in the livelihoods of rural people of southwestern part of Bangladesh which is considered the core areas for shrimp farming. To continue the trend of exporting shrimp worldwide it is very much needed to be familiar with the current culture practices with the precautions taken by the shrimp farmers. A total of 30 shrimp farmers in Shyamnagar upazilla of Satkhira district were interviewed to understand the present status of shrimp farming along with to identify the problems faced by the farmers, and to formulate some recommendations for better shrimp production development. Study showed that polyculture was the only culture technique followed by the shrimp farmers using natural water sources like rain and tide. Bagda (*Penaeus mondon*) was the dominant cultured species followed by Harina (*Metapenaeus monoceros*) because of their economic significance. Although wild post-larvae (PL) are better in quality than hatchery produced PL, farmers collected PL from both sources. Farmers usually used inorganic fertilizers like Urea and TSP instead of organic one, but they preferred natural feeds for cost efficiency and management purposes. The study also identified that shrimp diseases (white spot, gill rot and fin rot), lower market price, flood, high mortality and lack of scientific knowledge were the major constraints in shrimp farming. Government, donor agencies, planners, researchers and NGOs, therefore, should come forward to assist farmers for mitigating problems and achieve sustainable shrimp export earnings of Bangladesh.

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## INTRODUCTION

Bangladesh is widely recognized as one of the most suitable countries in the world for shrimp (*Penaeus monodon*) farming because of its favorable resources and agro-climatic conditions. A sub-tropical monsoonal climate, low lying agricultural land, saline water availability and a vast area of shallow water provide ideal conditions for shrimp production (Ahmed *et al.*, 2008a). During the last three decades development of shrimp farming has attracted considerable attention due to its high export potential. The shrimp and prawn sector are the second largest export industry after readymade garments, generating US\$396million annually and contributing by 5.7% to the total value of exports (DOF, 2013). During 2012-2013, Bangladesh exported 50,333 tons of shrimp and prawn, valued at US\$ 337.62 million, 82% of which was shrimp and the remaining 18% was prawn (Export Promotion Bureau, 2013).

Shrimp farming in the south and southeastern coastal belt of Bangladesh began in the early 1970s (DOF, 2012). Most shrimp and prawn farms (53%) are in southwest Bangladesh mainly in the districts of Satkhira, Khulna and Bagerhat and produce 46% of country's total shrimp and prawn production (DOF, 2013). In 2010, the total area under shrimp and prawn farming was estimated to be around 275,274 hectares (DOF, 2013) while in 1980 it was 20,000 hectares, indicating an average increase of 35% per annum (DOF, 2013). At different regions of Bangladesh, many shrimp/ prawn farms have been established, but maximum production (78%) come from greater Khulna regions which cover 74.5% area of total shrimp/prawn farms of Bangladesh (DOF, 2012). The most spectacular boost of shrimp farming has taken place in the Satkhira district where a large number of farmers have converted their rice fields to profitable shrimp and prawn farms (Ahmed *et al.*, 2008b). However, a number of studies have been conducted on shrimp farming in Bangladesh, including, technical efficiency of shrimp farming (Begum *et al.*, 2015), economic analysis of shrimp farming (Alam *et al.*, 2007), shrimp culture in Bangladesh with social and economic status (Alauddin and Hamid, 1999), shrimp farmers livelihood analysis (Mamun *et al.*, 2019), changing in shrimp culture practices in Southwestern region focusing on disease (Parvez *et al.*, 2006) etc. Despite these, we don't have enough information on how the farmers culture the shrimp and what are the problems they mostly face. Therefore, this study was conducted to know the present status of shrimp farming in the Southwestern region mainly in Satkhira district of Bangladesh as well as to formulate some recommendations for development of shrimp production.

## MATERIALS AND METHODS

The study was conducted in the Satkhira district, a coastal area of the Bay of Bengal, situated in the southwest part of Bangladesh from May to June, 2015. Satkhira is the most important and promising area for shrimp culture because of the availability of wild post larvae, favorable resources and climatic conditions. This district is divided into seven upazillas. Among them, Shyamnagar is situated in the most southern part, near the Bay of Bengal. It is divided into 13 unions. Among them, 6 unions were selected for data collection. A well-designed questionnaire was prepared for collection of relevant information in accordance with the objectives. Data were collected by questionnaire interviewing of 30 shrimp farmers in the selected unions of Shyamnagar upazilla of Satkhira district. Farmers were selected for questionnaire interview through random sampling and Participatory Rural Appraisal (PRA) tools like Large Group Discussion (LGD), Focus Group Discussion (FGD) and Cross-Check interviews with Key Information (KI). Besides primary information study, secondary data were collected from Department of Fisheries (DOF), Export Promotion Bureau (EPB), relevant journals, thesis, reports and official records.

Collected information obtained from the survey were accumulated, grouped and interpreted according to the objectives as well as parameters. Some data contained numeric and narrative facts. The collected data were then coded, summarized, processed, tabulated by using simple statistical tools like averages and percentages and analyzed by Microsoft Excel.

## RESULTS AND DISCUSSION

Coastal shrimp culture in the tidal waters had been an age-old practice around coastal areas of Satkhira, Khulna, Bagerhat and Cox's Bazar district of Bangladesh. At present, shrimp farming areas are rapidly expanding horizontally due to increasing demand of shrimps in the global market. As a result, shrimp farming practice is also increasing day by day, especially in the Southwest part of Bangladesh.

### Status of Shrimp Farmers

This study revealed that 50% shrimp farmers in Shyamnagar upazilla started shrimp farming in 2000-2009 whereas, 13.33% and 36.67% started shrimp farming in 1980-1989 and 1990-1999 respectively. That means 50% farmers were continuing their shrimp culture for 6-15 years where only 13.33% had 16-25 years and the rest farmers had 26-35 years of shrimp farming experience. Chowdhury (2007) observed that 80% farmers started shrimp farming in 2000-2004 in Southern region of Bangladesh which supported the present findings. A huge amount of fund is required for shrimp culture investment. It was found that 86.67% farmers arranged the fund by their own, but the rest 13.33% farmers had to take loan from bank.

Most of the farmers (73.33%) received training on shrimp culture from UFO, NGO and World Fish Centre but the rest farmers (26.67%) did not get any training. This finding was contradictory with the findings of Bari (2004) who reported that only 30% farmers in Bagerhat district of Bangladesh were trained on shrimp farming. However, the farmers were involved in different occupations, for example business, teaching, agriculture, daily workers, politics etc. even some were students too before shrimp culture (Figure 01). Major percentages of shrimp farmers (63.33%) in Shyamnagar upazilla practiced their shrimp farming both in their inherited land and leased land. But there were some farmers (33.33%) who cultured shrimp only in their own (inherited) land and a very few farmers (3.33%) practiced shrimp farming only in leased land. Similar findings were reported by Chandra *et al.* (2013).

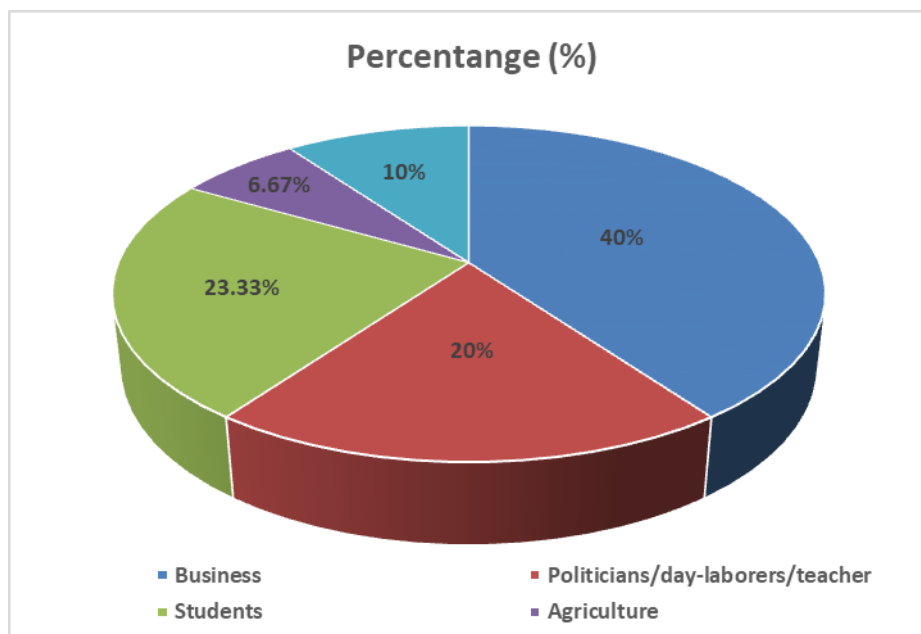
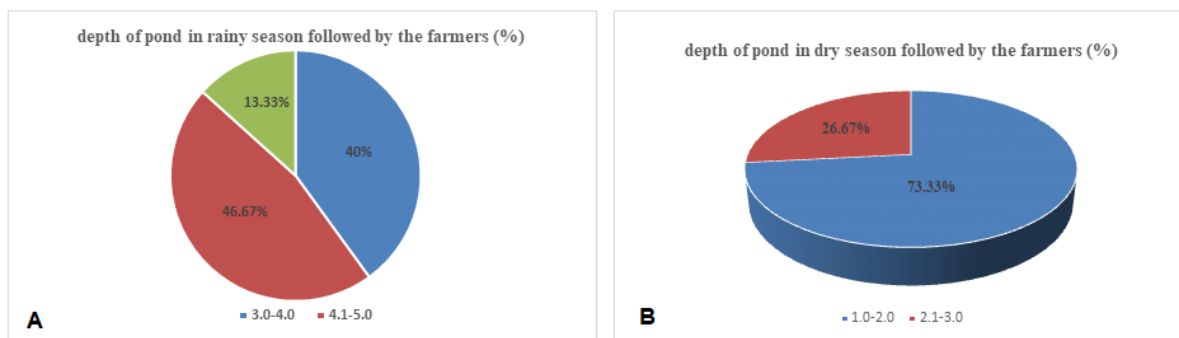


Figure 1. Occupations of shrimp farmers before starting shrimp farming in Southwestern region in Bangladesh

### Information on Shrimp culture pond

According to size, the ponds of the shrimp farms in the study area were divided into three categories: small (1-1000 dec.), medium (1001-2000 dec.) and large (>2000 dec.). Most of the farmers (70%) had small ponds where 20% and 10% farmers had medium and large ponds respectively. The present finding was similar to the finding of Kabir (2009) who reported the average pond size of shrimp farms in coastal region of Bangladesh 1-10 ha and slightly more than the findings of Sayeed (1995) and BAFRU (1990) who observed the shrimp ponds 5-20 ha and 60-100 ha respectively in size. On the other hand, the depth of the ponds was not constant, it varied depending on seasons. The average pond depth in rainy season (3-6 ft) was slightly more than that in dry season (1-3ft) (Figure 02), which was similar with the findings of Chandra *et al.* (2013). However, most of the farmers (80%) had single ownership of their ponds and others had multiple ownership. Among them, 10% farmers had joint 2 ownership and other 3.33% and 6.67% had joint 2-3 and joint 4-5 ownership respectively. Mehedie (2004) mentioned that 80% farms were in single ownership in Bagerhat region of Bangladesh which matched with the present finding.



**Figure 2.** Depth of pond followed by the shrimp farmers in (A) rainy season and (B) dry season in Southwestern region in Bangladesh

### Farming technology

All farmers of the study area practiced polyculture where they cultured Shrimp (Bagda, horina) with other small prawn, crabs, tilapia, tengra, bele etc. All of them cultured shrimp almost all the year round from January to December. That means shrimp farming was practiced in polyculture system over the year in Southwestern part of Bangladesh.

### Pre-stocking measures

#### i. Pond type and Embankment structures

All ponds of the farmers were perennial. But pond embankments of majority (56.67%) farmers were complete, some (36.67%) were well arranged and a few (6.67%) were complete as well as well arranged (Table 01). Therefore, almost all the pond embankments were well structured.

#### ii. Status of aquatic vegetation and pond drying

In the study area, aquatic vegetation was present in 73.33% ponds, but the rests (26.67%) were without aquatic vegetation (Table 01). All ponds of the farms were dried during the last dry season. This finding was different from the finding of Chowdhury (2007) who noticed that 75% farmers dried their shrimp ponds in south region of Bangladesh.

#### iii. Source of water supply

Quality water supply is very important for productive shrimp culture. In most (93.33%) of the ponds, water was supplied from rain and tidewater, but in few ponds (6.67%), water source was only rainwater (Table 01).

#### iv. Water colour of the ponds

Water colour indicates whether the pond is productive or not. In Shyamnagar upazilla, water colour of most of the ponds (73.33%) was green, some (23.33%) were light green and a very few (3.33%) were muddy (Table 01). That indicated most of the ponds were productive.

#### v. Status of fertilization and fertilizers used

Most of the farmers (76.67%) in the study area used fertilizers in their ponds for increasing productivity of the ponds, but some others didn't use any fertilizers. 69.57% farmers used Urea and TSP, 21.74% used cow-manure with Urea and TSP and the rests used only TSP in their ponds. Moreover, all the farmers used lime at the rate of 0.1-1.0 kg/dec/yr in their ponds (Table 01). Therefore, most of the shrimp farmers used inorganic fertilizers in their ponds and some used organic also. Bari (2004) mentioned that about 45% shrimp farmers used fertilizers in their farms, which was lower than the present finding.

**Table 1.** Pre-stocking condition of shrimp farming in Southwestern part of Bangladesh

Characteristics	Categories	Percentages (%) of farmers in the study area
Embankment Structures	Complete	56.67
	Well arranged	36.67
Status of aquatic Vegetation	Complete + Well arranged	6.67
	With vegetation	73.33
Source of water Supply	Without vegetation	26.67
	Rainwater	6.67
Water colour of the ponds	Rainwater + Tide water	93.33
	Green	73.33
Fertilization	Light green	23.33
	Muddy	3.33
	Yes	76.67
Fertilizers used	No	23.33
	Urea + TSP	69.57
	Cow manure + Urea + TSP	21.74
	TSP	8.69

### Stocking measures

#### i. Culture species

In the Southwestern part of Bangladesh, Bagda (*Penaeus monodon*) and Horina (*Metapenaeus monoceros*) were the dominant commercially cultured species. All farmers cultured Bagda among them, only 26.67% farmers cultured both Horina and Bagda for commercial purposes (Table 02). The present finding was similar to the findings of Kabir (2009) as well as Alauddin and Hamid (1999) who stated that the main species of Southwest coastal region of Bangladesh was Bagda (*Penaeus monodon*). Besides these commercial species, farmers also cultured some non-commercial species like Gura chingri, jhora chingri, chamina chingri, chaka chingri, kuchia, crabs, prawn, tengra, bele, poa, mullet, coral and tilapia in their farms (Table 02).

#### ii. Source and quality of Post Larvae (PL)

Both of natural and hatchery-produced PL were used by the shrimp farmers. 46.67% farmers collected PL from hatchery, 20% from natural source and 33.33% from both of hatchery and natural sources (Table 02). But all farmers mentioned that wild PL was better than hatchery-produced PL. Most of the farmers (86.67%) stocked high-quality PL and the rest 13.33% stocked medium quality PL in their shrimp farms (Table 02).

**iii. Stocking density**

An optimum PL stocking density determination is a pre-requisite for successful shrimp culture. 66.67% farmers stocked PL at the rate of 30-50/decimal, whereas the 20% and 13.33% farmers followed PL stocking density of 51-70/decimal and 71-90/decimal respectively. In different way, it can be said that 63.33% farmers stocked 10,000-3,10,000 PL per year while other 16.67% and 20% farmers annually stocked 3,10,000 – 6,10,000 and > 6,10,000 PL in their farms (Table 02). The present finding was also coincided with the findings of Moniruzzaman (1996).

**vii. Frequency of PL stocking /year**

Majority (53.33%) of the farmers stocked PL 10 times/year, 40% farmers 9 times/year and 6.67% stocked 8 times/year (Table 02). That means the farmers stocked almost every month interval. Kabir (2009) observed PL stocking in the farms in coastal region of Bangladesh 4-5 times/year which was less than the present finding.

**Table 2.** Stocking condition of shrimp farming in Southwestern part of Bangladesh

Characteristics	Categories	Percentages (%) of farmers in the study area
Commercial culture species	Bagda	73.33
	Bagda + Horina	26.67
	Gurachingri	93.33
	Jhorachingri	76.67
	Chaminachingri	33.33
	Chakachingri	26.67
	Kuchia	80
	Crabs	83.33
Non-commercial culture species	Prawn	60
	Tengra	76.67
	Bele	56.67
	Poa	26.67
	Mullet	26.67
	Coral	13.33
	Tilapia	13.33
	Private hatchery	46.67
Source of Post Larvae (PL)	Wild/Natural source	20
	Private hatchery + Wild/natural source	33.33
PL quality	High	86.67
	Medium	13.33
	30 – 50	66.67
	PL Per decimal	
Stocking density	51 – 70	20
	71 – 90	13.33
	10,000 - 3,10,000	63.33
	PL Per year	
	3,10,001 - 6,10,000	16.67
Frequency of PL stocking /year	>6,10,000	20
	10 times	53.33
	9 times	40
	8 times	6.67

**Table 3.** Post-stocking condition of shrimp farming in Southwestern part of Bangladesh

Characteristics	Categories	Percentages (%) of farmers in the study area	
Chemical application	Lime	100	
	Rotenone	6.67	
	Oxy-sos + Zeolite	23.33	
	Disinfectant + Zeofress	26.67	
Major shrimp diseases	White Spot Disease	100	
	Gill rot	16.67	
	Fin rot	10	
Use of medicines for disease treatment	Aqua clean plus	50	
	Comolex	30	
	KMno <sub>4</sub>	20	
	No medicine	50	
Annual production of shrimp	in 2012	40 - 240	40
	(av. Prod: 308 kg/acre)	241 - 440	30
		> 440	30
	in 2013	40 - 240	36.67
	(av. Prod: 320 kg/acre)	241 - 440	30
		> 440	33.33
	in 2014	40 - 240	40
	(av. Prod: 286.66 kg/acre)	241 - 440	43.33
		> 440	16.67
Areas for production supply	Dhaka	100	
	Chittagong	100	
	Sylhet	33.33	
	Khulna	66.67	
Places where shrimp were marketed	Local piker, arottdar, local agent	100	
	Upazila market	43	
	District market	16.67	

## Post-stocking measures

### i. Feeding

All the farmers in Shyamnagar upazilla preferred natural feed; they never used artificial feed because of its high value, insufficient supply and large size of farms which might create feed managing problem during culture period which also found by Kabir (2009).

### ii. Measurement of water quality parameters

Most of the farmers (63.33%) didn't measure water quality parameters due to lack of technical knowledge, measuring instruments etc. 36.67% farmers measured water quality parameters when they faced problems of which 63.33% measured temperature, dissolved oxygen and pH; 18.18% measured alkalinity including these parameters and the rest 18.18% measured only dissolved oxygen and pH.

### iii. Chemical application

Farmers applied different chemicals such as – lime, rotenone, oxy-sos, zeolite, disinfectant, zeofress etc. into the ponds to maintain the water quality. All the farmers used lime to increase the pH level of the pond, make the water free from germ, disinfect water, control disease and clean the water. 23.33% farmers used oxy-sos to increase dissolve oxygen and zeolite to purify water, 26.67% farmers used disinfectant to disinfect pond water and zeofress to maintain water quality and purify water. A very few farmers (6.67%) used rotenone to remove all species of the ponds during drying (Table 03).



#### iv. Use of medicines for disease treatment

Fifty percent farmers used medicine for treatment of shrimp diseases, but others didn't use any medicine. Among these 50% farmers, all used aqua clean plus and beside aqua clean plus, 30% farmers used comolex and 20% farmers used  $KMnO_4$  in their shrimp farms (Table 03).

#### v. Water discharge and exchange

All farmers in the study area discharged the farm water through drainage canal. Every 15 days interval all the farmers added or changed water into the ponds. They added or exchanged water to maintain the water level of the pond, to make the water germ free, to get PL and other fry from the natural source, for better growth, to recover from disease, for moulting purpose and to get natural PL from the tidewater.

#### vi. Harvesting of shrimp

All farmers used traps for harvesting of shrimp from the farms. During harvesting, some trash fish like Gura chingri (56.67%), chamina chingri (16.678%) or other species (26.67%) were generally thrown out.

#### Annual production of shrimp

Annual production of shrimp varied from year to year in the study area. Average shrimp production (320 kg/acre) in 2013 was higher than that in 2012 (308 kg/acre) and 2014 (286.66 kg/acre) (Table 03). The present finding was different from the findings of Chandar *et al.* (2013) and Ali *et al.* (2000) who reported the average shrimp production in Bagerhat region of 350 kg/ha/yr.

#### Marketing systems of shrimp

All the farmers of the study area marketed shrimp to local piker, arottdar and local agent. Beside these places, 43% farmers sold their products in upazilla markets and 16.67% sold in district markets (Table 03).

### Problems faced by the shrimp farmers

#### i. Shrimp mortality

High shrimp mortality occurred every year due to different diseases due to shortage of skilled person. Major shrimp diseases were White spot disease, gill rot and fin rot. Almost all farmers faced white spot diseases (WSD) in shrimp in their farms. Beside this, 16.67% and 10% farmers found gill rot and fin rot diseases in shrimp farms respectively (Table 03). This finding was similar with the finding of Chandra *et al.* (2013) who mentioned WSD as the main disease of shrimp and Islam (2011) also reported shrimp disease as a major problem in shrimp farm.

#### ii. Low market price

One of the most important problems was lower market price of products. Besides this, drought, lack of transport facilities, long distance of market, poor road facilities, harassment by professional fish seller and stealing of shrimp flood was common problems. Das (1993) also mentioned lack of scientific knowledge and lack of marketing facilities as major problems during shrimp culture which were similar with the present findings.

#### iii. Problems due to poor water quality

Due to lack of proper training and knowledge, the farmers faced problems to ensure good water quality. As a result of poor water quality, 63.33% farmers faced toxicity problem, 60% algal bloom and 46.67% found oxygen depletion in their shrimp farms.



## RECOMMENDATIONS

Although shrimp culture technology was being improved day by day in Southwestern part of Bangladesh, this study provides some recommendation based on the problems faced by the farmers to improve shrimp production further.

- I. Government and NGOs should actively encourage the shrimp farmers to apply scientific culture techniques.
- II. Root level farmers should be helped to get legal market value of shrimp as low market value can threaten the total culture method.
- III. Government should help to provide wild PL for better production.
- IV. Government and private sector or the NGOs should come forward to establish more shrimp seed multiplication farms and hatcheries in the study area to increase the production of good quality shrimp seeds so that the farmers can get the shrimp seed easily and at cheap rate.
- V. A processing plant should be established in Satkhira district by the government.
- VI. Medicines should be required against the severe and most common disease of shrimp, White Spot Disease.
- VII. Motivation programmes for the farmers should be strengthened to protect various shrimp and fish juveniles during bagda collection.
- VIII. Government should give enough loans to the farmers so that they can start and continue shrimp farming.
- IX. Government should take necessary steps to train shrimp farmers at free of cost.
- X. Government must ban all kinds of corruptions during processing and exporting shrimp.
- XI. Finally, if more areas could be brought under shrimp cultivation, the country could probably earn a huge amount of foreign exchange by exporting shrimp.

## CONCLUSION

Shrimp farming is the main activity of the rural people of the Southwestern coastal part of Bangladesh and is performing significant role in their livelihoods. Few decades ago, most of the farmers in coastal region started shrimp farming in small scale. In recent times, farmers are also practicing shrimp culture at larger scale by receiving proper training and gaining scientific knowledge on shrimp culture. Nevertheless, the production rate of shrimp in our country is lower compared to other countries. However, production can be raised up to 2 to 3 folds by improving culture systems and management practices. Having higher profit from shrimp culture, the farmers, as well as non-farmers, are being more interested in this sector. Therefore, the authorities should concern about import of virus-infected stocks, disease monitoring, and distribution of new scientific knowledge among the farmers which are important for the improvement of the conventional shrimp farming system to achieve sustainable development of the rural shrimp farmers.

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