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Value Chain Analysis of Mud Crab in the South-West Coastal Region of Bangladesh

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Abstract : Mud crab centric livelihood is one of the major provisionary services for mangrove adjacent poor community in the south-west coastal region of Bangladesh. The core objective of this research is to portray how the value adding activities are performed by multitudinous mud crab centric actors. In this regard the authors purposively choose total 93 actors related with mud crab centric activities and grouped them into seven main channels based on the information retrieved from field visit, KII and FGD. Analytical operations like percentile distribution and average calculation are executed in addition to generating flow-chart and tabular exhibitions for representing material flow, input and support service flow, money flow, involved stakeholders and stages, value adding activities and value addition. This study finds that in each of the main channels, crab catcher and depot are common. However, the fattener plays a dominant role for value addition of mud crab by nurturing and fattening them. Therefore, the paper recommends developing and expanding fattener-oriented chain so that the mud crab centric economic activities become more value additive. Two major actors, crab catcher and fattener are not getting proper price. They are trapped in the vicious circle of credit burden and supposed to sell crab at lower price to the middleman or depot owner. Therefore, alternative credit management is inevitable for the crab catchers at favorable terms and conditions.

Keywords: Mud Crab, Fattener, Sundarban, Value Chain

JEL Classification: Q57, Q22, Q23, D46

1. Introduction

Mud crab centric economic activities are mostly dependent on the direct catch from the nature by the crab catchers, while only a minor part of mud crab supply comes from crab fatteners(Alava et al., 2007). The ongoing fattening practice of mud crab in Bangladesh is related to farming large juvenile or small adult crab with soft shell or broken leg until it gains a commercially tradable size.

Wild mud crab is a popular seafood bearing rich nutritional value. Its' increasing market demand leads expansion of mud crab-oriented livelihood in the coastal region of Bangladesh. It is an export item of Bangladesh, which is playing an important role in boosting GDP of the country. Taiwan, Singapore, Hong Kong, Malaysia, Thailand, and the USA are the major mud crab export destinations of Bangladesh.

Mud crab-oriented economic activities are expanding rapidly because of its high economic value (Keenan, 1999). It generates direct and indirect employment opportunities to the people associated with its collection, fattening and marketing. This species provides livelihood support for millions of poor crab catchers, fatteners, fishers, traders, and transporters of the value chain (Azam et al., 1998).

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According to Woldesenbet (2013), value chain analysis (VCA) is a method for accounting and presenting the value of products and services, which is transformed from raw inputs to a final product consumed by the end users. VCA identifies the full set of economic cost along with the value chain and it determines where how much value is added and the relative importance of different actors (CYE Consult, 2009).

The chain for the mud crab begins from the crab catchers. The crab catchers collect crab from the mangrove and sell to the local traders i.e., agents of mud crab value chain (Hossain et al., 2018). The *foria*, fattener and the depot owner are the local traders of the mud crab value chain. Crab fattening practice in pond was introduced in Bangladesh in early 1990's (Kamal, 2002), while fattening and culture of mud crab in bamboo cages at experimental level started at early 2000's (Khatun, 2007). Therefore, the fatteners are newcomers in the crab value chain. Yet the number of crab fattener is increasing day by day. Rahman et al. (2015) state that more than 60 percent respondents in their study area consider crab fattening as their primary occupation.

The chain of the mud crab begins from the most disadvantaged section of coastal population, the crab catchers who collect crab from the forest and sell to the local traders, like *foria* or depot. *Foria* usually lend money to the collectors in the lean season in a condition that the later will sell their entire catch to the former at a certain price fixed earlier. Through such conditional trading, local collectors never get the actual price of their catch. According to the field visit, the local *foria* purchase crabs from the collectors in 2-4 grades, while the depot owners purchase crabs from the local *foria* in 8-10 grades. Depot *owners* also lend money in form of credit to the collectors in the lean season in a condition that the later will sell their entire catch to the former at a certain price fixed earlier. These forms of conditional credit hinder the local crab catchers to get the actual price of their catch (Zafar, 2004).

While exploring the production and marketing of mud crab in the south-west coastal region of Bangladesh, Das et al. (2012) finds that mud crab culture in the region is mostly concentrated on hardening and fattening of wild mud crab collected from the mangroves. Fattening and hardening of mud crab usually require 10 to 30 days. The market price of mud crab depends on season and grade which fluctuates frequently. During Chinese festival, the price of mud crab is high irrespective of grade. In addition, at off-season i.e., the ban period, the price of mud crab is high for all grades. However, the price of crab is low at peak season of crab catch. In fact, the price fluctuates depending on availability and international market demand.

Ferdoushi et al. (2010) concentrate on the flow of mud crab as a product from catching to grading to final arrangement for exporting. The study finds that about two-third of the crab catchers sell their procured crabs to the *foria*. The rest one-third catchers sell the procured crab directly to the depot owner. In most of the cases, the catchers are bound to sell the procured crab to *foria* or depot owners at a lower price due to the agreed contractual agreement (in local language *dadon*). In contrast, such an agreement facilitates poor crab catchers to get access to required finance and necessary catching equipment.

Mud crab-oriented economic activities are versatile in nature. Sometimes, the crab catchers collect mud crab from mangrove and then directly sell to the depot owner. Another channel is associated with collection of immature mud crab from crab catcher

and depot owner and then nursing them and ultimately selling it to the depot owner after a certain period. The under-weight crabs rejected by the depot owners are purchased by the crab fatteners for further nursing for several days to more than one month. The fatteners sell the fattened crabs to the depot owner when the shell of the mud crab becomes hard. In some cases, the depot owners also play the role of crab fattener through nursing the juvenile crab in their pond until the shell becomes hard. The depot owners grade the collected mud crab according to size, weight, and gender for final export. These versatile mud crab-oriented practices added some sort of value to the product. Therefore, we are interested to investigate the nature, degree, and amount of value addition by the agents of mud crab value chain.

Accordingly, the main objective of the study is:

- To analyze the value chain of wild mud crab in the south-west costal region of Bangladesh

To address this objective, the study attempts to find out how much value is added at different stages of the chain. It mainly covers the stages of crab value chain i.e., mud crab collection, value addition at each stage, distribution of collected wild mud crab at different distribution channels, grading of crab according to weight and gender and so on.

This section depicts the background of the study. The next section explains the methodology of the research. Section 3 introduces the study results and section 4 discusses study findings compared to available knowledge. Finally, section 5 concludes by highlighting recommendations.

2. Methodology

Considering the gained information from literature, KII and field visit as benchmark, this study attempts to figure out the detailed value chain of mud crab in the south-west coastal region of Bangladesh. We tried to identify the value adding activities across the mud crab-based value chain performed by different stakeholders. We also concentrate on addressing the question about how and how much value is added in different channels/stages of mud crab flow in the value chain. The time duration required for value addition at various stages i.e., the period of holding crab at hand for value addition is considered in this study. The literature, KII and field visit endorse catching wild mud crab, storing, sorting, grading, feeding, preserving alive, shell hardening, and packaging are the main value adding activities along the mud crab value chain. This study tries to cross-check and complete such value adding activity list in addition to identifying about which value adding activities are performed at which stage by different actors. In addition, we also explore the volume contribution of each of the actors in the value chain. Such an attempt will help us to understand the relative share/contribution in value addition by various actors across the chain. In summary, we are keen to make a comprehensive investigation on mud crab centric value adding activities in the south-west coastal region of Bangladesh. We consider multiple dimensions such as material flow, input and support service flow, money flow, involved stakeholders and stages, value adding activities and value addition to fill in the gaps (question marks) of Table 1.

Table 1: Matrix for Value Chain Analysis

Agents / Stages / Stakeholders	Main Activities	Main Value Adding Activities	Rejection Rate	Value Addition (BDT)
Mud crab catcher	Mud crab catching	?	?	?
Middlemen	Crab purchase and sell	?	?	?
Nursery owner	Cultivation	?	?	?
Fattener	Fattening	?	?	?
Depot owner	Crab purchase, grading and sell	?	?	?
Transporter	Crab transportation	?	?	?
Exporter	Crab export	?	?	?

Source: Authors' compilation based on literature review, KII and Field visit

As illustrated in Table 1, the aim of this study is to trace out the stakeholders and stages; materials, input & money flow; value adding activities and value addition associated at each stage/stakeholder in the value chain. The prevailing and prospective forward and backward linkages associated with each stage of the value chain are also explored through FGDs. Accordingly, this study tried to sketch an updated, complete, composite, and comprehensive value chain for mud crab with a specific focus on the south-west region of Bangladesh.

For analysis of the mud crab-oriented value chain, data from crab catcher, *foria*, fattener, nursery operator, depot and sub-depot owner are collected through FGD and interview method. Here, we are keen to draw a complete overview of mud crab value chain by exploring how stakeholders' value addition activities contribute to every single stage.

Table 2 explains the sampling framework. In this case, we apply purposive sampling procedure. The enumerators go to the local bazaar and collect information from different actors associated with mud crab centric economic activities. The agents of the value chain are crab catcher, *foria*, fattener 1, fattener 2, sub-depot and depot owners. The purposively selected agents of the value chain are located in the three districts adjacent to the Sundarban - Khulna, Satkhira and Bagerhat. Table 2 depicts the specification of agent-wise and district-wise sample size.

Table 2: Sampling Framework for Value Chain Analysis

Agent	Number		District	Number
Catcher	18		Khulna	33
Foria	18		Satkhira	30
Fattener 1	18		Bagerhat	30
Fattener 2	15		**Total**	**93**
Sub-Depot	6			
Depot	18			
Total[1]	**93**			

N.B.: Fattener 1 – Who are engaged in fattening for shorter time period, up to one month; Fattener 2 – Who are engaged in fattening for a longer time period, more than one month

After data collection through an interview schedule, the trained enumerators have successfully accomplished the data entry task. Then the data is compiled, cleaned, and sorted for making those useable for further analysis.

3. Results

Wild mud crab is a valuable provisionary service provided by the Sundarban mangrove ecosystem. Based on literature review, field visit, KII, FGD, field interviewand expert consultation, we identify eight major agents of wild mud crab value chain, namely crab catcher, *foria*, fattener 1, fattener 2, sub-depot, depot, exporter, and importer. All these agents are engaged in mud crab centric various economic activities in the value chain. However, due to lack of access to the importer, we consider only the first seven agents in this study while analyzing the value chain.

3.1 Value Adding Activities

Table 3 lists agent-wise main value adding activities. Feeding crab, preserving them at a cool place, binding of leg, contact with other agents are the main value adding activities performed by the crab catchers. Similarly, feeding crab, preserving crab at a cool place, providing credit to the catcher, taking loan from depot owner, contact with other agents are the main value adding activities performed by the *foria*. Cutting rope of leg, feeding crab, fencing the pond, medicinal support, using cage, nursing, contact with other agents are performed by the fatteners. Collecting crab, weighting, grading, packaging, contact with other agents are the main value adding activities performed by the sub-depot and depot (Table 3).

[1] In addition, we collected data from four exporters at Dhaka to get exporters' value addition data.

Table 3: Value Adding Activities

Agent	Value Adding Activities
Catcher	Feed the crab Preserve (keep) crab at a cool place Binding of leg Loan for meeting operating and capital expenses Contact with other agents of the crab value chain
Foria	Feed to crab Preserving (keeping) crab at a cool place Provide credit to the catcher Take loan from depot owner for supplying crab Contact with other agents of the crab value chain
Fattener 1 & 2	Cutting rope of leg Feed to crab Change water of pond Fencing the pond Provide medicinal support Keep crab inside the cage Repair broken cage of crab Nursing until the shell become hard Catching crab from pond for sale Binding leg again after catching Contact with other agents of the crab value chain
Sub-depot	Collecting crab Weighting Grading Packaging Contact with other agents of the crab value chain
Depot	Weighting Grading Packaging Contact with other agents of the crab value chain Purchasing big box and other things for sending to exporter

Source: Authors' compilation

3.2 Channels of Value Chain

Multiple parties are involved as agents of mud crab-oriented value chain. Accordingly, there is a variation in nature of dealings among the agents as well as their value adding activities. We consider 93 individual channels for 93 agents and try to classify those into several broader channels. We find five major channels having 2-3 agents in each. The Catcher-Depot (C-D) channel comprises around 14 percent of the total considered 93 channels. Some other important channels are Catcher-Sub Depot-Depot (C-SD-D),

Catcher-*Foria*-Depot (C-F-D), Catcher-Fattener 1-Depot (C-F1-D) and Catcher-Fattener 2-Depot (C-F2-D). All these separately comprise around 10 percent or more of the total considered 93 channels. The rest channels are broadly classified into two broader subgroups – with vs. without the presence of sub-depot. The subgroup having sub-depot is Catcher-*Foria*/Fattener 1/Fattener 2/Sub Depot-Depot (C-F/F1/F2/SD-D) and the other is Catcher-*Foria*/Fattener 1/Fattener 2-Depot (C-F/F1/F2-D). All the channels in these two subgroups have at least four agents having catcher and depot as common and at least two other agents among *foria*, fattener 1, fattener 2 and sub-depot.

Catcher and depot are the most important agents across the value chain. We find the presence of both catcher and depot in all 93 channels. However, other agents like *foria*, fattener 1, fattener 2 and sub-depot are involved less as compared to catcher and depot in the channels of value chain. Hence, we can say that catcher and depot are the key actors of the value chain channels. Crab catcher is the first agent of the value chain who brings the crab in the flow of value chain and depot is the last agent from whom the crab reaches to the hand of importer via exporter. After catcher and depot, the third and fourth important agents in the channels are sub-depot and *foria* respectively from frequency of involvement perspective. We find least involvement of fattener 1 and 2 in the channels. However, they play dominant role to increase the value of crab by performing fattening activities.

3.3 Frequency of Contact across the Value Chain

Table 4 describes the frequency of contact of the catcher with *foria*, depot, sub-depot, fattener 1, fattener 2, forest officer and local market.

Table 4: Frequency of Contact

	Foria	Depot / Sub-depot	Fattener 1	Fattener 2	Forest officer	Local market
No	111	69	233	221	23	257
Very rarely	8	24	3	6	11	7
Rarely	2	20	5	7	13	3
Sometimes	38	41	11	13	124	15
Frequently	39	65	24	23	92	16
Very frequently	102	81	24	30	37	2
All	300	300	300	300	300	300

Source: Authors' compilation

The data of Table 4 claims that the crab catchers contact with *foria*, depot, and sub-depot very frequently. However, the reverse scenario is found in case of fattener 1, fattener 2 and local market where they have very minimum contact. The crab catchers also contact frequently with forest officer. It is mainly for getting entry permit of entering inside the forest.

3.4 Agent-wise Analysis in the Value Chain

Table 5 delineates that the same agent is doing multiple activities across the chain. For example, the crab catcher is working as *foria* or fattener 1, in some cases *foria* is working as fattener 1, fattener 2, sub-depot and depot owner.

Table 5: Multiple Activities by the Same Agent of Value Chain

	Catcher	*Foria*	Fattener 1	Fattener 2	Sub-Depot	Depot
Catcher	******	*	*			
Foria		******	**	*	*	*
Fattener 1			******	**	*	
Fattener 2	*		***	******		
Sub-Depot			*		******	
Depot			**	*		******

Source: Authors' compilation

N.B.: Star (*) refers to frequency of attachment, three or more agents for each star. Please proceed horizontally.

Table 6 represents the agent-wise information of crab value chain. It comprises different issues like rejection of the defective crab, buying price, selling price, value addition and duration of crab holding.

Table 6: Agent-wise Information of Crab Value Chain

Agent	Rejection rate (%)	Buying price (BDT/kg)	Selling price (BDT/kg)	Value addition (%)	Holding duration (Day)
Catcher	9	0	355	-	2
Foria	7	299	364	21	2
Fattener 1	12	268	494	85	18
Fattener 2	11	292	622	113	37
Sub-Depot	9	305	333	9	1
Depot	9	333	442	33	3
Exporter	-	577	807	47	1

Source: Authors' compilation

In Table 6 we find that the rejection rate in percentage is higher in the case of fattener 1 and fattener 2. It is 12 percent and 11 percent, respectively. We also find that fattener 2 has the highest value addition (113 percent) while compared with other agents of the value chain. The selling price for fattener 2 is the highest as compared with other agents. Hence, based on the primary data we can say that fattener is a particularly important agent in the crab value chain whose value addition, selling price and holding duration is the highest. After fattener, the second highest place form value addition perspective is hold by the exporters.

3.5 Channel-wise Analysis in the Value Chain

Table 7 depicts channel-wise information of the crab value chain. The data shows that highest rejection rate is prevailing in Catcher-Fattener 2-Depot (C-F2-D) channel, which is around 14 percent.

Table 7: Channel-wise Information of Crab Value Chain

Value Chain Channels	Rejection rate (%)	Buying price (BDT/kg)	Selling price (BDT/kg)	Value addition (%)	Holding duration (Day)
C-D	14	357	385	8	1
C-SD-D	9	311	310	15	1
C-F-D	8	296	428	45	2
C-F1-D	10	310	548	77	28
C-F2-D	14	292	669	129	37
C-F/F1/F2-D	4	248	459	85	29
C-F/F1/F2-SD-D	10	308	372	21	6

N.B.: C – Catcher, F – Foria, F1 – Fattener 1, F2 – Fattener 2, SD – Sub Depot, D – Depot.

Table 7 demonstrates that value addition is also the highest (129 percent) in this chain. The second chain that contributes value-adding activities with minimum rejection rate and maximum value addition is Catcher-*Foria*-Fattener 1-Fattener 2-Depot (C-F/F1/F2-D). The rejection rate is only 4 percent and value addition is 85 percent in this channel. The duration of holding crab is also higher in both the chains. Therefore, we need to develop and expand this chain so that the mud crab centric economic activities become more value additive.

3.6 Grade-wise Analysis in the Value Chain

According to literature review, KII and field visit, the value chain agents classify crab in multiple major grades based on weight and gender. Table 8 reports grade wise rejection rate and value addition.

Table 8: Grade-wise Information of Crab Value Chain

Grade	Rejection rate (%)	Buying price (BDT/kg)	Selling price (BDT/kg)	Value addition (%)
M_XXL	3	677	790	17
M_XL	4	572	673	18
M_L	7	428	536	25
M_M	4	278	357	28
M_SM	22	217	276	27
M_SSM	22	155	171	11

Grade	Rejection rate (%)	Buying price (BDT/kg)	Selling price (BDT/kg)	Value addition (%)
M_P	21	68	100	46
M_PD	7	281	418	46
F_FF1	6	576	727	26
F_F1	8	309	400	29
F_F2	14	218	262	20
F_F3	2	56	184	226
F_P	0	300	750	150
F_PD	8	222	359	66
Male	11	335	415	27
Female	6	280	447	86
Grade	9	349	438	43
Non-grade	9	218	407	77

Source: Authors' compilation

The buying and selling price of large-sized crab is higher compared to small-sized crab for both male and female. However, the value addition as well as the rejection rate for female crab is higher than that of male crab. In Table 8 the highest rate of value addition is noticed from F3 grade female mud crab and the second highest rate of value addition is generated from female piece crab. The data also provide the evidence that female crab has higher percentage of value addition than that of male crab. It also signals that the value addition is more in non-graded crab than that of graded crab. The main reason behind this is that the graded crabs are sold in the market directly for export. In contrast, the crabs that are not yet eligible to be considered as a graded product instantly are purchased by the fattener 1 and fattener 2 for further nursing. When they are matured and eligible for categorized in any grade, they are caught by the fattener 1 and 2 and sold. Sometimes the depot owners have their own pond for fattening crab as they know that non-graded crab will gain value if they are nursed properly.

3.7 Mud Crab Value Chain in Brief

Figure 1 describes the mud crab value chain briefly. It includes six main agents of the value chain: crab catcher, *foria*, fattener 1, fattener 2, sub-depot and depot. It also describes five main channels: Catcher-Depot (C-D), Catcher-Sub Depot-Depot (C-SD-D), Catcher-*Foria*-Depot (C-F-D), Catcher-Fattener 1-Depot (C-F1-D) and Catcher-Fattener 2-Depot (C-F2-D). All other channels are included in Catcher-*Foria*/Fattener 1/Fattener 2/Sub Depot-Depot (C-F/F1/F2/SD-D). Here, 'N' refers to a channel's existence in total number of considered channels (in %) in the value chain, 'VA' refers to value addition in percentage, 'D' refers to crab holding duration (in days) in a channel, 'R' refers to crab rejection rate in a channel and 'V' refers to value addition per day in percentage.

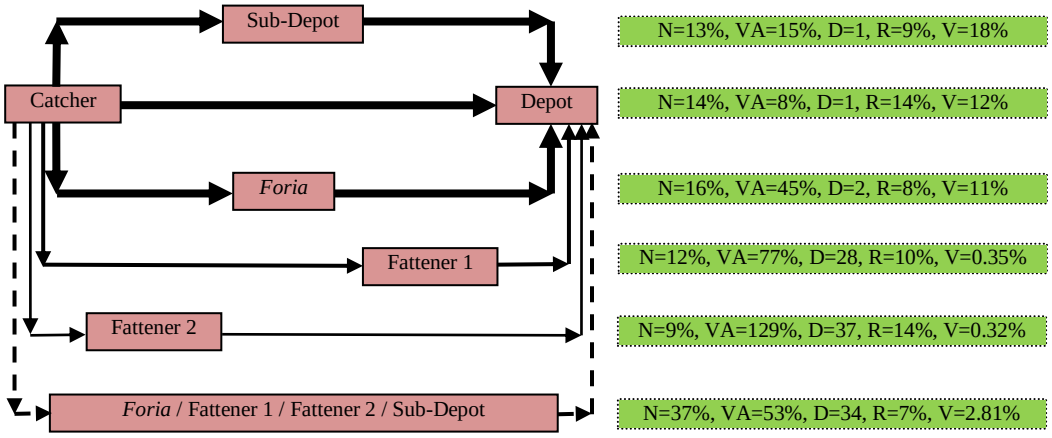

Figure 1: Mud Crab Value Chain

N.B.: N = A channel's existence in total number of considered channels (in %) in the value chain; VA = Value addition in percentage; D = Crab holding duration in a channel; R = Crab rejection rate in a channel; V = Value addition per day in percentage.

It seems that in Figure 1 the value addition is the highest when the crab passes through fattener 2 followed by fattener 1. However, a completely different and reverse scenario is observed if we consider value addition per day instead of total value addition. For example, per day value addition is the highest (18 percent) when the crab passes through C-SD-D channel. It is 12 percent for C-D and 11 percent for C-F-D channel, respectively. Hence, it is evident that the depot, sub-depot and *foria* are capturing the major amount of the added value. Furthermore, if werun the similar exercise of per day value addition for value chain agents, we find that it is the highest for the exporters, 47 percent followed by 11 percent for both *foria* and depot and 9 percent for sub-depot, whereas it is only 3-5 percent for fatteners. Hence, we find that the exporters, *foria*, depot and sub-depot are capturing the major amount of the added value.

Fatteners are doing the real value adding activities through fattening and nursing the crab, but they are getting very insignificant amount of added value, though they have to incur higher cost for accomplishing the value adding activities. According to the collected data, the direct cost incurred (in addition to buying price and office maintenance cost) by the fattener 1 and 2 are 46 BDT and 72 BDT per kg respectively on average. In contrast, the role of sub-depot, depot and *foria* is just to collect and buy crab from the catchers and supply it to the agents of forward linkage with very minimum value adding activities and minimum cost, only 5 and 8 BDT per kg. However, they are capturing a major share of the added value. The root cause behind the said discrepancy is the vicious cycle of informal credit. Most of the catchers depend on the loan taken from depot, sub-depot and *foria* to continue the mud crab collection activities from the mangrove ecosystem. Our data indicates that mean credit amount for the crab catchers is around 10,000 BDT per head. Such a scenario facilitates the credit providers i.e., the depot, sub-depot and *foria* to capture the major share of the added value in the mud crab value chain.

Another interesting finding is the change in crab grading by the exporters. The exporters usually buy as per the local grades such as **XXL(W**≥500), **XL(**500>**W**≥400),

L(400>**W**≥300), **M(**300>**W**≥250), **SM(**250>**W**≥200) and **SSM(**200>**W**≥150) as grades for male crab and **FF1(W**≥200), **F1(**200>**W**≥180), **F2(**180>**W**≥150) and **F3(**150>**W**≥120) as grades for female crab. However, they redefine the grades as 4XL, 3XL, XXL, XL, L, M and SM for male crab and 5F, 4F, 3F and 2F for female crabs. Such re-grading activities facilitate the exporters to grab a handsome amount of price margin and added value.

4. Discussion

Mud crab centric value adding activities are mostly confined to a certain cluster of stakeholders. The crab catcher and the depot owner remain present in every possible chain of the observed 93 patterns of value additive channels in the study area. These channels are rearranged into seven broader channels. The crab catchers have a high frequency of contact with *foria*, depot, and sub-depot than other actors in the chain. This finding is consistent with Bhuiyanet al. (2021) who endorsed the active presence of crab collector in each of the five distinct channels of crab value chain.

This study observed that the patterns of grading crabs vary in the domestic and international markets. Firstly, crabs are graded in the local market according to gender, size, and weight. After receiving the product, importers themselves re-grade the crabs as per the international market standard. Mahmud and Mamun (2013), Ferdousi et al. (2010), and Haque (2010) also endorse the grading pattern of mud crab on the same ground.

Internationally graded crabs are sold at a higher price than that of domestically graded mud crab. Bhuiyanet al. (2021) has also found price discrimination in the domestic and international markets. Hossain et al. (2018) also revealed that the price gap between crab catchers and the exporters is quite far from the added value at different intermediate steps.

This study finds that the price of female crab is higher than male crab because of the variation of meat, tenderness, and taste. The data also demonstrates that the fattener 2 contributes the highest percentage of value addition (113 percent). Fattener is an important agent in the crab value chain whose value addition, selling price, and holding duration are the highest. This study suggests developing and expanding fattener-oriented chain following Rahman et al. (2020) so that the mud crab centric economic activities become more value additive, which will ultimately facilitate more parties involved in the value addition process.

We find that the exporter, depot, sub-depot, and *foria* are capturing the major benefit of value addition. The fatteners are doing the real value adding activities through fattening and nursing the crab, but they are getting a very insignificant financial reward for their contributions. However, they incur a higher cost for accomplishing the mentioned value adding activities. The root cause behind the said discrepancy is the vicious cycle of informal credit provided by the depot, sub-depot, and *foria* to the crab catchers and fatteners. This finding is consistent with Zafar and Ahsan (2006). They argued that the crab collectors did not get the actual price due to the rent-seeking behavior of brokers and the burden of loans. They are supposed to sell crabs at a minimum price to the specified brokers or wholesalers who lend them money in their lean period. Sujan et al. (2021) also prioritized capital inadequacy as the second ranked constraint faced by the crab farmers.

5. Conclusion

This study tries to draw a composite picture of the value chain of mud crab. There are seven major actors in this value chain process. The actorsof the chain are performing multiple activities across the chain. However, the contribution of fattener-1and fattener-2 is dominant under the ground even though the reward in the form of money is trivial. Besides, the crab catchers are the lowest receiver of monetary benefit. Informal credit arrangements of the depot, *foria*, and middleman are the main culprit behind the discrepancies. Therefore, it is important to initiate credit accessibility at easy terms and conditions to the crab catchers from alternative sources. It might help the crab catcher and fattener to dissociate their bindings of selling products to those specific loan providers i.e., depot, *foria*, and middleman. Besides, it boosts the bargaining capabilities of the crab catchers and fatteners in the perfectly competitive market for a fair price. It will create an avenue for the mud crab value chain centric stakeholders to claim their own bite in the value addition cake. In addition, the grading of mud crab is different in the domestic and international markets. The price of internationally graded crab is higher than domestically graded crab. Therefore, depot and sub-depot owners should follow the internationally recognized grading system. It will accelerate more financial inflow in the crab value chain.

This paper addresses agent-wise, channel-wise, and grade-wise mud crab centric value adding activities which are the unique contributions of the paper. Future studies on this topic might be able to think of it as a baseline study for further exploring the issue. In addition, how financial inclusion at easy terms can benefit all the actors related to mud crab catch can be explored further by others.

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