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An Economic Study on Small-Scale Medicinal and Aromatic Plant Enterprises in Bangladesh

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Abstract: *The specific objectives of the study are: (i) to identify different entrepreneurs/actors and their activities in supply chain of the small-scale medicinal and aromatic plants (MAPs) enterprises; (ii) to determine marketing channel of the medicinal and aromatic plants and products; and (iii) to find out the constraints and improvement strategies for the enterprises sectors in Bangladesh. Both primary and secondary data were used for the study. Ten villages under Laxmipur- kholabaria Union of Natore sadar upazila in Natore district and ten unions of Barlekha Upazila in Moulabazar district were selected as study areas for medicinal plant and aromatic plant, respectively. Primary data were collected through two periodic 'Focus Group Discussion' (FGD) organized with the participation of the medicinal and agar plant entrepreneurs/actors and representatives of local Upazila Agriculture Offices in the study areas by using a checklist and a schedule as well as based on information recording and field observation. For getting secondary information several research papers, literatures and documents were collected from different agriculture and agribusiness line agencies and from website. For the medicinal plant enterprises, the major problems are: high price and low quality of inputs, high irrigation cost, lacking of scientific and appropriate knowledge, experience of the MAPs entrepreneurs and actors, absence of local assembling and processing centre and non-availability of government support. For the agar-atar enterprises, the problems are: absent of official recognition and priority of this sector; scarcity of standard/quality testing tools and machineries of government; high duty imposed by the imported countries; complexity of 'Transit Permit' (TP) and CITES Certificate.*

1. Introduction

In Bangladesh majority of the people who are engaged in agriculture have little knowledge on agribusiness activities. Due to development of infrastructure and

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construction of houses for additional population, cultivable land is decreasing day by day in a alarming rate. For increasing population, landholdings become fragmented and landlessness is increasing gradually. In these circumstances, development of agribusiness and agribusiness enterprises could generate more income and employment by adding more value to agricultural products using less land as well as intensive use of existing land. But in fact, promotion of agribusiness and agribusiness enterprises in Bangladesh is becoming in very slow motion. In these considerations, an attempt of developing small-scale medicinal and aromatic plants (MAPs) enterprises may be identified a great step for economic growth of the country.

At one time, Bangladesh, as a tropical country was very rich in diverse natural medicinal and aromatic plants scattered throughout the forests, plain lands, crop fields, roadsides, gardens and wetlands. Unfortunately, in Bangladesh, due to over population pressure, over exploitation, deforestation and change in land use patterns, many species of MAPs have reached the edge of extinction or severe genetic loss. In addition, the country has to face serious consequences of biodiversity loss from the over use of high toxic chemical inputs in agriculture and the global climate change that are causes for destroying the MAPs species.

In early 1980's Ayurvedic and Unani companies could procure 80% of MAPs from natural forests and then rest 20% from import. Now the scenario has changed: 80% imported and 20% from domestic production (Merry and Shahjahan, 2014). In spite of these inverse situations, Bangladesh is still now blessed with innumerable genetic diversity of medicinal plants. In Bangladesh there are about 250 – 300 thousand plant species; in fact, almost all of these plant species are either directly or indirectly used as source of herbal medicines (Nasrin, 2012). Bangladesh Agricultural Research Institute (BARI) recorded 722 plant species, growing or available in Bangladesh have medicinal values. More than 8000 plant species used as medicinal plant in world. In India 4000 plant species are used as medicinal plants, while 700 plant species are used as medicinal plants in Bangladesh. Almost 255 medicinal plants (Mohiuddin, 2014) used in ayurbedic and unani system of herbal medicine preparation.

World Health Organization (WHO) has given statistics that 80% of the world population including Asia and the rural population in Bangladesh depends on traditional medicine (TM) produced from MAPs due to an accessible, affordable and culturally appropriate source of primary health care needs (Banik and Chowdury, 2014).

In Bangladesh, majority of the farmers are still now totally unaware about the profitability of MAPs cultivation. So, it is clear that MAPs cultivation is still a rudimentary stage. There are very few farmers, who are cultivating MAPs by their own initiatives. The commercial cultivation of medicinal plants started in early

1990s mainly in sadar upazila of Natore district (Shahidullah and Haque, 2010). Recently, in other areas such as Bogra, Ghaibandha and Chittagong Hill tracks the commercial cultivation of medicinal plants has been introduced. Company cultivation is sporadic or in patchy form. No prescribed cultivation methods are practiced for MAPs. Farmers cultivate MAPs in their own way using indiscriminate harvesting, processing, storage and packaging. Both farmers and different NGOs are cultivating and promoting medicinal plants in limited area.

In order to resist the decline of MAPs resources and uphold the user's friendly traditional healing heritage, urgent actions are needed at local, regional and national levels. These sectors have huge potentials in economic development as well as export earnings for the country. So, scientific approaches for MAPs exploration, cultivation, conservation and value addition through harvesting, handling, processing, packaging, storage, transportation and marketing both in domestic and export markets are in high demand nowadays for entrepreneurship development in these sectors. Considering the present situation and future need, necessary and appropriate research studies should be conducted regarding these sectors to find out the scientific approaches on the aforesaid activities.

Therefore, this study is expected to provide valuable information that would be helpful formulating appropriate measures and policy for widespread production of MAPs plants and products in the country as well as marketing both in the country and the abroad. The MAPs entrepreneurs and actors, concerned organizations and policy makers are expected to benefit from the study. The present study seeks for achieving the following specific objectives.

The Specific Objectives are:

i. to identify different entrepreneurs/actors and their activities in supply chain of the small-scale medicinal and aromatic plants (MAPs) enterprises;

ii. to determine marketing channel of the medicinal and aromatic plants and products; and

iii. to find out the constraints and improvement strategies for the enterprises sectors in Bangladesh.

2. Materials and Methods

Both primary and secondary data were used in the study. Primary data were collected from different entrepreneurs and actors of selected small-scale medicinal and aromatic (agar) plants (MAPs) enterprise. Different entrepreneurs and actors identified are commercial producers, input suppliers andservice providers, processors, stockiest, transporters, wholesale traders, retailers, exporters, medicine companies and selected agents of foreign imported company. Secondary data were collected from various published and unpublished reports, documents and papers of national and international agencies working in agriculture and agribusiness

sectors and from website.

For collection of primary data, ten commercially medicinal plant cultivated villages such as Laxmipur, Kholabaria, Kahalbaria, Borabaria, Ibrahimpur, Dakhinpur, Chauri, Gazipur, Hoybatpur, Darabpur under Laxmipur-kholabaria Union of Natore Sadar Upazila in Natore district and ten commercially aromatic plant-agar cultivated unions such as Barlekha Sadar, South Sahbagpur, North Sahbaggpur, Niz Bahadur, Barni, Talimpur, North Dakhinbag (Katalthali), South Dakhinbag, Sujanagar, Dasher Bazar of Barlekha Upazila in Moulabazar district were selected as study areas. As the villages and the unions in the upazilas are closely situated, they are separately identified as single cluster for the medicinal and aromatic (agar) plant, respectively.

Separate 'Focus Group Discussion' (FGD) with participation of the different entrepreneurs and actors of MAPs enterprises and representatives of local upazila agriculture office were arranged in the each cluster. Number of participants of the two FGDs organized in Laxmipur-kholabaria Union of Natore Sadar Upazila in Natore district and Sujanagar Union of Barlekha Upazila in Moulavi Bazar district were 15 and 10, respectively. Details of the implemented FGDs are mentioned in Table 1.

Table 1: Information of Focus Group Discussion Organized in the Study Areas

Sl. No.	Type of agribusiness enterprises	Category of entrepreneurs and actors participated	Number of participants attended	Location of FGD organized	Date of FGD organized
01.	Medicinal plant enterprise	Seedling Supplier, Producer, Processor, Stockiest, Wholesale Traders and Sub-Assistant Agriculture Officer	15	Vill: Klolabaria, Union: Luxmipur-Klolabaria, Upazila: Natore Sadar, District: Natore	May 20, 2015
02.	Aromatic plant-agar enterprise	Seedling Supplier, Producer, Processor and Trader (Exporter)	10	Vill: Sujanagar, Union: Sujanagar Upazila: Barlekha District: Natore	December 27, 2014

Both primary and secondary data were collected from different sources through direct and indirect investigation and communication. Primary data on medicinal and aromatic plant enterprises from the study areas were collected through the aforesaid focus group discussion (FGDs), face to face interview method with

several lead, pioneer and potential entrepreneurs and actors and discussion with the aforesaid Upazilas Agriculture Officers by using developed checklists and schedules. It is worth to mention that during interviewing and discussion to the participants, respondents and the informants, observation and recording methods were applied by data collector (researcher) to capture the relevant information missing in the checklists and the schedules. During interviewing for the data collection, the background, goal and objectives of the study were clearly informed to the participants, respondents and informants.

The collected information and data were properly processed and maintained just after the collection in well manner form. Different errors in the collected data such as inconsistency, inaccuracy and unreliability were timely and properly edited through communication with the interviewed participants, respondents, informants; using the gained recording documents, observation, experiences, research reports, documents and guide books, etc. Then the justified data were tabulated through necessary cleaning. Finally, the data were made ready for the analysis as per the objectives of the study. The processed data were analyzed, interpreted and presented in descriptive methods including tables, diagrams, etc.

3. Results and Discussion

In the study areas, medicinal plant and aromatic plants (MAPs) were major cultivated crops and livelihood sources. These two crops are mainly commercially cultivated in both homestead farming and field cultivation. On basis of the produced crops, several types of agribusinesses were developed in the areas which contributed a vital role in the household livelihoods of the areas. Different types of commercial activities generated on basis of medicinal plant enterprise and aromatic plant (agar) enterprise are described below.

3.1 Production of medicinal plant

Most medicinal plants are commercially produced at Laxmipur-Klolabaria Union in the Natore sadar Upazila. According to the field information, about 109 types of medicinal plants are produced both in the homestead and in the field. Of the total number of medicinal plants, 10 types such as Amrul, Basak, Ghritokumary, Hostipolas Kalomegh, Misridana, Owshaganda, Shatamul, Shimulmul and Tulsi are commercially produced in large-scale in field level which were considered as samples for the study. Some basic information of the said medicinal plants and their medicinal uses are shown in Tables 2 and 3.

Table 2: Basic Information of the Selected Medicinal Plants

Sl. No.	Species of medicinal plant	Duration of life	Planting period	Harvesting period
01.	Amrul	1 year	Middle April .– Middle June	The whole year
02.	Basak	4-5 years	The whole year	The whole year
03.	Gritokumary	1 year	Middle Oct. – Middle Nov.	1st - Middle Jan. – Middle Feb. 2nd - Middle Nov. – Middle Dec.
04.	Kalomegh	6-8 months	Middle March.– Middle June	Middle Sept.– Middle Nov.
05.	Hostipolas	1-2 years	The whole year	The whole year
06.	Misridana	1 year	Middle March.– Middle June	Middle March.– Middle May
07.	Owshaganda	1 year	The whole year	The whole year
08.	Shatamul	1-2 years	The whole year	The whole year
09.	Shimulmul	1 year	Middle March.– Middle June	Middle Nov. – Middle March
10.	Tulsi	6-8 months	Middle March.– Middle June	Middle March.– Middle May

Source: FGD (2015).

Table 3: Medicinal Uses of selected Medicinal Plants

Sl. No.	Species of medicinal plant	Plant parts used as medicine	Name of diseases for which medicinal plant is used
01.	Amrul	Underground root of plant	(1). Reduce couf-cold, (2). Reduce alergy
02.	Basak	Only leaf	Remove Kasi-couf and Fever.
03.	Hostipolas	Only root	Reduce rheumatic pain.
04.	Gritokumary	Full/partial part of leaf	(1) Couf-kas, (2) Physcical cool & refresh, (3) Physcical weakness, (4) Reduce head pain, (5) Remove pain and injury incurred by firing.
05.	Kalomegh	All parts of plant without root and seed	(1) Increase eating taste and food digestion, (2) Control dysentery and fever.
06.	Misridana	Underground part of plant	(1) Useful for gas.
07.	Owshaganda	Full part but root is more useful	(1) Remove sexual diseases.
08.	Shatamul	Only root	(1) Reduce urine pain (2) Clear Urine Extraction (3) Purify blood.
09.	Shimulmul	Only root	(1)Gas control, (2) Increase digestion (3) Reduce complexity of toilet.
10.	Tulsi	The whole part of plant without root	Remove Kasi-couf and Fever.

Source: FGD (2015)

3.2 Diversity of medicinal plant enterprise

Based on the produced medicinal plants, multi-types of agribusiness and entrepreneurs/actors are developed in the study area. In Laxmipur-kholabaria union, about 800 farmers were commercially involved in the medicinal plant production. Some of them were directly involved in upstream and downstream (backward and forward linkages) activities of the medicinal plants and products such as primary processing business, seasonal stock business, partially seed and seedlings produce business and wholesale trading. They operate these business either in their residence or in their shops situated in the local markets. Besides these, about 50 traders, 100 processors, 30 stockiest, 1 transporter, 4 seedlings producers and suppliers and 15 seasonal seed (including other crop seeds) suppliers have smoothly been conducting their business on the medicinal plants and its products. All business activities directly contribute to generate local employments and income.

3.3 Marketing of medicinal plant

Generally farmers' produced medicinal plant are sold locally in either their cultivated land or in their residences to various kinds of customers such as local hakim/kabiraj, faria/bepari, local agent, wholesale trader, processor, stockiest, some national medicinal companies e.g. Navana Pharmaceuticals, Square Pharmaceuticals, Akmy Pharmaceuticals, Hamdard Laboratory Limited and commission agents of foreign imported companies of China and Thailand. The imported countries – China and Thailand do not direct purchase ghritocumary from the producers, they purchase through their contractual companies (commission agents) of this country. On the other hand, the medicine companies direct purchase the medicinal plants and its products from the producers through their recruited staff in the field.

All the producers, traders, processors, stockiest, faria/bapari and agents generally follow the marketing systems derived from their own knowledge and experience. Jute bag, polythene bag, jute rope and string, polythene rope and bamboo basket are used as package materials. After packaging in traditional method, dry medicinal plants are stored at their own residences. Any special standard is not followed for product grading. Locally low quality and high quality standards are always followed by the all parties. In all stages of the product selling, price is fixed by open bargaining method. As the products are mostly sold locally, in most stages artificial pressure is not faced by the producers for price fixing. No specialized transport is used for the products transportation. Traditional means such as van, truck, bus and train are used in this case. For most cases, payment is made at the time of purchase, but in some rare cases, payment is made in advance. Prices per unit of the products are given in Table 4 .

Table 4 : Form and Price of Sold Medicinal Plant and Products

Sl. No.	Species of medicinal plant	Price per kg (in Tk.)		Package size		
		Green form	Dry form	Green form (kg)	Dry form (kg)	
01.	Amrul	20.0	70 – 80.0	1 – 60		
02.	Basak	5.0	30.0	60	40	
03.	Gritokumary	2.0	No sale in dry form	50	-	
04.	Hostipolas	100.0	300.0	40	40	
05.	Kalomegh	No sale in green form	50.0	-	2 - 10	
06.	Misridana	80.0	160.0	50	40	
07.	Owshaganda	No sale in green form	Dry root = 200.0 Dry leaf = 150.0 Dry stem = 330-350.0	-	Dry root = 40 Dry leaf = 20 - 40 Dry stem = 20 – 50	
08.	Shatamul	60.0	400.0	40	40	
09.	Shimulmul	40.0	100.0	50	40	
10.	Tulsi	10.0	100.0	1 – 60		

Source : FGD (2014).

Figure 1 : Marketing Channels of Medicinal Plant

3.5 Major constraints for the medicinal plants enterprises

1. Prices of different inputs e.g. fertilizers and pesticides are high but quality is low and government fixed prices are not followed by the dealers.
2. Due to non-available electric supply, diesel pump is operated for irrigation which incurred high irrigation costs.
3. As in March and April ground water level goes down to high depth, water supply through pump is seriously hampered.

4. Over all, due to unscientific and non-appropriate knowledge and experience, the entrepreneurs and the actors perform all the activities based on their own developed knowledge and experience.
5. Due to lacking of scientific and appropriate knowledge and experience on medicinal uses of the medicinal plants and products, the entrepreneurs/actors conduct their sale promotion activities on their traditional knowledge and experience.
6. There exist no association of the medicinal plant entrepreneurs/actors.
7. Absence of local assembling and processing centre for proper processing and sale of the medicinal plants and products.
8. Non-availability of government and non-government support to the promotion of medicinal plant sector and the entrepreneurs/actors.

3.6 Recommendations to overcome the constraints

1. Proper monitoring and supervision are needed by concerned government authority for fixing input price and maintaining its quality.
2. Electricity supply could be made available in the medicinal plant cluster zone so that pumps can be operated electrically.
3. Necessary steps to be taken through government and non-government organizations for providing proper support and training to the medicinal plant entrepreneurs/actors on scientific and appropriate knowledge and experience regarding the aforesaid activities.
4. Locally a assembling, processing and ICT centre may be established in the medicinal plants and products cluster zone through government and non-government support.
5. As early as possible, multi-dimension appropriate and effective development program and project should be developed and started through government and non-government organizations to upgrade the existing condition of the medicinal plant sector and the entrepreneurs/actors.

3.7 Production of aromatic plant

There are various species of aromatic plant. Agar plant is one of them. Almost all unions of Barlekha Upazila in Moubazar district constitute the largest commercial produced agar plant cluster in Bangladesh. The heritage of agar industry in Bangladesh is about one thousand year old which was established based on the agar plants produced in the Barlekha upazila of Maulabibazar district (Boxs et al., 2009). Some basic information regarding agar plant enterprise in Barlekha area are mentioned in Table 5.

Table 5 : Basic Information of Agar Plant Enterprise in Barlekha

Particulars	Information
Cultivated land under agar plant	150 hectare
Number of employee engaged in agar plant and product nursery, production, Processing, and trading/exporting enterprises sector	50 thousand
Season of seed sowing	March – April
Season of seedling planting	June – September
Maturity period of agar plant harvested in natural method	25-30 years
Maturity period of agar plant harvested in nail method	15 -16 years
Average quantity of atar produced from a maturity agar plant	18 – 24 gm

Source: FGD (2014).

3.8 Diversity of aromatic plant enterprise

On depending of the produced aromatic plants-agar, several types of agribusiness and agribusiness entrepreneurs and actors are developed in the study areas. In the Barlekha upazila, about 500 farmers are commercially involved in the agar plant production. Some of them are directly involved in upstream and downstream (backward and forward linkages) activities of the agar seedlings production and products such as seedlings supply business, agar products processing business and agar products exporting business. They operate these businesses either in their residence or in their shops or processing factories situated in their residence areas. Besides these, about 25 exporters, 350 processors, and 15 seedlings producers and suppliers are conducting their business on the aromatic plants and its products. All business activities directly contribute to generate local employments and income.

3.9 Different uses of the agar products

Aromatic plants are treated as industrial crops or vegetables depending on their way of use. Actually in case of MAPs, all aromatic plants are medicinal but all medicinal plants are not aromatic. Different uses of agar plant products are described in Table 6.

Table 6: Different Uses of Agar products

Sl. No.	Name of products	Different uses
01.	Agar oil/atar	(i) Sweet smelling and liquid perfume Ingredient for making herbal medicine (iii) Ingredient for making perfume and perfume category product (iv) Natural colour in food item (v) Meditation
02.	Agar wood	(i) Medication (ii) Make smoky for medication
03.	Agar cheeps	(iii) Ingredient for making perfume and perfume category product (iii) Ingredient for making herbal medicine
04.	Agar residual/ dust/ powder	(i) Making agar candle (ii) Ingredient in making of cosmetic and perfume product

Source : FGD (2014).

3.10 Major products manufactured from agar plant and their marketing

After harvesting of agar plant, 4 types of products e.g., agar oil/atar, agar wood, agar cheeps and agar residual/dust/powder are produced through proper processing of agar plant. Almost all of the products are fully (approximate 99%) exported to different Middle East Countries, China and Japan (Boxes et al., 2009). It is locally said that any part of agar plant is not rejected, all the parts are fully exported to different countries in the world. Agar oil/atar is totally exported to Saudi Arabia, Qatar, Kuwait, Dubai and other Middle East Countries as well as to China and Japan. Agar wood and agar cheeps are fully exported in Saudi Arabia, Qatar, Kuwait, Dubai and other Middle East Countries. Agar residual/dust/powder are exported in Saudi Arabia, Qatar, Kuwait, Dubai and other middle east countries and are sold also to agar candle manufacturing companies in the country. Different types of agar products and their prices are mentioned in Table 7.

Table 7: Different types of Customers of Agar Products

Sl. No.	Name	Types of customer
01.	Agar oil/atar	Saudi Arabic, Qatar, Kuwait, Dubai and other middle east country, china and Japan
02.	Agar wood	Saudi Arabic, Qatar, Kuwait, Dubai and other middle east country
03.	Agar cheeps	Saudi Arabic, Qatar, Kuwait, Dubai and other middle east country
04.	Agar residual/ dust/ powder	1) Agar candle Company 2) Saudi Arabic, Qatar, Kuwait, Dubai and other middle east country

Source : FGD (2014).

Table 8 : Different Types of Agar Products and their Prices

Sl. No.	Major Product	Type of product	Price (Tk./Unit)	Remark
1.	Agar plant (harvested)	-	5,000– 50,000/-/plant	1 tola=11.85 gm
2.	Agar oil/atar	Boiyer /white atar	2,500 – 3,000/-/ tola	
		Lohar chos/black atar	6,000 – 7,000/-/ tola	
		Surun/original atar (lohar mal atar)	8,000 – 10,000/-/ tola	
		Surun/original atar (Allahr/natural mal atar)	20,000– 30,000/-/tola	
3.	Agar wood/Ud	Lohar mal/wood	15,000 – 30,000/-/kg	
		Allahr/natural mal/wood	40,000–2,00,000/-/kg	
4.	Agar cheep	Small piece cheep	50 – 60/-/kg	
		Cheep dust/powder	20 -30/-/kg	

Source : FGD (2014).

3.10 Major constraints for the agar plant enterprises

- Lack of official recognition of this sector as priority industry by government.
- Not included this sector in the government's priority list of the industry.
- Scarcity of standard testing tools and machineries for testing quality of agar products.

- High import duties imposed by imported countries on the agar products.
- Non-availability of bank loan for the agar enterprises at lower interest rate.
- In case of selling agar plant by government forest department, priority is given to intermediaries instead of actual entrepreneurs of the agar plant.
- There exists some chapters against the entrepreneurs in the 'Agar Plant Selling Policy - 2010' formulated by the Department of Forest.
- Due to complexity for delivery of TP for harvesting and transportation of the purchased agar plant, export of the agar products are seriously hampered.
- Provide CITES (Convention on International Trade in Endangered in Flora & Fauna) Certificate by the head office of Forest Department in Dhaka.

3.11 Recommendations to overcome the constraints

1. Agar-Atar Industry would be declared as a prior industry in publishable 'National Industry Policy – 2015'.
2. Necessary steps to be taken to delivery easy loan at lower interest rate to the agar-atar entrepreneurs.
3. To reduce system loss, special and specific training should be provided to the agar-atar entrepreneurs and their workers.
4. Necessary steps need to be taken for modernization of the Sujanagar Agar-Atar Production Cluster and Processing Plant.
5. Make easy and relax of CITES and TP delivery. CITES should be delivery through the local forest office of Moulabibazar District.
6. Necessary actions to be taken for developing of fast growing hybrid gene of agar plant.
7. MOU (Memorandum of Understanding) may be signed with importing countries for reducing their import duties and making easy access of the agar-atar products to their counties.
8. To establish a standard testing lab in the Barlekha aga-atar cluster for testing the qualities of the agar-atar products.
9. Over all, to develop the Barlekha aga-atar cluster as a perfect exported model of agar-atar cluster, integrated development program should be taken and implemented by government.

4. Concluding Remarks

Medicinal and Aromatic Plants (MAPs) are major cultivated crops and livelihood sources in the study areas. These two crops are mainly commercially cultivated in homestead area and in the field. Based on the produced crops, several types of

agribusiness are developed that generate a huge employment opportunity and income generation.

About 109 types of medicinal plant are produced in the study area. Of them, 10 types – Amrul, Basak, Gritokumary, Hostipolas, Kalomegh, Misridana, Owshaganda, Shatamul, Shimulmul and Tulsi are commercially produced in large-scale at field level. The produced medicinal plant are sold locally both at producers' cultivated land and residences to various kinds of customers such as local hakim/kabiraj, faria/bapari, local agent, wholesale trader, processor, stockiest, some national medicinal companies and commission agents of the imported countries - China and Thailand. Traditional marketing system, like other crops, is generally followed locally by all the entrepreneurs/actors. Some major problems for the medicinal plant enterprises are: high price and low quality of inputs, high irrigation cost, lack of scientific and appropriate knowledge and experience.

There exists various species of aromatic plant. Agar plant is one of them. Barlekha upazila in Moulavibazar district is the largest commercial produced agar plant cluster in Bangladesh. Cultivated land under agar plant production was about 150 hectare; number of agar plant producer was about 500; Atar processing plant/centers were 350; Agar plant products exporters were about 25 and number of employes engaged in agar and atar production and processing enterprises were about 50 thousand. After harvesting of agar plant, 4 types of products such as agar oil/atar, agar wood, agar cheeps and agar residual/dust/powder are produced from agar through proper processing of agar plant. Most of the products are exported to different middle east countries. Some major problems identified for agar-atar enterprises are : no official recognition and priority of this sector as industry by government, scarcity of standard/quality testing tools and machineries, high duty imposed by the imported countries, non-availability of bank loan, complexity of obtaining TP and CITES Certificates. The participants also suggested some recommendations for the solution of the problems.

In fact, government and non-government support services for the medicinal plant and agar-atar enterprises in the study areas are very limited. So necessary services according to the recommendation by the entrepreneurs should be taken by the government. and non-govt. organizations.

For the medicinal plant enterprises some major steps are: quality inputs supply at lower price; availability of electricity supply; provide necessary training to the entrepreneurs/actors on scientific activities regarding MAPs enterprises and establishing assembling, processing and ICT centres.

For the aromatic plant enterprises some recommendations are: give priority Agar-Atar Industry in publishable 'National Industry Policy – 2015'; take actions for modernization of the Barlekha Agar-Atar Production Cluster and Processing Plant; make easy and relax of CITES and TP delivery; develop fast growing hybrid

gene of agar plant; reduce import duties and make easy access of the agar-atar products to different export countries and establish a standard testing lab in the Barlekha aga-atar cluster.

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