COMMERCIALIZATION OF BETEL LEAF CULTIVATION BY THE FARMERS OF WAZIRPUR UPAZILA UNDER BARISHAL DISTRICT

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CERTIFICATE

This is to certify that the thesis entitled **"Commercialization of Betel Leaf Cultivation by The Farmers of Wazirpur Upazila under Barishal District"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agricultural Extension and Information System**, embodies the result of a piece of bonafide research work carried out by **Md. Aminul Islam**, Registration number: **18-09170** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this investigation has duly been acknowledged.

Dated:

_____
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DEDICATED
TO
MY BELOVED
PARENTS

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COMMERCIALIZON OF BETEL LEAF CULTIVATION BY THE FARMERS OF WAZIRPUR UPAZILA UNDER BARISHAL DISTRICT

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ABSTRACT

Betel leaf cultivation may helps the farmer with regard to farm income and medicinal value. In this context, the objectives of the study was to determine the extent of commercialization of betel leaf cultivation by the farmers and to explore the contribution of the selected characteristics of the betel leaf farmers to their commercialization of betel leaf cultivation. The study was conducted in the Wazirpur upazila under Barishal district. One hundred and two (102) betel leaf growers were selected randomly from a total of 746 growers of four villages of Wazirpur upazila under the Barishal district. A structured interview schedule was developed based on objectives of the study for collecting the data. The researcher himself collected data through personal contact. Commercialization of betel leaf cultivation by the farmers was dependent variable and 10 selected characteristics of the farmers was treated as independent variables. Data collection was started in 15 November, 2020 and completed in 10 December, 2020. Among the respondents, the majority (71.57 percent) of them had high commercialization of betel leaf by keeping very small portion for family consumption. Moreover it was observed that 87.24 percent of betel leaf growers had high to very high level commercialization of betel leaf. The statistical analysis exposed that educational qualification, extension media contact of betel leaf farmers and knowledge on betel leaf cultivation had significant positive relationships with the commercialization of betel leaf farmers. The findings may be helpful to formulate a better policy towards increasing the commercialization of betel leaf cultivation.

CHAPTER I

INTRODUCTION

1.1 General Background

Traditionally and predominantly Bangladesh is an agro based country with an area of 147570 sq. km. The country produces different type of crops such as cereal crops, cash crops, beverage crops, narcotic crops etc. Betel leaf is one of the most important narcotic crops in Bangladesh. The deep green heart shaped leaves of betel vine are popularly known as *Paan* in Bangladesh. The scientific name of betel leaf is *Piper Betel L.* The betel piper is the leaf of a family of a vine belonging to the *Piperaceae* family i.e., black pepper family. The most probable place of origin of betel vine is Malaysia. There are about 125 to 150 cultivars in the world (Verma *et al*, 2004). The leaf is popular as antiseptic and is commonly applied on wounds and lesions for its healing effects (Sarkar *et al*, 2008). Furthermore, it is also known as for its medicinal value, for instances its use for cold and asthma are well reported. However, it may cause severe health problems such as increased heart rate, palpitations, cardio-vascular disease, mouth tumor and cancer. The significance of betel leaf has been explained in relation to every sphere of human life including social, cultural, religious, and even day to day life (Guha, 2006). Among all the areas of Bangladesh, Sylhet, Moulvibazar, Jessore, Khulna, Kustia, Bagerhat, Satkhira, Narail, Bhola, Barisal, Faridpur, Rajshahi, Rangpur, Gaibandha, Pabna, Cox's Bazar, and the greater Chittagong district are the areas where betel leaf is cultivating widely (BBS, 2017; Fila *et al*. 2006). At present betel leaf has a broad market and Bangladesh is exporting quality betel leaves to many countries of Asia and Europe. The leading exporting country of betel leaves is India, Saudia Arabia, Pakistan, United Arab Emirates, England, Germany and Italy (Banglapedia).

Commercialization of production systems is a process through which a household production goal changes from subsistence to profit maximization and a production system in which households produce market oriented products based on the preference of consumers. Commercialization is a process involving a deliberate action on the part of the producers to use their land, labor, implements and inputs in such a way that profit is maximized from the crops produced or animals raised for exchange or sale (Ejupu, 2001). Hence, in the era of globalization, smallholder farmers need to

produce for the market as they are competing with farmers around themselves and with those producing the same commodity at regional as well as global level (Berhanu *et al*, 2006).

Betel leaf cultivation practice is linked up with subsistence in case of production, and socio- economic spectacle. Production chain is concerned to immediate economic distribution to subsistence of the betel leaf farmers. By using new agricultural practices in betel leaf cultivation, betel leaf farmers can attain over economic return from the identical unit of land against consecutive agriculture. Unemployment problem can be lessened in the rural areas of Bangladesh by betel leaf cultivation.

The subtropical monsoonal and prolific lands make Bangladesh much favourable for agricultural production. This prejudiced climate situation creates this country susceptible to generate a ample diversity of economically important agricultural products. Betel leaf usually known as Pan in Bangladesh swells well in tropical areas. The number of households that started betel leaf cultivation in the last 25 years or so grown quickly and the number of growers continues to cultivate.

It is a creeper cash crop which has been cultivated over Bangladesh from centuries. In Bangladesh, there are two methods of betel leaf cultivation practiced which are a closed system of cultivation called 'Barejas' and the other one is open system cultivation using confirmatory plants. Most of the betel leaf farmer except hill tracts areas contemplation close system method using Barejas. Bareja is a exceptional type of quadrangle formation which is chiefly used for shadow and synthetic clinch of betel leaf plant. Generally, it is made on vulnerably vicious land.

On the other hand, cultivators in Sylhet, Chittagong and some other regions contemplation open system betel leaf cultivation due to non-attainment of compatible flat land. Although, in Barishal and near about this area, a great amounts of cultivators are immediately and obliquely dependant on it for their subsistence, till now there are not adequate number revealed records which will assistance for further policy-making and impersonation. This study is schematic to measurement the economics and commercialization of betel leaf in Barishal to provide necessary information to the policy makers, researchers and scholars.

1.2 Statement of the Problem

Commercialization is the process of bringing new products or services to market. The

broader act of commercialization entails production, distribution, marketing, sales, customer support, and other key functions critical to achieving the commercial success of the new product or service. Betel leaf is one of the significant trades trim out Barishal district of Bangladesh. It connotes their financial condition and expectation for everyday comforts. The betel leaf develops encounter various issues which rise up out of administration practices, innovative issues, showcasing framework and ecological perspectives. Many reviews were led by numerous scientists, which were restricted to distinguishing proof of problems alongside their seriousness as it were. To the significance of problems encounter was quite recently seeking and run down the issues of concerned issues. In realities, the significance of issue encounter ought to be distinctive. A few analysts have seen that the issue encounter ought to depict the strategies for handling problems. The betel leaf farmers of Barishal district area are suitable where no issue can go unchallenged. Along these lines, their selfhood moves them to create gadget for settling betel leaf cultivation against problems. Where there is issue there is likewise arrangement. Sensibly, betel leaf farmers of Barishal district distinguish problems and handle the problems giving some level of accentuation.

Conducting the research in a planned and appropriate way, the researcher put forwarded the following questions:

- What were the extent of commercialization by the farmers in betel leaf cultivation?
- What were the characteristics of the betel leaf farmers?
- Was there any contributory relationship of selected characteristics of the betel leaf farmers' with the commercialization of betel leaf?

1.3 Specific Objectives of the Study

The following specific objectives were set forth in order to give proper direction of the study:

i. To describe selected socio-economic profile of betel leaf farmers;

ii. To determine the extent of commercialization of betel leaf by the farmers; and

iii. To assess the contributing relationships between the selected characteristics of the betel leaf growers and commercialization of betel leaf.

1.4 Scope of the Study

  i.   The present study was once designed to have a figuring out of the
       commercialization of betel leaf cultivation by the farmer and to explore its
       contributing relationship with their selected characteristics.

 ii.   The findings of the study will, in particular, be applicable to the study area at
       Wazirpur upazila in Barishal district. The findings may also be applicable to
       other locale of Bangladesh where socio-cultural, psychological and economic
       circumstance do not differ much than those of the study areas.

iii.   The findings of the study may also be helpful to the field works of agricultural
       marketing service providers to improve strategies of action for
       commercializing betel leaf.

 iv.   The findings of the study will likely be helpful for the specialist of various
       organizations and planners, policy makers and extortionists in taking away
       downside disagreement via the farmers in betel leaf cultivation.

1.5 Justification of the Study

The economic and medicinal value of betel leaf is well acknowledged and it has been
deliberated as one of the momentous cash crops of Bangladesh. Studies have in the
meantime shown the economic advantages of betel leaf cultivation over other crops.
Betel leaf is also an ordinary component for social events in Bangladesh. To achieve a
higher output and harvest proper quality leaves, farmers need to apply prosperous
contemplation and proper commercialization process. However, betel leaf is found to
be a less practiced object in academic experiment and not multiple studies were found
on this issue. Considering the above mentioned points the researcher has became
highly interested to conduct research entitled 'Commercialization of Betel Leaf by the
Farmers of Wazirpur Upazila under Barishal District'. The purpose of the study was
to determine the spread of commercialization of betel leaf farmers and also to work
out the relationships and the contribution of the selected characteristics of the farmers
to commercialization of betel leaf.

1.6 Assumptions of the Study

An assumption is the inference that an external fact or principle is true in the light of
available evidence (Goode and Hatt, 1952). The researcher had considered the
following assumptions while undertaking the study:

i.   The respondents were capable of furnishing proper answers to the questions contained in the interview schedule.

ii.   The data collected by the researcher were free from any bias and they were normally distributed.

iii.   Views and opinions furnished by the respondents included in the sample were the representative of the whole population of the study area.

iv.   Information investigated by the researcher expressed the real situation was the representative of the whole population of the study area to gratify the objectives of the study.

v.   The researcher was enough stable to himself with the social clinging of the study area. Hence, the collected data from the respondents were free from prejudice.

1.7 Limitations of the Study

Generally all research works have some limitations. The present study is not an exception to those. Some limitations were involved in collecting the necessary information of the study. Some of them are as follows:

Firstly, this study was restricted to a limited area, the area where more quantity of betel leaf is grown.

Secondly, there were the limitation of time and financial resources, all data and other necessary information were collected within the shortest possible time and could not cover all the markets of the upazila. So, the findings may not generalize for the entire betel leaf production, marketing and processing system in the district.

Thirdly, Producers, intermediaries and processors generally did not keep records of their daily works. So, the researcher had to solely on the memory of the respondent. So, the collected information might not be free from errors.

Fourthly, the secondary data were collected from different sources as there was unavailability of one particular source. So, there might be a limitation due to measurement and conceptual variation, if any, among the others.

Moreover, during data collection some difficulties were faced in eliciting answers from a number of both betel leaf traders and farmers. They hesitated in providing actual information thinking it might create problem to their business. However, they were ultimately convinced to report the facts.

The various limitations were handled paying consciously attention to minimize all vocal errors.

1.8 Definition of Terms

A concept is an abstract of observed thing; events or phenomenon or in other words, it is a short hand representation of variety of facts. A researcher needs to know the meaning and contents of every term that used for a study. It should clarify the issue as well as explain the fact to the investigator and readers. However, for clarity of understanding, a number of key concepts/terms frequently used throughout the study defined are interpreted as follows:

Age: It is defined as the period of time from the birth of the betel leaf growers to the time of interview. It was measured in terms of years.

Education: Education is defined as the ability if an individual to read and write or, formal education was measured in terms of actual year of successful schooling.

Dependency ratio: The dependency ratio is a measure of the number of dependents aged 0 to 14 and over the age of 65, compared with the total population aged 15-64.

Farm size: Farm size refers to the cultivated area either owned by a farmer or obtained from others on Borga (share cropping) system the area being estimated in terms of full benefit and benefit to the farmer respectively. The self-cultivated land as well as mortgaged land from others was full benefit.

Annual family income: Annual income of a respondent referred to the total earning by him and other members of his/her family from agricultural (field crop, fish, livestock, poultry, fruits and vegetables and timbers, etc.) and other sources (service, business, etc.) during a year. Annual family income of the respondent also included the cost of maintaining his family. It was expressed in Taka.

Knowledge on betel leaf cultivation: Literally knowledge means knowing or what one knows about a subject, fact, person etc. Knowledge on betel leaf cultivation referred to the understanding of the betel leaf farmers about the different aspects of betel leaf cultivation.

Extension media contact: This term referred to an individual's access to or contact

with the different communication media and source being used for dispersion of new technologies and for other perspectives.

Distance to market place: Distance to market place refers to the distance from farmers' field area to market place.

Training exposure: Training exposure of a respondent was referred by the number of days a respondent trained on betel leaf cultivation. The measurement included from the day of starting training on betel leaf cultivation and till the day of data collection.

Time spent in betel leaf cultivation: It referred to the average number of hour per day a respondent uses in betel leaf cultivation.

Commercialization of betel leaf: Commercialization of betel leaf referred to the ratio of value of betel leaf sold and total value of betel leaf raised. It was expressed in percentage. In the study, the concept of commercialization was the same that means it was measured based on farmers' total production and selling of betel leaf.

CHAPTER II

REVIEW OF LITERTURE

This Chapter deals with the review of past research works that relates to this investigation directly or indirectly. The reviews are conveniently presented based on the major objectives of the study. The aim of this study was to have an understanding of commercialization of betel leaf by the farmers at Wazirpur Upazila under Barishal district and their relationships with the selected individual characteristics. Despite anxious search, the researcher found only a few literatures related to this study. The researcher came across with some expert opinions and has tried his best to collect needful information through searching relevant studies, journals, periodicals, bulletins, leaflets, internet etc. These enhanced the researcher's knowledge for better and clear understanding of the present study. But unfortunately no previous literature was found related to relationship between commercialization of betel leaf by the farmers and their characteristics. On this consideration, a few of these studies relevant to this research are briefly discussed in this chapter under the following four segments:

First segment deals about betel leaf cultivation status in Bangladesh and abroad, second segment deals with commercialization of various crops including betel leaf, third segment deals with the review concerning the relationship between selected characteristics of the respondents and their commercialization and forth segment deals with the conceptual framework of the study.

2.1 Betel Leaf Cultivation Status in Bangladesh and Abroad

Mahfuza *et al.* (2020) conducted a study to identify the present and future production pattern of betel leaf in Bangladesh as well as its prospects and challenges. Secondary data of 29 years from 1991 to 2019 have been used to specify the production pattern and forecasting of betel leaf at national level by using deterministic, stochastic and dynamic time series model. While the primary data were collected from three sub-districts of the Rajshahi district namely Bagmara, Durgapur and Mohanpur to identify the prospects and challenges through SWOT analysis. This study found significant relationship among betel leaf production, price and annual average temperature of Bangladesh. A total of six growth models of different types were used for forecasting

production, cultivation area, and price of betel leaf.

Ullah *et al* (2020) stated that deforestation is a severe threat in the context of climate change and the establishment of protected forest areas is a crucial strategy to conserve and manage forests. This study aims to investigate the impact of betel leaf cultivation on the protected forest area known as the Teknaf Wildlife Sanctuary in the southern coastal area of Bangladesh. Among the factors analyzed the determinants of betel leaf cultivation, family size, occupation and encroachment in the forest were found to have a significant impact. This study identified 4273 paan boroj (betel leaf cultivation plots) covering an area of 250.74 ha, among which 1264 were found inside the forest area occupying 59.76 ha forestland. The average size of a paan boroj was 0.06 ha and in total required 1.32 tons of wooden poles from the forest. Over dependency by local people for their livelihood on forest resources is creating pressure on the protected forest and causing severe deforestation. Sustainable resource use, for example, following a tree-based agroforestry system and adopting more sustainable approaches for betel leaf cultivation, can reduce the deforestation inside the protected forest and conserve biodiversity.

Madhumita *et al* (2020) stated that *Piper betle* L., belonging to *Piperaceae* family, known as a traditional herbal medicinal plant and used for several health benefits in Asian countries. Currently, demand for its products such as herbal drugs, medicines, and natural herbal formulations has increased. The beneficial effects of betel leaves and its products have traditionally exploited for the treatment of several diseases like bad breath, cuts, injuries, inflammations, cold cough, indigestion, etc. Till now, a broad range of bioactive compounds including polyphenols, terpenes, etc., has been identified from the extracts and essential oil (EO) of betel leaves. The structural and functional characterization of the extract and EO bio actives has been derived by various advanced standard methods. Most of the health related benefits of betel leaves have been associated with their bioactive phenolic compounds. The extract of this highly perishable product can be used in organic synthesis, food, and beverage industry, pharmaceuticals, etc., to the environmental issues. The present review provides information on extraction techniques, identification of bioactive compounds, and their biological activities. That apart, information on processing, preservation, and health benefits along with their mechanisms has also been added.

Guha *et al* (2019) examined that betel leaf grows on a perennial vine (*Piper betle* L.). It was consumed in fresh and raw state for digestive, refreshing, stimulating, aphrodisiac, etc. effects by about two billion people. These beneficial effects, taste, and aroma were mainly contributed by the essential oil present in the leaves. This oil can be extracted from the leaves by various methods, but the betel leaf oil extractor was an efficient and economic option. The oil yield may range from 0.09% to 1.0% (wb) depending upon variety, extraction method, pretreatment, curing, agro-climatic conditions, etc. Betel oil is constituted by about 30–60 compounds which include eugenol, isoeugenol, methyl eugenol, safrole, chavicol, hydroxychavicol, chavibetol, anethole, estragole, germecrene-D, etc. The oil possesses good antioxidant and antimicrobial properties at a very low concentration (>0.20 μl/ml), and the susceptible microorganisms include gram-positive and gram-negative bacteria, and fungi, such as *Aspergillus*, *Candida*, *Escherichia*, *Penicillium*, *Salmonella*, *Staphylococcus*, *Streptococcus*, *Vibrio*, etc. species. The oil can be utilized as an excellent food preservative and organoleptic enhancer. It may also provide multiple health benefits. Some food products have been developed by incorporating this oil ranging from 0.005% to 0.50%, such as cupcake, chocolate, biscuit, suji halwa, lozenge, etc. This oil has a potential future in the world food sector.

Tani (2018) stated that the betel is a major cash crop on the Teknaf Peninsula. The cultivation of betel plants affects forests in two ways. The construction of *pan boroj*, a facility to provide the plants with shading, consumes a large amount of forest resources every year. Another way of betel cultivation's influence on forests is tree clearance in cultivation plots. *Pan boroj* tend to be constructed on gentle slopes where forests originally existed because more productive and limited flatlands are used for other crops such as rice. Trees are cleared to make room for a pan boroj, and as long as betel is cultivated, trees will not regrow at that spot. This study conducted village household surveys to record all pan boroj in a village and to quantitatively assess the impact of betel cultivation on the nearby forests. An estimate of forest resource use is equivalent to approximately 5% of biomass annually generated in the village area. Cultivation plots of betel plans also account for another 5% of the area. Despite the negative impacts of betel cultivation on forests, this study also finds the economic importance of betel cultivation in the village economy, and estimates that betel cultivation may compensate the lack of sufficient livelihood generated by rice

cultivation in limited flat land.

Tsuruta (2018) explained the socioeconomic status of betel leaf farmers within the wider society. Because betel leaf cultivation is one of the factors leading to deforestation, a study of the socioeconomic status of betel leaf farmers is important for understanding the characteristics of actors who contribute to deforestation through their dependence on forests for supporting their livelihoods in the study area. To ascertain the socioeconomic status of betel leaf farmers, they first present an overall socioeconomic profile of this society. Next, they situated betel leaf farmers within this society. Consequently, they discussed the socioeconomic issues that related to betel leaf farmers within the society, shedding light on the socio-economic status of this group. In this society, which evidences economic disparity associated with limited farm land, low education levels, an increasing population, and the expansion of illegal settlements, betel leaf farmers occupied a low class position that accounts for a major proportion of the society. Thus, the socioeconomic status of betel leaf farmers, who constituted the majority of new illegal forest dwellers, is characterized by poverty and low education levels.

Haider *et al* (2013) found that the *Khasia* community, living within reserve forests of Sylhet division mostly in Moulavibazar district. Traditionally they grow betel leaf on trees which is different from plain land betel leaf cultivation. Tree based betel leaf cultivation is a productive and sustainable agroforestry system. *Artocarpus chama* and *Areca catechu* are the most suitable support tree species for betel-leaf farming. Farmers propagated betel vine through stem cutting. June- August is the optimum time for planting betel vine. Support tree pruning and mulching were essential management practices for betel leaf farming. Leaf rot and stem rot are two common diseases occur in betel leaf farm. Male members conduct farm activity and harvesting of betel leaf and the female members operate betel leaf processing and marketing. The state of the art of betel-leaf cultivation as a viable and sustainable farm, lie in its management practices, a skill of the Khasia community. To extend this farming practice one is to understand its cultivation and management practices

Kathirvel (2015) stated that non availability of quality indigenous planting material had lower values than the other variables in betel leaf cultivation. The economic development of a country depends on the development of the core industry in which

the majority of its people have been engaged for quite a long time. Indian economy has been largely based on agriculture from time immemorial.

Guha (2006) stated that the fresh leaves of betel vine were popularly known as *Paan* in India, which were consumed by about 15-20 million people in the country. It was cultivated following the traditional methods in India on about 55,000 ha with an annual production worth about Rs 9000 million. On an average about 66% of such production was contributed by the state of West Bengal where it was cultivated on about 20,000 ha encompassing about 4-5 lakh *Boroj* employing about the same number of agricultural families. There was a menacing wastage of the leaves during storage, transportation and the glut season. Moreover, the surplus leaves, if not disposed off properly may cause environmental pollution and health hazards. Such wastage may be minimized by various ways and means including extraction of essential oil from the surplus betel leaves. This oil may be used as an industrial raw material for manufacturing medicines, perfumes, mouth fresheners, tonics, food additives etc. The leaves were nutritive and contain anticarcinogens showing promise for manufacturing of a blood cancer drug. Some disputed reports also claim that chewing betel leaves excessively may cause oral cancer. The agricultural, industrial, economic, medicinal and allied potentialities of the crop are discussed.

Sahoo and sahoo (2017) stated that the betel vine cultivation was a type of agricultural activities which provided livelihood for the rural farmers. Farmers collected seasonal income from other crops, while betel vine cultivation produced income throughout the year from a small piece of land. By this it could reduce poverty & unemployment level. Thus an attempt had been made by the study to examined the problems and prospects of the betel leaves cultivators in Puri district of Odisha. It had been found that the betel cultivators were facing various problems during production, marketing, and also some general constraints. Even the assistances provided by the Government were not sufficient enough. Thus it was therefore necessary to undertake various policy measures to eradicate the difficulties as the profit margin in betel leaves cultivation was very high and this could become an important source of livelihood.

Chaurasia (1994) found that leaf rot can damage the crop within a week when it attacked the vine. The vast economic potentiality of the crop can be adequately established by the fact that about 20-30 million people consume betel leaves in India

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on a regular basis besides those in other countries of the world which may include over 2 billion consumers. Its cultivation was highly labor intensive and offers employment to about 2.0 million families engaged in cultivation, trading and commerce in betel leaf throughout India. Betel vine leaf was used as medicine for certain diseases and also used as an antiseptic. During cultivation betel vine was very much affected by diseases such as Leaf spot , Leaf rot diseases and powdery mildew that result in great loss for the farmers. It occurred in a very virulent form and if not controlled, causes widespread damage and even total destruction of the entire betel vine plantations without any early indications of the diseases.

2.2 Commercialization of Various Crops Including Betel Leaf

Sharma *et al* (2016) stated that commercialization of agriculture was an activity where farmers produce principally for sale in far off markets, rather than to fulfill their demand for food or to sell in local or nearby markets. Number of different stimuli at different times is responsible for agricultural commercialization. In Assam about 86 % farmers belong to the small and marginal category. These groups should be oriented towards commercialization of their farms for improving their standard of living. Household commercialization index was used to measure the level of commercialization. The study revealed that the level of commercialization ranged from 63.3% to 74 %. It was reported that the higher farm size and access to market encouraged the farmers to go for higher level of commercialization.

Hagos and Geta (2016) stated that commercialization of agriculture was therefore, the strategy Ethiopia was following to bring dynamic change to transform the traditional agriculture of smallholder farmers. As a result, this paper reviewed the literature on smallholder commercialization to explore the conceptual developments in smallholder commercialization, measurements in the degree of commercialization, and the major determinants of smallholder commercialization. This review provided an overview of recent evidence on what factors affect smallholder farmers' commercialization in Ethiopia and what factors contribute to the improvement of rural livelihoods.

Seyoum *et al* (2011) conducted a study in Factors Determining the Degree of Commercialization of Smallholder Agriculture: The Case of Potato Growers and stated that commercializing such crops does have multiple benefits for the smallholder farmers and had great potential for commercial vegetable production and

there was a growing market opportunity for the products. However, potato growing smallholders in the district were producing at a subsistence level and their participation in the market (degree of commercialization) was not only low but also varies across the district. The OLS results indicated that farm size allocated to potato, access to irrigation and access to market information were found to be significant in affecting extent of market participation (degree of commercialization) at 1 % probability level. Hence, organizing farmers into groups in order to have better access to irrigation, providing market information through networking and institutions and improving extension service and availing improved varieties, overall, modernizing potato production are therefore crucial in enhancing the extent of market participation (the degree of commercialization).

Markman *et al* (2008) introduced the special themed section on organizational interactions involving universities and firms that result in the commercialization of research and technology. Their objective was to shed light on some of the most vexing, yet under- researched predicaments research institutions encounter, despite their best efforts to advance commercialization. First, they synthesized and extend recent studies, including the papers in the special themed section. Next, they developed a taxonomy of modes of commercialization. They also identified areas for further research at the individual (e.g. heterogeneity of entrepreneurial teams and experience; incentives), organizational and intra- university (e.g. corporate governance; nature of growth strategies; relationships with trading partners; boundary spanning activities) and technology levels (e.g. institutional context; reconfiguration of technology; valuation of technology).

Binswanger (1991) contended that the optimistic view was, by and large, correct: normally, technology and commercialization stimulate agricultural growth, improve employment opportunities, and expand food supply, all central to the alleviation of poverty. The evidence does not offer much encouragement to an extension of this view that through social engineering the benefits from technology and commercialization can easily be targeted toward the poor; the limited opportunities for such targeting should of course be seized.

Hoq (2014) researched on Production and Marketing of Green Chilli in Two Copious District of Bangladesh. The study was conducted in two chilli growing districts

Jamalpur and Bogra to examined the financial profitability, marketing cost and margin, post-harvest loss and seasonal price variation of green chilli. It was observed from the study that green chili cultivation was profitable and per hectare net return was Tk.92,250 and BCR was 1.64. The farm level net marketing margin per quintal of green chilli was Tk.1105.25 after post-harvest losses. At intermediaries' level highest net margin was Tk.333 for retailer (Dhaka) and lowest was Tk.120.5 for Arathdar.

Pingail *et al* (1995) showed that the commercialization process should not be expected to be a frictionless process, and significant equity and environmental consequences may occur, at least in the short to medium term, particularly when inappropriate policies were followed. However, they highlighted that appropriate government policies including investment in rural infrastructure and crop improvement research and extension, establishment of secure rights to land and water, and development and liberalization of capital markets, can help alleviate many of the possible adverse transitional consequences.

Muriithi *et al* (2015) investigated whether smallholder horticultural commercialization was able to, as often stipulated, reduce poverty in developing countries with the help of panel household survey data from Kenya. They find evidence for a positive association between vegetable commercialization and household welfare, even when controlling for unobserved heterogeneity across households. Interestingly, the effect differs depending on which market vegetables are being produced for: commercialization through the export market was consistently positively associated with income but not wealth, while there is some limited evidence for commercialization through the domestic market channel being positively related to welfare measured by asset holdings and income, depending on the specification.

2.3 Review Concerning the Relationship between Selected Characteristics of the Farmers and Commercialization

2.3.1 Age and commercialization

Rubhara *et al* (2019) examined that empirical evidence supports the attainment of economic growth through commercialization of agricultural and showed that age of household head was negatively associated with commercialization levels.

Akinlade *et al* (2013) analyzed the determinants of commercialization of urban

vegetable farming in southwest Nigeria. Their result of Tobit regression showed that age and age squared influenced the extent of commercialization.

2.3.2 Educational qualification and commercialization

Awotide *et al* (2016) assessed the determinants of intensity of adoption of Improved Rice Varieties (IRVs) and the effect of market participation on farmers' welfare in Nigeria using the Tobit and Heckman two-stage models, respectively. They showed that years of formal education was positive and statistically significant in increasing the probability that a farmer would participate in the market.

Akinlade *et al* (2013) analyzed the determinants of commercialization of urban vegetable farming in southwest Nigeria. Their result of Tobit regression showed that years of education influenced the extent of commercialization.

Kan *et al* (2006) conducted a study in the Republic of Georgia on farm output, non-farm income and commercialization in rural area and examined that education has a negative effect on market participation.

2.3.3 Dependency ratio and commercialization

Ullah *et al* (2020) examined the impact of betel cultivation on the protected forest area to understand the scenario of betel leaf cultivation due to deforestation. They stated that family size significantly affect betel cultivation in the forest area.

Kirimi *et al* (2013) examined that commercialization is often viewed as an avenue to improve household food security due to its comparative advantages over subsistence production.

2.3.4 Farm size and commercialization

Opondo *et al* (2018) developed commercialization index which integrated both value addition and market participation and examined that farm size was significant factors influencing cassava commercialization for Kilifi County.

Akinlade *et al* (2013) stated that markets and improved market access were critical for improving urban incomes and showed that farm size influenced the extent of commercialization.

Seyoum *et al* (2011) conducted a study in Ethiopia on commercialization on smallholder agriculture and mentioned that farm size allocated to potato had as

positive and significant relationship with the degree of commercialization.

Sharma *et al* (2016) stated that commercialization of agriculture is an activity where farmers produce principally for sale in far off markets, rather than to fulfill their demand for food or to sell in local or nearby markets. The study was reported that the higher farm size and access to market encouraged the farmers to go for higher level of commercialization.

2.3.5 Annual family income and commercialization

Mahfuza *et al* (2020) conducted a study on present and future production pattern of betel leaf in Bangladesh and found that price had a significant relationship with betel leaf production.

Rubhara *et al* (2019) examined that empirical evidence supports the attainment of economic growth through commercialization of agricultural and showed that off-farm income was negatively associated with commercialization levels.

Agwu and Ibeabuchi (2011) noted that increasing income of farm households increases the probability of undertaking agricultural commercialization.

Kan *et al* (2006) examined the decision of farmers to sell part of their farm output on the market, using data from the Republic of Georgia. They found that farm output affects market participation positively, while non-farm income affects it negatively.

2.3.6 Extension media contact and commercialization

Pandit *et al* (2013) conducted to determine the constraints faced by the farmers in commercial cultivation of vegetables. In this study extension media contact showed significant negative correlation with farmers' constraints in commercial cultivation of vegetables.

2.3.7 Distance from farmer's home to market and commercialization

Hailua *et al* (2015) examined the household level factors affecting the intensity of crop commercialization and its impacts on livelihood of smallholder farmers and showed that distant to market has a negative and significant effect on the intensity of crop commercialization.

Akinlade *et al* (2013) analyzed the determinants of commercialization of urban vegetable farming in southwest Nigeria. Their result of Tobit regression showed that distant to market influenced the extent of commercialization.

Opondo *et al* (2018) developed commercialization index which integrated both value addition and market participation and examined that distance to market was significant factors influencing cassava commercialization for Kilifi County.

2.3.8 Training exposure and commercialization

Hailua *et al* (2015) examined the household level factors affecting the intensity of crop commercialization and its impacts on livelihood of smallholder farmers training on crop marketing have a positive and significant effect on intensity of crop commercialization.

2.4 Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute on important task. The hypothesis of a research while constructed properly contains at least two important elements i.e. a dependent variable and an independent variable. A dependent variable in that factor which appears, disappears or varies on the researcher introduces, removes or varies as the independent variables. An independent variable is that factor which is manipulated by the researcher in this attempt to ascertain its relationship to an observed phenomenon. A simple conceptual framework for the study is shown in Figure 2.1.

| Independent variables | Dependent variable |

Selected characteristics

- ➢ Age
- ➢ Educational qualification
- ➢ Dependency ratio
- ➢ Farm size
- ➢ Annual family income
- ➢ Media exposure of betel leaf farmers
- ➢ Knowledge on betel leaf cultivation
- ➢ Distance from farmer's home to market
- ➢ Training exposure
- ➢ Time spend in betel leaf farming

Commercialization of betel leaf
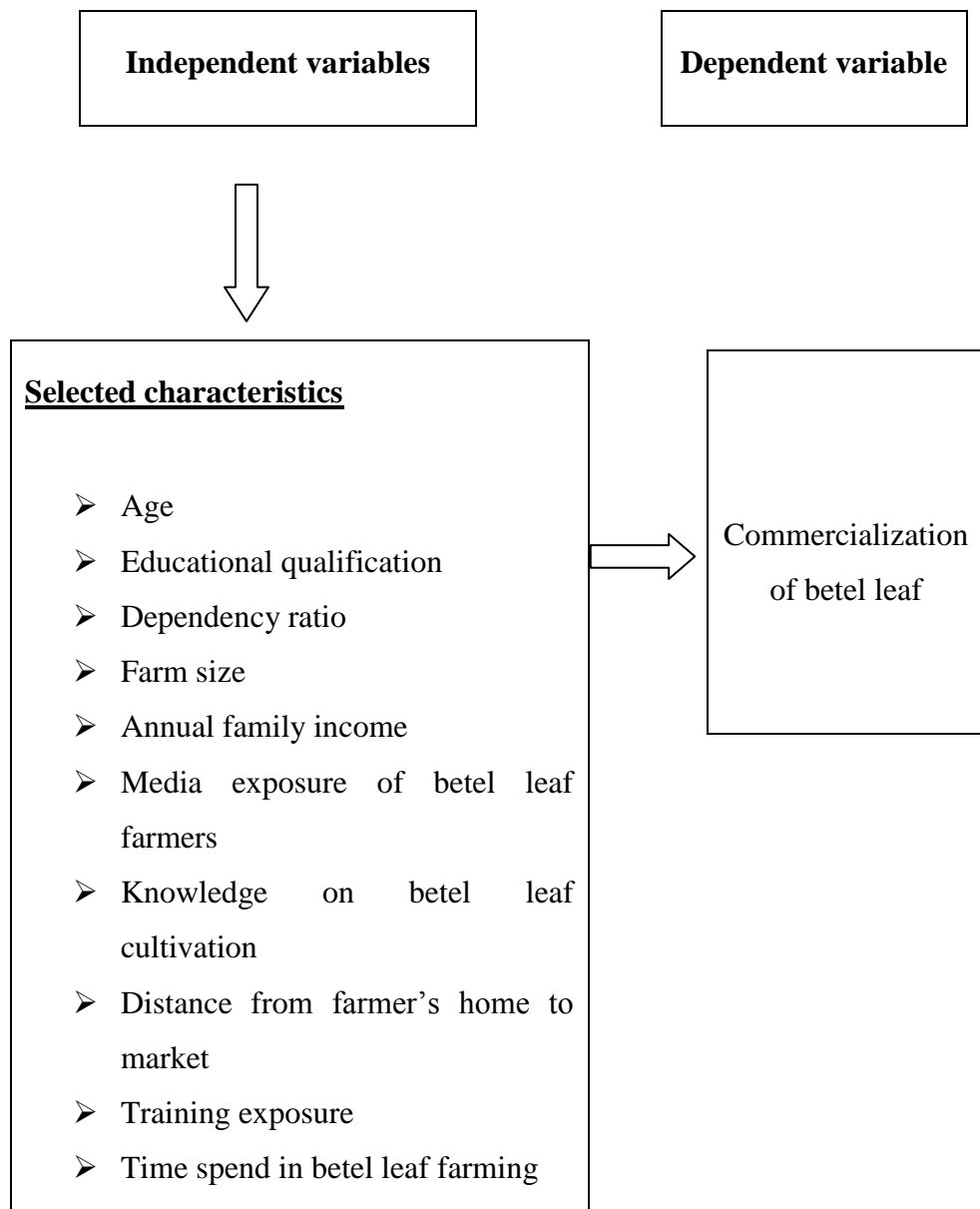
Figure 2.1 Conceptual framework of the study

CHAPTER III

MATERIALS AND METHODS

Methodology refers to the methods and procedures in the research work. In any scientific research, methodology plays an important role and requires a very careful consideration. More appropriate the methodology more accurate the research. The basic materials for conducting any research are the unbiased information and facts. Methodology should be appropriate so that the research will be able to collect necessary data and analyze them in a proper way, which will help him to reach correct decision. Building of research methodology requires a vast knowledge, experience and skill. Considering this, the researcher went through previous studies, obtained from supervisors and experts regarding all aspects of this piece of the study. A sequential description of the methodologies followed in conducting this research work has been presented in this chapter.

3.1 Locale of the Study

The study was conducted in Barishal district. There are ten upazilas in the district. The study was conducted in purposively selected one Upazila namely Wazirpur. There are nine unions in Wazirpur upazila. Out of those, four villages under Shikerpur and Bamrail unions were purposively selected as the locale of the study as these areas are very much famous for producing betel leaf. The map of Barishal district showing the study Upazilla appears in the Figure 3.1. The maps of selected Upazilla showing locale the study area are shown in Figure 3.2.

3.2 Population and Sampling Design

The farmers who permanently live in the selected villages and cultivate betel leaf was the population for the study. With the help of local leaders, contact farmers and Sub-Assistant Agricultural Officers (SAAO) an updated list of all betel leaf cultivars was collected. This was 746 which constituted the population of the study.

There are several methods for determining the sample size. Here, researcher used Yamane's (1967) formula for study group:

$$n = \frac{z^2 P(1-P)N}{z^2 P(1-P)+N(e)^2}$$

Where,

n = Sample size;

N, Population size = 746;

e, The level of precision = 9% ;

z = the value of the standard normal variable given the chosen confidence level (e.g.,

   z = 1.96 with a confidence level of 95 %) and

P, The proportion or degree of variability = 50%;

So, the sample size (n) is = 102.

A reserve list of 10 farmers was also prepared. Farmers in the reserve list were used only when a respondent in the original list was not available. The distribution of the sample farmers and those in the reserved list from the villages is shown in Table 3.1.

Table 3.1 Distribution of betel leaf growers constituting the population, sample and reserve list

District	Upazila	Villages	Population	Sample	Reserve list
Barishal	Wazirpur	Shikerpur	172	22	3
		Isladi	281	40	4
		Kalibari	195	25	2
		Dhamura	98	15	1
Total			746	102	10

After selecting the sample size using the above formula, the farmers were distributed among the selected four villages using proportionate random sampling. Finally the farmers for data collection was selected through using simple random sampling.
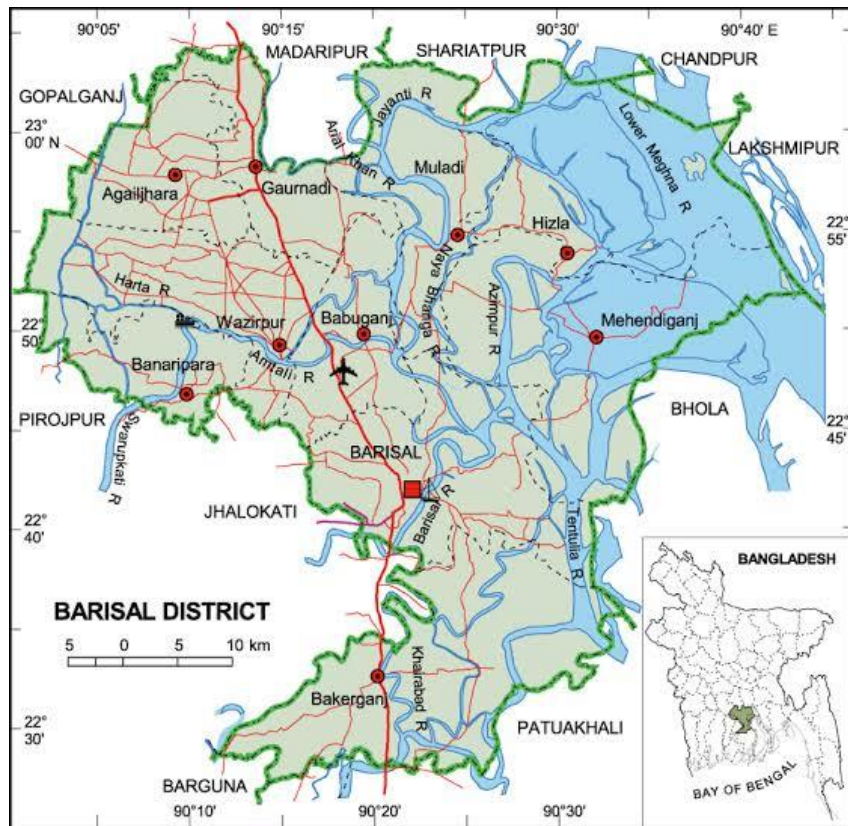
Figure 3.1: Map of Barishal district
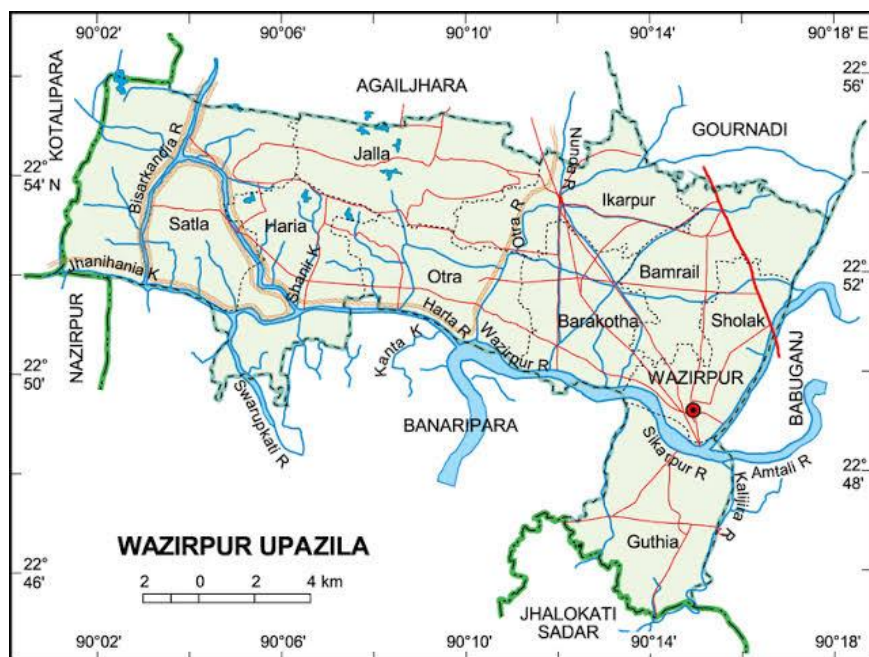
Figure 3.2: Map of Wazirpur upazila

3.3 Data Collection Method

The survey method was used to collect quantitative data that allow to answer the research questions framed and to gain an understanding of the determinants of betel leaf farmers" problems. Individual interviews were used in the survey and were conducted in a face-to-face situation by the researcher (Bryman, 2001). This method is useful to get unanticipated answers and to allow respondents to describe the world as they really see it rather than as the researcher does (Bryman, 2001).

3.4 Data Collection Tools

Structured interview schedule was prepared to reach the objectives of the study. A structured interview schedule was prepared containing open and closed formed questions. The open questions allowed for the respondents to give answers using their own language and categories (Casley and Kumar, 1998). The questions in this schedule were formulated in a simple and unambiguous way and arranged in a logical order to make it more attractive and comprehensive. The instruments were first developed in English and then translated into Bengali. The interview schedule initially prepared was pre-tested by administering the same to ten betel leaf growers of the study area. The pre-test was helpful to identify faulty questions and statements in the draft schedule. Necessary additions, corrections, alterations and adjustments were made in the schedule on the basis of the pre-test experience. The schedule was multiplied in its final form for the collection of data. An English version of the interview schedule has been presented in the Appendix A. The Bangla version of the interview schedule was used during final data collection.

The researcher himself collected data from the betel leaf growers by using the interview schedule. The interviews were conducted individually in the household of the respondents during their leisure period. Ten (10) betel leaf growers of the original list were not available during interview and hence, they were replaced from the reserve list. Prior information was given to the respondents before going to them for interviewing. The researcher took all possible care to establish rapport with them. While any respondent faced difficulty in understanding any question, the researcher took utmost care to explain the issue. He obtained excellent cooperation from the respondents and others concerned during the time of interview. The entire process of collecting data took 26 days from November 15 to December 10, 2020.

3.5 Variables and Their Measurement Techniques

The variable is a characteristic, which can comprise discrepant or various grades in consecutive prominent cases. In the scientific research, the volition and assessment of variable comprise an important task. According to this thought, the researcher reconsidered literature to broaden that conviction about the temperaments and targets of the variables pertinent to this research. At last 11 characteristics of the betel leaf growers were elected as the causal variables which includes age, educational qualification, dependency ratio, farm size, annual family income, extension media contact, knowledge on betel leaf cultivation, distance from farmer's home to market, training exposure, time spend in betel leaf farming. Commercialization of betel leaf was the only calculated variable of the study. The process and action in ascertained the variables of this study are presented below:

3.6 Measurement of Independent Variables

Ten characteristics of the betel leaf farmers alluded above comprise the causal variables of this study. The following process were imitated for ascertained the variables.

3.6.1 Age

Age of a respondent was surveyed in terms of years from birth to the time of interview which was found on the basis of repercussion (Azad, 2003). A score of one (1) was attributed for each year of age. Question regarding this variable appears in item no. 1 in the interview schedule (Appendix-A).

3.6.2 Educational qualification

The education of betel leaf farmers was measured by the number of years of schooling completed in an educational institution. A score of one (1) was given for each year of schooling completed. If betel leaf farmers did not know how to read and write, his education score was zero (0), while a score of 0.5 was given to betel leaf farmers who could sign his name only. If a betel leaf farmer did not go to school but studied at home or adult learning center, his knowledge status was considered as the equivalent to a formal school student. Question regarding this variable appears in the item no. 2 in the interview schedule (Appendix-A).

3.6.3 Dependency ratio

The dependency ratio is a measure of the number of dependents aged zero to 14 and over the age of 65, compared with the total population aged 15 to 64. This demographic indicator gives insight into the number of people of non-working age, compared with the number of those of working age. It is also used to understand the relative economic burden of the workforce and has ramifications for taxation. The dependency ratio is also referred to as the total or youth dependency ratio. Questions regarding this variable appear in item no. 3 of the interview schedule (Appendix-A).

3.6.4 Farm size

Farm size of respondent referred to the total area of land on which his/her family carried out farming operation and received full benefit for his family. It was measured in hectares for each respondent using the following formula:

FS= A + B + 1/2 (C + D) + E + F

Where,

FS = Farm size

A = Area under homestead

B = Area under own cultivation

C = Area given to others on share cropping

D = Area taken from others on share cropping

 E = Area taken from others on lease

F = Fallow land

3.6.5 Annual family income

Annual income of a respondent was measured in '000' taka on the basis of total yearly earning from agricultural and non-agricultural sources by the respondent himself and other family members. This variable appears in item number 5 in the interview schedule as presented in Appendix-A.

3.6.6 Extension media contact

This variable was measured by computing an extension media contact score on the basis of a betel leaf farmer extent of contact with 8 selected media as obtained in response to item no.8 of the interview schedule (Appendix-A).

Extent of exposure	Scores assigned
Not at all	0

Rarely	1
Occasionally	2
Often	3
Regularly	4

The extension contact score of a respondent was determined by summing up his/her scores for contact with all the selected media. Thus possible extension contact score can vary from zero (0) to 40, where zero (0) indicated no extension contact and 40 indicated the highest level of extension contact.

3.6.7 Knowledge on betel leaf cultivation

Knowledge refers to the ability of a respondent to recall or recognize items of information related to anything. A scale consisting of 12 questions was used to determine the knowledge score of the respondents on betel leaf cultivation. The questions were selected from different dimensions of betel leaf production, harvesting and marketing after thorough consultation with the relevant experts and review of relevant literatures as shown in Appendix A. Each respondent was asked 20 questions. A score of two (2) was assigned for each complete and correct answer and 0 (zero) for incorrect or no answer for each question. Partial score was assigned for partially correct answer for each question. Thus, the total assigned score of all the questions was 24. The total score obtained by answering all the questions by a respondent was the knowledge score of the respondents. Thus, the score could range from 0 to 24 where '0' indicating 'very low knowledge' and '24' indicating 'very high knowledge' on betel leaf cultivation. Questions regarding this variable appear in item no. 7 of the interview schedule (Appendix-A).

3.6.8 Distance from farmers' home to market

Distance to the market place was asked to the betel leaf farmers. Based on the information cited by the farmers, the distance of the market place was determined and was expressed in kilometer. This variable appears in item number 8 in the interview schedule as presented in Appendix-A.

3.6.9 Training on betel leaf cultivation

Training was measured by the total number of days a respondent received training in his/her life on betel leaf cultivation. A score of 1 (one) was given to a respondent for

every day of training. A zero (0) score was assigned for no training exposure. Questions regarding this variable appear in item no. 9 of the interview schedule (Appendix-A).

3.6.10 Time spent in betel leaf farming

Time spent in betel leaf farming was determined by the total hour involved in betel leaf farming per week. A score of one (1) was assigned for each hour betel leaf farming activities. This variable appears in item number 10 in the interview schedule as presented in Appendix- A.

3.7 Measurement of Dependent Variable

Commercialization of betel leaf was the dependent variable of the study. It was measured by score of a farmer which was determined on the basis of value of crops sold out of the total value of crops raised. Later it was converted in percentage. As developed by Karim and Mahboob (1974) and used by Ali (2008) the following formula was used in computing the commercialization of betel leaf score of a farmer:

$$\text{Commercialization score} = \frac{Value\ of\ sold\ betel\ leaf}{Total\ value\ of\ raised\ betel\ leaf} \times 100$$

Relevant market price was used in determining the commercialization score of an individual. Commercialization score could range from 0 to 100, while 0 indicating no commercialization and 100 indicating very high commercialization.

3.8 Statement of the Hypotheses

As defined by Goode and Hatt (1952) a hypothesis is "a proposition which can be put to test to determine its validity. It may seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test."

3.8.1 Research hypothesis

Based on review of literature and development of conceptual framework, the following research hypothesis was formulated:

"Each of the 10 selected characteristics (age, educational qualification, dependency ratio, farm size, annual family income, media exposure of betel leaf farmers, knowledge on betel leaf cultivation, distance from farmer's home to market,

training exposure, time spend in betel leaf farming) of the farmers has significant relationship with the Commercialization of betel leaf."

3.8.2 Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables. The following null hypothesis was formulated to explore the relationship of the selected characteristics of the farmers with the Commercialization of betel leaf :

"There is no relationship of each of the selected characteristics (age, educational qualification, dependency ratio, farm size, annual family income, media exposure of betel leaf farmers, knowledge on betel leaf cultivation, distance from farmer's home to market, training exposure, time spend in betel leaf farming) of the farmers with the Commercialization of betel leaf."

3.9 Data Processing and Analysis

Bogdan and Biklen (2006) insist that data analysis is an on-going part of data collection. Initially, all collected data were carefully entered in Access, exported to Microsoft Excel. Exported data were checked randomly against original completed interview schedule. Errors were detected and necessary corrections were made accordingly after exporting. Finally, data were exported from the program Microsoft Excel to SPSS/windows version 22.0, which offered statistical tools applied to social sciences. Qualitative data were converted into quantitative numbers, if required, after processing, scaling and indexing of the necessary and relevant variables to perform subsequent statistical analysis for drawing inferences.

3.10 Statistical Analysis

The statistical measures such as range, mean, standard deviation, percentage, rank order were used for describing both the independent and dependent variables. Tables were also used in presenting data for clarity of understanding. To find out the contribution of selected characteristics of the betel leaf growers to their Commercialization of betel leaf, linear regression was used. The analysis of data was performed by using SPSS computer program. Throughout the study, at least five percent (0.05) level of probability was used as a basis of rejecting any null hypothesis.

CHAPTER IV

RESULTS AND DISCUSSION

This Chapter deals with the result and discussion of present research work. Necessary explanations and appropriate interpretations have also been made showing possible and logical basis of the findings. However, for convenience of the discussions, the findings are systematically presented in the following sections. The chapter was discussed according to the objectives of the study. The first sub-section highlights to determine and describe some selected characteristics of betel leaf farmers, the second sub-section highlights to determine the extent of commercialization of betel leaf by the farmers and the third sub-section highlights to determine the relationships between each of the selected characteristics of the betel leaf growers and commercialization of betel leaf.

4.1 Selected Characteristics of the Farmers

Eleven characteristics of the farmers were selected for this research. The characteristics include: age, educational qualification, dependency ratio, farm size, annual family income, media exposure of betel leaf farmers, knowledge on betel leaf cultivation, distance from farmer's home to market, training exposure, time spend in betel leaf farming and commercialization of betel leaf. Some descriptive statistics of these features are given in Table 4.1 Data contained in the Table 4.1 reveal the salient features of the characteristics of the farmers in order to have an overall picture of these characteristics at a glance. However, for ready reference, separate tables are provided while presenting categorizations, discussing and /or interpreting results concerning each of the characteristics in this Chapter.

Table 4.1 The salient features of the selected characteristics of the farmers

Categories	Measuring Unit	Range		Mean	S D
		Possible	Observed		
Age	Years	-	27-73	47.60	9.56
Educational qualification	Year of schooling	-	00-16	5.09	4.04
Dependency ratio	Number	-	0-150	28.29	25.80
Farm size	Hectare	-	.12-2.81	.57	.48
Annual family income	'000' Tk	-	50-620	168.73	104.79
Extension media contact	Score	0-32	3-14	6.66	2.47
Knowledge on betel leaf cultivation	Score	0-24	8-23	15.41	3.43
Distance from farmer's home to market	Km	-	.50-6	2.14	1.06
Training exposure	Score	-	0-8	1.83	1.57
Time spend in betel leaf farming	Hour/week	-	21-52	36.13	10.26
Commercialization of betel leaf	Score	0-100	45.56-95	79.14	8.99

4.1.1 Age

The age of the betel leaf growers varied from 27 to 75 years with a mean and standard deviation of 47.60 and 9.56 respectively. Considering the recorded age the respondents were classified into three categories namely, young, middle and old aged. The distribution of the respondents in accordance with their age is presented in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	Farmers		Mean	SD
	Number	Percent		
Young aged (up to 35)	11	10.78		
Middle-aged (36-50)	54	52.94	47.60	9.56
Old aged (>50)	37	36.27		
Total	**102**	**100**		

Table 4.2 reveals that the middle-aged farmers comprised the highest proportion (52.94 percent) followed by old aged category (36.27 percent) and the lowest proportion were made by the young aged category (10.78 percent). Data also indicates that the middle and old aged category constitute almost 89.21 percent of total farmers. It was found from the table that among the betel leaf cultivars the middle aged group and old aged group farmers are higher.

4.1.2 Educational qualification

The level of educational scores of the betel leaf farmers ranged from 0 to 14 with a mean and standard deviation of 5.09 and 4.04 respectively. Based on the educational scores, the respondents were classified into four categories such as 'illiterate' (0-0.5), 'primary education' (1-5), 'secondary education' (6-10), above secondary (above 10). The distributions of the respondents according to their level of education are presented in Table 4.3.

Table 4.3 Distribution of the farmers according to their educational qualification

Categories	Farmers		Mean	SD
	Number	Percent		
Illiterate(0-0.5)	44	43.14		
Primary level(1-5)	16	15.69		
Secondary level(6-10)	27	26.47	5.09	4.04
Above secondary level(>10)	15	14.71		
Total	**102**	**100**		

Table 4.3 shows that respondent under illiterate category constitute the highest proportion (43.14 percent) followed by secondary education (26.47 percent). On the other hand the lowest 14.71 percent in above secondary education level category followed by primary level category (15.69 percent). About half of the farmers were illiterate. This might be due to fact that by inheritance there is less interest towards gaining formal education among the betel leaf cultivars.

4.1.3 Dependency ratio

Dependency ratio of the respondent betel leaf farmers ranged from 0 to 150 with the mean and standard deviation of 28.29 and 25.80 respectively. According to dependency ratio the respondents were classified into four categories viz. no

dependency, low dependency, medium dependency and high dependency. The distribution of the respondents according to their dependency ratio is presented in Table 4.4.

Table 4.4 Distribution of the farmers according to their dependency ratio

Categories	Farmers		Mean	S D
	Number	Percent		
No dependency (0)	28	27.45	28.29	25.80
Low dependency (1-50)	61	59.80		
Medium dependency (51-100)	12	11.76		
High dependency (above 100)	01	0.98		
Total	**102**	**100**		

Data in Table 4.4 indicate that the low dependency constitute the highest proportion (59.80 percent) followed by no dependency family (27.45 percent) and medium dependency (11.76 percent). Only 0.98 percent respondents had high dependency. As the number of high dependency is lowest. So, it can be said that the family had a scope to support betel leaf cultivation in a great extent.

4.1.4 Farm size

Farm size varied from 0.12 ha to 2.81 ha with a mean and standard deviation of 0.57 and 0.48 respectively. Based on their farm size, the respondents were classified into three categories following the categorization of DAE. These categories were marginal farmers (below 0.2 ha), small farmers (0.21-1.0 ha) and medium farmers (1.01-3.0 ha). The distribution of the betel leaf farmers according to their farm size is presented in Table 4.5.

Table 4.5 Distribution of the farmers according to their farm size

Categories	Farmers		Mean	SD
	Number	Percent		
Marginal farm(up to 0.2 ha)	5	4.90		
Small farm(0.21-1.0 ha)	85	83.33		
Medium farm(1.01-3.0 ha)	12	11.76	0.57	0.48
Large farm (>3.01 ha)	0	0		
Total	**102**	**100**		

Table 4.5 indicates that the small farm holder constitute the highest proportion (83.33 percent) and the lowest 4.90 percent marginal farm holder followed by medium farm holder (11.76 percent). The findings of the study reveal that majority of the betel leaf farmers were small to medium sized farm holder.

4.1.5 Annual family income

Annual family income of the betel leaf farmers ranged from 50 to 620 thousand taka with a mean and standard deviation of 168.73 and 104.79 respectively. On the basis of annual income, the betel leaf farmers were divided into three classes (Mean $\pm$ Standard Deviation) viz. low, medium and high annual income. The distribution of the betel leaf farmers according to annual income are presented in Table 4.6.

Table 4.6 Distribution of the farmers according to their annual income

Categories	Farmers		Mean	SD
	Number	Percent		
Low income (up to 64 thousand taka)	04	3.92		
Medium income (65-272 thousand taka)	88	86.28	168.73	104.79
High income (above 272 thousand taka)	10	9.80		
Total	**102**	**100**		

Table 4.6 indicates that the betel leaf farmers having medium family annual income comprises the highest proportion (86.28 percent) followed by high income (9.80 percent) and low income (3.92 percent).

4.1.6 Extension media contact

The observed score of extension media contact of the farmers ranged from 3 to 14 against a possible range of 0 to 32. The mean of the farmers' extension media contact was 6.66 with a standard deviation 2.47 (Table 4.7). The farmers were classified into three categories on the basis of their expression to betel leaf farming information through communication channel (Mean ± Standard Deviation) namely 'low', 'medium' and 'high' extension media contact of the farmers.

Table 4.7 Distribution of the farmers according to their extension media contact

Categories	Farmers		Mean	SD
	Number	Percent		
Low (up to 4)	22	21.57		
Medium (5-8)	59	57.84	6.66	2.47
High (above 8)	21	20.59		
Total	**102**	**100**		

Data shows that the highest proportion (57.84 percent) of the farmers had medium extension media contact and lowest extension media contact was 20.59 percent of them having high media exposure and 21.57 percent fell in low extension media contact. From this table, it might be concluded that majority of the farmers had medium extension media contact. It could be concluded that different media of the study area were available to the farmers.

4.1.7 Knowledge on betel leaf cultivation

Betel leaf farmers' knowledge scores could theoretically range from 0 to 26. But their observed knowledge scores ranged from 6 to 23, the mean being 15.41 and standard deviation 3.43. Based on the theoretical scores, the farmers were classified into three categories (Mean ± Standard Deviation) as: "low knowledge", "medium knowledge" and "high knowledge". The distribution of the farmers according to their knowledge level is shown in Table 4.8.

Table 4.8 Distribution of farmers according to their knowledge on Betel leaf cultivation

Categories	Farmers		Mean	SD
	Number	Percent		
Low knowledge (up to 12)	23	22.55		
Medium knowledge (13-18)	61	59.80	15.41	3.43
High knowledge (>18)	18	17.65		
Total	**102**	**100**		

Data presented in the table 4.8 revealed that 59.80 percent of the betel leaf farmers had medium knowledge on betel leaf cultivation, 22.55 percent had low knowledge and 17.65 percent had high knowledge on betel leaf cultivation

4.1.8 Distance from farmer's home to market

Distance to market place scores of the farmers ranged from .5 to 6 km. The average score and standard deviation were 2.14 and 1.06 respectively. Based on the distance to market place scores, the farmers were classified into three categories (Mean ± Standard Deviation) namely low, medium and long distance to market place (Table 4.9).

Table 4.9 Distribution of the farmers according to their distance from farmer's home to market

Categories (km)	Farmers		Mean	SD
	Number	Percent		
Low distance (up to 1)	24	23.53		
Medium distance (1.01-3)	69	67.65	2.14	1.06
Long distance (above 3)	09	8.82		
Total	**102**	**100**		

Table 4.9 reveals that 67.65 percent of the farmers had medium distance to market place where 8.82 percent had low distance to market place and 23.53 percent had long distance to market place.

4.1.9 Training exposure

Training exposure score of the betel leaf farmers ranged from 0 to 8 with an average and standard deviation of 1.83 and 1.57 respectively. Based on their agricultural training received scores, four groups of the respondents were identified namely 'no

training', 'low', 'medium' and 'high' training exposure. The distribution of the betel leaf farmers according to their training exposure is presented in Table 4.10.

Table 4.10 Distribution of the farmers according to their training exposure

Categories	Farmers		Mean	SD
	Number	Percent		
No training (0)	31	30.39	1.83	1.57
Low training (1-2)	54	52.94		
Medium training (3-6)	15	14.71		
High training (above 6)	2	1.96		
Total	**102**	**100**		

Table 4.10 indicates that the highest proportion (52.94 percent) of the betel leaf farmers had low training exposure compared to 30.39 percent in no training exposure and 14.71 percent in medium training exposure category, respectively and (1.96 percent) had high training. The finding reveals that respondents agricultural training received status is poor. Training is very important process of learning new things and developing skills.

4.1.10 Time spent in betel leaf cultivation

Time spent in betel leaf cultivation growers ranged from 21 to 52 with a mean and standard deviation of 36.13 and 10.26 respectively. Based on the time spent in betel leaf farming score, the betel leaf growers were classified into three categories (Mean ± Standard Deviation) namely minimum, average and maximum time spent in betel leaf cultivation. The distribution of the betel leaf growers according to their time spent in betel leaf cultivation is presented in Table 4.11.

Table 4.11 Distribution of the respondents according to their time spend in betel leaf farming

Categories (hr/wk)	Farmers		Mean	SD
	Number	Percent		
Little time spend (up to 26)	26	25.49	36.13	10.26
Medium time spend (27-46)	41	40.20		
Long time spend (above 46)	35	34.31		
Total	**102**	**100**		

Table 4.11 indicates that the highest proportion (40.20 percent) of the betel leaf growers had average time spent compared to 25.49 percent in minimum time spent and 34.31 percent betel leaf growers in maximum time spent category, respectively.

4.2 Commercialization of betel leaf

Computed commercialization of betel leaf scores ranged from 45.56 to 95 percent with a mean of 79.14 percent and standard deviation of 8.99. On the basis of commercialization of betel leaf scores, the respondents were classified into three categories (Mean ± Standard Deviation) as shown in Table 4.12.

Table 4.12 Distribution of the farmers according to their Commercialization of betel leaf

Categories	Farmers		Mean	SD
	Number	Percent		
Medium (up to 71)	13	12.75		
High (72-87)	73	71.57	79.14	8.99
Very high (above 87)	16	15.68		
Total	**102**	**100**		

Data presented in Table 4.12 indicated that majority (71.57 percent) of the respondents of the study had high commercialization of betel leaf by keeping very small portion for family consumption. Moreover it was observed that 87.24 percent of betel leaf growers had high to very high commercialization of betel leaf.

4.3 The Contribution of the selected characteristics of the respondents to their Commercialization of betel leaf cultivation

In order to estimate the commercialization of betel leaf cultivation, the multiple regression analysis was used which is shown in the Table 4.13.

Table 4.13 Regression coefficients of the contributing variables related to their Commercialization of betel leaf cultivation

Dependent variable	Independent variable	β	ρ	R^2	Adj. R^2	F
Commercialization of betel leaf cultivation	Age	0.03	0.59	0.70	0.67	13.19
	Educational qualification	0.12	0.04*			
	Dependency ratio	0.01	0.83			
	Farm Size	0.09	0.45			
	Annual family income	0.02	0.87			
	Extension media contact	0.10	0.04*			
	Knowledge on betel leaf cultivation	0.14	0.02*			
	Distance from farmer's home to market	0.04	0.43			
	Training exposure	0.01	0.84			
	Time spend in betel nut farming	0.006	0.90			

** Significant at p<0.01;*Significant at p<0.05

Table 4.13 shows that there is a significant contribution of the respondents, educational qualification, extension media contact of betel leaf farmers and knowledge on betel leaf cultivation. Of these, educational qualification, extension media contact and knowledge on betel leaf were the most important contributing factors (significant at the 5% level) while coefficients of other selected variables don't have any contribution on commercialization of betel leaf cultivation.

The value of R^2 is a measure of how of the variability in the dependent variable is accounted by the independent variables. So, the value of $R^2 = 0.702$ means that independent variables account for 70% of the variation on commercialization of betel leaf cultivation. The F ratio is 13.191 which is highly significant (ρ<0.000).

However, each predictor may explain some of the variance in respondent's on commercialization of betel leaf cultivation simply by chanced. The adjusted R^2 value penalizes the addition of extraneous predictors in the model, but values 0.67 is still show that variance is commercialization of betel leaf cultivation can be attributed to the predictor variables rather than by chanced the suitable model (Table 4.14). In summary, the models suggest that the respective authority should be consider the farmers educational qualification, extension media contact, knowledge on betel leaf cultivation and in this connection some predictive importance has been discussed below:

4.3.1 Significant contribution of educational qualification of the farmers and commercialization of betel leaf cultivation

From the regression, it was concluded that the contribution of educational qualification to the farmers' commercialization of betel leaf cultivation was measured by the testing the following null hypothesis; "There is no contribution of educational qualification and commercialization of betel leaf cultivation."

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a. The contribution of educational qualification was significant at 5% level.

b. So, the null hypothesis could be rejected.

c. The b-value of educational qualification was 0.129. So, it can be stated that as extension media contact increased by one unit, commercialization of betel leaf cultivation increased by 0.129 units. Considering the effects of all other predictors are held constant.

From the regressions, it was concluded that educational qualification of the farmers had highest positive contribution to the commercialization of betel leaf cultivation. This implies that with the increase of educational qualification of the farmers will increase their commercialization of betel leaf cultivation. The findings is supported by an educated betel leaf farmers' is likely to be more responsive to the modern facts, ideas, technology and information of betel leaf production. To adjust with the same, they would be progressive minded to adopt as well as involve with modern cultural, processing and marketing facilities of betel leaf.

4.3.2 Significant contribution of extension media contact and commercialization of betel leaf cultivation

From the regression, it was concluded that the contribution of extension media contact to the farmers' commercialization of betel leaf cultivation was measured by the testing the following null hypothesis; 'There is no contribution of extension media contact and commercialization of betel leaf cultivation'.

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

  a.   The contribution of extension media contact was significant at 5% level.

  b.   So, the null hypothesis could be rejected.

  c.   The b-value of media exposure of betel leaf farmers was 0.101. So, it can be stated that as extension media contact increased by one unit, commercialization of betel leaf cultivation increased by 0.101 units. Considering the effects of all other predictors are held constant.

From the analysis, it was concluded that extension media contact had highest positive contribution to the commercialization of betel leaf cultivation. This implies that with the increase of extension media contact will increase their commercialization of betel leaf cultivation. Media exposure pertains to ones contact with multifarious sources of farming knowledge and information about betel leaf cultivation. This results in cognitive change of the users with an eventual change in behavior and also in skill.

4.3.3 Significant contribution of knowledge on betel leaf cultivation and commercialization of betel leaf cultivation

From the regression, it was concluded that the contribution of knowledge on betel leaf cultivation to the farmers' commercialization of betel leaf cultivation was measured by the testing the following null hypothesis; 'There is no contribution of knowledge on betel leaf cultivation and commercialization of betel leaf cultivation'.

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

  a.   The contribution of knowledge on betel leaf cultivation was significant at 5% level.

b.   So, the null hypothesis could be rejected.

c.   The b-value of knowledge on betel leaf cultivation was 0.146. So, it can be stated that as extension media contact increased by one unit, commercialization of betel leaf cultivation increased by 0.146 units. Considering the effects of all other predictors are held constant.

From the analysis, it was concluded that knowledge on betel leaf cultivation of the farmers had highest positive contribution to the commercialization of betel leaf cultivation. This implies that with the increase of knowledge on betel leaf cultivation of the farmers will increase their commercialization of betel leaf cultivation. Knowledge on betel leaf cultivation is very important aspects for creating positive attitude towards betel leaf cultivation. Hence, betel leaf farmers must require skill and modern knowledge to bring more yield and profit to ensure creating favorable attitude towards betel leaf cultivation. This might be logical because the education facilities at the study area were more available as well as the training provided by the different GO and NGO were also satisfactory.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents summary of findings, conclusions and recommendations of the study.

5.1 Summary of findings

The major findings of the study are summarized below:

5.1.1 Selected characteristics of the betel leaf growers

Age

The highest proportion (52.94 percent) of the respondents was in middle aged category compared to 36.27 percent old aged and 10.78 percent young aged category.

Educational qualification

A large proportion (43.14 percent) of the respondents fell under category of illiterate compared to 26.47 percent secondary education, 15.69 percent primary level and 14.71 percent above secondary education.

Dependency ratio

The low dependency constitute the highest proportion (59.80 percent) followed by no dependency family (27.45 percent) and medium dependency (11.76 percent). Only 0.98 percent respondents had high dependency.

Farm size

The small farm holder constitute the highest proportion (83.33 percent) and the lowest 4.90 percent marginal farm holder followed by medium farm holder (11.76 percent). The findings of the study reveal that majority of the betel leaf farmers were small to medium sized farm holder.

Annual family income

The betel leaf farmers having medium family annual income constitute the highest proportion (86.28 percent) followed by high income (9.80 percent) and low income (3.92 percent). Overwhelming majority (90 percent) betel leaf farmers have low to medium level annual income.

Extension media contact

The betel leaf farmers have medium extension media contact comprise the highest proportion (57.84 percent), whereas the lowest proportion (20.59 percent) has high media exposure.

Knowledge on betel leaf cultivation

The finding indicates that highest proportion (59.80 percent) of the respondents had medium knowledge compared to 22.55 percent had low knowledge while 17.65 percent had high knowledge in betel leaf cultivation.

Distance from farmer's home to market

The highest proportion (66.65 percent) of the farmers had medium distance where 23.53 percent had low distance to market place and 8.82 percent farmers had long distance to market place category.

Training exposure

The highest proportion (52.94 percent) of the betel leaf farmers had low training exposure compared to 30.39 percent in no training exposure and 14.71 percent in medium training exposure category, respectively and (1.96 percent) had low training.

Time spend in betel leaf farming

The highest proportion (40.20 percent) of the betel leaf growers had average time spent compared to 25.49 percent in minimum time spent and 34.31 percent betel leaf growers in maximum time spent category, respectively.

5.1.2 Commercialization of betel leaf

The highest proportion (71.57 percent) had high commercialization compared to 15.67 percent and 12.75 percent having very high and medium commercialization of betel leaf cultivation respectively.

5.1.3 Relationships between each of the selected characteristics of the betel leaf growers to their commercialization of betel leaf

Out of the ten independent variables, only three variables namely educational qualification, extension media contact of betel leaf farmers, knowledge on betel leaf cultivation had significant contribution to their commercialization of betel leaf as indicated by step-wise multiple regression analysis.

5.2 Conclusions

A conclusion presents the statements based on major findings of the study and these statements mostly confirm to the objectives of the research in the shortest form. It presents the direct answers of the research objectives, or it relates to the hypothesis (Labon and Schefter, 1990).

Findings of the present study and the rational explanation of other pertinent facts prompted the researcher to draw the following conclusion:

- In the study area farmers have been commercializing betel leaf cultivation practices in various extents. There were 12.75% medium commercialization, 71.57% high commercialization and 15.68% very high commercialization. Therefore it could be said that they are reasonably happy to market their yield for cash money.

- Majority (59.80 percent) of the betel leaf farmers had medium knowledge on betel leaf cultivation, 22.55 percent had low knowledge and 17.65 percent had high knowledge on betel leaf cultivation. Thus it may be resolved that knowledge on betel leaf cultivation of the farmers had highest positive contribution to the commercialization of betel leaf cultivation. This connotes that with the increase of knowledge on betel leaf cultivation of the farmers will increase their commercialization of betel leaf cultivation.

- A great majority (79.41percent) of the farmers had low to medium extension media contact, while there had been a positive significant relationship between extension media contact and commercialization of betel leaf cultivation. Therefore, it may be concluded that in low extension media contact farmers commercialize less betel leaf cultivation and with the increase of extension media contact of the farmers tends to increase their extent of commercialization.

- Education of the farmers had significant positive relationship with their commercialization of betel leaf cultivation. Therefore it may be concluded that the farmers having more education were more favorable to commercialization of betel leaf cultivation. So, extension workers should keep contact with literate and illiterate equally. Farther, they should arrange to provide training to less literate or educated.

5.3 Recommendations

5.3.1 Recommendations for policy implications

Based on the findings and conclusions of the study, the following recommendations are proposed:

i.   It is recommended that the farmers educational qualification, extension media contact and knowledge on betel leaf cultivation during impersonation the program for rising the commercialization of betel leaf cultivation by the farmers

ii. Preparation should be taken for improving the education level of the betel leaf growers by the respected authorities through the launching of night school, adult education and other extension methods as possible which would develop their knowledge at all aged farmers and also would gathered experience.

iii. Availability of inputs in proper time might be helpful for maximum production. It is therefore, necessary to take care for ensuring the availability of inputs for betel leaf cultivation as far as possible.

iv. The extension agent should conduct farm and home visit to the betel leaf farmers.

5.3.2 Recommendations for further study

On the basis of scope and limitations of the present study and observation made by the researcher, the following recommendations are made for future study.

i.   The present study was directed in Barishal district. It is recommended that corresponding studies should be directed in other areas of Bangladesh.

ii. Eleven characteristics of the farmers were considered as the experimental variable of the study. Therefore, it is recommended that further studies should be conducted with other variables.

iii. This study was conducted commercialization of betel leaf cultivation. Similar study may be undertaken on the commercialization of towards other modern crops of Bangladesh

iv. The study was based on the farmers' commercialization of betel leaf cultivation. Further studies may be directed in respect of commercialization by the farmers of other crop production.

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APPENDIX-A

DEPARTMENT OF AGRICUITURAL EXTENSION AND INFORMATION
SYSTEM SHER-E-BANGLA-AGRICUITURAL UNIVERSITY, DHAKA- 1207

An interview schedule for collection of data on
**"COMMERCIALIZATION OF BETEL LEAF CULTIVATION BY THE
FARMERS OF WAZIRPUR UPAZILA UNDER BARISHAL DISTRICT"**

Serial no.
Name of the Respondent :
……………………………………………………………
Village: …………………………. Union: ……………………………………………
Upazila: ………………………….   District:
…………………………………………………
Mobile No: ……………………………....

(*Please answer the following questions. All information will be kept confidential.*)

1. Age:

How old are you?
Ans:...................................years.

2. Educational qualification:

Please mention your educational qualification:
   a) I cannot read or write……………
   b) I can sign only…………………….
   c) I studied up to class………………..
   d)   Non-formal education……………..
   e) Adult education………………….

3. Dependency ratio:

Please mention following information:

$$\text{Dependency Ratio} = \frac{(Population\ 0-14 + Population > 64)}{Working\ age\ population\ 15-64} \times 10$$

4. Farm size:

Please indicate your farm size:

Sl.No.	Type of land use	Local unit	Hectare
1	Area under homestead		
2	Area under own cultivation		
3	Area given to others on share cropping		
4	Area taken from others on share cropping		
5	Area taken from others on lease		
6	Fellow land		
	Total farm size		

5. Annual family income:

Please furnish your annual family income from different sources in the last year:

Sl. No.	Sources of Income	Amount of Production (kg)	Unit Price (tk)	Annual Income (tk)
1	Agriculture Rice Wheat Potato Pulses Vegetables Betel leaf			
2	Livestock			
3	Poultry			
4	Fishery			
5	Business			
6	Labor wage			
7	Others			
	Total			

6. Extension media contact:

Please mention your nature of contact with the following media:

Sl. No.	Media/Sources	Extent of exposure				
		Regularly(4)	Often (3)	Occasionally (2)	Rarely(1)	Not at all (0)
1	Model farmers	> 6 times/month	5-6 times/ month	3-4 times/ month	1-2 time /month	0 time/ month
2	Neighbor farmers	> 6 times/month	5-6 times/ month	3-4 times/ month	1-2 time /month	0 time/ month
3	SAAO	>5 times/month	4-5 times/ month	2-3 times/ month	1 time /month	0 time/ month
4	AEO	>5 times/year	4-5 times/ year	2-3 times/ year	1 time /year	0 time/ year
5	Agricultural development related NGO workers	>5 times/year	4-5 times/ year	2-3 times/ year	1 time /year	0 time/ year
6	Agro-based newspaper	More than 3 times/Week	3 times/ Week	2 times/ Week	1time/ Week	0 time/ Week
7	Farm radio talk	More than 3 times/Week	3 times/ Week	2 times/ Week	1time/ Week	0 time/ Week
8	TV agricultural program	More than 3 times/Week	3 times/ Week	2 times/ Week	1time/ Week	0 time/ Week

7. Knowledge on betel leaf cultivation:

Please answer the following questions:

Sl. No.	Questions	Total marks	Marks obtained
1	Mention the suitable time for betel leaf cultivation.	1	
2	How do you prepare the land for betel leaf cultivation?	2	
3	Name two varieties of betel leaf	2	
4	Mention two usage of betel leaf.	2	
5	Mention two diseases of betel leaf	2	
6	Which types of betel vines are used in cultivation?	1	
7	What are the doses of fertilizers applied?	3	
8	When manure is needed in betel leaf cultivation?	2	
9	Mention irrigation time in betel leaf cultivation?	1	
10	Mention the items of intercultural operations those are practiced in betel leaf cultivation?	2	
11	How betel leaf is harvested?	3	
12	What operations are taken before marketing betel leaf?	3	
	Total	24	

8. Distance from farmer's home to market:

Please mention distance of market place from your farm or home

Ans: ……………………………….

9. Training exposure:

Did you participate in any agricultural training program?
- a) YES
- b) NO

If yes, then please give the following information:

Name of the training courses	Sponsoring organization	Duration of training(days)

10. Time spend in betel leaf farming:

How much time do you spend in farming?

Ans:...hours/week.

11. Commercialization of betel leaf:

Please mention following information:

Amount of total betel leaf production =............................Bira

Total value of raised betel leaf =...............................Tk

Value of sold betel leaf =............................Tk

$$\text{Commercialization score} = \frac{\text{Value of sold betel leaf}}{\text{Total value of raised betel leaf}} \times 100$$

Thank you for your kind co-operation in data collection.

Date……………………   …………………….

(Signature of the interviewer)