“Factors influencing entrepreneurial activities of small-scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia”

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Thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

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2010
Abstract

The significant decline of the world fish catch has given aquaculture a promising future. Many countries, including Indonesia, are developing their aquaculture industry. Although the fish farming industry in Indonesia is dominated by small scale fish farmers, it still showed a significant growth in the last decades. Operating a fish farming business is different to other small business or other manufacturing-based businesses because it looks after live species that live in an aquatic environment. Therefore, besides mastering business skills, fish farmers also master technical fish farming skills which include water quality management, feeding management, fish parasite and disease handling. Inadequate fish farming skills can lead to business failure and even business closure. In their attempt to achieve income improvement and ensure product sustainability, small scale fish farmers carry out dedicated activities. The present research focused on entrepreneurial activities of small scale fish farmers that included fish feed production, fish seed production, market extension, fish species extension, product range extension and utilisation of other fish parts. In carrying out fish farming activities, the fish farmers contend with endogenous and exogenous factors as well as constraints and problems. This research identified the endogenous and exogenous factors as well as constraints and problems that influence fish farmers’ income improvement and product sustainability, identified implemented entrepreneurial activities in Central Java, compared entrepreneurial activities between fish farmers with different demographic background and developed recommendations based of the findings of this research.

This research collected data through questionnaire distribution to small scale fish farmers in Central Java. The questionnaire was distributed to two different groups of fish farmers: groups of fish farmers that had received awards in the last five years and groups that had not. The data was analysed by using exploratory factor analysis in order to group the variables into meaningful factors. This assisted in the interpretation of results and testing of hypotheses. The reliability of the eight scales was tested by using Cronbach’s Alpha test and Pearson’s correlations. The core analysis of this research used descriptive analysis, logistic regression analysis and chi-square test of association.
The findings of this research showed that there was a positive correlation between income improvement and endogenous factors but not with exogenous factors. On the other hand, product sustainability was found to have positive correlation with both endogenous and exogenous factors. Results also indicated that both income improvement and product sustainability correlated positively with constraints and problems. The analyses showed that there is at least one entrepreneurial activity that was carried out by small scale fish farmers in Central Java and that there were significant differences between awardees and non-awardees in Central Java in carrying out entrepreneurial activities. Significant differences were also found between gender groups, age groups, marital status, different education level, different fish farmer group level, and different reasons to become fish farmers.

Based on the findings of this research, recommendations for the aquaculture and fisheries industry, government, educational institutions and research communities in Indonesia were developed on aspects that may contribute to the success of small scale fish farmers in obtaining their income improvement and product sustainability. It is hoped that the Indonesian federal, provincial and regional governments can include promotion of entrepreneurial activities in the aquaculture development programs and future policies. Also with support from the government, it is expected the small scale fish farmers will proactively implement entrepreneurial activities to increase their income and to implement sustainable aquaculture to ensure product sustainability in their business.
Acknowledgements

First of all I would like to thank God Almighty, my words will never be enough to express my thankfulness for this great life and everything he has given me.

I would like to take this opportunity to extend my greatest gratitude to my Principal Coordinating Supervisor, Dr Harchand Singh Thandi who guided me most patiently throughout my candidature until the completion of this thesis. I also wish to give my greatest appreciation to my associate supervisor Dr Janusz Tanas who believed in my capability to complete my thesis no matter what my circumstances are.

My deepest appreciation to my statistical advisor Dr Denny Meyer who has been an angel to me by being very generous and patient in assisting me with my statistical analysis. Without her great help, it would be impossible to complete this thesis.

To my thesis editor, Barbara Bok, I am very grateful for all your kind assistance in making my thesis more comprehesable.

I would also like to express my gratitude to Dr Toby Harfield who has helped me in stressful time applying for ethics approval. She also always remind me on how important my children are and to do things one step at a time.

I would like to thank my AusAID officer Emilia Tabrizi who is always there when I needed her assistance and special thanks to AusAID for providing me the opportunity to study PhD in Australia.

To my parents who have always believed in my capability and encourage me throughout my study, I will never be who I am now without their prayer and support. Last but not least, to my husband Albert, and my children Alita, Ayesha and Alden who have always been on my side the whole time, thank you for supporting and motivating me all the way, you are all the light of my life.
Declaration

This thesis:

- Contains no material which has been accepted for the award to the candidate of any other degree or diploma, except where due reference is made in the text of the examinable outcome;

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Chapter 1

Introduction

1.1 Introduction

In a developed country, where most of its people are highly educated, almost every business has planning, organising, and controlling functions. But, in developing countries, like Indonesia, where most people have lower levels of education, things are different: business people may not know about business planning, organising, or controlling. Undoubtedly though, many business owners in Indonesia are still successful, including those owners of fish farming businesses. The global aquaculture industry is experiencing growth, and in Indonesia many resources are available for the industry to achieve its maximum potential. This raises questions about how these people achieve success, and the factors that contribute to their success. This research explores the factors that the small-scale fish farmers in Central Java, Indonesia, regard as important to achieve success. This research also examines the constraints and problems that influence fish farmers’ income improvement and product sustainability, as well as their entrepreneurial activities.

According to Erondu and Anyanwu (2005), fish farming is one of the world’s fastest growing industries, and fish is becoming the fastest developing food produce in the world. The importance of aquaculture as a world fish supply has been widely acknowledged due to the sharp declines in the global fish harvest since the 1980s as a result of overfishing in many parts of the world. This decline has created many new problems such as the declining number of species that resulted in food web simplification (Pauly et al. 2002) which has created a shortage of several fish species and has decreased fish stock supply around the globe. Furthermore, the human population has continued to grow each year and this has contributed to the increase in demand for fish stock (Poor countries will dominate world fish production 2003; Edwards et al. 1996; Ministry of Marine Affairs and Fisheries 2005).
To sufficiently provide for the global fish demand, aquaculture has become an important option to address the shortage of fish stock. Aquaculture has grown tremendously over the past few decades (Naylor et al. 2000). Jia et al. (2000, p. 9) explained that “over the past three decades, aquaculture has developed to become the fastest growing food production sector in the world; it has expanded, diversified, intensified and technologically advanced”. This statement clearly gives support to the view that aquaculture is now becoming the number one source of fish supply in the world and that it is developing constantly. It shows that the prospects for aquaculture are bright, especially for developing countries in the Asian region.

In coming years, the increasing population in developing countries will not only produce and consume fish, but will also trade them to fulfil world fish demand. According to Poor countries will dominate world fish production (2003) in coming years the majority of fish supplies from aquaculture industry will come from developing countries; in the future, 77 per cent of fish consumption and 79 per cent of world fish production will take place in developing countries. This has emerged as the result of the large population growth in developing countries, and therefore also the rise in demand for fish. Asia is responsible for most of the world’s fish supply as it provides 63 per cent of world fish production with 90 per cent from fish farming (Briones, Dey & Ahmed 2004). Indonesia is among the world’s top ten fish producers and is the third largest in the aquaculture industry after China and India (Suara Pembaruan 2005). With the increasing global demand for fish, it is not surprising that the aquaculture industry around the world is also growing significantly, including in Indonesia where small-scale fish farmers are the predominant players.

Owning a fish farming business is different to operating other small business or other manufacturing-based businesses because fish farming businesses look after live animals that live in an aquatic environment. Therefore, besides mastering the skills of business, a fish farmer should also master technical fish farming skills, which include water management and fish disease handling. Without adequate water management and fish disease handling skills, fish farmers can lose their whole fish harvest. Furthermore, if the mismanagement or mishandling re-occurs, it can lead to business closure.
Financial planning is also an important business skill for fish farmers. Each fish farming season has a duration of several months, from the time fish seeds are introduced into the grow-out pond until harvest time. Therefore, fish farmers must carefully calculate their financial capital for the whole season in advance. And then they must wait till the end of the season to first sell their produce before they can collect the profit. In spite of the complexity of this financial planning, many small-scale fish farmers in Indonesia manage this type of business successfully.

Given the aquaculture potential and the complexities of fish farming as a business, the researcher considers it worthwhile to explore how fish farmers in a developing country, like Indonesia, achieve income improvement and product sustainability. As the majority of the players in the Indonesian fish farming industry come from the lower education strata, it is also economically justifiable to explore and analyse the small-scale fish farmers’ opinions and views about the constraints and problems affecting them and their businesses, and the entrepreneurial activities they conduct.

1.2 Background to the study

The aquaculture activities in Indonesia have grown in the past few decades. According to FAO (2008), the fish farming activities in Indonesia have increased approximately 8.5 per cent per year. Figure 1.1 shows the aquaculture growth in Indonesia from 1950 to 2006.

Figure 1.1 Reported aquaculture production in Indonesia (1950-2006)

Source: FAO (2008)
http://www.fao.org/fishery/countrysector/naso_indonesia
Figure 1.1 shows that significant growth began to form around the 1980s and there is a big jump in aquaculture production in 2005. The increase in the Indonesian aquaculture industry is due to developments in technology, the availability of better quality of fish seeds, and the development of the fish farming area (FAO 2008). In addition, this increase is also the result of the trawl fishing ban in 1980 and the government’s priority to develop the Indonesian aquaculture industry.

As a country, Indonesia has many benefits to support the aquaculture industry and it has great scope to maximise this potential. In fact, according to the report from ADB (2003), Indonesia uses less than 3 per cent of its total potential aquaculture area. FAO (2008) also claimed that Indonesia have only used 0.03 per cent of its marine culture potential, 39.9 per cent of the brackish water, and 11.22 per cent of the freshwater aquaculture potential. Therefore, Indonesia shows great potential to widely expand its fish farming industry.

The aquaculture industry in Central Java is also experiencing an increase with huge potential for more still available. Its fish farming production has increased by 7.49 per cent per year, in the report year 2002-2004 (Central Java Fisheries and Marine Affairs Office 2005). Moreover, the potential area for aquaculture in Central Java is 293 thousand hectares with less than 46 thousand hectares currently being exploited. Human capital also contributes to supporting the aquaculture industry in Indonesia. By 15th June 2008, the total number of Indonesian population has reached more than 227.5 million people (Indonesian Statistical data 2008). Therefore, there is huge potential for further aquaculture development in Central Java.

So, despite having the potential aquaculture resources and the human capital to develop the resources, Indonesia has not yet been able to maximise its fish farming industry. This may be caused by the internal weaknesses of small-scale fish farmers’ businesses, or by a lack of external support by the Indonesian government or other institutions. Four constraints and problems faced by small-scale fish farmers were recognised: (1) lack of knowledge, skills, and experience, (2) lack of quality fish seed, (3) lack of capital, and (4) a lack of support from Government agencies (Das 2006; Practical Action n.d.).

Other authors have identified problems such as lack of market opportunity and the low input supply (De la Cotera 2001), and marketing (Nurdjana 2006). Many fish farmers
depend on middlemen to buy and market their produce. Besides marketing their produce, these middlemen often also act as moneylenders to provide funding or credit to fish farmers who are unable to secure sufficient capital from the banks or cooperatives. This gives the moneylenders the ability to set the price they pay for the farmer’s produce (Nurdjana 2006). This reduces the fish farmers’ ability to sell their produce freely since they are bound to the moneylender (Kinseng 2005). In some cases moneylenders may force farmers to sell their produce at a very low price. These constraints and problems may only be part of the issues that influence the income improvement and product sustainability of the fish farming business. Small-scale fish farmers may have to manage other factors that influence their success.

1.3 Rationale of the study

Indonesia is the largest archipelago in the world, possessing more than 17,000 large and small island (Asianinfo 2000) comprising 81,000 km of coastline (Nurdjana 2006) with 2.5 million fish farmers across the country (ADB 2006). It also has a geophysical environment conducive to aquaculture, such as a stable tropical temperature all year through, surrounded by smaller islands that provide shelter, and geographically located close to potential markets (Nurdjana 2006). With all of these strengths, there is no question that Indonesian aquaculture industry has great potential for future growth.

The Indonesian government has supported the fisheries industry in many ways. One of the significant supports was provided through the formation of the Department of Marine Affairs and Fisheries in 2000 (Department of Marine Affairs and Fisheries 2008) to provide support to the fish farmer groups (FFGs). Fish farmers in Indonesia usually belong to their village’s locally formed FFG. It is most often the head of the village who initiates the formation of the FFG which is then officially certified by local Fisheries Office. The members of the FFG are fish farmers who are located in the same village, who carry out similar fish farming activities, and have similar needs. Annually, the regional government organises a regional fish farming competition between FFGs to encourage their activities by awarding them with prize money and certificates. The winner of the competition is decided on social, technical, and economic criteria. It is expected that through the formation of an FFG the livelihoods of the FFG members are increased (Semarang Marine Affairs and Fisheries Office 2005).
Despite having an abundance of natural resources, the available human capital, and government support, Indonesian aquaculture has yet to reach its maximum production. The main problem may be in the quality of the human resources. The number of fish farmers exceeds 2.5 million and small-scale fisheries or backyard aquaculture industries dominate the industry (Central Java Fisheries and Marine Office 2005). Previous research have reported that the predominant small-scale fish farming conditions with lack of access to good quality fish seed and poor farming systems is restraining the growth of the industry. It also causes environmental degradation and pollution in the area of operations (ADB 2006). Problems like financial limitations, lack of marketing strategies, and other constraints are also holding back the fish farmers’ business expansion. These problems are only part of the possible restrictions faced by Indonesian fish farmers. They may also have internal constraints that prevent them from achieving more.

Income improvement and product sustainability are two aspects that are important for fish farming in Central Java and have been selected as the indicators for this research. Income improvement is selected as an indicator for this research because income is an important constraint for every living person. And for the small-scale fish farmer in Indonesia income is even more important, since their daily income has to support their daily needs for food, education, health care, and so on. It is therefore very important to determine if their fish farming businesses are able to deliver income improvement for the fish farmers.

Product sustainability is selected as an important indicator for this research based on the results of past studies. Past reports and research have found that, although aquaculture is considered as a reliable activity in generating fish supply, it has also created new problems. Science Daily (1998) claimed that aquaculture is the cause of environmental destruction and is using huge quantity of wild fish for “fish food”. A similar report by Pauly et al. (2002) has claimed that current aquaculture is unsustainable since it adversely affects the environment by contributing to pollution and fish disease outbreak.

The Indonesian government is trying to implement sustainable aquaculture by introducing an “eco-friendly production process” (Sukadi 2006) because many aquaculture activities have resulted in environmental degradation. For example, one of the major unsustainable aquaculture problems in Central Java was shrimp production.
Elfitasari (2006) explained that shrimp culture in Central Java in the 1970s increased rapidly due to the high export demand. Unfortunately, sustainable fish farming management did not accompany the increase in shrimp production. Many mangrove forests were removed to provide production space for the shrimp culture and this eventually resulted in the deterioration of the ecosystem.

This research explored the possible factors as well as constraints and problems that the small-scale fish farmers in Central Java regard as influencing them in achieve income improvement and product sustainability. Two factors influence fish farmers’ business outcomes and activities: endogenous and exogenous factors (Bouchiki 1993). This is explained in greater detail in the literature review chapter. According to Bouchikhi exogenous factors come from the entrepreneur’s environment (both sociological and economic factors), and endogenous factors are those related to the personality and strategy of the entrepreneur.

However, in spite of having limited capitals and income, some fish farmers in Indonesia are very active and through their fish farming groups have achieved regional and national awards from the fisheries sector. This research also explores how these fish farming groups can become so much more successful than other fish farmer groups. Through a questionnaire distributed to the individual fish farmers, the opinions of fish farmers will provide a more detailed description of how they value their own weaknesses and strengths, and what factors they regard as having the most influence on their business success.

In their attempt to achieve income improvement and product sustainability, fish farmers carry out entrepreneurial activities. Previous studies of entrepreneurial activities of small-scale businesses focused on industrial based business, while the few studies of small-scale fish farming have mainly concentrated on the methodological and technological aspects of fish farming. Therefore, this research examined entrepreneurial activities of small-scale fish farmers in Central Java and compared the implementation methods between the FFGs. The present research will fill the gap in research of small-scale fish farmers’ activities in their attempt to derive income improvement and product sustainability in Central Java, Indonesia.
The entrepreneurial activities of small-scale fish farmers in Central Java were explored by asking participants to choose from a list the entrepreneurial activities that they had implemented. The list of activities included activities such as fish feed production, fish seed production, market extension, fish species extension, product range extension (adding value), and utilisation of other fish parts. Also, the ways in which different groups of fish farmers implemented these activities were surveyed and compared. These groups included recipients (awardees) and non-recipients (non-awardees) of government awards, members of different ages, gender, educational levels, marital statuses, level of FFGs, and their reasons for become fish farmers.

In summary, this research analysed the endogenous and exogenous factors, as well as constraints and problems faced by fish farmers. In addition, the entrepreneurial activities implemented by small-scale fish farmers were identified, and compared between different fish farmers groups. This research provides recommendations regarding the endogenous and exogenous factors, as well as constraints and problems that influence income improvement and product sustainability. Recommendations are also made regarding the entrepreneurial activities that can be implemented in other provinces to assist small-scale fish farmers to improve their income and product sustainability.

1.4 Objectives of the study

This research has five objectives:

1. Identify the endogenous and exogenous factors that small-scale fish farmers regard as influencing their income improvement and product sustainability.

2. Identify the constraints and problems that small-scale fish farmers regard as influencing their income improvement and product sustainability.

3. Identify and describe various aspects of the entrepreneurial activities of small-scale fish farmers in Central Java, Indonesia.

4. Compare the entrepreneurial activities implementation of small scale fish farmers with different demographic background.

5. Develop recommendations for the aquaculture and fisheries industry, government, educational institutions, and research communities in Indonesia on aspects that may
contribute to the success of small-scale fish farmers in obtaining their income improvement and product sustainability.

1.5 Benefits of the study

This study contributes new knowledge of the entrepreneurial activities of small-scale fish farmers. Many previous studies have been carried out regarding small-scale fish farmers. This research is the first to contribute to a more detailed understanding of fish farmers’ entrepreneurial activities, and the factors that influence them in carrying out their fish farming activities in order to derive their income improvement and product sustainability.

This research also contributes information to the aquaculture industry, the small-scale fish farmer, government/related institutions, and students and researchers who wish to carry out similar research.

For the aquaculture industry, this research contributes by:

- providing new information regarding small-scale fish farmer entrepreneurial activities in Central Java, Indonesia,
- providing information on problems and constraints that are faced by small-scale fish farmers in Central Java, Indonesia,
- providing information regarding the endogenous and exogenous factors that influence small-scale fish farmer entrepreneurial activities in Central Java, Indonesia,
- providing recommendations to the industry on how to help and support fish farmers in deriving their income improvement and product sustainability, through supporting their entrepreneurial activities, and
- providing information on the different groups of fish farmers in implementing entrepreneurial activities.

For the small-scale fish farmers, the results of this study are hoped to:

- provide a better understanding of how to derive income improvement and product sustainability,
• provide ideas on how to rapidly expand their business through innovative entrepreneurial activities,
• help change the way they value themselves, so they will have confidence to achieve more in their businesses and improve their income, and
• increase their awareness of the importance of sustainable fish farming.

For the government and related institutions, the results of this research are intended to:
• give them information on what is needed to achieve small-scale fish farmer income improvement and product sustainability,
• encourage them to act more to rapidly implement a sustainable aquaculture in Indonesia,
• provide them with the information about the kinds of support small-scale fish farmers report that they need,
• provide ideas on how to increase small-scale fish farmers’ entrepreneurial activities in order to support them in their income improvement and product sustainability, and
• provide ideas of what to prioritise in order to overcome poverty in the small-scale fish farmer community.

For students and researchers who wish to carry out similar research, this study:
• provides additional information needed for their research,
• provides information and better understanding regarding small-scale fish farmer entrepreneurial activities in Central Java, Indonesia,
• provides information concerning the problems and constraints faced by the small-scale fish farmers in Central Java, Indonesia,
• provides information about the endogenous and exogenous factors of the small-scale fish farmer that either support or obstruct them from carrying out their activities, and
• provides information on the importance of income improvement and product sustainability for small-scale fish farmer in Central Java, Indonesia.
1.6 Scope of the study

This research explores the fisheries industry in Central Java, Indonesia, focusing on the small-scale fish farmers. The research investigates the possible aquaculture entrepreneurial activities that have been carried out by these fish farmers. The questionnaire used in the research asked farmers about possible entrepreneurial activities that they have implemented such as fish feed production, fish seed production, market extension, and so on. This study also gathered demographic data concerning farmers’ personal and business information. This data was used to compare how groups of fish farmers with different demographic background carried out their entrepreneurial activities. Any additional information presented in the discussion section of this document, which correlated with other provinces in Indonesia, was used as a standard guide to execute and support the interpretation of data analysis.

This research also tries to reveal major problems and constraints that emerge and obstruct the small-scale fish farmers from obtaining income improvement and product sustainability. The individual fish farmers were surveyed for their opinions about the problems and constraints they regard as having greatest influence on their attempts to derive their income improvement and product sustainability. The information obtained are analysed to search for any possible reasons to why fish farmers in Central Java have remained in a vulnerable situation in spite of assistance from the government and other domestic and international institutions to support their businesses.

The questionnaires for this research were distributed to two major groups. The first group (awardees) consisted of the individual fish farmers of Fish Farming Groups that have received Central Java regional awards within the past five years. The second group (non-awardees) consisted of individual fish farmers of Fish Farming Groups that have not received any Central Java regional awards in the past five years. The aim with the two research groups was to compare and analyse for significantly different views, strengths, and abilities between members of the two groups.

1.7 Limitations of the study

This study investigates the small-scale fish farmers’ business point of view; therefore, this research is limited to the business side of fish farming. The scientific and technical side of fish farming are not be discussed nor analysed. Although some data are derived
1.8 Structure of the study

The study comprise of eight chapters:

**Chapter 1. Introduction**

This chapter explains the basic development of the conceptual framework of the thesis. It discusses the key concepts such as the thesis background, rationale, objectives, benefits, scope, and limitations.

**Chapter 2. Literature Review**

The literature review chapter reviews existing literature that serve as the fundamental conceptual framework in this thesis. It explains concepts of the endogenous and exogenous factors, constraints and problems, and entrepreneurial activities of small-scale fish farmers.

**Chapter 3. The aquaculture industry**

This chapter discusses the development of the aquaculture industry. It contains information on the development of the world’s aquaculture industry. It also describes the development of this industry in Indonesia and Central Java, Indonesia.

**Chapter 4. Conceptual framework and research methodology**

The fourth chapter of this thesis provides an explanation of the formation of the conceptual framework and methodology of this research. It also provides information of the research hypothesis, the respondents’ personal and business characteristics, as well as the data collection and analyses steps.

**Chapter 5. Preliminary analysis**

This chapter provides the preliminary analysis of the data. It explains the results of the exploratory factor analysis that collapses numerous variables into a smaller number of meaningful factors. It creates factors for the endogenous and
exogenous variables that influence income improvement and product sustainability.

This chapter also shows the Cronbach’s alpha reliability test result to examine the reliability of the scales developed, and the Pearson correlation analysis result to observe the relationships between scales.

**Chapter 6. Data analysis – findings and interpretation**

The analysis in this chapter is divided into four sections aligned with the research objectives. These sections are:

- The effect of endogenous and exogenous factors on income improvement and product sustainability (associated with objective #1).
- The effects of constraints and problems on income improvement and product sustainability (associated with objective #2).
- Entrepreneurial activities that have been implemented by small-scale fish farmers in Central Java (associated with research objective #3)
- Comparison between small scale fish farmers with different demographic background in implementing entrepreneurial activities (associated with objective #4)

Description analysis, chi-square test and binary logistic regression analyses are used to address these research objectives.

**Chapter 7. Discussion**

This chapter examines the results found in chapter 5 and 6. It discusses the four parts of the thesis:

- Endogenous and exogenous factors that influence income improvement and product sustainability.
- Constraints and problems that influence income improvement and product sustainability.
- Implemented entrepreneurial activities in Central Java.
• Compare small scale fish farmers with different demographic background in implementing entrepreneurial activities.

Chapter 8. Conclusions and recommendations

This final chapter presents the conclusions of the thesis’ objectives. It also makes recommendations for the aquaculture and fisheries industries and related institutions.

1.9 Conclusion

The depletion of global fish stocks has turned aquaculture into the fastest growing food industry in the world. This development is also evident in Indonesia: the Indonesian industry continues to grow each year. Indonesia’s geographical location and topographical conditions also supports the aquaculture industry, increasing its potential even more compared to other countries. The large numbers of human resources also supports Indonesia’s ability to establish a potential aquaculture industry.

In carrying out their activities, small-scale fish farmers implement entrepreneurial activities. In this research these activities are identified and include fish seed production, fish feed production, market extension, product range extension, fish species extension, and utilisation of other fish parts.

In their attempt to derive income improvement and product sustainability, small-scale fish farmers may experience obstacles and difficulties. There are many factors that influence small-scale fish farmers’ income improvement and product sustainability. In this research these factors are divided into endogenous factors, exogenous factors, constraints, and problems.

There are five objectives developed in this research: (1) identify endogenous and exogenous factors, (2) identify the constraints and problems, (3) describe various aspects of the entrepreneurial activities, (4) Compare the entrepreneurial activities implementation of small scale fish farmers with different demographic background and (5) develop recommendations, for aquaculture / fisheries industry and related institutions.
Chapter 2

Literature Review

2.1 Introduction

Farming is a different type of business compared to other small businesses or manufacturing businesses. This is because the farming business includes taking care of live animals, which, if managed incorrectly, may result in business closure. Not only does the farming business need business knowledge, skills and experience, the farming entrepreneur also needs strong farming knowledge, skills and experience. This is especially true for fish farming: the fish farmer entrepreneur needs advanced knowledge and skills. Taking care of fish is much more difficult than farming cattle: fish farming requires additional skills in water management, knowledge of fish diseases and parasites, as well as fish rearing skills. The task is made difficult because fish live in a water environment where, by the time disease is detected, it may already have spread throughout the whole pond leading to total fish mortality and a complete harvest failure. This makes water quality management an essential element of the fish farming business.

To make things even more difficult, fish farmers also need to plan their operational capital months in advanced. Fish farmers need to rear their fish for two or more months before they can sell their harvest and collect an income. Therefore, the initial operational capital needs to include the operational cost for the whole fish rearing season.

In carrying out fish farming activities, small scale fish farmers in Central Java encounter problems and constraints that hinder their fish farming activities. Each fish farmer approaches these problems and constraints differently in accordance with endogenous and exogenous factors that occur within their domain of business activity. As well, these endogenous and exogenous factors impede each fish farmer’s ability to carry out their entrepreneurial activities.

The entrepreneurial activities that fish farmers engage in have been identified as, but not limited to: fish feed production, fish seed production, fish species extension (poly-culture system), market extension, product range extension (adding value to product), and utilisation of other fish parts. The entrepreneurial activities implemented by small
scale fish farmers in Central Java influence the actions they take in their attempts to improve their income and ensure their product sustainability.

2.2 Entrepreneurship, the entrepreneur and entrepreneurial activities

This section examines entrepreneurship as a discipline, the entrepreneur as the person who runs the business, and entrepreneurial activities as the actions carried out by fish farmers.

2.2.1 Entrepreneurship and the entrepreneur

**Entrepreneurship**

Entrepreneurship is a complex area of research since it involves many domains of knowledge. As defined by Shane and Venkataraman “entrepreneurship involves the study of (a) the source of opportunities, (b) the processes of discovery, (c) evaluation and taking advantage of the opportunities as well as (d) the group of individuals who discover, evaluate and exploit these opportunities” (Shane & Venkataraman cited in Ulhoi 2005, p. 939). Entrepreneurship can also be defined as a process that appears in any type or size of business venture and depends on specific personal characteristics (Morris & Lewis 1995). This definition of entrepreneurship emphasises the effort of the entrepreneur in turning his or her innovative ideas into a successful business. The definition of entrepreneurship is often associated with the growth process of a business; the growth of a business can either be slow or fast depending on the business entrepreneur. Morris and Lewis (1995) believed that the determination of this entrepreneurship process depends on two questions: “how much?” and “how often?”. 

Figure 2.1 shows Morris and Lewis’s (1995) determinants of entrepreneurial activity according to how much and how often entrepreneurship events occur. In the graph the vertical axis represents the “how much” determinant as measured by the number of entrepreneurship events that occur. The horizontal axis represents the “how often” determinant as measured by the degree of entrepreneurship (whether the events are innovative, risky, or proactive). Morris and Lewis developed five scenarios from the combination of these two entrepreneurship determinants: periodic/incremental, periodic/discontinuous,
dynamic, continuous/incremental, and revolutionary. The higher the number of events that occurs, the longer and more continuous the product is. For example, a black market vendor selling blue jeans in Moscow would be positioned at the periodic/incremental scenario on the graph because of the short business cycle. On the other hand, Procter and Gamble produces a continuous flow of innovative consumer goods and therefore is positioned at the continuous/incremental scenario on the graph. An example of a company positioned at the periodic/discontinuous area of the graph is Polaroid because of their technological discontinuous products. The dynamic entrepreneurship scenario is represented by Sony with its consumer electronics innovations. The highest degree of entrepreneurship is revolutionary, which is determined by a long, continuous business cycle with high degrees of innovativeness, risk and proactivity. An example at this scenario is AT&T’s Bell Labs with its innovative breakthrough in telecommunication innovations (Morris & Lewis 1995).

Figure 2.1 Entrepreneurship as a variable phenomenon

Besides measuring “how often” and “how much” entrepreneurial activity takes place, Morris and Lewis (1995) believed that three factors influenced the level of entrepreneurship: environmental infrastructure, environmental turbulence, and personal life experience. These three factors are presented in more detail in Figure 2.2.

The environmental infrastructure consists of six structures: economic, political, legal, financial, logistical and social aspects. Figure 2.2 shows that more free enterprise, more democracy, more limited liability, more competitiveness, more well developed logistics, and more individualism will likely lead to increases in the level of entrepreneurship.

The same can be said for environmental turbulence which includes the technological, economic, customer, competitor, legal, resource, and social environment: environmental turbulence also plays a big role in determining the level of entrepreneurship. The more an environment is unstable, the higher the level of entrepreneurship that will develop. Similarly the life experiences such as
family, education, peer group, and job experience also influence the level of entrepreneurship. Job dissatisfaction and creative educational experiences will encourage entrepreneurship to emerge.

However, Morris and Lewis (1995) warned that although the relationships in Figure 2.2 seem linear, this may not always be the case. For example, environmental turbulence will determine the level of entrepreneurship. More turbulence will encourage a higher level of entrepreneurship; nevertheless, too much turbulence will actually discourage entrepreneurship. In fact it is difficult to successfully implement new innovations under extreme levels of environmental turbulence. Likewise, for financial or logistical infrastructure, if these are underdeveloped then it will discourage entrepreneurship. Even an overdeveloped financial or logistical infrastructure can also discourage entrepreneurship.

**The entrepreneur**

There are distinct differences between the entrepreneur and the small business owner: although an entrepreneur and a small business owner have many characteristics in common, an entrepreneur is believed to expand beyond the small business owner. According to Littunen (2000), successful entrepreneurs are characterised as: taking risk, innovating, possessing market awareness, having production knowledge, possessing marketing skills, having business management skills, being able to cooperate, having a sense of business, competently recognising and grabbing opportunities, and being proficient at adjusting efficiently to failures.

Carland *et al.* (1984) also believed that small business owners differed from entrepreneurs and that small business ventures differed from entrepreneurial businesses. Entrepreneurial businesses were identified by Carland *et al.* (1984) as having the following characteristics:

- innovating new product,
- innovating new means of manufacturing,
- expanding market distribution,
- expanding supplier resources, and
These entrepreneurial business characteristics can be recognised in the fish farming businesses of Central Java. The characteristic of innovating new products can be recognised in the way fish farmers create new products by selling their harvest in forms other than fresh fish. Fish farmers can sell their produce as frozen, dried, smoked, or fermented fish (Heruwati 2002). Fish farmers who are more creative will innovate to a greater extent to produce an even wider range of products. For example, the members of one FFG in Central Java turned catfish of lower quality into a variety of processed foods such as shredded catfish, catfish crackers, catfish balls, and catfish nuggets (Suara Merdeka 2007c). This group used the different parts of catfish such as the meat, skin, and fins to make the catfish products. In addition to transforming the catfish into processed food products, they also provided the consumer with many choices of flavour such as a sweet, onion, or spicy flavour.

The characteristic of innovating new means of manufacturing would equate to innovation of the fish farming method. One of the entrepreneurial innovations of fish farming methods has been the adoption of a poly-culture system. A poly-culture system is about cultivating more than one species of fish in the same pond. The idea is to utilise the same space but at the same time not to create food and space competition between the fish. This method of fish farming combines fish with different feeding habits (Bocek 2008) to decrease the chance of food rivalry but at the same time to enhance fish production. An example of a poly-culture system is the combination of seaweed, shrimp, and milkfish. The seaweed provides oxygen for the shrimp and milkfish while the pieces of seaweed that drop to the bottom of the pond, including the algae that grow on the seaweed, can be used by the shrimp and the milk fish for their feed.

Expanding market distribution is a very common business characteristic of fish farmers. Fish farming market expansion comes from selling their products to new fish markets, restaurants, hotels, or at other potential locations. Most often the small scale fish farmers expand their markets after receiving information regarding potential markets from their colleagues or other trusted sources. They
may not have the courage or ability to search for their own potential markets due to the lack of capitals to invest in market extension.

The characteristic of expanding supplier resources may include finding additional sources for their fish feed and fish seed supplies to their existing suppliers. Fish farmers may need to find suppliers at times when they are planning to expand their fish species, therefore, they will need suppliers that produce fish seed of the species which they are planning to culture. Accordingly, they will need to find new fish feed suppliers that can supply them with fish feed suitable for their new fish species. Other supplier expansions may include finding new manure suppliers and suppliers of fish farming related equipment.

The characteristic of reorganising the industry may happen when fish farming responsibilities are shifted between the employees of the business. Since most small scale fish farmers do not have large business organisations and therefore often only employ their own family members in their fish farming business, reorganisation will be in terms of shifting responsibilities between family members. For example the wife who was previously in charge of feeding the fish may be moved to fish processing, while feeding is done by another family member. Business reorganisation helps to make sure that the most suitable person is handling the tasks and that the business is managed more effectively and efficiently.

The entrepreneurial characteristics just mentioned can lead new ventures to achieve significant growth, which is the key distinguishing feature of entrepreneurial ventures. Many new businesses will remain stagnant over the years, but true entrepreneurial ventures will show remarkable growth over time (Carland et al. 1984). Previous research showed that entrepreneurs tended to have higher levels of motivation, set higher goals, and used more innovative strategies.

Small business owners, on the other hand, mainly ran their businesses to fulfil family needs, were interested in higher income only to support the family, and tended to be less motivated to expand their businesses. Consequently, the small business owner’s actions did not focus on company growth (Carland et al. 1984;
Stewart et al. 1998). Table 2.1 compares the characteristics of small businesses and entrepreneurial ventures. It shows that small businesses do not take innovative actions to develop the business and do not use strategic planning. On the other hand, entrepreneurial ventures focus on business growth by taking innovative actions and using strategic planning to increase profit and to establish a bigger business.

Table 2.1 Small business and entrepreneurial business characteristics

<table>
<thead>
<tr>
<th>Source</th>
<th>Small Business</th>
<th>Entrepreneurial Venture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carland et al. (1984)</td>
<td>• Start small and remain small</td>
<td>• Start small and rapidly grow</td>
</tr>
<tr>
<td></td>
<td>• Do not take innovative actions</td>
<td>• Taking innovative actions</td>
</tr>
<tr>
<td></td>
<td>• Do not seek new market</td>
<td>• Seeking new market</td>
</tr>
<tr>
<td></td>
<td>• Focus on income for family needs</td>
<td>• Focus on profit and growth</td>
</tr>
<tr>
<td></td>
<td>• Do not use innovative planning</td>
<td>• Use innovative planning</td>
</tr>
<tr>
<td>Stewart et al. (1998)</td>
<td>• Lower in achievement motivation</td>
<td>• Higher in achievement</td>
</tr>
<tr>
<td></td>
<td>• Lower in risk taking</td>
<td>• Higher in risk taking</td>
</tr>
<tr>
<td></td>
<td>• Low in innovation</td>
<td>• Higher in innovation</td>
</tr>
<tr>
<td></td>
<td>• Focus goals for family income</td>
<td>• Focus goals for profit and growth</td>
</tr>
<tr>
<td></td>
<td>• Do not use strategic planning</td>
<td>• Use strategic planning</td>
</tr>
</tbody>
</table>


2.2.2 Entrepreneurial activities

What are entrepreneurial activities? The definition varies depending on the reference consulted and is viewed from many different perspectives. Krause (2003) defined entrepreneurial activity from a political perspective as the capability of generate and apply new creative ideas in a political practice. Uhlaner and Thurik (2007) defined entrepreneurial activity from a time period perspective referring to people who had just started a business or who had been managing a business for no more than 42 months. Another definition was given by Jackson and Rodkey (1994) who defined entrepreneurial activity as all those efforts made to grow small firms into big businesses. Although many definitions of entrepreneurial activity have been proposed, entrepreneurial activity is always
concerned with the implementation of an idea as an effort to develop a business to a higher level.

In the context of this research, entrepreneurial activity is viewed from an aquaculture perspective, and is defined as the implementation of an idea to improve aquaculture techniques, management, and product quality in order to develop the aquaculture business so as to achieve income improvement and product sustainability.

Morris and Lewis (1995) believed that there are three factors that influence the level of entrepreneurial activity: environmental infrastructure, environmental turbulence, and personal experience (see Figure 2.3). As shown in Figure 2.3, the environmental infrastructure, environmental turbulence, and personal environmental experiences of societal members influence the level of entrepreneurial intensity in the society. A discussion of the three factors follows Figure 2.3.
Environmental infrastructure factors consist of logistical, financial, economic, political, legal, and social structures. Well developed infrastructure supports entrepreneurial behaviours as it assists entrepreneurs in finding supplies and markets. For small scale fish farmers who live in rural areas, well developed infrastructures, such as roads and telecommunications, are crucial and can assist small scale fish farmers in many ways. Developed road ways may help small scale fish farmers in locating new suppliers, finding new information on potential markets, having easy access to government offices, and attending...
important training sessions, as well as delivering rapid market service and adapting new methods and technologies (Morris & Lewis 1995).

Entrepreneurial activity is encouraged where the financial and economic systems are more competitive in terms of source of capital and interest rates (Morris & Lewis 1995). Entrepreneurial activity is also encouraged in a free competitive market that provides more options to choose from and compare, and where there are greater opportunities for starting a business. In a similar way to the financial and economic systems, a free political system encourages the development of new entrepreneurial businesses and increases the entrepreneurial intensity. As Morris and Lewis described: “the political system fosters entrepreneurship when it is built around freedom of choice, individual rights, democratic rule and a series of checks and balances among the executive, legislative and judicial branches of government” (Morris & Lewis 1995, p. 36).

Legal structures refer to the legal protection available to ventures such as permit structures, contract enforcement, patent protection, and strong restrictions on monopolistic trade practises. Such legal structures encourage the emergence of new ventures since their rights are protected by legal systems.

Social structure is associated with network development. Morris and Lewis explained that “social systems that facilitate the development of networks are conducive to entrepreneurial activity. Social relationships provide forum for entrepreneurs to share information, identify opportunities and marshal resources” (Morris & Lewis 1995, p. 37).

**Environmental turbulence**

There are three conditions of environmental turbulence that can affect the intensity of entrepreneurship in the society: dynamic, threatening, and complex. These three conditions can develop from threats as well as opportunities. Fast change in technology, the economy, customer needs, competition, and the legal and social environments forces businesses to make innovative decisions. It has been found that “the more dynamic, hostile and heterogenous the environment, the higher the level of innovative, risk-taking and proactive behaviours” (Morris & Lewis 1995, p. 38).
A key concept of environmental turbulence is change. Where there is a high level of infrastructure change, entrepreneurial activity will also be higher. On the other hand, in stable conditions where there are no changing environments to deal with, there is no need to develop innovative and creative reactions.

**Personal environmental experiences**

The personal experiences that influence entrepreneurial intensity include personal experiences within the family, educational, and work environment, and contact with role models. Many researchers have observed a positive effect of family on the emergence of entrepreneurship (Matthews & Moser 1996; Morris & Lewis 1995). Entrepreneurs with a family business background are more prepared for unexpected situations since they have previously been exposed to the risks of business and they have a better understanding of the consequences for the business. Entrepreneurs with a family business background are more alert and ready for a downturn in business. Furthermore, a successful family business will influence a person’s decision to become an entrepreneur (Scott & Twomey 1988; Wang & Wong 2004). It has been found that continuous business demonstration encourages children to have their own business in the future (Brown 1990).

Education has a large effect on business and self employment decisions (Morris & Lewis 1995; Rees & Shah 1986; Robinson & Sexton 1994) since an education provides the entrepreneur with the necessary skills to deal with unexpected business situations. Educated entrepreneurs have a higher sense of confidence and efficacy which enhance their ability to observe and pursue opportunities (Robinson & Sexton 1994). Higher educated people also have the ability to seek out more information about business opportunities.

Work related factors also impact entrepreneurial activity. Many people who are dissatisfied with their work are forced to go into business (Amit & Muller 1995). Reasons such as unemployment (being out of a job or struggling to find suitable work) or dissatisfaction with a workplace will finally push a person to establishing their own business. Morris and Lewis (1995) observed that the majority of entrepreneurs (59%) are desperate to start a business before they even know what product they are going to sell or produce, or what type of
service they want to provide. Despite the negative impact of job dissatisfaction, Brockhaus (1980) found that greater experience of job dissatisfaction increased the success of an entrepreneur.

2.3 Identification of small scale fish farmer entrepreneurial activities

The entrepreneurial business characteristics identified by Carland et al. (1984) include five characteristics that differentiated entrepreneurial ventures from small businesses and were described as innovating new product, innovating new means of manufacturing, expanding market distribution, expanding supplier resources, and reorganising the industry. Based on the two characteristics of taking innovative actions and seeking new markets, this research elaborated six fish farming entrepreneurial activities as shown in Table 2.2. Five entrepreneurial activities were developed as innovative actions: fish feed production, fish seed production, fish species extension, product range extension and utilisation of other fish parts. The sixth entrepreneurial activity, market extension, was developed from the second entrepreneurial characteristics identified by Carland namely seeking new market. These fish farming entrepreneurial activities are discussed next.

| Table 2.2 Entrepreneurial characteristics and entrepreneurial activities |
|------------------------------------------------|---------------------------|
| Entrepreneurial characteristics | Entrepreneurial activities in this research |
| (Carland et al., 1984) | |
| 1. Taking innovative action | 1. Fish feed production |
| | 2. Fish seed production |
| | 3. Fish species extension |
| | 4. Product range extension |
| | 5. Utilisation of other fish part |
| 2. Seeking new market | 6. Market extension |

2.3.1 Fish feed production

The Food and Agriculture Organisation (FAO) of the United Nations carried out a Regional Expert Consultation on Farm-made Aquafeeds in Thailand to increase awareness of the importance of self made fish feed by fish farmers (hereafter called farm-made aquafeeds). This meeting was attended by representatives from ten Asian countries who defined the term farm-made aquafeeds as “feeds in pellet or other forms, consisting of one or more artificial and/or natural feed stuffs, produced for the exclusive use of a particular farming activity, not for commercial sale or profit” (New, Tacon & Csavas 1994, p. 4).

According to New, Tacon and Csavas (1994) although there is still a high dependence on commercially made fish feed, most representatives at this meeting agreed on the potential and importance of the farm-made aquafeeds for the following reasons:

- Most of the Asian finfish and crustacean aquaculture productions are depending on this feeds.
- Farm-made aquafeeds can reduce production costs since it is reasonably cheaper than commercial feed.
- Farm-made aquafeeds are environmentally friendly since it uses wastes from agro-processing industries.
- Farm-made aquafeeds provide fish feed to small scale fish farmers who are not covered by commercially made fish feed.

The importance of farm-made aquafeeds was based on the assumption that at least 1 million tons of farm-made aquafeeds have been annually produced and used in Asia (New & Csavas 1993). Despite the large amount of farm-made aquafeeds produced in Asian countries, and despite some freshwater fish farmers who produce their own fish feed by using local ingredients such as rice bran, cassava leaves, and soy bean cake, the majority of Indonesian fish farmers still prefer to use commercial feed (Djunaidah 1992). This is because producing their own fish feed is time consuming and the required ingredients are difficult to obtain.
Indonesian small scale fish farmers are facing problems in producing farm-made aquafeed for several reasons but the greatest problem is the lack of good quality raw material within the farmers’ area of activity. Raw materials needed to produce farm-made aquafeed are mostly imported and it is difficult to supply locally. Consequently the prices of the raw materials are too high for small scale fish farmers (Djunaidah 1992).

2.3.2 Fish seed production

Aquaculture has become the fastest growing food sector in the world and, according to Siriwardena (2007), Asia ranks as the world’s largest aquaculture suppliers. In order to achieve optimum aquaculture production a supply of good quality fish seed is vital to the security of ongoing aquaculture operations. In developing countries fish seed supply is a major problem due to a lack of sufficient productive fish hatcheries (Akpaniteaku, Weimin, & Xinhua 2005).

The limited supply of fish seed has meant that fish farmers remain dependent on natural spawning or fish hatcheries for supplies. This condition has forced some fish farmers to innovate to produce their own fish seed (Mantau, Rawung, & Sudarty 2004) simply to survive under the unreliable conditions and to improve their standard of living (Nandeesha 2007). Therefore, there are concerns that need to be addressed in the development of fish seed production (Bondad-Reantaso 2007):

- Seed supplies are unpredictable and insufficient.
- The genetic quality of fish seed is not guaranteed.
- The number of hatcheries for fish seed rearing is insufficient.
- Problems with fish seed distribution.

Indonesian aquaculture has experience significant growth associated with the growth in global fish demand. In turn, this has led to an increase in demand for good quality fish seed. To date, freshwater fish seed in Indonesia are mostly supplied from hatcheries and only small amounts are obtained from the wild (Budhiman 2007). Although the supply of freshwater fish seedling has expanded, the progress is slow compared to the developments taking place in
marine fish and shrimp seedling technology. Budhiman (2007) suggested that this difference may be associated with the following circumstances:

- Freshwater fish seed supplies are more likely to fulfill local demand with only small amounts available for export purposes.
- A decrease in the quality of freshwater fish seed.
- The slow growth characteristic of most freshwater fish.
- Strict export requirements.
- The inability of small scale fish farmers to obtain sufficient loans.

In spite the difficulties in producing freshwater fish seed, fish farmers still prefer it to marine fish cultivation. This may be because freshwater fish cultivation is easier to put into effect due, for example, to the relative ease of obtaining fresh water compared to obtaining seawater or brackish water.

2.3.3 Fish species extension (poly-culture system)

In the main, small scale fish farmers in Indonesia will start their business cultivating one species of fish and gradually add other fish species. As their business grows and they see other opportunities, some fish farmers will expand into a poly-culture system where they cultivate more than one fish specie in the same pond. For this type of system fish farmers have to have adequate knowledge of fish feeding habits because a poly-culture system works by combining fish with different feeding habits (Bocek 2008). A poly-culture system reduces the possibility of food competition and at the same time increases fish production.

Many benefits can be derived from poly-culture systems. In addition to the increase in production, there is less need to add fish feed. For example, in a poly-culture system of shrimp, seaweed, and milkfish, the pieces of seaweed that drops at the bottom of the pond and the algae that grow on the seaweed, become feed for the shrimp and milk fish. The seaweed also produces oxygen for the shrimp and milk fish.

Many small scale fish farmers have experienced significant increases in profits by adopting poly-culture systems. A fish farmer in West Java claimed that prior
to poly-culture his income was Rp 3 million per month. After implementation of the poly-culture system, his income increased five times (Kompas 2006). Similar examples were given by Bisnis Indonesia (2007) to demonstrate that poly-culture system implementation significantly increased fish farmers’ profits.

2.3.4 Product range extension (adding value to product)

Small-scale fish farmers in Indonesia usually sell their fish harvest as fresh fish, but some add value to their fish harvest. In Indonesia only 23 - 47 percent of fish are processed into higher value products while the rest are sold as fresh fish (Heruwati 2002). Adding value to the product is a common and widely accepted method to preserve fish harvest quality and reduce fish harvest spoilage (Venugopal & Shahidi 1995). By the time fish products reached consumers the quality of many fish products has deteriorated because of the long distribution time from the producer to the consumer (Heruwati 2002). Not only is it important to find ways to preserve the fish product such as by adding salt but the preserved fish also fetches a higher market price since consumers are able to keep their purchased fish for longer. Fish farmers also sell fish as frozen, dried, smoked, or fermented fish (Heruwati 2002). The traditional ways to add value such as via salting, smoking, drying and fermenting still predominate in the Indonesian market. Modern techniques like freezing and canning are used less frequently in Indonesia because these techniques require high quality fish as the raw material inputs which are still difficult for small scale Indonesian fish farmers to achieve.

Susilowati (2005) explained that with adequate knowledge a fish farmer can attract more buyers by finding ways to add value to their fish product. This was exemplified by a successful FFG in the Mangkubumen village of Central Java that transformed their fish waste into high quality edible fish products. Nearly all of the village residents were catfish farmers whose livelihoods depend on cultivating catfish (Suara Merdeka 2007b). Four male residents, led by Darseno, started to cultivate catfish in 1999 when the price of catfish was on the increase. Darseno took risks that secured him great profits (Suara Merdeka 2007d). His rapid success encouraged other village residents to cultivate catfish and in 1999 they formed a FFG called ‘Karya Mina Utama’ with 92 members. Over the next
few years the wealth of the village increased dramatically as evidenced by the number of beautiful new houses and new cars belonging to the FFG members.

In 2007 the President of the Republic of Indonesia visited this famous village and accorded the village an appreciation ‘Minapolitan’ (translated to English it means: fish-town) (Suara Merdeka 2007b). The name Minapolitan was chosen because almost all of its residents cultivated catfish over 21 hectares of land comprising 1,661 catfish ponds. In this village it is not surprising to see fish harvest activity on a daily basis; the village can produce a phenomenal 7 - 10 tons of catfish each day.

Not only does the catfish farming benefit the pond owners, but it also benefits the local people who work as their employees. The catfish pond workers are paid higher than average local wages. Suara Merdeka (2007b) explained that the high salaries for pond workers were possible because of the high profits that pond owners could garner.

The women sub-members of this FFG have also contributed to the value added catfish products by creatively turning lower quality catfish into processed foods such as shredded catfish, catfish crackers, catfish balls, and catfish nuggets (Suara Merdeka 2007c). In addition to creating the range of processed food products, the women have also provided consumers with a choice of sweet, onion, or spicy flavours. The catfish crackers are made from a combination of the meat, skin, and fin parts of fish. These innovations made by the Karya Mina Utama women sub-members have provided additional income for the FFG families. The FFG’s successful activities have attracted the attention of many government officers from other Indonesian provinces to duplicate this in their own region.

2.3.5 Utilisation of other fish parts

The women sub-members of the FFG Karya Mina Utama in the catfish town (described in the previous section) is a demonstration of one of the five innovative actions identified for this research. The women created delicious fish crackers by utilising fish waste like fish skin, fin, and tail (Suara Merdeka 2007c).
Other uses of fish have also been identified through research. According to Wahyuni and Peranginangin (2007) there has been a major increase in the number of exports between 1998 and 2000 of fish waste from Indonesia. The fish waste includes fish bones which are processed into gelatine. Gelatine is a protein substance made from the collagen derived from skin, bones, and cartilage. For many decades, Indonesia has imported thousands of tons of gelatine for domestic requirements (see Table 2.3).

**Table 2.3 Indonesian gelatine imports**

<table>
<thead>
<tr>
<th>Year</th>
<th>Gelatine import (kg)</th>
<th>Value (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>1,169,197</td>
<td>5,503,803</td>
</tr>
<tr>
<td>1996</td>
<td>2,673,500</td>
<td>7,406,426</td>
</tr>
<tr>
<td>1997</td>
<td>2,148,415</td>
<td>8,831,742</td>
</tr>
<tr>
<td>1998</td>
<td>1,851,328</td>
<td>6,781,571</td>
</tr>
<tr>
<td>1999</td>
<td>2,371,738</td>
<td>9,095,440</td>
</tr>
<tr>
<td>2000</td>
<td>2,712,345</td>
<td>9,119,997</td>
</tr>
<tr>
<td>2001</td>
<td>3,115,382</td>
<td>8,683,771</td>
</tr>
<tr>
<td>2002</td>
<td>1,925,732</td>
<td>6,102,019</td>
</tr>
<tr>
<td>2003</td>
<td>1,102,019</td>
<td>9,962,237</td>
</tr>
</tbody>
</table>


Table 2.4 shows that the world’s demand for gelatine in both the food and non-food industries is very high.

**Table 2.4 Utilisation of gelatine in world’s food and non-food industry use**

<table>
<thead>
<tr>
<th>Food industry</th>
<th>Usage (tons)</th>
<th>Non-food industry</th>
<th>Usage (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confectionary</td>
<td>68,000</td>
<td>Film product</td>
<td>27,000</td>
</tr>
<tr>
<td>Jelly</td>
<td>36,000</td>
<td>Soft capsule</td>
<td>22,600</td>
</tr>
<tr>
<td>Meat product</td>
<td>16,000</td>
<td>Capsule shells</td>
<td>20,200</td>
</tr>
<tr>
<td>Dairy product</td>
<td>16,000</td>
<td>Pharmacy industry</td>
<td>12,600</td>
</tr>
<tr>
<td>Margarine/butter</td>
<td>4,000</td>
<td>Technical industry</td>
<td>6,000</td>
</tr>
<tr>
<td>Food supplement</td>
<td>4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>144,000</strong></td>
<td><strong>Total</strong></td>
<td><strong>88,400</strong></td>
</tr>
</tbody>
</table>

Table 2.5 shows names of some large Indonesian companies that use large amounts of gelatine in their production processes.

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Types of Industry</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT. Kimia Farma</td>
<td>Pharmacy</td>
<td>Jakarta</td>
</tr>
<tr>
<td>PT. Merck</td>
<td>Pharmacy</td>
<td>East Java</td>
</tr>
<tr>
<td>PT. Henson</td>
<td>Pharmacy</td>
<td>Jakarta</td>
</tr>
<tr>
<td>PT. Capsugel</td>
<td>Empty capsule</td>
<td>Surabaya</td>
</tr>
<tr>
<td>Nova Chemie Utama</td>
<td>Plastic bag</td>
<td>Bogor</td>
</tr>
<tr>
<td>Super World Wide Foodstuff Industry</td>
<td>Confectionary</td>
<td>Jakarta</td>
</tr>
<tr>
<td>PT. Gita Madu</td>
<td>Confectionary</td>
<td>Semarang</td>
</tr>
<tr>
<td>Jamafac</td>
<td>Matches</td>
<td>Jakarta</td>
</tr>
<tr>
<td>Kyung Dong Indonesia</td>
<td>Spoon, fork</td>
<td>East Java</td>
</tr>
<tr>
<td>Sindhu Amritha</td>
<td>Confectionary</td>
<td>East Java</td>
</tr>
</tbody>
</table>


Without sufficient local production of gelatine Indonesia has to import the raw material and fish gelatine may be able to fill the gap. To date the raw material to produce gelatine has come mainly from cows and pigs. It will be very advantageous if fish gelatine can be produced in Indonesia as an alternative solution. It will also reduce the amount of fish waste that is exported as well as generate a profitable product for fish farmers.

Fish fillet is another fish commodity exported from Indonesia but due to the fish fillet production process, the waste fish skin has become a problem creating pollution and annoyance to surrounding communities. Indonesia has become the second largest exporter of fish fillet to the USA (Department of Marine Affairs and Fisheries 2005; Warta Pasar Ikan 2007) which means that it has a large fish skin waste problem. In order to overcome this problem, researchers from the Center of Leather, Rubber and Plastics (Balai Besar Kulit, Karet dan Plastik) in Yogyakarta have produced an innovative solution to utilising fish skin (Handicraft Indonesia 2006). They overheard complaints from handcrafters regarding rising cow and goat skins prices started performing experiments with fish skin to replace the cow and goat skin. The results were overwhelming. The
fish skin waste was transformed into beautiful products such as shoes, bags, purses, wallets, belts, and other handmade products.

The fish skin process technology can transform fish waste into a valuable product with a comparatively high sales price for Indonesian small handcrafters (Department of Marine Affairs and Fisheries 2005). Processing will add between 30 to 60 per cent to the value of fish skin compared to unprocessed fish skin. Handicraft Indonesia (2006) stated that the value of processed fish skin (12 - 15 cm in width) are worth Rp 25,000 (approximately AU$ 3.50), whereas finished fish skin product (e.g., shoes, or bags) can reach Rp 150,000 to Rp 300,000 (approximately AU$ 22.00 to AU$ 43.00). This product shows tremendous potential to utilise Indonesia’s large amounts of fish skin waste by turning it into value added products.

2.3.6 Market extension

It has been claimed that market extension is a basic entrepreneurial activity carried out by businessmen (Morris & Lewis 1995). It is believed that entrepreneurial activity is applicable at the individual, societal, and organisational level. Therefore, entrepreneurial activity also applies to small scale fish farmers. Currently, many Indonesian small scale fish farmers are dependent on fish gatherers as middlemen to market their harvest (Nurdjana 2006). Some farmers take their product to the local fish market however some fish farmers with an entrepreneurial mind will try and expand their market range. As described by Susilowati (2005), fish sellers should know about marketing strategy to sell their fish. A marketing strategy is concerned with (1) the market or consumer, (2) attractive communications to buyers, (3) the price of the product, and (4) managing profits through future planning.

Market extension has strong parallels with networking. It was found that high density networking may result in wider market extension. With higher numbers and a wider range of networks, it is believed that a firm is able to expand its market distribution into a wider geographical range and to greater numbers of markets (Havnes & Senneseth 2001).
2.4 Comparison between fish farmers with different demographic background in carrying out entrepreneurial activities

This research included comparative analyses using demographic and farming group data to increase understanding of how fish farmers implemented entrepreneurial activities and to reveal the most commonly practiced entrepreneurial activities. The research survey was developed to collect demographic information, amongst other data, with which to compare the entrepreneurial activities of fish farmers. The demographic information made it possible to compare fish farmers on the basis of: awardees and non awardees status, gender, age groups, marital status, educational levels, FFG levels, and reasons to become fish farmers.

2.4.1 Comparing awardees and non awardees

The first comparison of entrepreneurial activities was between the awardees and non awardees FFGs. The definition of awardees used in this research is fish farmers who belonged to FFGs that had won the annual FFG competition organised by the Indonesian government in the last five years. The non awardees were defined as fish farmers who belonged to FFGs that had not won awards in the last five years.

It is important to compare entrepreneurial activities between fish farmers who had received awards and those who had not because FFGs that have received awards are evaluated by the government officials according to at least three classes of criteria relevant to this research. The three classes of criteria or aspects that FFGs are evaluated on are: social aspects, technical aspects, and economical aspects (Semarang Marine Affairs and Fisheries Office 2005).

The social aspects of the FFGs that are evaluated consider the ability of the group members to manage their social activities. This includes managing their organisational structure, arranging internal FFG meetings, organise fish farmers’ member social activities, planning on capital collection, and other socially related issues which they enact internally (within the FFG member) and externally (with other parties).

The technical aspects that are evaluated consider all the fish farming related technical aspects such as aquaculture skills, raw material knowledge,
aquaculture infrastructure, and the members’ ability to develop these. The FFG members’ technical knowledge and skills include the methods to obtain supplies, pond engineering, as well as fish feed and fish seed management. The way the members develop each skill is also evaluated and scored. The more skills they possess the higher the score they receive.

The economical aspects criteria evaluate business development and management skills. This includes the ability of FFG member to analyse their business, to obtain and secure sufficient loans, to organise and manage their capital, and also how they collaborate with village cooperation units. FFGs that demonstrate greater skills in managing their finances will receive a higher score in the competition evaluation.

The competition follows two steps during evaluation. In the first step the competition evaluator team establishes a questionnaire based on the three aspects mentioned earlier. When the FFG has answered and returned the questionnaire, the competition team carries out a field evaluation based on the answers that the FFG had given in the questionnaire.

The FFG that received the highest score is declared the winner of the FFG competition. The winner is given a certificate and prize money to use in their FFG. Despite the Indonesian government’s commitment to this annual competition, some fish farmers do not see the benefit and regard it as a waste of their time and money. For example, a winning FFG in Bali had declined the invitation to visit Jakarta to receive their national award arguing that the cost to travel to and stay in Jakarta was more than the prize money (Terranet 2001).

This is not surprising considering that most of the fish farmers are small scale businesses with very limited capital that must carefully plan their financial affairs. Furthermore, some fish farmers who are located far from the capital city of Indonesia need the government’s assistance with the expenses incurred for the sake of the award ceremony.

The three key aspects evaluated in the competition generally cover all developmental aspects of a farm based business. The winning FFG is deemed to have the highest capability in those three aspects. However, there are concerns
regarding the objectiveness of the evaluation. Although each FFG receives the same questionnaire, the field evaluation carried out by the government officials may not be objective. It is impossible for one person or one evaluation team to evaluate the large numbers of FFGs in a country as large as Indonesia. The field evaluation is usually performed by many teams which may result in different judgements between teams. Therefore, the final result may not be valid or objective.

2.4.2 Comparing male and female small scale fish farmers

The second demographic characteristic that was used for comparing fish farmers’ entrepreneurial activities was that of gender. The aim of this comparison was to explore how men and women fish farmers differ in the entrepreneurial activities they implemented. The most favoured type of entrepreneurial activities between men and women was also compared.

There have been arguments regarding men and women working as fish farmers. Some believed that being a fish farmer is a man’s job (Mbozi 1991) because fish farming involves hard physical labour such as harvesting and pond cleaning. However, when it comes to implementing entrepreneurial activities, certain activities may be dominated by women instead of men. This is especially true for activities that require women’s knowledge and skills. For example product range extension may involve cooking, adding flavour to products, or creating new flavours, which are tasks that women are most familiar with.

Gender arguments extend to beliefs that men carry out more entrepreneurial activities than women (Cowling & Harding 2001; Reynolds et al. 2002). This may be associated with beliefs that women focus more on family matters rather than on business development. The role of women as the primary family nurturers somehow limits the women’s ability to put emphasis on work related issues. Nevertheless, despite the fact that women implemented fewer entrepreneurial activities than men, it was found that women were better at repaying loans than men (Panjaitan-Drioadisuryo & Cloud 1999). Based on this finding, the Bank of the Republic of Indonesia (BRI) had developed the world’s largest micro enterprise credit program called ‘Kupedes’ that target small scale women entrepreneurs as their primary customers.
Previous researches have also observed that men and women had different reasons for choosing to become self-employed (Matthews & Moser 1996; Robinson & Sexton 1994). While both men and women tried to find balance between life and work, women chose to be self employed for the flexibility it offers her to be with her children. Since women have the power to control their working hours, they have more time to look after their children while earning an income. On the other hand, men with families chose to become self employed to achieve stable financial conditions (Robinson & Sexton 1994). Therefore, men will choose to be self-employed if they know that the business can deliver a stable income.

Panjaitan-Drioadisuryo and Cloud (1999) described the different ways men and women spent their income. They observed that women spent most of their income to provide for their family’s needs such as investing in better education for their children, better health care, buying more nutritious foods, birth control, and other family related issues. In other words women focused on developing their families rather than developing their businesses.

Research carried out by Matthews and Moser (1996) found that men were more interested in becoming self-employed than women. Self-employed men primarily had role model entrepreneurs who inspired them to develop an entrepreneurial interest (Cowling & Harding 2001).

An interesting observation was made by Robinson and Sexton (1994) regarding the effect of children on men and women entrepreneurs. Children were found to have a positive effect on men but a negative effect on women entrepreneurs. The presence of children gave men the stability to be self-employed and tended to increase their earnings because children inspired men to work harder in order to fulfil their families’ needs. Conversely, children interrupted most women in their business development and resulted in decreased income. Women as the primary carer of children always served her children before the needs of her company, therefore her working hours were also shorter and her income less.

The timing for starting a business was also different between men and women: men tended to be older, more experienced, and married when they started their
business (Cowling & Harding 2001; Robinson & Sexton 1994). Older men were more experienced and had wider networks that increased their confidence to start a business. They were already aware of the possible negative impacts on their financial situations from being self-employed. On the other hand, women were found to be married and had young children when they started their business (Robinson & Sexton 1994).

2.4.3 Comparing fish farmers of different ages

The implementation of entrepreneurial activities of small scale fish farmers in different age groups was also explored in this research. The aim of comparing fish farmers in different age groups was to determine whether age differences influenced the carrying out of entrepreneurial activities. The aim was also to determine whether age influenced fish farmers’ preferences for implementing particular types of entrepreneurial activities.

Age group was considered to be an important influence to measure in this research since fish farming activities involve heavy physical labour and hence influenced how fish farmers worked. For example, younger fish farmers may choose to implement activities that require new knowledge such as fish species extension. In practising fish species extension or poly-culture, fish farmers require knowledge of fish feeding habit because the system combines a few species of fish in one pond. These fish need to have different feeding habits to avoid feeding competition. For example herbivore fish is combined with plankton feeder fish, so they will feed on different food.

On the other hand, older fish farmers may choose to implement entrepreneurial activities that they are familiar with and that do not require them to learn new skills or carry out heavy work. One of the entrepreneurial activities that fit into these criteria is market extension. It is well known that market extension is one of the major and most basic entrepreneurial activities, and hence older fish farmers may choose this type of activity more frequently than other activities.

Research supports the link between age and implementation of entrepreneurial activity. The average age to start a business was 40 years and increased to reach peak at 45 years old before it decreased significantly above 45 (Cowling &
Taylor 2001; Devine 1994). The research showed that it took time for an interest in entrepreneurship to emerge (Devine 1994). The older the person, the more experience they have, the more self-employment opportunities they recognised, and the more interested they become in self-employment.

### 2.4.4 Comparing fish farmers of different marital status

The marital status of fish farmers was one of the demographic variables used to analyse the implementation of entrepreneurial activities. The reason for this choice of demographic variable was that the presence of a husband or a wife was thought to influence the way a person made decisions in life: decisions which includes the carrying out entrepreneurial activities.

The aim was therefore to compare how fish farmers of different marital statuses implemented entrepreneurial activities. This comparison also aimed to determine whether or not differences in marital status influenced fish farmers’ preferences for types of entrepreneurial activities.

Previous researchers have found a positive relation between being married and the probability of being an entrepreneur (Rees & Shah 1986; Robinson & Sexton 1994). Robinson and Sexton (1994) found that being single or divorced had a negative impact on self employment. Their findings showed that being married and having a partner and children, increased a person’s sense of responsibility to secure financial stability. This increased the person’s interest in becoming self-employed as a way to reach financial stability.

### 2.4.5 Comparing fish farmers with different educational levels

The fourth demographic characteristic of fish farmers used to compare entrepreneurial activities implementation was their levels of education. The entrepreneurial activities implemented by fish farmers who have completed high school were compared to those who have not completed high school. The aim of this comparison was to explore how fish farmers with different education level differed in terms of implementing entrepreneurial activities. The most favourite type of entrepreneurial activities implemented by those with different education levels was also compared.
Education is known to have a large effect on business activity since it equips the entrepreneur with the necessary skills to deal with unexpected business situations. Education has also been found to have be positive associated with self employment (Morris & Lewis 1995; Rees & Shah 1986; Robinson & Sexton 1994). People who were educated had a higher sense of confidence and efficacy which increased their ability to notice and take hold of opportunities (Robinson & Sexton 1994). Furthermore, people with higher education levels tended to have an ability to find more information on business opportunities.

It is thought that people with higher levels of education may be more successful in business, as they received more information, and had more skills and knowledge including those of entrepreneurial activities. However, other factors may contribute to the success of small scale fish farmers and success may not depend exclusively on education. Hence, it cannot be generalised that people with higher levels of education are necessarily more successful. Although education contributed to the level of people’s knowledge, it may be that confidence and efficacy, and other factors such as government support ranging from the provision of capital equipment and fish farming training, may have contributed more to their success.

### 2.4.6 Comparing different fish farming groups

Comparisons of the implementation of entrepreneurial activities between small scale fish farmers at different levels of FFGs were also conducted in this research. The aim of comparing fish farmers’ communities at different FFG levels was to determine whether the level of FFG influenced the carrying out of entrepreneurial activities. The aim was also to determine whether the level influenced the FFGs’ preferences for the types of entrepreneurial activities implemented.

According to the Semarang’s Marine Affairs and Fisheries Office’s (2005) *Fish Farmer Group Formation Guide Book*, there are two steps in FFG formation: the group development and group monitoring steps. In forming a FFG, fish farmers should have five things in common. They should have the same needs, same location, same social and economic status, trust in each other, and able to select one person to become the FFG leader. There are also five characteristics
of the FFGs that are monitored by the government: the ability to plan the business, the ability to honour agreements made with other institutions, the ability to increase capital, the ability to increase relationships with other FFGs and with the village unit cooperation, and the ability to implement new technology and information systems.

According to Semarang Marine Affairs and Fisheries Office (2005), there are four levels of FFGs: kelas pemula (starter level or level 1), kelas lanjut (level 2), kelas madya (level 3), and kelas uatama (advanced level or level 4). These levels are determined by annual evaluations carried out by the local Fisheries and Marine Affairs office.

*Kelas Pemula (Level 1 – the lowest level or starter level).*

This is the lowest level of FFGs. Groups at this level have the lowest ability to perform according to the evaluation criteria.

*Kelas Lanjut (Level 2 – the secondary level).*

This is a step higher than Level 1. The FFG members usually have more advanced ability to carry out the activities of the evaluation criteria than those from level 1.

*Kelas Madya (Level 3 – the mid advance level).*

FFG members at this level have much higher levels of abilities than the FFGs at Levels 1 or 2, which include their ability to perform activities mentioned in the evaluation criteria.

*Kelas Utama (Level 4 – the advanced level)*

This is the most advanced level a FFG group can reach. The members have the highest ability to perform according to all ten evaluation criteria.

There are ten evaluation criteria used to evaluate the levels of FFGs:

a. The ability to search and use information.

b. The ability to plan activities which can increase productivity.
c. The ability to work as a team in carrying out the planned activities in a disciplined way.

d. The ability to provide and develop the FFGs own facilities.

e. The ability to collect the FFGs capital.

f. The ability to properly carry out and honour cooperative agreements with other parties.

g. The ability to cope with adverse circumstances.

h. The development of the leader and other members and their efforts to improve their skills.

i. The quality of the relationship between the FFG and the village cooperation unit.

j. The level of productivity. (Translated from *Fish Farmer Group Formation Guide Book 2005*, pp. 8-9)

The ten evaluation criteria used to assess the levels of FFG distinguishes the FFGs by their creativity, productivity, mutual unity, cooperation, and self improvement. Based on these evaluation criteria, it is obvious that FFGs at higher levels would also be a higher performing group. And higher performance includes the ways that FFGs to increase their business through innovative entrepreneurial activity.

### 2.4.7 Comparing fish farmers with different reasons for become fish farmers

The fish farmers’ reasons for choosing their businesses were also included as a demographic of practical implication used to compare farmers’ implementation of entrepreneurial activities. This choice was made because the different reasons (push factors or pull factors) influence the way a person makes decision in life, including the decision to carry out entrepreneurial activities.

The aim of this comparison was to explore how fish farmers who had different reasons for becoming fish farmers implemented entrepreneurial activities. The aim was also to determine whether or not differences in reasons influenced the farmers’ preferences for types of entrepreneurial activities to implement.
There are two types of reasons or motivations that people have for turning to self-employment. The reasons or motivations can be classified as either push factors or pull factors. The push and pull factors of entrepreneurs are determined by the initial motivations prior to starting their own businesses (Amit & Muller 1995). People motivated by pull factors are people who are naturally attracted to start their own venture because they have many business ideas and are attracted by the potential results of implementing those ideas (Amit & Muller 1995). Entrepreneurs motivated by pull factors are naturally attracted to business simply because they have the financial capacity to do so, or because of other psychological or sociological reasons such as the attraction of personal independence (Basu 1998; Watson, Hogarth-Scott & Wilson 1998). Therefore, these people in self-employment are more willing to try anything in order to grow their business.

On the other hand, people motivated by push factors are people who are not happy with their work for reasons not associated with their entrepreneurial characteristics and are forced to go into business (Amit & Muller 1995). The reasons may be unemployment (out of a job or inability to find suitable work) or dissatisfaction at their current workplaces. Any of these reasons pushes a person into establishing their own business.

Researchers have found that entrepreneurs motivated by push factors are less likely to succeed (Solymossy 1997) and earn less money (Amit & Muller 1995) than those motivated by pull factors. Pushed entrepreneurs were forced to leave their jobs which resulted in unemployment. This meant that the majority of entrepreneurs (59%) were already desperate to start their business before they had decided which products to sell or produce or what type of service to deliver (Morris & Lewis 1995).

2.5 Extant constraints and problems faced by small scale fish farmers

In performing their fish farming practices, small scale fish farmers in Indonesia face many and harsh obstacles. In this research these obstacles are divided into constraints and problems. Most research do not distinguish between constraints and problems and instead use either name for the same circumstances. In this research constraints and problems are separated to distinguish different situations. Ask Oxford (2008), defined a
constraint as “a limitation or restriction or stiffness of manner and inhibition” and a problem is defined as “an unwelcome or harmful matter needing to be dealt with”.

The above definition shows that constraint is characterised as a person’s limits and is viewed as an internal restriction. On the other hand, according to the Oxford dictionary a problem is viewed as an external obstruction that creates difficult conditions for a person with which to deal. Therefore, in this research constraint is associated with internal matters and problems to external issues.

Research has identified some constraints and problems faced by fish farmers, as described next. However, since no distinctions were made between constraints and problems, the following obstructions are not defined specifically as constraints and problems. Rather, the classification of specific obstructions as either constraints or problems was made according to the results of the exploratory factor analysis in Chapter 5.

2.5.1 Lack of start up capital

Lack of start up capital is a common constraint for many small scale farmers around the world (Awulachew et al. 2008; Das 2006). Most small scale fish farmers in Central Java came from lower income families with limited funds for business start-up. The lack of start-up capital often forces small scale fish farmers into minimising their budgets, with the result that they end up using only the simplest equipment they can afford. This sometimes then also means that the outcomes of the fish farming process is also minimised. For example, a good water circulation system is necessary to obtain the optimum performance of a fish pond, however, due to the lack of capital, the minimum requirements of a good water circulation system are not met. The consequences may be that waste is accumulated in the process which reduces the survival rate of fish. This will lead to even lower income and lower product sustainability.

The lack of start up capital is also linked to the priorities given to cash expenditures. Many small scale fish farmers are forced to save their money for more important family matters such as school fees and health services (FAO 2009). This creates a dilemma for small scale fish farmers in setting their priorities for financial expenses: they have to decide whether to invest in their
business or save for unexpected family circumstances. To complicate matters, many small scale fish businesses do not keep records of their expenses and rarely separate between family and business transactions (Honig 1998). This has made it more difficult to determine whether they have had a return on capital invested.

2.5.2 Lack of technical abilities

A technical ability to rear fish is one of the most important requirements of fish farmers. In spite of the potential of a fish farming business, if the fish farmer has limited technical skills, then the potential for a fish harvest failure is high (Mkoka 2007). This technical ability may be developed in several ways, such as from the family (many fish farmers inherit their fish farming business from their parents or relatives), from neighbours, or from training delivered by government or other agencies.

2.5.3 Lack of family support

Family, as a person’s closest community contact, has a large influence on a person’s ability to manage a business (Basu 1998). Research has found a positive correlation between the importance of family and running a business (Verheul, Van Stel & Thurik 2006). There are two positive impacts between self-employed people and their families. A supportive family will encourage their family members in running the business, including giving them financial and moral support. Secondly, a person who runs their own business can be flexible about their working hours and can also work from home. Conversely, a non-supportive family environment may discourage or even obstruct a person in running their business. This was a finding by Loscocco et al. (1991) who also believed that a lack of family support will disadvantage small business owner, since they do not have emotional support from their family to manage their business.

2.5.4 Lack of federal and regional government support

Indonesia’s wide geographical position may be contributing to a lack of support from federal and regional government. Indonesia consists of thousands of large and small islands that are spread widely across the nation. This creates
difficulties at the federal and national governmental levels to control and support every region. Furthermore, some of the fish farmer communities are located in isolated and hard to reach areas which make it even more difficult to support their development. This lack of access to farms in “hard to reach places” may have been the reason why some fish farmers interviewed by Kristiansen (2002) complained that the Indonesian government was not providing them with support for their businesses. Nonetheless, irrespective of the reason, lack of government support creates problems for the small scale fish farmers (Das 2006).

It is important that government supports small scale business. If a government can support entrepreneurial behaviours, it can encourage and increase the development of businesses (Willis, cited in Morris & Lewis 1995). An example of the Indonesian government’s support is the development of the small farmers development programs (SFDP) (Panjaitan-Drioadisuryo & Cloud 1999). This is a financial credit program from the Bank of the Republic of Indonesia (BRI) supported with training programs. The program of training consists of essential guidance needed to manage a business. The small scale farmers are taught how to lead a business, how to start a business, how to find and evaluate the market, and how to manage the business. The Indonesian government developed this program with the support from BRI as well as international institutions such as FAO and IFAD. The targets groups of this program meet the following conditions: they have the same economic interests, they know each other, they are able to get along well, and they are able to cooperate and to support each other. The impact of the Small Farmer Development Program (SFDP) has been very satisfying. Some of the reported positive affects of the program are:

1. The majority of participants have been able to increase their household income. Some have even been able to help members of their family to create new job opportunities.

2. The members are more independent in managing their business. They are also more open to discuss family issues and to share their decisions with other family members.

3. Their increased income has helped them to increase the quality and quantity of their family’s nutritional provisions.
4. Inspired their views on their children’s education. The majority of members now wish for their children to go to college and have a higher education. (Panjaitan-Drioadisuryo & Cloud 1999)

The results show that a supportive government can have positive and helpful impacts on the establishment of successful small farming businesses.

2.5.5 Lack of training provided by local government

Aquaculture training is an important element in boosting the technical abilities of small scale fish farmers. Some fish farmers may be fortunate to have been taught technical skills by their relatives or neighbours. Fish farmers without relatives or neighbours willing to teach fish farming technical skills may need to obtain their skills from the training provided by local government. However, not every local government has training programs for the small scale fish farmers due to a lack of financial resources (De La Cotera 2001).

2.5.6 Lack of fish farming experience and knowledge

Most fish farmers in Indonesia are small scale businesses run by farmers with low levels of education. Some of these fish farmer may have past fish farming experience obtained from working with their parents or neighbours but most of them have no institutionally delivered fish farming education. Some may have gained knowledge from governmental training programs that they then applied through trial and error. The lack of knowledge, skills, and experience act as constraints for small scale fish farmers (Das 2006). Not only are these constraints on how to cultivate fish, or on how much, what, and when to feed, but also equally important on how to prepare and manage their ponds and how to combine fish species (Nam & Thuok 1999). Fish farmers with more years’ experience will have accumulated more knowledge and skills on how to successfully cultivate fish and earn more income. This is backed up by research that has shown that longer experience will result in higher earnings (Robinson & Sexton 1994).
2.5.7 Lack of potential market

Lack of potential markets may be a problem faced by fish farmers who are located far from market sites. Fish farmers with long established businesses usually already have steady customers and steady markets and may not consider access to markets as a problem.

Anecdotal interviews with Central Java local fish farmers found that they did not have market problems: they reported that no matter how much they produced, they can always find markets since they cannot even fulfill local market demand of fish. This may be the situation with the low production small scale fish farmers who may not want to expand their businesses. Nevertheless, lack of potential markets is considered one of the critical factors (Sukadi 2006) for most entrepreneurial small scale fish farmers as it may limit their ability to expand their business.

2.5.8 Low selling price

For many small scale fish farmers, low sales prices are closely associated with their inability to secure sufficient loans. Sales prices become a problem when the inability to secure loans forces them to find other loans from money lenders (Kinseng 2005). In Indonesia, a money lender is someone who lends money to small farmers at times when they cannot borrow elsewhere. The money lenders charge fish farmers very high interest rates and force the farmers to sell their produce to them at very low prices (Effendi 2008). Many money lenders operate during difficult times for the fish farmers such as when their harvests fail or when they have urgent financial needs.

2.5.9 Low profits

The role of money lenders (as discussed above) also affect how much profit the small scale fish farmer can receive. Since they are forced to sell their produce at very low prices, the fish farmers earn very low profits. If this situation is prolonged, it is likely that the small scale fish farmers may have to go out of business since they can not maintain the positive cash flow of their business.

Small scale fish farmers who wish to expand their businesses need to increase their working capital. This investment for expansion will include not only
additional operational costs, but may also include investments in new tools and equipment. This will result in higher production costs, and if it is not accompanied by an increase in the sales price, will result in lower profit margins (Zainal 1998).

2.5.10 Low quality and quantity of fish seed

Fish seed shortages are a common problem in Central Java. Most fish farmers obtain their fish seed from outside their local regions which raises their operational costs. These seed shortages are due to the limited number of fish hatcheries that operate in the region (Akpaniteaku, Weimin, & Xinhua 2005). In addition, Mantau, Rawung, & Sudarty (2004) gave a similar account of the shortage of fish seed supplies. This limitation does not only refer to the quantity but also the quality of fish seed. Most of the time fish seed cannot be obtained at the time of production or hatcheries are too far from the area of operation. This situation led to higher operation costs for fish farming businesses (FAO 2009).

2.5.11 Low quality and quantity of fish feed

Fish feed and fish nutrition is one of many important factors in the success of a sustainable aquaculture system (Hasan 2001). The focus of many aquaculture researchers is to develop good quality fish feed formulas that will result in perfect fish maturation while maintaining fish quality.

The quality and quantity of fish feed is still a problem for many small scale fish farmers (Bueno 1999). With limited available cash, they attempt to minimise their expenditure on the good quality fish feed. Instead of the good formulas, farmers may use commercial feed with very simple formulas or they will produce their own fish feed with locally available ingredients (Djunaidah 1992).

2.5.12 Poor financial management skills

The ability to manage cash flow is one of the skills of successful business management. However, many small scale fish farmers have limited cash flow management skills. Their small amounts of money have to be divided between business investments and family support (such as meeting their children’s’ educational and health expenses). Their limited financial management skills were listed as one of the four major problems faced by small business owners;
the other constraints include marketing, accounting and stock control (Theng & Boon 1996).

2.5.13 Poor quality control

Another weakness for small scale fish farmers is the inability to control the quality of their produce. In order to keep cash flow going, fish farmers need to sell their fish harvest as soon as possible. This has meant that fish farmers tended to ignore fish quality. Aquaculture is different from many other manufacturing companies. In aquaculture, cash flow cannot be revolved in a short time. Fish need time to reach maturity and hence it takes a few months before fish farmers can sell their harvest. Within the few months of fish rearing, fish farmers continue to require money for their own needs. This may be one of the dilemmas faced by small scale fish farmers, where working capital needs to be calculated ahead for several months to keep the business operational.

Poor quality control is one of the challenges for Indonesia in achieving sustainable aquaculture (Sukadi 2006). According to Sukadi, the other challenging aspects include fish seed quality, better maturation systems, marketing, environmental issues, and fish parasite and disease problems.

2.5.14 Low ability to handle fish disease and parasite problems

Fish parasite and disease breakouts are a major problem. Without adequate knowledge of fish diseases and parasites, many small scale fish farmers are unable to manage outbreaks in their fish ponds. Most fish farmers will ask for assistance from the government on how to identify and manage diseases or parasites.

A low ability in managing fish diseases and parasites results in low fish survival rates and can even result in total mortality of the fish life in the pond. That is why fish disease and parasite management is considered a critical factor in achieving a sustainable aquaculture in Indonesia (Sukadi 2006).
2.5.15 Poor water quality

There have been significant developments in the global aquaculture industry that have attracted many new investors to the aquaculture industry. This phenomenon has introduced new side effects because the increased aquaculture production has not been accompanied by environmental sustainability (Elfitasari 2006). This has led to environmental degradation and poor water quality for the aquaculture industry (ADB 2006).

In aquaculture, poor water quality means poor quality fish habitat and limited opportunity for fish to grow to the desired quality. Poor water quality also means that there is a low probability for achieving product sustainability due to the unsustainable environment.

2.5.16 Inability to secure sufficient loans

The inability to secure sufficient loans is one of the most common problems in developing countries: applying for a loan requires a well prepared financial plan but many small scale fish farmers did not develop a well thought out and organised financial plan (Nam & Thuok 1999). This is because of the complexity of developing a financial plan for small scale fish farmers; their financial plans require that the operational cash flows have to be carefully calculated to accommodate the long fish maturation cycle before profits can be earned at harvesting time. For this reason many fish farmers in Central Java prefer to cultivate fish with short time to harvest such as tilapia, carp, and catfish.

From the money lender’s point of view, lending to small scale businesses is a high risk activity due to the high operational costs and low repayment rates (Panjaitan-Drioadisuryo & Cloud 1999). It has been observed that women are better at repaying loans than men and so the Bank of the Republic of Indonesia (BRI) launched a program called KUPEDES which targeted small scale businesses especially those owned by women. The program was very successful and many small business owners have been able to increase their standard of living or help other family members create new jobs.
2.6 Endogenous and exogenous factors affecting small scale fish farmers

In undertaking their activities, there are several factors that support entrepreneurs in successfully achieving their goals. There are two types of factors that influence the entrepreneurial process outcome (Bouchikhi 1993). The first type consists of those factors that arise from within the individual (endogenous factors) and the second type consists of those factors that arise externally to the person (exogenous factors). Many different definitions of endogenous and exogenous factors were found in the research; definitions depended on how the endogenous and exogenous factors were viewed. Bouchiki (1993) believed that endogenous factors are those within the entrepreneur, whereas Ploeg and Long (1994) described endogenous factors as local potential that include local ecology or local environmental strengths. In order to objectively explain the endogenous and exogenous factors, this section will identify and discuss all factors identified without specifying whether they were classified as endogenous or exogenous factors (see sections 2.6.1 to 2.6.15 below). The groupings of these factors for this research were determined through exploratory factor analysis reported in Chapter 5.

Figure 2.4 shows that here are two business outcome possibilities namely success and failure. Bouchiki (1993) believed that two areas influenced the success or failure of business: the entrepreneur’s personality and behaviour (the endogenous factors), and the constraining and facilitating environment (the exogenous factors). The exogenous factors either supported or obstructed the business. Bouchiki identified chance as another intermediate factor that influenced the success or failure of a business. He believed that “chance may be present in all stages of an entrepreneurial process. It does not operate only as an opportunity. Sometimes, chance events may destroy decades of work” (Bouchiki 1993, p. 566). Just like the endogenous and exogenous factors, chance can also be supportive as well as destructive.
2.6.1 Quantum of knowledge

Knowledge is a basic requirement for any business. In starting a new business, no matter how small, entrepreneurs would generally have at least some product knowledge. Small-scale fish farmers in Indonesia usually have initial aquaculture knowledge before they set up their fish farms. This aquaculture knowledge could have been obtained from family, friends, government, or other institutions.

2.6.2 Mastery of fish farming skills

Similarly to aquaculture knowledge, fish farming skills can also be developed by working with family, friends, government, or other institutions. Skills are more advanced than knowledge as it represents the actual implementation of fish farming. Having aquaculture skill, means that the farmers have the ability to implement all fish farming activities including fish feeding, seedling, maturing,
harvesting, as well as the ability to deal with problems associated with fish disease and parasites, water quality, and feed quality.

2.6.3 Length of experience

Aquaculture experience usually comes from the application of skills and knowledge over a period of time. The greater the person’s experience the higher their levels of skill and the wider their domains of knowledge. Experience is defined as the number of years an individual has worked in the fish farming industry. As observed by Lee and Tsang (2001), half of the important success factors arise from within the entrepreneur and experience is one of these. Experience can be grouped according to three classes: entrepreneurial, managerial, and industrial experience. Industrial experience was found to be positively associated with business performance. Business growth and performance was found to depend on experience and relevant experience is compulsory for entrepreneurs prior to starting their own business (Lee & Tsang 2001).

2.6.4 Level of education

Some fish farmers may have received fish farming education. This can be through formal or informal education. Formal education includes any type of attendance based education such as at High Schools, Academies, or Universities, whereas informal education may include training or taking part in aquaculture projects.

Since education has become an “essential quality” for entrepreneurs (Lee & Tsang 2001), it is believed that education will play a big role and will be positively associated with successful businesses. Furthermore, education is important because it prepares a person with essential skills to manage a business. In developing countries improvement of the educational systems has become one of the top future strategic priorities. As pointed out by Ramphele (2003), without a strong educational system, developing countries will not be able to achieve prosperity.
2.6.5 Entrepreneurial characteristics and personality

Many opinions have been put forward regarding entrepreneurial characteristics. Successful entrepreneurs have been identified as having the ability to take risks, to innovate, to have marketing skills, being able to identify business opportunities, and being able to correct errors in an effective way (Littunen 2000).

Many other entrepreneurial characteristics have also been proposed, but there is one basic characteristic that is essential for entrepreneurs: the willingness to take risks. However, the willingness to take risk should be accompanied by calculated planning. Someone who takes risks without careful calculation is known as a foolish person, while someone who plans too much but cannot take risk is a doubtful person (Susilowati 2005). This calculation ability includes conducting sufficient planning prior to forming a business.

Lichtkoppler (1993) prescribes four steps that should be taken to establish a successful aquaculture business. The first step is getting to know how the aquaculture industry works. As much as possible essential information, techniques, and methodologies should be gathered through attending workshops, seminars, and training sessions provided by institutions or government. The second step is to evaluate the availability of essential capital requirements such as human, financial, and natural capital, which includes land, water, and fish capital. The third step is to plan the business. Planning is important as it ensures the entrepreneur prepares an operational strategy, considers the possible risks that may arise, and identify strategies to avoid. Planning is also essential for obtaining financial loans. The last step should be to test the plan on a small scale to see if the entrepreneur can cope and whether the planned strategy works before deciding to make the commitment on a larger scale.

2.6.6 Reasons for going into business

A person can choose to have an unemployed, paid-employment, or self-employment status (Watson, Hogarth-Scott & Wilson 1998), and, at some stage, a person will change from one status to another. With high unemployment rates,
an unemployed person will be forced to choose between being self-employed or remaining unemployed.

There are many reasons why people decide to become self-employed or to become an entrepreneur. Some reasons can be called push factors, where someone is forced to be an entrepreneur because of reasons such as being unable to find a suitable job or being made redundant. Other reasons can be called pull factors, where a person is naturally attracted to becoming an entrepreneur either simply because they have the financial resources to do so, or they have other psychological or sociological reasons such as being attracted to the possibility of personal independence (Basu 1998; Watson, Hogarth-Scott & Wilson 1998).

2.6.7 Length of personal business experience

Evidence has been found of a positive correlation between the business’ performance and the entrepreneur’s experience (Lee & Tsang 2001). The length of personal business experience has a large impact on the success or failure of an entrepreneur’s performance in running their business: the longer an entrepreneur’s business experience the greater the benefits to the business. Entrepreneurs who have been in business for longer periods of time would have gained more technical and managerial knowledge, experience, and skills compared to those entrepreneurs who have just ventured into business. Entrepreneurs have also had a chance to develop more business contacts which were useful in business expansion (Lee & Tsang 2001).

2.6.8 Family business experience

Family background plays a major role in the development of entrepreneurial behaviour of an individual (Morris 1995). Furthermore, an entrepreneur with a family business background is more likely to be prepared for the unexpected. This suggests that if a person has previously been exposed to business, has experience running a business, and an understanding of business consequences, they will be more aware and ready should they have experience business downturns. This suggestion is supported by Brown (1990) findings that students who were interested in owning a business were most likely to have had parents or grandparents who had owned businesses. Similar findings by Scott and
Twomey (1988) established that self employment was preferred by people whose parents were full time business owners. Matthew and Moser (1996) also believed that role models have solid influence on how entrepreneurial a person will become.

A successful family business will influence a person’s decisions to become an entrepreneur (Scott & Twomey 1988; Wang & Wong 2004). Research by Brown (1990) has shown that having an entrepreneurial family background encouraged the children to start their own businesses in the future. In addition to that, experienced families also demonstrated the importance of planning before starting a business. Hiemstra, Van der Kooy, and Frese (2006) established that a key success factor in business was a well planned strategy. They found that most business failure in businesses that did not sufficiently prepare plans prior to formation.

2.6.9 Density of business network

Research emphasised the importance of networking in business. To achieve success in business, entrepreneur did not only focus on internal issues but also created external relations by expanding their industrial networks (Lee & Tsang 2001). In Lee and Tsang’s research, network relations included governments, suppliers, consumers, buyers, neighbours, and institutions, virtually anyone that could support the small-scale fish farmer’s business expansion. The density of business networks played a big role in increasing the opportunities for business expansion. Greater network density meant more personal contacts to help an entrepreneur to expand their business. Other research has also assumed that networking may increase small businesses performance and growth (Havnes & Senneseth 2001).

2.6.10 Start-up financial capital (quantum and sources)

Lack of capital was one of the constraints faced by small scale farmers (Das 2006). There were many cases in Indonesia where small farmers could not freely sell their produce due to the contracts they had with money lenders (Kinseng 2005). Usually farmers had to sell their produce to the money lender at a low
price. This condition is common amongst fish farmers since many poor farmers are unable to secure sufficient loans from the banks or cooperatives.

2.6.11 Family support

Family support contributes to the success of an individual since the family includes the people closest to the person. Entrepreneurial success was influenced by close family and community networks (Basu 1998). Family support also substantially influenced the continuity of the business (Morrison 2000). A family did not only contribute financially but also provided moral support: without a family to support them it was doubtful that an entrepreneur would be able to achieve success in business.

2.6.12 Market demand

A market is the cornerstone of business success. Without a market to sell their products, a business will most likely close down. Before starting a business, a smart entrepreneur will plan everything ahead, including doing research on their markets. Through market research an entrepreneur will not only know the market size, but will also evaluate the strengths and weaknesses of their competitors (Hyde 1997). In addition, adopting a market approach ensures the entrepreneur has excellent contact with customers.

In relation to the aquaculture industry, Lichtkoppler developed questions that fish farmers should answer prior to starting their businesses: “(1) Who is specifically is going to buy my fish? (2) Is there a market for fish that I can supply? (3) At what price can I sell my fish? (4) What is my market risk? (5) How do plan to sell what I produce? (6) Why produce something if I cannot sell it?” (Lichtkoppler 1993, p. 2). It was suggested that these questions had to form part of the planning strategy prepared and evaluated by every business owner. However, small scale fish farmers may have limited capital and access to markets. They might also be unfamiliar with market research and not know how to market their product (De la Cotera 2001).
2.6.13 Infrastructure in the area of operation

Small scale fish farmers require developed infrastructure in their area of operation. Without developed infrastructure, fish farmers, especially those who operate in remote rural areas may not have access to markets or suppliers. It is critical that for their operations, small scale fish farmers can access roads, transport facilities, and receive electricity supply to operate their businesses (Islam 2004). Developed infrastructure will assist them in operating their business with greater ease. If fish farmers do not have access to infrastructure they may not be able to operate their fish farming businesses; they will have limited access to markets to sell their produce, limited access to suppliers for supplies, and without electricity they will not be able to carry out their daily fish farming activities.

2.6.14 Government support

The government plays an important role in the growth of entrepreneurship since it holds authority over the rules of business (Morrison 2005). Besides maintaining the business rules, government also has the power to assist the community, especially to support the poor. Issues have arisen regarding the lack of assistance from the government to poor communities. International funding institutions such as the International Fund Agriculture Development (IFAD) and the Asian Development Bank (ADB) have given financial support directly to Indonesian poor fish farmers and fishermen instead of to the Indonesian government for distribution (Kompas 2002). Kristiansen (2002) reported on his interview with a local fish farmer. The fish farmer complained that the State Fish Seed Centre controlled him and that foreign traders were the ones that had opened his eyes. The fish farmer claimed that he did not trust the government staff who gave him trouble but no support.

Despite such controversial opinions regarding the lack of support from the government, there are also reports about the support that the Indonesian government has given to small scale fish farmers. Detiknet (2005) confirmed that the Indonesian government had announced the elimination of the 10 per cent fishery tax to boost exports and to stimulate investment. Their hope was
that the policy would increase fisheries’ production in Indonesia and help poor fish farmers to find more markets.

Since realising the huge potential of aquaculture the Indonesian government has increased their assistance to the fish farmers in Central Java. The government is now providing support through various means described next.

**Providing soft loans from the bank**

The Department of Marine Affairs and Fisheries have made cooperative arrangements with an Indonesian Bank to give soft loans to fish farmers in Indonesia (Bernas 2003). This soft loan arrangement was established to support fish farmers to develop their businesses. It is expected that with loans like these fish farmers will be able to increase their prosperity.

**Providing capital support**

The Indonesian government is not only providing seed subsidies but is also providing capital support to fish farmers through their FFGs. Rokanhilir (2008) reported that the government had given as much as Rp 194.5 million capital support for FFGs. The report goes on to explain that the objective of the capital support was to motivate the FFGs to develop their businesses and indirectly to increase their productivity. The capital support given to the FFGs, according to the report, was in the form of a complete fish feed producing machine which allowed FFGs to produce their own fish feed. Antaranews (2007) reported that the President of the Republic of Indonesia has given FFGs in Central Java supporting capital of around Rp 600 million to build irrigation for FFG fish ponds. Saragih (2000) reported that the government has given capital support to FFGs to motivate FFGs to develop themselves and become the center of fish production in the area.

**Providing technical and managerial training**

The local and regional governments often provide training programs to FFG members. Training material include not only technical materials, but also managerial content to support FFG members in running their businesses. Usually local government offices prepare annual training schedules specifically
for fish farmers and the fees for this training come from the APBD/APBN (Regional Budget and State Budget).

Providing fish disease and parasite management support

FFG members receive assistance from the government during fish disease or parasite outbreaks. Suara Merdeka (2002) reported that FFGs in Central Java received around Rp 500 million support from the government in the form of antibiotic vaccine, vitamins, and clinical laboratory tools for the local fisheries’ officer to monitor the outbreak and from spreading of diseases. The report further explains that the government has also assisted with fish disease and parasite outbreak management by building fish clinics in Magelang, Central Java.

Providing subsidies

The government has shown their concern for small scale fish farmer in Indonesia by giving them subsidies. In 2007, the Indonesian President gave about Rp 2.5 million fish seed subsidies to FFGs in Central Java who had shown significant growth in production and have demonstrated innovative undertakings (Antaranews 2007). Suara Merdeka (2007a) also reported that the Fisheries and Marine Affairs Office has given seed subsidies to FFG members in order to support their fish farming businesses. The fish farmers were reportedly very happy with the fish seed subsidies since they had experienced difficulty in obtaining good quality fish seed.

Encouraging the formation of FFGs

The government is encouraging fish farmers to form FFGs in their villages. The objective is to unite fish farmers who conduct similar practices, who reside in the same area, and who have similar views and goals (Semarang Marine Affairs and Fisheries Office 2005). It is expected that raising fish farmers’ awareness will encourage them to make the first move in forming a FFG in their village. Further objectives of encouraging FFG formation were to improve the fish farmer family’s standard of living and to increase the opportunities for self development available to fish farmers.
2.6.15 Other institutional support

In addition to the support from the Indonesian government to fish farmers, other agencies, such as international organisations and domestic institutions, are also making available support. Some of the more active agencies who conduct projects to help fish farmers in Central Java are:

- Asian Development Bank (ADB) mainly provides loans or technical assistance for aquaculture development in Indonesia (ADB 2008).

- Food and Agriculture Organisation of the United Nation (FAO) actively carry out campaigns and give support to fish farmers to implement responsible fisheries through their Fish Code and fish farm partnerships (FAO 2008). They mainly give technical support and carry out projects in Central Java.

- Australian Centre for International Agricultural Research (ACIAR) carries out research projects to overcome aquaculture problems in Indonesia, specifically in shrimp farming (Martin 2008).

- International universities, such as the University of Sydney in cooperation with ACIAR, carry out projects in Central Java. They assist small scale shrimp farmers to produce shrimp of a good quality standard for both export and domestic markets. (ACIAR 2008).

- Many local universities fund research projects and civil service programs for fish farmers. This includes developing technical skills.

2.7 Income and income improvement

Income improvement is a crucial consideration in decreasing the level of poverty in developing countries. Fish farmers in most parts of Indonesia are small scale and have limited capital to run their businesses. They also have limited avenues through which to upgrade their businesses. The Indonesian Constitution No. 9/1995 defined small-scale businesses as having the following characteristics:

- A productive business owned by Indonesian citizens and formed with or without legal status.

- Is not affiliated with or a branch of a middle or large scale business.
• Possesses assets of no more than Rp 200 million, not including land and building, or, has maximum annual revenue of Rp 1 billion.

According to the Department of Marine Affairs and Fisheries (2005), almost 80 per cent of fish farmers in Indonesia are people with low levels of education. Susilowati (2005) explained that generally people with low levels of education did not have inspiration and aspiration, and therefore that they did not have the motivation to change their lives. Contrary to this it has also been argued that higher levels of education did not guarantee success in business, although to some extent it did play a role. For example, higher education may give a person a chance to expand networks as well as expand their knowledge, but, at the end of the day, it is up to the person to use their large networks and knowledge to benefit their business. In some cases, it has also been recognised that knowledge is not the only key to successful business. There have been other arguments presented on the extent to which education affects entrepreneurs in creating successful businesses.

Lee and Tsang (2001) observed that education was vital in establishing successful entrepreneurs in the increasingly complex global business environment. The information from the Department of Marine Affairs and Fisheries (2005) showed that since almost 80 percent of Indonesian fish farmers do not complete their primary school education it significantly affected the way these fish farmer think and manage their business. Although much research has been conducted in the fisheries industry, only people with higher levels of education can understand and gain benefit from such information. Flor explained that many people can use information, including farmers, except those with lower income (Flor 2005). In other words such information can only benefit those that have sufficient intellect, since “poor farmers” are normally assumed to have lower levels of intellect.

Bolt (2005) established a conceptual framework of the influences on farmers’ income. This framework links micro, meso and macro factors. Macro factors like producers, consumers, and the economy (e.g., interest rates and trade policies), and meso factors (e.g., infrastructure, institutions, and incentives) facilitated as well as constrained farmers. Macro and meso factors were both out of the farmer’s control and the influences that they had on the farmer’s income.
Based on Bolt’s framework, and together with farmers’ capital, the meso and macro factors are important factors that effect farmers’ income improvement. Governments, both federal and local, to a great extent determine the macro and meso factors and are therefore an essential part in improving farmers’ income through their policies and support. The Indonesian government still needed to give their full support to lower income communities with an official declaration in their five-year development plan (Booth 1993).

2.7.1 Current status of Indonesian small scale fish farmers’ income

The small scale fish farmers’ income improvement is important if they are to expand their businesses and at the same time enhance their families’ welfare. Improvement in the small scale fish farmers’ family welfare means that their families have better access to health and educational services. This will lead to better life for their descendents in the future. Unfortunately, this has not yet a reality for many fish farmers in Central Java: many have indicated that fish farming is a promising source of income but it is only enough to meet their daily needs. Many may not have enough capital to expand their business. However, this is a reflection of how individuals manage their financial situations because some fish farmers with limited income are able to use their profits to meet their family needs as well as expand their businesses.

2.7.2 Importance of income improvement for small scale fish farmers in Indonesia

The ability of fish farmers to improve their income will also mean an ability to improve their levels of business since they will have a larger amount of capital to run their businesses. Growth in income is an important aspect for all businesses; while larger companies may have growth planned right from the start, smaller family businesses or micro scale businesses may have not done so at all.

Many aquaculture projects are aimed at increasing fish farmers’ income in Indonesia. It is believed that income improvement will bring many benefits to fish farmers. For example, they will have more capital to expand their businesses and more income for their own family expenses (such as health and education).
2.8 Product sustainability

Despite the large increase in global aquaculture production, unsustainable aquaculture has led to a negative view of aquaculture since the practices may have caused environmental degradation. Science Daily (1998) reported that instead of resolving problems, the fish farming practices of some species of fish were causing problems. Salmon and shrimp farming was mentioned as causing fish depletion, environmental disruption because of excess fish feed and pesticides, and consuming more fish for fish feed. Examples such as this will damage the image of aquaculture as “the solution of overfishing” and will cause unsustainable aquaculture in the future. It is crucially important that fish farmers adopt sustainable aquaculture practices.

2.8.1 Definition and importance of product sustainability

Sustainability has been viewed from many perspectives by past researchers. Pezzey (1992) defined sustainability as the ability to maintain the needs of human beings over a long period of time by using various interdisciplinary ideas to sustain industrial civilisation. Be (1994) quoted the definition of sustainability from the World Commission on Environment and Development—WCED (1987)—as the ability to meet the current generation’s needs without disturbing the needs of future generations. Based on past research product sustainability can be defined as the ability to continuously provide a product over a long period of time.

Sustainability as described by Caffey et al. (1998), referred to in Wurts (2000), and by Phillips et al. (2001), referred to in McCausland et al. (2005), was categorised according to three types: social, economic, and environment sustainability. Social sustainability highlights the social aspects, for instance local concerns about employment and ownership. For example, the rapid rise in the aquaculture industry in the last decades has resulted in the rise of employment rates. In fact, according to McCausland et al. (2005), aquaculture was the only subdivision in the fisheries industry to achieve increases in working opportunities. The second type focuses on economic aspects such as market demand and profitability, which are important factors in achieving revenue growth. The third type, environmental sustainability, focuses on environmental concerns such as water and soil quality. McCausland et al. (2005)
highlighted concerns about the relationship between environmental and social aspects: environmental degradation may well cause unsustainable aquaculture which could lead to job losses.

Similar definitions of sustainability were put forward by Caffey, Kazmierczak, and Avault (2001) who categorised sustainability into economic, biological, and socio-cultural types. These three types are believed to be the main source of achieving sustainability and are depicted in figure 2.5. From these three discipline, Beveridge, Phillips and Macintosh (1997) have stated that the most important factor that can no longer be ignored is the environmental discipline. They reasoned that the environmental discipline may well be the key to ensuring the socio-cultural and economic concerns since without a sustained environment the sustainability of the other disciplines may be threatened.

**Figure 2.5 Sustainability as the intersection of three discipline: ecology, economy, and sociology**

![Figure 2.5](image)


The research carried out by Caffey, Kazmierczak and Avault (2001) examined sustainability from a business and aquaculture perspective. Sustainable aquaculture is very important in the future fulfillment of fishery demand (Alder et al. 1996, Boyd 1999; Hopkins 1996). People have in the past made improvements in many industrial areas, including fisheries; however, some efficiency improvements may have included unforeseen side affects that caused new problems. For example, environmental degradation has emerged as a consequence of chemical use in farming (Hopkins 1996). High demand for
certain products have also been known to degrade environmental conditions. During the 1970s when world demand for shrimp was increasing rapidly, many investors were encouraged to invest in shrimp cultivation. This led to land clearing for shrimp cultivation through the removal of some mangrove forests. Unfortunately, this expansion was not environmentally sustainable and resulted in rapid environmental degradation (Elfitasari 2006). Failure to move swiftly to overcome these problems will have direct consequences for aquaculture product sustainability in the future.

Many aspects are involved in achieving aquaculture product sustainability. Caffey, Kazmierczak, and Avault (2001) named four stakeholders in aquaculture: producer, researcher, government, and other institutions. In this research, the focus was on the first group—the producers—the small scale fish farmers who directly produce and carry out the fish farming activities.

2.8.2 Aquaculture product sustainability in Indonesia

Many steps have been taken to obtain aquaculture sustainability in Indonesia, however there was still a long way to go before achieving sustainability since the aquaculture industry was dominated by small scale fish farmers. Therefore, strong action is needed to empower small scale fish farmers to use sustainable aquaculture practices (Sukadi 2006).

Some of the steps required as recommended by Sukadi (2006) to empower small scale fish farmers are:

1. Provide information that empowers small scale fish farmers about the importance and requirements of aquaculture product quality that meet regulator and consumer demands.

2. Empower small scale fish farmers to use and produce good quality fish seed and fish feed.

3. Empower small scale fish farmers to implement sustainable fish farming techniques and management practices that support environmental preservation.
4. Improve small scale fish farmers’ production and marketing activities.

5. Improve small scale fish farmers’ production and income in a more responsible, effective and efficient way.

2.8.3 Obstructions in sustainable aquaculture practices

There are many obstructions encountered by the Indonesian government in their attempt to implement sustainable aquaculture practices. The most frequently mentioned problems in achieving sustainable aquaculture are as follows.

a. The frequent occurrence of fish diseases and parasites in fish stocks

Disease outbreak in fish farming is known for its enormous impact on fish products. Since fish stocks share the same environment, when a disease outbreak occurs, it is already too late to save the other fish, and often the result is total mortality of the affected fish stocks.

Based on this experience, the shrimp farmers in Lampung, South Sumatra, have changed their strategy from disease treatment to disease prevention (Sukadi 2006). They took several preventative measures to minimise the possibility of disease outbreak and the introduction of parasites into their fish stocks. The preventative measures included maintenance of water quality (including positioning a filter devise at the inlet pipe), developing bio-security fences, and obtaining high quality fish feed and fish seed.

b. The frequent use of by catch fish as fish feed

One of the causes of the depletion of a number of wild fish stocks was the high volumes of by catch products. Although fishing has had a large direct impact on decreasing the numbers of wild fish, the volumes of by catch have also had a high impact; the by catch figures are often not reported (Tidwell & Allan 2001). Furthermore, it has been estimated that in some areas in the Gulf of Mexico, that the by catch are higher than the main species targeted. It was found that of the total catch the accidental by catch was almost four times the intended shrimp catch.
In Indonesia, although by catch feed are not always available, it is used by many marine water fish farmers. There has been continuing fears and reports that this by catch may be the cause of the decreasing stocks of demersal fish in the Malaka straits (Sumiono cited in Sukadi 2006).

To minimise the depletion of wild fish stocks as a consequence of by catch feeding, the usage of commercial feed in the aquaculture industry has been recommended.

c. The use of chemicals in aquaculture

Chemicals are in common use in aquaculture to enhance the pond soil and water quality as well as to control phytoplankton bloom and fish disease or parasites in fish ponds (Boyd & Massaut 1999). The Indonesian government realised the harm that may be caused by chemicals used in aquaculture and issued a prohibition on the usage of chemicals. As reported by Sukadi: “Chapter 8 Indonesian Act No. 31/2004: Owner of aquaculture farm, representative of the owner, and/or responsible person who run aquaculture business is not allowed to use chemicals, biological agents, explosive materials, equipments and/or methods and/or constructions which may be harmful and/or threatening the sustainability of fish resources and/or its environments of fisheries management area in the republic of Indonesia.” (Sukadi 2006, p. 5) To enforce this act, a monitoring program is carried out in Indonesia to control the use of chemicals in fish farming, and also to check for the introduction of possible trace heavy metals in molluscs or mussel cultures.

Some research has established the use of bio catalyzation in fish farming as substitute for the use of chemicals in fish farming (Simbolon & Juyana 2007). This technique uses plankton feeder fish in integrated fish farming with shrimp cultures called a poly-culture system. The fish feed on the phytoplankton that grow in the shrimp pond eliminates the need for chemicals to control phytoplankton blooms. Another positive effect of this method is additional income from the harvest of the plankton feeder fish itself.
d. The lack of infrastructure in remote areas

Lack of infrastructure in remote areas such as roads, electricity, and irrigation channels are hindering efficiency increases in fish farming (Sukadi 2006). The lack of infrastructure makes selling products, obtaining supplies, and even attending training at local fisheries offices difficult. Without well developed infrastructure in fish farming areas it is difficult to achieve sustainable aquaculture.

e. The availability of good quality fish seed

Fish seed production controls are necessary to maintain good quality fish seed. To facilitate fish farmers in obtaining good quality fish seed, Sukadi (2006) made the following development recommendations:

1. Development of controlled brood stock centers. These centers are developed to multiply brood stocks and distribute them to hatcheries. The brood stock center for shrimp is located in Java, Sulawesi, and Sumatra, while Tilapia brood stock center is located in Java, Sulawesi and Kalimantan. Other specific brood stock center such as carps, prawns, seaweed etc. are developed in several area across Indonesia.

2. Development of backyard hatcheries. These hatcheries are usually small scale and produces milkfish, grouper, shrimp and prawns. Most are located in coastal areas in Indonesia to support mariculture development.

3. Introduction of new species that can be developed in Indonesia. One of the new species and now widely cultured, is freshwater lobster *Cherax*, which originated from Australia.

4. Development of fish seed certification programs, established in 2004, to guarantee the quality of seed produced by hatcheries.

f. The availability of good quality fish feed

One of the problems that hinder the availability of good quality fish feed is the use of imported ingredients. Imported ingredients lead to high production costs and lower profit margins (Sukadi 2006). To minimise the use of imported ingredients several solutions have been put forward:

- Encouraging the use of local ingredients rather than imported ones.
• Encouraging the use of agricultural waste and products as substitutes for commercial fish feed.

• Improving feed composition without decreasing its nutritional value.

2.9 Conclusion

Many factors support small scale fish farmers’ entrepreneurial activities in deriving their income improvement and ensuring their product sustainability. The entrepreneurial activities that have already been implemented in Central Java according to research were identified as, but not limited to, fish feed production, fish seed production, fish species extension, product range extension, utilisation of other fish parts, and market extension.

In carrying out their fish farming activities, small scale fish farmers in Central Java face problems and constraints that hamper their activities. Sixteen constraints and problems were identified in this research.

Factors that influence the small scale fish farmers in carrying out these activities can be divided into two categories: endogenous factors and exogenous factors. Endogenous factors are controllable since they arise from within the person, whereas exogenous factors are uncontrollable since they appear in the person’s environment. Eight endogenous factors have been identified such as fish farming knowledge and skills, levels of education, experience, and entrepreneurial characteristics. Six exogenous factors have been identified including business networks, financial capital, family support, and market.

Income improvement is an important factor for small scale fish farmers. It acts as a tool for business expansion but also serves as a device to fulfill the needs of their families.

Product sustainability can be achieved through practicing sustainable aquaculture. Indonesia still faces obstacles in implementing sustainable aquaculture such as fish diseases and parasites, the use of by-catch as fish feed, the use of chemicals, a lack of infrastructure, and the unavailability of good quality fish seed and fish feed.
Chapter 3

The Aquaculture Industry

3.1 Introduction

The aquaculture industry has been growing over the past decade and the growth in fish trade has exceeded the production of traditional crops in many developing countries. One reason for this growth is the declining global fish catch (Hanneson 2002). Another reason is that over the last 30 years fish consumption has doubled. Sukadi (2006) stated that aquaculture has been acknowledged as the fastest growing food sector in the world. These facts confirm that aquaculture is now globally accepted as the fastest growing sector and that it has great prospects for further growth. Development of aquaculture will help reduce the huge strain on the global fish catch and will create new job opportunities (Yusuf, Pahlevi & Tambunan 1995). At the same time aquaculture generates income and employment, decreases the pressure on the dwindling wild catch, and supports food security in countries (FAO 2008).

Indonesia has a large population; in Central Java alone the population reached 30 million people in 2003. Around 400,000 people or 1.33 per cent of Central Java’s population are employed in the aquaculture industry and most of them work as small-scale fish farmers (Central Java Fisheries and Marine Affairs Office 2005). The topographical advantages of Central Java also favor the development of its fish farming industry. The Indonesian government has recognised this potential and has given their support to the development of this industry. The government support come in many forms such as the establishment of the Indonesian Marine Affairs and Fisheries Department in 2000, fish seed subsidies to fish farmer groups, and capital support.

3.2 The development of the world’s aquaculture industry

Fish is a vital source of nutrients to human beings and the downward trend in the wild fish stock has spurred governments and fishermen into action to respond to the problem. Unfortunately one of the solutions has been to invest in more sophisticated tools and technology to locate new fish populations into waters much further and deeper than previously harvested. The consequences are that fish populations are being found more easily, wild fish stocks are being caught much faster, and overfishing are occurring more intensely (Larsen 2005; Tidwell & Allan 2001). Figure 3.1 presents the actual
decline in global fish species since 1950 to the present, with predictions to the year 2050.

**Figure 3.1 Prediction of global seafood species in a century (1950-2050)**

The global seafood species is expected to have collapsed completely in less than half a century if the current levels of fish exploitation stay the same (Black 2006). The graph shows that by the year 2050, 100 per cent of fish species will have collapsed. The introduction of technology such as larger fisheries vessels and more advanced equipment is detrimental to the size of the wild fish stock. In fact, it is accelerating the collapse of the wild seafood stock (Black 2006). In response to the severe depletion of wild fish stock, aquaculture is becoming the favored substitute option and is being developed rapidly by countries all over the world.

Taken together the wild catch and farmed fish world production is on the increase. However, a significant increase in farmed fish only began in the 1980's when it was realised that the wild catch was suffering a major decline and when, in 1980, the practice of trawl fishing was banned (FAO 2008). In spite of many efforts to reduce the size of the wild fish harvest, it is still on the increase. Even with the sharp increases in farmed fish production, it is still far behind the wild fish catch production. This situation is presented in Figure 3.2.
One of the major problems of marine fishing is that although fishermen always target a specific species and size of fish, they often catch more than they intend (Larsen 2005). Most fishermen only target the larger size fish, hoping that the younger and smaller fish will escape through the nets to live and breed. However, the nature of the fishing net during dragging tends to capture all fish species of any size that are around the net at the time. Hence, no matter how careful the fishermen may be, they are unable to accurately target the fish species and size they want to catch with their fishing nets and are unable to avoid catching unwanted marine creatures. They usually end up with a by-catch of smaller sized untargeted fish species. The size of the by-catch can be immense but is frequently not reported (Tidwell & Allan 2001).

An indication of the size of by-catch came from a report of a trawling operation in the Gulf of Mexico that produced an unintended by-catch almost four times that of the intended shrimp catch. This enormous figure helps to explain the significant depletion of global wild fish stocks. Scientists are finally coming to the realisation that it is very important to manage the whole wild fish ecosystem in order to save the wild fish stock (Larsen 2005).
Several solutions have been recommended for adoption to manage the wild fish stock:

- Create marine reserve areas where fishing is banned, completely, to give fish stock the chance to regain their numbers.
- Set a strict limit on fishing quotas.
- Enforce stricter controls over illegal fishing.
- Restrict the use of fishing equipment that is known to be most damaging to fish stocks.
- Develop by-catch reducing equipment to stop unwanted fish harvesting (Larsen 2005).

By implementing the above solutions, it is expected that the depletion of wild fish stock can be slowed down, and perhaps even allow wild fish stock to regain past numbers.

As previously explained, the aquaculture industry has experienced significant growth in the past few decades in response to the depletion of the wild fish harvest. However, Figure 3.3 shows that in spite of the significant increase in aquaculture production, it is remains well below the capture fisheries landings.

Figure 3.3 Contribution of aquaculture to total world fisheries landing (1970 – 2000)

It can be seen in Figure 3.3 that in 2000 aquaculture production was only half as much as the capture fisheries landings. It is hoped that aquaculture production will continue to increase relative to capture fisheries landings in coming years to overcome the decreasing wild fish stock.

The world’s aquaculture production varies according to the types of produce. Aquaculture produces finfish, aquatic plants (e.g., seaweed), molluscs, crustaceans, and others. Compared to other marine produce, finfish is still the favorite product. This is depicted in the pie charts in Figure 3.4, where finfish production has the major share of production.

From the pie charts in Figure 3.4 it can be seen that in 2003 fin fish production accounted for the largest portion of global fisheries production by value and by weight. Aquatic plants production accounted for the second highest portion by weight but the lowest portion in value. This may indicate that even though a greater mass of aquatic plants are produced than molluscs and crustaceans, the value per weight of aquatic plants is below that of molluscs and crustaceans.

Figure 3.4 Projected total world aquaculture production in 2000

3.3 The development of the aquaculture industry in Indonesia

Indonesia is one of the countries in the world with the largest archipelago, consisting of more than 17 thousand islands and 81,000 km of coastline (Dyspriani 2007; FAO 2008). This makes Indonesia a very attractive location for aquaculture development. Aquaculture already plays a significant role in the Indonesian economic improvement with 2.5 million people employed in this industry (ADB 2006). It also provides a source of protein and generates economic income for rural communities (FAO 2008). Nurdjana declared that “[a]quaculture is an important component for Indonesian fisheries which contributes to national food security, income, and employment generation and foreign exchange earnings” (2006, p. 1). This underscores the importance of aquaculture for national economic growth and the necessity to urgently develop the industry in Indonesia.

Indonesia is very fortunate and blessed with geographical and typological conditions ideally suited to aquaculture. Nurdjana (2006) and Dyspriani (2007) explained that with a very extensive coastline of 81,000 km, Indonesia has enormous potential to develop its fish farming industry. Nurdjana (2006) further pointed out that the total potential area available for brackish water aquaculture development is 1,225,000 hectares and the total potential area for freshwater aquaculture is 2,230,500 hectares. With the stable water temperature of the area the fish farming industry is able to operate all year round, and with the large numbers of small islands surrounding the big island they are protected from the dangers of destructive waves. The large human population also provides the aquaculture industry in Indonesia with access to low-cost labour (Nurdjana 2006). For these reasons aquaculture in Indonesia has expanded fast and the favorable conditions have made it easier for Indonesian fish farmers to carry out their fish farming activities.

Another reason contributing to the rapid expansion of the industry is simply that many people are motivated when they observing the success of their families’ or neighbours’ in their fish farming businesses, and they attempt to follow in their footsteps. Without sufficient capital, however, fish farmers experience many difficulties in successfully operating their fish farming businesses.
China is the largest aquaculture producer in the world. There are six other Asian countries that contribute to the aquaculture industry: Bangladesh, India, Indonesia, Korea, Philippines, and Japan, as can be seen in Figure 3.5 (Tacon 2003).

The top ten aquaculture producers in the Asian region in 2003 are listed in Table 3.1. According to the list, Indonesia is one of the top five aquaculture producers in the Asian region contributing 2.4 per cent of Asian aquaculture production.
Table 3.1 The top ten aquaculture producers in the Asian region

<table>
<thead>
<tr>
<th>Country</th>
<th>Aquaculture production (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainland China</td>
<td>77.7</td>
</tr>
<tr>
<td>India</td>
<td>5.0</td>
</tr>
<tr>
<td>Japan</td>
<td>3.1</td>
</tr>
<tr>
<td>Philippines</td>
<td>2.5</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2.4</td>
</tr>
<tr>
<td>Thailand</td>
<td>1.7</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>1.7</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1.6</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1.3</td>
</tr>
<tr>
<td>Democratic People’s</td>
<td>1.1</td>
</tr>
<tr>
<td>Republic of Korea</td>
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According to Figure 3.6 China contributed 81.1 per cent of the global total aquaculture production in the world in 2000 (for reporting countries). In comparison Indonesia’s contribution was 3.2 per cent in that year.

Figure 3.6 Non-species specific aquaculture production reported in 2000

Figure 3.7 presents the contribution of aquaculture production to national aquatic production in 1996 for the top 14 producing countries. The chart shows that Indonesian aquaculture production contributes 17 per cent to the Indonesian aquatic production. This figure is low compared to the figure for China but similar to other Asian countries such as Philippines, Korea, Taiwan, Vietnam, and Japan.

The Indonesian aquaculture industry has increased its aquaculture production and is currently seen to be one of the most important sectors to support the economic development of rural communities (FAO 2008; Nurdjana 2006). There are three aquaculture industries in Indonesia: freshwater, brackish water, and marine water or mariculture. Ornamental freshwater fish production has also expanded due to large export demand (Nurdjana 2006). The very large expansion of the brackish water aquaculture industry was triggered by the development of the ablation technique of the shrimp eyestalk in 1978, which resulted in the rapid growth of shrimp production. The world’s high shrimp demand in the 1970’s has also resulted in the booming of shrimp culture in the coastal area of Central Java (Elfitasari 2006). The mariculture industry is not as advanced as the freshwater and brackish water aquaculture industries, but it also has high potential. Most of the mariculture harvest such as shellfish, seaweed, and sea cucumber are high in value and much of it is produced for export purposes (Nurdjana 2006).
3.4 The development of the aquaculture industry in Central Java

The Central Java aquaculture industry has also experienced growth within the last few decades. Media Indonesia (2008) predicted that the Central Java aquaculture production for the period 2006-2009 will grow annually by 4.20 per cent.

The Central Java Fisheries and Marine Office defined aquaculture as “activities that relates to managing and using of resources for culturing and harvesting fish” (2006, p. ix). Unlike fishing where fish can be caught by anyone, the fish and activities of aquaculture are owned by a certain person or group of people and are carried out at a certain location. The Indonesian aquaculture business was defined as “a legally recognized (by the Indonesian government) economic unit that carry out fish culture / other water plants / animal culture with aim to sell partly / whole of its production” (Central Java Fisheries and Marine Office 2005, p. x).

Central Java is a province located on the Java Island of Indonesia between West Java and East Java. The northern part of Central Java lies along the Java Sea, and the southern part of Central Java joins the Indian Ocean. This province has a variety of water resources occurring naturally and man made, such as rivers, streams, and dams. Central Java also has estuaries and a long coastal line which potentially supports brackish water aquaculture. The Java Sea and Indian Ocean are rich in natural resources to develop its sea water culture (Central Java Fisheries and Marine Office 2005).

The Central Java Fisheries and Marine Affairs provincial office is located in the capital city of Central Java, Semarang. It acts as the technical resource for the Central Java government in all aspects related to fisheries and marine affairs in the Central Java region. The head of the Fisheries and Marine Affairs office is responsible for the provincial office and reports to the Governor through the Regional Secretary (Government of Central Java 2007b).

The Central Java Government has provided funding to the Fisheries and Marine Affairs office to develop the Central Java fisheries and marine structure. Their activities currently consist of three major programs: (1) the development of aquaculture, (2) the development and empowerment of capture fisheries, and (3) the growth of fisheries landings. The Indonesian Government is also funding (through national funding) the Central Java Fisheries and Marine Affairs office to conduct a development program to
develop the fisheries resources of Central Java. This program has four objective or subprograms: (1) development of capture fisheries, (2) development of aquaculture, (3) technical support to marine and fisheries activities, and (4) development in fisheries exports, competition, promotion, market sourcing, and import control (Government of Central Java 2007c).

**Central Java Aquaculture**

Central Java Fisheries and Marine Office’s vision for Central Java aquaculture is “to develop aquaculture as a main economic development resource which is carried out through fisheries businesses with competitiveness and fairness” (2005, p. 3). This determines that the status of businesses in the fisheries industry is to be based on principles of competition and fair play. The Central Java Fisheries and Marine Office defined their vision according to several missions:

- Develop aquaculture in a responsible and environmentally friendly way based on science and technology.
- Empower and improve the prosperity of fish farmers.
- Provide food, increase foreign exchange, and raw materials for fish processing industry.
- Create employment and business opportunities.
- Establish a conducive aquaculture business environment (Central Java Fisheries and Marine Office 2005, pp. 3-5).

The objectives for aquaculture in Central Java, according to the Central Java Fisheries and Marine Office, are:

- Increase production and productivity of fish culturist.
- Increase income and prosperity of fish farmer community.
- Increase fish production follow by the increase of fish consumption and community nutrition.
- Enhance the resource and environmental rehabilitation and protection.
- Increase employment and business opportunity.
• Boost national investment and export (Central Java Fisheries and Marine Office 2005, pp. 3-5).

The Central Java government also has five Seedling and Aquaculture technical workshops, which assist the small scale fish farmers in developing their aquaculture system and technology, as well as training them with aquaculture skills (Government of Central Java 2007d). In Janti, Ngrajek, Ambarawa the technical workshops are focused on freshwater seedling and aquaculture. In Sluke the workshops centre brackish water seedling and aquaculture, and on the Karimunjawa islands the workshops focus on seawater seedling and aquaculture.

There are many species cultivated in Central Java depending on the type of water available: fresh water, brackish water, or sea water. Elfitasari (2006) explained that in the coastal area of Central Java, many brackish water ponds can be found and many fish farmer culture milkfish and shrimp along the coastline of Central Java. Shrimp is one of the most promising products for production in Central Java. It is being cultivated by many fish farmers located near the coast who have access to a brackish water supply. Besides brackish water cultivation, fish farmers in Central Java also carry out freshwater aquaculture and sea water culture (also known as mariculture). The Central Java Fisheries and Marine Office organises the areas of development according to these three types of cultivation and hence there are three aquaculture industries: (1) seawater culture or mariculture (2) brackish water culture, and (3) freshwater culture (Central Java Fisheries and Marine Office 2005).

The Central Java Fisheries and Marine Office divides Central Java into three aquaculture regions: (1) the northern part of Central Java (2) the middle part of Central Java, and (3) the southern part of Central Java. These divisions correspond to the type of fish farming carried out in each region. The aquaculture regional divisions are shown in Figure 3.8.
Three regions of Central Java aquaculture: (a) Northern (b) Middle (c) Southern


The northern and southern parts of Central Java, are located in proximity to brackish water and sea water and therefore the type of cultivation carried out in villages from this area consist of mariculture, brackish water cultivation, and fresh water cultivation. On the other hand, fish farmers in the middle region of
Central Java only carry out freshwater cultivation activities, since they are not close to the coast.

The aquaculture industry in Central Java is showing promise for development. The huge resources that could support aquaculture have not been fully exploited yet. According to Central Java Fisheries and Marine Office (2005), only 6.57 per cent of the land suitable for freshwater cultivation, and 0.73 per cent of the land is suitable for mariculture has been exploited. In other words there is potential for the aquaculture industry in Central Java as long as it can be developed and supported in the best way.

3.5 The small scale fish farmer in Central Java

According to the Central Java Fisheries and Marine Office (2005), the Central Java aquaculture industry is currently dominated by small scale or home based fish farmers. Sukadi (2006) also reported similarly that the number of small scale fish farmers in Indonesia outnumbered large aquaculture companies.

Most of the fish farmers live in small villages. Most fish farmer communities in a village start out with one fish farmer. The communities then expand to the neighbours when they see the success and become motivated to achieve the same success. A specific example of this expansion is given by the Boyolali Animal Husbandry and Fisheries Office (2007). In their example a fish farmer community in a village in the Boyolali region started off with one successful fish farmer cultivating about 3,000 fish in two ponds. This built interest amongst the neighbours and many decided to follow their neighbour’s success. A similar example is mentioned by Miyata and Manatunge (2004) from their observation of 400 fish farmers in Indonesia that adopted Floating Net Aquaculture (FNA). In their example they explained that the reason the fish farmers adopted FNA is because they observed the success of their neighbours who had already adopted FNA. Furthermore, an important factor in the early years of FNA adoption was that many of the fish farmers learned about FNA from their colleagues (Miyata and Manatunge 2004).

The Indonesian government has fully realised the importance of aquaculture for national economic growth. Nurdjana, the Director General for Aquaculture, Ministry of Marine Affairs and Fisheries, the Republic of Indonesia, acknowledged this during the
International Workshop on Innovative Technologies for Eco-Friendly Fish Farm Management and Production of Safe Aquaculture Foods in Bali, December 2006. He said:

Aquaculture is an important component for Indonesian fisheries which contributes to National food security, income and employment generation and foreign exchange earnings. Aquaculture has played its role as an alternative source of income for coastal fishery communities. It has also contributed for reducing the pressure on marine natural resources. Recently, aquaculture development in Indonesia has been accelerated and considered as an important sector for in supporting rural economic development (Nurdjana 2006, p. 1).

There are several factors that have contributed to the growing importance of aquaculture in Indonesia:

1. **Securing food supply**

   Aquaculture is being slated as the solution to the fish supply shortages as the result of global overfishing. Aquaculture is a growing supply of protein food for rural fish farming communities. In addition to being a source of protein, fish also provide vitamins, fatty acids, minerals, and is high in energy (Edwards 2000).

2. **A source of income and employment**

   With fish farming it is expected that land owners can make use of their land to cultivate fish and to obtain additional income for their family. Furthermore, by establishing many new fish farms, many new employment opportunities can be created in the neighbourhood. This is a strategy that the Central Java aquaculture has adopted in the implementation of its mission, which is to create employment and business opportunities (Central Java Fisheries and Marine Affairs office 2005). Therefore, aquaculture in Central Java can be directed to increase employment opportunities for the community and expand business opportunities in the aquaculture industry.
3. Increased foreign exchange earnings

Aquaculture is a means of increasing the Indonesian national exports of fisheries products and this strategy has been adopted for implementing the Central Java aquaculture mission, which is to secure food, increase foreign exchange earnings and increase raw material for the fish processing industry (Central Java Fisheries and Marine Affairs Office 2005). It is expected that aquaculture developments in Central Java can enhance the export volumes of both fresh fish produce and processed fish. Hutabarat (2002) claimed that the development in the fishery sector can increase the national income of foreign exchange and added that during the economic crisis, the fishery sector had not been badly affected. Indeed, it had been beneficial for those with export oriented businesses because of the Indonesian currency exchange rate against the US dollar.

3.6 Small scale fish farmers and their activities

Small scale fish farming involves many activities. This section will define small scale fish farmers and identify some of their activities.

3.6.1 Definition of the small scale fish farmer

The small scale fish farmer has the following characteristics: (1) uses a small piece of land, only up to 1 hectare with low fertility, (2) usually dependent on rain for water and water storage, and (3) dependent on raw material inputs that can be collected in the local area (Edwards et al., 1996).

According to the Indonesian Constitution, the characteristics of a small-scale business are:

- A productive business owned by an Indonesian citizen and formed with or without legal status.
- Is not affiliated to or a branch of a middle or large scale business.
- Possesses assets of no more than Rp 200 million, not including land and buildings, or, has maximum annual revenue of Rp 1 billion (Indonesian Constitution No. 9/1995).

For the purposes of this research, based on the characteristics of a small scale business, the definition of a small scale fish farmer is: a productive business
owned by an Indonesian citizen, having no official legal status, with only up to 1 hectare of land, depended on raw material inputs that are collected from nearby places, and possessing no more than Rp 200 million in assets.

3.6.2 Small scale fish farmer activities

Semarang’s Marine Affairs and Fisheries Office have publicly announced their support for the importance of aquaculture development in Indonesia. They pointed out that the efficiency and productivity of the individual fish farmer depended on the strength of the fish farmer to develop his or her own aquaculture business. And in order to strengthen the fish farmer’s and their family’s position as part of the developing community, the Indonesian government has recommended that fish farmers establish and merge into Fish farmer Groups (FFGs) (Marine Affairs and Fisheries Office 2005).

According to the Semarang’s Marine Affairs and Fisheries Office’s Book of Fish Farmer Group Formation Guide, there are two steps in the FFG formation: group development and group monitoring. The following text provides an overview of these steps and draws heavily from the guide.

a. Group development

Fish Farmer Groups are formed when fish farmers recognise a need for unity to achieve shared objectives. There are five factors that influence the formation of a Fish Farmer Group:

1. The members of the Fish Farmer (FF) community should have the same needs. If the FFs do not have the same needs, they might not be able to work closely together. Moreover, they might even have opposing objectives.

2. The FF community should be located in the same area using similar resources or carrying out similar aquaculture practices. If FFs are located in different areas, it will be difficult to carry out their group activities.

3. The members of the FF community should have similar social and economic backgrounds. Generally, it is difficult to unify when members are of different social and economic status because people with higher economic
status will prefer to socialize with people that have a similar status to them and vice versa. Therefore, a FFG should be formed by fish farmers with similar social and economic status so they can match their vision, mission, and objectives.

4. All member of the FF community should trust one another. Psychologically, it will be difficult to work together if individual members of the FFG do not trust each other. As explained by Dirks: “trust seems to influence how motivation is converted into work group processes and performance” (1999, p. 1). It follows that trust will have a tremendous impact on how people will cooperate and this will affect the outcome of their teamwork. Consequently, trust is one of the crucial components in the formation of a FFG since it will influence how the FFG members will work together.

5. The FF community should be able to select someone in their community to become the leader of the group. This requirement is simply to avoid competition for leadership of the FFG. When competition is involved in a group it will influence the teamwork and may lead to separation of the group itself.

It is expected that the formation of the FFG will help the members of the group and their families to increase the quality of their livelihoods. The expected outcomes of the FFG formation are:

- Increased ability to meet the primary needs of the fish farmer group and their family, such as providing for food, clothes, and home security. It is expected that by merging into a FFG individual fish farmers will have a greater chance of expanding their business since members share the business capital, the risk, and the profit.

- Making it easier for FFG members to earn a living.

- Improved education, skills and personal development of the FFG members and their families.
b. Group monitoring

The Semarang Marine Affairs and Fisheries Office, with their objective to increase and develop the number of FFGs, monitors the Fish Farmer Groups. There are five areas that are monitored in the development of each FFG:

1. Monitoring the ability of the group to plan their business activities in order to increase their productivity. This includes aspects of post harvest planning, business analysis, and optimization of resource usage.

2. Monitoring the ability of the FFG to carry out and honour agreements with other institutions.

3. Monitoring the ability of the group to increase its capital and the way they spend their income.

4. Monitoring the relationship between the FFG and the village unit cooperation (KUD) in order to enhance the relationship.

5. Monitoring the ability of the FFG to implement and use new technology and information, and monitor the ability of members to cooperate to improve their levels of productivity.

Existing FFGs are evaluated annually and accredited to a FFG level. The local Fisheries and Marine Affairs office conducts the evaluation to determine the accreditation levels. The evaluation criteria are:

a. The ability to search and use information.

b. The ability to plan activities which can increase productivity.

c. The ability to work as a team in carrying out the planned activities in a disciplined way.

d. The ability to provide and develop the FFGs own facilities.

e. The ability to collect the FFGs capital.

f. The ability to properly carry out and honour cooperative agreements with other parties.

gh. The ability to cope with adverse circumstances.
h. The development of the leader and other members and their efforts to improve their skills.

i. The quality of the relationship between the FFG and the village cooperation unit.

j. The level of productivity.

(Translated from *Fish Farmer Group Formation Guide Book 2005, pp. 8-9*)

In general there are four accreditation levels assigned to FFGs (Semarang Marine Affairs and Fisheries Office 2005). In the following section the group levels are given in the original Indonesian language, and, because there are no direct translations for these descriptions into English, are identified as Level 1 to Level 4.

*Kelas Pemula (Level 1 – the lowest level or starter level).*

This is the lowest level and usually the newly formed FFGs are assigned to this level. They are evaluated as having the lowest capabilities according to the ten evaluation criteria. The village head signs the certificate for this level.

*Kelas Lanjut (Level 2 – the secondary level).*

This is a step up from Level 1. The FFG members are usually evaluated as having a higher level of abilities according to the ten evaluation criteria than the FFG at Level 1. The Head of District officer, in Indonesia known as Camat, signs the certificate for this level.

*Kelas Madya (Level 3 – the mid advance level).*

The FFG at this level has much higher levels of abilities than the FFGs at Levels 1 or 2, as measured according to the ten evaluation criteria. The Head of the Region officer, in Indonesia known as Walikota or Bupati, signs the certificate for this level.

*Kelas Utama (Level 4 – the advanced level)*

This is the highest level of FFG achievement. The members perform at the highest level according to all ten evaluation criteria. The Governor of the province where the FFG is located signs the certificate for this level.
In order to motivate the FFGs in Central Java to improve their businesses, the Central Java Fisheries and Marine office conducts an annual FFG competition. The winning FFG is given a certificate and prize money. The competition criteria are grouped into three categories:

1. Social criteria. These criteria evaluate the ability of the FFG to self manage, its organisational structure, the conduct of internal FFG meetings, activities, capital collection, and other socially related aspects both within the FFG and externally between the FFG and other parties.

2. Technical criteria. These criteria include technical aspects such as aquaculture skills, raw materials, aquaculture infrastructure, and technology development.

3. Economical criteria. These criteria include aspects of business analysis, business loans, capital, and cooperation with village cooperation unit.

(Semarang Marine Affairs and Fisheries Office 2005)

The competition evaluation team establishes a questionnaire based on the above criteria which the FFG completes. When the completed questionnaires have been collated, the competition evaluation team carries out a field evaluation based on the answers that the FFG provided in the questionnaire.

Many of the fish farmers believe that the FFG not only benefit their livelihoods but that they receive additional benefits from membership. The benefits fish farmers have identified are:

Income growth

Kadin-sumbar (2008) explained that the impact of FFG formation can be directly seen in the increase of the FFG member’s income. As an example, the income of Erman, a member of a FFG, doubled after he became a member of FFG. He received fish seedling training and implemented his fish seedling technique in his business. The increase in his income was a result not only of the increase in fish production but also of the establishment of processed fish products (Kabupaten Jombang 2007).
Soft loans from the bank

The Department of Marine Affairs and Fisheries has developed cooperation between an Indonesian bank and fish farmers in Indonesia for the provision of soft loans (Bernas 2003). These soft loans help to support fish farmers in developing their business. It is expected that these loans will help to increase the fish farmers’ level of prosperity.

Fish disease and parasite handling support

Another government service to FFG members is provided during fish disease or parasite outbreaks. Suara Merdeka (2002) reports that FFGs in Central Java received support of around Rp 500 million from the government in the form of antibiotic vaccine, vitamins, and clinical laboratorial tools for the local fisheries officer to anticipate outbreaks and prevent the spreading of the outbreaks. As an example the government built a fish clinic in Magelang, Central Java to monitor fish diseases and parasite outbreaks.

Government subsidies

The government has shown their concern for small scale fish farmer in Indonesia through the provision of subsidies. In 2007, the Indonesian President provided Rp 2.5 million’s worth of fish seed to FFG in Central Java. Since then these FFGs have shown significant growth in their production and have demonstrated themselves to be creative FFGs (Antaranews 2007). Suara Merdeka (2007a) described another case of seed subsidies received by FFG members from the Fisheries and Marine Affairs Office. The fish farmers are reported to be very happy with the fish seed subsidies as they found it difficult to obtain good quality fish seed.
**Capital support from the government**

The Indonesian government has shown their concern and full support towards aquaculture development in Indonesia not only by subsidising seed but also providing capital support to FFGs. Rokanhilir (2008) reported that the government provided as much as Rp 194.5 million capital support to FFGs. The aim of the subsidy was to encourage FFGs to develop and indirectly to increase their productivity. The capital support was given in the form of a complete fish-feed producing machine that allows a FFG to produce their own fish feed. Antaranews (2007) provides another example of capital support to FFGs: the President of the Republic of Indonesia made available around Rp 600 million to improve fish pond irrigation systems. Saragih (2000) reported that the government gave capital support to FFGs to encourage the development of FFGs in order to become a centre of fish production.

**Government supplied training**

The local and regional governments often provide training workshops to FFGs. Training focuses not only on the technical aspects of fish farming, but also on the managerial aspects of running the business. Usually each local government office prepares a list of training sessions for the year. The government subsidises the fees for the training from the APBD or APBN (Regional Budget and State Budget).

**Business expansion support**

The FFG business expansion support does not only develop and increase production of fish farming, but also improves the ability of female farmers to creatively process fish food produce such as fish ball, fish crackers, and shredded fish (Kabupaten Jombang 2007). Through process fish produce leads to expansion which leads to significant increases in FFG revenue. A similar situation is currently being experienced at Karya Mina Utama, an excellent example of a FFG in Central Java, that are have rapidly expanded their product
range and have turned their village into the largest catfish producer in Central Java. They produce not only fresh catfish, but also other processed catfish product managed by the female FFG submembers (Suara merdeka 2007).

3.7 Conclusion

The rapid decline of the world’s fish stock has been a factor in the rise of the global aquaculture industry. The realisation that aquaculture is the only solution that can offset the declining global fish stock has been a catalyst in the industry’s growth.

The Indonesian aquaculture industry has also experienced significant development over the recent past and has become an important sector supporting the economic development of the rural community. There are national conditions that are advantageous to the aquaculture industry in Indonesia: the topographical condition of the Indonesian islands and the high availability of human labour.

The aquaculture industry in Central Java is developing rapidly along with the Indonesian developments. The development of the Central Java aquaculture industry is monitored by the Central Java Fisheries and Marine Affairs provincial office which act as technical support to the Central Java government.

There are three divisions of aquaculture development in Central Java based on the geographical location of the aquaculture practice: the northern, middle and southern areas. The northern and southern parts of Central Java practice brackish water and seawater cultivation. The middle part of Central Java practices freshwater aquaculture because they are far from seawater resources.

Three factors contribute to making aquaculture an important industry in Indonesia. The first is that it helps to secure the food supply. The second is that it is a source of income and employment for the people. And thirdly, it increases foreign exchange earnings.

The Indonesian government is supporting fish farmers’ communities by encouraging them to form Fish Farmer Groups (FFGs). The government specifies certain conditions for the formation of a FFG. The conditions include that all those in the community have the same needs, that they are located in the same area, that they have the same economic and social status, and that they choose one member as their leader. By bringing fish farmers together into a FFG derives many benefits to the farmers. For example, their
incomes increase, they can receive soft loans from the bank, they receive fish disease and parasite handling support, they receive subsidies and capital support, and they receive training and business expansion support from the government. In addition, the government holds an annual competition between FFGs that serves to encourage self development of the FFGs. The FFGs in Indonesia are classified into four levels depending on their ability to perform to ten evaluation criteria.
Chapter 4
Conceptual framework and research methodology

4.1 Introduction

This chapter describes the conceptual framework, the research methodology, and the research design in this study’s overall research process. The seven sections of this chapter cover the research steps of: hypothesis development (section 4.2), conceptual framework (section 4.3), research process (section 4.4), sample/participants (section 4.5), measurement instrument (section 4.6), data collection procedure (section 4.7) and data analysis (section 4.8).

This research had five objectives:

1. Identify the endogenous and exogenous factors that small-scale fish farmers regard as influencing their income improvement and product sustainability.

2. Identify the constraints and problems that small-scale fish farmers regard as influencing their income improvement and product sustainability.

3. Identify and describe various aspects of the entrepreneurial activities of small-scale fish farmers in Central Java, Indonesia.

4. Compare the entrepreneurial activities implementation of small scale fish farmers with different demographic background.

5. Develop recommendations for the aquaculture and fisheries industry, government, educational institutions, and research communities in Indonesia on aspects that may contribute to the success of small-scale fish farmers in obtaining their income improvement and product sustainability.

4.2 Conceptual framework

Three key domains form the foundations of the research: the aquaculture industry, constraints and problems faced by small scale fish farmers, and small scale fish farmers’ entrepreneurial activities. These key concepts form a conceptual framework on which an understanding of the whole research idea was developed. The conceptual framework is shown in Figure 4.1.
Entrepreneurial activities of small scale fish farmers

Constraints and problems faced by small-scale fish farmers

Aquaculture industry

Endogenous Factors

Entrepreneurial Activities

Exogenous Factors

Income Improvement

Product Sustainability

Recommendations for aquaculture industry and related institutions for income improvement and product sustainability

INDEPENDENT Variables

DEPENDENT Variables

Figure 4.1 Conceptual Framework
The conceptual framework for this research, as illustrated in Figure 4.1, was centered on endogenous and exogenous variables that influence entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability.

The conceptual framework was divided into three independent but related domains:

1. **Antecedents.** This part examined and described previous studies with similar research topics as the baseline for this research. It contained information found by previous studies regarding constraints and problems faced by small scale fish farmers, the development of the aquaculture industry, and entrepreneurial activities of small scale fish farmers. Previous studies that focused their research on small scale fish farmer activities in Indonesia as well as other parts of the world were compiled and discussed. The aquaculture activities in Indonesia have grown in the past few decades. The increase in the Indonesian aquaculture industry relate to developments in technology, the availability of better quality of fish seeds, and the development of the fish farming area (FAO 2008). The trawl fishing ban in 1980 and also the government’s priority to develop the Indonesian aquaculture industry, have also contributed to the significant increase in the Indonesian fish farming business.

The aquaculture industry in Central Java is also experiencing an increase with huge potential for more still available, especially with its topographical and human resources support. Nevertheless, despite having the potential aquaculture resources and the human capital to develop the resources, Indonesia has not yet been able to maximise its fish farming industry. This may be caused by the internal weaknesses of small-scale fish farmers’ businesses.

In carrying out fish farming activities, small scale fish farmers in Central Java face problems and constraints that obstruct their fish farming activities. Each fish farmer approaches these problems and constraints differently in accordance with endogenous and exogenous factors that occur within their domain of business activity. As well, these endogenous and exogenous factors impede each fish farmer’s ability to carry out their entrepreneurial activities.
The entrepreneurial business characteristics identified by Carland et al. (1984) include five characteristics that differentiated entrepreneurial ventures from small businesses and were described as innovating new product, innovating new means of manufacturing, expanding market distribution, expanding supplier resources, and reorganising the industry. Based on the two characteristics of taking innovative actions and seeking new markets, this research elaborated six fish farming entrepreneurial activities. Five entrepreneurial activities were developed as innovative actions: fish feed production, fish seed production, fish species extension, product range extension and utilisation of other fish parts. The sixth entrepreneurial activity, market extension, was developed from the second entrepreneurial characteristics identified by Carland namely seeking new market.

2. Variables under study. The variables from previous references discovered in the antecedents were gathered into three major groups: endogenous and exogenous factors, constraints and problems, and entrepreneurial activities of small scale fish farmers. Based on the results of the antecedent studies, these variables were predicted to influence income improvement and product sustainability. This part also collected data on the commonly implemented entrepreneurial activities in Central Java and developed comparisons of different groups of small scale fish farmers in carrying out these activities.

In undertaking their activities, there are factors that support entrepreneurs in successfully achieving their goals. The first type consists of those factors that arise from within the individual (endogenous factors) and the second type consists of those factors that arise externally to the person (exogenous factors).

The entrepreneurial activities that fish farmers engage in this study have been identified as: fish seed production, fish species extension (poly-culture system), market extension, product range extension (adding value to product), and utilisation of other fish parts. The entrepreneurial activities implemented by small scale fish farmers in Central Java influence the actions they take in their attempts to improve their income and ensure their product sustainability.
Income improvement and product sustainability are two aspects that are important for fish farming in Central Java and have been selected as the indicators for this research. Income improvement is selected as an indicator for this research because income is an important constraint for every living person. And for the small-scale fish farmer in Indonesia income is even more important, since their daily income has to support their daily needs for food, education, health care, and so on. It is therefore very important to determine if their fish farming businesses are able to deliver income improvement for the fish farmers.

The comparison between fish farmers with different demographic background in implementing entrepreneurial activity were were also examined in this research by comparing different classification of fish farmers communities such as awardees and non awardees, male and female, different age groups, different education level, different level of fish farmer group, different marital statuses, and different reasons for becoming fish farmers. This comparative analyses using demographic and farming group data were included to increase understanding of how fish farmers implemented entrepreneurial activities and to reveal the most commonly practiced entrepreneurial activities in Central Java.

3. Outcomes. The expected outcomes of this research had to establish several recommendations for the aquaculture industry and related institutions on factors that influence entrepreneurial activities among small scale fish farmers in deriving income improvement and product sustainability.

4.3 Hypothesis development

According to Ethridge (2004), a hypothesis is an untested possible outcome. Sixteen hypotheses were developed from the four research objectives:

Objective # 1.

Identify the endogenous and exogenous factors that small-scale fish farmers regard as influencing their income improvement and product sustainability.

Four hypotheses were developed from the first objective:
Hypothesis # 1

H1: there is a positive correlation between the endogenous factors and the small scale fish farmers’ income improvement.

Hypothesis # 2

H2: there is a positive correlation between the exogenous factors and the small scale fish farmers’ income improvement.

Hypothesis # 3

H3: there is a positive correlation between the endogenous factors and the small scale fish farmers’ product sustainability.

Hypothesis # 4

H4: there is a positive correlation between the exogenous factors and the small scale fish farmers’ product sustainability.

Objective # 2.

Identify the constraints and problems that small-scale fish farmers regard as influencing their income improvement and product sustainability.

Four hypotheses were developed from the second objective:

Hypothesis # 5

H5: there is a correlation between constraints and the small scale fish farmers’ income improvement.

Hypothesis # 6

H6: there is a correlation between problems and the small scale fish farmers’ income improvement.
Hypothesis # 7

H7: there is a correlation between constraints and the small scale fish farmers’ product sustainability.

Hypothesis # 8

H8: there is a correlation between problems and the small scale fish farmers’ product sustainability.

Objective # 3.

Identify and describe various aspects of the entrepreneurial activities of small-scale fish farmers in Central Java, Indonesia.

One hypothesis was developed from the third objective:

Hypothesis # 9

H9: there is at least one entrepreneurial activity implemented by small scale fish farmers in Central Java.

Objective # 4.

Compare the entrepreneurial activities implementation of small scale fish farmers with different demographic background.

Seven hypotheses were developed from the fourth objective:

Hypothesis # 10

H10: there are significant differences between awardees and non awardees in implementing entrepreneurial activities in Central Java.

Hypothesis # 11

H11: there are significant differences between different gender groups in implementing entrepreneurial activities in Central Java.
Hypothesis # 12

H12: there are significant differences between groups of different ages in implementing entrepreneurial activities in Central Java.

Hypothesis # 13

H13: there are significant differences between groups of different marital status in implementing entrepreneurial activities in Central Java.

Hypothesis # 14

H14: there are significant differences between groups with different educational levels in implementing entrepreneurial activities in Central Java.

Hypothesis # 15

H15: there are significant differences between groups with different fish farmer levels in implementing entrepreneurial activities in Central Java.

Hypothesis # 16

H16: there are significant differences between groups with different reasons for becoming fish farmers in implementing entrepreneurial activities in Central Java.

4.4 Research process

Leedy (1997) observed that a research design is a research plan. The research process is a plan of all the steps required to start and complete a journey of research. DeBakey (cited in Leedy 1997, p. 93) asserted that “thinking through your project clearly and thoroughly before beginning to write a proposal is crucial”, which means that designing a research project requires forethought about potential research problems and planning and carefully thinking about finding the answers to the research questions.

It is beneficial to draw out the research project into a well planned research process, where the steps required are placed in order and required actions for each step are
elaborated (Figure 4.2). This research process was specifically designed with the steps shown in Table 4.1.

Table 4.1 Steps in the research process

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The above process shows the eight steps that were needed to be carried out to complete this research. Once the research interest had been firmed up, it was followed with several more steps of reading, planning, data collecting, analysing, and interpretation of results. More details of the research process were shown in Figure 4.2 and discussed in the rest of this section.
Pre-Research

Formation of research interest

Emerging problems

Information search

1. Literature review
2. Problem identification based on previous research
3. Develop objectives for the research

Development of research design

1. Development of conceptual framework
2. Development and decision of research approach (Quantitative)
3. Population definition
4. Sample selection

Development of research methodology

1. Decision of data collection method
2. Development of English version of questionnaire
3. Translation of questionnaire into Indonesian for the data collection step

Data collection

1. Descriptive analysis
2. Exploratory factor analysis and Cronbach’s alpha
3. Chi-square test analysis
4. Binary logistic regression analysis

Data analysis and interpretation

Presentation of the research findings

1. Result discussion
2. Research conclusion

Recommendations and future research

1. Recommendations based on the research findings for the aquaculture industry and related institutions.
2. Future research needed
4.4.1. Development of research interest

The interest to conduct research on factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java emerged from a lack of previous research which focused on and studied the entrepreneurial activities of the many fish farmers in Central Java. Interest grew out of a situation in Central Java where currently small scale fish farmers dominate the aquaculture industry. These small scale fish farmers encounter many constraints and problems, yet despite facing many obstacles, some of the small scale fish farmers are able to increase their income and win the government annually sponsored competition. It was felt that this situation warrants research to discover the conditions that have led to the success of the small scale fish farmers.

In addition, it is of interest that this research was the first to study the entrepreneurial activities of small scale fish farmers. This was a major breakthrough since there was no prior research on this topic. This research had objectives to observe the factors that have greatest effect on fish farmers’ entrepreneurial activities and to develop recommendations to the aquaculture industry and related institutions based on the research findings.

4.4.2. Information search

The first step of this research accumulated previous research and related literature to gather together information in support of the three fundamental key concepts of this research. This information was used during the problem identification and objective development stages of this research.

4.4.3. Development of research design

The development of the research design step consisted of four actions:

1. Development of conceptual framework

The development of the conceptual framework was considered essential in order to facilitate the research process. The conceptual framework that was developed is shown in Figure 4.1.
2. Development and decision of research approach (Quantitative)

Creswell defined a quantitative research as “an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers and analysed with statistical procedures, in order to determined whether the predictive generalisations of the theory hold true” (cited in Leedy 1997, p. 104). The decision to use a quantitative study for this research was based on the consideration that the purpose of this study was to test and confirm a theory or hypotheses, accommodate a large number of samples, and employ a standardised instrument or questionnaire to gather data.

3. Population definition

The population for this research was the small scale fish farmers in Central Java. The factors (endogenous, exogenous, problems, and constraints) that were predicted to influence income improvement and product sustainability were observed in this population. The sample of the population of small scale fish farmers in Central Java who were surveyed had to meet the following criteria:

- Had to be located in the Central Java region.
- Had to be registered as members of a Central Java fish farmer groups under the Central Java Fisheries and Marine Office.
- Had to be classified as small-scale businesses according to the Indonesian Constitution No. 9/1995 and the Ministry of Finance Rule No. 12/PMK.06/2005. Therefore, according to these classifications the criteria that the fish farmers had to meet were:
  1. Be a productive business owned by an Indonesian citizen and formed with or without legal status.
  2. Not be affiliated to or a branch of a middle or large scale business.
  3. Possess assets of no more than Rp 200 million, not including land and buildings, or, has maximum annual revenue of Rp 1 billion.
The small scale fish farmers were divided into two groups in order to compare responses: those who had received regional awards and those who had not received awards. The publicly available lists of fish farmer groups and their addresses were obtained from the local and regional Fisheries and Marine Offices in Central Java. The lists of fish farmers who had won the regional awards were also obtained from the Central Java Fisheries and Marine office in Semarang. To increase the chances that the fish farmers who had received regional awards were still in operation, the lists of regional award farmers were restricted to the five years from 2003 to 2007.

4. Sample selection

The list of small scale fish farmers obtained publicly from the Central Java Fisheries and Marine Office was entered into a computer spreadsheet file. The names of fish farmers for this study were then randomly selected in proportion to the percentage of award winners (coded A in the questionnaire) and non award winners (coded NA in the questionnaire).

4.4.4. Development of research methodology

The research methodology comprised of the following steps:

1. Decide on the data collection method.

2. Develop an English version of the questionnaire (see Appendix 1).

3. Translate the English questionnaire into Indonesian for the data collection step (see Appendix 2).

The steps above are described in greater detail in section 4.6 of this chapter.

4.4.5. Data collection

Data collection was performed in Central Java, Indonesia between December 2007 and May 2008. The steps in carrying out the data collection were:

1. Contact the Central Java Fisheries and Marine Affairs Office to obtain a detailed list of FFGs in Central Java. This list included the name of the FFGs and their contact details.
2. From the Central Java government office obtain a list of FFGs that have received awards from the Provincial government in the past 5 years.

3. Contact appointed staff from the Central Java Fisheries and Marine Affairs Office for a supporting letter for the designated Regional Fisheries and Marine Affairs Office.

4. Randomly choose the FFGs to include in the data collection sample.

5. Make copies of the questionnaire.

6. Make appointments and visit the Regional Fisheries and Marine Affairs Office with the questionnaire and support letter and place the questionnaires at the regional Fisheries and Marine Affairs office. Obtain the cooperation of the staff at these offices to assist data collection by encouraging members of appointed FFGs to take and complete the questionnaires.

7. Collect the questionnaires at an agreed date.

The steps above are described in greater detail in section 4.7 of this chapter.

4.4.6. Data analysis and interpretation

This research used the SPSS statistical software application for data analysis using functions such as:

Descriptive analysis. Descriptive analysis was used to describe the characteristics of the small scale fish farmers’ personal and business backgrounds and of their implemented entrepreneurial activities.

Binary Logistic Regression. Binary (or binomial) logistic regression was used for measurements made with dichotomous dependent variables (Garson 2008). This research used binary logistics regression to carry out the analysis where the dependant variables used a Likert scale and the independent variables were categorical (Pallant 2005).

Chi-square statistics. Chi-square statistics are used in this research to compare different groups of small scale fish farmer communities. For example this
research compared the entrepreneurial activities between awardees and non awardees of different gender, age, and educational background.

The analyses above are described in greater detail in section 4.8 of this chapter.

4.5 Sample/Participants

The data sample consisted of responses collected from two categories of small scale fish farmers groups: fish farmer groups who had not won the regional fish farming award in the past five years (labeled the non awardees), and those who had won the regional award in the past five years (labeled the awardees). The sample selection step is described in greater detail in section 4.7 of this chapter.

4.5.1 Personal Characteristics

The data collected about the personal characteristics of the respondents were: age, gender, marital status, number of children, and highest education.

1. Respondents’ Age

There was a significant gap in the number of respondents in the awardees’ age categories. Only 15 awardees respondents were counted in the age category 20-39, whereas in the age category 40-59 there were 75 respondents. For the non awardees respondents, there is a more fair distribution with 155 respondents for the age category 20-39, and 145 respondents for the age category 40-59. Moreover, there were only ten responses from non awardees and no responses from awardees. The response figures for the age categories are shown in Table 4.2.

<table>
<thead>
<tr>
<th>Table 4.2 Cross tabulation between awardees and non awardees and age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Awardees</td>
</tr>
<tr>
<td>Non Awardees</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia
For the final analysis, in order to simplify the binary logistic regression analysis, the respondents’ ages were grouped into two categories: (i) under 40 years of age, and (ii) 40 years old and over.

2. Respondents’ Gender

The number of responses from men was significantly more than those from women. This was not unexpected because most of the small scale fish farmers in Central Java are men. There were 18 female non awardees fish farmers and none of the awardees. The response figures for the gender categories are shown in Table 4.3.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awardees</td>
<td>90</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>292</td>
<td>18</td>
<td>310</td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>18</td>
<td>400</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

3. Respondents’ Marital Status

Most of the respondents (both awardees and non awardees) were married. Only five awardees were single with no divorced awardees, and 34 non awardees were single and five non awardees were divorced. The response figures for the marital status categories are shown in Table 4.4.

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Single</th>
<th>Married</th>
<th>Divorced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awardees</td>
<td>5</td>
<td>85</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>34</td>
<td>271</td>
<td>5</td>
<td>310</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>356</td>
<td>5</td>
<td>400</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia
For the final analysis, in order to simplify the binary logistic regression analysis, the respondents’ marital status was grouped into two categories: (i) married, and (ii) single (which included single and divorced respondents).

4. Respondents’ Number of Children

Most awardees and non awardees respondents reported having two or more children. Ten awardees respondents reported having only one child while 29 non awardees reported having only one child. There were five awardees respondents who reported having no children, whereas 57 non awardees respondents reported having no children. The response numbers for respondents’ number of children categories are shown in Table 4.5.

Table 4.5 Cross tabulation between awardees/non awardees and their number of children

<table>
<thead>
<tr>
<th>Number of Children</th>
<th>One</th>
<th>Two or more</th>
<th>None</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Awardees</strong></td>
<td>10</td>
<td>75</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td><strong>Non Awardees</strong></td>
<td>29</td>
<td>224</td>
<td>57</td>
<td>310</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>299</td>
<td>62</td>
<td>400</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

5. Respondents’ Highest Education

Most awardees and non awardees respondents were high school graduates. There were four awardees respondents who were university graduates, three who had completed primary school, and one who had not completed primary education. For the non awardees three respondents had graduated from university, 129 had completed primary school education, and 27 respondents who had not completed primary school. The response numbers for respondents’ highest education are shown in Table 4.6.
Table 4.6 Cross tabulation between awardees/non awardees and highest education

<table>
<thead>
<tr>
<th>Highest Education</th>
<th>University graduate</th>
<th>Completed high school</th>
<th>Completed primary school</th>
<th>Did not complete primary school</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awardees</td>
<td>4</td>
<td>82</td>
<td>3</td>
<td>1</td>
<td>90</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>3</td>
<td>151</td>
<td>129</td>
<td>27</td>
<td>310</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>233</td>
<td>132</td>
<td>28</td>
<td>400</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

For the final binary logistic analysis, the respondents’ education level was grouped into two categories: (i) did not complete high school (included respondents who had not complete primary school and those who had completed primary school), and (ii) completed high school (included respondents who had completed high school and those who were university graduates).

4.5.2 Respondents Business Characteristics

The business characteristics of the respondents included information about their fish farming group classes, annual income, land size, and number of employees.

1. Respondents’ Fish Farmer Group (FFG) Class

Most of the awardees respondents came from the fourth level of business class group and only two awardees came from the starter group, one from the second level group, and five from the third level group. The non awardees respondents came mostly from the third level class group (114 respondents), followed by 107 respondents from the starter group, 55 from the second level group, and 28 respondents from the fourth level group. The response numbers for respondents’ fish farmer group class are shown in Table 4.7.
Table 4.7 Cross tabulation between awardees/non awardees and business group

<table>
<thead>
<tr>
<th>Fish farmer group class</th>
<th>Awardees</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Starter (Pemula)</td>
<td>Second level (Lanjut)</td>
<td>Third level (Madya)</td>
<td>Fourth Level (Utama)</td>
<td></td>
</tr>
<tr>
<td>Awardees</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>77</td>
<td>90</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>107</td>
<td>55</td>
<td>114</td>
<td>28</td>
<td>310</td>
</tr>
<tr>
<td>Total</td>
<td>109</td>
<td>56</td>
<td>119</td>
<td>105</td>
<td>400</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

To simplify groupings for the binary logistic regression analysis, the fish farmer group class was divided into two categories: (i) starter category (which included the starter and second level classes), and (ii) advanced category (which included the third and fourth level classes).
2. Respondent’s Annual Income

Most of the awardees respondents annual income were higher than Rp 50 million (69 respondents), and only 21 had annual income of less than Rp 50 million. Most non awardees reported annual incomes of less than Rp 50 million, and only eight reported annual incomes higher than Rp 50 million. The response numbers for respondents’ annual income are shown in Table 4.8.

<table>
<thead>
<tr>
<th>Income per year</th>
<th>Under Rp. 50 million</th>
<th>Rp. 50 million and over</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awardees</td>
<td>21</td>
<td>69</td>
<td>90</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>302</td>
<td>8</td>
<td>310</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>323</strong></td>
<td><strong>77</strong></td>
<td><strong>400</strong></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

3. Respondents’ Land Size

Most small scale fish farmers in Central Java reported having fish farming land of a size less than 2 hectares (awardees 90, non awardees 252). Only 53 non awardees had land of size 2 to 5 hectares, and only five non awardees respondents reported to have land of size 5 to 10 hectares. The response numbers for respondents’ land size are shown in Table 4.9.

<table>
<thead>
<tr>
<th>Size of fish farming business land</th>
<th>&lt; 2 Ha</th>
<th>2 - &lt; 5 Ha</th>
<th>5 - &lt; 10 Ha</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awardees</td>
<td>90</td>
<td>0</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>252</td>
<td>53</td>
<td>5</td>
<td>310</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>342</strong></td>
<td><strong>53</strong></td>
<td><strong>5</strong></td>
<td><strong>400</strong></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia
4. Respondent’s Number of Employee

Most awardees reported having 3-5 employees (72 respondents), and 18 respondents reported employing 0-2 people. Of the non awardees respondents, 280 answered that they only have 0-2 people working for them, 16 respondents reported having 3-5 employees, nine respondents reported having 6 to 8 workers, and five respondents stated that they have nine or more people working for them. The response numbers for respondents’ number of employees are shown in Table 4.10.

Table 4.10 Cross tabulation between awardees/non awardees and number of employee

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>0-2 people</th>
<th>3-5 people</th>
<th>6-8 people</th>
<th>9 or more people</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awardees</td>
<td>18</td>
<td>72</td>
<td>0</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>280</td>
<td>16</td>
<td>9</td>
<td>5</td>
<td>310</td>
</tr>
<tr>
<td>Total</td>
<td>298</td>
<td>88</td>
<td>9</td>
<td>5</td>
<td>400</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

4.6 Measurement instrument

The steps involved in the development of the data collection instrument included the construction of a questionnaire in English and then the translation of the English questionnaire into Indonesian for use during the data collection step.

4.6.1. The questionnaire

The questions used on the questionnaire were developed from different sources. Some of the questions in the questionnaire were borrowed from previous research questionnaires. Other questions were borrowed from previous research questionnaires but modified to suite the surveying of small scale fish farmers. Some new questions were developed specifically to meet the objectives of this research. Table 4.11 shows the sources of questions on the questionnaire. The table also lists the parts of the questionnaire that were adapted or modified from previous studies or the parts that the researcher developed afresh for this research.
### Table 4.11 Sources of questions for the questionnaire

<table>
<thead>
<tr>
<th>Section</th>
<th>Background Details</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2.</td>
<td>Family Business Experience</td>
<td></td>
</tr>
</tbody>
</table>

### Section B. Current Situation

<table>
<thead>
<tr>
<th>Section</th>
<th>Current Situation</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1.</td>
<td>Entrepreneurial Activities</td>
<td>Developed by researcher</td>
</tr>
<tr>
<td>B3.2.</td>
<td>Aquaculture skills</td>
<td></td>
</tr>
<tr>
<td>B3.3.</td>
<td>Aquaculture experience</td>
<td></td>
</tr>
<tr>
<td>B3.4.</td>
<td>Aquaculture education</td>
<td></td>
</tr>
<tr>
<td>B3.5.</td>
<td>Entrepreneurial personality</td>
<td>Morris, Avila, and Teeple (1990), Blackman (2003)</td>
</tr>
<tr>
<td>B3.8.</td>
<td>Business network relation</td>
<td></td>
</tr>
<tr>
<td>B3.9.</td>
<td>Financial capital</td>
<td></td>
</tr>
<tr>
<td>B3.10.</td>
<td>Family support</td>
<td></td>
</tr>
<tr>
<td>B3.12.</td>
<td>Logistics</td>
<td>Developed by researcher</td>
</tr>
</tbody>
</table>
Section C. Other Aspects of the Business

<table>
<thead>
<tr>
<th>Section</th>
<th>Other aspects of the Business</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1.</td>
<td>Income improvement</td>
<td>Susilowati, Winarni, and Sudaryono (2005), Blackman (2003)</td>
</tr>
</tbody>
</table>

4.6.2. Steps in the questionnaire development

The questionnaire was tested with a small number of Indonesian people to obtain their views about the questionnaire and to estimate the completion time. The questionnaire was revised from the test feedback for use during the data collection step to make it easier for the small scale fish farmer to answer and complete.

1. Paper based methods

A paper based questionnaire was chosen for carrying out this survey because it was considered more suitable since few small scale fish farmers have access to the Internet or computers.

2. Interviews

No interviews were carried out for this research.

4.6.3. Translation of the questionnaire

The questionnaire was translated into Indonesian for data collection. The questionnaire was edited several times to find the most suitable language that small scale fish farmers would understand.

The Indonesian version of the questionnaire was then tested with Indonesian colleagues to obtain responses and feedback. Several necessary changes were then made for even easier understanding. The final version of the questionnaire is presented in the Appendices.
4.7 Data collection procedure

Prior to returning to Indonesia to do the fieldwork, and in accordance with the Swinburne research policy, an ethics application was submitted for approval. The application was approved by the Swinburne University Human Ethics Committee (SUHREC) on 9 November 2007 (see Appendix 3). With this clearance the research could commence in Central Java, Indonesia; the fieldwork of this research was carried out from December 2007-May 2008.

The researcher gathered information regarding small scale fish farmers in Central Java from the Central Java Fisheries and Marine Affairs Provincial Office. In order to obtain more detailed contact information of the small scale fish farmers in each region and the Central Java Fisheries and Marine affairs Office have provided an official support letter for the researcher to give to the Regional Fisheries Office to obtain the necessary data.

4.7.1 Preliminary correspondence

A publicly available list of small scale fish farmer groups with their addresses were obtained from the Central Java Fisheries and Marine Office. Another publicly available list was also taken from the Central Java Government Office which contained names of small scale fish farmer groups that have won the regional or national awards.

These lists were then combined to develop two lists of small scale fish farmer groups. The first list contained the details of the farmers who had won the regional awards in the last five years, from 2003 – 2007, and the second list contained the details of those farmers who had not won an award in the five years, from 2003 - 2007.

The lists of names and addresses were then entered manually into a computer spreadsheet file and 400 names of potential respondents were randomly picked. The numbers of potential respondents from the two groups were proportionally divided according to the size of the population in each group. Data obtained from the Central Java Fisheries and Marine Affairs Office (2005) reported that the size of the fish farmer community in Central Java was approximately 400,000 fish farmers and that 22 per cent of fish farmers had received awards in
the past five years while 78 per cent of fish farmers had not received awards in the past five years.

### 4.7.2 Personal approaches and leads

The survey was conducted by using a paper based questionnaire distributed to the potential participants. Each questionnaire contained a code to differentiate the two groups. Questionnaires with the code “A” at the top right corner was distributed to the small scale fish farmers who had won regional awards and questionnaires with the code “NA” at the top right corner were distributed to the other group.

The Central Java Marine and Fisheries Office was personally approached to ask for support for this research. The Central Java Fisheries and Marine Office endorsed the research with a formal letter that was given to the local fisheries offices from where the questionnaires were distributed.

### 4.7.3 Questionnaire distribution method

Questionnaires were distributed to participants by leaving the questionnaires at the designated local Fisheries and Marine Affairs office. The participants voluntarily completed the questionnaires and returned them to the Fisheries and Marine Affairs Office.

Questionnaire distribution to several selected regions in Central Java occurred in January 2008. In order to avoid confusion between awardees and non awardees, one category (out of awardees or non awardees) was assigned to a region. For example only questionnaires for awardees were distributed in regions A, B, and C, whereas, regions D, E, F, and G received questionnaires for non awardees.

Deadlines were set for the collection of the completed questionnaires. Questionnaires that were not fully completed were omitted from the collected data set. At the first deadline date, the required sample size had not yet been reached and therefore a second distribution of questionnaires was carried out using the same method, but in different regions.
Four hundred completed questionnaires were collected after the second distribution. The data was then entered into a software application to enable statistical analysis on the data.

4.8 Data analysis

This research used the SPSS statistical software to carry out statistical analyses on the collected data. Several analyses and tests were used to examine the data:

4.8.1 Descriptive analysis

Descriptive statistics were used in this research analysis to describe the characteristics of the sample used in a research. According to Pallant (2005) there are three reasons to use descriptive analysis: (i) to characterise the sample, (ii) to address the research questions, and (iii) to look for patterns in the data that will invalidate statistical tests when answering the research questions. In this research, the descriptive analysis was used to describe the personal and business characteristics of the participants, for example their age, educational levels, marital status, and number of employees. This analysis was also used to test hypothesis number 9 that examines the implemented entrepreneurial activities of small scale fish farmers in Central Java.

4.8.2 Exploratory Factor Analysis

Exploratory factor analysis was used to collapse numerous variables into a smaller number of meaningful variables. It minimised the number of variables for endogenous factors, exogenous factors, constraint, and problems that influence income improvement and product sustainability. It is a type of analysis usually used to construct a small number of scales from a large number of variables. This assisted manipulation of the data and eased the interpretation of the results.

There are two kinds of factor analysis: (i) exploratory factor analysis (EFA) to explore the relationships between variables, and (ii) confirmatory factor analysis (CFA) to confirm the hypotheses or theories that underlie the variables (Pallant 2005). In this research the EFA approach was used since the research formulated hypotheses regarding the correlation between variables.
There are three steps in carrying out EFA: (i) assessment of the appropriateness of the data for factor analysis, (ii) factor extraction, and (iii) factor rotation (Pallant 2005). For data to be suitable for EFA, the sample size should be large (at least 300 samples) and there should be strong relationships between items (Tabachnick & Fidell 2007).

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett’s test of sphericity can be used to assess the appropriateness of the data for factor analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy should have a minimum value of 0.6 but a value above 0.8 would be ideal and the Bartlett’s test of sphericity should be significant (p<.05) (Tabachnick & Fidell 2007).

The reason for using EFA is to find the least number of factors that would make the interpretation of the results easier but, at the same time, would explain as much variation in the original data as possible (Pallant 2005). Three techniques—Kaiser’s criterion, a scree plot test, and parallel analysis—can be used to assist with the process of identifying the numbers of factors to be extracted. The Kaiser’s criterion uses the number of eigenvalues above one to determine the number of factors that should be extracted. The Catell’s scree plot test involves the investigation of the scree plot curve which plots eigenvalues by number. It is suggested that all factors with eigenvalues above the sharp curve or “the elbow” should be retained. The Parallel analysis technique involves a comparison between “the size of the eigenvalues from the research data with the size of eigenvalues obtained from randomly generated data sets of the same size” (Pallant 2005, p. 175). Eigenvalues higher than the eigenvalues generated from random data provide evidence for the retention of a factor.

With factor rotation, there are two types of rotation: orthogonal (uncorrelated factors) or oblique (correlated factors) (Pallant 2005). Both techniques can be used to further decide which result is easiest to interpret. Tabachnick and Fidell (2007) explain that oblique rotation is more difficult to interpret but allows the factors to be correlated while the orthogonal approach is easier to interpret but is based on the assumption that there is no correlation between the factors.
4.8.3 Binary Logistic Regression

Binary logistics regression was used to analyse the research data because the dependent variable was dichotomous and the independent variable was continuous. This statistical analysis was carried out to test hypotheses number 1 to 4, which explored the correlation between endogenous and exogenous factors with income improvement and product sustainability. It was also used to examine hypotheses 5 to 8 which assessed the interaction between constraints and problems with income improvement and product sustainability. Binary logistics regression was used, because these hypotheses used the same dichotomous dependent variable (income) and was categorised into two classes which was (a) lower than Rp. 50 million and (b) Rp. 50 million or more.

4.8.4 Chi-square test analysis

There are two types of chi-square test: the chi-square goodness of fit and the chi-square test of independence (Pallant 2005). Pallant explained that the chi-square for the goodness of fit “explores the proportion of cases that fall into the various categories of a single variable, and compares these with hypothesised values” (Pallant 2005, p. 287). On the other hand, the chi-square test of independence is used to explore relationships between two categorical variables by comparing the frequency of categories in one variable with the categories in the other variable. The chi-square test of independence is used in this research to compare two groups of categorical variables. It was used to answer hypotheses 10 to 16, which compared relationships between: (a) awardees and non awardees, (b) male and female, (c) ages, (d) marital status, (e) educational levels, (f) fish farmer groups, and (g) reason to go into business, according to the types of implemented entrepreneurial activities.

4.8.5 Cronbach’s alpha test

The Cronbach’s alpha test was used in this research to test the reliability of the scales that were developed for the binary logistics regression analysis. According to Pallant (2005) ideally the Cronbach’s alpha coefficient should be above 0.7 for good reliability of scales.
In this research four scales were developed: (i) constraints and problems that influence income improvement, (ii) constraints and problems that influence product sustainability, (iii) endogenous and exogenous factors that influence income improvement, and (iv) endogenous and exogenous factors that influence product sustainability. These four scales were tested with the Cronbach’s alpha test to confirm their reliability.

4.9 Interpretation and presentation of results

The results obtained from each of the statistical analyses described in the previous step were interpreted and presented separately. The statistical analyses are presented in two chapters: the preliminary analysis chapter and the main data analysis chapter. The preliminary analysis chapter describes the data reduction by using the exploratory factor analysis and the main analysis chapter presents the results from the binary logistic regression analysis, the chi-square test, the descriptive analysis, and the Cronbach’s alpha test.

4.10 Conclusion

This research administered a paper based questionnaire because it was believed that most of the expected respondents would not have access to a computer or the Internet. A questionnaire was developed in English from English academic research literature and then translated into Indonesian for the data collection step of the research.

The questionnaires were distributed to two groups (fish farmer groups that had won awards and fish farmer groups that had not won awards) through a stratified random sampling method. A proportional number of questionnaires were distributed to possible participants from the two groups. The proportional number was determined according to the information about fish farmer groups obtained from Central Java Fisheries and Marine Office, the Department of Marine and Fisheries, and the Governor of Central Java Office. With the assistance from the regional Fisheries and Marine Office, questionnaires were left at the office to be voluntarily taken by the small scale fish farmers and returned back to the regional office after completion. Questionnaires were collected from the regional Fisheries and Marine Office at an agreed collection date. The questionnaires were checked for completion and only completed questionnaires were used. Uncompleted questionnaires were omitted from the collected data.
Questionnaires were distributed on two occasions to collect the required number of responses. Once sufficient responses were collected, the researcher typed the data into a SPSS dataset for analysis.

The five objectives of this research were broken down into several hypotheses. The research used several statistical analyses to analyse the data: descriptive analysis, exploratory factor analysis, binary logistics regression, and chi-square analysis.
Chapter 5

Preliminary Analysis

5.1 Introduction

This chapter presents the preliminary analysis of the thesis. It includes information regarding the data reduction of variables that were used in the research. It also provides information on the test for the reliability of the eight scales that were used by using Cronbach’s Alpha test and Pearson’s correlations. The preliminary analysis used exploratory factor analysis in order to group the variables into meaningful factors. This assisted in the interpretation of results and testing of hypotheses.

5.2 Exploratory factor analysis

Exploratory factor analysis is a statistical function programmed in SPSS that assists with data reduction (Pallant 2005). It is usually used by researchers with a large number of variables to help them discover the small number of variables which account for the greatest percentage of variation in the original variables. This makes it easier for the researcher to work with the data and interpret the result.

There are two ways of approaching factor analysis, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Exploratory factor analyses are widely used to explore the relationship between variables, whereas confirmatory factor analyses are used to confirm the hypotheses or theories that underlie the variables (Pallant 2005). In this research, an exploratory factor analysis approach was used because there are no relevant models available in the literature.

5.2.1 Steps in conducting factor analysis

In order to successfully carry out the factor analysis, several steps have to be followed. These steps are to firstly assess the appropriateness of the data for factor analysis, and then do the factor extraction and factor rotation (Pallant 2005). If a simple structure is obtained the factors are checked for face validity and named. If a simple structure is not obtained, the factor analysis is rerun using a different extraction method or rerun with items removed until a simple structure is achieved. The simple structure obtained is defined in more detail below.
5.2.1.1 Assessment for suitability of data

There are two data requirements which must be met in order for a factor analysis to be suitable. These requirements relate to the sample size and the strength of the relationship between the variables. It is commonly known that the larger the sample size, the better and more reliable an analysis will be. According to Tabachnick and Fidell (2007), the minimum sample size needed to appropriately use factor analysis is at least 300 cases. In this research 400 observations were gathered; therefore, the sample size in this research was sufficiently large.

Regarding the strength of the relationship among items, Tabachnick and Fidell (2007) suggested checking the correlation matrix for the number of coefficients larger than 0.3. If only a few correlations are found with value greater than 0.3, they suggest that factor analysis may not be appropriate for the data. In this research, most of the values in the correlation matrix were larger than 0.3, therefore, factor analysis was considered to be appropriate for this research.

There are two statistical measures that can be used to assess the appropriateness of a factor analysis: Bartlett’s test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The Bartlett’s test of sphericity should be significant (p < 0.05) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy should have a minimum value of 0.6 but ideally a value above 0.8 to have a good factor analysis (Tabachnick & Fidell 2007). All of the KMO and Bartlett’s statistics for the research data are presented in section 5.3.

5.2.1.2 Factor extraction

In EFA the goal is to find the least number of factors to make the interpretation easier but, at the same time, to explain as much variation in the original data as possible (Pallant 2005). In order to achieve a satisfactory solution, it is recommended that the researcher explore and experiment with different numbers of factors until a best decision can be made. Three techniques can be used to assist with this process: Kaiser’s criterion, a scree plot test and parallel analysis.

a. Kaiser’s criterion

Kaiser’s criterion uses the number of eigenvalues above one to determine the number of factors that should be extracted.
b. Catell’s scree plot test

This technique involves the investigation of the scree plot curve which is a plot of eigenvalues by number. It is recommended that all factors with eigenvalues above the “elbow” should be retained.

c. Parallel analysis

The Parallel analysis technique involves a comparison between “the size of the eigenvalues from the research data with the size of eigenvalues obtained from randomly generated data sets of the same size” (Pallant 2005, p. 175). Eigenvalues higher than the eigenvalues generated from random data provide evidence for the retention of a factor.

5.2.1.3. Factor rotation and interpretation

There are two types of rotation, either orthogonal (uncorrelated factors) or oblique (correlated factors) (Pallant 2005). Rotation techniques can be used in addition to the previous factor extraction techniques to decide which solution is easier to interpret. Tabachnick and Fidell (2007) explained that the orthogonal approach gives results that are easier to interpret but the technique requires an assumption of no correlation between the factors. Although the results for an oblique rotation are more difficult to interpret it does allow for the factors to be correlated.

5.3 Endogenous and Exogenous Factors

The step to do data reduction for endogenous and exogenous factors was based on the large numbers of variables used in this research to measure exogenous and endogenous factors. There were 14 such variables that influence income improvement and another 14 variables that influence product sustainability. The variables were grouped under income improvement and product sustainability categories because the aim was to study the respondents’ perceptions about how these variables affect their business’ efforts to achieve income improvement and product sustainability.
5.3.1 Endogenous and exogenous factors that influence income improvement

The data used for the endogenous and exogenous factors that influence income improvement were obtained from question number 65 in the questionnaire: “To what extent do you agree that the factors below influence income improvement for your business?”. The answers were given on a Likert scale, ranging from “strongly agree” (number 6) to “strongly disagree” (number 1).

An initial EFA was performed for the income improvement variables in order to reduce the 14 variables to a smaller number of meaningful factors. The KMO and Bartlett’s test scores for the endogenous and exogenous factors relating to income improvement are shown in Table 5.1: the test results indicate that the requirements for factor analysis were met with the KMO value of 0.809 and a Bartlett p-value less than 0.05.

Table 5.1 KMO and Bartlett’s Test results for endogenous and exogenous factors that influence income improvement

<table>
<thead>
<tr>
<th>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</th>
<th>.809</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartlett’s Test of Sphericity</td>
<td>Approx. Chi-Square</td>
</tr>
<tr>
<td>df</td>
<td>66</td>
</tr>
<tr>
<td>Sig.</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 5.2 shows that according to Kaiser’s criterion three factors explained 67.5% of the variation in the data. However, an initial three factor solution was not successful because the third factor had only two items assigned to it.
Table 5.2 Total variance explained for endogenous and exogenous factors that influence income improvement when two factors are selected

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings&lt;sup&gt;(a)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Total of Variance</td>
</tr>
<tr>
<td>1</td>
<td>4.805</td>
<td>40.045</td>
<td>4.805</td>
</tr>
<tr>
<td>2</td>
<td>2.157</td>
<td>17.972</td>
<td>2.157</td>
</tr>
<tr>
<td>3</td>
<td>1.138</td>
<td>9.486</td>
<td>1.138</td>
</tr>
<tr>
<td>4</td>
<td>.881</td>
<td>7.345</td>
<td>.881</td>
</tr>
<tr>
<td>5</td>
<td>.724</td>
<td>6.034</td>
<td>.724</td>
</tr>
<tr>
<td>6</td>
<td>.549</td>
<td>4.577</td>
<td>.549</td>
</tr>
<tr>
<td>7</td>
<td>.446</td>
<td>3.720</td>
<td>.446</td>
</tr>
<tr>
<td>8</td>
<td>.358</td>
<td>2.986</td>
<td>.358</td>
</tr>
<tr>
<td>9</td>
<td>.290</td>
<td>2.415</td>
<td>.290</td>
</tr>
<tr>
<td>10</td>
<td>.244</td>
<td>2.032</td>
<td>.244</td>
</tr>
<tr>
<td>11</td>
<td>.215</td>
<td>1.789</td>
<td>.215</td>
</tr>
<tr>
<td>12</td>
<td>.192</td>
<td>1.599</td>
<td>.192</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

(a) When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The Scree Plot in Figure 5.1 shows that there were two eigenvalues before the elbow that explained 58% of the variation in the data. According to the Catell’s scree plot test, all factors with eigenvalues above the elbow should be retained, so for this data it was determined that two factors should be extracted. Theory suggested that one of these factors related to endogenous influences while the other related to exogenous influences.
Figure 5.1 Scree Plot for endogenous and exogenous factors that influence income improvement

![Scree Plot](image)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The result of the two factor data reduction for the endogenous and exogenous factors that influence income improvement is presented in the Pattern Matrix (see Table 5.3).
Table 5.3 Pattern Matrix(a) for endogenous and exogenous factors that influence income improvement

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Agree that market influence income improvement&quot;</td>
<td>.953</td>
<td>-.200</td>
</tr>
<tr>
<td>&quot;Agree that financial capital influence income improvement&quot;</td>
<td>.871</td>
<td>-.078</td>
</tr>
<tr>
<td>&quot;Agree that logistics influence income improvement&quot;</td>
<td>.808</td>
<td>.051</td>
</tr>
<tr>
<td>&quot;Agree that gov./other institution support influence income improvement&quot;</td>
<td>.800</td>
<td>.025</td>
</tr>
<tr>
<td>&quot;Agree that business network influence income improvement&quot;</td>
<td>.586</td>
<td>.230</td>
</tr>
<tr>
<td>&quot;Agree that family support influence income improvement&quot;</td>
<td>.549</td>
<td>.231</td>
</tr>
<tr>
<td>&quot;Agree that aquaculture skills influence income improvement&quot;</td>
<td>-.146</td>
<td>.917</td>
</tr>
<tr>
<td>&quot;Agree that aquaculture knowledge influence income improvement&quot;</td>
<td>-.093</td>
<td>.821</td>
</tr>
<tr>
<td>&quot;Agree that aquaculture experience influence income improvement&quot;</td>
<td>.159</td>
<td>.753</td>
</tr>
<tr>
<td>&quot;Agree that personal business experience influence income improvement&quot;</td>
<td>.118</td>
<td>.633</td>
</tr>
<tr>
<td>&quot;Agree that aquaculture education influence income improvement&quot;</td>
<td>.091</td>
<td>.574</td>
</tr>
<tr>
<td>&quot;Agree that family business background influence income improvement&quot;</td>
<td>-.009</td>
<td>.491</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
(a) Rotation converged in 6 iterations.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

In the factor reduction process two variables: “Agree that strong entrepreneurial characteristics influence income improvement” and “Agree that family support influence income improvement” were removed from the data. The decision to take out these two variables led to a simple structure with each variable loading on only one factor.

In Table 5.3 the component loadings show that the variables were grouped into exogenous factors and endogenous factors. According to the data reduction results, six variables were included as exogenous factors which influence income improvement:

1. Business network
2. Financial capital
3. Market
4. Logistics
5. Government/other institution support
6. Family support

There were also six variables that were included as endogenous factors that influence income improvement:
1. Aquaculture knowledge
2. Aquaculture skills
3. Aquaculture experience
4. Aquaculture education
5. Personal business experience
6. Family business background

5.3.2 Endogenous and exogenous factors that influence product sustainability

The data for factors that influence product sustainability was derived from question number 66 in the questionnaire: “To what extent do you agree that the factors below influence product sustainability for your business?”. The answer were given on a Likert scale ranging from 1 to 6 (“strongly disagree” to “strongly agree”).

An initial EFA was performed for product sustainability variables to reduce the 14 variables to a smaller number of meaningful factors. Table 5.4 shows the value of KMO and Bartlett’s test for endogenous and exogenous factors relating to product sustainability. The results show that the requirements for factor analysis were met with KMO value of 0.857 and a Bartlett Test Sphericity p-value below 0.05.
Table 5.4 KMO and Bartlett’s Test for endogenous and exogenous factors that influence product sustainability

<table>
<thead>
<tr>
<th>Kaiser-Meyer-Olkin Measure of Sampling Adequacy</th>
<th>.857</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartlett's Test of Sphericity</td>
<td></td>
</tr>
<tr>
<td>Approx. Chi-Square</td>
<td>3425.476</td>
</tr>
<tr>
<td>df</td>
<td>66</td>
</tr>
<tr>
<td>Sig.</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 5.5 suggests that the three factors selected by Kaiser’s Criterion explained 73% of the variation in the data. However, the third factor (1.094) was very close to 1.0, so the Catell’s scree plot (see Figure 5.2) was also examined prior to deciding how many factors to retain. Two factors explained 64% of the variation in the data while the first factor explains 53% of the variation in the data.
Table 5.5 Total variance explained for endogenous and exogenous factors that influence product sustainability

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings(^{(a)})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total % of Variance</td>
<td>Cumulative %</td>
<td>Total % of Variance</td>
</tr>
<tr>
<td>1</td>
<td>6.386</td>
<td>53.214</td>
<td>53.214</td>
</tr>
<tr>
<td>2</td>
<td>1.305</td>
<td>10.875</td>
<td>64.089</td>
</tr>
<tr>
<td>3</td>
<td>1.094</td>
<td>9.117</td>
<td>73.206</td>
</tr>
<tr>
<td>4</td>
<td>.835</td>
<td>6.961</td>
<td>80.167</td>
</tr>
<tr>
<td>5</td>
<td>.584</td>
<td>4.867</td>
<td>85.035</td>
</tr>
<tr>
<td>7</td>
<td>.344</td>
<td>2.866</td>
<td>91.249</td>
</tr>
<tr>
<td>8</td>
<td>.319</td>
<td>2.656</td>
<td>93.905</td>
</tr>
<tr>
<td>9</td>
<td>.279</td>
<td>2.325</td>
<td>96.230</td>
</tr>
<tr>
<td>10</td>
<td>.199</td>
<td>1.657</td>
<td>97.887</td>
</tr>
<tr>
<td>11</td>
<td>.151</td>
<td>1.260</td>
<td>99.147</td>
</tr>
<tr>
<td>12</td>
<td>.102</td>
<td>.853</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

(a) When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The Scree Plot in Figure 5.2 shows only one eigenvalue above the first elbow. However, the theory suggested that there should be two factors.

Figure 5.2 Scree Plot for endogenous / exogenous factor that influence product sustainability

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.
The result of the data reduction with two factors is presented in the Pattern Matrix (see Table 5.6).

**Table 5.6 Pattern Matrix**(a) for endogenous and exogenous factors that influence product sustainability

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Agree that business reason influence product sustainability&quot;</td>
<td>.835</td>
<td>-.175</td>
</tr>
<tr>
<td>&quot;Agree that family business background influence product sustainability&quot;</td>
<td>.820</td>
<td>-.028</td>
</tr>
<tr>
<td>&quot;Agree that strong entrepreneur character influence product sustainability&quot;</td>
<td>.773</td>
<td>.089</td>
</tr>
<tr>
<td>&quot;Agree that family support influence product sustainability&quot;</td>
<td>.753</td>
<td>-.156</td>
</tr>
<tr>
<td>&quot;Agree that personal business experience influence product sustainability&quot;</td>
<td>.734</td>
<td>-.105</td>
</tr>
<tr>
<td>&quot;Agree that aq. education influence product sustainability&quot;</td>
<td>.683</td>
<td>.214</td>
</tr>
<tr>
<td>&quot;Agree that logistics influence product sustainability&quot;</td>
<td>.651</td>
<td>.295</td>
</tr>
<tr>
<td>&quot;Agree that aq. knowledge influence product sustainability&quot;</td>
<td>.634</td>
<td>.401</td>
</tr>
<tr>
<td>&quot;Agree that aq. skills influence product sustainability&quot;</td>
<td>.623</td>
<td>.401</td>
</tr>
<tr>
<td>&quot;Agree that business network influence product sustainability&quot;</td>
<td>-.190</td>
<td>.792</td>
</tr>
<tr>
<td>&quot;Agree that financial capital influence product sustainability&quot;</td>
<td>.372</td>
<td>.675</td>
</tr>
<tr>
<td>&quot;Agree that gov./other institution support influence product sustainability&quot;</td>
<td>.400</td>
<td>.624</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
(a) Rotation converged in 9 iterations.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

According to the results of the factor reduction data in Table 5.6, there were two groups of variables: endogenous and exogenous factors that influence product sustainability. Nine variables were grouped into the endogenous factor, and three variables into the exogenous factor. Two variables were removed from the variable set to ensure a simple structure with each variable loading on only one factor. The two variables that were removed were:

1. Agree that potential market influence product sustainability
2. Agree that aquaculture experience influence product sustainability
The nine variables that were included as the endogenous factors that influence product sustainability were:

1. Aquaculture knowledge
2. Aquaculture skills
3. Aquaculture education
4. Strong entrepreneur character
5. Business reason
6. Personal business experience
7. Family business background
8. Family support
9. Logistics

The three variables that were included as the exogenous factors influencing product sustainability were:

1. Business network
2. Financial capital
3. Government/other institution support

5.4 Constraints and Problems

The constraints and problems in this research were classified according to two groups:

1. Constraints and problems which result in lower income.
2. Constraints and problems which result in lower product sustainability.

The constraints and problems were divided into two groups to differentiate the respondents’ perceptions of how these variables affected their fish farming business’ to achieve higher income and higher product sustainability.

5.4.1 Constraints and problems that influence income improvement

The data used in factor analysis for the constraints and problems that relate to income improvement were obtained from question number 30 of the questionnaire: “To what extent do you agree that each of the following circumstances faced by your business prevents you from achieving your income
improvement?”. The answers were given on a Likert scale ranging from 1 to 6 (1 for “strongly disagree” and 6 for “strongly agree”).

The EFA was performed for the constraints and problems variables related to income improvement in order to reduce the 16 variables to a smaller number of meaningful factors. The KMO and Bartlett’s test results for the constraints and problems relating to income improvement are shown in Table 5.7; they show that the requirement for factor analysis were met with the KMO value of 0.856 and a Bartlett p-value less than 0.05.

Table 5.7 KMO and Bartlett’s Test results for constraints and problems that influence income improvement

<table>
<thead>
<tr>
<th>Kaiser-Meyer-Olkin Measure of Sampling Adequacy</th>
<th>.856</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartlett's Test of Sphericity</td>
<td></td>
</tr>
<tr>
<td>Approx. Chi-Square</td>
<td>6089.441</td>
</tr>
<tr>
<td>df</td>
<td>78</td>
</tr>
<tr>
<td>Sig.</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 5.8 shows that according to Kaiser’s criterion two factors had to be extracted, because they explained 79% of the variation in the data.
Table 5.8 Total variance explained for constraints and problems that influence income improvement

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative</td>
</tr>
<tr>
<td>2</td>
<td>1.652</td>
<td>12.711</td>
<td>79.162</td>
</tr>
<tr>
<td>3</td>
<td>.587</td>
<td>4.517</td>
<td>83.679</td>
</tr>
<tr>
<td>4</td>
<td>.449</td>
<td>3.456</td>
<td>87.135</td>
</tr>
<tr>
<td>5</td>
<td>.369</td>
<td>2.840</td>
<td>89.975</td>
</tr>
<tr>
<td>6</td>
<td>.284</td>
<td>2.188</td>
<td>92.163</td>
</tr>
<tr>
<td>7</td>
<td>.262</td>
<td>2.018</td>
<td>94.180</td>
</tr>
<tr>
<td>8</td>
<td>.205</td>
<td>1.580</td>
<td>95.761</td>
</tr>
<tr>
<td>9</td>
<td>.170</td>
<td>1.308</td>
<td>97.069</td>
</tr>
<tr>
<td>10</td>
<td>.152</td>
<td>1.169</td>
<td>98.238</td>
</tr>
<tr>
<td>12</td>
<td>.071</td>
<td>.543</td>
<td>99.670</td>
</tr>
<tr>
<td>13</td>
<td>.043</td>
<td>.330</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

(a) When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The result of the screeplot (see Figure 5.3) also showed that two factors had to be retained.

Figure 5.3 Scree Plot for constraints and problems that influence income improvement

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.
The result of the two factor data reduction is shown in the Pattern Matrix (see Table 5.9). It shows constraints and problems as separate factors that influence income improvement.

Table 5.9 Pattern Matrix\(^{(a)}\) for constraints and problems that influence income improvement

<table>
<thead>
<tr>
<th>Component</th>
<th>Constraints</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Low quality of fish seed&quot;</td>
<td>.975</td>
<td>-.139</td>
</tr>
<tr>
<td>&quot;Poor quality control&quot;</td>
<td>.970</td>
<td>-.093</td>
</tr>
<tr>
<td>&quot;Low quality of fish feed&quot;</td>
<td>.927</td>
<td>-.087</td>
</tr>
<tr>
<td>&quot;Poor water quality&quot;</td>
<td>.901</td>
<td>-.025</td>
</tr>
<tr>
<td>&quot;Poor financial management skills&quot;</td>
<td>.878</td>
<td>.036</td>
</tr>
<tr>
<td>&quot;Cannot secure a sufficient loan&quot;</td>
<td>.821</td>
<td>.119</td>
</tr>
<tr>
<td>&quot;Lack of Capital &quot;</td>
<td>.667</td>
<td>.234</td>
</tr>
<tr>
<td>&quot;Lack of profit&quot;</td>
<td>.659</td>
<td>.339</td>
</tr>
<tr>
<td>&quot;Low selling price&quot;</td>
<td>.611</td>
<td>.405</td>
</tr>
<tr>
<td>&quot;Lack of family support &quot;</td>
<td>-.228</td>
<td>1.023</td>
</tr>
<tr>
<td>&quot;Lack of government support&quot;</td>
<td>.195</td>
<td>.785</td>
</tr>
<tr>
<td>&quot;Lack of fish farming experience&quot;</td>
<td>.343</td>
<td>.659</td>
</tr>
<tr>
<td>&quot;Lack of training&quot;</td>
<td>.367</td>
<td>.653</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
(a) Rotation converged in 6 iterations.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

In this data reduction analysis three variables were removed:

1. Fish diseases and parasites
2. Lack of potential markets
3. Lack of technical abilities
According to the EFA results the constraints that influence income improvement that were retained were:

1. Lack of Capital
2. Low selling price
3. Lack of profit
4. Low quality of fish seed
5. Low quality of fish feed
6. Poor financial management skills
7. Poor quality control
8. Poor water quality
9. Cannot secure a sufficient loan

Problems that influence income improvement were:

1. Lack of family support
2. Lack of government support
3. Lack of training
4. Lack of fish farming experience

5.4.2 Constraints and problems that resulted in lower product sustainability

Similar to the constraints and problems for income improvement, the data used to perform factor analysis in this section also used Likert scale data with a range from 1 to 6. The EFA was executed for constraints and problems relating to product sustainability in order to reduce the 16 variables into a smaller number of meaningful factors.

The data used was obtained from question number 31 in the questionnaire: “To what extent do you agree that each of the following circumstances faced by your business prevents you from achieving your product sustainability?”. The KMO and Bartlett’s test for constraints and problems that influence product sustainability in Table 5.10 shows that the requirement to carry out EFA were met with KMO value of 0.921.
Table 5.10 KMO and Bartlett’s Test for constraints and problems that influence product sustainability

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | .921 |
| Bartlett’s Test of Sphericity | Approx. Chi-Square | df | Sig. |
| | 8366.005 | 120 | .000 |

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 5.11 shows that according to Kaiser’s criterion two factors had to be extracted; the two factors explained 78% of the variation in the data.

Table 5.11 Total variance explained for constraints and problems that influence product sustainability

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative %</td>
</tr>
<tr>
<td>2</td>
<td>1.775</td>
<td>11.091</td>
<td>78.410</td>
</tr>
<tr>
<td>3</td>
<td>.991</td>
<td>6.192</td>
<td>84.602</td>
</tr>
<tr>
<td>4</td>
<td>.433</td>
<td>2.705</td>
<td>87.307</td>
</tr>
<tr>
<td>5</td>
<td>.369</td>
<td>2.309</td>
<td>89.616</td>
</tr>
<tr>
<td>6</td>
<td>.320</td>
<td>1.999</td>
<td>91.615</td>
</tr>
<tr>
<td>7</td>
<td>.254</td>
<td>1.587</td>
<td>93.202</td>
</tr>
<tr>
<td>8</td>
<td>.224</td>
<td>1.403</td>
<td>94.605</td>
</tr>
<tr>
<td>9</td>
<td>.178</td>
<td>1.110</td>
<td>95.715</td>
</tr>
<tr>
<td>10</td>
<td>.158</td>
<td>.988</td>
<td>96.703</td>
</tr>
<tr>
<td>11</td>
<td>.121</td>
<td>.758</td>
<td>97.460</td>
</tr>
<tr>
<td>12</td>
<td>.106</td>
<td>.663</td>
<td>98.123</td>
</tr>
<tr>
<td>13</td>
<td>.096</td>
<td>.603</td>
<td>98.726</td>
</tr>
<tr>
<td>14</td>
<td>.079</td>
<td>.495</td>
<td>99.220</td>
</tr>
<tr>
<td>15</td>
<td>.076</td>
<td>.474</td>
<td>99.694</td>
</tr>
<tr>
<td>16</td>
<td>.049</td>
<td>.306</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

(a) When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.
The scree plot in Figure 5.4 shows that there were three factors which lie above the second elbow. However, the literature suggested only two factors namely constraints and problems, so the third eigenvalue certainly had a value less than one.

**Figure 5.4 Scree Plot for constraints and problems that influence product sustainability**

![Scree Plot](image)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The result of the two factor data reduction for constraints and problems that influence product sustainability is presented in the Pattern Matrix (see Table 5.12).
Table 5.12 Pattern Matrix\(^{(a)}\) for constraints and problems that influence product sustainability

<table>
<thead>
<tr>
<th>Component</th>
<th>Constraints</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Poor financial management skills&quot;</td>
<td>.931</td>
<td>-.131</td>
</tr>
<tr>
<td>&quot;Fish diseases and parasites&quot;</td>
<td>.927</td>
<td>-.098</td>
</tr>
<tr>
<td>&quot;Poor water quality&quot;</td>
<td>.894</td>
<td>.032</td>
</tr>
<tr>
<td>&quot;Low quality of fish feed&quot;</td>
<td>.867</td>
<td>.091</td>
</tr>
<tr>
<td>&quot;Low selling price&quot;</td>
<td>.852</td>
<td>.038</td>
</tr>
<tr>
<td>&quot;Low quality of fish seed&quot;</td>
<td>.848</td>
<td>.057</td>
</tr>
<tr>
<td>&quot;Poor quality control&quot;</td>
<td>.841</td>
<td>.118</td>
</tr>
<tr>
<td>&quot;Cannot secure a sufficient loan&quot;</td>
<td>.822</td>
<td>.131</td>
</tr>
<tr>
<td>&quot;Lack of profit&quot;</td>
<td>.800</td>
<td>.123</td>
</tr>
<tr>
<td>&quot;Lack of family support&quot;</td>
<td>-.207</td>
<td>.969</td>
</tr>
<tr>
<td>&quot;Lack of potential market&quot;</td>
<td>.045</td>
<td>.892</td>
</tr>
<tr>
<td>&quot;Lack of government support&quot;</td>
<td>.076</td>
<td>.891</td>
</tr>
<tr>
<td>&quot;Lack of training provided by the government&quot;</td>
<td>.109</td>
<td>.846</td>
</tr>
<tr>
<td>&quot;Lack of fish farming experience&quot;</td>
<td>.098</td>
<td>.790</td>
</tr>
<tr>
<td>&quot;Lack of capital&quot;</td>
<td>.279</td>
<td>.669</td>
</tr>
<tr>
<td>&quot;Lack of technical abilities&quot;</td>
<td>.114</td>
<td>.657</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
\( (a) \) Rotation converged in 5 iterations.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

According to Table 5.12, constraints that influence product sustainability were:

1. Poor financial management skills
2. Fish diseases and parasites
3. Poor water quality
4. Low quality of fish feed
5. Low selling price
6. Low quality of fish seed
7. Poor quality control
8. Cannot secure a sufficient loan
9. Lack of profit
Table 5.12 shows that the problems that influence product sustainability were:

1. Lack of family support
2. Lack of potential market
3. Lack of government support
4. Lack of training provided by the government
5. Lack of fish farming experience
6. Lack of capital
7. Lack of technical abilities

5.5 Construction of scales and Cronbach’s Alpha

The Cronbach’s alpha test in this research was used to test the reliability of the four scales that were developed for this research. The preliminary analysis of EFA resulted in only one endogenous factor and one exogenous factor for income improvement and product sustainability. Similarly, there was only one constraints factor and only one problems factor that influence income improvement and product sustainability.

Summated scales were constructed for each of these factors and the reliability of each scale was assessed using Cronbach’s Alpha. A value for Cronbach’s Alfa above 0.8 indicates excellent reliability; a value above 0.7 indicates good reliability while a value above 0.6 indicates adequate reliability, according to Hair et al. (2006). Table 5.13 and Table 5.14 show the descriptive statistics and correlations for the eight scales defined above.

Table 5.13 shows that six out of the eight scales developed had excellent reliability given that their values for Cronbach’s Alpha were above 0.8. The endogenous factors for income improvement and exogenous factor for product sustainability had good reliability given their Cronbach’s Alpha values above 0.7.
Table 5.13 Cronbach’s Alpha test of scales

<table>
<thead>
<tr>
<th>Scales for Income Improvement</th>
<th>Cronbach’s Apha</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Endogenous</td>
<td>0.798</td>
<td>29.41</td>
<td>3.51</td>
</tr>
<tr>
<td>2) Exogenous</td>
<td>0.867</td>
<td>29.81</td>
<td>4.45</td>
</tr>
<tr>
<td>3) Constraints</td>
<td>0.959</td>
<td>35.79</td>
<td>12.11</td>
</tr>
<tr>
<td>4) Problems</td>
<td>0.905</td>
<td>14.27</td>
<td>5.78</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scales for Product Sustainability</th>
<th>Cronbach’s Apha</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5) Endogenous</td>
<td>0.910</td>
<td>42.20</td>
<td>6.41</td>
</tr>
<tr>
<td>6) Exogenous</td>
<td>0.754</td>
<td>15.14</td>
<td>2.42</td>
</tr>
<tr>
<td>7) Constraints</td>
<td>0.967</td>
<td>33.19</td>
<td>12.57</td>
</tr>
<tr>
<td>8) Problems</td>
<td>0.944</td>
<td>26.57</td>
<td>10.08</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 5.14 shows Pearson’s correlation: values greater than 0.7 for the correlations between these scales is an indication of strong positive correlation. The Pearson’s correlations for the scales show strong positive correlations between: 1) constraints income improvement and constraints product sustainability, 2) constraints income improvement and problems product sustainability, 3) problems income improvement with problems product sustainability. The strong correlations suggested that these scales were strongly associated with each other, for example if constraints for income improvement increased, constraints for product sustainability were also expected to increase, and vice versa.
Table 5.14 Pearson’s correlation of the scales

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraints II</td>
<td>1</td>
<td>.622**</td>
<td>.871**</td>
<td>.744**</td>
<td>-.336**</td>
<td>-.093</td>
<td>-.136**</td>
<td>-.144**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problems II</td>
<td>.622**</td>
<td>1</td>
<td>.505**</td>
<td>.761**</td>
<td>-.094</td>
<td>-.085</td>
<td>.048</td>
<td>-.021</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constraints PS</td>
<td>.871**</td>
<td>.505**</td>
<td>1</td>
<td>.714**</td>
<td>-.390**</td>
<td>-.050</td>
<td>-.104**</td>
<td>-.193**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problems PS</td>
<td>.744**</td>
<td>.761**</td>
<td>.714**</td>
<td>1</td>
<td>-.315**</td>
<td>-.065</td>
<td>-.064</td>
<td>-.226**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endogenous II</td>
<td>-.336**</td>
<td>-.094</td>
<td>-.390**</td>
<td>-.315**</td>
<td>1</td>
<td>.384**</td>
<td>.466**</td>
<td>.466**</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exogenous II</td>
<td>-.093</td>
<td>-.085</td>
<td>-.050</td>
<td>-.065</td>
<td>.384**</td>
<td>1</td>
<td>.639**</td>
<td>.625**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endogenous PS</td>
<td>-.136**</td>
<td>.048</td>
<td>-.104**</td>
<td>-.064</td>
<td>.466**</td>
<td>.639**</td>
<td>1</td>
<td>.572**</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Exogenous PS</td>
<td>-.144**</td>
<td>-.021</td>
<td>-.193**</td>
<td>-.226**</td>
<td>.466**</td>
<td>.625**</td>
<td>.572**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

II: Income Improvement, PS: Product Sustainability

Significance level: Strong correlation if value > 0.7, moderate correlation if value > 0.5

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Moderate positive correlations are shown by correlation values greater than 0.5. From Table 5.14 it can be seen that moderate correlations occurred between: 1) exogenous income improvement with endogenous product sustainability, 2) exogenous income improvement with exogenous product sustainability, 3) constraints income improvement with problems income improvement and 4) problems income improvement with constraints product sustainability. These moderate correlations suggested that these scales were related to each other. Nevertheless, it was possible that either strong or moderate correlations may be considered as spurious correlations that occurred without any causal connections.

5.6 Conclusion

Exploratory factor analysis (EFA) described in this chapter reduced the number of variables in the endogenous and exogenous factors, constraints and problems, to a smaller number of meaningful factors.
The EFA results showed that there were six endogenous and six exogenous variables that related to income improvement, and nine endogenous and three exogenous variables that influenced product sustainability. There were nine constraint and four problem variables that influenced income improvement, nine constraint and seven problem variables that influenced product sustainability.

Scales for endogenous and exogenous factors and scales for constraints and problems were calculated for income improvement and product sustainability. The scales were reliable with Cronbach’s alpha above 0.8 (for six of the developed scales) and above 0.7 (for two of the scales). In addition strong correlations were found between constraints income improvement and constraints product sustainability, constraints income improvement and problems product sustainability, and problems income improvement and problems product sustainability.
Chapter 6

Data analysis – findings and interpretation

6.1 Introduction

The primary analysis of the research is presented in this chapter. It includes the results of several statistical analyses that include descriptive analyses, logistic regression analyses, and chi-square tests of association. These results are discussed further in chapter 7 in relation to the hypotheses developed in Chapter 4 Methodology.

The core analyses in this research used binary logistic regression analysis because the dependent variable was a dichotomous categorical variable. Multiple regression analysis was not a suitable technique for this case because multiple regression analysis requires a continuous dependent variable. Following the core analyses, a chi-square test of association was used to compare the data of small scale fish farmers with different demographic background in regard to their entrepreneurial activities.

6.2 Statistical analysis

Three statistical analysis techniques were used for the primary analyses of this research: descriptive analysis, binary logistic regression analysis, and the chi-square test. Overviews of the functions of these techniques are described next and the results of the techniques are presented in the sections after this.

6.2.1 Descriptive analysis

Descriptive analysis was used in this research to describe the characteristics of the research sample. There are three uses of descriptive analysis according to Pallant: “to describe the characteristics of your sample in the Method section of your report; to check your variables for any violation of the assumptions underlying the statistical techniques that you will use to address your research questions; and to address specific research questions” (2005, p. 49).

In this research, descriptive analysis was used for the personal and business characteristics of the research sample, for example for the variables of the participants such as age, education, marital status, and number of employees. Descriptive analysis was also used to test Hypothesis #9 for the most commonly
implemented entrepreneurial activities of small scale fish farmers in Central Java.

Frequency tables were used as the descriptive analysis technique in this research; this method was chosen because all the variables were categorical variables. Frequency tables were used for the specific characteristics of the respondents such as the number of participants who were male or female, the number of participants who were single or married, and the number of participants who had completed or not completed high school. Frequency tables were also used to show how frequently small scale fish farmers implemented particular entrepreneurial activities in Central Java.

6.2.2 Binary logistic regression

Logistic regression analysis is a statistical tool to test models where the dependent variable is categorical and the independent variable is categorical or continuous (Pallant 2005). Binary logistic regression was used for the cases of this research where the dependent variable was dichotomous (when it had only two category values). Multinomial logistic regression was used when the dependent variable consisted of more than two categories.

There are three assumptions that have to be considered before deciding to use logistic regression analysis. The assumptions are: sample size, multicollinearity, and outliers (Pallant 2005).

Sample size

The sample size assumption concerns the number of cases and the number of independent variables. A small sample with many independent variables could be a problem; this situation occurs when there are large numbers of independent variables but very few cases in each category. When this occurs it is advisable to collapse or delete the categories with the fewer cases.

Multicollinearity

Multicollinearity occurs when there is a high inter-correlation between the independent variables. Ideally, there should be a strong relationship between the independent variable and the dependent variable, but not with the other
independent variables. When multicollinearity occurs, the variable set of the model may need to be reconsidered to remove the highly correlated variables.

**Outliers**

May be predicated as one category but turned out to classify as other category. The outliers should be identified by examining residuals.

### 6.2.3 Chi-square test

There are two types of chi-square tests that can be used with categorical data (Pallant 2005): the chi-square goodness of fit test and the chi-square test of independence. Overviews of these two tests are given next.

**1. The chi-square goodness of fit test**

According to Pallant the chi-square goodness of fit test “explores the proportion of cases that fall into the various categories of a single variable, and compares these with hypothesised values” (2005, p. 287). This type of chi-square test was not used in this research.

**2. The chi-square test of independence**

The chi-square test of independence is used to test for correlation between two categorical variables by comparing the frequency of categories in one variable with the frequency of categories of the other variable. The chi-square test of independence was used in this research to compare two groups of categorical variables.

The test was performed to test Hypotheses #10 to #16 for comparisons between some groups of small scale fish farmer communities according to the types of entrepreneurial activities they implemented. The groups of small scale fish farmer communities that were compared were:

1. awardees and non awardees,
2. male and female,
3. ages,
4. marital status,
5. educational level,
6. fish farmer groups, and
7. reason to go into business.

6.3 Endogenous and Exogenous Factors

The analysis of the endogenous and exogenous factors was performed to address the first research objective which was to identify endogenous and exogenous factors that small scale fish farmers regard as influencing their income improvement and product sustainability. The objective was developed into two questions in the questionnaire: “to what extent do you agree that the factors below influence income improvement for your business?” and “to what extent do you agree that the factors below influence product sustainability for your business?”. The sample data was analysed separately for each of the two questions.

The questions were intentionally analysed separately in order to differentiate the answers of the fish farmers in their response to their income improvement and their awareness of product sustainability. The analyses for the two questions are presented next in section 6.3.1 for income improvement and section 6.3.2 for product sustainability.

6.3.1 Influence income improvement

The analyses of this section are based on the responses obtained for the survey question: “to what extent do you agree that the factors below influence income improvement for your business?”.

The dependent variable used for this analysis was income which was divided into two categories: (i) less than Rp 50 million, and (ii) Rp 50 million and over. Table 6.1 shows that small scale fish farmers in Central Java mainly earned incomes less than Rp 50 million (80.0%), while 19.2% earned annual incomes of Rp 50 million and over.
Table 6.1 Frequency table for income

<table>
<thead>
<tr>
<th>Income</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than Rp 50 million</td>
<td>323</td>
<td>80.8</td>
</tr>
<tr>
<td>Rp 50 million and over</td>
<td>77</td>
<td>19.2</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.2 shows the Omnibus test of model coefficients; a significant result for this test indicates good model performance. In this case the test result was highly significant with p-value of 0.005.

Table 6.2 Omnibus Tests of Model Coefficients for endogenous and exogenous factors that influence income improvement

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Step</td>
<td>10.571</td>
<td>2</td>
<td>.005</td>
</tr>
<tr>
<td>Block</td>
<td>10.571</td>
<td>2</td>
<td>.005</td>
</tr>
<tr>
<td>Model</td>
<td>10.571</td>
<td>2</td>
<td>.005</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.3 shows that the endogenous factors made a significant contribution to income levels (p = 0.019). For the exogenous factors the p-value was 0.316 which indicated that the exogenous factors did not make a significant contribution to income improvement.

Table 6.3 Variables in the equation for endogenous and exogenous factors that influence income improvement

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1^{(a)}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endogenous</td>
<td>.122</td>
<td>.052</td>
<td>5.525</td>
<td>1</td>
<td>.019</td>
<td>1.130</td>
</tr>
<tr>
<td>Exogenous</td>
<td>.042</td>
<td>.042</td>
<td>1.006</td>
<td>1</td>
<td>.316</td>
<td>1.043</td>
</tr>
<tr>
<td>Constant</td>
<td>-5.718</td>
<td>1.447</td>
<td>15.611</td>
<td>1</td>
<td>.000</td>
<td>.003</td>
</tr>
</tbody>
</table>

(a) Variable(s) entered on step 1: Endogenous, Exogenous.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.
According to Table 6.3, the odds of earning a higher income (Rp 50 million and over) increased by 13.0% when the endogenous factors scale for income improvement was increased by one unit while the exogenous scale was statistically controlled.

6.3.2 Influence product sustainability

The following binary logistic regression analyses show the results for the effects of the endogenous and exogenous factors on product sustainability as measured by the dependent variables for the activities of checking water quality, giving fish feed at the right quantity and at the right time, maintaining fish feed quality and availability, and maintaining fish seed quality and quantity. These four dependent variables were measured using dichotomous categorical variables.

<table>
<thead>
<tr>
<th>Activities for product sustainability</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check water quality</td>
<td>210</td>
<td>52.5</td>
</tr>
<tr>
<td>Give feed at the right quantity and time</td>
<td>213</td>
<td>53.2</td>
</tr>
<tr>
<td>Maintain fish feed quality and availability</td>
<td>156</td>
<td>39</td>
</tr>
<tr>
<td>Maintain fish seed quality and availability</td>
<td>110</td>
<td>27.5</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.4 shows that, of the four activities, giving feed at the right quantity and time was the most common activity carried out by small scale fish farmers in Central Java to sustain their produce. The second most common activity of the fish farmers was checking the water quality, followed by maintaining fish feed quality and availability, and then maintaining fish seed quality and availability.

a. Check water quality

The Omnibus test for model coefficients resulted in a p-value of 0.067 (see Table 6.5). This result was not significant because the p-value needed to be less than 0.05 to be significant (Pallant 2005). This suggested that the endogenous and exogenous factors associated with product sustainability did not affect the water checking activity.
Table 6.5 Omnibus Tests of Model Coefficients for endogenous and exogenous factors influencing product sustainability by checking water quality

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step</td>
<td>5.399</td>
<td>2</td>
<td>.067</td>
</tr>
<tr>
<td>Block</td>
<td>5.399</td>
<td>2</td>
<td>.067</td>
</tr>
<tr>
<td>Model</td>
<td>5.399</td>
<td>2</td>
<td>.067</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.6 shows that the endogenous factors significantly influenced product sustainability through the activity of checking water quality. This is shown by the p-value of 0.024. Conversely, the exogenous factors did not have a significant relationship with the activity of checking water quality (p = 0.314).

Table 6.6 Variables in the equation for endogenous and exogenous factors influencing product sustainability through checking water quality

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td>Lower</td>
<td>Upper</td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endogenous</td>
<td>.049</td>
<td>.022</td>
<td>5.088</td>
<td>1</td>
<td>.024</td>
<td>1.051</td>
</tr>
<tr>
<td>Exogenous</td>
<td>-.069</td>
<td>.069</td>
<td>1.014</td>
<td>1</td>
<td>.314</td>
<td>.933</td>
</tr>
<tr>
<td>Constant</td>
<td>-.949</td>
<td>.775</td>
<td>1.500</td>
<td>1</td>
<td>.221</td>
<td>.387</td>
</tr>
</tbody>
</table>

(a) Variable(s) entered on step 1: AprilEndogenousPS, AprilExogenousPS.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The odds ratio, Exp(B), shows that the odds of influencing product sustainability by checking water quality was increased by a factor of 1.051 for a one unit increase in the endogenous factors scale while the exogenous factors scale was statistically controlled.

b. Give feed in the right quantity and at the right time

As displayed in Table 6.7, the model using endogenous and exogenous factors influencing product sustainability to predict the activity of giving feed at the right quantity and time was not significant (p = 0.225).
Table 6.7 Omnibus Tests of Model Coefficients for endogenous and exogenous factors influencing product sustainability by giving feed at the right quantity and time

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>2.980</td>
<td>2</td>
<td>.225</td>
</tr>
<tr>
<td>Block</td>
<td>2.980</td>
<td>2</td>
<td>.225</td>
</tr>
<tr>
<td>Model</td>
<td>2.980</td>
<td>2</td>
<td>.225</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The result of the analysis shown in Table 6.8 confirmed that the exogenous factors influencing product sustainability did not impact significantly on the activity of giving fish feed in the right quantity and at the right time ($p = 0.086$). Also, endogenous factors influencing product sustainability did not have a significant influence ($p = 0.339$) on giving feed in the right quantity and at the right time.

Table 6.8 Variables in the equation for endogenous and exogenous factors influencing product sustainability by giving feed at the right quantity and time

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td>Lower</td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Step 1$^{(a)}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endogenous</td>
<td>.020</td>
<td>.021</td>
<td>.914</td>
<td>1</td>
<td>.339</td>
<td>1.021</td>
</tr>
<tr>
<td>Exogenous</td>
<td>-.118</td>
<td>.069</td>
<td>2.942</td>
<td>1</td>
<td>.086</td>
<td>.888</td>
</tr>
<tr>
<td>Constant</td>
<td>.764</td>
<td>.759</td>
<td>1.014</td>
<td>1</td>
<td>.314</td>
<td>2.147</td>
</tr>
</tbody>
</table>

(a) Variable(s) entered on step 1: AprilEndogenousPS, AprilExogenousPS.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The odds ratio in Table 6.8 shows that the odds of influencing product sustainability by giving feed in the right quantity and at the right time was increased by a factor of 1.021 for a one unit increase in the endogenous factors scale while the exogenous factors scale was statistically controlled.

c. Fish feed quality and availability

Table 6.9 shows the results of the Omnibus test of model coefficients and it was found that the model relating endogenous and exogenous factors influencing
product sustainability to the activity of maintaining fish feed quality and availability was significant with p-value of 0.000.

Table 6.9 Omnibus Tests of Model Coefficients for endogenous and exogenous factors influencing product sustainability by maintaining fish feed quality and availability

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>15.379</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Block</td>
<td>15.379</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Model</td>
<td>15.379</td>
<td>2</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.10 shows that the endogenous factors contributed to the product sustainability through maintaining fish feed quality and availability. This was shown by the significant result for the endogenous factors (p = 0.04). On the other hand, the exogenous factors did not show a significant result with a p-value of 0.578 which indicated that exogenous factors did not contribute significantly to the fish farmers’ product sustainability through their activity of maintaining fish feed quality and availability.

Table 6.10 Variables in the equation for endogenous and exogenous factors influencing product sustainability by maintaining fish feed quality and availability

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td>Lower</td>
<td>Upper</td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Step 1(a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endogenous</td>
<td>.072</td>
<td>.025</td>
<td>8.130</td>
<td>1</td>
<td>.004</td>
<td>1.075</td>
</tr>
<tr>
<td>Exogenous</td>
<td>.041</td>
<td>.073</td>
<td>.309</td>
<td>1</td>
<td>.578</td>
<td>1.041</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.678</td>
<td>.957</td>
<td>14.783</td>
<td>1</td>
<td>.000</td>
<td>.025</td>
</tr>
</tbody>
</table>

(a) Variable(s) entered on step 1: AprilEndogenousPS, AprilExogenousPS.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.10 shows that the odds of influencing product sustainability by maintaining fish feed quality and availability was increased by a factor of 1.075 for a one unit increase in the endogenous factor scale while the exogenous factors scale was statistically controlled.
**d. Fish seed quality and availability**

Table 6.11 shows the Omnibus test of model coefficients for endogenous and exogenous factors influencing product sustainability through maintaining fish seed quality and availability. It presents a significant result of .000 which indicated that this model performs well.

**Table 6.11 Omnibus Tests of Model Coefficients for endogenous and exogenous factors influencing product sustainability by maintaining fish seed quality and availability**

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step</td>
<td>30.968</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Block</td>
<td>30.968</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Model</td>
<td>30.968</td>
<td>2</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.12 shows that both endogenous and exogenous factors significantly contributed to product sustainability through maintaining fish seed quality and availability. This was shown by the significant result for both the endogenous and exogenous factors (both with p-value of 0.000).

**Table 6.12 Variables in the Equation for endogenous and exogenous factors influencing product sustainability by maintaining fish seed quality and availability**

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td>Lower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Variable(s) entered on step 1: Endogenous, Exogenous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endogenous</td>
<td>.122</td>
<td>.029</td>
<td>17.865</td>
<td>1</td>
<td>.000</td>
<td>1.129</td>
</tr>
<tr>
<td>Exogenous</td>
<td>-.422</td>
<td>.085</td>
<td>24.789</td>
<td>1</td>
<td>.000</td>
<td>.656</td>
</tr>
<tr>
<td>Constant</td>
<td>-.666</td>
<td>.906</td>
<td>.541</td>
<td>1</td>
<td>.462</td>
<td>.514</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The odds of influencing product sustainability by maintaining fish seed quality and availability increased by a factor of 1.129 for a one unit increase in the endogenous factor scale while the exogenous scale was statistically controlled. However, the odds of influencing product sustainability by maintaining fish seed quality and availability is decreased by 34% when the exogenous factors scale was increased by one and the endogenous factors scale was statistically controlled.
Table 6.13 Significant effect of endogenous and exogenous factors

<table>
<thead>
<tr>
<th>Influencing</th>
<th>Endogenous factors (p-value)</th>
<th>Exogenous factors (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>0.019*</td>
<td>0.316</td>
</tr>
<tr>
<td>Check water quality</td>
<td>0.024*</td>
<td>0.314</td>
</tr>
<tr>
<td>Give feed at the right quantity and time</td>
<td>0.086</td>
<td>0.339</td>
</tr>
<tr>
<td>Maintain fish feed quality and availability</td>
<td>0.004*</td>
<td>0.578</td>
</tr>
<tr>
<td>Maintain fish seed quality and availability</td>
<td>0.000*</td>
<td>0.000*</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.13 summarises the significant effect of endogenous and exogenous factors. It shows that the endogenous factors significantly affected the income, but the exogenous factors did not. Three of the product sustainability activities: check water quality, maintain fish feed quality and availability, and maintain fish seed quality and availability, were significantly affected by the endogenous factors, while exogenous factors only affected product sustainability through one activity: maintain fish seed quality and availability.

6.4 Constraints and Problems

The following logistic regression analyses present the tests for determining whether constraints and problems experienced by small scale fish farmers affected the income and product sustainability.

6.4.1 The effect of problems and constraints on income

Income is split into higher and lower categories: (i) below Rp 50 million, and (ii) Rp 50 million and above. For this analysis the chapter 5 scales for constraints and problems affecting income improvement were used as the independent variable.

Table 6.14 shows the Omnibus test of the model coefficients for constraints and problems faced by small scale fish farmers in their attempts to improve their income. The highly significant result of 0.005 demonstrates that the model performed well.
Table 6.14 Omnibus Tests of Model Coefficients for constraints and problems influencing income improvement

<table>
<thead>
<tr>
<th>Type</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>104.434</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Block</td>
<td>104.434</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Model</td>
<td>104.434</td>
<td>2</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.15 shows that both constraints and problems influenced income. This is indicated by the significant result for both constraints and problems with p-value of 0.000.

Table 6.15 Variables in the Equation for constraints and problems influencing income improvement

<table>
<thead>
<tr>
<th>Type</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Constraints</td>
<td>.194</td>
<td>.027</td>
<td>53.155</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Problems</td>
<td>-.397</td>
<td>.048</td>
<td>67.361</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-3.831</td>
<td>.769</td>
<td>24.828</td>
<td>1</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The odds ratio shows that the odds of a higher income are decreased by a factor of 0.672 for a one unit increase in the problems scale while the constraints scale was statistically controlled. However, a one unit increase in the constraints scale was associated with a 21.4% increase in the odds of a higher income while the problems scale was statistically controlled.

6.4.2 The effect of problems and constraints on product sustainability

a. Checking water quality

The Omnibus test of model coefficients for constraints and problems influencing income improvement is shown in Table 6.16. The result was significant with p-value of .000. This suggests that constraints and problems associated with product sustainability affect water quality checking.
Table 6.16 Omnibus Tests of Model Coefficients for constraints and problems influencing product sustainability through checking water quality

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step</td>
<td>18.282</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Block</td>
<td>18.282</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Model</td>
<td>18.282</td>
<td>2</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.16 shows that constraints contributed to the product sustainability through water quality checking. This is shown by the p-value of 0.006. Conversely, problems did not have a significant relationship with water quality (p = 0.822).

Table 6.17 Variables in the Equation for constraints and problems influencing product sustainability through checking water quality

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Constraints</td>
<td>-.037</td>
<td>.013</td>
<td>7.443</td>
<td>1</td>
<td>.006</td>
</tr>
<tr>
<td></td>
<td>Problems</td>
<td>-.004</td>
<td>.017</td>
<td>.050</td>
<td>1</td>
<td>.822</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>1.298</td>
<td>.317</td>
<td>16.776</td>
<td>1</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The odds ratio shows that the odds for influencing product sustainability by checking water quality were decreased by a factor of 0.996 for a one unit increase in the problems scale while the constraints scale was statistically controlled.

b. Give feed at the right quantity and at the right time

Table 6.18 shows the Omnibus test of the model coefficients for using constraints and problems influencing product sustainability to predict giving feed at the right quantity was significant (p = 0.000).
Table 6.18 Omnibus Tests of Model Coefficients for constraints and problems influencing product sustainability through giving feed at the right quantity and time

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>49.875</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Block</td>
<td>49.875</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Model</td>
<td>49.875</td>
<td>2</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.19 confirms that the problems influencing product sustainability impacted significantly on giving feed at the right quantity and time (p=0.000). On the other hand, constraints influencing product sustainability did not have significant influence (p = 0.979) on giving feed at the right quantity and time.

Table 6.19 Variables in the Equation for constraints and problems influencing product sustainability through giving feed at the right quantity and time

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constraints</td>
<td>.000</td>
<td>.014</td>
<td>.001</td>
<td>1</td>
<td>.979</td>
<td>1.000</td>
</tr>
<tr>
<td>Problems</td>
<td>.084</td>
<td>.018</td>
<td>21.372</td>
<td>1</td>
<td>.000</td>
<td>1.088</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.783</td>
<td>.335</td>
<td>28.372</td>
<td>1</td>
<td>.000</td>
<td>.168</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The odds ratio shows that the odds of influencing product sustainability by giving feed at the right quantity and time was increased by a factor of 1.088 for a one unit increase in the problem scale while the constraints scale was statistically controlled.

c. Fish feed quality and availability

Table 6.20 shows the Omnibus test of model coefficients where a significant result indicates a useful model. In this case the model relating constraints and problems influencing product sustainability to maintaining fish feed quality and availability was significant with a p value of 0.002.
Table 6.20 Omnibus Tests of Model Coefficients for constraints and problems influencing product sustainability through managing fish feed quality and availability

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>12.688</td>
<td>2</td>
<td>.002</td>
</tr>
<tr>
<td>Block</td>
<td>12.688</td>
<td>2</td>
<td>.002</td>
</tr>
<tr>
<td>Model</td>
<td>12.688</td>
<td>2</td>
<td>.002</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.21 shows constraints and problems variables which influence product sustainability through managing fish feed quality and availability. The result for both variables shows that constraints (p = 0.186) and problems (p = 0.166) did not contribute significantly to product sustainability.

Table 6.21 Variables in the Equation for constraints and problems influencing product sustainability through managing fish feed quality and availability

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Constraints</td>
<td>-.017</td>
<td>.013</td>
<td>1.746</td>
<td>1</td>
<td>.186</td>
</tr>
<tr>
<td></td>
<td>Problems</td>
<td>-.023</td>
<td>.016</td>
<td>1.922</td>
<td>1</td>
<td>.166</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>.578</td>
<td>.307</td>
<td>3.557</td>
<td>1</td>
<td>.059</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

The odds of influencing product sustainability by managing fish feed quality and availability was decreased for a one unit increase in the problem scale while the constraint scale was statistically controlled.

**d. Fish seed quality and availability**

Table 6.22 shows that the model coefficients for constraints and problems influencing product sustainability through managing fish seed quality and availability, was highly significant with result of 0.000 which indicated that this was a useful model.
Table 6.22 Omnibus Tests of Model Coefficients for constraints and problems influencing product sustainability through managing fish seed quality and availability

<table>
<thead>
<tr>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>42.668</td>
<td>2</td>
</tr>
<tr>
<td>Block</td>
<td>42.668</td>
<td>2</td>
</tr>
<tr>
<td>Model</td>
<td>42.668</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.23 presents a significant result that problems influenced product sustainability (0.000) by managing fish seed quality and availability. Conversely, constraints that influenced product sustainability significantly influenced managing fish seed quality and quantity (p = 0.957).

Table 6.23 Variables in the Equation for constraints and problems influencing product sustainability by managing fish seed quality and availability

<table>
<thead>
<tr>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constraints</td>
<td>.001</td>
<td>.014</td>
<td>.003</td>
<td>1</td>
<td>.957</td>
</tr>
<tr>
<td>Problem</td>
<td>.091</td>
<td>.019</td>
<td>23.709</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.227</td>
<td>.454</td>
<td>50.584</td>
<td>1</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The odds of influencing product sustainability by managing fish seed quality and availability were increased by a factor of 1.095 for a one unit increase in the problem scale while the constraints scale was statistically controlled.

Table 6.24 Significant effect of constraints and problems to income and product sustainability

<table>
<thead>
<tr>
<th>Influencing</th>
<th>Constraints (p-value)</th>
<th>Problems (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>0.000*</td>
<td>0.000*</td>
</tr>
<tr>
<td>Check water quality</td>
<td>0.006*</td>
<td>0.822</td>
</tr>
<tr>
<td>Give feed at the right quantity and time</td>
<td>0.979</td>
<td>0.000*</td>
</tr>
<tr>
<td>Maintain fish feed quality and availability</td>
<td>0.186</td>
<td>0.166</td>
</tr>
<tr>
<td>Maintain fish seed quality and availability</td>
<td>0.957</td>
<td>0.000*</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.24 summarises the significant effects of constraints and problems on income and product sustainability. It shows that both constraints and problems
significantly affected income. Constraints showed a significant relation to product sustainability by checking water quality, but no relationships to other product sustainability activities. Problems showed significant effect on two of the product sustainability activities: give feed at the right quantity and time, and maintain fish seed quality and availability.

6.5 Implemented Entrepreneurial activities in Central Java

This section describes the entrepreneurial activities that have been implemented by small scale fish farmers in Central Java. These activities include fish feed production, fish seed production, market extension, fish species extension, product range extension, and utilisation of other fish parts.

<table>
<thead>
<tr>
<th>Number</th>
<th>Types of entrepreneurial activities</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Market extension</td>
<td>48.5</td>
</tr>
<tr>
<td>2</td>
<td>Fish species extension</td>
<td>27.3</td>
</tr>
<tr>
<td>3</td>
<td>Product range extension</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Others</td>
<td>13.8</td>
</tr>
<tr>
<td>5</td>
<td>None of the above</td>
<td>7.8</td>
</tr>
<tr>
<td>6</td>
<td>Fish seed production</td>
<td>5.8</td>
</tr>
<tr>
<td>7</td>
<td>Utilisation of other fish parts</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Fish feed production</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

As shown in Table 6.25 the most commonly implemented entrepreneurial activities by small scale fish farmers in Central Java were market extension (48.5%) and fish species extension (27.3%), followed by product range extension (18%). The least favourite entrepreneurial activities were fish seed production (5.8%), utilisation of other fish parts (3%), and fish feed production (1%).

Table 6.26 shows that there were only 4 respondents of the 400 (1%) that implemented the entrepreneurial activity of fish feed production in Central Java. It shows that this entrepreneurial activity was not practised by small scale fish farmers in Central Java.
Table 6.26 Frequency of implemented entrepreneurial activity

<table>
<thead>
<tr>
<th>Type of entrepreneurial activity</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish feed production</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Fish seed production</td>
<td>23</td>
<td>5.8</td>
</tr>
<tr>
<td>Market extension</td>
<td>194</td>
<td>48.5</td>
</tr>
<tr>
<td>Fish species extension</td>
<td>109</td>
<td>27.3</td>
</tr>
<tr>
<td>Product range extension</td>
<td>72</td>
<td>18</td>
</tr>
<tr>
<td>Utilisation of other fish part</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>None of the above</td>
<td>29</td>
<td>7.2</td>
</tr>
<tr>
<td>Others</td>
<td>55</td>
<td>13.8</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.

Neither was fish seed production widely practiced widely by small scale fish farmers in Central Java. The results in Table 6.26 show that only 23 respondents (5.8%) confirmed that they conducted fish seed production as an entrepreneurial activity in Central Java.

On the other hand, market extension as an entrepreneurial activity is commonly carried out by small scale fish farmers in Central Java. Of the 400 respondents, 194 (48.5%) confirmed that they had implemented this activity.

According to Table 6.26, only 27.3% of the 400 small scale fish farmers in Central Java had implemented fish species extension as one of their entrepreneurial activities. Almost 75% of the respondents answered “no” to extending fish species in their fish farming activity.

Seventy two of the respondents reported that they had implemented product range extension as part of their entrepreneurial activity in Central Java. That represents only 18% of the sample of small scale fish farmers.

Utilisation of other fish parts is also not a common entrepreneurial activity of small scale fish farmers in Central Java. According to the results of the survey as given in Table 6.26, only 3% (12 respondents) answered “yes” to having implemented this activity.
Table 6.27 shows that of all six entrepreneurial activities, 83.2% of the respondents have implemented at least one activity. The rest of the respondents (5.8%) answered “none of the above” which suggested that they either had not implemented any entrepreneurial activities or had implemented other activities.

Table 6.27 also shows that some small scale fish farmers had implemented entrepreneurial activities that have not been identified in this study. This represented nearly 11% of the sample who had implemented “other” entrepreneurial activities.

<table>
<thead>
<tr>
<th>Answer option</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement entrepreneurial activity</td>
<td>414</td>
<td>83.2</td>
</tr>
<tr>
<td>“None of the above”</td>
<td>29</td>
<td>5.8</td>
</tr>
<tr>
<td>“Others”</td>
<td>55</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

6.6 Comparison between fish farmers with different demographic background in entrepreneurial activities implementation

The comparison between fish farmers with different demographic background in implementing entrepreneurial activity were examined by comparing different demographic classification of fish farmers such as awardees and non awardees, male and female, different age groups, different education level, different level of fish farmer group, different marital statuses, and different reasons for becoming fish farmers.

6.6.1 Comparing awardees and non awardees

The first demographic characteristic to be compared was the awardees and non awardees category. The awardees were fish farmers who belonged to fish farmer groups (FFGs) that have received government awards in the last five years, whereas the non awardees were fish farmers who belonged to FFGs that had not received government awards in the last five years.

Table 6.28 shows a frequency table of awardees and non-awardees respondents. It shows that 90 respondents who had participated in this research were awardees and 310 were non-awardees.
Table 6.28 Frequency between awardees and non-awardees

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Awardees</td>
<td>90</td>
<td>22.5</td>
<td>22.5</td>
<td>22.5</td>
</tr>
<tr>
<td>Non Awardees</td>
<td>310</td>
<td>77.5</td>
<td>77.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The Chi-square test result presented in Table 6.29 indicates that there was no significant difference between awardees and non-awardees in implementing entrepreneurial activities through the fish feed production, fish seed production, and product range extension activities. Significant differences (p-value of 0.000) were found between awardees and non-awardees regarding market extension and fish species extension activities. Although the p-value for utilisation of other fish parts was significant, no conclusion can be drawn because the percentage for non awardees was zero.

Table 6.29 Relationship of awardees/non awardees to entrepreneurial activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pearson chi-square</th>
<th>df</th>
<th>p</th>
<th>% awardees</th>
<th>% non awardees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish feed production</td>
<td>0.014</td>
<td>1</td>
<td>0.904</td>
<td>0.25</td>
<td>0.75</td>
</tr>
<tr>
<td>Fish seed production</td>
<td>4.611</td>
<td>1</td>
<td>0.32</td>
<td>0.25</td>
<td>5.5</td>
</tr>
<tr>
<td>Market extension</td>
<td>71.727</td>
<td>1</td>
<td>0.000</td>
<td>19.75</td>
<td>28.75</td>
</tr>
<tr>
<td>Fish species extension</td>
<td>40.024</td>
<td>1</td>
<td>0.000</td>
<td>0.25</td>
<td>27</td>
</tr>
<tr>
<td>Product range extension</td>
<td>0.004</td>
<td>1</td>
<td>0.950</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Utilisation of other fish part</td>
<td>42.612</td>
<td>1</td>
<td>0.000</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

6.6.2 Comparing male and female small scale fish farmers

The second demographic characteristic to be compared was between male and female fish farmers. As predicted earlier in the research there was is a significant gender imbalance of small scale fish farmers who participated in the survey. As shown in Table 6.30, of the 400 participants, 95.5% (382 people) were male and only 4.5% (18 people) were female.
Table 6.30 Frequency between gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>382</td>
<td>95.5</td>
<td>95.5</td>
<td>95.5</td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>4.5</td>
<td>4.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Significant differences were found between men and women fish farmers in implementing entrepreneurial activities as far as fish seed production, market extension, and product range extension was concerned. This was shown by the p-value of less than 0.05 for those activities. Although the p-value for fish species extension also suggests a significant difference, no conclusion can be drawn because the female percentage was zero.

Table 6.31 Relationship of gender to entrepreneurial activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pearson chi-square</th>
<th>df</th>
<th>p</th>
<th>% Male</th>
<th>% Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish feed production</td>
<td>0.190</td>
<td>1</td>
<td>0.663</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fish seed production</td>
<td>4.145</td>
<td>1</td>
<td>0.042</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Market extension</td>
<td>4.246</td>
<td>1</td>
<td>0.039</td>
<td>45.25</td>
<td>13</td>
</tr>
<tr>
<td>Fish species extension</td>
<td>7.060</td>
<td>1</td>
<td>0.008</td>
<td>27.25</td>
<td>0</td>
</tr>
<tr>
<td>Product range extension</td>
<td>18.011</td>
<td>1</td>
<td>0.000</td>
<td>15.5</td>
<td>10</td>
</tr>
<tr>
<td>Utilisation of other fish</td>
<td>0.583</td>
<td>1</td>
<td>0.445</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

6.6.3 Comparing fish farmers of different ages

The actual demographic characteristics question for age in the questionnaire was collapsed. Originally the data was collected according to four age groups: (a) under 20 years, (b) 20-39 years, (c) 40-59 years, and (d) 60+ years. However, after the questionnaires were collected, it was shown that some categories contained too few samples. Therefore, in order to successfully carryout logistic regression, the categories were reduced to two categories (a) under 40 years old, and (b) 40 years and over.
The frequency results in Table 6.32 show an evenly balanced number of small scale fish farmers under 40 and over 40 years old who participate in the survey. There were 170 participants (42.5%) who were under 40 years and 230 participants (57.5%) aged over 40 years.

<table>
<thead>
<tr>
<th>Table 6.32 Frequency between ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Valid</td>
</tr>
<tr>
<td>Under 40</td>
</tr>
<tr>
<td>40 or more</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The p-values in Table 6.33 show that significant differences in implementing entrepreneurial activities were found between different fish farmers of different ages in terms of the fish species extension, and product range extension entrepreneurial activities.

<table>
<thead>
<tr>
<th>Table 6.33 Relationship of age to entrepreneurial activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
</tr>
<tr>
<td>Fish feed production</td>
</tr>
<tr>
<td>Fish seed production</td>
</tr>
<tr>
<td>Market extension</td>
</tr>
<tr>
<td>Fish species extension</td>
</tr>
<tr>
<td>Product range extension</td>
</tr>
<tr>
<td>Utilisation of other fish part</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

6.6.4 Comparing fish farmers of different marital status

The actual demographic characteristics question for marital status in the questionnaire was collapsed into two categories. Originally there were three marital status options: (a) single, (b) married, and (c) divorced. However, after the questionnaires were collected, it showed that the “single” and “divorced” categories had too small sample sizes. Therefore, in order to successfully
carry out logistic regression, these two categories (single and divorced) were collapsed into one category: single.

The marital status of small scale fish farmers in Central Java who participated in the survey was predominantly married fish farmers. The results shown in Table 6.34 illustrate the marital condition of participants. Three hundred and fifty six participants (89%) were married, and only 44 (11%) were single.

<table>
<thead>
<tr>
<th>Table 6.34 Frequency of marital status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.

The only significant difference in implementing entrepreneurial activities between fish farmers of different marital status were observed in the fish species extension activity with a p-value of 0.012.

| Table 6.35 Relationship of marital status to entrepreneurial activities |
|-----------------------------|-----------------|-----------------|-----------------|-----------------|
| Activity                    | Pearson chi-square | df | p    | % Single | % Married |
| Fish feed production        | 0.499            | 1  | 0.480 | 0       | 1         |
| Fish seed production        | 3.016            | 1  | 0.082 | 0       | 5.75      |
| Market extension            | 0.045            | 1  | 0.833 | 5.5     | 43        |
| Fish species extension      | 6.294            | 1  | 0.012 | 1.25    | 26        |
| Product range extension     | 0.749            | 1  | 0.387 | 2.5     | 15.5      |
| Utilisation of other fish part | 1.529          | 1  | 0.216 | 0       | 3         |

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.

6.6.5 Comparing fish farmers with different educational levels

The original demographic characteristics question for highest education level achieved in the questionnaire provided five selection options: (a) University Graduate, (b) Completed High School, (c) Completed Primary School, (d) Did not complete primary school, and (e) Never went to school. However, after the questionnaires were collected and analysed, it was shown that some categories
had too small sample sizes to successfully carry out logistic regression. Therefore the categories were reduced into two categories (a) completed high school, and (b) did not complete high school.

Table 6.36 shows the frequency results of highest education, comparing the small scale fish farmers who have completed high school and those who had not completed high school. Two hundred and forty participants (60%) had completed high school while 160 participants (40%) had not completed high school.

<table>
<thead>
<tr>
<th>Valid</th>
<th>Completed high school</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid</td>
<td></td>
<td>240</td>
<td>60.0</td>
<td>60.0</td>
<td>60.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Did not completed high school</td>
<td>160</td>
<td>40.0</td>
<td>40.0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

From Table 6.37 it can be observed that the different education level of fish farmers have an influence on the implementation of entrepreneurial activities. Such influence was found in almost every activity: fish seed production, market extension, fish species extension, and product range extension. Fish feed production and utilisation of other fish parts also showed a significant p-value, however, since there were no participants in either of these categories for those two activities, the significant effect is not valid.
Table 6.37 Relationship of education level to entrepreneurial activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pearson chi-square</th>
<th>df</th>
<th>p</th>
<th>% Completed</th>
<th>% Not completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish feed production</td>
<td>6.061</td>
<td>1</td>
<td>0.014</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fish seed production</td>
<td>26.764</td>
<td>1</td>
<td>0.000</td>
<td>5.25</td>
<td>0.5</td>
</tr>
<tr>
<td>Market extension</td>
<td>8.890</td>
<td>1</td>
<td>0.003</td>
<td>15.75</td>
<td>32.75</td>
</tr>
<tr>
<td>Fish species extension</td>
<td>8.079</td>
<td>1</td>
<td>0.004</td>
<td>14</td>
<td>13.25</td>
</tr>
<tr>
<td>Product range extension</td>
<td>6.778</td>
<td>1</td>
<td>0.009</td>
<td>4.75</td>
<td>13.25</td>
</tr>
<tr>
<td>Utilisation of other fish part</td>
<td>8.247</td>
<td>1</td>
<td>0.004</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

6.6.6 Comparing different fish farmer groups (FFGs)

The original demographic characteristics question for different fish farming groups in the questionnaire was also reduced. Previously there were four levels of fish farming group options to select: (a) starter, (b) secondary, (c) tertiary, and (d) advanced. However, after the questionnaires were collected, and the descriptive analysis was carried out to observe the frequencies, it was found that these categories had very small sample sizes. Therefore, in order to successfully carry out logistic regression, the categories were reduced to two categories: starter and advanced.

Table 6.38 shows the frequency statistics of fish farmer groups divided into the two groups: starter and advance. The result show that of the 400 respondents, 42.4% came from starter fish farmer groups while 57.6% came from advanced fish farmer groups.
### Table 6.38 Frequency of Fish farmer groups

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starter</td>
<td>165</td>
<td>41.3</td>
<td>42.4</td>
<td>42.4</td>
</tr>
<tr>
<td>Advanced</td>
<td>224</td>
<td>56.0</td>
<td>57.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>389</td>
<td>97.3</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.39 shows that the different fish farmer group levels resulted in significant differences between the implementation of the following entrepreneurial activities: fish seed production, market extension, and fish species extension. Fish feed production and utilisation of other fish parts also show significant p-values, however, since there were no participants in either of these category for these two activities, the significant effect was not valid.

### Table 6.39 Relationship of fish farmer groups to entrepreneurial activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pearson chi-square</th>
<th>df</th>
<th>p</th>
<th>% Starter</th>
<th>% Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish feed production</td>
<td>5.487</td>
<td>1</td>
<td>0.019</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fish seed production</td>
<td>12.859</td>
<td>1</td>
<td>0.000</td>
<td>4.5</td>
<td>1.25</td>
</tr>
<tr>
<td>Market extension</td>
<td>42.245</td>
<td>1</td>
<td>0.000</td>
<td>11.5</td>
<td>35.25</td>
</tr>
<tr>
<td>Fish species extension</td>
<td>28.169</td>
<td>1</td>
<td>0.000</td>
<td>5.75</td>
<td>21.5</td>
</tr>
<tr>
<td>Product range extension</td>
<td>1.261</td>
<td>1</td>
<td>0.262</td>
<td>8.25</td>
<td>8.75</td>
</tr>
<tr>
<td>Utilisation of other fish parts</td>
<td>6.017</td>
<td>1</td>
<td>0.014</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

#### 6.6.7 Comparing fish farmers with different reasons for become fish farmers

The original demographic characteristics question for different reasons to become fish farmers in the questionnaire was reduced. The original question provided six answer options: (a) Could not find suitable work that matched my skills and educational level, (b) Salaried job was underpaid, (c) Saw a business opportunity, (d) Family tradition in business, (e) Lost my job, and (f) Previous experience in running a business. However, after the questionnaires were
collected, and the descriptive frequency analysis was carried out, it was evident that some categories had very small sample sizes. Therefore, in order to successfully carry out logistic regression, the categories were reduced to two categories: (a) push factor, and (b) pull factor. Three of the original categories were collapsed into the push factor: (a) Could not find suitable work that matched my skills and educational level, (b) Salaried job was underpaid, and (c) Lost my job. Three categories were also collapsed into the pull factor: (c) Saw a business opportunity, (d) Family tradition in business, and (f) Previous experience in running a business.

The reasons for becoming fish farmers were divided into push factor and pull factor. Table 6.40 shows that 211 respondents (52.8%) selected push factors as their reason for becoming fish farmers, and 189 respondents (47.3%) selected pull factors as their reasons.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push factor</td>
<td>211</td>
<td>52.8</td>
<td>52.8</td>
<td>52.8</td>
</tr>
<tr>
<td>Pull factor</td>
<td>189</td>
<td>47.3</td>
<td>47.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia.

The result of the chi-square test in Table 6.41 shows that the different reasons (pull factor or push factor) to become fish farmer had significant effect for the implementation of the following entrepreneurial activities: market extension and fish species extension. Fish feed production and utilisation of other fish parts also show significant p-values (0.034 and 0.001 respectively); however, since there were no participants in either of these categories for these two activities, the significant effects were not valid.
Table 6.41 Relationship of reasons to become fish farmer to entrepreneurial activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pearson chi-square</th>
<th>df</th>
<th>p</th>
<th>% Push factor</th>
<th>% Pull factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish feed production</td>
<td>4.511</td>
<td>1</td>
<td>0.034</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Fish seed production</td>
<td>3.161</td>
<td>1</td>
<td>0.075</td>
<td>0</td>
<td>5.75</td>
</tr>
<tr>
<td>Market extension</td>
<td>5.160</td>
<td>1</td>
<td>0.023</td>
<td>5.5</td>
<td>43</td>
</tr>
<tr>
<td>Fish species extension</td>
<td>41.104</td>
<td>1</td>
<td>0.000</td>
<td>0.5</td>
<td>26.75</td>
</tr>
<tr>
<td>Product range extension</td>
<td>1.098</td>
<td>1</td>
<td>0.295</td>
<td>5.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Utilisation of other fish part</td>
<td>11.081</td>
<td>1</td>
<td>0.001</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

Table 6.42 summarises the significant results of the different fish farmers groups that effected the implementation of entrepreneurial activities. The most significant effect was found for the different education levels with four entrepreneurial activities. This suggested that fish farmers who had completed high school and those who had not completed high school differed significantly in their implementation of entrepreneurial activities.
Table 6.42 Summary of significant effect of implemented entrepreneurial activities between different groups of fish farmer community

<table>
<thead>
<tr>
<th>Activity</th>
<th>Between awardees and non awardees</th>
<th>Between gender</th>
<th>Between ages</th>
<th>Between marital statuses</th>
<th>Between education level</th>
<th>Between level of FFGs</th>
<th>Between different reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish feed production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish seed production</td>
<td></td>
<td>**</td>
<td></td>
<td></td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Market extension</td>
<td>**</td>
<td>**</td>
<td></td>
<td>**</td>
<td></td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Fish species extension</td>
<td>**</td>
<td></td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Product range extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilisation of other fish part</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Significant effect

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.

The groups with the second most significant effect for entrepreneurial activities was between different level of FFGs (starter and advanced) and for different fish farmer gender. This suggested that differences in FFG level and gender also significantly affected the way fish farmers implemented entrepreneurial activities.

The other groups of fish farmers community (awardees/non awardees, different age groups, different marital status, and different reasons) have a slight significant affects for implementation of entrepreneurial activities since they only resulted in one or two entrepreneurial activities that showed significant differences.
6.7 Conclusion

The primary analysis of the research comprised of binary logistic regression, descriptive analysis, and chi-square test. The binary logistic regression analysis included factors that influenced income improvement and product sustainability. The results showed that factors which correlated positively with income improvement were endogenous factors, constraints, and problems. Factors that correlated positively with product sustainability were endogenous factors, exogenous factors, constraints, and problems.

The descriptive analysis concluded that the highest frequencies of entrepreneurial activities carried out by small scale fish farmers in Central Java were market extension, followed by fish species extension, and product range extension (adding value to fish product).

The Chi-square test results showed that all compared fish farmers of different demographic background were significantly different in carrying out entrepreneurial activities. However, fish farmers with different education level have the highest number of significant effect in entrepreneurial activities implementation, followed by fish farmers of different FFG level, and fish farmers of different gender. The other groups of fish farmers (awardees/non awardees, different age groups, different marital status, and different reasons) showed a slight significant affects with only one or two entrepreneurial activities that showed significant differences.
Chapter 7
Discussion

7.1 Introduction

This research focused on factors that influenced small scale fish farmers’ activities in their attempt to derive income improvement and ensure their product sustainability. As described in the methodology chapter, a questionnaire was developed for this research and was distributed to small scale fish farmers at designated regions in Central Java. The completed questionnaires were collected at an agreed date.

Four hundred completed questionnaires were collected from two rounds of distribution. Only fully completed questionnaires were retained. Chapters 5 and 6 presented the analyses of the data obtained from the questionnaires and this chapter discusses the results of the analyses. The discussion is divided into the following sections:

1. Demographic characteristics of the respondents.
2. Endogenous and exogenous factors that influenced income improvement.
3. Endogenous and exogenous factors that influenced product sustainability.
4. Constraints and problems that influenced income improvement.
5. Constraints and problems that influenced product sustainability.
6. Implemented entrepreneurial activities by small scale fish farmers in Central Java.
7. Compare the entrepreneurial activities implementation of small scale fish farmers with different demographic background.

7.2 Demographic characteristics of the respondents

The discussion of demographic characteristics of the research respondents is divided into two sections: the personal characteristics and the business characteristics.
7.2.1 Respondents’ Personal Characteristics

The following discussion about the personal characteristics of the respondents comprises the aspects: age range, gender, marital status, number of children and highest education.

Age Range

According to Table 4.2 the research sample contained more awardee than non awardee respondents. Most of the respondents were in the 40-59 years age range. This finding is supported by previous research that found that the average age for starting self-employment was around 40 years old and older (Cowling & Taylor 2001; Matthews & Moser 1996; Robinson & Sexton 1994). The reason given for why most people start self employment at an older age was that at an older age people were believed to have enough experience and more confidence to step into a riskier situation. Devine (1994) also mentioned that it took time for entrepreneurial interest to develop. As people get older, they will be more experienced, have more knowledge, greater networks, and more confidence about taking on a business opportunity. The more they understood about self employment, the more interested they were in becoming self employed.

Gender

Table 4.3 showed that respondents for this research were predominantly men. There were only 18 women in contrast to 292 men who responded to the questionnaires. This finding was as previously predicted: that the majority of small scale fish farmers in Central Java were men. This result is aligned with previous research that found that fish farming was considered as a man’s job since it involved physical work (Mbozi 1991). In a fish farming business, heavy physical work may include harvesting, pond cleaning and manuring. This condition as stated by Mbozi was also applicable in Central Java as shown by the number of men in fish farming businesses. This finding was also in accordance with the finding by Matthews and Moser (1996) and Cowling and Harding (2001) who observed that men were more likely to have higher entrepreneurial skills and be more interested in owning their own businesses than women.
**Marital Status**

Table 4.4 showed that the majority of the respondents were married (356 respondents) while only 44 respondents were single (either divorced or never married). This result was supported by previous research. According to Cowling and Harding (2001) and Robinson and Sexton (1994), marital status was associated with higher probability of being self-employment. Moreover, Robinson and Sexton (1994) found that being single, divorced or widowed was associated with a lower probability of being self employment. It was supposed that being married and having children meant having more responsibility for balancing work and family life. Furthermore, people with family decided to become self employed for different reasons: men tended to be self employed to be financially more stable, whereas women chose to become self employed to obtain working hour flexibility allowing them to be with their children more often (Robinson & Sexton 1994).

**Number of Children**

According to Table 4.5, the majority of the respondents had two or more children (299 respondents) while 101 respondents either had one or no children. Children have a large impact on entrepreneurs (Robinson & Sexton 1994). Nevertheless, the affects are different for men and women. Children were found to have a positive effect for men, but a negative effect for women. Male entrepreneurs with children tended to have more financially stable conditions and were able to increase their earnings, while children disrupted women’s careers and tended to decrease their income (Robinson & Sexton 1994).

**Highest Education**

More than half of the respondents were high school graduates (see Table 4.6). Only seven respondents were university graduates while the other respondents (160) had not completed high school. In Indonesia, where there is no free education, people struggle to send their children to school. And, even when children attend public schools, parents still have to pay for uniforms, school fees, books, stationary, and other school related expenses. This is why school related fees are one of the top priorities on low income parents’ expenditure list after health and food.
Every parent aspires to help their children achieve the highest education possible. In spite of their aspirations, many small scale fish farmers can only support their children to a high school education. College or university costs are considered very high and only the people with higher incomes can afford to pay for tertiary education for their children. This could explain the low number of university qualified respondents of this research. Approximately forty per cent of the respondents did not complete high school. This result can also be explained with the above discussion about the high cost of education in Indonesia, including for public school.

7.2.2 Respondents’ Business Characteristics

The following discussion about the business characteristics of the respondents comprises the aspects: their fish farming group classes, income, land size and number of employees.

**Respondent’s Fish Farmer Group (FFG) level**

According to Table 6.38, most of the respondents in this research were members of FFGs of advanced level (57.6%). There were four levels of FFGs in Central Java: starter (level one), secondary (level two), tertiary (level three) and advanced (level four). All four levels were provided as selection options on the questionnaire but the frequency analysis revealed that some categories had very low sample counts. Therefore, in order to carry out the logistic regression analysis, the four categories of FFGs were collapsed into two: starter level and advanced level. The starter level included the level one and level two FFGs, while the advanced level consisted of the level three and four FFGs.

The FFG levels were assessed according to their members’ abilities to conform to ten evaluation criteria developed by the Fisheries and Marine Affairs Office. The ten evaluation criteria were used to assess the FFGs’ creativity, productivity, mutual unity, cooperation and self improvement. Government officials used these evaluation criteria to annually evaluate FFGs and to upgrade or downgrade the FFGs’ levels depending on the results.

Since the majority of respondents in this research belonged to an advanced FFG it meant that most respondents were members of either a level three or a level
four FFG. According to the evaluation criteria an advanced FFG should have a higher ability to manage and develop their business than a starter FFG. This ability to manage and develop their business may include the ability to carry out entrepreneurial activities since the evaluation criteria include the following performance criteria: (a) the ability to search and use information and (b) the ability to plan activities which can increase their productivity. This indicated that being entrepreneurial is part of the evaluation where the majority of fish farmers were evaluated as being able to search and use any information obtained to increase their productivity.

**Respondent’s annual income**

According to Table 6.1, over 80 per cent of the respondents had an annual income below Rp 50 million, and only 19.2% had an annual income over Rp 50 million. Having an income of Rp 50 million per year (approximately Rp 4 million per month) was approximately equivalent to earning A$ 520.00 per month. From this the household expenses, school fees, health related expenses and other family related expenses had to be paid. In addition, the operational costs of the fish farming business also needed to be paid. This made it difficult for fish farmer to decide how to allocate their income between their home and business expenses. The situation was made more difficult when members of the family were sick or children needed new school uniforms or books. Fish farmers had to carefully balance their priorities so that home and business expenses could be met.

It was previously predicted that the majority of the respondents would have an annual income under Rp 50 million which accorded with the findings of this research. This prediction was based on the fact that most fish farmers in central Java are small scale and only utilised their back yards for their fish ponds. In this way they were able to maximise the use of their land and so earn an income.

**Respondent’s Land size**

Table 4.9 showed that the majority of respondents reported having land size of less than two hectares. Only 53 respondents reported having land size of 2-5 hectares, and only five respondents reported having between 5-10 hectares of
land. Most of small scale fish farmers utilised their backyards as their fish farming business area. In spite of having small land area, many fish farmers were still able to achieve income improvement. A well known example in Central Java is the fish farmers from the “catfish village”. Approximately 105 fish farmers in this village only cultivate catfish using 20 hectares of pond to produce between seven and ten tons of catfish per day (Boyolali Animal Husbandry and Fisheries Office 2007). These fish farmers belonged to the “Karya Mina Utama” FFG and became the first fish farming group winner in their region and in Central Java. Karya Mina Utama is an excellent example of a FFG in Central Java that had rapidly expanded their products and turned their village into the largest catfish producer in Central Java. Their ability to achieve income improvement was demonstrably visible in their increasing ability to afford new cars and homes improvements (Suara Merdeka 2007c).

**Respondent’s Number of Employees**

The majority of respondents reported having only up to two employees. Most of the fish farmers in Indonesia employed family members to assist them in managing the fish ponds. Not many small scale fish farmers employed paid workers because it entailed paying salaries which they cannot afford.

7.3 Endogenous and exogenous factors that influenced income improvement

The literature review chapter used the research from Bouchiki (1993) to explain that there were endogenous and exogenous factors that influenced business outcomes. Fourteen endogenous and exogenous factors were identified, however, after performing an Exploratory Factor Analysis (EFA) some of these factors were removed in order to obtain a simpler structure of the endogenous and exogenous factors.

7.3.1 Results of Exploratory Factor Analysis (EFA) for endogenous and exogenous factors that influenced income improvement

The EFA for factors that influenced income improvement classified the factors into two groups: endogenous and exogenous factors. This was aligned with research literature that suggested that two groups of factors influenced business outcomes (Bouchiki 1993). Figure 7.1 shows the result of the factor analysis for endogenous and exogenous factors that influenced income improvement.
According to the literature review (see Chapter 2), there were 14 endogenous and exogenous factors that influenced income improvement. After conducting the EFA (see Chapter 5) the factors were classified into six endogenous factors and six exogenous factors. The six endogenous factors that influenced income improvement were: aquaculture knowledge, aquaculture skills, length of aquaculture experiences, aquaculture education, personal business experience and family business background. The factor analysis also identify six exogenous factors: density of business network, start up financial capital, market demand, infrastructure in the area of operation, government or other institution support, and family support. The factor analysis suggested that the factors entrepreneurial characteristics or personality and reason for going into business could be excluded as factors.

Question 65 of the questionnaire provided the data for the endogenous and exogenous factors that influence income improvement. The question was: “To what extent do you agree the following factors influence income improvement for your business?”. Answers were provided on a Likert scale coded from 1 (Strongly disagree) to 6 (Strongly agree). The purpose of this question was to
find out how small scale fish farmers saw the endogenous and exogenous factors affecting their business in their attempt to improve income.

It has been explained previously that Bouchiki (1993) classified factors that influenced entrepreneurial process outcomes into two types: endogenous and exogenous factors. Endogenous factors arise from within the individual and exogenous factors are external to the person. On the other hand, Morris and Lewis (1995) believed that three dimensions influenced the level of entrepreneurship: environmental infrastructure, environmental turbulence and personal life experience. It has been assumed that the environmental infrastructure mentioned by Morris and Lewis is similar to the exogenous factors of this research. Exogenous factors therefore consist of economic, political, legal, financial, logistical and social structures. Hence personal life experience is assumed to be the same as endogenous factors and consisting of family, educational, peer group and work experiences.

These different perceptions of viewing a variable imply that an endogenous factor can also be viewed as exogenous factor and vice versa. Start up financial capital was classified as exogenous even though it was previously predicted to be an endogenous factor. Based on the definition of endogenous and exogenous factors by Bouchiki (1993), financial capital was a part of individual strength (endogenous factor). However, based on Morris and Lewis (1995), financial capital was classified into environmental infrastructure (exogenous factor). The EFA classified financial capital as an exogenous factor, suggesting that it could be viewed as a resource needing to be obtained from several external sources, for example banks, cooperatives, neighbours or families. While financial capital could be viewed as an endogenous as well as exogenous factor, for factors that influenced income improvement in this research, financial capital was viewed as an exogenous factor.

7.3.2 Results of Binary Logistic Regression Analysis for endogenous and exogenous factors that influenced income improvement

The results from the binary logistic regression analysis showed that only endogenous factors had an influence on income improvement while exogenous factors had no positive correlation with income improvement. The negative
correlation of the exogenous factors with income improvement may have been due to income improvement requiring more internal strength than external support. The endogenous factors that influenced income improvement were: quantum of knowledge, fish farming skills, length of experience, education, personal business experience and family business experience (see Figure 7.2).

Figure 7.2 Factors that influenced income improvement

<table>
<thead>
<tr>
<th>Endogenous factors</th>
<th>Highly correlated with</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quantum of knowledge</td>
<td>Income improvement</td>
</tr>
<tr>
<td>2. Mastery of fish farming skills</td>
<td></td>
</tr>
<tr>
<td>3. Length of experience</td>
<td></td>
</tr>
<tr>
<td>4. Level of education</td>
<td></td>
</tr>
<tr>
<td>5. Personal business experience</td>
<td></td>
</tr>
<tr>
<td>6. Family business experience</td>
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</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

Knowledge, skills and length of experience

The first four endogenous factors shown in Figure 7.2, quantum of knowledge, mastery of fish farming skills, length of experience, and level of education, were basic requirements of a successful fish farming business. Without fish farming knowledge and skills, it is difficult to carry out an aquaculture business because the fish farmer needs to know how to cultivate fish. The importance of knowledge was supported by the research literature as both a useful tool in business and as one of the company’s assets (Winter 1998). Additionally, fish farming experience will support a fish farmer in achieving a more successful fish farming business. Lee and Tsang (2001) also acknowledged the strength of experience as an important contributing factor to a successful business.

Education

As expected education was also identified as one of the endogenous factors that influenced income improvement. Education was one of the essential qualities required by entrepreneurs in running their business (Lee & Tsang 2001). Furthermore, an entrepreneur equipped with a higher education will be better
prepared to face unexpected obstacles since they have more skills to face and resolve problems. Therefore, fish farmers with higher educational levels will be more aware of the risks they face and the problems that may arise, including financial situations and seeking ways to improve their income.

**Personal business experience**

The length of personal business experience may also assist fish farmers in managing their business. Lee and Tsang (2001) suggested that business experience prior to starting an own business is better than no experience since business experience prepared a person for unexpected downturns in business and being able to handle downturns more professionally.

**Family business experience**

Family business background plays a large role in determining the success of an entrepreneur. It has been observed that entrepreneurs with family business experience were more prepared to face unexpected circumstances that occurred within their business (Morrison 2000).

### 7.4 Endogenous and exogenous factors that influenced product sustainability

As was previously explained, fourteen endogenous and exogenous factors that influenced business outcomes have been identified from the literature review. As described in section 7.3, the exploratory factor analysis categorised these factors into two groups: endogenous and exogenous factors. This finding agreed with the literature which found that there were two groups of factors that influenced business outcomes (Bouchiki 1993). The results of the exploratory factor analysis were then further analysed using binary logistic regression analysis to establish the factor groups that had positive correlation with the product sustainability activities.

#### 7.4.1 Results of Exploratory Factor Analysis (EFA) of endogenous and exogenous factors that influenced product sustainability

The exploratory factor analysis classified the fourteen identified endogenous and exogenous factors into two groups. It was established that nine endogenous factors and three exogenous factors influenced product sustainability.
The endogenous factors that influenced product sustainability were: knowledge, skills, education, entrepreneurial characteristics, reason for going into business, personal business experience, family business experience, family support and infrastructure in the area of operation. The exogenous factors that influenced product sustainability were: density of business network, financial capital and government or other institution support. Figure 7.3 presents the result of the factor analyses for endogenous and exogenous factors that influenced product sustainability.

The Exploratory Factor Analysis for endogenous and exogenous factors that influenced product sustainability therefore excluded length of experience and market demand from the factors. However, two factors that were previously predicted to be exogenous factors were classified as endogenous factors: family support and infrastructure in the area of operation.

Figure 7.3 Result of data reduction for endogenous and exogenous factors that influenced product sustainability

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia
The family support factor was predicted to be exogenous, since it was seen as coming from outside the individual. However, the exploratory factor analysis suggested otherwise since the definitions of endogenous and exogenous were dependent on one’s viewpoint. Bouchiki (1993) defined endogenous factors as factors arising from within the individual and exogenous factors were factors arising externally to the person. Morris and Lewis (1995) on the other hand found that three dimensions influenced the level of entrepreneurship: environmental infrastructure, environmental turbulence and personal life experience. In this research it was taken that the meaning of environmental infrastructure by Morris and Lewis was similar to the exogenous factors as meant by Bouchiki, while personal life experience was similar to endogenous factors. According to Morris and Lewis (1995), family experience was included in the personal life experience or endogenous factor category. Their view was that endogenous factors were not only limited to the individual’s possessions (knowledge, skills, experience, etc.) but also to how the individual was raised and the closest people who significantly influenced their way of thinking and their behaviour (in this case, family business experience).

The infrastructure in area of operation factor was also classified as one of the endogenous factors that influenced product sustainability even though it was previously predicted to be an exogenous factor. The explanation for this is similar to the description of family support above. The exact definitions of endogenous and exogenous factors were unclear and depend on how the endogenous and exogenous factors were viewed. Bouchiki (1993) defined the endogenous and exogenous factors from the perspective that endogenous is strength from within the person and exogenous is support from outside the person. Porta and Ona (2006) on the other hand, took a wider perspective on endogenous and exogenous, defining endogenous as the strength possessed by a business as a whole (internal assets) and exogenous as support from structures external to the business. Hence, according to Porta and Ona’s (2006), endogenous may include all internal assets, not just the individual, but also family support, family background, including infrastructure that supports the business. Conversely, exogenous factors may include every other aspect that...
does not have direct relation to the internal strength of the business, for example the government, international institutions, networking, and financial institutions.

The startup financial capital factor was also grouped into the exogenous factors that influenced product sustainability even though it was predicted to be an endogenous factor. The EFA classified financial capital as an exogenous factor possibly because in the majority of cases financial capital was obtained from external sources such as cooperatives, neighbours, families, friends, banks or money lenders. This classification aligns with Morris and Lewis’ (1995) definition that financial structure was classified into environmental infrastructure (exogenous factors).

Question 66 of the questionnaire provided the data for the endogenous and exogenous factors that influenced product sustainability. The question was: “To what extent do you agree the following factors influence product sustainability for your business?”. Answers were provided on a Likert scale coded from 1 (Strongly disagree) to 6 (Strongly agree). The purpose of this question was to find out how small scale fish farmers saw the endogenous and exogenous factors affecting their business in the attempt to sustain their product.

7.4.2 Results of Binary Logistic Regression Analysis of endogenous and exogenous factors that influenced product sustainability

The results of the binary logistic regression analysis showed that nine endogenous factors and three exogenous factors influenced product sustainability activities. Unlike the results obtained for factors influencing income improvement, both the endogenous and exogenous factors were found to have positive correlations with product sustainability activities. Endogenous factors were found to significantly affect three of the product sustainability activities: checking water quality, maintaining fish feed quality and availability and maintaining fish seed quality and availability. The exogenous factors were observed to only significantly affect one product sustainability activity: maintaining fish seed quality and availability. Conversely, no significant correlation was found for both of the endogenous and exogenous factors to the activity of giving feed at the right quantity and time.
The results from the binary logistic regression for the endogenous and exogenous factors that influenced product sustainability are shown in Figure 7.4. The endogenous factors that influenced three of the product sustainability activities were: quantum of knowledge, fish farming skills, education, entrepreneurial characteristics, reason for being a fish farmer, personal business experience, family business experience, family support and infrastructure. The exogenous factors that affected the one product sustainability activity namely maintain fish seed quality and availability were: density of business network, financial capital and support from government/other institution.

Figure 7.4 Endogenous and exogenous factors that influenced product sustainability activities

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

**Quantum of knowledge and skills**

The quantum of knowledge was one of the critical factors that influenced product sustainability. Indonesian fish farmers were yet to become aware of the importance of sustainable aquaculture. This was one of the challenges faced by the Indonesian fisheries industry. The implementation of sustainable aquaculture was not as easy as anticipated because of the large numbers of small scale fish farmers in Indonesia (Sukadi 2006). Most small scale fish farmers had low levels of education and hence they had limited knowledge of the importance of...
applying sustainable aquaculture to their fish farming activities. They also had limited skills in applying sustainable aquaculture. Many of their current fish farming activities may not include sustainable fish farming techniques such as checking water quality on daily basis and maintaining fish feed and fish seed quality and availability.

**Level of education**

The level of education also significantly affected product sustainability. Education was one of the essential qualities in running a business since it equipped an entrepreneur with the necessary skills and knowledge to face negative circumstances in their business (Lee & Tsang 2001). This included having knowledge of the importance of sustainable aquaculture and having relevant skills in performing sustainable aquaculture practices.

**Entrepreneurial characteristics**

One of the characteristics that differentiated an entrepreneur from a small business owner was that entrepreneurs focused on company growth (Carland et al. 1984). For an entrepreneur to focus on company growth required undertaking any actions needed to increase the development of the business. One of the actions to secure their product was implementing sustainable aquaculture.

**Reasons for going into business**

The reasons given for going into business factor were also found to be related to product sustainability. There were two reasons for why someone decided to become an entrepreneur: either because he had no other opportunities and was forced to be a fish farmer (push factor), or because he was naturally attracted to the fish farming business (pull factor) (Basu 1998; Watson, Hogarth-Scott & Wilson 1998). Someone basing their decision on a pull factor was more likely to experiment with new techniques in order to increase their business performance than a person who was forced to become a fish farmer. New techniques tried may include implementing sustainable aquaculture techniques in their fish farming business.
Business experience

Previous business experience (personal and family business experience) was also found to have significant affect for product sustainability. In the literature review chapter it was found that business experience had a positive impact for an existing business. This finding also applied to the implementation of sustainable aquaculture. Fish farmers with previous fish farming business experience that used sustainable aquaculture practises were more likely to implement such practises themself.

Family support

Family members often assisted small scale fish farmers in their businesses. This included helping them to run the fish ponds, giving feed, and changing water. For this reason family support was very crucial for running their businesses. Family support has a strong relation with product sustainability because family members are the closest people able to help the fish farmers manage their fish farms and if family members apply sustainable aquaculture practices in their daily tasks then product sustainability can be achieved.

Infrastructure

A developed infrastructure in the area of operation was critically needed in order to obtain product sustainability. Without developed infrastructure, it was difficult for fish farmers to obtain supplies (Islam 2004) or even information on sustainable aquaculture from the government officers or other related institutions. Without developed infrastructure, it was also difficult for the government officers to provide sustainable fish farming training to fish farmers who were located in inaccessible rural areas.

Density of business network

Business networks were important because it helped to increase business performance and growth (Havnes & Sanneseth 2001). The greater the density of the network the more personal contacts the fish farmers had. More contacts also meant that fish farmers had access to more information about sustainable aquaculture issues and how to implement them in their fish farming businesses.
**Start up financial capital**

Financial capital was one of the critical constraints faced by small scale fish farmers (Das 2006). This also applied to small scale fish farmers in their attempt to achieve product sustainability. In implementing sustainable aquaculture, small scale fish farmers may need additional funds to obtain tools for sustainable aquaculture practises. For example they may need water quality measuring equipment to control the temperature, pH and salinity of the water. Therefore, financial capital was a factor that strongly influenced small scale fish farmers in achieving product sustainability.

**Government/other institution support**

Government played a big role in the success of small scale fish farmers in implementing sustainable aquaculture. The government acts as a regulator by developing policies on sustainable aquaculture. The government also monitors small scale fish farmers’ attempts at implementing sustainable aquaculture. The Fisheries Act No. 31 (2004) listed environmental sustainability as one of the objectives of the Indonesian Fisheries Management (Sukadi 2006).

The exogenous factors were shown to have a significant affect on only one product sustainability activity. This result may be explained by the condition of limited fish seed stock (Mantau, Rawung & Sudarty 2004) and the fact that not many fish farmers produced their own fish seed. This explanation was supported by the results of this research that found that producing own fish feed was not a common activity among small scale fish farmers in Central Java (see figure 7.1). Fish farmers ordered their fish seed from hatcheries (Budhiman 2007), some of which were subsidised by the government (Suara Merdeka 2007a). This result may conversely be explained by pointing out that other activities such as checking water quality required the presence of endogenous factors such as knowledge, skills and experience to be aware of its importance.

The maintaining fish feed quality and availability activity was not affected by exogenous factors possibly because fish feed were widely available. Therefore, although fish farmers did not produce their own fish feed, they could still easily obtain fish feed.
The result that endogenous and exogenous factors were influencing three product sustainability activities: checking water quality, maintaining fish feed quality and availability and maintaining fish seed quality and availability was supported by the research of Sukadi (2006). In his paper, Sukadi explained that few sustainable practices and management techniques were implemented to preserve the aquaculture environment. The practises included water management, providing good quality fish seed and fish feed management.

### 7.5 Constraints and problems that influenced income improvement

Several internal and external obstacles were identified as influencing income improvement. This research identified 16 internal and external obstacles however the EFA results indicated that some obstacle variables could be removed to produce a simpler structure with fewer but more meaningful variables.

In the literature there was not a clear differentiation between what was meant by the terms constraints and problems. Many authors have used both terms for describing the same situation. In this research, the terms constraints and problems were specifically differentiated and were used for describing different situations. According to Askoxford (2008), a constraint is “a limitation or restriction or stiffness of manner and inhibition” and a problems is “an unwelcome or harmful matter needing to be dealt with”.

The above definition associates the term constraint with a limitation of a person and therefore was viewed as an internal restriction. On the other hand, the term problem was viewed as an external obstruction. Therefore, in this research constraint was approached as an internal matter and problem as an external issue.

#### 7.5.1 Results of Exploratory Factor Analysis (EFA) for constraints and problems that influenced income improvement

According to the literature review there were sixteen obstructions faced by small scale fish farmers. Based on the outcomes of the EFA, these common obstructions were classified into two groups: constraints and problems. The obstructions were classified into nine constraints and four problems that influenced income improvement (see Figure 7.5).

According to the EFA results as shown in Figure 7.5, the constraints that influenced income improvement were: lack of capital, low selling price, low
profit, low quality and quantity of fish seed, low quality and quantity of fish feed, poor financial management skills, poor quality control, poor water quality and inability to secure a sufficient loan. Figure 7.5 shows that according to the EFA results the problems that influenced income improvement were: lack of family support, lack of federal and regional government support, lack of training and lack of fish farming experience and knowledge. According to the EFA results the obstacles that were removed because they had less impact on income improvement were: lack of technical abilities, lack of family support, lack of potential market and low ability to handle fish disease and parasite as obstacles that influenced income improvement.

Figure 7.5 Result of data reduction for constraints and problems that influenced income improvement

<table>
<thead>
<tr>
<th>Constraints and problems</th>
<th>Constraints that influence income improvement</th>
<th>Constraints that influence income improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of startup capital</td>
<td>Lack of startup capital</td>
<td>Lack of startup capital</td>
</tr>
<tr>
<td>Lack of technical abilities</td>
<td>Low selling price</td>
<td>Low selling price</td>
</tr>
<tr>
<td>Lack of family support</td>
<td>Low profit</td>
<td>Low profit</td>
</tr>
<tr>
<td>Lack of federal and regional government support</td>
<td>Low quality and quantity of fish seed</td>
<td>Low quality and quantity of fish seed</td>
</tr>
<tr>
<td>Lack of training</td>
<td>Low quality and quantity of fish feed</td>
<td>Low quality and quantity of fish feed</td>
</tr>
<tr>
<td>Lack of fish farming experience and knowledge</td>
<td>Poor financial management skills</td>
<td>Poor financial management skills</td>
</tr>
<tr>
<td>Lack of potential market</td>
<td>Poor quality control</td>
<td>Poor quality control</td>
</tr>
<tr>
<td>Low selling price</td>
<td>Poor water quality</td>
<td>Poor water quality</td>
</tr>
<tr>
<td>Low profit</td>
<td>Inability to secure a sufficient loan</td>
<td>Inability to secure a sufficient loan</td>
</tr>
<tr>
<td>Low quality and quantity of fish seed</td>
<td></td>
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<tr>
<td>Low quality and quantity of fish feed</td>
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</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

7.5.2 Results of Logistic Regression Analysis for constraints and problems that influenced income improvement

The results from the EFA suggested that there were nine constraints and four problems that played a role in influencing income improvement. Unlike the
research findings where only endogenous factors were correlated with income improvement (see Section 7.3), the results of the binary logistic regression suggested that positive correlations existed for both constraints and problems that influenced income improvement.

Figure 7.6 shows the constraints and problems that influenced the income improvement of small scale fish farmers. There were nine constraints and four problems classified by the exploratory factor analysis that influenced income improvement.

**Figure 7.6 Constraints and problems that influenced income improvement**

![Diagram showing constraints and problems affecting income improvement](source)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmers in deriving income improvement and product sustainability in Central Java, Indonesia

**Financial constraints**

Financial constraints consisted of all the weaknesses of fish farmers that affected their income. The two main financial constraints identified by fish farmers in Central Java were: lack of capital and inability to secure sufficient loans. These were the most common problems found in small business in developing countries. There were many factors associated with these financial problems. Sinar harapan (2007) proposed unavoidable natural disaster as one such factor. They reported that some fish farmers’ milkfish brackish water pond cultures were swept away during strong high tides. This left the fish farmers more vulnerable since they could not continue their production and had to rebuild their fish cultures from scratch. This situation gives rise to financial problems because they no longer have an income having lost their fish harvest and hence they no
longer had capital to buy new fish seed. Financial problems also emerged when fish farmers needed instant cash for their production or daily needs (Kompas 2003). Most fishermen in this situation were willing to sell their products to middlemen at lower than market prices, rather than selling to large restaurants or hotels for higher prices but having to wait weeks before receiving full payment.

Lack of capital, poor financial management skills and the inability to secure sufficient loans, were all constraints that played a big role in influencing the small scale fish farmers’ income. This is because without adequate sources of money to run the business and without an ability to manage it fish farmers were limiting their income. Obtaining low sales prices and hence having reduced profits also affected their income. Some of the low sales price and lack of profits were situations caused by money lenders who forced fish farmers to sell their harvest at very low prices (Effendi 2008).

**Technical constraints**

An inability to provide good quality harvests as a result of low quality fish seed, low quality fish feed, poor quality control and poor water quality may also have influenced income. This was because low quality fish seed and fish feed together with poor quality control will result in a low quality fish that fetches low sales prices. Further more, poor quality control can result in the total mortality of fish and a total harvest failure.

**Lack of training, family and government support**

Problems such as a lack of support from family and government have strong influences on income improvement. Family members were the closest people to the fish farmers and therefore had a large impact on the fish farming activities, including the income. Family needs also influenced the fish farmers’ decisions about allocating the income to providing family needs and business development. Government supports have considerable impact through establishment of policies and providing trainings for small scale fish farmers.

**Experience and knowledge**

Experience was an important factor in determining the success of a business (Lee & Tsang 2001). Fish farmers with more fish farming experience may be
able to achieve higher incomes since they may be able to predict what can happen in a fish farming business and, having learnt from experience, are better able to counter obstructions.

7.6 Constraints and problems that influenced product sustainability

Several variables were identified as influencing product sustainability. This research identified 16 common obstructions from the literature. The obstructions were divided into internal obstructions (constraint) and external obstructions (problems). The EFA grouped the 16 common obstructions into two categories and showed that some variables could be removed to produce a simpler structure with fewer but more meaningful variables.

7.6.1 Result of Exploratory Factor Analysis (EFA) for constraints and problems that influenced product sustainability

The literature review identified 16 obstructions faced by small scale fish farmers. Based on the outcomes of the EFA, the obstructions that influenced product sustainability were classified into two groups: constraints and problems. The obstructions were classified into nine constraints and seven problems as shown in Figure 7.7.
7.6.2 Result of Binary Logistic Regression Analysis for constraints and problems that influenced product sustainability

The results of the binary logistic regression analysis for constraints and problems that influenced product sustainability are illustrated in Figure 7.8. It shows that nine constraints had positive correlation with the activity of checking water quality, while seven problems were positively correlated with the activities of giving feed at the right quantity and time, and maintaining fish seed quality and availability. The nine constraints were: poor financial management skills, fish diseases and parasites, poor water quality, low quality fish feed, low selling price, low quality fish seed, poor quality control, inability to secure a sufficient loan and lack of profit. The seven problems were: lack of family support, lack of potential market, lack of government support, lack of training,
lack of fish farming experience and knowledge, lack of capital and lack of technical abilities.

Figure 7.8 Constraints and problems that influenced product sustainability activities

Technical constraints

Five technical constraints directly impacted product sustainability through the activity of checking water quality: low ability to handle fish disease and parasites, poor water quality, low quality and quantity of fish feed, low quality and quantity of fish seed, and poor quality control. The combination of low quality fish feed, low quality fish seed, a low ability to handle fish disease and parasite, and low water quality were signs of a lack of sustainable aquaculture practises. The poor quality control constraint, which also includes environmental quality control, also indicated the absence of sustainable fish farming practices.

Managerial constraints

Four managerial constraints influenced product sustainability through the activity of checking water quality: poor financial management skills, low selling price, inability to secure sufficient loans and lack of profit. These managerial constraints had no direct impact on product sustainability. Nevertheless, they
had significant indirect impact on product sustainability. Without access to sufficient loans and without adequate financial management skills already makes it difficult for small scale fish farmers to manage their fish farming businesses, let alone implementing sustainable aquaculture practises. Obtaining low sales prices and lacking profits exasperate the business situation and make it even harder to implement sustainable fish farming.

**Lack of family support**

Family members were the closest people to fish farmers in their ability to influence how the fish farmers conduct their business (Basu 1998). Without a supportive family, fish farmers may be discouraged in developing their businesses. This includes their ability to develop and implement sustainable aquaculture in order to achieve product sustainability.

In addition, many small scale fish farmers received direct assistance from family members in running their businesses. Many family members help out in managing the fish ponds, which includes managing fish feed and fish seeds, and hence their direct assistance influenced product sustainability.

**Lack of potential market**

The lack of potential market had a significant influence on achieving product sustainability. It was identified as one of the critical factors in achieving sustainable aquaculture (Sukadi 2006). Without fish markets, fish farmers were unable to sell their products. Fish products have limited shelf life and the longer it takes to sell the products, the greater the deterioration and decomposition of the fish which influenced the quality of the environment.

**Lack of government support and lack of training provided by the government**

Governments have the power to develop policies to support small scale fish farmers. As it pertains to the implementation of sustainable aquaculture practices by small scale fish farmers, the Indonesian government developed the Indonesian Fisheries Act No. 31 (2004) which required that environmental sustainability practices be included in all fish farming practices (Sukadi 2006). Small scale fish farmers were also dependent on the government to provide them with training on sustainable aquaculture and other subsidies.
Lack of fish farming experience and knowledge

Small scale fish farmers cannot implement sustainable aquaculture if they do not have sufficient experience and knowledge of the practices. Prior fish farming experience and knowledge was important in equipping fish farmers with technical and managerial skills needed in conducting sustainable aquaculture, practices such as how to prepare and manage their pond as well as how to combine fish in poly-culture system (Nam & Thuok 1999).

Lack of capital

Financial capital was an ongoing problem faced by small scale fish farmers (Awulachew et al. 2008; Das 2006). A lack of adequate funds makes it difficult for small scale fish farmers to run their business. This includes their ability to implement sustainable aquaculture as a means to achieving product sustainability.

Lack of technical abilities

Lack of technical skills was a rising problem as some of these fish farmers did not receive adequate fish farming education. Some fish farmers started their fish farming business simply because they had witnessed their neighbours or relatives achieve success in fish farming. They tried to copy what they see but they did not have the required knowledge to undertake this type of business. Boyolali Animal Husbandry and Fisheries Office (2007) cited the example of the catfish Village in Boyolali region that started off with one successful fish farmer managing his pond that inspired his neighbours to follow suit by fortuitously being willing to share his fish farming secrets. Unfortunately this situation is rare and competition often exceeded the willingness to share and help each other. A similar observation was made by Miyata and Manatunge (2004) about the adoption of floating net aquaculture (FNA) amongst fish farmers. They detected that decisions to adopt FNA by fish farmers were attributed to other fish farmers’ success.

A lack of technical abilities includeds a lack of technical skills to implement sustainable aquaculture. Limited technical abilities in implementing sustainable aquaculture may result in failure to obtain product sustainability and even total
fish harvest failure (Mkoka 2007). This technical inability is incorporated in fish feed and fish seed management.

7.7 Implemented entrepreneurial activities by small scale fish farmers in Central Java

This section is based on question number 17 of the questionnaire: “Which of the following activities have you implemented in your business?”. There were eight answers that could be selected from; six of the selection items were entrepreneurial activities that were identified from the literature review. These activities were: producing own fish feed, producing own fish seed, extending market distribution, extending the varieties of fish species, adding value to product and finding other use of fish part. Respondents also had the option to answer “others” to specific other activities that were not listed. Respondents could also select the option “none of the above”, which was taken as an indication that the respondent had not implemented any entrepreneurial activities.

Participants were asked to answer all activities that apply to their fish farming business and the data was analysed descriptively. Results showed that some of these entrepreneurial activities had been implemented by many small scale fish farmers in Central Java while others had not. This section will discuss in detail the result of the implemented entrepreneurial activities by small scale fish farmers in Central Java.

Figure 7.9 illustrates the frequency of implemented entrepreneurial activities by small scale fish farmers in Central Java. It shows that the most frequently implemented entrepreneurial activity was extending market distribution, followed by extending the varieties of fish species and adding value to product. Conversely, the least frequently implemented entrepreneurial activities were producing own fish feed, finding other use of fish parts and producing own fish seed. Figure 7.9 also shows that some respondents chose “none of the above” and “others” which indicated that some small scale fish farmers in Central Java have either implemented other activities or have not implemented entrepreneurial activities at all.
Figure 7.9 Percentage of implemented entrepreneurial activities by small scale fish farmers in Central Java

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

7.7.1 Fish feed production

Figure 7.9 shows the entrepreneurial activities implemented by small scale fish farmers in Central Java. It shows that producing own fish feed was the least implemented activity. The descriptive analysis in Table 6.26 shows that only one percent or four out of 400 respondents had implemented this activity in their fish farming businesses in Central Java. This may be due to the complexity of producing fish feed and the scarcity of the needed ingredients. This finding was supported by Djunaidah (1992) who believed that most Indonesian fish farmers prefered to use commercial fish feed rather than produce their own fish feed. Besides finding it difficult to locate the ingredients, small scale fish farmers also regarded this activity as time consuming.
7.7.2 Fish seed production

According to Table 6.26, producing own fish seed was found to be the sixth most frequently implemented entrepreneurial activity in Central Java: 5.75% of respondent (or 23 of the 400 respondents) had implemented this activity. The reason why only small numbers of fish farmers in Central Java implemented this activity was because most small scale fish farmers in Indonesia still obtained fish seed from the wild or bought it from hatcheries (Mantau, Rawung, & Sudarty 2004).

7.7.3 Market extension

Extending market distribution was found to be the most frequently implemented entrepreneurial activity. According to Table 6.26 the activity of extending market distribution was reported by the largest percentage of respondent (48.5%). This may be because market size was one of the fundamental obstacles in business. This was supported by Morris and Lewis (1995) who believed market extension to be one of the primary entrepreneurial activities for carrying on business. Moreover, through market extension an entrepreneur can also increase the size of networks, thus allowing the business to expand its market distribution into a wider geographical range and a greater number of markets (Havnes & Senneseth 2001).

7.7.4 Fish species extension (poly-culture system)

Extending the varieties of fish species was Central Java’s fish farmers’ second most frequently implemented entrepreneurial activity (27.3%). Many fish farmers extended the variety of their fish species because they can increase their income significantly by adopting poly-culture systems. This was supported by Kompas (2006) that reported that a fish farmer in West Java increased his income five times by adopting the poly-culture system.

Although poly-culture systems were associated with an increase in income, it required knowledge of fish feeding habit. This is because in a poly-culture system the fish species are combined according to their different feeding habits (Bocek 2008). For example carnivore fish is combined with herbivore fish, or plankton feeder is combined with demersal fish etc. The central idea of this
system is to breed different fish species that do not compete with each other for food.

7.7.5 Product range extension (adding value to fish product)

Product range extension was the third most frequently implemented entrepreneurial activity carried out by small scale fish farmers in Central Java. According to Table 6.26 eighteen per cent of respondents carried out this activity in Central Java. The participants that confirmed their participation in this activity may have included those that came from the FFG called Karya Mina Utama. Besides selling fresh catfish, they extended their product range by adding value to their product. They sold shredded catfish, catfish crackers, catfish balls, and catfish nuggets (Suara Merdeka 2007c). Whilst this activity was not widely implemented among small scale fish farmers, based on the results achieved by the members of Karya Mina Utama, this entrepreneurial activity has good prospects for implementation by other FFGs in Indonesia.

7.7.6 Utilisation of other fish parts

The frequency analysis showed that three per cent of respondents had taken steps to utilise other fish parts as an entrepreneurial activity. This very small figure indicated that this activity was not widely carried out by fish farmers in Central Java. This low frequency may be due to a lack of knowledge of this topic. The small scale fish farmers may not have adequate knowledge of how to utilise their fish waste and are simply discarding it. Nevertheless, the three per cent small scale fish farmers who confirmed this activity may include participants from the FFG called Karya Mina Utama. They were utilizing their fish waste like fish skin, fin and tail to create and sell delicious fish crackers (Suara Merdeka 2007c).

7.8 Comparison between fish farmers with different demographic background in carrying out entrepreneurial activities

Fish farmers were compared for their implementation of entrepreneurial activities according to the groupings: awardee and non awardee, different gender groups, different age groups, different marital status groups, groups of different educational levels, different FFG levels and different reasons for becoming fish farmers. The Chi-square analysis presented in Chapter 6 shows how different groups performed in their
implementation of entrepreneurial activities. This section discusses the significant
differences between the groups in how they carried out entrepreneurial activities.

7.8.1 Comparison between awardees and non awardees

Four hundred small scale fish farmers from Central Java participated in this research survey. The “Non-awardees” participants dominated the sample population. Non-awardees participants were fish farmers who belonged to a fish farmer groups (FFGs) that had not received any awards from the government in the last five years. The “Awardees” participants are fish farmers who belonged to a FFG that had won the government award in the last five years. In the sample 310 participants (77.5%) were non awardees and 90 participants (22.5%) were award receivers.

The significant differences between awardees and non awardees in implementing entrepreneurial activities are shown in Table 6.29. According to the chi-square test result, significant differences between the groups were found for the following entrepreneurial activities: market extension, fish species extension and utilisation of other fish part. No significant differences were found for producing own fish feed, producing own fish seed and adding value to product.

The bar chart in Figure 7.10 shows the results of comparisons between awardees and non awardees in implementing entrepreneurial activities. It shows that non awardees implemented more entrepreneurial activities than awardees. The initial prediction was that awardees would implement more entrepreneurial activities that non-awardees.
Figure 7.10 Comparison between awardees and non awardees in implementing entrepreneurial activities

![Graph showing comparison between awardees and non awardees in implementing entrepreneurial activities.](image)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

However, based on a proportional comparison, where the proportion of non awardees (77.5%) is to awardees (22.5%), a different result is obtained. Figure 7.11 shows the results of comparing the entrepreneurial activities proportionally.

Figure 7.11 shows that a greater proportion of non awardees implemented entrepreneurial activities than awardees. The proportion of awardees only exceeds non awardees in implementing market extension. This is contrary to expectations that awardees would have higher abilities than non awardees and would therefore implement more entrepreneurial activities than non awardees. The only explanation for this contradictory finding is the quality of the award winners. The selection of FFG winners may be impossible to justify given that field evaluations may be performed by different people. As a result the assessment of award winners may not be objective and result in invalid evaluations.
Figure 7.11 Proportional Comparison between awardees and non awardees in implementing entrepreneurial activities

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

7.8.2 Comparison between male and female small scale fish farmers

According to the frequency analysis shown in Table 6.30, there were only 18 female (4.5%) participants and 382 male participants (95.5%). This may be due to the view that fish farming activities require physical hard work which is more likely to be carried out by men.

The result of the chi-square test in Chapter 6 suggests that there were four entrepreneurial activities that showed significant differences given the gender of the fish farmer: fish seed production, market extension, fish species extension and product range extension. The chi-square test also suggested that no significant differences existed between the two groups in carrying out fish feed production and utilisation of other fish part.

Figure 7.12 shows that male fish farmers implemented the whole range of entrepreneurial activities while female fish farmers only implemented three of the entrepreneurial activities (fish seed production, market extension and product range extension). This finding may have been due to the significant difference in
the proportion of male (95.5%) and female (4.5%) survey respondents. The bar chart in Figure 7.13 presents the proportional comparison between men and women in their implementation of entrepreneurial activities.

**Figure 7.12 Comparison between gender in implementing entrepreneurial activities**

![Bar chart comparing male and female participation in entrepreneurial activities.](chart)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

Figure 7.13 shows that women implemented only three entrepreneurial activities: fish seed production, market extension and product range extension. What is interesting is that women implemented fewer entrepreneurial activities, but when they did, they did so in greater proportions than men. A greater proportion of women than men implemented the following activities: fish seed production, market extension and product range extension. The outcome of this research, where men implemented a greater range of entrepreneurial activities, is supported by previous research that found that men tended to be more entrepreneurial than women (Cowling & Harding 2001; Reynolds et al. 2002). This may be associated with the reality that women are more focused on family matters than business development because the role of women as the primary family caretaker restricts their ability to give priority to work related issues.
7.8.3 Comparison between age groups

Respondents were classified into two age groups: under 40 years old and 40 years old and over. The frequency analysis in Table 6.32 showed that there were 170 respondents (42.5%) who were under 40 years old, and 230 people (57.5%) who were 40 years old and over.

According to the chi-square test analysis in Table 6.33, significant differences were found between the age groups in their implementation of the following entrepreneurial activities: fish feed production, fish species extension and product range extension. Conversely, according to the chi-square test there were no significant differences between the age groups in implementing the following entrepreneurial activities: fish feed production, fish seed production, market extension and utilisation of other fish part.

Figure 7.14 shows that older fish farmers implemented more market extension and utilisation of other fish parts activities than younger fish farmers. On the other hand, younger fish farmers implemented a greater range of entrepreneurial
activities than older fish farmers. This may be due to younger fish farmers being more willing to experiment with new activities than older people. The finding that a greater number of the older fish farmers had implemented the activities of market extension and utilisation of other fish parts may be due to older fish farmers’ longer experience in implementing these activities.

Figure 7.14 Comparison between age groups in implementing entrepreneurial activities

Figure 7.15 presents a proportional comparison between age groups in implementing entrepreneurial activities. It shows that the proportion of older fish farmers exceeded younger fish farmers only in the activity of market extension. This is possibly because older fish farmers were only familiar with market extension as a form of business expansion. They were perhaps not as familiar with the other means of entrepreneurial activities that younger fish farmers may be more familiar with given their greater use of the latest information technologies.

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia
7.8.4 Comparison between marital status

Respondents were classified into two marital status groups: single and married respondents. “Single” respondents included not only people who have not married, but also those who were divorced. The frequency analysis in Table 6.34 shows the survey sample was dominated by married fish farmers: only 44 respondents (11%) were single and 356 respondents (89%) were married.

Significant differences were found between the marital status groups in their implementation of only one of the entrepreneurial activities namely fish species extension. No significant differences between single and married fish farmers were found in their implementation of the other activities: fish feed production, fish seed production, market extension, fish species extension, product range extension and utilisation of other fish part.

Figure 7.16 shows a frequency graph of the activities of the marital groups of this research sample. It shows that the married fish farmers of this sample implemented all the entrepreneurial activities compared to only three activities implemented by the single fish farmers. This condition may be due to family
influence. Married fish farmers have to care for other family members (spouse and children). This means they will try anything to obtain more income than single fish farmers.

**Figure 7.16 Comparison between marital status groups in implementing entrepreneurial activities**

![Graph showing comparison between marital status groups in implementing entrepreneurial activities](image)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

However, the proportions of married (89%) and single (11%) fish farmers in the sample were very different. Figure 7.17 shows a proportional comparison between marital status groups in their implementation of entrepreneurial activities. It shows that married fish farmers had implemented all six entrepreneurial activities. The proportions of married fish farmers exceeded the single fish farmers in four entrepreneurial activities: fish feed production, fish seed production, fish species extension and utilisation of other fish parts. Conversely, the proportions of single fish farmers surpassed married fish farmers in two activities: market extension and product range extension.
7.8.5 Comparison between different educational levels

Respondents were classified into groups of different education levels: completed high school and did not complete high school. The results of the frequency analysis in Table 6.36 show that 240 respondents (60%) had completed high school, while 160 respondents (40%) had not complete high school.

Significant differences were found between the levels of education for five of entrepreneurial activities: fish seed production, market extension, fish species extension, product range extension and utilisation of other fish part. The only entrepreneurial activity that did not show a significant difference between education levels was fish feed production. The differences found between groups with different education levels had the greatest influence on entrepreneurial activities implemented by small scale fish farmers in Central Java. This may be due to the possibility that higher levels of education contribute to higher knowledge.

The bar chart in Figure 7.18 shows the comparison between fish farmers in implementing entrepreneurial activities who had completed high school and...
those who had not completed high school. Of the two groups, fish farmers who had not completed high school were more numerous in implementing the following activities: fish feed production, fish seed production and fish species extension. Conversely, those who did complete high school were more numerous in implementing the following entrepreneurial activities: market extension, product range extension and utilisation of other fish parts. The greatest difference between the groups was in their implementation of the market extension activity. The number of fish farmers that had completed high school was nearly double the number of fish farmers that had not completed high school. The reason for this significant difference may be that fish farmers with a higher education may also have higher knowledge, including market knowledge. People with higher education were also more prepared with the essential and necessary skills to manage a business (Lee & Tsang 2001).

Figure 7.18 Comparison between different education levels in implementing entrepreneurial activities

![Comparison between different education levels in implementing entrepreneurial activities](image)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

Figure 7.19 shows a proportional comparison of the two groups. The proportion of fish farmers who had completed high school exceeded the proportion of fish farmers who had not completed high school in their implementation of the following entrepreneurial activities: market extension, product range extension and utilisation of other fish parts. Surprisingly, the proportion of fish farmers
who had not completed high school exceeded the proportion of fish farmers who had completed high school in implementing the following entrepreneurial activities: fish feed production, fish seed production and fish species extension. Therefore, it cannot be generalised from Figure 7.19 that differences in educational levels played a role in the implementation of entrepreneurial activities. Such a discussion will need to go far beyond the information provided in Figure 7.19 because many other factors are involved in how small scale fish farmers with lower educational levels are able to implement entrepreneurial activities. For example, possible explanations can be that in the area where this research survey was carried out the government had provided training to fish farmers and encouraged them to produce their own fish feed and fish seed. Fish species extension may also have been carried out successfully over the years and have made poly culture systems one of the commonly implemented fish farming methods in the area.

![Figure 7.19 Proportional comparison between different education levels in implementing entrepreneurial activities](image)

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

Fish farmers who had completed high school were shown to implement the more complicated entrepreneurial activities: market extension, product range extension and utilisation of other fish parts. Market extension required that fish
farmers have wider networks, broader knowledge of potential markets and have a greater “risk taking” attitude to sell their product to a wider area. Product range extension also required fish farmers to innovate and create new products to a greater extent than other fish farmers. Likewise, the utilisation of other fish parts also required fish farmers to be innovative.

A very good example of fish farmers with a greater “risk taking” attitude is the fish farmer group in the Mangkubumen village in Central Java where almost all residents were catfish farmers whose livelihoods depended on cultivating catfish (Suara Merdeka 2007b). Four male residents, led by farmer Darseno, started to cultivate catfish in 1999 when the price of catfish was rising. Darseno was an optimist and grew 5000 catfish and made a healthy profit (Suara Merdeka 2007d). Their success led other resident into the cultivation of catfish and in less than one year they formed the “Karya Mina Utama” FFG with 92 members. Over a few years this village’s prosperity rose rapidly as evidenced by the new and beautiful houses and new cars owned by the FFG members. The benefits of this activity were not only confined to the pond owners, but also extended to the people around who were employed by the farmers. The catfish pond workers were paid very well because, as Suara Merdeka (2007b) explained, the pond owner obtained high profits.

A very good example of fish farmers who implemented more complicated entrepreneurial activities is the woman sub-members of the “Karya Mina Utama” FFG. These women turned lower quality catfish into delicious processed food such as shredded catfish, catfish crackers, catfish balls, and catfish nuggets (Suara Merdeka 2007c). They also provided the consumer with many choices of flavor for example the shredded catfish was supplied with an original sweet flavour, onion flavour or spicy flavour. Additionally, the catfish crackers were made from different parts of the fish body: fish meat crackers, fish skin crackers and fish fin crackers. These innovations produced additional income for the FFG members and their families. Their success has also attracted the attention of many government officers from other province in Indonesia who came to study their activities with the view to implement what they learn in their own regions.
7.8.6 Comparison between different fish farmer groups

The FFGs of small scale fish farmers in Central Java, were classified into two groups: starter and advanced. According to the frequency analysis result in Table 6.38, there were 165 respondents belonging to a starter FFGs and 224 respondents from an advanced FFGs.

Differences were found between the FFG levels for four entrepreneurial activities: fish seed production, market extension, fish species extension and utilisation of other fish parts. The entrepreneurial activities that did not show any significant differences between FFG levels were fish feed production and product range extension.

Figure 7.20 supports the expected outcome that fish farmers who belonged to advanced FFGs were more likely to implement entrepreneurial activities than fish farmers who were members of starter level FFGs. Figure 7.20 shows that more fish farmers belonging to advanced FFGs compared to starter FFGs implemented the following activities: market extension, fish species extension, product range extension and utilisation of other fish parts. This finding matched what was expected since fish farmers from higher level FFGs were awarded their FFG levels from the local Fisheries and Marine Affairs office that carried out annual evaluations to allocate levels to FFG. Ten evaluation criteria are used to distinguish FFG levels (Semarang’s Marine Affairs and Fisheries Office’s Book of Fish Farmer Group Formation Guide 2005). Therefore, FFGs at higher levels can be assumed to have higher levels of abilities including the ability to carry out entrepreneurial activity as part of the evaluation criterion “plan activities which can increase their productivity”.

Nevertheless, although Figure 7.20 shows that fish farmers from advanced FFGs were more likely to implement entrepreneurial activities, the number of respondents from advanced FFGs was more than those from starter FFGs. Figure 7.21 presents a proportional comparison between fish farmers from different level of FFGs in implementing entrepreneurial activities.

Figure 7.21 shows that the proportion of fish farmers from advanced FFGs exceeded the proportion of fish farmers from starter FFGs in the entrepreneurial activities of market extension, fish species extension and utilisation of other fish parts. On the other hand, the proportion of fish farmers from starter FFGs exceeded the proportion of fish farmers from advanced FFGs in the entrepreneurial activities of fish feed production, fish seed production and product range extension. This latter finding was very similar to the finding about fish farmers that did not complete high school (see section 7.8.5) that implemented in greater proportion the following entrepreneurial activities: fish feed production and fish seed production. This may be due to government training provided to fish farmers that focused mainly on these two production methods. Therefore, it is likely that many fish farmers have implemented these activities.
Figure 7.21 Proportional comparison between different levels of FFGs in implementing entrepreneurial activities

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

Figure 7.21 shows that a greater proportion of starter FFGs than advanced FFGs implemented the activity of product range extension. Therefore, it cannot be generalised that a greater proportion of starter FFGs implemented product range extension than advanced FFGs. This finding may be because fish farmers in the survey area already produced and sold products other than fresh fish. It may be that the fish farmers in this area already produced salted fish or cooked fish products in order to preserve them.

It seems conceivable that members of an advanced FFG would implement more entrepreneurial activities than member of starter fish farmer groups. However, in this case, there was a balance of activities between fish farmers from advanced and starter FFGs. This is a good sign since it indicates that even fish farmers from a starter fish farmer groups can also be independent. It may be a sign that the government program to support FFGs has been successful. Therefore, not only have fish farmers from advanced FFGs been implementing entrepreneurial activities, but also those from starter FFGs.
7.8.7 **Comparison of the different reasons to become fish farmers**

Reasons to become fish farmers were divided into two groups: push factors and pull factors. Push factors were all the reasons that forced fish farmers into becoming what they are today such as losing a job or not having any other choice. Pull factors were all the reasons given when respondents willingly became or choose to become fish farmers such as finding opportunities or being motivated by other people’s success.

Table 6.40 presents frequency results that show that 189 (47.3%) respondents became fish farmers because of pull factors, and 211 (52.8%) because of the push factors. Therefore, more respondents were forced to become fish farmers than respondents who willingly chose to become fish farmers.

Differences were found between the fish farmers with different reasons for becoming fish farmers in their implementation of entrepreneurial activities. The chi-square test results in Table 6.41 shows that there were significant differences in implementing the following entrepreneurial activities according to the different starting reasons: market extension, fish species extension and utilisation of other fish parts. On the other hand, no significant differences were found between fish farmers with different reasons for becoming fish farmers in their carrying implementation of the following entrepreneurial activities: fish feed production, fish seed production and product range extension.

Figure 7.22 shows that the number of fish farmers who responded to pull factors reasons to becoming fish farmers, implemented a greater range of entrepreneurial activities than those who had responded to push factor reasons. This was an expected outcome since fish farmers who responded to pull factor reasons on becoming fish farmers were likely to be more willing to try out and implement new activities than those who responded to push factor reasons.
People reporting push factor reasons were forced to become fish farmers because of various reasons such as an inability to find a suitable job or being pulled out from employment. These people were not as interested in applying new activities as fish farmers reporting pull factor reasons. This was because fish farmers with pull factor reasons were naturally attracted to become fish farmers. This was supported by Basu (1998) and Watson, Hogarth-Scott and Wilson (1998) who believed that entrepreneurs with pull factor reasons were naturally attracted to business simply because they have the capital to do so, or have other psychological or sociological reasons such as the attraction of personal independence.

Figure 7.23 illustrates the proportional comparisons between participants with pull and push factor reasons in implementing entrepreneurial activities. It shows that participants with pull factor reasons compared to push factors implemented more of the following entrepreneurial activities: fish feed production, fish seed production, market extension and fish species extension. This finding matched the prediction that fish farmers with pull factor reasons will implement more entrepreneurial activities. The result was confirmed by research reporting that entrepreneurs with pull motivations were more likely to earn more money than entrepreneurs with push factor motivations (Amit & Muller 1995).
Figure 7.23 Proportional comparison between reasons to become fish farmers in implementing entrepreneurial activities

![Bar chart showing the proportion of participants with push factor reasons versus pull factor reasons for different entrepreneurial activities.]

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia

Figure 7.23 also shows that the proportions of participants with push factor reasons exceeded the proportion of participants with pull factor reasons in their implementation of the following entrepreneurial activities: product range extension and utilisation of other fish parts. This may correspond to one of the examples given by Morris and Lewis (1995) in research. They observed that entrepreneurs pushed as a result of job dissatisfaction were more likely to be successful. The greater the entrepreneurs’ dissatisfaction, the more likely they were to succeed. Relating Morris and Lewis’s results to the findings of this research, it may be that fish farmers with push factor reasons may implement more entrepreneurial activities than those with pull factors.
7.9 Discussion

Entrepreneurial activities have been the topic of much research especially in the areas of small business and other manufacturing based businesses, but no research has focused on the entrepreneurial activities of small scale fish farmers. Small scale fish farmers are unique in how they run their businesses. Small scale fish farmers need to give extra attention to managing their financial cash flows because of the nature of their business. The small scale fish farmer has to manage living animals that require several months of fish rearing before they can be harvested, sold and the profits collected. Moreover, since fish farmers deal with living animals, extra care is needed to ensure the living requirements of the fish are met. Without extra care there exists the possibility of total collapse of the fish farmer’s fish stock which could result in total economic failure of the small scale fish farmers’ business.

Due to the complex nature of the fish farming business, several factors contribute to the support needed by fish farmers to achieve income improvement. Furthermore, additional factors contribute to the ability of fish farmers to ensure the sustainability of their fish farming business. This research explored these factors and also identified the most common internal and external obstructions faced by small scale fish farmers in Central Java. The entrepreneurial activities of small scale fish farmers were identified in the literature review chapter (Chapter 2) and an inquiry was designed and conducted into the actual implementation of small scale fish farming in Central Java. Finally, this research compared the different groups of fish farmer communities in implementing their entrepreneurial activities in their fish farming businesses.

The analyses results of this research classified the factors that affected income improvement and product sustainability into two groups: endogenous and exogenous factors. This classification of results is aligned with research literature that identified two groups of factors that influence business outcome (Bouchiki 1993). The results of the binary logistic regression analyses confirmed that income improvement was only affected by the endogenous factors, whereas product sustainability was affected by both endogenous and exogenous factors. The reason why income improvement was only influenced by endogenous factors is possibly because more internal strength is needed to achieve income improvement than external support. Conversely, product sustainability involves the wider communities and hence internal strength is not enough
to achieve sustainable aquaculture. Without continuous support from business networks, federal and regional government and other institutions, it is difficult for a fish farmer to achieve sustainable aquaculture.

The results of analyses of this research classified the most common obstructions faced by small scale fish farmers into two groups: constraints and problems. Results of the binary logistic regression analyses confirmed that both constraints and problems influenced income improvement and product sustainability. These positive correlations of both constraints and problems with income improvement and product sustainability confirmed that any obstructions (either internal or external) will affect small scale fish farmers’ abilities in achieving income improvement and product sustainability.

This research identified six entrepreneurial activities carried out by small scale fish farmers: fish seed production, fish feed production, market extension, fish species extension, product range extension and utilisation of other fish parts. Results of the descriptive analysis showed that the most common entrepreneurial activities implemented by small scale fish farmers in Central Java were: market extension, fish species extension and product range extension.

This research also compared the entrepreneurial activities carried out by different groups of small scale fish farmer communities in Central Java. The comparison was carried out between different fish farmer groups in carrying out their entrepreneurial activities, such as fish farmer groups with different educational levels, age and fish farmer group levels. Results of the Chi-square tests for the differences between fish farmers groups showed that different educational levels had the most significant impact for fish farmers in carrying their out entrepreneurial activities.

The following section discusses the hypotheses developed for this research and how the findings contributed to accepting or rejecting the hypotheses.
Hypothesis # 1

There is a positive correlation between the endogenous factors and the small scale fish farmers’ income improvement: accepted

The aim of the first hypothesis of this research was to test for a positive correlation between income improvement and the endogenous factors. The result from the binary logistic regression confirmed that income improvement had a positive relationship with endogenous factors. Therefore, hypothesis number one was accepted.

The positive correlation of endogenous factors with income improvement may be interpreted as indicating that internal strength is required to increase income. The endogenous factors that were found to influence income improvement are:

1. aquaculture knowledge,
2. aquaculture skills,
3. aquaculture experience,
4. aquaculture education,
5. personal business experience, and
6. family business background.

The combined result of the exploratory factor analysis and binary logistic regression analysis showed that these five internal characteristics were the most important endogenous factors in determining the ability of small scale fish farmers in deriving income improvement. Therefore, the first hypothesis was accepted.

Hypothesis # 2

There is a positive correlation between the exogenous factors and the small scale fish farmers’ income improvement: rejected

The aim of hypothesis number two was to test for a positive relationship between income improvement and the exogenous factors. The result from the binary logistic regression showed there was no positive correlation between income improvement and the exogenous factors. As explained for hypothesis
number one, the ability to increase income requires more internal strength characteristics than external support.

The exogenous factors that were previously thought to influence income improvement are:

1. business network,
2. financial capital,
3. market,
4. logistics,
5. government/other institution support, and
6. family support.

The above exogenous factors did not show a direct relationship with income improvement as evidenced by the result of a negative effect reported by the binary logistic regression. Business network, government support and family support, can only assist fish farmers with achieving income improvement but cannot directly improve the fish farmers’ income. Other exogenous factors such as capital, market and logistics also showed no direct relation to income improvement. Therefore, the second hypothesis was rejected.

**Hypothesis # 3**

There is a positive correlation between the endogenous factors and the small scale fish farmers’ product sustainability: accepted

The aim of hypothesis number three was to test for a positive correlation between product sustainability and the endogenous factors. The result from the binary logistic regression confirmed there was a positive relation between product sustainability and the endogenous factors. The endogenous factors that influenced product sustainability are:

1. aquaculture knowledge,
2. aquaculture skills,
3. aquaculture education,
4. strong entrepreneur character,
5. reason for going into business,
6. personal business experience,
7. family business background,
8. family support, and
9. logistics.

All nine of the identified endogenous factors of this research were found to be important factors needed by small scale fish farmers in order to achieve product sustainability. Knowledge, skills, education, character, reason and business experience were all interpersonal characteristics needed to implement sustainable fish farming. Family related factors (family business background and family support) were also important factors that can support fish farmers in implementing a sustainable aquaculture. Logistics too is considered important to the achievement of product sustainability since services such as roads make it easier for fish farmers to obtain information and training regarding sustainable aquaculture. Logistics also make it possible for government officials to visit fish farming locations to monitor sustainable aquaculture practices. Therefore, the third hypothesis was accepted.

Hypothesis # 4

There is a positive correlation between the exogenous factors and the small scale fish farmers’ product sustainability: accepted

The aim of the fourth hypothesis for this research was to test for a positive correlation between the small scale fish farmers’ product sustainability and the exogenous factors. The analyses result confirmed there was a positive correlation between product sustainability and the exogenous factors. The exogenous factors that influenced product sustainability were:

1. business network,
2. financial capital, and
3. government/other institution support.

These three exogenous factors had the greatest influence on product sustainability. The government played the greatest role in assisting small scale fish farmers in their attempt to achieve product sustainability. The Indonesian government is aware on the importance of carrying out sustainable aquaculture to secure the long term viability of fish farming businesses (Sukadi 2006).
Business networks also had an influence on product sustainability, since through networking fish farmers shared information regarding product sustainability and ways to implement sustainable aquaculture in their businesses. Networks may assist the transfer of information regarding the consequences of unsustainable aquaculture.

Access to financial capital also influenced product sustainability since implementing sustainable aquaculture resulted in extra expenses for equipment such as thermometers, pH meters, and salinometers. Therefore, the fourth hypothesis was accepted.

**Hypothesis # 5**

**There is a correlation between constraints and the small scale fish farmers’ income improvement: accepted**

The aim of hypothesis number five was to test for a correlation between constraints and fish farmers’ income improvement. The result of the binary logistic regression analysis confirmed there was a correlation between constraints and income improvement. According to the results of the exploratory factor analysis the constraints that influenced income improvement were:

1. lack of capital,
2. low selling price,
3. lack of profit,
4. low quality fish seed,
5. low quality fish feed,
6. poor financial management skills,
7. poor quality control,
8. poor water quality, and
9. cannot secure a sufficient loan.

The constraints that directly influence income is lack of capital, low selling price, lack of profit and poor financial management skills. The other constraints, such as low quality fish feed, low quality fish seed, poor quality control and poor water quality influenced income improvement through having and effect on the quality of the fish harvest. Low quality fish will fetch low selling prices. An
inability to secure sufficient loans also influenced income since insufficient funds to operate the fish farming business will result in financial problems. Therefore, the fifth hypothesis was accepted.

**Hypothesis # 6**

There is a correlation between problems and the small scale fish farmers’ income improvement: accepted

The aim of hypothesis number six was to test for a correlation between problems and the small scale fish farmers’ income improvement. The result of the binary logistic regression analysis confirmed there was a correlation between income improvement and problems. According to the exploratory factor analysis results the problems that influenced income improvement were:

1. lack of family support,
2. lack of government support,
3. lack of training, and
4. lack of fish farming experience.

These problems had the greatest influence in obstructing fish farmers from achieving income improvement. Without reasonable support from family members, it is difficult for fish farmers to develop their business. This was a result also supported by Lascocco et al. who believed that “a lack of family support may place small business owners at a disadvantage” (Lascocco et al. 1991, p. 67). Fish farmers with supportive families benefited from their family’s emotional support.

The government played a big role in the income improvement of small scale fish farmers. The Indonesian government upheld the important contribution that aquaculture made to the national economy. Nurdjana, the Director General for Aquaculture, Ministry of Marine Affairs and Fisheries, the Republic of Indonesia acknowledged this during the International Workshop on Innovative Technologies for Eco-Friendly Fish Farm Management and Production of Safe Aquaculture Foods in Bali, December 2006:

> Aquaculture is an important component for Indonesian fisheries which contributes to National food security, income and

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employment generation and foreign exchange earnings. Aquaculture has played its role as an alternative source of income for coastal fishery communities. It has also contributed for reducing the pressure on marine natural resources. Recently, aquaculture development in Indonesia has been accelerated and considered as an important sector for in supporting rural economic development. (Nurdjana 2006, p. 1)

The Indonesian government has supported the aquaculture industry with actions such as:

1. *Providing soft loans through the bank*

   The Indonesian government has developed cooperative measures with an Indonesian bank to provide soft loans to fish farmers in Indonesia to develop their business (Bernas 2003).

2. *Providing capital support from the government*

   The Indonesian government has providing capital support to fish farmers through their FFGs to benefit aquaculture development in Indonesia. As much as Rp 194.5 million has been provided to motivate the self development of FFGs and as a result indirectly increase their productivity (Rokanhilir 2008). Antaranews (2007) also reported that the President of the Republic of Indonesia has given FFGs in Central Java Rp 600 million in supporting capital to install and improve irrigation systems in FFG fish ponds.
3. **Providing technical and managerial training**

The Indonesian government, through the Department of Marine Affairs and Fisheries, often delivered free training programs to FFG members. Training programs were provided nationally, regionally and locally depending on the specific training course. The training courses may cover technical content such as fish farming methodologies, fish feed production or fish seed production. It may also cover managerial training such as leadership and financial management to enable FFGs in running their businesses. The fees for this training were provided from the APBD/APBN (Regional Budget / State Budget).

4. **Providing fish disease and parasite handling support**

The Indonesian government has also provided fish disease or parasite outbreak services. Suara Merdeka (2002) reported that fish farmer groups in Central Java received around Rp 500 million in support from the government in the form of antibiotic vaccine, vitamins, and clinical laboratory tools to assist the local fisheries officer to predict outbreaks and prevent outbreaks from spreading. This fish disease and parasite handling centres were usually located at local Fisheries and Marine Affairs Offices.

5. **Providing subsidies**

The Indonesian government has also provided small scale fish farmers in Indonesia with subsidies. The Indonesian president has given up to 2.5 million fish seed to fish farmer groups in Central Java (Antaranews 2007). The fish seed subsidies have been very valuable to fish farmers because fish farmers have had difficulties in obtaining good quality fish seed. These subsidies were another demonstration of the Indonesian government’s support to fish farmers. Therefore, the sixth hypothesis was accepted.
Hypothesis # 7

There is a correlation between constraints and the small scale fish farmers’ product sustainability: accepted

The aim of hypothesis number seven was to test for a correlation between constraints and the small scale fish farmers’ product sustainability. The result of the binary logistic regression analysis confirmed there was a correlation between product sustainability and constraints. According to the exploratory factor analysis result the constraints that influenced product sustainability were:

1. poor financial management skills,
2. fish diseases and parasites,
3. poor water quality,
4. low quality fish feed,
5. low selling price,
6. low quality fish seed,
7. poor quality control,
8. cannot secure a sufficient loan, and
9. lack of profit.

The above constraints were divided into two major categories: financially related and technically related constraints. The financially related constraints included: poor financial management skills, low selling price, cannot secure a sufficient loan and lack of profit. These financially related constraints influenced product sustainability. The technically related constraints included: fish diseases and parasites, poor water quality, low quality fish feed, low quality fish seed and poor quality control. Therefore, the seventh hypothesis was accepted.
Hypothesis # 8

There is a correlation between problems and the small scale fish farmers’ product sustainability: accepted

The aim of the eighth hypothesis of this research was to test for a correlation between problems and the small scale fish farmers’ product sustainability. The result of the binary logistic regression analysis confirmed there was a correlation between product sustainability and problems. According to the exploratory factor analysis result the problems that influenced product sustainability were:

1. lack of family support,
2. lack of potential market,
3. lack of government support,
4. lack of training provided by the government,
5. lack of fish farming experience,
6. lack of capital, and
7. lack of technical abilities.

These seven problems listed above were believed to be the most influencing problems faced by small scale fish farmers in Central Java in ensuring their product sustainability.

Family support undoubtedly affected product sustainability since family members were the closest persons supporting the fish farmers in their businesses. The government support that focused on providing continuous information and monitoring on sustainable aquaculture practices also played a big role in affecting product sustainability. The government support included government provided training, in particular training in sustainable aquaculture. Other problems also affected product sustainability although not as directly as the three problems discussed above. Therefore, the eighth hypothesis was accepted.
Hypothesis # 9

There is at least one entrepreneurial activity implemented by small scale fish farmers in Central Java: accepted

The aim of hypothesis number nine was to test if there was at least one entrepreneurial activity that was implemented by small scale fish farmers in Central Java. The result of the descriptive analysis through the frequency analyses confirmed that there was at least one entrepreneurial activity that was implemented by small scale fish farmers in Central Java. Therefore, hypothesis number nine was accepted.

Hypothesis # 10

There are significant differences between awardees and non awardees in implementing entrepreneurial activities in Central Java: accepted

The aim of the tenth hypothesis was to test for a significant difference between awardees and non awardees in implementing entrepreneurial activities in Central Java. The result from the chi-square test confirmed a significant difference between awardees and non awardees small scale fish farmers in implementing entrepreneurial activities. The test found that awardees and non awardees showed significant differences in their implementation of two activities: market extension and fish species extension. The fact that there was at least one activity that showed a significant difference suggested that awardees and non awardees did have significant differences in implementing entrepreneurial activities. Therefore, hypothesis number ten was accepted.

This research predicted that there was a significant difference between small scale fish farmers who had won the regional competition and received an award from the government in the last five years and small scale fish farmers that had not won the competition and received an award in the last five years. The results of the chi-square analysis confirmed this prediction. It would seem obvious to assume that members of fish farmer groups that had received a government award would have a higher ability in implementing entrepreneurial activities than those who had not received the award since the abilities of FFGs
participating in the competition were evaluated according to three aspects: social, technical and economic aspects.

According to the social aspects evaluation, the FFGs were evaluated to identify their abilities to manage their social activities such as managing their organisational structure and activities as well as planning on how to gather their working capital and other social issues related internally (within the fish farmer group member) and externally (with other parties). The technical aspects evaluation included all fish farming related technical aspects such as the FFG’s ability to implement and develop fish farming skills. The competition evaluated the FFG members’ technical fish farming knowledge and skills which included the methods to obtain supplies, pond engineering as well as fish feed and fish seed management. The way in which the FFG made innovations to each skill was also evaluated and scored. Fish farmers with higher skills received higher scores. The economic aspects evaluation of FFGs included business development and management evaluations which included the ability of FFG member to analyse their business. These also included the way in which they obtained and secured sufficient loans, organised and managed their capital, and also how they collaborated with village cooperative units. FFGs with members with higher abilities for managing their finances received higher scores in the competition evaluation.

The annual competition consisted of a two stage process of evaluation: (1) FFGs answered a standard questionnaire and (2) field evaluations were conducted. Since the three aspects mentioned above are included in the evaluation, it would seem logical that the winning fish farmer group must have the highest capability for those three aspects. However, there are some concerns regarding the objectiveness of the evaluation. It would be impossible for one person or one evaluation team to evaluate all fish farmer groups in Central Java not to mention the whole country. The field evaluations have to be performed by many teams assigned by each regional government. This may result in different judgements being made between evaluation teams. Although standard guidelines were available for the field evaluations, individual judgements between evaluators differed and hence the results of the evaluation may not be objective.
Despite the differences in the objectiveness of the competition evaluation, the result of the Chi-square analysis confirmed that there was a positive correlation between awardees and non-awardees in implementing entrepreneurial activities. However, the positive correlation was not as expected. The research had predicted that awardees should implement more entrepreneurial activities than non-awardees. However, according to the results shown in Figures 7.10 and 7.11, non-awardees implemented more entrepreneurial activities than awardees. As was explained, this finding may be due to invalid and non-objective qualities of the competition evaluation.

The possibility of an invalid evaluation outcome of the competition has been observed in actuality by the researcher. During data collection, one of the FFGs listed as an awardee showed ambiguous signs. This FFG was listed as one of the awardees of the 2007 competition, however, when the researcher inspected the detailed data of this FFG, it was found that production had dramatically decline over the years and that the number of members had also decreased. During a personal interview with past members of that particular FFG, they claimed that they had fish disease problems over the years which resulted in regular collapses in fish stocks. This resulted in the decline of production and some members had given up fish farming and changed to other activities. When the fish farmer was questioned about the competition and about how they had won despite their current condition, they claimed that the government officials had used their data from prior years when they were still at the height of their success and still had many members in their FFG.

This personal observation showed that the quality of the competition evaluations may not have been valid. This invalidity may also occur at the regional level of the Department of Marine Affairs and Fisheries office from where the field examinations are carried out. Monitoring of government officials to ensure field evaluation validity may not be easy since many government officials are involved, and another strategy may be needed to avoid invalidity during FFG competitions.
Hypothesis # 11

There are significant differences between different gender groups in implementing entrepreneurial activities in Central Java: accepted

The aim of the eleventh hypothesis was to test for a significant difference between genders in implementing fish farming entrepreneurial activities in Central Java. The result from the chi-square test confirmed a significant difference between genders in implementing the following three entrepreneurial activities: fish seed production, market extension and product range extension. This result confirmed that different genders of fish farmers showed a significant difference in implementing entrepreneurial activities. Therefore, hypothesis number eleven was accepted.

The significant difference between men and women fish farmers was obvious just by looking at the large imbalance in the number of men and women fish farmers that participated in this research. According to Table 6.30, 95.5% of the participants were men and only 4.5% were women. This research had predicted that there were more male fish farmers than female fish farmers. This is also aligned with traditional beliefs that fish farming is a man’s job (Mbozi 1991). This is because fish farming involves many heavy physical works such as harvesting and pond cleaning. Furthermore, it was also found that men carried out more entrepreneurial activities than women (Cowling and Harding 2001; Reynolds et al 2002). This statement also supported the finding of this research that significant differences were found between men and women in carrying out entrepreneurial activities and that men implemented more entrepreneurial activities than women (see Figures 7.12 and 7.13). This may be related to the observation that women concentrate more on their family issues rather than their business. The role of women as the primary family caretaker may limit the women’s ability to focus on work related issues.
**Hypothesis # 12**

There are significant differences between groups of different ages in implementing entrepreneurial activities in Central Java: accepted

The aim of the twelfth hypothesis of this research was to test for significant differences between small scale fish farmers from different age groups in implementing entrepreneurial activities in Central Java. The result from the chi-square test confirmed that small scale fish farmers from different age groups showed significant differences in implementing the following entrepreneurial activities: fish species extension and product range extension. Since two entrepreneurial activities identified in this research showed significant differences between different age groups, hypothesis number twelve was accepted.

Figures 7.14 and 7.15 show that younger fish farmers implemented more entrepreneurial activities than older fish farmers. This finding contradicts previous research that believed that older people were more interested in becoming entrepreneurs (Cowling and Taylor 2001; Matthews & Moser 1996; Robinson and Sexton 1994), which also implied that older people would be more entrepreneurial. However, these previous research studied non-farm based entrepreneurs and moreover, were carried out in developed countries. In developing countries like Indonesia, especially in villages where low income earners dominate society, young people are already trained to work hard in order to help their parents to earn money and provide for their daily needs. Going to school is often not an option because of the expensive. Therefore fish farmers already have a heavy responsibility from a young age, while older fish farmers expect their children to work hard and replace them. This may be an explanation for why the result in this research that showed that young fish farmers implemented more entrepreneurial activities than older fish farmers.
Hypothesis # 13

There are significant differences between groups of different marital status in implementing entrepreneurial activities in Central Java: accepted

The aim of the thirteenth hypothesis of this research was to test for a significant difference between small scale fish farmers with different marital status in implementing entrepreneurial activities in Central Java. The result from the chi-square test confirmed that small scale fish farmers with different marital status showed significant difference in the entrepreneurial activity of fish species extension. Since a significant difference was found in one of the entrepreneurial activities identified in this research showed significant differences between groups of different marital status, hypothesis number thirteen was accepted.

Figure 7.16 and Figure 7.17 show the comparison of small scale fish farmers with different marital statuses in implementing entrepreneurial activities. The figures both show that married fish farmers implement more entrepreneurial activities than single. This finding is supported by previous references who claimed that being married positively influence the probability of being entrepreneurial (Cowling & Harding 2001; Robinson & Sexton 1994). It is confirmed that by being married, fish farmers have bigger responsibility to provide needs for their partner and children. Therefore, married fish farmers are willing to implement any new techniques that can increase their income.

Hypothesis # 14

There are significant differences between groups with different educational levels in implementing entrepreneurial activities in Central Java: accepted

The aim of the fourteenth hypothesis was to test for significant differences between small scale fish farmers with different educational levels in implementing entrepreneurial activities in Central Java. The result from the chi-square test confirmed that small scale fish farmers with different educational levels showed significant differences in implementing the following entrepreneurial activities: fish seed production, market extension, fish species extension and product range extension. Since significant differences were found
in four of the entrepreneurial activities identified in this research, hypothesis
number fourteen was accepted.

Figures 7.18 and 7.19 present the frequency and proportional comparisons of
small scale fish farmers with different education levels in implementing
entrepreneurial activities. The results showed that although there were four
entrepreneurial activities that showed significant differences between groups
with different education levels, there were only two activities that were
dominated by fish farmers who had complete high school: market extension and
product range extension. The other two activities, fish seed production and fish
species extension, were dominated by fish farmers who had not completed high
school.

These findings contradict this research’s prediction that fish farmers who have
completed high school should implement more entrepreneurial activities than
fish farmers who had not completed high school. The explanation for this
disparity may be found by focusing on the type of entrepreneurial activities that
were carried out. Fish farmers who had completed high school implemented the
entrepreneurial activities that were more complex and required higher levels of
innovativeness, knowledge and wider networks. Market extension required
market knowledge as well as wider networks in order to successfully expand
their market. Product range extension also required a higher level of creativeness
to create new products that were accepted in the market.

On the other hand, fish farmers who had not completed high school
implemented the activities of fish seed production and fish species extension.
Although these two activities were considered as entrepreneurial, the activities
did not require the fish farmer to have wider networks, knowledge or creativity.
Training for these activities was usually provided by the government for free.
The fish farmers did not have to make much extra effort in attending these
training courses.
Hypothesis # 15

There are significant differences between groups with different fish farmer levels in implementing entrepreneurial activities in Central Java: accepted

The aim of the fifteenth hypothesis of this research was to test for significant differences between small scale fish farmers from different levels of fish farmer groups in implementing entrepreneurial activities in Central Java. The result from the chi-square test confirmed that small scale fish farmers from different levels of fish farmer groups showed significant differences in implementing the following entrepreneurial activities: fish seed production, market extension and fish species extension. Since significant differences were found in three of the entrepreneurial activities identified in this research, hypothesis number fifteen is accepted.

Figure 7.21 shows the proportional comparison between small scale fish farmers from different levels of fish farming groups in implementing entrepreneurial activities. The figure shows that fish farmers from advanced fish farmer groups implemented more market extension and fish species extension activities than farmers from starter fish farmer groups. Conversely, fish farmers from starter fish farmer groups implemented more fish seed production activities than advanced fish farmer groups.

The explanation for these results may be similar to the explanation provided for the differences between fish farmers with different education level at Hypothesis #14. Fish farmers from an advanced fish farmer groups implemented entrepreneurial activities that were more complicated and required greater effort. Market extension activities required that fish farmers have wider networks and market knowledge, while fish species extension activities additionally required fish farmers have adequate knowledge of fish feeding habits. On the other hand, fish seed production activities only required the fish farmers had attend fish seed production training courses and had implemented them according to the instructions.
Hypothesis # 16

There are significant differences between groups with different reasons for becoming fish farmers in implementing entrepreneurial activities in Central Java: accepted

The aim of the last hypothesis of this research was to test for significant differences between small scale fish farmers with different reasons for becoming fish farmers in implementing entrepreneurial activities in Central Java. The result from the chi-square test confirmed that small scale fish farmers with different reasons for becoming fish farmers showed significant differences in implementing the following entrepreneurial activities: market extension and fish species extension. Since there were two entrepreneurial activities identified in this research that showed significant differences between fish farmers with different reasons for becoming fish farmers, the last hypothesis is accepted.

The finding relevant to this last research hypothesis is shown in Figure 7.23. The figure shows a proportional comparison between fish farmers with different reasons for becoming fish farmers in implementing entrepreneurial activities. Small scale fish farmers reporting pull factors dominated both of the significant entrepreneurial activities. This finding was aligned with previous research that found that entrepreneurs reporting pull factors as their reasons were more likely to succeed and earn more money than entrepreneurs reporting push factors (Amit & Muller 1995). This is not surprising as fish farmers reporting pull factors were naturally attracted to business since no one had forced him or her into becoming a fish farmer. The people became fish farmers because they wanted to, or have been inspired by the success of others and have become interested in achieving the same success.

7.10. Conclusion

In carrying out their activities, small scale fish farmers have to face constraints and problems that obstruct their fish farming businesses. In dealing with these obstructions, fish farmers experience endogenous and exogenous factors that influence their actions in their attempt to achieve income improvement and product sustainability. This research explored the constraints and problems as well as the endogenous and
exogenous factors that fish farmers regard as influencing their activities in achieving income improvement and product sustainability.

The results of the exploratory factor analyses and logistic regression analyses showed that:

- Six endogenous factors influenced income improvement, while none of the identified exogenous factors influenced income improvement.
- Nine endogenous factors and three exogenous factors influenced product sustainability.
- Nine constraints and four problems influenced income improvement.
- Nine constraints and seven problems influenced product sustainability.

The descriptive analyses conducted for the implemented entrepreneurial activities in Central Java illustrated that the most frequently implemented entrepreneurial activities were: market extension, fish species extension and product range extension.

The comparisons between different groups of fish farmers in carrying out entrepreneurial activities were analysed with Chi-square tests. The results showed that significant differences in carrying out entrepreneurial activities were found in all of the compared small scale fish farmer communities, namely between awardee and non awardees, between different gender groups, between different age groups, between different marital status groups, between groups with different educational levels, between groups with different levels of fish farmer groups and between groups with different reasons for become fish farmers.

In terms of the research hypotheses, of all sixteen hypotheses developed in this research, only the second hypothesis was rejected. This rejection was the statistical analyses showed no positive correlation between the small scale fish farmers’ income improvement and the exogenous factors.
Chapter 8
Conclusions and Recommendations

8.1 Introduction

This research explored factors that influenced entrepreneurial activities of small scale fish farmers in Central Java, in their attempt to improve their income and sustain their production. Results and discussion of the findings have led to some recommendations for the fisheries industry and related institutions, as presented below.

As the final chapter of the research, this chapter encapsulates the research from the basic concept through to the final discussion based on the results of the analyses. This chapter is divided into two sections: conclusions drawn from the analyses (section 8.2 to section 8.6) and the development of recommendations including recommendations for further research (section 8.7).

8.2 Endogenous and exogenous factors that influenced income improvement and product sustainability

The results of the exploratory factor analyses and logistic regression analyses confirmed that income improvement was positively correlated with six endogenous factors but showed no correlation with exogenous factors.

The analyses also found that three product sustainability activities: check water quality, maintain fish feed quality and availability, and maintain fish seed quality and availability were positively correlated with nine endogenous factors. Also, the analyses found one product sustainability activity: maintain fish seed quality and availability to be positively correlated with three exogenous factors. The positive correlation found for both endogenous and exogenous factors in relation to product sustainability indicated that in achieving product sustainability, endogenous strength and exogenous support were important. Endogenous strength was not enough by itself to achieve product sustainability. Exogenous support such as support from the government also played an important role in determining the success of product sustainability.
8.3 Constraints and problems that influenced income improvement and product sustainability

The results of the analyses indicated a positive correlation between income improvement and nine constraints. The analyses also found a positive correlation between income improvement and four problems. Constraints consist of all the internal weaknesses of fish farmers that affected their income. On the other hand, problems arose as the result of uncontrollable negative support from people or institutions surrounding the fish farmers. In this research, both constraints and problems were found to influence income improvement.

Results of the exploratory factor analyses and logistic regression analyses showed that one product sustainability activity: check water quality, was influenced by nine constraints. Also, two product sustainability activities: give feed at the right quantity and time, and maintain fish seed quality and availability were found to be influenced by seven problems.

8.4 Entrepreneurial activities implemented by small scale fish farmers in Central Java

The implemented entrepreneurial activities refer to activities that were most commonly carried out by small scale fish farmers in Central Java. Survey participants of this research were asked to select from a list the entrepreneurial activities that they applied in their fish farming businesses. The list of activities contained eight options: fish feed production, fish seed production, market extension, fish species extension, product range extension, utilisation of other fish parts, others and none of the above.

The analyses results indicated that the activity of market extension was most frequently implemented by small scale fish farmers in Central Java. The next two most frequently implemented options, in ascending frequency order, was: fish species extension, and product range extension (adding value to fish product).

The least frequently implemented entrepreneurial activities by small scale fish farmers were found to be fish feed production, fish seed production and utilisation of other fish parts.

Participants who selected the ‘others’ option were assumed to have indicated that they were carrying out activities that were not identified in this research and therefore not on
the list. Participants who chose the ‘none of the above’ option were taken to have indicated that they had not implemented any entrepreneurial activities.

8.5. Comparison between fish farmers with different demographic background in carrying out entrepreneurial activities

The comparative analyses between fish farmers with different demographic background aimed to determine how different groups of fish farmers implemented entrepreneurial activities. The comparisons were made between: awardees and non awardees groups, different gender groups, different age groups, groups of different marital status, groups with different educational level, groups with different fish farmer group levels and groups with different reasons for becoming fish farmers.

The results found that of all the groups compared, those that varied significantly in implementing entrepreneurial activities were: fish farmers with different educational level, groups with different fish farmer group level, groups with different reasons for becoming fish farmers, and the awardees and non awardees groups. The comparisons between groups based on different gender, different ages and different marital statuses did not show significant variation in carrying out entrepreneurial activities.

8.6. Hypotheses acceptance or rejection

Objective # 1: Identify the endogenous and exogenous factors that small-scale fish farmers regard as influencing their income improvement and product sustainability

Hypothesis # 1: accepted

There is a positive correlation between the endogenous factors and the small scale fish farmers’ income improvement

The results of the binary logistic regression analyses confirmed that there was a positive correlation between the small scale fish farmers’ income improvement and the endogenous factors. Therefore, the first hypothesis of this research was accepted.
Hypothesis # 2: rejected

There is a positive correlation between the exogenous factors and the small scale fish farmers’ income improvement

The results of the binary logistic regression analyses found no positive correlation between the small scale fish farmers’ income improvement and the exogenous factors. Therefore, the second hypothesis of this research was rejected.

Hypothesis # 3: accepted

There is a positive correlation between the endogenous factors and the small scale fish farmers’ product sustainability

The results of the binary logistic regression analyses confirmed that there was a positive correlation between the small scale fish farmers’ product sustainability and the endogenous factors. Therefore, hypothesis number three of this research was accepted.

Hypothesis # 4: accepted

There is a positive correlation between the exogenous factors and the small scale fish farmers’ product sustainability

The results of the binary logistic regression analyses verified that there was a positive correlation between the small scale fish farmers’ product sustainability and the exogenous factors. Therefore, hypothesis number four of this research was accepted.
Objective # 2: Identify the constraints and problems that small-scale fish farmers regard as influencing their income improvement and product sustainability

Hypothesis # 5: accepted

There is a correlation between the small scale fish farmers’ income improvement and constraints

The results of the binary logistic regression analyses verified that there was a correlation between the small scale fish farmers’ product sustainability and the exogenous factor. Therefore, hypothesis number four of this research was accepted.

Hypothesis # 6: accepted

There is a correlation between the small scale fish farmers’ income improvement and problems

The results of the binary logistic regression analyses verified that there was a correlation between the small scale fish farmers’ product sustainability and the exogenous factors. Therefore, hypothesis number four of this research was accepted.

Hypothesis # 7: accepted

There is a correlation between the small scale fish farmers’ product sustainability and constraints

The results of the binary logistic regression analyses verified that there was a correlation between the small scale fish farmers’ product sustainability and the exogenous factors. Therefore, hypothesis number four of this research was accepted.
Hypothesis # 8: accepted

There is a correlation between the small scale fish farmers’ product sustainability and problems

The results of the binary logistic regression analyses verified that there was a correlation between the small scale fish farmers’ product sustainability and the exogenous factors. Therefore, hypothesis number four of this research was accepted.

Objective # 3: Identify and describe various aspects of the entrepreneurial activities of small-scale fish farmers in Central Java, Indonesia

Hypothesis # 9: accepted

There is at least one entrepreneurial activities implemented by small scale fish farmers in Central Java

The results of the descriptive analyses confirmed that at least one entrepreneurial activity was implemented by small scale fish farmers in Central Java is. Therefore, hypothesis number nine was accepted.

Objective# 4: Compare between different groups of fish farmers in carrying out entrepreneurial activities

Hypothesis # 10: accepted

There are significant differences between awardees and non awardees in implementing entrepreneurial activities in Central Java

The results of the chi-square test confirmed that awardees and non awardees small scale fish farmers displayed significant differences in implementing entrepreneurial activities. These significant differences were found in the following entrepreneurial activities: market extension and fish species extension. Therefore, hypothesis number ten was accepted.
Hypothesis # 11: accepted

There are significant differences between different gender groups in implementing entrepreneurial activities in Central Java

The results of the chi-square test confirmed that different gender groups showed significant differences in implementing entrepreneurial activities. Therefore, hypothesis number eleven was accepted.

There were three entrepreneurial activities that were found to be significantly different when carried out by small scale fish farmers of different gender. These entrepreneurial activities were: fish seed production, market extension and product range extension.

Hypothesis # 12: accepted

There are significant differences between different groups of different ages in implementing entrepreneurial activities in Central Java

The results of the chi-square test verified that groups of small scale fish farmers of different ages showed significant differences in implementing entrepreneurial activities. Therefore, hypothesis number twelve was accepted.

There were two entrepreneurial activities that were found to be significantly different when carried out by small scale fish farmers with different ages. These activities were: fish species extension and product range extension.

Hypothesis # 13: accepted

There are significant differences between groups of different marital statuses in implementing entrepreneurial activities in Central Java

The results of the chi-square test suggested that groups of small scale fish farmers with different marital statuses showed significant differences in implementing entrepreneurial activities. Therefore, hypothesis number thirteen was accepted.

There was only one entrepreneurial activity that showed significant differences. This activity was fish species extension.
Hypothesis # 14: accepted

There are significant differences between different education levels in implementing entrepreneurial activities in Central Java

The results of the chi-square test confirmed that groups of small scale fish farmers with different educational levels show significant differences in implementing entrepreneurial activities. Therefore, hypothesis number fourteen was accepted.

There were four entrepreneurial activities that were found to be significantly different when carried out by groups of small scale fish farmers with different educational levels. These entrepreneurial activities were: fish seed production, market extension, fish species extension and product range extension.

Hypothesis # 15: accepted

There are significant differences between different groups with different fish farmer levels in implementing entrepreneurial activities in Central Java

The results of the chi-square test suggested that small scale fish farmers from groups with different levels of fish farmer group levels showed significant differences in implementing entrepreneurial activities. Therefore, hypothesis number fifteen was accepted.

There were three entrepreneurial activities that were found to be significantly different when carried out by small scale fish farmers who belonged to different levels of fish farmer groups. These entrepreneurial activities were: fish seed production, market extension and fish species extension.
Hypothesis # 16: accepted

There are significant differences between groups with different reasons for becoming fish farmers in implementing entrepreneurial activities in Central Java

The results of the chi-square test suggested that small scale fish farmers with different reasons for becoming fish farmers showed significant differences in implementing entrepreneurial activities. Therefore, the last hypothesis was accepted.

There were only two entrepreneurial activities that were found to be significantly different when carried out by small scale fish farmers with different reasons for becoming fish farmers. These entrepreneurial activities were: market extension and fish species extension.

Table 8.1 summarises the research objectives as well as the acceptance or rejection of the research hypotheses.
Table 8.1 Research objective and acceptance/rejection of related hypotheses

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Related hypotheses</th>
<th>Accepted / Rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the endogenous and exogenous factors that small-scale fish farmers regard as influencing their income improvement and product sustainability</td>
<td>H # 1: There is a positive correlation between the small scale fish farmers’ income improvement and the endogenous factors</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 2 :There is a positive correlation between the small scale fish farmers’ income improvement and the exogenous factors</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H # 3 :There is a positive correlation between the small scale fish farmers’ product sustainability and the endogenous factors</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 4 :There is a positive correlation between the small scale fish farmers’ product sustainability and the exogenous factors</td>
<td>Accepted</td>
</tr>
<tr>
<td>Identify the constraints and problems that small-scale fish farmers regard as influencing their income improvement and product sustainability</td>
<td>H # 5 :There is a positive correlation between the small scale fish farmers’ income improvement and constraints</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 6 :There is a positive correlation between the small scale fish farmers’ income improvement and problems</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 7 :There is a positive correlation between the small scale fish farmers’ product sustainability and constraints</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 8: There is a positive correlation between the small scale fish farmers’ product sustainability and problems</td>
<td>Accepted</td>
</tr>
<tr>
<td>Identify and describe various aspects of the entrepreneurial activities of small-scale fish farmers in Central Java, Indonesia</td>
<td>H # 9: There is at least one entrepreneurial activities implemented by small scale fish farmers in Central Java</td>
<td>Accepted</td>
</tr>
<tr>
<td>Compare between different groups of fish farmers in carrying out entrepreneurial activities</td>
<td>H # 10: There are significant differences between awardees &amp; non awardees in implementing entrepreneurial activities in Central Java</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 11: There are significant differences between different gender in implementing entrepreneurial activities in Central Java</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 12: There are significant differences between different groups of age in implementing entrepreneurial activities in Central Java</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 13: There are significant differences between different marital statuses in implementing entrepreneurial activities in Central Java</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 14: There are significant differences between different education levels in implementing entrepreneurial activities in Central Java</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 15: There are significant differences between different levels of fish farmer groups in implementing entrepreneurial activities in Central Java</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H # 16: There are significant differences between different reasons to become fish farmers in implementing entrepreneurial activities in Central Java</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Source: Survey on the factors influencing entrepreneurial activities of small scale fish farmer in deriving income improvement and product sustainability in Central Java, Indonesia.
8.7. Development of recommendations

This study hoped to establish new understanding of the entrepreneurial activities of small scale fish farmers. Many research projects have been carried regarding small scale fish farmers, however, this research was the first that contributed to a more detailed understanding of fish farmers’ entrepreneurial activities and the factors that influenced them in carrying out their fish farming activities in order to derive their income improvement and product sustainability.

The recommendations of this study derived from the research findings will provide information to the aquaculture industry, the federal government and related institutions, the provincial governments, the regional governments, students and researchers who wish to carry out similar research.

**Recommendations for small scale fish farmers**

(1) For small scale fish farmers that have not yet implemented entrepreneurial activity, the recommendation is to proactively implement entrepreneurial activities to support them in achieving income improvement and product sustainability.

Figure 7.9 showed that of the six entrepreneurial activities identified in this research, there were three activities that were most frequently implemented by the respondents in Central Java. These activities were: market extension, followed by fish species extension and then product range extension. The figure also showed that the entrepreneurial activities least frequently implemented were fish feed production, utilisation of other fish parts and fish seed production.

Figure 7.9 also showed that there were fish farmers that had responded with the option “none of the above” to the question about which of the listed entrepreneurial activities they have implemented. This indicated that some of the respondents had not implemented any entrepreneurial activity. It is advised that these small scale fish farmers that have not implement any entrepreneurial activities seek information from the government or from other small scale fish farmers that have been successful in implementing of entrepreneurial activities to improve their income and sustain their production.
This recommendation may be easier to achieve if there support is provided by the federal, provincial and regional governments to encourage small scale fish farmers to carry out entrepreneurial activities. Currently, the Diponegoro University, the Wonososbo regional government and the Department of Marine Affairs and Fisheries, as well as the Department of Youth and Sports are developing a fish cultivation development program which includes four of the entrepreneurial activities identified in this research (Undip, 2010). Their fish cultivation development program includes fish seed production, product range extension, utilization of other fish parts and market extension. This program is expected to encourage young fish farmers in the Wonosobo region to increase their income through cultivating of nila and patin species by undertaking those four activities. Therefore, not only they will have the ability to cultivate fish but will also add value to their harvest.

(2) For small scale fish farmers that have implemented entrepreneurial activities, the recommendation is to continue to carry out these activities and implement additional ones. As showed in Figure 7.9 that there was a significant gap between the numbers of respondents who had implemented market extension, fish species extension and product range extension, and respondents who had implemented fish feed production, utilization of other fish parts and fish seed production. Based on this finding, the recommendation for small scale fish farmers is to try and implement the other entrepreneurial activities (such as produce their own fish feed, produce their own fish seed and utilize other parts of fish) in their fish farming activities.

To encourage other fish farmers, small scale fish farmers who have successfully implemented entrepreneurial activities are advised to share their success stories with other fish farmers and to encourage those other small scale fish farmers to do the same thing. The most recent and well known example of fish farmers who are sharing their success stories in Central Java is the fish farmers from the catfish village. The approximately 105 fish farmers in this village cultivate only catfish in 20 hectares of pond and produce 7-10 tons of catfish per day (Boyolali Animal Husbandry and Fisheries Office 2007). These fish farmers belong to the FFG called “Karya Mina Utama” and was the first winning fish farming group in the region and in Central Java. Karya Mina Utama is an excellent example of
a FFG in Central Java that have expanded their product range rapidly and turned their village into the largest catfish producer in Central Java. Their products are not limited to fresh catfish, but also include processed catfish product such as fish ball, fish crackers, fish skin crackers, fish nuggets, and shredded catfish that are managed by the female FFG members (Suara merdeka 2007c).

(3) It is recommended that small scale fish farmers attend every training and skill enhancement opportunity provided by government and other institutions in order to support their business development. Any kind of technical or managerial training or skill enhancement is very important for increasing the knowledge and skills of small scale fish farmers. The findings of this research have confirmed the importance of fish farming skills in achieving income improvement and product sustainability. Figure 7.2 showed that mastery of fish farming skills were included as one of the endogenous factors that influenced the success of fish farmers in achieving income improvement. Figure 7.4 also showed that mastery of fish farming skills is an important endogenous factor that influenced product sustainability. Based on these findings, it is advised that small scale fish farmers attempt to attend these training opportunities under any circumstances, that is, they are advised to attend training no matter what their circumstances, whether they are located far from the training centre or experience any other condition that might make it difficult for them attend.

(4) It is recommended that small scale fish farmers proactively implement sustainable fish farming activities to achieve product sustainability. Many small scale fish farmers are unaware of the importance of implementing sustainable aquaculture to sustain their production. It is vital for small scale fish farmers to understand just how important this is for their own business. Figure 7.4 showed that there were nine endogenous factors that were important for fish farmers to achieve product sustainability. Knowledge, skills and experience in sustainable fish farming can be more successful if the government provides full support. As explained previously that Sukadi (2006) mentioned several factors that Indonesia is facing such as fish disease, fish farming systems and environmental management in order to achieve sustainable aquaculture, therefore, it is important that the government also fully support small scale fish farmers in sustainable aquaculture implementation.
Recommendations for the federal government

It is recommended that the federal government establish new policies and develop new programs to support fish farmers such as:

(1) Include the promotion of entrepreneurial activities into future aquaculture development policy and encourage the implementation of entrepreneurial activities by small scale fish farmers through the provision of development programs.

Most policies established by the Indonesian federal government are focused on the outcomes of aquaculture and the quality the fish that the farmer produces. For example, the Regulation and Decision from the Marine and Fisheries Minister of the Republic of Indonesia mainly focuses on aquaculture production guidelines, the monitoring of the use of chemicals, biological and contaminants in aquaculture, good methods of fish cultivation, quality surveillance, and more. Most of these policy objectives concentrate on the consumer and are focus to a lesser extent on the importance of the fish farmers. One of the few of policies targeting fish farmers is the Decision from the Marine and Fisheries Minister No. KEP. 18/MEN/2004: The general guidelines for the implementation of economic empowerment programmes for coastal communities (Decision of the Minister of Marine and Fisheries No. KEP. 18/MEN/2004). This aim of this guideline is to increase the welfare of the coastal communities through economic development activities, increase the quality of human resources, and optimise the use of fisheries and marine resources in Indonesia. The implementation of this guideline focuses on providing soft loans to coastal communities for expanding their businesses. The recommendation of this research is for the federal government to include the promotion of entrepreneurial activities as a program to enable the fisheries community to improve their own welfare. Suara Merdeka (2007d) and Kompas (2006) reported that fish farmers improved their income through implementing entrepreneurial activities and therefore it is important to include these activities in the federal government’s future policies and programs.
(2) Encourage small scale fish farmers to proactively implement sustainable aquaculture practice.

The implementation of sustainable aquaculture has been developed as the vision and mission for aquaculture development in Indonesia. The vision was to “shape Indonesian aquaculture as a competitive and sustainable mainstay of economic growth”, and the third mission was to “develop an aquaculture sector which is responsible and environmentally friendly (Nurdjana 2006, p. 16). The results of this research strongly support the government’s mission and vision for sustainable aquaculture development. The findings have shown that product sustainability was positively correlated with the endogenous and exogenous factors as well as with the problems and constraints. Therefore, future programs to encourage sustainable aquaculture implementation can be developed and based on the findings of this research.

**Recommendations for the provincial governments**

It is recommended that the provincial governments:

(1) Establish aquaculture development program which focus on fish farmers’ income improvement through entrepreneurial activities.

The findings of this research showed that some of the fish farmers in Central Java have not yet implement entrepreneurial activities. This is shown in Figure 7.9 where some of the respondents selected the “none of the above” option, which indicated that they had not implemented any entrepreneurial activities.

The importance of entrepreneurial activities is also supported by research that found that these activities can support small scale fish farmers in achieving income improvement. For example Kompas (2006) reported that a fish farmer in West Java had successfully increased his income five times after he implemented fish species extension systems (poly-culture system). Another example of successful entrepreneurial activity implementation was reported by Suara Merdeka (2007d) that a fish farmer group in Central Java had applied product range extension and utilization of other fish parts (Suara Merdeka 2007c) which brought them large profits that could be seen in the increased number of new houses and cars within the village.
According to the Central Java Fisheries and Marine Affairs Office (2007), the focus of aquaculture development in Central Java is on the development of aquaculture commodities according to the regions. For example, development of Vennamae shrimp is focused in four regions: Brebes, Tegal, Pekalongan and Kendal, while catfish or seaweed development is focused in other regions. The Provincial governments have not yet focused on the development of entrepreneurial activities that will not only increase the fisheries production but that can also add value to the product. Just like the federal government, the aquaculture development in Central Java is still focused on the development of production and the quality of the harvest and has not yet focused on the development of the fish farmers.

Based on the findings of this research it is important for provincial governments to establish aquaculture development program which focus on income improvement of the fish farmers through the implementation of entrepreneurial activities.

(2) Establish a small scale fish farmers’ Entrepreneurial Activities Department (EAD) at the Provincial Fisheries and Marine Affairs office.

This recommendation is provided because the Indonesian government has not yet included a developmental program which focuses on the income improvement of the fish farmers. Findings of this research have suggested that although governments or other institution have no direct correlation with income improvement (Figure 7.2), governments can help fish farmer to increase their knowledge, skills and experience (which were important endogenous factors that influenced income improvement) by providing them with training and other developmental programs. Research by, for example, Kompas (2006), Suara Merdeka (2007d) and Suara Merdeka (2007c) reported on the importance of entrepreneurial activities in increasing fish farmers’ income. Therefore, it is recommended that entrepreneurial activities be included into the Indonesian Aquaculture Development Program. In order to support the implementation of entrepreneurial activities and practices, a separate department which focuses on entrepreneurial activities should be established at the Provincial Fisheries and Marine affairs office. This department can arrange training sessions, as well as
monitor the progress of implementation of entrepreneurial activities of small scale fish farmers.

(3) In order to stimulate the implementation of entrepreneurial activities, it is recommended that the provincial governments establish an annual entrepreneurial activities’ competition for small scale fish farmers.

Currently, the provincial government has organised an annual fish farmer’s group (FFG) competition. The current competition evaluates FFGs according to three evaluation criteria:

a. Social criteria. These criteria evaluate the ability of the FFG to self manage, its organisational structure, the conduct of internal FFG meetings, activities, capital collection, and other socially related aspects both within the FFG and externally between the FFG and other parties.

b. Technical criteria. These criteria include technical aspects such as aquaculture skills, raw materials, aquaculture infrastructure, and technology development.

c. Economical criteria. These criteria include aspects of business analysis, business loans, capital, and cooperation with village cooperation unit.

(Semarang Marine Affairs and Fisheries Office 2005)

It is recommended that entrepreneurial activities are included in this competition either as part of the evaluation criteria or as a stand alone entrepreneurial activities competition. For example, the competition could evaluate fish farmer groups according to their ability to significantly increase their income by developing new aquaculture techniques or by inventing new value added products. The winner of the entrepreneurial activity competition should receive not only prize money, but also recognition and guarantees by the government for markets for their new products or patent protection for their new aquaculture techniques. The hope is that this may encourage more small scale fish farmers to implement entrepreneurial activities in their fish farming business.
Recommendations for the regional governments

For regional governments and related institutions, the recommendations are to:

(1) Establish an Entrepreneurial Activities Centre (EAC) at the regional Fisheries and Marine affairs office to conduct continuous training and monitoring of small scale fish farmers.

To be aligned with Entrepreneurial Activities Department (EAD) in the Fisheries and Marine Affairs office at the provincial level, it also recommended that a similar department at the regional level is established. The Entrepreneurial Activities Centre (EAC) at the regional Fisheries and Marine Affairs Office are to:

a. Provide information of entrepreneurial activities that can be implemented by small scale fish farmers.

b. Provide entrepreneurial activities training for small scale fish farmers in the region.

c. Carry out continuous monitoring of fish farmers that implement entrepreneurial activity.

d. Become the direct technical support for small scale fish farmers in the case of any problems that arise or to support fish farmers with advice.

(2) Provide training and continuous monitoring of sustainable aquaculture in order to achieve product sustainability.

Indonesia is still facing challenges in implementing sustainable aquaculture (Sukadi 2006) and therefore it is crucial for the government to provide training and continuous monitoring in the establishment of sustainable aquaculture. In order to achieve sustainable aquaculture the recommendation is for the Regional Fisheries and Marine Affairs Office to:

a. Provide information on the importance of sustainable aquaculture implementation to fish farmers.
b. Provide training on the implementation of sustainable aquaculture in fish farmers’ businesses.

c. Carry out continuous monitoring of fish farmers that carry out sustainable aquaculture.

d. Provide technical support for fish farmers that need assistance in implementing sustainable aquaculture.

(3) Provide soft loans as well as financial management skills training and continuous financial monitoring for the period of the loan.

Lack of capital and inability to secure sufficient loans (Awulachew et al. 2008; Das 2006; Nam & Thuok 1999) are recurrent problems faced by many small scale fish farmers. In order to support fish farmers, it is important for the government to assist them through the provision of soft loans that are tied to financial management skills training and continuous monitoring for the period of the loan. It is hoped that in this way fish farmers will be able to manage their finances and receive financial advice before they make wrong decisions. It is expected that by following this program, small scale fish farmers will be able to eventually become financially independent and not need financial support again from the government or from other related institutions.

(4) Establish fish seed and fish feed production centers to assist small scale fish farmers with fish seed and fish feed production training as well as providing the seed and feed to them for purchase.

This recommendation is provided in support of the federal government’s policy to encourage fish feed and fish seed production. By providing fish feed and fish seed production centers, small scale fish farmers will be able to secure their fish feed and fish seed stock. They can also be trained to produce their own fish feed and fish seed and also maintain the quality and quantity of their fish feed and fish seed.
(5) Provide training and information about potential markets.

In order to open up other market opportunities, it is recommended that the government provide training to small scale fish farmers on how to develop new customers as well as to provide them with information on potential markets. It is expected that this can assist fish farmers in broadening their market potential and widening their networks. For example, Undip (2010) reported on a program that is being developed to empower young small scale fish farmers and to find potential markets for small scale fish farmers in the Wonosobo region. This development program is supported by the Wonosobo Regional government as well as the Department of Marine Affairs and Fisheries and also the Department of Youth and Sport.

(6) Provide training and continuous monitoring on poly-culture systems.

Poly-culture systems have been shown to increase small scale fish farmers’ income (Kompas 2006). Therefore, it is important for the government to provide training on poly-culture systems. Continuous monitoring on poly-culture systems is also important to make sure the small scale fish farmers are using correct techniques.

(7) Provide training on product range extension.

The activity of product range extension (adding value to product) has been implemented by several FFGs in Central Java and it has been shown to increase their income (Suara Merdeka 2007d). Success stories on product range extension should be distributed to encourage other fish farmers to adopt similar activities. Government involvement is critically needed in the form of training on product range extension for fish farmers who have not implemented this activity.

(8) Provide training on the utilisation of other fish parts.

Utilisation of other fish parts is a very infrequently implemented activity since many fish farmers may have no idea on what to do with their fish waste. However, a FFG in Central Java have utilised their fish waste by turning it into food such as fish skin crackers and fish fin crackers (Suara Merdeka 2007c). The fish farmers were able to raise a good amount of money by utilising other fish
parts. It is crucial that the government assist small scale fish farmers by providing training on the utilisation of other fish parts. Through this small scale fish farmers will be able to recognise opportunities for utilising other parts of fish and improve their income.

(9) Assist small scale farmers in all aspects for carrying out their fish farming activities.

Many unexpected circumstances may befall fish farmers while carrying out their activities. Hence, it is important that the government provide constant assistance to small scale fish farmers in all aspects of fish farming activities.

**Recommendations for further research**

This study is limited to the factors that influence a small number of entrepreneurial activities implemented by small scale fish farmers in Central Java, in their attempt to improve their income and sustain their product. There are only six entrepreneurial activities identified in this research. Furthermore, each of the identified activities in this study has not been researched individually in detail. Therefore, for students and researchers who wish to conduct similar research to this study is recommended to:

(1) Develop further research on entrepreneurial activities of small scale fish farmers.

It is recommended that other students or researchers carry out further research on the entrepreneurial activities of small scale fish farmers. It is important that this community group is not ignored but is supported. By carrying out further research on entrepreneurial activities, this group can enhance their standard of living and increase the potential of the world’s aquaculture.

(2) Conduct comparative research on entrepreneurial activities of fish farmers in developing and developed countries.

There may be differences between entrepreneurial activities carried out by fish farmers in developed and in developing countries. By comparing the activities in different countries, the success of fish farmers in developed country may be
identified for implementation by fish farmers in developing countries, or vice versa.

(3) Conduct more detailed research on each of the entrepreneurial activities identified in this research.

This research only made a cursory examination of six entrepreneurial activities. It is recommended that further research of a more detailed construction is carried out for each of the entrepreneurial activities identified in this research.

(4) Identify additional entrepreneurial activities for small scale fish farmers’.

The entrepreneurial activities identified in this research have not exhausted all possibilities for entrepreneurial activities of small scale fish farmers. There may be activities carried out by fish farmers that were not been identified in this research. It is advisable that further research be carried out to identify other possible entrepreneurial activities.

8.8. Conclusion

The objectives of this research have been achieved by testing the sixteen hypotheses. After the statistical analyses were carried out, the results showed that of all sixteen hypotheses, only one hypothesis was rejected while the other fifteen were accepted.

The first objective for this research was to identify endogenous and exogenous factors that small-scale fish farmers regarded as influencing their income improvement and product sustainability. There were four hypotheses developed from this objective and one of them was rejected. The statistical analyses suggested that there was a positive correlation between the endogenous factors and income improvement, but there was not a positive correlation between the exogenous factors and income improvement. On the other hand the analyses showed that both endogenous and exogenous factors influenced product sustainability.

The second objective was to identify the constraints and problems that small-scale fish farmers regarded as influencing their income improvement and product sustainability. There were also four hypotheses developed from this objective and all of them were
accepted. The tests indicated that both product sustainability and income improvement were correlated with constraints and problems.

The third objective for this research was to identify and describe various aspects of the entrepreneurial activities of small-scale fish farmers in Central Java, Indonesia. One hypothesis was developed from this objective and the hypothesis was accepted based on the results of the descriptive analyses. The analyses showed that there was at least one entrepreneurial activity that was being carried out by small scale fish farmers in Central Java.

The fourth objective was to compare different groups of fish farmers in implementing entrepreneurial activities. Seven hypotheses were developed from the fourth objective and all of them were accepted. The statistical analyses indicated that there was a significant difference between awardees and non-awardees in Central Java in carrying out entrepreneurial activities. Significant difference were also found between groups of different gender, different age groups, groups of different marital statuses, groups with different educational levels, groups with different fish farmer group levels, and groups with different reasons for becoming fish farmers.

The last objective for this research was to develop recommendations for the aquaculture and fisheries industry, government, educational institutions and research communities in Indonesia on aspects that may contribute to the success of small scale fish farmers in obtaining their income improvement and product sustainability. Based on the fifth objective, the following recommendations were developed:

For small scale fish farmers:

1. For small scale fish farmers that have not yet implemented entrepreneurial activity, the recommendation is to proactively implement entrepreneurial activities to support them in achieving income improvement and product sustainability.

2. For small scale fish farmers that have implemented entrepreneurial activities, the recommendation is to continue to carry out these activities and implement additional ones.
3. It is recommended that small scale fish farmers attend every training and skill enhancement opportunity provided by government and other institutions in order to support their business development.

4. It is recommended that small scale fish farmers proactively implement sustainable fish farming activities to achieve product sustainability.

For the federal government:

It is recommended that the federal government establish new policies and develop new programs to support fish farmers such as:

1. Include the promotion of entrepreneurial activities into future aquaculture development policy and encourage the implementation of entrepreneurial activities by small scale fish farmers through the provision of development programs.

2. Encourage small scale fish farmers to proactively implement sustainable aquaculture practice.

It is recommended that the provincial governments:

1. Establish aquaculture development program which focus on fish farmers’ income improvement through entrepreneurial activities.

2. Establish a small scale fish farmers’ Entrepreneurial Activities Department (EAD) at the Provincial Fisheries and Marine Affairs office.

3. In order to stimulate the implementation of entrepreneurial activities, it is recommended that the provincial governments establish an annual entrepreneurial activities’ competition for small scale fish farmers.

For regional governments and related institutions, the recommendations are to:

1. Establish an Entrepreneurial Activities Centre (EAC) at the regional Fisheries and Marine affairs office to conduct continuous training and monitoring of small scale fish farmers.

2. Provide training and continuous monitoring of sustainable aquaculture in order to achieve product sustainability.

3. Provide soft loans as well as financial management skills training and continuous financial monitoring for the period of the loan.
4. Establish fish seed and fish feed production centers to assist small scale fish farmers with fish seed and fish feed production training as well as providing the seed and feed to them for purchase.

5. Provide training and information about potential markets.

6. Provide training and continuous monitoring on poly-culture systems.

7. Provide training on product range extension.

8. Provide training on the utilisation of other fish parts.

9. Assist small scale farmers in all aspects for carrying out their fish farming activities.

For students and researchers who wish to conduct similar research the recommendations are to:

1. Develop further research on entrepreneurial activities of small scale fish farmers.

2. Conduct comparative research on entrepreneurial activities of fish farmers in developing and developed countries.

3. Conduct more detailed research on each of the entrepreneurial activities identified in this research.

4. Identify additional entrepreneurial activities for small scale fish farmers’.
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Appendices

CONFIDENTIAL QUESTIONNAIRE

For each item, please circle the number that relates to your response or fill in your answer(s) as required. In some cases, multiple selections may be appropriate. No individual participant will be identifiable, as your responses are confidential.

Section A. BACKGROUND DETAILS

A1. PERSONAL
   1) Are you:
      1. Male       2. Female
   2) Your age in years:
      1. Under 20  2. 20-39   3. 40-59   4. 60 +
   3) Your marital status:
   4) How many children do you have:
      1. One       2. Two or more 3. None
   5) What is your highest educational level
      1. University Graduate  4. Did not completed primary school
      2. Completed High School 5. Never went to school
      3. Completed Primary School

A2. FAMILY BUSINESS EXPERIENCE
   6) Your father’s present or past profession
      1. Fish Farmer
      2. Government employee
      3. Private company employee
      4. Other than fish farmer, but self employed, please specify......................
      5. Not working
      6. Others, please specify..............................................
   7) Your mother’s present or past profession
      1. Fish Farmer
      2. Government employee
      3. Private company employee
      4. Other than fish farmer, but self employed, please specify......................
      5. Not working
      6. Others, please specify..............................................
   8) What links your parents to your current fish farming profession (you may circle more than one):
      1. They have their own fish farming business.
      2. They started the business that I am currently running.
      3. None of the above
      4. Others, please specify..............................................
   9) Who has always been your role model in business (you may circle more than one answer):
      1. Father       5. Neighbours
      2. Mother       6. Family friend
      3. Sibling      7. None
      4. Relative     8. Others (please specify).............

A3. BUSINESS INFORMATION
   10) What is your fish farming business class group?
      1. Starter (Pemula)
      2. Secondary (Lanjut)
      3. Tertiary (Madya)
      4. Advanced (Utama)
11) How much do you earn per year?
   1. Under Rp. 50 million
   2. Rp. 50 million – < Rp.100 million
   3. Rp. 100 million – < Rp. 500 million
   4. Rp. 500 million or more
12) What is the size of your land for your fish farming business?
   1. < 2 Ha
   2. 2 - <5 Ha
   3. 5 - <10 Ha
   4. 10 Ha or more
13) How many employees do you currently have?
   1. Up to 2 people
   2. 3-5 people
   3. 6-8 people
   4. 9 people or more
14) What type is your fish culture? (you may circle more than one answer)
   1. Sea water
   2. Brackish water
   3. Fresh water
15) What is your method of culture? (you may circle more than one answer)
   1. Brackish water pond
   2. Floating net cage
   3. Paddy field
   4. Freshwater pond
   5. Others (please specify).....................
16) What stage of fish culture do you produce?
   1. Seedling
   2. Seedling and grow-out
   3. Ornamental Fish
   4. Grow-out
   5. Others, (please specify).....................

Section B. CURRENT SITUATION

B1. ENTREPRENEURIAL ACTIVITIES

17) Which of the following aquaculture activities have you implemented in your business
    (you may circle more than one answer):
    1. Producing your own fish feed
    2. Producing your own fish seed
    3. Extending market distribution
    4. Extending the variety of fish species
    5. Extending the product range (adding value)
    6. Find other use of product
    7. None of the above
    8. Others (please specify)..............................
18) How long have you produced your own fish feed?
    1. Since I started my business.
    2. A few years ago
    3. Just recently
    4. I do not produce my own fish feed.
19) Why do you produce your own fish feed
    1. I can control the quality.
    2. It is more economical for me.
    3. To ensure fish feed availability
    4. To increase my revenue by selling some of my fish feed product
    5. Other reason (please specify).....................
    6. I do not produce my own fish feed
20) How long have you produced your own fish seed?
   1. Since I started my business.
   2. A few years ago
   3. Just recently
   4. I do not produce my own fish seed.
21) Why do you produce your own fish seed
   1. I can control the quality.
   2. It is more economical for me.
   3. To ensure fish feed availability
   4. To increase my revenue by selling some of my fish seed product
   5. Other reason (please specify)……………………..
   6. I do not produce my own fish seed.
22) To whom do you usually sell your fish harvest? (you may circle more than one option):
   1. my neighbours    5. large companies
   2. my family    6. international market
   3. local fish market    7. local fish gatherers
   4. fish gatherers elsewhere    8. others, please specify....................
23) In addition to your present customers, who else do you plan to sell your fish harvest in the future? (you may circle more than one answer):
   1. my neighbours    6. large companies
   2. my family    7. international market
   3. local fish market    8. no one else
   4. local fish gatherers    9. others, please specify.........................
   5. fish gatherers elsewhere
24) In what form do you sell your fish harvest (you may circle more than one answer):
   1. Fresh fish
   2. Salted fish
   3. Roasted fish
   4. Frozen fish
   5. Cooked food
   6. Others (please specify)...................................................................
25) With how many species of fish did you start this business?
   1. < 3 species
   2. 4-6 species
   3. 7 or more species
26) How many species do you have now?
   1. < 3 species
   2. 4-6 species
   3. 7 or more species
27) Why did you decide to increase the variety of your fish species?
   1. Want to sell more variety of fish.
   2. Want to get more profit.
   3. To fulfil market demand
   4. I did not increase the variety of my fish species.
   5. Others (please specify)..........................
28) Why did you decide NOT to increase the variety of your fish species?
   1. I didn’t have the capital to do so.
   2. I didn’t know the method of culturing other fish species.
   3. I didn’t have enough land to extend the fish variety.
   4. I didn’t want to extend, I am happy with what I have now.
   5. I have increased the variety of my fish species.
   6. Others (please specify)..........................
29) Which part of the fish do you sell? (you may circle more than one answer)
   1. Whole fish
   2. Fish fillet
   3. Skin
   4. Gut
   5. Blood
   6. Carcass / bones
B2. PROBLEMS/CONSTRAINTS

30) To what extent do you agree that each of the following circumstances faced by your business prevents you from achieving your income improvement?

<table>
<thead>
<tr>
<th>Circumstances that occur</th>
<th>Strongly Agree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Lack of capital</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>b. Lack of technical abilities</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>c. Lack of family support</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>d. Lack of government support</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>e. Lack of training provided by government/other institution</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>f. Lack of fish farming experience and knowledge</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>g. Lack of potential markets</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>h. Low selling price</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>i. Lack of profit</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>j. Low quality of fish seed</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>k. Low quality of fish feed</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>l. Poor financial management skills</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>m. Poor quality control</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>n. Fish diseases and parasites</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>o. Poor water quality</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>p. Cannot secure a sufficient loan</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
</tbody>
</table>

Numbers are interpreted as:
(6) Strongly agree  (5) Agree  (4) Somewhat agree
(3) Somewhat disagree  (2) Disagree  (1) Strongly disagree

31) To what extent do you agree that each of the following circumstances faced by your business prevents you from achieving your product sustainability?

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</tbody>
</table>

Numbers are interpreted as:
(6) Strongly agree  (5) Agree  (4) Somewhat Agree
(3) Somewhat disagree  (2) Disagree  (1) Strongly disagree
B3. ENDOGENOUS AND EXOGENOUS FACTORS

B3.1. AQUACULTURE KNOWLEDGE

32) How did you gain knowledge about fish farming? (you may circle more than one answer)
   1. From my parents
   2. From my other family members (please specify)………………..
   3. From my neighbours
   4. From governmental training
   5. Others (please specify)……………………………..

B3.2. AQUACULTURE SKILLS

33) In which of the following fish farming activities are you most experienced (you may circle more than one answer)
   1. Fish seedling
   2. Fish grow-out
   3. Fish feed production
   4. Fish disease and parasite handling

B3.3. AQUACULTURE EXPERIENCE

34) How long have you carried out fish farming activities, both in your own business and elsewhere?
   1. Less than a year
   2. 1-5 years
   3. 5-15 years
   4. more than 15 years

B3.4. AQUACULTURE EDUCATION

35) Which of the following aquaculture education have you been through? (you may circle more than one answer):
   1. Aquaculture education in tertiary level
   2. Aquaculture education high school level
   4. Aquaculture training provided by education institutions.
   5. Aquaculture training provided by private companies.
   6. Aquaculture training provided by International organisations.

36) In which of these forms of training have you participated? (you may circle more than one answer)
   1. Fish culture training. Provided by…………………………..
   2. Entrepreneurship training. Provided by………………………
   3. Management training. Provided by…………………………
   4. Fish seedling training. Provided by…………………………
   5. Fish feed production training. Provided by……………………
   6. Others (please specify)……………………….Provided by…………………………

B3.5. BUSINESS KNOWLEDGE

37) Are you familiar and carry out production planning for your business?
   1. Yes  2. No  3. Sometimes  4. I don’t know

38) Are you familiar and carry out financial planning for your business?
   1. Yes  2. No  3. Sometimes  4. I don’t know

39) Are you familiar and carry out marketing/selling plan for your business?
   1. Yes  2. No  3. Sometimes  4. I don’t know

40) Do you have job description for your employees?
   1. Yes  2. No  3. Sometimes  4. I don’t know

41) Do you perform quality control in your business?
   1. Yes  2. No  3. Sometimes  4. I don’t know

B3.6. PERSONAL BUSINESS EXPERIENCE

42) What other business experience did you have prior to becoming a fish farmer?
   1. Retail
   2. Production (please specify) …………………..
   3. Service business
   4. Other (Please specify)……………………
   5. None, this is my only business experience
43) Prior to becoming a fish farmer, how long did you work in business?
   1. Not at all   2. Less than 5 years   3. 6-10 years   4. More than 10 years

B3.7. ENTREPRENEURIAL CHARACTERISTICS

44) To what extent do you agree that each of these characteristics for business people like you is vital for your success in the aquaculture business?

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Strongly Agree</th>
<th>Agreed</th>
<th>Somewhat Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Intelligence</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>b. Action-oriented</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>c. Organisational skills</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>d. Self-discipline</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>e. Experience</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>f. Leadership skills</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>g. Risk taking</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>h. Analytical skills</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>i. Persistence</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>j. Independence</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>k. Self confidence</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>l. Business network</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>m. Strong moral values</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>n. Luck</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Numbers are interpreted as:
(6) Strongly agree  (5) Agree  (4) Somewhat agree
(3) Somewhat disagree  (2) Disagree  (1) Strongly disagree

45) If you had Rp. 20 million, what would you do with it?
   1. Invest to rapidly expand my business.
   2. Deposit it in the bank
   3. Spend it
   4. Other (please specify)…………..

B3.8. REASON

46) Which of the following factors influenced your decision to go into business on your own?
   1. Could not find suitable work that matched my skills and educational level.
   2. Salaried job was underpaid.
   5. Lost my job
   6. Previous experience in running a business

47) How did you become interested in fish farming?
   1. My parents are fish farmers.
   2. My extended family are fish farmers.
   3. My neighbours are fish farmers.
   4. Others, please specify……………………

48) What motivated you to become a fish farmer?
   1. I had previous experience in this business.
   2. My parents invited me to join in their business.
   3. I saw others succeeding through fish farming.
   4. I wanted to be wealthy.
   5. I didn’t want to work for other people.
   6. I had no job and no other option.
   7. None of the above (please specify)……………………..
49) How satisfied are you with your fish farming activities?
   1. I am very satisfied with and enjoy my fish farming activities.
   2. I am satisfied with but do not enjoy my fish farming activities.
   3. I am not satisfied with but I enjoy my fish farming activities.
   4. I am not satisfied with nor enjoy my fish farming activities.

50) If you had other options, what would you like to do?
   1. I do not need another option, I like being a fish farmer.
   2. I’d like to work for private companies.
   3. I’d like to work as a civil servant.
   4. I’d like to own another kind of business (please specify) ……………………
   5. None of the above (please specify)……………………

B3.9. BUSINESS NETWORK RELATION

51) With which of these do you deal in your business? (you may circle more than one answer):
   1. Suppliers
   2. Buyers
   3. Consumers
   4. Government institutions
   5. Neighbours
   6. Lending bodies (eg. Banks and cooperatives)
   7. Others (please specify)……………………

B3.10. FINANCIAL CAPITAL

52) With how much initial capital did you start this business?
   1. Less than Rp. 10 million
   2. Rp. 10 million – less than Rp. 20 million
   3. Rp. 20 million – less than Rp. 30 million
   4. More than Rp. 30 million
   5. I do not know, I inherited the business from my parents.
   6. I do not remember

53) How was the money raised for the capital? (you may circle more than one answer)
   1. Own savings
   2. Loan from family / relative(s)
   3. Loan from neighbours
   4. Loan from bank/cooperative
   5. Others (please specify)……………………
   6. I do not know, I inherited the business from my parents

B3.11. FAMILY SUPPORT

54) At anytime in the past, who gave you financial support in your business? (you may circle more than one answer)
   1. Spouse
   2. Children
   3. Parents
   4. Extended family member
   5. No one
   6. Other (please specify)…………………

55) At anytime in the past, who gave you non-financial support (giving ideas, suggestions, moral support) in running your business? (you may circle more than one answer)
   1. Spouse
   2. Children
   3. Parents
   4. Extended family member
   5. No one
   6. Other (please specify)…………………

56) Now, who gives you financial support in your business? (you may circle more than one answer)
   1. Spouse
   2. Children
   3. Parents
   4. Extended family member
   5. No one
   6. Other (please specify)…………………

57) Now, who gives you non-financial support (eg. giving ideas, suggestions, moral support) in running your business? (you may circle more than one answer)
   1. Spouse
   2. Children
   3. Parents
   4. Extended family member
   5. No one
   6. Other (please specify)…………………

295
58) Who is NOT supporting you financially at all in this business? (you may circle more than one answer)
   1. Spouse
   2. Children
   3. Parents
   4. Extended family member
   5. No one
   6. Other (please specify)……………

59) Who is NOT giving you non-financial support in this business? (you may circle more than one answer)
   1. Spouse
   2. Children
   3. Parents
   4. Extended family member
   5. No one
   6. Other (please specify)……………

60) Which of your family members is helping to manage your business? (you may circle more than one answer)
   1. Spouse
   2. Children
   3. Parents
   4. Extended family member
   5. No one
   6. Other (please specify)……………

B3.12. MARKET

61) From whom do you get the potential market information? (you may circle more than one answer):
   1. Federal government
   2. Local government
   3. Educational institution
   4. International organisation
   5. Others, please specify……………………
   6. Media
   7. Family / friends
   8. Business colleagues

62) How do you offer your product to new market? (you may circle more than one answer):
   1. Door to door
   2. I send out marketing material through mail.
   3. I send out marketing material through e-mail.
   4. Through my website
   5. I have steady customers only.
   6. Mouth to mouth advertisement
   7. I don’t know
   8. Others (please specify)……………………

B3.13. TRANSPORTATION INFRASTRUCTURE

63) What type of transportation do you use for your business? (you may circle more than one answer)
   1. My own vehicle
   2. I borrow my friend’s/relative’s vehicle.
   3. I rent a vehicle.
   4. Public transport
   5. Others (please specify)……………

64) How far is the nearest public transport from your business location?
   1. 0 – 1 km
   2. 1 km - < 5 km
   3. more than 5 km
B3.14. INFLUENCING FACTORS

65) To what extent do you agree that the factors below influence *income improvement* for your business?

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Strongly Agree</th>
<th>Somewhat Agree</th>
<th>Somewhat Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aquaculture knowledge</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
</tr>
<tr>
<td>2. Aquaculture skills</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
</tr>
<tr>
<td>3. Aquaculture experience</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
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<tr>
<td>4. Aquaculture education</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
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<tr>
<td>5. A strong character in the entrepreneur / business owner</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
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<td>6 5 4 3 2 1</td>
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<tr>
<td>6. Reason</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
</tr>
<tr>
<td>7. Personal business experience</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
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<tr>
<td>8. Family business background</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
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<tr>
<td>9. Business network</td>
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<td>6 5 4 3 2 1</td>
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<tr>
<td>10. Financial capital</td>
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<td>6 5 4 3 2 1</td>
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<tr>
<td>11. Family support</td>
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<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
<td>6 5 4 3 2 1</td>
</tr>
<tr>
<td>12. Market</td>
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<tr>
<td>13. Logistics</td>
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<tr>
<td>14. Support from government and other institutions</td>
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</table>

66) To what extent do you agree that the factors below influence *product sustainability* for your business?

<table>
<thead>
<tr>
<th>Characteristics</th>
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<tr>
<td>3. Aquaculture experience</td>
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<tr>
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</tbody>
</table>

B3.15. GOVERNMENT/OTHER INSTITUTIONS SUPPORT

67) Which of these institutions are most helpful in supporting your business? (you may circle more than one answer)

1. Federal government
2. Local government
3. Educational Institution
4. International organisation
5. Private company
6. Others (please specify)........
68) Which of the following support has the government / other institution provided you to help your fish farming business? (you may circle more than one answer)
1. soft loans in appointed banks / cooperatives
2. technical aquaculture training
3. technical assistance
4. marketing assistance
5. information on potential market
6. fish seed subsidies
7. fish feed subsidies
8. other subsidies (please specify)…………………………..

C. OTHER ASPECTS OF THE BUSINESS

C1. INCOME IMPROVEMENT

69) How do you define your current financial status compared to 5 years ago?
1. It is much better  2. It is the same  3. It is worse

70) How do you think your financial condition will be in 3 years time with running this business?
   a. It will be much better.  2. It will be the same.  3. It will be worse.

71) How do you think your business affects your family?
1. It supplements my family’s overall income.
2. It diminishes my family’s overall income.
3. It significantly increases my family income.

72) How do you plan to increase your business income in the future? (you may circle more than one answer):
1. Producing my own fish feed.
2. Producing my own fish seed.
3. Extending market distribution.
4. Extending the variety of fish species.
5. Extending the product range (adding value).
6. Finding other uses of product.
7. Others (please specify).…………………………..

C2. PRODUCT SUSTAINABILITY

73) How concerned are you that your fish farming activities might adversely affect the **SOIL** quality of the fish habitat?
1. I am very concerned  3. I am not concerned
2. I am rather concerned  4. I don’t know

74) How concerned are you that your fish farming activities might adversely affect the **WATER** quality of the fish habitat?
1. I am very concerned.  3. I am not concerned.
2. I am rather concerned.  4. I don’t know.

75) How do you ensure the **ENVIRONMENTAL** quality of your fish farm? (you may circle more than one answers):
1. I clean my fish culture environment on regular basis.
2. I prohibit littering around my fish culture pond.
3. I am not concerned about environmental quality.
4. I don’t know
5. Others (please specify).…………………………..

76) How do you ensure the **WATER** quality of your fish farm? (you may circle more than one answer):
1. I check and control the water quality on daily basis.
2. I lime the pond prior to every fish stocking.
3. I store water in a quality controlled water tank.
4. I am not concerned about water quality.
5. This question does not apply to my practice
6. Others (please specify).…………………………..
77) Which of these activities will ensure that your fish farm keeps producing the expected quality and quantity of fish? (you may circle more than one answer):
   1. Checking water quality on daily basis
   2. Ensuring feeding at right time with correct quantity
   3. Assuring fish feed quality and supply
   4. Assuring fish seed quality and supply
   5. I don’t know
   6. Others (please specify)........................................

78) What would happen if you could not get your fish seed / fish feed required for your business?
   1. I do not know
   2. I will buy fish seed / fish feed from my business colleague.
   3. I will try to find other suppliers.
   4. I will produce my own fish seed / fish feed.
   5. I already produce and keep stock of my own fish seed / fish feed
Appendix 2

PERTANYAAN RAHASIA, MOHON UNTUK TIDAK MEMBERI NAMA

Untuk masing-masing pertanyaan lingkarilah angka pada jawaban yang dianggap paling sesuai dengan kondisi saudara. Pada beberapa pertanyaan, saudara diperbolehkan melingkari lebih dari satu jawaban.

1) Apakah saudara:
   1. Pria
   2. Wanita

2) Umur:
   1. Dibawah 20
   2. 20-39
   3. 40-59
   4. 60 +

3) Status:
   1. Belum menikah
   2. Menikah
   3. Janda/duda

4) Jumlah anak:
   1. Satu
   2. Dua atau lebih
   3. Tidak ada

5) Pendidikan tertinggi:
   1. Sarjana
   2. Lulus SMP/SMA
   3. Lulus SD
   4. Tidak selesai SD
   5. Tidak sekolah

6) Pekerjaan Ayah (dulu ataupun sekarang)
   1. Petani ikan
   2. Pegawai negeri sipil
   3. Pegawai swasta
   4. Bisnis sendiri tapi bukan petani ikan. Jelaskan...............................
   5. Tidak bekerja
   6. Lainnya, mohon jelaskan............................................................

7) Pekerjaan Ibu (dulu ataupun sekarang)
   1. Petani ikan
   2. Pegawai negeri sipil
   3. Pegawai swasta
   4. Bisnis sendiri tapi bukan petani ikan. Jelaskan...............................
   5. Tidak bekerja
   6. Lainnya, mohon jelaskan............................................................

8) Apa yang menghubungkan orang tua saudara dengan profesi petani ikan sudara sekarang ini? (saudara boleh melingkari lebih dari satu jawaban):
   1. Mereka memiliki bisnis budidaya ikan sendiri.
   2. Mereka memulai bisnis budidaya ikan yang sekarang saya jalani.
   3. Tidak ada
   4. Lainnya, mohon jelaskan............................................................

9) Siapakah sosok pebisnis unggul yang saudara ingin tiru? (saudara boleh melingkari lebih dari satu jawaban):
   1. Ayah
   2. Ibu
   3. Kakak/adik
   4. Saudara
   5. Tetangga
   6. Teman
   7. Tidak ada
   8. Lainnya, mohon jelaskan............................................................

10) Termasuk klas kelompok apakah bisnis budidaya milik saudara?
    1. Pemula
    2. Lanjut
    3. Madya
    4. Utama
    5. Tidak tahu

11) Berapakah penghasilan saudara pertahun dari budidaya ikan?
    1. Dibawah Rp. 50 juta
    2. Rp. 50 juta – < Rp.100 juta
    3. Rp. 100 juta – < Rp. 500 juta
    4. Rp. 500 juta atau lebih
12) Berapa ukuran tanah milik saudara yang digunakan untuk budidaya ikan?
   1. < 2 Ha
   2. 2 - <5 Ha
   3. 5 - <10 Ha
   4. 10 Ha atau lebih

13) Berapa orang pegawai yang saudara miliki saat ini?
   1. Sampai dengan 2 orang
   2. 3-5 orang
   3. 6-8 orang
   4. 9 orang atau lebih

14) Apakah jenis budidaya ikan saudara? (saudara boleh melingkari lebih dari satu jawaban)
   1. Air laut
   2. Air payau
   3. Air Tawar

15) Apakah metode budidaya ikan saudara? (saudara boleh melingkari lebih dari satu jawaban)
   1. Tambah
   2. Karamba
   3. Sawah
   4. Kolam
   5. Lainnya, mohon jelaskan

16) Budidaya jenis apakah yang anda produksi?
   1. Pembenihan
   2. Pembesaran
   3. Pembenihan dan pembesaran
   4. Budidaya rumput laut
   5. Ikan hias
   6. Lainnya

17) Kegiatan apa saja yang telah saudara jalankan pada usaha budidaya ikan saudara?
    (saudara boleh melingkari lebih dari satu jawaban)
    1. Memproduksi pakan ikan sendiri
    2. Memproduksi benih ikan sendiri
    3. Memperluas jaringan pemasaran
    4. Menambah species ikan yang dibudidayakan
    5. Menjual ikan dalam bentuk lain (ikan asap, ikan asin, lauk dsb.)
    6. Menjual bagian lain ikan selain daging (tulang, kulit, dsb.)
    7. Bukan salah satu diatas
    8. Lainnya, sebutkan

18) Semenjak kapan saudara memproduksi pakan ikan sendiri?
   1. Sejak saya memulai bisnis.
   2. Beberapa tahun yang lalu
   3. Baru saja
   4. Saya tidak memproduksi pakan ikan sendiri.

19) Mengapa saudara memproduksi pakan ikan sendiri? (saudara boleh melingkari lebih dari satu jawaban)
   1. Agar saya dapat mengontrol kualitas pakannya.
   2. Untuk menurunkan biaya produksi.
   3. Untuk menjaga ketersediaan pakan ikan
   4. Untuk meningkatkan pendapatan dengan menjual sebagian produksi pakan ikan kepada orang lain
   5. Alasan lain, jelaskan
   6. Saya tidak memproduksi pakan ikan sendiri.

20) Semenjak kapan saudara memproduksi benih ikan sendiri?
   1. Sejak saya memulai bisnis.
   2. Beberapa tahun yang lalu
   3. Baru saja
   4. Saya tidak memproduksi benih ikan sendiri.
21) Mengapa saudara memproduksi benih ikan sendiri? (saudara boleh melingkari lebih dari satu jawaban)
   1. Agar saya dapat mengontrol kualitas benih ikan.
   2. Untuk menurunkan biaya produksi.
   3. Untuk menjaga ketersediaan benih ikan.
   4. Untuk meningkatkan pendapatan dengan menjual sebagian benih ikan kepada orang lain
   5. Alasan lain, mohon dijelaskan.................................................................
   6. Saya tidak memproduksi benih ikan sendiri

22) Kepada siapa saja saudara menjual hasil panen? (saudara boleh melingkari lebih dari satu jawaban):
   1. Tetangga saya    5. perusahaan besar
   2. Keluarga saya    6. keluar negeri
   3. Pasar ikan lokal   7. pengumpul ikan lokal
   4. pengumpul ikan ditempat lain  8. Lainnya, sebutkan.................................

23) Selain pembeli saat ini, kepada siapa lagi saudara berencana untuk menjual hasil panen ikan saudara? (saudara boleh melingkari lebih dari satu jawaban)
   1. Tetangga saya    6. Perusahaan besar
   2. Keluarga saya    7. keluar negeri
   3. Pasar ikan lokal   8. Tidak ada
   4. Pengumpul ikan lokal  9. Lainnya, sebutkan.................................
   5. pengumpul ikan ditempat lain

24) Dalam bentuk apakah saudara menjual hasil panen ikan? (saudara boleh melingkari lebih dari satu jawaban)
   1. Ikan segar
   2. Ikan asin
   3. Ikan asap
   4. Ikan beku
   5. Lauk (sudah dimasak dan dijual sebagai lauk)
   6. Lainnya, jelaskan.................................................................

25) Berapa jenis ikan yang anda budidayakan pada awal memulai bisnis?
   1. Kurang dari 3 jenis ikan
   2. 4-6 jenis ikan
   3. 7 jenis ikan atau lebih

26) Berapa jenis ikan yang saudara budidayakan sekarang?
   1. Kurang dari 3 jenis ikan
   2. 4-6 jenis ikan
   3. 7 jenis ikan atau lebih

27) Mengapa saudara menambah jenis ikan untuk dibudidayakan?
   1. Ingin menjual lebih banyak jenis ikan.
   2. Ingin mendapatkan keuntungan lebih banyak.
   3. Mengikuti permintaan pasar
   4. Saya tidak menambah jenis ikan budidaya.
   5. Alasan lain, jelaskan.................................................................

28) Mengapa saudara TIDAK menambah jenis ikan untuk dibudidayakan?
   1. Saya tidak memiliki modal untuk menambah jenis ikan.
   2. Saya tidak mengetahui metodologi budidaya ikan lain.
   3. Luas tanah saya tidak mencukupi untuk menambah jenis ikan.
   4. Saya tidak ingin menambah jenis ikan.
   5. Saya telah menambah jumlah jenis ikan untuk dibudidayakan.
   6. Alasan lain, mohon dijelaskan.................................................................

29) Bagian tubuh ikan mana saja yang saudara jual? (saudara boleh melingkari lebih dari satu jawaban)
   1. Ikan utuh
   2. Fillet ikan
   3. Kulit
   4. Isi perut
   5. Darah
   6. Tulang/duri
30) Seberapa setujukah saudara bahwa keadaan berikut ini dihadapi oleh bisnis saudara dan mempersulit saudara untuk dapat meningkatkan pendapatan?

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<thead>
<tr>
<th>Keadaan yang terjadi</th>
<th>Sangat setuju</th>
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<tbody>
<tr>
<td>a. Modal terbatas</td>
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<td>b. Kemampuan teknis terbatas</td>
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<td>c. Dukungan keluarga terbatas</td>
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<td>d. Dukungan pemerintah terbatas</td>
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<td>e. Pelatihan yang diberikan oleh pemerintah / institusi lain terbatas</td>
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<td>f. Pengalaman dan pengetahuan tentang budidaya ikan terbatas</td>
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<td>g. Pasar yang menjanjikan terbatas</td>
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<td>h. Harga jual rendah</td>
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<td>o. Kualitas air jelek</td>
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<td>p. Sulit mendapatkan kredit</td>
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31) Seberapa setujukah saudara bahwa keadaan berikut ini dihadapi oleh bisnis saudara dan mempersulit saudara untuk dapat menjaga kesinambungan produk?

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<th>Keadaan yang terjadi</th>
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<td>c. Dukungan keluarga terbatas</td>
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<td>d. Dukungan pemerintah terbatas</td>
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<td>e. Pelatihan yang diberikan oleh pemerintah / institusi lain terbatas</td>
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<tr>
<td>f. Pengalaman dan pengetahuan tentang budidaya ikan terbatas</td>
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<td>g. Pasar yang menjanjikan terbatas</td>
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<td>h. Harga jual rendah</td>
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<td>j. Kualitas pakan rendah</td>
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<td>k. Kualitas benih rendah</td>
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<td>l. Kurangnya kemampuan manajemen keuangan</td>
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<td>m. Kurangnya pengontrolan kualitas</td>
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<td>n. Parasit dan penyakit ikan</td>
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<td>o. Kualitas air jelek</td>
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<tr>
<td>p. Sulit mendapatkan kredit</td>
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</table>
32) Dari mana saudara mendapatkan pengetahuan tentang budidaya ikan? (saudara boleh melingkari lebih dari satu jawaban)
1. Dari orang tua saya
2. Dari keluarga saya yang lain, mohon dijelaskan..............................................
3. Dari tetangga saya
4. Dari pelatihan yang diadakan pemerintah/institusi lain
5. Lainnya, jelaskan........................................................................................................

33) Kegiatan budidaya ikan yang manakah yang suadara paling kuasai? (saudara boleh melingkari lebih dari satu jawaban)
1. Pembenihan ikan
2. Pembesaran ikan
3. Pembuatan pakan ikan
4. Penanganan parasite dan penyakit ikan

34) Seberapa lama saudara telah menjalankan budidaya ikan, baik pada bisnis saudara sendiri ataupun bekerja pada orang lain?
1. Kurang dari satu tahun
2. 1-5 tahun
3. 5-15 tahun
4. lebih dari 15 tahun

35) Pendidikan budidaya ikan yang manakah yang telah suadara ikuti? (saudara boleh melingkari lebih dari satu jawaban)
1. Pendidikan tinggi pada jurusan perikanan/budidaya perikanan
2. Sekolah menegah pada jurusan perikanan/budidaya perikanan
3. Pelatihan budidaya ikan oleh pemerintah
4. Pelatihan budidaya ikan oleh institusi pendidikan
5. Pelatihan budidaya ikan oleh perusahaan swasta.
6. Pelatihan budidaya ikan oleh organisasi Internasional

36) Bentuk pelatihan mana sajakah yang telah suadara ikuti? (saudara boleh melingkari lebih dari satu jawaban)
1. Pelatihan budidaya ikan. Diadakan oleh……………………………………..………..
2. Pelatihan kewirausahaan. Diadakan oleh…………………………………………
3. Pelatihan manajemen. Diadakan oleh………………………………………………
4. Pelatihan pemberian ikan. Diadakan oleh…………………………………………
5. Pelatihan pembuatan pakan ikan. Diadakan oleh……………………………………
6. Pelatihan lainnya………………………………………………………………………

37) Apakah suadara mengetahui dan menjalankan perencanaan produksi dalam bisnis suadara?

38) Apakah suadara mengetahui dan menjalankan perencanaan keuangan dalam bisnis suadara?

39) Apakah anda mengetahui, mengembangkan dan menjalankan perencanaan pemasaran/penjualan dalam bisnis saudara?

40) Apakah saudara memiliki pembagian tugas bagi para pegawai saudara?

41) Apakah saudara menjalankan control kualitas (quality control) dalam bisnis saudara?

42) Pengalaman bisnis lain apakah yang anda miliki sebelum menjadi petani ikan?
1. Ritel/jual beli
2. Produksi, jelaskan produk apa...........................................................
3. Bisnis jasa
4. Lainnya, jelaskan...........................................................................................
5. Tidak ada, ini satu-satunya pengalaman bisnis saya.

43) Sebelum menjadi petani ikan, berapa lama anda telah memiliki pengalaman bisnis?
1. Tidak ada 2. < 5 tahun 3. 6-10 tahun 4. Lebih dari 10 tahun
44) Seberapa setujukah saudara bahwa karakter berikut adalah penting untuk mencapai kesuksesan dalam bisnis budidaya ikan?

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<th>Karakter</th>
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<td>g. Mau mengambil resiko</td>
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<td>h. Kemampuan menganalisa</td>
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<td>i. Kegigihan</td>
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<td>j. Berdiri sendiri</td>
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<td>k. Percaya diri</td>
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<td>l. Hubungan bisnis</td>
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<td>m. Nilai moral yang kuat</td>
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(6) Sangat setuju  (5) Setuju  (4) Agak setuju
(3) Agak tidak setuju  (2) Tidak setuju  (1) Sangat tidak setuju

45) Kalau saudara memiliki 20 juta rupiah, apa yang akan saudara lakukan dengan uang tersebut?
1. Menginvestasikannya ke bisnis saya agar cepat berkembang.
2. Mendepositokannya di dalam bank
3. Membelanjakannya
4. Lainnya, jelaskan……………………………………………………………………..

46) Yang mana dari faktor-faktor dibawah ini yang mempengaruhi saudara untuk menjadi seorang wiraswasta?
1. Tidak mendapatkan pekerjaan yang sesuai dengan pendidikan dan kemampuan saya.
2. Gaji pada pekerjaan sebelumnya terlalu rendah.
3. Melihat ada kesempatan berbisnis.
4. Tradisi keluarga dalam berbisnis.
5. Saya kehilangan pekerjaan saya/kena PHK.
6. Pengalaman sebelumnya dalam memiliki usaha sendiri.

47) Bagaimana anda tertarik untuk menjadi petani ikan?
1. Orang tua saya adalah petani ikan.
2. Keluarga lain saya adalah petani ikan.
3. Tetangga saya adalah petani ikan.
4. Lainnya, jelaskan……………………………………………………………………..

48) Apa yang memotivasi saudara menjadi petani ikan?
1. Saya memiliki pengalaman dalam berbisnis budidaya ikan.
2. Orang tua saya mengajak untuk membantu mereka berbisnis budidaya ikan.
3. Saya melihat orang lain sukses berbisnis budidaya ikan.
4. Saya ingin menjadi kaya.
5. Saya tidak mau bekerja untuk orang lain.
6. Saya tidak memiliki pekerjaan ataupun kesempatan lain.
7. Alasan lainnya, mohon dijelaskan…………………………………………………..

49) Seberapa puaskah saudara terhadap bisnis budidaya ikan ini?
1. Saya sangat puas dan menyenangi aktivitas budidaya ikan saya.
2. Saya puas tetapi kurang menyenangi aktivitas budidaya ikan saya.
3. Saya kurang puas tetapi menyenangi aktivitas budidaya ikan saya.
4. Saya kurang puas dan kurang menyenangi aktivitas budidaya ikan saya.

50) Seandainya saudara punya pilihan lain, apa yang saudara akan lakukan?
1. Saya tidak perlu pilihan lain, saya suka menjadi petani ikan.
2. Saya ingin bekerja di perusahaan swasta.
3. Saya ingin menjadi pegawai negeri sipil (PNS).
4. Saya ingin memiliki bisnis lain (sebutkan) .................................
5. Tidak ada diatas, jelaskan.................................................................

51) Dengan siapa sajakah anda berhubungan dalam bisnis ini? (saudara boleh melingkari lebih dari satu jawaban):
   1. Supplier
   2. Pembeli
   3. Konsumen
   4. Kantor / staff pemerintah
   5. Tetangga
   6. Bank / koperasi
   7. Lainnya, mohon dijelaskan..........................................................

52) Berapakah modal awal bisnis ini?
   1. Kurang dari 10 juta rupiah.
   2. Rp. 10 juta – kurang dari Rp. 20 juta
   3. Rp. 20 juta – kurang dari Rp. 30 juta
   4. Lebih dari Rp. 30 million
   5. Saya tidak tahu, saya mewarisi bisnis ini dari orang tua saya.
   6. Saya tidak ingat

53) Bagaimana saudara mengumpulkan uang untuk modal awal? (saudara boleh melingkari lebih dari satu jawaban)
   1. Tabungan sendiri
   2. Pinjam dari keluarga
   3. Pinjam dari tetangga
   4. Pinjam dari bank/koprasi
   5. Lainnya, mohon dijelaskan..........................................................

54) Di masa lalu, siapakah yang memberikan dukungan finansial (keuangan) untuk bisnis saudara? (saudara boleh melingkari lebih dari satu jawaban)
   2. Anak           5. Tidak ada
   3. Orang tua      6. Lainnya, sebutkan.............................................

55) Di masa lalu, siapakah yang memberikan dukungan non-finansial (dukungan moral) untuk bisnis saudara? (saudara boleh melingkari lebih dari satu jawaban)
   2. Anak           5. Tidak ada
   3. Orang tua      6. Lainnya, sebutkan.............................................

56) Saat ini, siapakah yang memberikan dukungan finansial (keuangan) untuk bisnis saudara? (saudara boleh melingkari lebih dari satu jawaban)
   2. Anak           5. Tidak ada
   3. Orang tua      6. Lainnya, sebutkan.............................................

57) Saat ini, siapakah yang memberikan dukungan non-finansial (dukungan moral) untuk bisnis saudara? (saudara boleh melingkari lebih dari satu jawaban)
   2. Anak           5. Tidak ada
   3. Orang tua      6. Lainnya, sebutkan.............................................

58) Siapakah yang sama sekali TIDAK mendukung saudara secara FINANSIAL (KEUANGAN) dalam bisnis ini? (saudara boleh melingkari lebih dari satu jawaban)
   2. Anak           5. Tidak ada
   3. Orang tua      6. Lainnya, sebutkan.............................................

59) Siapakah yang sama sekali TIDAK mendukung saudara secara NON-FINANSIAL (MORAL) dalam bisnis ini? (saudara boleh melingkari lebih dari satu jawaban)
   2. Anak           5. Tidak ada
   3. Orang tua      6. Lainnya, sebutkan.............................................

60) Siapa saja dalam keluarga yang membantu menjalankan bisnis saudara? (saudara boleh melingkari lebih dari satu jawaban)
   2. Anak           5. Tidak ada
   3. Orang tua      6. Lainnya, sebutkan.............................................
61) Dari manakah saudara mendapatkan informasi tentang pasar yang berpotensi? (saudara boleh melingkari lebih dari satu jawaban):
1. Pemerintah pusat
2. Pemerintah daerah
3. Institusi pendidikan
4. Organisasi Internasional
5. Lainnya, sebutkan…………………………………………………………………….
6. Media masa (koran, radio, TV, dll)
7. Keluarga/teman
8. Teman bisnis

62) Bagaimana saudara menawarkan hasil panen saudara kepada konsumen baru? (saudara boleh melingkari lebih dari satu jawaban):
1. Menawarkan dari rumah ke rumah
2. Saya mengirimkan penawaran lewat pos
3. Saya mengirimkan penawaran lewat e-mail.
4. Melalui website saya
5. Saya memiliki konsumen tetap saja.
6. Pemasaran dari mulut ke mulut (gethok tular)
7. Saya tidak tahu
8. Lainnya, sebutkan…………………………………………………………………….

63) Jenis transportasi apakah yang saudara gunakan untuk berbisnis? (saudara boleh melingkari lebih dari satu jawaban)
1. Kendaraan pribadi
2. Saya pinjam kendaraan teman/keluarga.
3. Saya menyewa kendaraan.
4. Transportasi umum
5. Lainnya, sebutkan……………………………………………………………………

64) Seberapa jauhkan tempat transportasi umum terdekat dengan lokasi budidaya saudara?
1. 0 – 1 km
2. 1 km - < 5 km
3. lebih dari 5 km

65) Seberapa setujukah saudara bahwa faktor-faktor dibawah ini mempengaruhi usaha untuk meningkatkan pendapatan bisnis saudara?

<table>
<thead>
<tr>
<th>Faktor-faktor</th>
<th>Sangat setuju</th>
<th>Sangat tidak setuju</th>
</tr>
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<tbody>
<tr>
<td>(6) Sangat setuju</td>
<td>(5) Setuju</td>
<td>(4) Agak setuju</td>
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<td>(3) Agak tidak setuju</td>
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<td>1. Pengetahuan budidaya ikan</td>
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<tr>
<td>2. Ketrampilan budidaya ikan</td>
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<td>4. Pendidikan budidaya ikan</td>
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<tr>
<td>5. Karakter kuat sebagai seorang wirausaha/pemilik bisnis</td>
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<tr>
<td>6. Alasan menjadi wiraswasta</td>
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<td>7. Pengalaman pribadi dalam berbisnis</td>
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<td>8. Latar belakang bisnis keluarga</td>
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<td>9. Hubungan bisnis</td>
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<td>10. Modal keuangan</td>
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<td>11. Dukungan keluarga</td>
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<td>12. Pasar</td>
<td>6 5 4 3 2 1</td>
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<tr>
<td>13. Transportasi</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
<tr>
<td>14. Dukungan pemerintah dan institusi lainnya</td>
<td>6 5 4 3 2 1</td>
<td></td>
</tr>
</tbody>
</table>
66) Seberapa setujukah saudara bahwa faktor-faktor dibawah ini mempengaruhi usaha untuk menjaga kestabilan produksi bisnis saudara?

<table>
<thead>
<tr>
<th>Faktor-faktor</th>
<th>Sangat setuju</th>
<th>Setuju</th>
<th>Agak tidak setuju</th>
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<td>1. Pengetahuan budidaya ikan</td>
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<td>14. Dukungan pemerintah dan institusi</td>
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<tr>
<td>lainnya</td>
<td>6</td>
<td>5</td>
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</tr>
</tbody>
</table>

67) Institusi yang manakah yang paling membantu dalam mendukung bisnis saudara? (saudara boleh melengkapi lebih dari satu jawaban)

1. Pemerintah pusat
2. Pemerintah daerah
3. Institusi pendidikan
4. Organisasi Internasional
5. Perusahaan swasta
6. Lainnya, sebutkan..........................

68) Bentuk dukungan apa sajakah yang telah diberikan oleh pemerintah/ institusi lainnya kepada usaha budidaya ikan saudara? (saudara boleh melengkapi lebih dari satu jawaban)

1. kredit lunak dari bank/koperasi yang ditunjuk
2. Pelatihan teknis budidaya perikanan
3. Bantuan teknis
4. Bantuan pemasaran
5. Pemberian informasi tentang adanya pasar yang berpotensi
6. Subsidi benih ikan
7. Subsidi pakan ikan
8. Lainnya, sebutkan..........................

69) Bagaimana saudara menggambarkan kondisi keuangan saudara bila dibandingkan 5 tahun yang lalu?

1. Lebih baik
2. Sama saja
3. Lebih jelek

70) Bagaimana kira-kira kondisi keuangan saudara 3 tahun kedepan dengan adanya bisnis budidaya ikan ini?

1. Lebih baik
2. Sama saja
3. Lebih jelek

71) Bagaimanakah bisnis ini mempengaruhi keluarga saudara?

1. Menambah penghasilan total keuarga saya
2. Mengurangi penghasilan total keluarga saya
3. Menaikkan pendapatan keluarga saya secara tajam

72) Bagaimanakah rencana saudara untuk menaikkan pendapatan bisnis saudara dimasa mendatang? (saudara boleh melengkapi lebih dari satu jawaban):

1. Memproduksi pakan ikan sendiri.
2. Memproduksi benih ikan sendiri.
3. Memperluas jaringan pemasaran.
4. Memperbanyak jenis ikan yang dibudidayakan.
5. Memperbanyak jenis produk yang dijual (ikan asap, ikan asin, dll).
6. Menjual bagian lain ikan (kulit, tulang dll).
7. Lainnya, sebutkan..........................

Nomer diartikan sebagai berikut:
(6) Sangat setuju  (5) Setuju  (4) Agak setuju
(3) Agak tidak setuju  (2) Tidak setuju  (1) Sangat tidak setuju
73) Seberapa khawatir kah saudara bahwa budidaya ikan saudara akan mempengaruhi kualitas TANAH tempat budidaya ikan saudara?
1. Saya sangat khawatir
2. Saya agak khawatir
3. Saya tidak khawatir
4. Saya tidak tahu

74) Seberapa khawatir kah saudara bahwa budidaya ikan saudara akan mempengaruhi kualitas AIR budidaya ikan saudara?
1. Saya sangat khawatir
2. Saya agak khawatir
3. Saya tidak khawatir
4. Saya tidak tahu

75) Bagaimanakah saudara menjaga kualitas LINGKUNGAN tempat budidaya ikan saudara? (saudara boleh melingkari labih dari satu jawaban):
1. Saya membersihkan lingkungan budidaya ikan saya secara rutin setiap hari.
2. Saya melarang pembuangan sampah dekat kolam budidaya ikan saya.
3. Saya tidak khawatir tentang kualitas lingkungan.
4. Saya tidak tahu
5. Lainnya, sebutkan……………………………………………………………………

76) Bagaimanakah saudara menjaga kualitas AIR budidaya ikan saudara? (saudara boleh melingkari labih dari satu jawaban):
1. Saya mengecek dan mengontrol kualitas air secara rutin setiap hari.
2. Saya memupuk kolam setiap akan memulai budidaya.
3. Saya menyimpan air dalam tanki yang terkontrol kualitasnya.
4. Saya tidak khawatir tentang kualitas air.
5. Pertanyaan ini tidak sesuai dengan kegiatan budidaya saya.
6. Lainnya, sebutkan……………………………………………………………………

77) Kegiatan yang manakah yang akan menjaga bahwa budidaya saudara akan menghasilkan kualitas dan kuantitas produk yang diharapkan? (saudara boleh melingkari lebih dari satu jawaban):
1. Mengecek kualitas air secara rutin setiap hari
2. Memberikan pakan pada waktu dan jumlah yang tepat
3. Menjaga kualitas dan ketersediaan pakan ikan
4. Menjaga kualitas dan ketersediaan benih ikan
5. Saya tidak tahu
6. Lainnya, sebutkan……………………………………………………………………

78) Apa yang akan saudara lakukan apabila tidak dapat memperoleh pakan/benih ikan yang diperlukan?
1. Saya tidak tahu
2. Saya akan membeli pakan/benih dari teman bisnis saya.
3. Saya akan mencoba mencari supplier.
4. Saya akan memproduksi pakan/benih sendiri.
5. Saya menyimpan stok pakan/benih ikan sendiri.
6. Pertanyaan ini tidak sesuai dengan kegiatan budidaya saya.
Dear Harch

SUHREC Project 0708/110 Factors influencing aquaculture entrepreneurial activity of small-scale fish farmers in deriving income improvements and ensuring product sustainability in Central Java, Indonesia

Dr Harchand Thandi FBE Ms Tita Elfitasari
Proposed Duration: From 15/11/2007 To 15/07/2008

Ethical review of the above project was carried out on behalf of Swinburne's Human Research Ethics Committee (SUHREC) by a SUHREC SubCommittee (SHESC3) on Friday 9 November, 2007.

I am pleased to advise that Ethics Clearance has been given for the project as submitted in line with standard conditions here outlined:

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the current National Statement on Ethical Conduct in Research Involving Humans and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project.

- A duly authorised external or internal audit of the project can be undertaken at any time.

Please contact me if you have any queries or concerns about on-going ethics clearance. The SUHREC project number should be cited in communication.

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