Abstract

This paper addresses the trend of livelihood diversification in agrarian communities that results from growth-oriented development policies. This study uses empirical data from rice-farming communities in Maha Sarakham province, Thailand, that are diversifying into freshwater aquaculture to examine the impacts of such changes in economic activity. The case study compares inland cage culture in Ban Kilek and subsistence pond aquaculture in Ban Makha to analyze the effects and benefits associated with the introduction of the activities. The results suggest that significant differences exist between the two communities with cage culture leading to greater benefits than pond culture, including higher income and mobility levels. However, the benefits from diversifying into commercialized aquaculture are unequally distributed between men and women as evidenced by extra-community mobility levels. Among cage culturists, women are significantly less mobile than men, and despite women's high income levels, they exhibit similar mobility levels to women not engaged in the activity. The combination of the corporate organization of cage culture, kinship networks and traditional expectations, and household responsibilities continues to confine women's mobility to within the community and, thus, inhibits an increase in mobility that male cage culturists experience. While livelihood diversification into activities such as cage and pond culture provides significant benefits, the paper recommends a critical review of the impacts on the individuals and households involved.

Introduction

Since the 1970s, Thailand’s rural development strategies have promoted livelihood diversification (Pingali et al. 1997; Hanpongpondh 2001). The low return, high risk and uncertainty associated with agricultural production have fueled the transition from extensive to intensive farming systems, subsistence to commercialized crops and farm to non-farm employment. In the aftermath of the 1997 economic crisis, the government’s dual objectives of economic growth and self-sufficiency have advanced the trends of crop and employment diversification, which has included the promotion of freshwater aquaculture. For inland rural communities, freshwater fish culture has been hailed as a poverty alleviation initiative to
enhance incomes and improve food security (DoF 2002). Projects have targeted women for involvement because of livelihood benefits and ease of integrating aquaculture into other agrarian activities (Kelkar 2001; Kusakabe 2001).

The purpose of this paper is to examine the impacts of freshwater aquaculture development on rural households and the men and women in them. The study compares intensive and subsistence freshwater aquaculture systems to address the effects associated with diversification. The paper also examines the growing reliance of rural livelihoods on an increasingly wide range of activities and the varied effects of this dependency (Rigg and Nattapoolwat 2001).

**Background: Agricultural Transformation**

**Rural livelihood diversification**

Rural households in Thailand are increasingly diversifying their livelihood activities and becoming evermore hybrid, both spatially and sectorally (Rigg and Nattapoolwat 2001). This livelihood diversification is linked to the country's economic growth orientation, which has fueled the commercialization and commoditization of agriculture (Pingali 2004). The growth orientation is balanced by His Majesty the King's philosophy of a sufficiency economy, which advocates self-reliance and moderation.

With economic growth, non-farm activities have been introduced to the economy at large. Traditionally, rural villagers were only engaged partly and temporarily in non-farm seasonal employment by migrating to urban areas. With industrial expansion, rural laborers found more permanent work, and beginning in the 1980s, rural laborers began to migrate abroad, meeting the demand for skilled as well as manual laborers (Hanpongpandh 2001). Diversified on-farm and agro-industrial activities have also been introduced to the rural economy, including commercialized crops other than rice and rubber and the integration of livestock and fish farming. The agrofood industry has developed, and of the transnational agro-industrial conglomerates, Charoen Pokphand (CP) Group is Thailand's largest with annual revenues of $13 billion (Goss et al. 2000). The CP has grown beyond feed processing and into the production chain to organize contract production in a system of vertical integration. For several commodities, the CP provides all the production inputs and then processes and markets the outputs (Goss et al. 2000).

**Freshwater aquaculture development**

Worldwide, aquaculture is the fastest growing food-producing sector, and in Thailand, a popular form of on-farm livelihood diversification. The practice of farming aquatic species has existed for centuries, and in recent decades, technological innovations have intensified the production process to increase yield and profit levels. This so-called “blue revolution” has been hailed for its potential to relieve pressure on capture fisheries and to meet growing demand for aquatic resources (The Economist 2003).

The Department of Fisheries (DoF) aquaculture policy under the National Fishery Development Policy 2002-2006 promotes an increase in production at the rate of 5% per year (DoF 2002). This proposed intensification is significant for the freshwater sector because of its traditional subsistence production level and potential for income generation and domestic food security. The two types of freshwater aquaculture discussed in this study are cage culture and subsistence pond culture, which differ in their production intensity. Cage culture is market-oriented requiring significantly more investments of time and monetary resources (Kusakabe et al. 2003).

Subsistence pond culture is the most common type of aquaculture in Thailand and involves either monoculture, stocking one species, or polyculture, many species. The fish are raised mainly for household consumption and occasionally for sale. On average, subsistence-level
The impacts of aquaculture development in relation to gender in northeastern Thailand

Ponds are small in size, no larger than 1 rai (0.16 ha), and can be part of integrated farms. These ponds have low stocking rates and often do not use feed (Kusakabe et al. 2003).

Cage culture uses natural open water sources, such as a river or reservoir, to decrease the pressure on land use for aquaculture. Intensive cage culture has been promoted in Thailand since the late 1990s and is the newest form of aquaculture in the northeast region. The private sector introduced monosex tilapia cage culture, which is intensive and for-profit. The stock is all male and of big-fingerling size, which allows culturists to harvest more than two crops per year. The fish are given high-protein feed more than three times per day and the maturing period is three to four months (Kusakabe et al. 2003). The feed comprises the most significant production cost and makes cage culture capital-intensive. Farmers are in frequent contact with feed and fingerling companies for inputs and with middlepersons for sales. In utilizing open source water, cage culture does not require the conversion of land, but rather an investment of financial resources and time. Farmers who initiate cage culture often are able to maintain the same levels of rice and other crop farming.

Women and freshwater aquaculture

Freshwater aquaculture has been promoted for women farmers throughout South and Southeast Asia. Subsistence pond culture is a livelihood activity easily incorporated into farm systems and in which women traditionally have been involved. This form of aquaculture requires low levels of time commitment and technical support. Women’s engagement in aquaculture is often considered an extension of the domestic sphere and work, which is beneficial for incorporating it into household responsibilities (Kelkar 2001). Research has demonstrated that women’s participation in small-scale aquaculture yields numerous benefits for themselves and their households (see Nandeesh 1994; Voeten and Ottens 1997; Debashish et al. 1999).

The promotion of cage culture for women has been more recent and more limited. Women’s participation in intensive aquaculture systems has been considered lower than in subsistence systems (Kusakabe 2001). Cage culture produces high incomes, but women have less control over the production in comparison with less intensive forms of aquaculture (Kusakabe et al. 2003). In cage culture production, the farmers’ mobility is a critical component because, as a commercialized production system, more information sources exist and are required. In the study of Kusakabe et al. (2003) on freshwater aquaculture in northeast Thailand, female culturists reported having equal levels of mobility to men but traveling shorter distances, which potentially affected their access to information sources and control over culture activities.

Survey Methods

A survey was conducted of 70 villagers in two rice-farming communities in Kantarawichai district, Maha Sarakham province. Interviews were conducted in person during March and April 2004 in Ban Kilek, Tambon Khaow Yai, where cage culture is being developed and Ban Makh, Tambon Makha, where pond culture is practiced (Figure 1). The sample was selected randomly with the objective of interviewing equal numbers of men and women and of aquaculturists and non-aquaculturists. Interviews were conducted during the dry season, and each interview lasted 35-45 minutes. The response rate was 100% (all villagers approached for the survey agreed to participate). The survey instrument is provided in the Appendix.

In the interviews, villagers were asked about their economic activities, involvement in aquaculture and mobility outside of the household. The first section of the survey contained questions about the demographic characteristics of the respondents. The next two sections included a list of questions relating to income sources, assets and livelihood activities including aquaculture, rice farming and non-farm activities. The final section of the survey addressed physical mobility and contained questions on the frequency of movement, type of transportation used and purpose for mobility. Their mobility was ranked as a composite
index on a scale of one to five (one being low mobility and five high), and the distance between rankings was assumed to be equal for statistical purposes.

Maha Sarakham province was selected as the research site for having a large variability in freshwater aquaculture production, including both cage and pond culture. The province is located in the center of the northeast or *Isaan* region where aquaculture is a diversification strategy in the farm sector. The northeast is the least developed and poorest region of Thailand, and rural villagers there are the most engaged in seasonal and permanent migration for non-farm employment. This out-migration has contributed to a dependence of rural areas on remittances (Hanpongpanndh 2001).

Pond culture is the most common type of aquaculture practiced in the region (Kusakabe et al. 2003). Of the mostly herbivorous and some omnivorous fish species cultured, tilapia is highly demanded throughout the region (Kusakabe et al. 2003). Tilapia is the second most important fish produced in freshwater aquaculture, providing an important source of protein for poor people in developing nations (WorldFish Center 2001). In Maha Sarakham, the Chi River is the major area for cage culture, flowing from Khon Kaen to the Mun River in Ubon Ratchathani.
Survey Results

The random sample of respondents in Ban Makha and Ban Kilek included 26 males and 44 females, ranging in age from 27 to 68. The median age was 48. All respondents were married with 4 being widowed and 1 separated. Two-thirds (66%) of respondents reported having 4 years of schooling, and only 4 respondents have attended university. In Ban Kilek, 21 cage culturists and 14 non-culturists were interviewed, and in Ban Makha, 20 pond culturists and 15 non-culturists. The sample distribution was not evenly balanced between genders with there being a predominance of female respondents. As shown in Table 1, this was especially the case in Ban Kilek where fewer men were available to be interviewed.

Table 1: Sample distribution in Ban Kilek and Ban Makha.

<table>
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<td>Male</td>
<td>8</td>
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<td>7</td>
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<tr>
<td>Female</td>
<td>13</td>
<td>12</td>
<td>25</td>
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<td>Total</td>
<td>21</td>
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*No culture means not involved in aquaculture activities.

Economic activities

The villagers interviewed are engaged in a wide range of farm and non-farm activities. Every respondent reported involvement in at least one agrarian activity, such as rice cultivation, aquaculture, animal husbandry, and fruit and vegetable farming (Figure 2). Furthermore, 94% of respondents reported that they are engaged in more than one activity with more than two-thirds (70%) of them being engaged in both farm and non-farm activities.
Nearly all, 96%, of the respondents are involved in rice cultivation. All keep part if not all of the harvest for domestic consumption. However, only 19% reported rice cultivation as their primary income source, reflecting diversification into more lucrative on-farm and off-farm activities. The most frequently reported primary income source, for nearly 56% of respondents, is on-farm employment.

The primary income sources for households differed between Ban Kilek and Ban Makha. In Ban Kilek, 77% of respondents reported either cage culture or remittances from abroad as their main income source. For 90% of cage culturists, this activity is their primary income. Half of all households in Ban Kilek have family members working abroad who send money home. For 47% of such households, these payments are the primary income. The high levels of temporary out-migration to other countries have mostly involved men as demonstrated by only 16% of Ban Kilek women interviewed reporting working abroad. As one woman commented, “all men over 20 years old have passports in preparation for working abroad.” Cage culture presents a new livelihood activity that provides local and comparable income to foreign labor.

In Ban Makha, not a single villager reported remittances from abroad as primary income, which relates to only 6 households having family members who have worked abroad. In addition, only 1 of the 20 villagers involved in pond culture reported it as the primary income, reflecting the subsistence level of aquaculture there. Instead, the majority of respondents rely on either rice cultivation (34%) or non-farm employment (52%) for income.

**Aquaculture activities**

In Ban Kilek, aquaculturists farm an average of 10 cages, which they harvest 2-3 times a year depending on environmental and market conditions. They have cultured fish for a median time of 4 years. Ten households reported involvement in a cage culture group that started 7 years ago, and from this group’s success, farmers decided to invest in their own cages, spreading the information to relatives and neighbors. In addition, the CP Group, several CP subsidiaries, and other feed and fingerling companies have been closely involved in Ban Kilek’s cage culture development. The CP Group hosts seminars in the region, to which culturists working with the company reported being invited throughout the year.

The cage culturists reported close involvement with companies with 95% of cage households describing “dependent” relationships. This dependence categorization relates to their use of one or several companies for feed, fingerlings and middlepersons. In contrast, independent cage culturists seek production inputs and markets themselves. The companies make site visits to cage households, delivering feed and gathering fish, and the culturists are not required to go anywhere. All cage culturists have at least one mobile phone, which they reported using to contact companies. Cage culturists did not report formal contract relationships with companies, but several respondents noted that purchasing inputs from vertically integrated companies did ensure later sales of fish. One respondent switched from Wiboon to CP fingerlings because he was unable to sell his fish last year when the tilapia market was oversaturated and CP middlepersons would not purchase Wiboon fish. The corporate organization of cage culture in Ban Kilek parallels that of the shrimp industry. The system of cage aquaculture production is characterized by a large degree of vertical integration, in which companies are involved in several production steps. As in shrimp aquaculture, many cage farms are part of a corporate presence and not small-scale entrepreneurial locals (Goss et al. 2000).

Pond aquaculture in Ban Makha has no corporate presence. Three in four farmers interviewed (75%) do not use any feed in their ponds. All pond culturists reported consuming the tilapia they farm in comparison to only half (52%) of all cage respondents, who often reported consuming only the dead fish. Twenty-five percent of pond culturists sell the fish they raise, mostly one time per year. Pond culturists have an average of two ponds, which they have farmed for a median time of eight years. Pond culturists reported farming fish for consumption
purposes and noted the benefits of improved food security, which differs from cage culturists who noted seeking new income sources.

Women and men equally reported involvement in aquaculture activities. In cage culture, women noted gaining knowledge on it through male relatives. Women also reported that men attend seminars on cage culture more often than women.

**Income levels and assets**

The income levels between Ban Kilek and Ban Makha are significantly different ($t = 4.22$, $p<0.001$, $df = 68$). The median annual income level of Ban Makha is 63,000 baht versus 120,000 baht for Ban Kilek, which relates to the high incomes generated in Ban Kilek from cage culture and remittances (Figure 3). In Ban Kilek, cage culturists rank in the top income quartile, and the total income levels reported by cage households are significantly higher than those not engaged in aquaculture ($t = -3.33$, $p<0.05$, $df = 33$). Cage respondents also consistently reported viewing their incomes as better now in comparison to 5 years ago with 90% reporting improvement. Among Ban Makha respondents, only half (54%) noted improvement while the other half (46%) complained of declining income levels. Despite the fact that many Ban Makha respondents have diversified out of rice cultivation, they have not initiated activities as lucrative as cage culture. Pond culture especially does not provide the same economic gains as cage culture.

![Figure 3. Average annual income per household.](image)

The results also suggest that respondents with high income levels have more assets. Ownership of mobile phones increased with income levels ($\chi^2 = 8.62$, $p<0.01$, $df = 2$). Sixty-four percent of all respondents reported owning mobile phones, and the majority of them are from Ban Kilek where nearly nine in ten (89%) Ban Kilek respondents own mobile phones, and 100% of cage culturists own them. For transportation assets, the majority of all respondents (89%) reported household ownership of at least one motorbike. The number of motorbikes
owned increases with rising income levels (chi-square = 13.25, p<0.001, df = 2). Respondents in Ban Kilek reported ownership over more modes of transport—motorbikes and cars—than those in Ban Makha (t = 2.06, p<0.05, df = 68). The total number of cars Ban Kilek residents reported owning doubled that of Ban Makha.

Women and men reported similar household-wide income levels and asset ownership with no significant difference between incomes or ownership of mobile phones or motorbikes (p>0.05). Despite household ownership over modes of transport, half (48%) of all female respondents reported being unable to drive motorbikes or cars themselves. The majority (57%) of the female motorbike drivers noted only driving within their community to rice fields or neighbors’ houses.

**Mobility and kinship networks**

Physical mobility levels within the communities themselves were very high. Eighty-five percent of respondents reported leaving their households daily to visit neighbors and relatives in their village for social purposes. Respondents reported walking or riding motorbikes for travel within the community. This high level of intra-village physical mobility reflects the strong kinship networks existent in the communities. Eighty percent of respondents were born in their village and have lived there most of their lives, especially due to the matrilocal Isaan tradition.

In considering physical mobility beyond the community, respondents’ responses varied broadly, from never having left the village to leaving every day. Ban Makha respondents reported moving outside of the village significantly less frequently than Ban Kilek respondents, who cited high mobility levels (t = 2.81, p<0.01, df = 68). In Ban Makha, no significant difference in mobility levels was reported between pond aquaculturists and other respondents. Among all respondents, the cage culturists interviewed stated significantly higher levels of mobility (t = -2.72, p = 0.01, df = 68).

Yet these general results on highly mobile Ban Kilek respondents and cage culturists mask the significant gender differences in physical mobility levels that actually exist. In comparing male and female cage culturists in Ban Kilek, the men interviewed reported significantly more mobility beyond the community than women (t = -2.33, p<0.05, df = 19). Actually among all respondents, men were cited being significantly more mobile than women (t = 2.23, p<0.05, df = 68). Despite these differences between men and women’s mobility levels, no significant differences emerge between women. In considering the female respondents in Ban Kilek, women cage culturists did not report significantly more mobility than women not engaged in cage culture. Furthermore, in such a mobile community as Ban Kilek, the women there did not report significantly higher mobility levels than the women in Ban Makha.

**Discussion**

**Impacted mobility**

The survey results portray differences between men and women in their movement within versus beyond the community. Both men and women reported high levels of intra-community mobility. Yet men appear to have greater physical mobility beyond the community while women’s mobility is confined to the village level. Even among highly mobile cage culturists, women’s mobility has remained significantly lower than men’s and comparable to that of other women in Ban Kilek and even Ban Makha. The persistently low mobility levels of women cage culturists can possibly restrict their full participation in aquaculture activities, control over production and leadership in technology innovation (Kusakabe et al. 2003). For women more generally, their limited mobility beyond the community can impinge on their ability to carry out productive and reproductive roles.
Empowering mobility

Men’s and women’s extra-familial but intra-community mobility is important for reducing isolation within the household and providing access to community resources. The purposes for this and other types of physical mobility can be categorized broadly as domestic, social and economic (Mashiri and Mahapa 2002). For women especially, their access to social networks and extra-household resources has proven critical to domestic relations, enabling women to exhibit improved self-perception and bargaining positions (Dwyer and Bruce 1988; Fernando and Porter 2002). Women’s participation in social groups can also bring community benefits, leading them to mobilize community resources and participate in political activities (Dwyer and Bruce 1988). Kabeer (1994) found that women’s esteem and influence within a community is closely connected to the extent of their participation in extra-domestic associations. Improving women’s mobility also increases their access to markets and their exposure to education, training and information (Fernando and Porter 2002). Mobility is a precondition for women’s ability to activate their other rights and entitlements whether to political participation, employment, education or health (Matin et al. 2002).

Restricted mobility

Despite these diverse benefits, isolation and limited mobility persist throughout the developing world. With globalization increasing cultural transfers and mobile capital, it has, in the words of Joseph Stiglitz (2002), “reduced the sense of isolation felt in much of the developing world.” However, such general claims that highlight migration and mobile people mask the isolation and confined daily mobility that many still confront. For women especially, their mobility is often restricted and more curtailed than men’s (Fernando and Porter 2002). Numerous factors, which vary between cultural and social contexts, contribute to the persistence of isolation. Several broad trends affecting women’s mobility include cultural constraints and norms, domestic responsibilities, poverty, safety and limited transportation infrastructure (Kabeer 1994; Fernando and Porter 2002).

These factors restrict women’s mobility and limit their command over the political and social processes that determine their lives. As Massey (1991) describes, “the mobility and control of some groups can actively weaken other people. Differential mobility can weaken the leverage of the already weak.” Restrictions on women’s physical movement define their entitlements to income and employment opportunities, and safe and secure transport (Matin et al. 2002). Improving the transport infrastructure alone will not directly lead to improved mobility or improved access to goods and services. Rather, having “mobility” is crucial for accessing goods and services (Fernando and Porter 2002).

Mobility within confines

Women in both Ban Kilek and Ban Makha experience the benefits of extra-household mobility, but face restrictions on physical mobility beyond this level. Female respondents frequently commented on not going anywhere beyond the household or community because of domestic responsibilities, including caring for children and home-based economic responsibilities, such as silk production. Women also noted having modes of transport in their household but not being able to access them. For motorbikes especially, only one-quarter (26%) of all women who reported household ownership actually ride them outside of the community. The women who could not ride motorbikes reported being too old to learn or too small to ride them. For those who ride only in the community, they stated safety as a concern as well as not having legal driving licenses.

For the women who reported extra-community mobility, diverse activities bring them beyond the community. Women reported such purposes as non-farm employment located outside of the village and community groups’ seminars and trainings. For women in Ban Kilek, the out-migration of male relatives factors into their mobility levels as they make monthly deposits.
at the bank in Maha Sarakham City. These women running Ban Kilek households while men are abroad take responsibility over new tasks and perhaps gain increased self-confidence to move beyond the village.

The nature of cage culture and its corporate organization operate to both enhance and curtail mobility. The activity can boost mobility through company-sponsored seminars and site visits as well as increased income levels and asset ownership. However, corporate-organized cage culture is structured so that those involved do not have to leave the household or community for aquaculture-related reasons. The agro-industrial companies provide all of the production needs to the households and cages themselves, and thus, remove an economic reason for extra-community mobility. All cage culturists reported owning mobile phones, which are used for contacting companies and could substitute for actual physical mobility. At night, many culturists either turn lights on over cages or sleep near them to ensure that no fish are stolen, and these actions require proximity to the household and/or cages.

Additional aspects of cage culture contribute to the location of female culturists, in particular, in the household and community. Someone from the household must feed the cages three times a day, and this is usually performed by women (Kusakabe et al. 2003). Furthermore, women cage culturists do not participate in seminars at equal rates to men, and many women comment that their husbands or male relatives attend instead of them. Women reported receiving most of their information on cage culture through their male relatives and strong community networks, and not needing to leave the community to learn about the activity. Even though women cage culturists have high incomes, they exhibit similar mobility levels to women non-culturists rather than to other men cage culturists. Women’s engagement in aquaculture is often viewed as an extension of their domestic responsibilities, reducing its social value and consideration as a productive activity (Kelkar 2001).

**Conclusions and Recommendations**

The livelihood transitions occurring throughout the farm sector in Thailand bring varied benefits to and impacts on each community. The diversification of the communities studied has widened job opportunities for the rural poor and realized the macrolevel objectives of economic growth and self-reliance. Many households continue to be involved in on-farm livelihood activities, and even in households dependent on non-farm income, rice cultivation remains an important agrarian activity for traditional and consumption purposes.

The diversification into freshwater aquaculture results in numerous benefits that vary significantly depending on the intensity of production. The introduction of subsistence pond culture to Ban Makha contributes to improved domestic food security and self-reliance, and in Ban Kilek, cage culture contributes to increased levels of incomes, assets and mobility. Cage culture brings additional benefits as a lucrative on-farm livelihood activity, providing a significant income source located within the community, which is important for Ban Kilek in which numerous residents migrate abroad to work. Furthermore, cage culture is not necessarily a mutually exclusive activity in which households must convert land or discontinue sending family members abroad. Ultimately, each type of culture has different but successful components of poverty alleviation initiatives.

Yet are these benefits distributed gender neutrally? The answer is no. Cage culture appears to bring significantly more benefits to men who can more readily access and utilize the benefits of increased incomes and asset ownership. Whether these benefits contribute to increased mobility levels or not, male cage culturists do experience more frequent movement beyond the community level. For female cage culturists, their mobility is not restricted per se, but rather continues to be confined to the intra-community level of other women. This persistence of low extra-community mobility is pertinent because these female cage culturists ideally have access to the same increased incomes and asset ownership as male cage culturists. Perhaps the corporate organization of cage culture, kinship networks, cultural norms and
household responsibilities act to maintain female cage culturists’ mobility levels at customary levels. Additionally, these women’s access to mobile phones could substitute for increases in physical mobility that may have otherwise been experienced.

Livelihood diversification is the direction of agrarian change occurring across the world, and involves gender differences in its impacts and benefits (Pingali 2004). Several recommendations are proposed to improve the distribution of benefits between men and women from diversifying into freshwater aquaculture:

- **Increasing leadership:** Support women’s involvement in leadership positions in community aquaculture groups to increase access to networks and provide mentors.
- **Improving participation:** Increase women’s involvement in company and DoF-sponsored seminars and site visits to other aquaculture systems to provide them with mobility beyond the household level and technical knowledge on aquaculture.
- **Providing support:** Strengthen the DoF’s social policies and socioeconomic analysis of fisheries programs, improve gender mainstreaming of fisheries policies and gender training of DoF staff, and provide extension services to women.
- **Enabling access:** Provide workshops that discuss women’s and men’s transport needs and the factors that contribute to and hinder mobility levels.

An underlying recommendation is to address gendered power relations, which ultimately factor into the distribution of benefits among men and women. The survey suggests that currently imbalanced power relations are disabling women, especially female cage culturists, from experiencing the full gains of livelihood diversification. Unless some change in the direction of aquaculture policy occurs, however, few women will have the opportunity to claim such benefits.

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**References**


of Technology, Bangkok, Thailand.

Bibliography


Appendix: Survey Instrument Used in Research

Demographics

What is your name, age and gender?
Where do you live and how long have you lived there?
Are you married?
How many children do you have, and how many people reside in your household?
How many years of schooling do you have?

Aquaculture activity

Are you involved in cage/pond culture?
Do you have your own and/or group cages/ponds?
If you are not involved in aquaculture, why? Do you want to have cages/ponds?
**Group:**
How many households are involved in the group?
How many cages/ponds does the group have?
How many years has the group existed?
What was the income earned last harvest (and on average)? How many harvests per year?
From which company do you buy feed and fingerlings?
Do you sell to middlepersons from the same company where you purchase feed and/or fingerlings?
Last harvest, to whom did you sell fish?
Do you consider the group to be company-independent?
Are you a member of any community groups?

**Own:**
How many cages/ponds do you have?
How many years have you had cages/ponds?
What was the income earned last harvest (and on average)? How many harvests per year?
What is the size of cages/ponds?
From which company do you buy feed and fingerlings?
How many bags of feed do you use per harvest? How often do you feed fish?
Why did you build the cages/ponds? What benefits did you derive from these?
Have you worked with this company the whole time you have done cage/pond culture?
Do you sell to middlepersons from the same company where you purchase feed and/or fingerlings?
Last harvest, to whom did you sell fish?
Who in the family goes to look for fingerlings and to market fish? Where? How? How often?
Who goes to contact officers of DoF, CP, etc.?
Do you consider yourself to be company-independent?
What did you do before becoming involved in aquaculture?
How does your income compare to pre-aquaculture on 1 2 3 scale?

**Economic activities**
Do you have land? How many rai? What is it used for?
How many rice harvests do you farm per year? Is the rice for consumption and/or sale?
How much did you earn last harvest?
Do you grow any fruits and/or vegetables? For consumption and/or sale?
Do you have water buffalo? Cattle? Chickens?
(In Ban Kilek) Does anyone in your family fish in the Chi River? For consumption and/or sale?
What other economic activities are you involved in? How much income is accrued from these?
Have you ever worked in Bangkok and/or abroad? Do any family members work abroad?
Do they and/or other family members send money to you?
What is the primary source of income in your household?
How does your income compare to 5 years ago on 1 2 3 scale?
Mobility

Do you have a bicycle? Motorbike? Car? Mobile phone? Others?
If you have a motorbike and/or car, can you drive it/them yourself? Is safety a concern?
In considering the following places, please answer the questions: How many times did you go there? How did you get there? What was the purpose of going?

Neighbors’ houses
Relatives’ houses in the ban (village)
Neighboring tambon (subdistrict)
Mahasarakham town
Other Mahasarakham amphor (district)
Other provinces
Fields (rice/vegetable/fruit)
Cages/ponds

What is the farthest place you have been to? What was the purpose of your travel?
Last month did you travel outside Maha Sarakham province? If so, where? What was the purpose of your travel? How long were you away?

Do you view any difference in the purpose, distance and frequency of movement outside the home between men and women? Is so, why?
Do you view any difference in the safety between men and women traveling?