

Fisheries and rural livelihoods in Viet Nam, 2006 and 2008

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Introduction

- Part of in depth analysis of VARHS surveys conducted in 12 provinces in 2006 and 2008
- Fisheries → important and growing activity in Viet Nam only briefly considered in survey report
- Focus on household level production from both private and open-access resources
- Focus on VARHS panel households only, full sample without weights
- Input to Danida Fisheries report for CIEM
- Presentation of some initial findings to invite comments and follow-up

1 Introduction

2 Household livelihood strategies

- Participation to aquaculture
- Household members characteristics
- Livelihood combinations
- Time in aquaculture in 2008
- Investments, inputs and size of ponds
- Consumption and sales of fisheries products

3 Participation to fisheries and revenue

- Modelling approach
- Participation and revenue
- Switching in or out 2006-2008
- Participation to fish sales
- Preliminary findings

4 Conclusion

Context

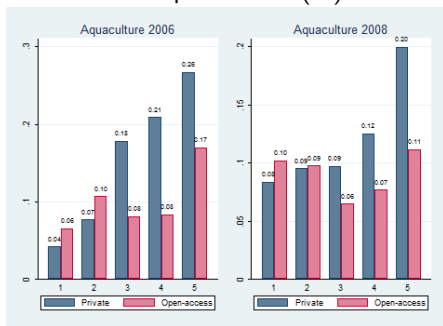
- Focus on fisheries development since 1960s in Viet Nam → development of small scale extensive culture systems
- Last two decades → sector diversification and growth
 - Fisheries production → 4.6 million tonnes of fish, crustacean and molluscs in 2008
 - Increase in fisheries exports ⇒ from US\$2.75 billion in 2005 to US\$3.78 billion in 2007
 - Fisheries → third key economic sectors (MoFI, 2005) in (Nguyen and Truong, 2005)

Types of fisheries

- Three types of fisheries in Viet Nam
 - Marine fishing → onshore or offshore, some done by households
 - Aquaculture in fish/shrimp ponds → household level, in-land and sometimes coastal
 - Extraction from common property resources → river, lakes, ponds...
- Aquaculture ⇒ 30 to 40% contribution to total national fisheries production
⇒ Fisheries revenue → 4% of the Vietnamese GDP in 2003 (Duc, 2008)
- Aquaculture → in prospect for a rapid development → 2 million hectares of potential water surface (FICEN, 2005) in (Duc, 2008)

In each quintile

Figure: Participation rate in different quintiles of total production (%)



■ Private aquaculture

High entry costs \Rightarrow investments in ponds, reduction of share of land dedicated to rice cultivation, high risks due to diseases of fish, floods ...

- ### ■ Open-access activity
- most of it \rightarrow low entry costs (households access nearest ponds according to access regulation system)

Household members characteristics

Table: Household members characteristics 2008

| Province | Priv Aqua 2008 | | | O-A Aqua 2008 | | |
|--------------|----------------|------|-----|---------------|------|-----|
| | Men | Age | Edu | Men | Age | Edu |
| Ha Tay | 47.2 | 37.9 | 4 | 59.4 | 36.7 | 3 |
| Lao Cai | 57.1 | 35.3 | 3 | | | |
| Phu Tho | 54.8 | 40.7 | 3 | 80.0 | 31.4 | 5 |
| Lai Chau | 51.2 | 32.4 | 3 | | | |
| Dien Bien | 53.7 | 31.1 | 3 | 90.6 | 26.2 | 3 |
| Nghe An | 54.3 | 42.1 | 3 | 92.8 | 36.9 | 3 |
| Quang Nam | 53.3 | 43.2 | 3 | 83.3 | 40.6 | 3 |
| Long An | 55.9 | 42.4 | 3 | 87.1 | 37.4 | 3 |
| Total | 54.3 | 36.6 | 3 | 80.6 | 35.6 | 3 |

- Men more represented than national average in aquaculture and especially in open-access
- Individual education levels similar in private and open-access aquaculture and not different from national average
- Aquaculture workers → slightly older than national average

Livelihood combinations

- Fisheries → small part of most households' livelihoods combined with other aspects
 - 293 out of 335 that do private aquaculture combine it with 4 or more activities and 309 out of 391 doing open-access
 - 80 to 90% of those doing aquaculture → rice cultivation, non-rice cultivation or livestock, slightly lower for open-access
 - around 50% combine with wage work
 - 73 out of 335 doing private aquaculture → also fisheries from common resources
 - 7 households only open-access → 5 in 5th quintile in 2008 in Nghe An, Quang Nam and Khanh Hoa

Total production distribution

Figure: 2006

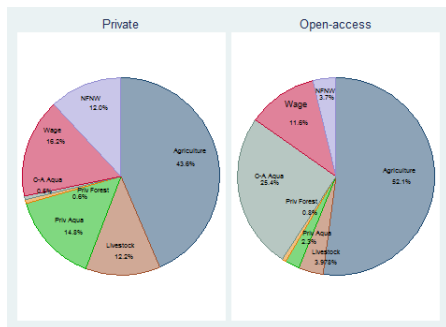
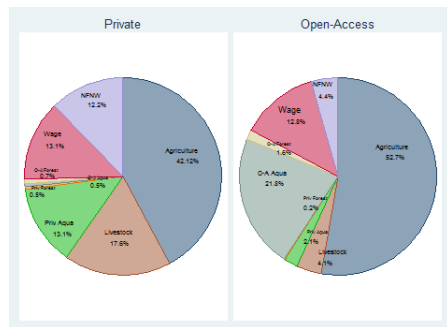


Figure: 2008



Total production distribution

- **Agriculture** ⇒ more important for these households than for the average
- **Private aquaculture** → 13% of total production for households participating
- **Open-access fisheries** → 22% of total production for households participating
- **Wage** → important for households in each type of fisheries
- **Livestock** → important for households in private aquaculture

Total production distribution is for households participating to fisheries (private or open-access)

Revenues at province level

Table: Revenue in each province and contribution to total production (1,000 dong/capita)

| Province | Priv aqua 2006 | O-A Aqua 2006 | Priv aqua 2008 | O-A Fisheries 2008 |
|--------------|----------------|----------------|----------------|--------------------|
| | Revenue (%) | Revenue (%) | Revenue (%) | Revenue (%) |
| Ha Tay | 2171.9 (28.9) | 728.0 (21.9) | 6278.8 (25.8) | 714.1 (9.7) |
| Lao Cai | 814.7 (12.8) | 1550 (16.2) | 966 (15.4) | 129.9 (2.5) |
| Phu Tho | 475.6 (7.6) | 377.9 (6.5) | 1194.1 (14.8) | 328.8 (5.7) |
| Lai Chau | 279.6 (9.8) | 296.5 (11.5) | 368.8 (6.0) | 127.1 (2.8) |
| Dien Bien | 1316.2 (35.9) | 97.8 (4.2) | 764.6 (11.7) | 183.0 (2.9) |
| Nghe An | 760.5 (19.6) | 4794.0 (77.7) | 1831.9 (25.8) | 7058.7 (66.5) |
| Quang Nam | 5054.4 (53.6) | 22165.4 (91.7) | 4524.0 (23.3) | 31144.4 (86.4) |
| Long An | 1287.7 (12.5) | 477.9 (3.8) | 2609.3 (9.4) | 407.8 (2.0) |
| Total | 1076.5 (14.8) | 2132.5 (25.4) | 2031.8 (13.1) | 2921.3 (21.3) |

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Contribution of aquaculture in each quintile of total production

Table: Revenue in quintiles of total per capita production and contribution to total production (1,000 dong/capita)

| Quintile | Priv aqua 2006 | O-A Aqua 2006 | Priv aqua 2008 | O-A fisheries 2008 |
|--------------|----------------|---------------|----------------|--------------------|
| | Revenue (%) | Revenue (%) | Revenue (%) | Revenue (%) |
| First | 136.3 (5.4) | 167.3 (7.5) | 338.9 (13.0) | 219.0 (7.5) |
| Second | 221.0 (7.8) | 290.1 (11.8) | 520.2 (11.6) | 353.5 (7.7) |
| Third | 334.9 (6.7) | 289.2 (9.4) | 920.6 (13.2) | 650.8 (9.2) |
| Fourth | 709.3 (13.2) | 733.1 (14.7) | 1831.8 (17.4) | 867.7 (7.8) |
| Fifth | 2253.1 (18.3) | 5621.1 (30.0) | 4129.3 (12.3) | 10381.6 (27.7) |
| Total | 1076.5 (14.8) | 2132.5 (25.4) | 2031.8 (13.1) | 2921.3 (21.3) |

- Importance of **private aquaculture** increases with quintile in 2006 → less the case in 2008
- Wealthier households engaged in **open-access** → nearly one third from open-access fisheries

Time uses

- Households spend 9.6% of their time uses working in **private aquaculture** and 8.4% working in **open-access**
- Households living in Nghe An and Ha Tay → 16.1% and 11% of their total time uses in **private aquaculture** and 22.5% and 13% working in **open-access fisheries**
- Few households in Quang Nam working in aquaculture → 13.4% of their time in private aquaculture and 32% in open-access
- Wealthier households devote less time to **private aquaculture** → 9.4% of their time while poorer devote 12.8%
- Wealthier households devote more time to **open-access fisheries** → 17.9% of their time while poorer devote 5.2%

Fish ponds at province level

- Increase of investments in fish ponds → 36.9% of households doing private aquaculture in 2006 and 47.5% in 2008
- decrease size of fish ponds → 1,396.7m² in 2006 to 1,160.7m² in 2008
 - same proportion of households investing in **Dien Bien** and **Nghe An** but size of ponds **Dien Bien** → half the size of ponds in **Nghe An**
 - **Quang Nam** → small number of households investing in fish ponds but large fish ponds
- Spending on inputs → 85.3% in 2006 and 98.4% in 2008

Fish ponds in each quintile

Table: Size of fish ponds and share of fish ponds in 2006 and 2008

| Province | Fish ponds 2006 | | | Inputs in 2006 | | Fish ponds 2008 | | | Inputs in 2008 | |
|--------------|-----------------|---------------|------------|------------------|---------------|-----------------|---------------|-------------|------------------|---------------|
| | Invest. | Area | Share | % of house-holds | Value | Invest. | Area | Share | % of house-holds | Value |
| First | 44.4 | 396.9 | 9.2 | 83.3 | 3477.6 | 63.9 | 200.1 | 6.2 | 94.4 | 763.1 |
| Second | 33.3 | 322.9 | 6.4 | 87.9 | 641.9 | 65.8 | 611.3 | 8.7 | 97.5 | 1404.6 |
| Third | 40.2 | 395.4 | 8.7 | 84.4 | 1172.1 | 50.0 | 733.3 | 8.9 | 100 | 2319.6 |
| Fourth | 42.2 | 530.1 | 7.1 | 84.4 | 1502.4 | 38.9 | 1696.0 | 14.5 | 100 | 3339.8 |
| Fifth | 30.4 | 3131.8 | 13.9 | 86.1 | 6394.7 | 36.0 | 1697.4 | 10.9 | 98.8 | 9918.8 |
| Total | 36.9 | 1369.7 | 9.9 | 85.3 | 3137.1 | 47.5 | 1160.7 | 10.3 | 98.4 | 4694.4 |

- Share of land and size of fish ponds go up with quintile but not the percentage of households investing in fish ponds
- Poorer are more likely to invest in ponds especially in 2008
- Spending on inputs goes up with quintiles and proportion of households investing remains same

Returns in aquaculture

- Higher average returns per unit area than agriculture
 - ⇒ in 2006, 2.7 dong/ m^2 in agriculture and 7.9 dong/ m^2 in aquaculture
 - ⇒ in 2008, 5.0 dong/ m^2 in agriculture and 11.8 dong/ m^2 in aquaculture
 - ⇒ Aquaculture is not more variable than agriculture
- Input expenses are greater for aquaculture
- Relative to time use also higher returns in aquaculture
 - ⇒ 9.6% of time and 13% of income in aquaculture
 - ⇒ 51% of time and 35% of income in agriculture

Consumption and sales at province level

- Sales of private and open-access fish are important and increasing
 - **Private aquaculture**: 58% of fish production in 2006 and 75% in 2008
 - **Open-access fisheries**: 55% of fish production in 2006 and 91% in 2008
 - ⇒ Participation to sales remain the same over time
- **Ha Tay**: both types of sales important → 83% and 97% and around 82% of households sell
- **Quang Nam**: open-access sales more important → 98% of production in both waves and more open-access sellers in 2008 (78%)
- **Long An**: private and open-access sales → less than 50% and 22% to 30% of households sell
- Sales go up with quintiles in both private and open-access fisheries
- Richer households are not more likely to participate to sales

Summary of descriptive analysis

- Fisheries done by agricultural households as part of multiple livelihood
- However, fisheries → high-return activity and important source of income
- Open-access fisheries → important for some wealthy households as well as for many poor ⇒ different types of open-access fisheries
- High proportion of sales → done by wealthier households

Modelling approach

- Participation in fisheries - Private or open-access - and revenue from it \Rightarrow Heckman model to control selection bias
 - Estimate participation in fisheries according to different household composition and characteristics (size of household, age of members and education) and participation in alternative activities
 - Estimate household revenue from fisheries as a function of households' investments, size of ponds and household characteristics
- Estimate household switching strategy in or out of private aquaculture and household participation to sales \Rightarrow Probit function of household characteristics, aquaculture activity characteristics and participation to alternative activities

Results for 2006

| | Private | | Open-access | |
|---------------|--------------------|------------------------|----------------------|--------------------|
| | Participation | log revenue | Participation | log revenue |
| children | -0.0554 (0.0436) | | 0.0501 (0.0444) | |
| elder | 0.0586 (0.0798) | | -0.0745 (0.0985) | |
| lstockdu | 0.825*** (0.135) | | -0.340*** (0.100) | |
| nonlab | -0.820*** (0.169) | | -1.162*** (0.199) | |
| healthinsur | -0.0864 (0.0790) | | -0.0970 (0.0918) | |
| halfagricarea | -0.651*** (0.110) | | -0.294** (0.143) | |
| invfor | 0.271*** (0.102) | | -0.0279 (0.132) | |
| dumaquainput | | 1.704*** (0.199) | -0.163 (0.126) | |
| aquaarea | | 3.93e-05*** (1.03e-05) | -0.000120 (7.97e-05) | |
| agehead | 0.00573 (0.00427) | -0.00615 (0.00608) | -0.00234 (0.00509) | 0.000379 (0.00920) |
| genderhead | 0.380*** (0.117) | -0.131 (0.267) | 0.476*** (0.139) | -0.487 (0.363) |
| agecat4hhsz | -0.160 (0.276) | 0.536 (0.501) | -0.638** (0.319) | 0.759 (0.723) |
| agecat5hhsz | -0.299 (0.291) | -0.0413 (0.462) | -0.625* (0.346) | 1.644** (0.724) |
| agecat6hhsz | -0.215 (0.289) | 0.470 (0.461) | -0.677* (0.379) | 0.946 (0.793) |
| gedu4head | 0.380*** (0.0948) | | -0.0964 (0.110) | |
| gedu5head | 0.239* (0.129) | | -0.202 (0.166) | |
| gedu2 | 0.0310 (0.0418) | | 0.116*** (0.0416) | |
| gedu3 | 0.0947*** (0.0355) | | 0.149*** (0.0370) | |
| Constant | -1.962*** (0.341) | 6.988*** (0.730) | -0.556 (0.371) | 10.64*** (0.890) |
| lnsigma | -0.545*** (0.200) | | -0.752*** (0.208) | |
| arrho | 0.271*** (0.0752) | | 0.474*** (0.0952) | |
| Observations | 2156 | 2156 | 2156 | 2156 |

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results for 2008

| | Private | | Open-access | |
|---------------|-------------------|------------------------|------------------------|-------------------|
| | Participation | log revenue | Participation | log revenue |
| children | -0.105** (0.0458) | | 0.0342 (0.0448) | |
| elder | 0.124 (0.0863) | | -0.0344 (0.0981) | |
| lstockdu | 0.545*** (0.108) | | 0.116 (0.0989) | |
| nonlab | -1.000*** (0.253) | | -0.872*** (0.315) | |
| healthinsur | 0.138 (0.0877) | | -0.141 (0.0999) | |
| halfagricarea | -0.452*** (0.108) | | -0.176 (0.130) | |
| invfor | 0.451*** (0.0931) | | 0.250** (0.104) | |
| dumaquainput | | 1.040* (0.571) | 0.396*** (0.119) | |
| aquaarea | | 0.000103*** (1.79e-05) | -0.000208** (9.93e-05) | |
| agehead | 0.00135 (0.00457) | 0.000906 (0.00666) | -0.00666 (0.00502) | 0.00688 (0.00890) |
| genderhead08 | 0.256** (0.115) | 0.237 (0.253) | 0.0472 (0.122) | 0.0789 (0.280) |
| gedu4head | 0.0323 (0.110) | | -0.00424 (0.119) | |
| gedu5head | 0.131 (0.147) | | -0.145 (0.184) | |
| agecat4hhsz | 0.0662 (0.298) | 0.716 (0.562) | -0.340 (0.326) | 0.565 (0.733) |
| agecat5hhsz | -0.176 (0.315) | 0.542 (0.521) | -0.341 (0.352) | 1.217 (0.748) |
| agecat6hhsz | 0.0548 (0.311) | -0.122 (0.500) | -0.0521 (0.345) | -0.530 (0.672) |
| gedu2 | 0.0608 (0.0542) | | 0.186*** (0.0516) | |
| gedu3 | 0.101*** (0.0373) | | 0.0994** (0.0397) | |
| Constant | -1.404*** (0.327) | 8.704*** (1.177) | -1.631*** (0.373) | 10.74*** (0.871) |
| lnsigma | -0.515** (0.251) | | -0.564** (0.250) | |
| arrho | 0.208** (0.0893) | | 0.352*** (0.102) | |
| Observations | 2155 | 2155 | 2155 | 2155 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Switching IN - OUT aquaculture in 2008

| | Switching IN | Switching OUT |
|------------------|--------------------|--------------------|
| lstockdu | | -0.132 (0.445) |
| nonlab | -0.213 (0.276) | 0.591 (0.411) |
| halfagricarea | -0.251 (0.246) | 0.488* (0.262) |
| genderhead | -0.0212 (0.164) | |
| agehead | 0.0105 (0.00713) | -0.0167* (0.00969) |
| agemean | -0.0157* (0.00953) | 0.0275** (0.0133) |
| agecat2hhsz | | 1.040** (0.511) |
| agecat3hhsz | 0.862** (0.378) | |
| agecat4hhsz | 0.518 (0.370) | 0.256 (0.605) |
| agecat5hhsz | | -0.220 (0.626) |
| agecat6hhsz | -0.361 (0.411) | -0.386 (0.610) |
| agecat7hhsz | | -0.168 (0.657) |
| gedu2max | | -1.040* (0.597) |
| gedu3max | 0.279 (0.205) | -0.262 (0.330) |
| gedu4max | 0.248 (0.179) | -0.418 (0.265) |
| gedu5max | 0.146 (0.187) | -0.183 (0.266) |
| gedu1head | -0.0179 (0.241) | -0.245 (0.446) |
| gedu2head | | 0.0453 (0.255) |
| gedu3head | 0.414** (0.191) | -0.133 (0.230) |
| gedu4head | 0.456** (0.207) | |
| gedu5head | 0.350 (0.285) | |
| dumaquainput | | -0.644*** (0.244) |
| invpond | | -0.201 (0.183) |
| numbfishpond | | -0.269** (0.130) |
| duminpcrop | 0.423 (0.326) | -0.146 (0.413) |
| duminplstock | 0.0384 (0.280) | -0.358 (0.533) |
| pwage | -0.299** (0.132) | 0.160 (0.166) |
| pfnfw | -0.150 (0.147) | -0.197 (0.192) |
| plstock | 0.159 (0.264) | |
| caqua | 0.710*** (0.159) | |
| Constant | -2.996*** (0.513) | 0.662 (0.829) |
| Observations | 1824 | 332 |
| Pseudo R-squared | 0.217 | 0.162 |

Standard errors in parentheses



Results for 2006

| | Private | Open-access |
|---------------|--------------------|------------------|
| lstockdu | -0.350 (0.493) | 0.532 (0.371) |
| nonlab | -0.121 (0.436) | -0.204 (0.642) |
| halfagricarea | 0.589** (0.282) | -0.712* (0.400) |
| agehead | -0.00760 (0.00961) | 0.0155 (0.0136) |
| agemean | 0.0195* (0.0116) | -0.0766 (0.0467) |
| agecat1hhsz | | -2.094 (1.990) |
| agecat2hhsz | | -1.948 (1.483) |
| agecat3hhsz | 0.416 (0.468) | -1.840* (0.991) |
| agecat5hhsz | -0.292 (0.474) | 0.859 (0.717) |
| agecat6hhsz | -0.0755 (0.562) | 0.798 (0.957) |
| agecat7hhsz | -0.702 (0.695) | 0.932 (1.286) |
| gedu1head | 0.674 (0.414) | |
| gedu2head | 0.369 (0.250) | |
| gedu3head | | -0.468* (0.274) |
| gedu4head | 0.438* (0.231) | -0.316 (0.331) |
| gedu5head | 0.358 (0.318) | -0.396 (0.582) |
| gedu2max | | -0.0734 (0.565) |
| gedu3max | 0.624** (0.291) | 0.105 (0.292) |
| gedu4max | 0.501*** (0.191) | -0.338 (0.317) |
| dumaquainput | 0.785*** (0.291) | -0.374 (0.348) |
| invpond | 0.473*** (0.182) | -0.348 (0.551) |
| numbfishpond | -0.0968 (0.127) | |
| duminpcrop | -0.601 (0.459) | -0.151 (0.396) |
| duminplstock | 0.552 (0.586) | -0.199 (0.370) |
| pwage | -0.274 (0.168) | -0.280 (0.224) |
| pnfnw | 0.115 (0.200) | 0.559** (0.283) |
| Constant | -1.745** (0.855) | 2.839 (1.793) |

Results for 2008

| | Private | Open-access |
|------------------|-------------------|--------------------|
| lstockdu | 0.272 (0.445) | 0.589 (0.523) |
| nonlab | -0.430 (0.704) | -1.282 (1.833) |
| halfagricarea | -0.322 (0.259) | -1.251*** (0.480) |
| agehead | 0.0128 (0.0113) | 0.00627 (0.0145) |
| agemean | -0.00238 (0.0172) | -0.0574** (0.0266) |
| agecat2hsize | -1.665** (0.786) | -1.588* (0.956) |
| agecat3hsize | -0.960 (0.715) | -0.551 (0.934) |
| agecat6hsize | -0.640 (0.603) | -1.241 (0.967) |
| agecat7hsize | -2.219*** (0.816) | -0.120 (1.769) |
| gedu2head | -0.0664 (0.427) | -0.0915 (0.465) |
| gedu3head | 0.229 (0.393) | 0.345 (0.455) |
| gedu4head | -0.177 (0.452) | 0.227 (0.513) |
| gedu5head | | 0.287 (0.509) |
| gedu2max | | 0.994 (0.786) |
| gedu3max | 0.560 (0.407) | 0.871* (0.458) |
| gedu4max | 0.649** (0.312) | 0.347 (0.444) |
| gedu5max | 0.252 (0.339) | 0.224 (0.535) |
| dumaquininput | 0.471 (0.747) | -0.208 (0.379) |
| invpond | -0.0875 (0.229) | 0.593 (0.737) |
| numbfishpond | 0.0623 (0.139) | -0.303 (0.480) |
| duminplstock | -0.506 (0.509) | -0.328 (0.536) |
| pwage | -0.0539 (0.199) | -0.595** (0.296) |
| pnfnw | 0.335 (0.237) | -0.224 (0.301) |
| Constant | 0.251 (1.091) | 2.977*** 1.141) |
| Observations | 259 | 138 |
| Pseudo R-squared | 0.220 | 0.264 |

Standard errors in parentheses



Interpretation

- Households participating to agriculture → more likely to participate to private aquaculture
- Households participating to livestock → more likely to participate to private aquaculture but less likely to participate to open-access fisheries
- Households with non-labour income or wage income → less likely to participate to private aquaculture
- Households with wage income → less likely to switch in private aquaculture
⇒ no effect of wage income on switching out of private aquaculture
- Households participating to open-access fisheries in 2006 → more likely to switch in private aquaculture in 2008

Findings

- Regressions corroborate findings from descriptive analysis
 - Agricultural households more likely to participate in fisheries
 - Households with livestock more likely to participate in private aquaculture
- additional insights from the regressions
 - Households with non-labour income less likely to participate in fisheries → Households with more educated more likely to participate in private aquaculture

Future research

- Labour allocation to private and open-access fisheries building on household model of production to investigate welfare impacts of participating to these activities
- Distinguish aquaculture for coastal and in-land provinces to capture effects of marine fishing or in-land fishing against fish/shrimp farming
- Extend model to third round

Thank you



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