

Entrepreneurial Rationale in Rural Areas : the Case of Shrimp Farming

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Introduction

Within the same sectoral but macro-economic environment, different types of entrepreneurship may develop. In other words, a favourable macro-economic environment, which is the same for all and whose variables may be the stimulating call of an external market or the mode of operating a production chain, gives rise to not one, but several entrepreneurial responses. Thus the development of a new product and the insertion of Thailand in the world economy for that product may be brought about by the coexistence of different but obviously interactive production systems, resulting from the choices made by corporate heads. Our study, instead of merely reporting on these facts, is designed to grasp the reasoning behind the choices made by the players in entrepreneurial ventures, and to review the consequences of these choices on the entire production chain and on the strategy of newcomers.

Shrimp farming provides the optimal analytical framework in that, on the one hand, it incorporates several types of entrepreneurship, and on the other hand, its recent and very rapid development may be considered as having affected the options of the newcomers and even modified those of the old timers. And the spectacular growth of this sector, which has made it one of the top sectors in the Thai economy (Baht 12 billion in exports in 1990 and about 80,000 direct jobs), was indeed accompanied by the constant restructuring of the different segments of the aquacultural production chain and its macro-economic environment.

1. The Different Strategies to Mobilize the Factors of Production (Land and Capital)

A positive response by the head of a holding to farming innovations, in shrimp farming for instance, depends on his capacity to mobilise new land, capital or labour resources, or to distribute the resources already being used differently. This mobilisation or reallocation takes place not just on the basis of the characteristics of the holding, but also depends on exogenous factors.

Thus, the mobilisation or allocation modalities, the land available, the ways and means of using manpower and its cost, the shrimp farmer's financial situation and the conditions of access to loans will determine the entrepreneur's choice of one production system as opposed to another.

But obviously, this choice is made by taking into account a set of factors over which the entrepreneur has little or no control, such as the attraction of an internal or external market, the possibility of benefitting from technological transfers, the existence or reduction of bottle-necks in the different stages of the production chain, the cost of the factors of production, the setting up of a credit line, etc.

In shrimp farming, a distinction is usually made between three main types of production systems : extensive, semi-intensive and intensive (relating to the nomenclature used by the Department of Fisheries). A brief description of the characteristics of the different systems of production may be useful here.

-Extensive shrimp culture, which represents the first Thai stage in this context, is practised in ponds, sometimes natural, but most often artificial, watered by the tide, with a sluice gate to retain the water and the trapped fry until the next tide. This is therefore a system which requires hardly any inputs, but at the same time, the output is low.

-The semi-intensive system is, by definition, heterogeneous, because it combines both the extensive and intensive systems depending on the farmer; the fry and the feed come from both the natural environment and are injected into the pond by the supplementary addition of post-larvae and industrial feed. This combined practice explains the very high variability of annual yield, depending on the degree of intensification of the artificial pond : from 0.5 to 3 tons per hectare during the two or three annual cycles of three to four months each, a supplementary addition of industrial feed, varying from one to seven, and especially, a daily water renewal rate of 5% to 20%.

-The intensive system in Thailand was based on the Taiwanese model, and is characterised by high densities, requiring inputs in the hatcheries or nurseries, and therefore, the addition of industrial feed, fertiliser and various chemicals to maintain an adequate level of water quality, veterinarian products to prevent disease and the use of aquaculture equipment to provide oxygen and renew the water daily (the rate of renewal varies between 10% and 30%). However, even more markedly than in the semi-intensive system, the intensive system covers a wide variety of different situations, depending on the level of investment or operating costs, and thus records a wide range of annual yields, which can be anything between three and thirty tons per hectare.

The 1990 DOF's census (Department of Fisheries) relating to the shrimp culture households and companies allowed us to know the whole figure of shrimp farms. This census, like the former ones, was classified by type of production system (extensive, semi-intensive and intensive) and by cultivated area (shrimp farming). We choose a sample of shrimp farms by province, following the importance of each production system : 61 extensive shrimp farms, 73 semi-intensive ones and 212 intensive holdings. Our field work was conducted in 1991, through questionnaires distributed among a representative sample of 346 shrimp farms along the entire coastline. This survey was completed by interviews of 54 entrepreneurs all along the chain of shrimp production and marketing.

As a result of our field work¹, we make the following distinction within the intensive system : titled holdings², untitled holdings³, and tenant-farmer holdings. A breakdown of shrimp farms according to land ownership status highlights the very small number of untitled or tenant farmers in extensive or semi-intensive farming, whereas the three forms are equally represented in intensive farming.

Table 1 : Distribution of Shrimp Farms by Land Tenure and Production System (1991).

	Titled	Tenant	Untitled
Intensive	36%	33%	31%
Semi-intensive	80%	7%	13%
Extensive	85%	7%	8%

Source : field survey 1991.

Table 2 : Shrimp Farms Area by Land Tenure and by Production System (1991; in hectare).

	Titled	Tenant	Untitled	Average
Intensive	3,17	2,00	2,33	2,50
Semi-intensive	6,33	4,83	5,17	6,17
Extensive	7,67	7,50	6,50	7,67

Source : field survey 1991.

Tenant and untitled farmers develop a much smaller surface area than titled farmers. The most significant difference between them is to be found in intensive farming and may be explained by the very great pressure exerted on shrimp farming land, which, in turn, has repercussions on the lease or cost of using untitled land. Firstly, the tenant or untitled intensive farmer has to pay a very high rent per hectare. Secondly, there is a considerable price to pay for access to the land, which is presented as the price of servicing the plot, but which, in fact, is far higher than the true value, since it includes all the profits and informal costs related to illegal servicing (for instance when the land is mangrove forest). We shall see that these extra costs in using untitled land induce greater intensification and lead to a higher loan being contracted than for other forms of intensive farming, where the costs appear in the holding's fixed operating costs.

Generally speaking, shrimp farmers' strategies seem to be aimed at maintaining or improving their economic gains while reducing the risks. To this end, they seek to counteract the constraints of the production system they have adopted and to capitalise on production factors : this behaviour is described by many authors and is not just true of aquaculture. But shrimp farmers divide the overall production risk into partial risks to cover each separate factor of production and test their control over each individual factor, for example to see how far the new technologies are more risky than existing technology.

1- Conducted with the help of Abha Siriwongs (CUSRI).

2- Where the owner can mortgage his land.

3- i.e. those encroaching illegally (for example on mangrove forests, without being legalized), or temporarily enjoying the right of usufruct. The distinction made between titled and untitled farmers in agriculture is used here. Cf G. Feder and alii (1988).

An analysis of land assets and other fixed assets shows that intensification is related to land-ownership status : the weaker the ownership link, the greater the intensification to compensate for the cost of access to the land. Thus, within the intensive system, the value of each hectare of fixed assets, other than land for shrimp tenant or untitled farmers, was an average of almost Baht 300,000, or more than twice that of "intensive", titled shrimp farmers and more than ten times that of "semi-intensive" or "extensive" farmers.

Table 3 : Land and Others Fixed Assets by Production System (1991; in Baht; by hectare⁴)

	Extensive (titled)	Semi-intensive (titled)	Intensive (titled)	Intensive (tenant)	Intensive (untitled)
Land assets					
Owned land	510000	600000	840000	-	-
Tenancy title or use	-	-	-	54000	38000
Total	510000	600000	840000	54000	38000
Others fixed assets					
Serviced plot, pond construction and water circulation system	1900	9700	57000	131000	151000
Building	2600	6500	22000	50000	51000
Equipment	3900	6400	25000	55000	60000
Transportation	6500	3200	16000	35000	34000
Total	14900	25800	120000	271000	296000
Total	524900	625800	960000	325000	334000

Source : field survey 1991.

The value of land assets owned by titled farmers could explain an apparent under-investment attitude in relation to the optimum bio-economic potential. The owner of these assets, benefitting from land speculation, makes a hefty profit of the value added in any case, without having to run the risk of intensifying the shrimp farming process. Nonetheless, the value of land assets per hectare is greater in the intensive system than in in the semi-intensive or extensive systems, and is Baht 840,000, 600,000, 510,000 respectively, the difference being due to land development (servicing and landscaping for aquaculture). Measured, not in terms of the value of land assets, but in terms of the cost of leasing the land, the difference between the systems adopted is even greater : on average and by hectare, Baht 38,000 for the intensive system, 8,000 for the semi-intensive system and 6,000 for the extensive system.

According to our surveys, the development over two years of land assets and other fixed assets by shrimp farmer category highlights the value added earned in property by titled farmers. Similarly, a comparison, two years later, of the purchase price and rent of land, regardless of their very high amounts, which generally affects all regions, albeit unequally, confirms the gains made by titled farmers from land speculation.

4- During the survey : 1 bath = 0,04 US\$

Table 4 : Change in Inventory of Assets by Shrimp Farm and Production System
(1988-1991; in constant Baht, based 1991)

	1988	1991
<u>Extensive</u>		
Land assets	1700000	4830000
Others fixed assets	66000	70000
<u>Semi-intensive</u>		
Land assets	1500000	4560000
Others fixed assets	151000	160000
<u>Intensive (titled)</u>		
Land assets	1600000	3420000
Others fixed assets	365000	390000
<u>Intensive (tenant)</u>		
Land assets (tenancy title)	42000	75000
Others fixed assets	493000	540000
<u>Intensive (untitled)</u>		
Land assets (land use)	34000	69000
Others fixed assets	607000	682000

Source : field survey 1991.

Table 5 : Change in Land Price and Rent by Region (1988-1991;
by hectare; in constant Baht, base 1991)

	Purchasing price		Rent(intensive system)	
	1991	1988	1991	1988
Eastern part	610000	346000	40000	28000
Inner part	1960000	1680000	53000	43000
Central part	9820000	780000	43000	33000
Southern part	580000	340000	30000	18000
Andaman sea	410000	280000	21000	12000

Source : field survey 1991 (32 missing values).

On the other hand, untitled farmers have to pay a large access fee, which encourages them to intensify by taking out loans (the possession of a title deed is not a prerequisite for obtaining a loan). But in such cases, the shrimp farmer will go deep into debt to develop his activity, and thus runs a higher risk, given the numerous hazards of shrimp farming (epizootics, pollution, etc.), than the farmer who is not obliged to intensify. On average, untitled and tenant "intensive" farmers have similar debts of around Baht 270,000 per hectare, 65 % of which is tied to institutional credit, which is more than twice that of titled "intensive" shrimp farmers. At the other end of the scale are those who practice the extensive system, characterised by much lower debts, of less than Baht 10,000 per hectare, 26 % of which is tied to informal loans.

Table 6 : Debt Outstandings by Type of Loan and Production System
(1991; by hectare; in Baht)

	Institutional loans	Informal loans	Total
Extensive	2000	5700	7700
Semi-intensive	14500	12000	26500
Intensive (titled)	83400	37900	121300
Intensive (tenant)	182000	80000	262000
Intensive (untitled)	176500	94000	270500

Source : field survey 1991 (25 missing values).

2. Extensive Production System Holding and Intensification.

Ideally, to understand the reasoning behind the selection of a new system of aquaculture, the choice must be related to the constraints affecting all the economic activities of the entrepreneur in question. While not adopting such an approach, which would require too cumbersome an investigation, mention should be made of some indicators, such as the 'rate of pluri-activity' or the annual income drawn from other activities, which may explain the rationale, which must often be sought outside the strict framework of the activity under consideration. Our surveys indicate that the number of other activities decreases with intensification since, while 81% of extensive farmers have one or two additional activities besides aquaculture, the percentage drops to 23% for the farmers practicing the more intensive system.

Table 7 : Distribution of Shrimp Farmers by Number of Complementary Jobs
(1991; by production system).

	None	One	More than 1	Total
Extensive	19	68	13	100
Semi-intensive	29	59	12	100
Intensive (titled)	58	32	10	100
Intensive (tenant)	69	23	8	100
Intensive (untitled)	77	20	3	100

Source : field survey 1991 (21 missing values).

Thus, on average, an extensive farmer declares an annual income of Baht 31,000 from other activities besides aquaculture, as opposed to Baht 12,000 for an intensive farmer and Baht 25,000 for a semi-intensive farmer. The 'pluri-activity' of extensive farmers reveals their refusal to take the risks related to intensification (debts, risks of production, possibly having to mortgage their land), while seeking to better distribute the risks involved by engaging in several activities such as aquaculture and rice cultivation or aquaculture and fisheries; our surveys show that in the extensive system, the income from aquaculture is lower than from other activities. However, in the few cases where another activity is practised by "intensive" farmers, they generally earn more from it than extensive farmers, probably because their activities are more specialised, and correspond to a higher level of education. Thus, they are usually less involved in primary sector activities, such as rice cultivation or fisheries than extensive or semi-intensive farmers.

Table 8 : Distribution of Shrimp Farmers by Main Complementary Job
(by production system)

	Extensive	Semi-intensive	Intensive
Agricultural activities (rice, orchard, plantation)	47	39	18
Fishery	29	24	8
Mechanic, craftsman, food processing	9	14	32
Wholesaler, retailer	7	11	26
Government employee	-	2	5
Private sector employee	3	3	8
Others	5	7	3
Total	100	100	100

Source : field survey 1991.

Over the past five years, the extensive system has not undergone any major changes, as can be seen from the figures for the number of holdings, their average surface area, their yield per hectare and the development of their fixed assets. From 1988 to 1991, the number of extensive shrimp farms remained stable (2,900 to 2,800), their average surface area increased by only 4% (from 7 to 8 hectares), their yield dropped by only 14 % and their fixed assets (other than land or financial) increased by only 6%. This stability in the number of "extensive" holdings and their overall configuration points to their viability and the fact that they remain outside the process of intensification.

Table 9 : Change in Number of Farms, Area, Yield per Hectare and Fixed Assets
(extensive production system)

	1988	1991
Number of farms	2910	2819
Area (hectare)	20113	22343
Yield/hectare	349	316
Fixed assets/farm (Baht)	66000	70000

Source : field survey 1991.

The extensive farmers' refusal to intensify is confirmed by the small number of extensive holdings which moved towards the semi-intensive or intensive production systems. In fact, there is very little shifting between production systems, even if the number of semi-intensive holdings that opted for the intensive system is slightly higher.

Thus, there was practically no moving from one production system to another : the original choice was maintained. It follows that the current intensive boom, therefore, does not stem from the conversion of holdings practicing another system of production, the crucial year of the boom being 1987, when the number of "intensive" holdings was multiplied by five and total output by intensive farmers increased six-fold. The driving force of this development was the setting up, by the government, of a sectoral credit policy through the main institutional credit supplier, the Bank of Agriculture and Cooperatives (BAAC); the amount earmarked by the BAAC for the development of shrimp farming increased from Baht 246 million in 1986 to Baht 1,911 million in 1991.

Table 10 : Change in Production System.

	% of present farms
Extensive shrimp farming system	
From extensive to extensive (area extending)	10
From extensive to semi-intensive	5
From extensive to intensive	3
No change	82
Semi-intensive shrimp farming system	
From semi-intensive to semi-intensive (area extending)	8
From semi-intensive to extensive	1
From semi-intensive to intensive	11
No change	80
Intensive shrimp farming system	
From intensive to extensive (area extending)	-
From intensive to semi-intensive	4
From intensive to intensive	9
No change	87

Source : field survey 1991.

A breakdown of holdings, according to the date of their establishment, confirms that "intensive" farms came about recently, since 70% of them were created after 1986. But the details of their establishment also indicate that it was the tenant and untitled farmers who were established the most recently. The shortage of land for aquaculture, strong demand and the refusal of the extensive or semi-intensive farmers to give up their activity, led the newcomers to encroach on mangrove forests - without obtaining any proper title to the land.

Table 11 : Distribution of Shrimp Farms by Date of Creation (by production system; %)

	Before 1980	From 1980 to 1986	From 1987 to 1989	From 1989 to 1991
Extensive production system	44	43	8	5
Semi-intensive production system	15	68	12	5
Intensive production system (titled)	5	33	48	24
Intensive production system (tenant)	5	15	23	57
Intensive production system (untitled)	2	19	26	53

Source : field survey 1991 (28 missing values).

An analysis of operating costs and average incomes according to the production system adopted indicates the heavy land development burden borne by the newcomers, which took the form of a rent (in the case of tenant farmers), or interest rates⁵ (for the untitled farmers) : this additional land cost

5- Our surveys show that the latter were obliged to incur much higher debts to pay for access to the land, which was labelled serviced land, but which in fact, was overpriced since it included all the profits and informal costs related to illegal encroachment (for example when the land was mangrove forest).

may be estimated at Baht 130,000 per hectare per year, an extra cost which gave the intensive titled farmers a comparative advantage. This initial handicap obliged the newcomers to intensify to earn the same profits as titled intensive farmers, while running a greater risk, and with very little added value for the land.

Table 12 : Annual Production and Revenue per Hectare (by production system;1991; in Baht)

Revenue	Intensive (titled)	Intensive (tenant)	Intensive (untitled)	Semi-intensive	Extensive
Production sold	394800	489000	576000	86000	21000
Consumed on farm	20400	17400	19200	15000	10000
Gift	25800	23400	21600	18000	6000
Change in inventory	4200	6000	9000	1000	
Total	445200	535800	625800	120000	37000

Source : field survey 1991.

Table 13 : Annual Operating Costs per Hectare (by production system;1991; in Baht)

	Intensive (titled)	Intensive (tenant)	Intensive (untitled)	Semi-intensive	Extensive
<u>Variable costs</u>					
Labor	48000	50000	60000	8000	4000
Feed	120000	126000	132000	22000	2000
Fuel and electricity	66000	60000	58000	8000	4000
Post-larvae	42000	48000	54000	11000	1000
Maintenance	6000	5500	6000	4000	2000
Medicine, fertilizers, pesticides	12000	14000	14000	8000	3000
Miscellaneous	6000	10000	12000	4000	2000
Total	300000	313500	336000	65000	18000
<u>Fixed costs</u>					
Lease (land and equipment)	12000	50000	6000	9000	1000
Interest	30000	48000	158000	12000	3000
Repairs	12000	18000	12000	4000	1000
Depreciation	36000	52000	58000	16000	5000
Miscellaneous	6000	7000	6000	4000	2000
Total	96000	175000	240000	45000	12000
Total	396000	488500	576000	110000	30000
Profit/hectare	49200	47300	49800	10000	7000

Source : field survey 1991.

Naturally, the annual profit of shrimp farms varies, depending on the production system and the farmer's land-owning status : we estimated it at an average of Baht 120,000 for the intensive system, and Baht 60,000 and 50,000 for the semi-intensive and extensive systems respectively.

Within the intensive system, the best results were obtained by titled farmers, who, on average, obtained a profit which was 1.5 times higher. Nevertheless, the sample of "intensive" holdings is characterised by a greater variation in the return on investment, which is not always higher in capital-intensive holdings, and shows up the difficulties that they have to overcome with regard to their accumulation capacity. In these cases, labour productivity does not grow in equal measure to compensate for the drop in capital productivity : this may be explained by diminishing returns of scale, and the lack of skilled manpower to adapt to new technology.

The gains obtained from the extensive system, especially when income from other activities and land value added are included, show the current viability of this system, which explains its resilience.

Conclusion

The analysis of shrimp farming brings out the viability and the coexistence of several production systems. This coexistence is explained by the various alternatives which entrepreneurs are faced with when making their choices, in light of the possibilities of mobilising the different factors of production as well as in view of factors outside the holding, which, as it has turned out, have been favourable over the last five years of the shrimp boom in Thailand, but which might be less so in the near future. However, the possibilities of mobilising the factors of production are changing, depending, for example, on the availability of certain factors, such as land for aquaculture : this is illustrated in the tremendous difference in the position of a land owning rice farmer who converted to shrimp farming five years ago, and the untitled newcomer, who has to pay a substantial amount to even gain access to land.

The inequality of the situation highlights both the maintenance of the extensive system and the process of intensification. The degree of intensification is dictated by the necessities which different categories of entrepreneurs are obliged to bow to : according to our surveys, when it is possible to establish a viable holding with a low or medium level of intensification, this solution is generally adopted. More particularly, the possibility of passive accumulation stimulated by land speculation, which the titled farmer can benefit from, slows down the degree of intensification. Again, the possibility of exercising several lucrative activities helps to maintain the extensive system.

These entrepreneurial strategies take account of the risks of intensifying, particularly the cost of mobilising the necessary factors of production and thus, the debts that must be incurred to do so. But while Asian and world demand for shrimps has kept Thai aquaculture buoyant over the past five years, the emergence of very competitive big producers (like China, Indonesia, Vietnam and Central America) may change the basics of the problem. It is the intensive farmers, who are in the front line, because they are most vulnerable to changes affecting the entire chain of production : they will thus have to reduce their costs and obtain better yields. To do this, they will have to improve their control over technological constraints to ensure an adequate return on investment and to limit the effects of pollution. They may be assisted in this approach by directive government action.

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