

Implementing clusters for economic development in emerging economies: the luong bamboo sector, Thanh Hoa province, Vietnam¹

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Abstract

Purpose of the paper: Clusters have proven their effectiveness for economic development and have been set throughout the world for a number of decades. More recently, they have been applied in emerging and developing countries to boost their economic performance. Choosing a suitable type of clusters for a typical economic sector, in a specific geographical region with many different issues at stake, including today sustainable development, is a difficult task. Therefore, the purpose of this study is to initially investigate, analyze and select the most suitable and appropriate factors to build up a workable and efficient cluster for emerging economies.

Methodology: Based on existing literature on clusters, analysis of practices in the sector studied and interviews with the different stakeholders have been carried out.

Results: A typical agro-industrial model has been designed. Then, the case study on Luong bamboo production and processing in Thanh Hoa has led to design a specific agro-industrial bamboo cluster.

Limits to research: This study is the first phase of a wider study, which will assess the progress made in the industry after application of the cluster model.

Practical implications: The specific cluster model is helping actors in the industry to improve their practices and performance.

Originality of the paper: This is the only existing study in this field.

Key words: cluster; emerging economies; supply chain management; sustainability; bamboo industry

1. Introduction

The concept of economic cluster is not a recent one. Its origin can be traced back to the 1950s. However, it won its fame in 1990 with the publication of “The competitive advantage of nations” by Michael Porter together with the now well-known “diamond model”. Since that time many scholars, policy-makers and business leaders have worked on this concept, developed it and applied it. Some successful economic clusters have become widely known and used as models, such as the Silicon Valley in California, for electronics and IT, Bangalore in India for IT; Switzerland for watches; Italy for leather

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products, Wall Street in New York City or the City of London for finance (Solvell, 2008).

Originally, economic clusters were set up near transportation routes (rivers, roads, lakes, maritime ports), or natural resources with the availability of skilled workers, benefiting by natural or geographical advantages (Solvell *et al.*, 2003). However, clusters have recently developed near educational or academic centers, research facilities (for innovation), design centers for example in the fashion world and financial centers to tap on intangible resources and facilitate interactions between suppliers and customers.

So today, many governments, policy makers and scholars, especially in emerging economies, advocate the setting-up of clusters as a privileged way of boosting economic performance. Indeed, a number of these clusters have been great successes such as the California wine cluster or the Italian leather fashion cluster (Porter, 1998), the Anji-a bamboo cluster in China (Nilsson, 2013), and the Sinos Valley shoe cluster in Brazil (Nadvi, 1995) for emerging economies. However, success is not guaranteed as the examples of the Kirkos textile and leather cluster or the Gundish Meda textile and garment cluster in Ethiopia show (Ali, 2012). Finding a suitable and economically viable cluster model for a typical sector in a specific region is not a simple task: a cluster model cannot be successfully implemented without some modifications to suit different business environments even in a similar business sector. Therefore, wise choices of appropriate cluster policies from country leaders or policy makers should be carefully made to achieve good economic results while being responsible towards the natural environment and resources.

Therefore, the primary purpose of this paper is to design a general industrial cluster model, then an agro-industrial cluster model for emerging economies and finally a specifically designed agro-industrial cluster model for the Thanh Hoa bamboo sector.

The paper is structured as follows: in a first part, the theoretical background with a literature review will be presented. Then, the different types of clusters will be analyzed and the three models in the context of an emerging economy will be proposed. In a second part, the case of the Luong bamboo sector in Thanh Hoa province in Vietnam will be presented and analyzed.

2. Theoretical background

2.1 Literature Review

A cluster is a group of business entities operating in the same economic field and in a specific region where constituents have strong links with each other and provide a related group of products or services (Ketels, 2008). According to Porter (1998) “clusters are geographic concentrations of interconnected companies and institutions in a particular field”. For Solvell (2003) a cluster “consists of co-located and linked industries, government, academia, finance and institutions for collaboration”. Industrial clusters

connect producers of outputs with suppliers of inputs, buyers, service providers and in some cases, governmental and non-governmental organizations (Ali, 2012). In addition, natural input resources, specialized labor and other services that are available in near-by areas help reduce business costs within clusters. Shorter distances between actors of the cluster also decrease delivery time, transport and storage costs thus increasing business profitability. Due to the geographical proximity, knowledge, technologies and know-how can be easily spilled-over (sometimes through non-institutionalized relationships, such as associations or social networks) and in some cases with the emergence of training and research facilities (Porter, 1990; Solvell, 2008; Ketels, 2003; Ketels and Memedovic, 2008; Ketels *et al.*, 2006). Competition and close proximity lead to higher performance, while closeness permits fast feedback from customers and suppliers (Ketels, 2003). As a result, better products/services are offered at competitive prices and provide a competitive advantage for all stakeholders over similar products/services from outside.

At the beginning, the success of clusters heavily depended on input costs (natural resources or abundant labor force) and location (near a maritime port, a major transportation hub, big conurbations with a large number of customers). Therefore, clusters could enjoy a persistent comparative advantage over time (Porter, 1998). Nowadays although these factors can still be important, they are less decisive determinants for the clusters' competitiveness. Enterprises can compensate disadvantages such as lack of cheap labor, qualified workers and employees or even natural resources by outsourcing, while maintaining a comparative advantage through a more productive use of inputs, which requires regular innovation (Porter, 1998). A striking example is the Apple company, whose products are all designed in California's Silicon Valley with parts produced in Korea, Taiwan and China, finally assembled in China by Foxconn, a Taiwanese company. This also means that a competitive advantage today will be short-lived if it is not continuously revived through innovation. We can mention the examples of Sony and Nokia in the sector of electronics. In the past, Sony took the leading role in consumer electronics with its Trinitron Television set and Walkman and Nokia did likewise with its hard-touch durable cell phone. However, due to the lack of innovation, Sony lost its advantage to more innovative products by Samsung or LG, and, Nokia has disappeared from the mobile phone market, now dominated by Apple and Samsung.

Therefore, innovative ideas or designs are decisive factors for the continued success of an economic cluster and its constituents, but they cannot be generated anywhere; they require an environment that fosters innovation; hence, today the presence of a high concentration of universities, research institutes, laboratories and high-tech zones that spur the innovative process and increase the spillover effects within the cluster.

In addition, an increasing productive use of inputs can be performed through innovation in the management of the supply chain (SCM) and more recently the green management of the supply chain (GSCM). Supply chain management encompasses the whole production process involving all upstream to downstream production activities. Green supply chain management adds concern about the impact on the environment from the

start of the production chain, now including the design of the product till the end of the product's life cycle, recycling and waste treatment included, and about the use of natural resources not only for the present demands, but also for future generations' demands (WCED, 1987). The main purpose of GSCM is then to eliminate or reduce waste (energy, emissions, hazardous liquid, gas or solid chemical wastes) (Lakshimeera and Palanisamy, 2013). Thus, SCM and GSCM create value all along the chain. This notion of value chain and the value system ensuing was first introduced by Porter in 1990: the value chain involves economic actors all along the supply chain from upstream to downstream through all the stages of production. An optimization of costs can be operated at any stage of the value chain thanks to the close cooperation and interactions between the actors improving the global economic performance of the supply chain.

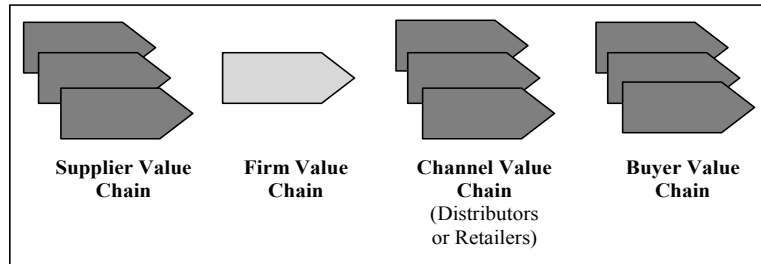


Exhibit 1: Porter's Value system

Source: Porter

A “just-in-time” model (Kanban) in each part of the value chain and globally can significantly streamline the flow of inputs thus reducing purchasing, storage and delivery costs. Inside participating firms a total quality management system helps to reduce lead times and defective products through an effective and efficient use of human and material resources. Such management systems together with the close-knit relationships between actors inside the cluster also contribute to controlling impacts on the environment and facilitate sustainability.

2.2 Types of clusters

Clusters can be divided into 3 main types: “natural clusters”, “government created clusters” and “privately created clusters”.

- 1- Natural clusters, which have been common worldwide for a long time, are based on the presence of resources such as abundant raw materials, market proximity, available workforce for labor-intensive sectors, skilled workers or highly-educated workforce, universities and other research facilities, infrastructure advantages (transportation, communication, etc.), suitable climate, etc. (Ali, M., 2012). Some successful natural clusters are for example High-tech industries of Bangalore in India, Wine clusters in Chile, Sialkot surgical instruments cluster in Pakistan (Ali, M., 2012), and Rheinhessen-Pfalz chemical cluster in Mainz, Germany (Ketels, 2007).

- 2- Government created clusters, which are very popular in planned economies, some developing or emerging countries and even in some developed countries, are created based on governmental long-term projects or state policies (e.g. Kirkos textile and leather cluster in Addis Ababa (Ali, 2012), Thai Nguyen Industrial Park, Dung Quat Economic Zone, Saigon Hi-tech Park and Hoa Lac High-tech Park in Vietnam, Pôles de Compétitivité et d'Excellence in France). Government created clusters are established through deliberate governmental policies such as Industrial Parks, Export Processing Zones and High-Tech Parks for attracting industries to specific areas planned by the government. Another type of government created cluster is a cluster created on the basis of a co-operation between two governments (e.g. Viet-Sing Industrial Parks 1&2: 2 industrial zones set-up based on the Singapore and Vietnam governmental agreements in Binh Duong province, 3 other VSIPs in Bac Ninh, Hai Phong, Quang Ngai provinces and 2 coming VSIPs in Nghe An and Phu Quoc in Vietnam). Thanks to strong support from government(s), clusters of this kind have good infrastructures (roads, power and water supplies, communication system, sewage treatment system, etc.) even at the initial stage and benefit by priority policies from government(s) and provincial authorities.
- 3- Privately created clusters, which have been recently developed in developing or emerging countries, are established mainly based on the financial capital of private investors bringing the technologies, know-how, experience and markets for the products (e.g. Orange City Garment Cluster Private Limited-Vidharbha, India; Phong Phu Industrial Zone created by Phong Phu Industrial Park Company, Vietnam). The cluster developer initiates a cluster by getting land usually by signing a 50 to 70 years' lease contract with the government, provides some infrastructures and then rents out land for investors to build their own production premises or sometimes leases ready-to-use premises. Privately developed clusters may receive some support from the government. A typical characteristic of this kind of cluster is that the cluster does not provide full adequate infrastructure at the initial stage. Infrastructures are timely built based on cluster developers and on newcomer enterprises' demands. However, for the industrial sectors, which cause much pollution such as textile, steel, or chemical industries, a sewage treatment system for the whole cluster must be ready before any investors' investments. Privately created clusters can sometimes be a joint-venture project between private investor(s) and the government (usually through providing land) such as The KwaZulu-Natal Clothing and Textile Cluster (KZN CTC), a Public Private Partnership, a not-for-profit public/private sector, South Africa; Tan Thuan Export Processing Zone, a joint venture project between Tan Thuan Industrial Promotion Co. IPC - representing the Ho Chi Minh City People's Committee (30% stake) and Central Trading & Development Group (CT&D Group) (70% stake); Tan Thuan e-office Park (Tan Thuan IPC and CT&D Group). In that case, private investor(s) usually take the managing role in cluster management.

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Apart from the geographical closeness, which is of course common to the different types of clusters, there are significant differences between the three kinds of clusters (Exhibit 2).

Exhibit 2: Typical characteristics of natural, government created and privately created clusters

Characteristics	Natural clusters	Government - created clusters	Privately - created clusters
Geographical proximity among firms within clusters	Yes	Yes	Yes
Time for cluster formation	Long	Short	Short
Priority and aid from government	Weak	Strong	Weak to average
Spillover effect	Strong	Weak	Weak
Reasons for cluster creation	Natural advantages	Deliberate policies	Business advantages
Significant nearby product markets at the beginning	Available	Few	Few
Cluster life time	Long	Long	Depending on project (normally 50~70 years)
Linkages among firms	Horizontal links	Vertical links	Vertical links or mixed links
Infrastructure (water, power, outer and inner roads, communication, sewage treatment system)	Developed over time	Ready to be used	Developed mainly based on enterprises' demands
Security	Weak	Strong	Strong
Types of enterprises	Small to large enterprises	Mostly large and vertically linked firms	Small to large enterprises
Cluster proprietorship	No	Government entities	Investor(s) or joint-ventures
Pressure on competitive and innovative products	High	High	High
Education & Vocational entities and R&D facilities within clusters	Nearly all or all are present	Vocational and R&D entities; presence of educational facilities but fewer than those in natural clusters	Only training programs; few R&D facilities

Source: authors

Input suppliers and service providers are usually present in natural clusters but not often in government created clusters and privately created clusters. The reason is that these two kinds of clusters are often created to attract large and vertically integrated enterprises, meaning that they do not rely on outputs of other firms as their inputs for production. Therefore, the specialization level and firm linkages are not as high as those in the natural clusters. As a direct result, the spillover effect of technologies, knowledge and know-how, good management practices, etc., a vital factor

for the cluster's advantages, is weak in those two kinds of clusters. However, the pressure for innovative products with competitive prices and quality is present in all kinds of clusters.

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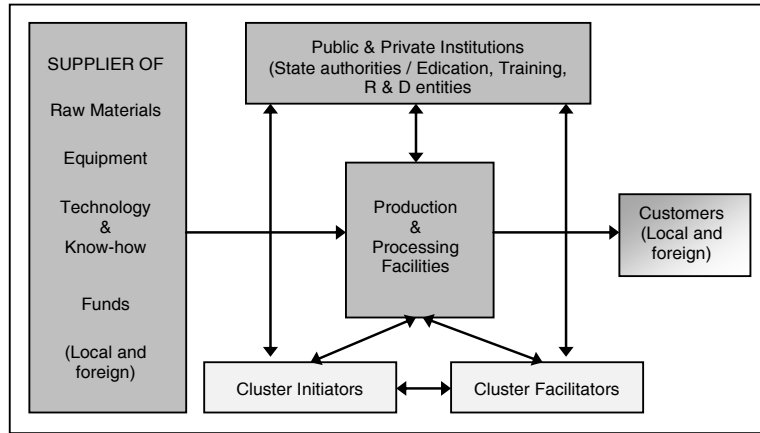
2.3 Cluster Models

Based on Porter's diamond, different cluster models are possible. They can be designed according to the main criterion of business activity, business size, business sector or even stage of economic development of the country. Hence finding an appropriate cluster model for a business sector is not an easy task as a successful cluster model in one country can be a failure in another country. That is the reason why it is necessary to design a model integrating the specific economic and business environment and culture.

In the context of an emerging economy where, by definition, we start from scratch, we need to build a model making the very existence of the cluster possible. An explicit will to create a cluster is required. Therefore, not only will we find government created or privately created clusters, but also the presence of cluster initiators and cluster facilitators to make the cluster come to life, which is the main specific characteristic of such a cluster. The cluster initiators are the ones that significantly "push" the cluster into operation but initiators are neither the cluster's creators (government-created cluster) nor the cluster's developers (private-created cluster). In other words, initiators can be considered as "starters" of the cluster. Initiators not only kick-start business activities but also attract other business entities to operate in the cluster. The role of initiators is important at the cluster's initial stage especially in developing or emerging countries which have abundant but not exploited resources (natural and/or human). Initiators can be, for example, a business organization or a NGO.

Cluster facilitators are the ones that help business activities operating within the cluster. Facilitators can be governmental entities pursuing favorable policies with adapted regulations such as tax breaks or exemptions, low or no import/export duties, free or low land rents, quotas, etc. Banks and other financial institutions can also be facilitators by granting loans with lower-than-market interest rates, long-term loans with less stringent conditions or even acting as "donors" for some projects in the cluster. In addition, facilitators can be NGOs offering training courses for operators and managers, introducing new production and processing technologies and techniques. NGO facilitators can help to boost the cluster by attracting new investors, finding new related products, both incrementally and radically, and new markets thanks to their economic and social connections and experience. Finally, NGOs as facilitators can help businesses to get loans from banks or financial institutions (e.g GRET Vietnam helped the Song Ma Cooperative in Quan Hoa District-Thanh Hoa Province to get a loan of VND 1,060 million from Oxfarm Hong Kong) (GRET report, 2014). There can also be donors of funds, materials or equipment using the channel of NGOs or State, religious or other associations to help the development of the cluster.

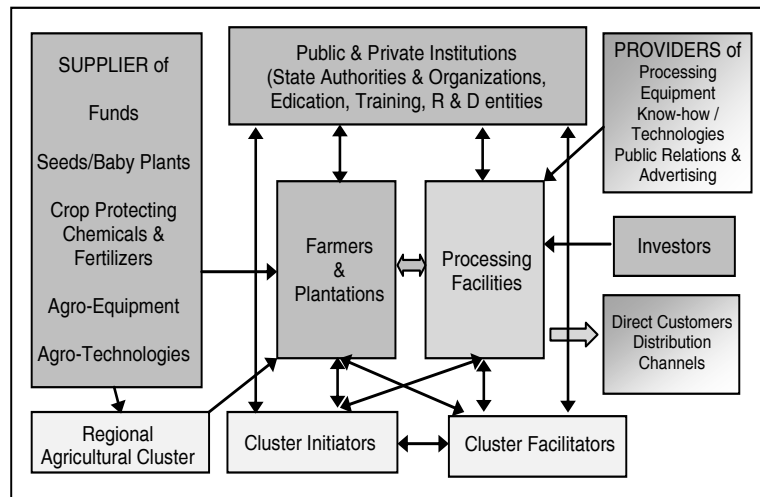
Exhibit 3: Emerging Economy Industrial Cluster Model



Source: Authors

When applying this cluster model for emerging economies to the agro-industrial sector, which in emerging economies will remain, for many years, the main source of work and income for the majority of the population in spite of the rapid growth of the industrial sector and of services, we find some specific characteristics. The providers of supplies directly feeding the agricultural activities and the farmers make up a regional agricultural cluster in themselves. In parallel, there are providers of supplies for the processing facilities (the industrial aspect) who are part of the global cluster. Besides the initiators and facilitators, there are a number of investors in the production processes.

Exhibit 4: Emerging Economy Agro-Industrial Cluster Model



Source: Authors

After the formalization of the general model and the agro-industrial model, we can now examine the case of the Luong Bamboo Sector to apply the model(s) to a particular agro-industrial activity.

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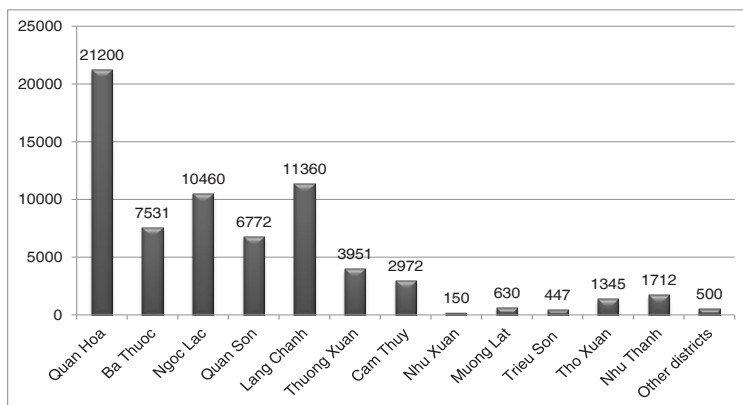
3. The case of luong bamboo sector in Thanh Hoa province

3.1 Profile of luong bamboo sector in Thanh Hoa province

Thanh Hoa Province, located in the Centre North of Vietnam, has an area of 11,136km², a population of 3.491 million inhabitants, with a density of 313/km² and an average GDP per capita of VND 28.9 million (# USD 1,365 in 2014) (*Thanh Hoa Statistics Office, 2014*), 67% of the average Vietnamese GDP per capita of VND 43,402 million (# USD 2,028) (*Viet Nam General Statistics Office, 2014*).

Luong bamboo resources in Thanh Hoa Province are about 251 million culms; annually harvested bamboo culms can reach a figure of 70 million culms/year: an equivalent to 1.75 million tons/year. Current local demand is around 25 million culms/year (*Thanh Hoa Service of Agriculture and Rural Development, 2013*). The Luong bamboo sector with a total area of 69,000 hectares (2006), covering over 55% of total Luong bamboo areas in Vietnam, is located in Nord-West hilly and mountainous districts mainly Quan Hoa, Ba Thuoc, Ngoc Lac, Quan Son, Lang Chanh, Thuong Xuan and Cam Thuy districts. Those districts, which can be considered as the Luong bamboo zone, cover a Luong bamboo area of 64,246 hectares and a population of more than half a million inhabitants.

Exhibit 5: Luong bamboo areas in districts of Thanh Hoa Province



Source: Thanh Hoa Forestry Service, May 2007

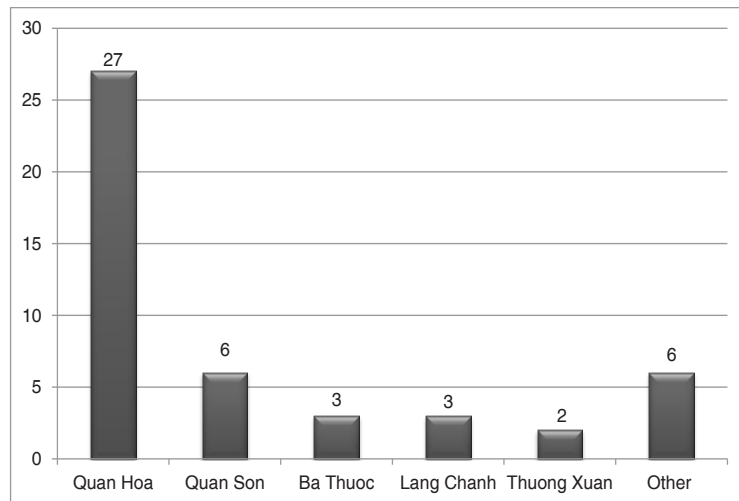
Bamboo plants can be found everywhere in Vietnam from plains to mountainous regions; however, most are used to produce low value added products like utensil products (baskets, chopsticks), furniture (table, chair, bed, mat), doors and windows, thatched cottage frames, construction uses (ladders, scaffolding) or used as food (bamboo shoots). Moreover, bamboo

plantations are scattered, which creates difficulty to collect bamboo culms for a large demand like that from industries. In contrast, the Luong bamboo species is a bamboo species which can be industrially processed with higher value added. Bamboo plants were planted with a high density in Thanh Hoa province in 1960s. Most inhabitants in those districts are 75~85% Thai and Muong minorities (*Thanh Hoa Statistics Office, 2014*) with low education and unskilled resulting in a lower income than other coastal or plain districts of Thanh Hoa province (50% to 57% respectively, *Thanh Hoa Statistics Office, 2014*). Three districts among those districts are among the 62 poorest districts in Vietnam. Each year, the Vietnamese government gives food to support those districts (some thousand tons of rice) in difficult times (1,211 tons of rice in early 2015, *Tuoi Tre newspaper, February 07th 2015*).

Compared to Anji county in China, the most successful bamboo cluster in the world, with 450,000 inhabitants and 57,400 hectares of *Moso-Phyllostachys heterocycla*, a biennial bamboo species, quite similar to the bamboo region in Thanh Hoa, the economic results of the Luong bamboo of Thanh Hoa are much lower, the annual turnover from Moso bamboo products in China being USD 2.03 billion (*Xuan T., China Daily, May 05th, 2013*). We should note, however, that the price of Vietnamese bamboo is about 50% lower than China's and labor costs are a fifth of those in China (ADB, 2006).

According to Patrice Lamballe (LDP Project-GRET), the Luong bamboo annual yield is around 520 culms of Grade A, B and C usable per hectare and they can be harvested from October to April (*An T. BAMPAR Project, 2012*).

Exhibit 6: Number of firms/workshops in districts



Source: Service of Agriculture and Rural Development of Thanh Hoa, September 2013

This shows a high concentration of firms in Quan Hoa district; the district which has the largest resources of Luong bamboo. Therefore, most NGO projects have been carried out in this district.

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3.2 Research Methodology

As shown in the literature review, implementing a cluster model not only for boosting economic results, but also preserving the environment and natural resources, presents a lot of advantages. The literature review was also conducted by examining several case studies and scientific papers related to industrial clusters focusing on those in developing and emerging countries. As stated, our objectives were first to design a typical industrial cluster model based on Porter's Diamond for emerging economies, then develop a model for emerging countries' agro-industries and finally one for Luong bamboo in Thanh Hoa province. Several field-studies were carried out in the concerned areas (mostly north-western districts in Thanh Hoa province and nearby provinces such as Phu Tho, Vinh Phuc and Ha Noi) to understand the current situations and the issues at stake. In addition, a brief study of some successful cluster models especially the successful bamboo Moso cluster in Anji County-China was very helpful for designing an applicable cluster model and then identifying important factors, which could be applicable and economically viable for the Thanh Hoa bamboo sector.

The data gathered for this study were mostly from field studies in several districts in Thanh Hoa province where important bamboo plantations are located and other regions for downstream bamboo products. Primary data and information were collected through 3 types of questionnaires (different questionnaires for farmers, firms and bamboo product traders/sellers) and interviews at sites.

- Questionnaires for workshops were given to managers or owners of bamboo workshops/firms based on the number of firms in the districts: at least 25% of firms operating in one district. Therefore, 7 questionnaires were distributed for Quan Hoa district, 2 for Quan Son, 1 for Ba Thuoc, 1 for Lang Chanh, 1 for Thuong Xuan and finally 1 for Thanh Cong Company in Thanh Hoa city. Each has 24 closed questions and 3 open questions.
- Questionnaires for farmers were given to farmers or bamboo producers based on the surface of bamboo plantations within each district: 1 questionnaire for every 1,000 hectares in the district. Therefore, 21 questionnaires for Quan Hoa district, 8 for Ba Thuoc, 10 for Ngoc Lac, 7 for Quan Son, 11 for Lang Chanh, 4 for Thuong Xuan, and finally 3 for Cam Thuy. Each has 21 closed questions and 2 open questions;
- questionnaires for traders were given to final bamboo product traders, wholesalers, sellers in important wholesale markets in big cities of Vietnam mainly Ho Chi Minh City, Da Nang and Ha Noi. Each has 8 closed questions with 3 sub-tables and 2 open questions.

Direct interviews were carried out with farmers (in case they are illiterate), workshop managers (if possible), bamboo culm traders/collectors, final bamboo product traders and sellers (in case they were not

willing to fill the questionnaire or were busy), cadres of GRET, CRD and HADEVA, and officials of concerned state organizations and authorities. For traders, questions were focused on some questions, namely investment capital, workforces, equipment, turnover, business results in recent years, problems and business outcomes.

Observations, notes, brochures (if available) and photos (if possible) were taken at visits.

In addition, visits at markets, supermarkets, shops in Vietnam and abroad as well as on the internet, etc. were conducted to collect samples and find out bamboo products with their designs and selling prices.

Secondary data were collected from studies of several theses, studies, reports of some NGOs, a big number of cooperatives operating in Thanh Hoa province (GRET Vietnam, HADEVA Vietnam, IFC, CRD, bamboo enterprises, etc.) and studies, reports of some private companies operating outside Thanh Hoa (DVC Vietnam, TBF, Thanh Cong, Duong Thanh Phu companies, etc.). Finally, additional secondary data were also found on websites, Vietnamese newspapers, official data and documents of state organizations and authorities of different levels. Then, all those facts, together with the literature review and lessons from Anji- successful Moso bamboo cluster in China, were used to create an appropriate bamboo cluster model for Thanh Hoa bamboo region.

3.3 Setting-up a bamboo cluster

Findings:

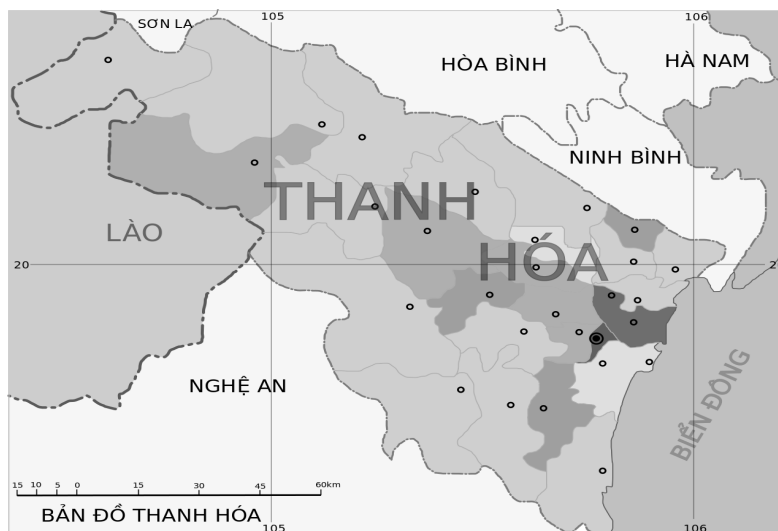
The Thanh Hoa bamboo cluster is at present operational, but at an initial stage, thanks to the help from some NGOs and donors. It is however facing a number of problems hindering its development. Upstream in production, there are the problems of degenerated bamboo species, over exploitation and hard competition from construction demands. Then processing suffers from low quality equipment, high waste, a high percentage of defective products, weak designs, and low-value-added products. Downstream problems concern waste treatment, weak distribution channels, lack of markets for products and hard competition from Chinese products. Therefore, real incentives are needed from facilitators such as State entities (preferential policies and regulations) and investors (preferred foreign investors with high financial capacities, high production technologies, new high-value-added products and new, large foreign markets).

a. Identifying locations:

For bamboo production:

Due to an appropriate climate, humidity, rain fall and soil in North-Western Thanh Hoa districts, bamboo can be planted everywhere in this region including hilly and mountainous areas (up to 35~40° slope), along roads and river banks, and even in front of farmers' houses and in their back yards.

Exhibit 7: Thanh Hoa Bamboo Cluster



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Source: Vietnam Administrative Atlas 2009

For bamboo processing:

An industrial processing of bamboo consumes a very large volume of bamboo culms every day. Therefore, transportation is the most important criterion for choosing an adequate area to establish a concentrated processing zone; scattered processing zones cannot be chosen due to infrastructure difficulties in hilly and mountainous areas. Besides transportation by trucks, simple transportation means (buffalo carts, bicycles, on people's shoulder) and transportation on rafts are popular in this zone. Bamboo rafts floating on Ma, Luong rivers and other small rivers and streams are popular means due to their low cost and suitability in hilly regions where there are no roads or they are muddy in the rainy season. In addition, electrical power, water and labor are also essential criteria for bamboo processing. Finally, the treatment of waste and polluted water can only be set-up in one location because of the high investment required and the control of the treatment.

Taking into account the 4 criteria cited above and after considering the information and data available, Quan Hoa Town and an adjacent area in Ba Thuoc District, where an industrial zone is planned, were chosen for the following reasons:

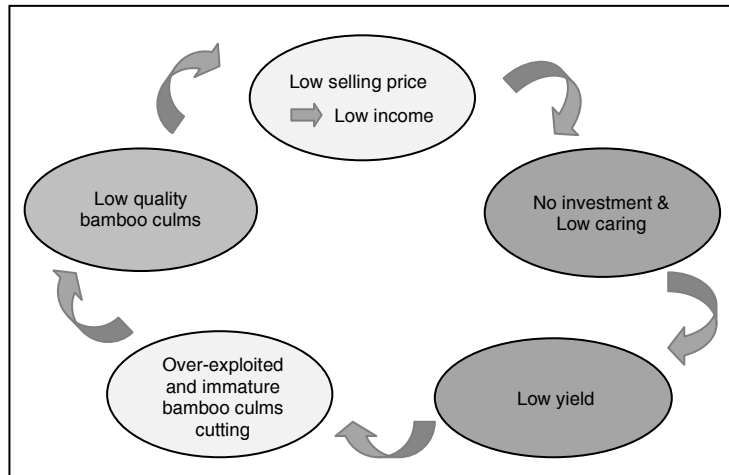
- Quan Hoa Town and an adjacent area in Ba Thuoc are located along National Road 15 and Provincial Road 217: the backbone of the transportation network inside and outside Thanh Hoa province. Besides, it is close to the confluences of Ma, Luong and Nam Niem rivers satisfying all water demands. National Road 15 and Provincial Road 217 are main roads connecting to National Road 1 and the National Railroad (the backbones of Vietnam's transport system); in addition, the newly opened Tho Xuan Airport is an important gate for foreign investors, and Nghi Son Seaport (is) an important port for importing equipment and exporting bamboo products.

- the power grid of Quan Hoa Town and its adjacent area is connected to the National Power grid assuring stable and regular electrical power;
- Quan Hoa district has the largest bamboo resources (21,200 ha) along with its nearby Ba Thuoc District (7,531 ha), Lang Chanh (11,360 ha) and Quan Son (6,772 ha) ensuring a stable supply of bamboo culms with short delivery time for processing. It currently has 27 processing firms; the highest concentration of bamboo processing firms in Thanh Hoa province;
- the adjacent area of Quan Hoa Town has a planned area for an industrial and processing zone;
- Quan Hoa and an adjacent part of Ba Thuoc district have received most concerns from NGOs and investors; most of the development and experimental activities have been conducted in this area.

Other districts within the bamboo cluster can set up processing firms as satellite firms by producing semi-finished products. All semi-finished products and bamboo waste should then be transported to Quan Hoa processing zone for processing final products and waste treatment. Processed bamboo waste varies from 20% to 75%, whereas in China it is just 5% (Renard, 2012). Therefore, there is ample room for improvement.

b. Farmers and plantations:

Exhibit 8: The vicious circle of poor farmer households



Source: Authors

Overexploitation, immature bamboo culms cut for the daily needs of farmers result in low yields and poor quality, providing farmers with a low income and thus creating a vicious circle. To expand bamboo production, farmers need more fertilizers, new high-yield baby plants and training in growing techniques. For all that, they rely on support from NGOs, private investors and entities or the government. Moreover, new plantations do not generate any income for the first four years in which farmers can

only partly compensate for by growing peanuts or cassava. This makes the support of the entities cited above even more essential.

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c. Supporting industries and services:

Results from field-studies have shown that most equipment was made in Thanh Hoa or Ha Noi and some was imported, mainly from China. In order to strengthen the links between economic actors in the cluster, future local equipment manufacturers producing suitable equipment and providing fast maintenance should be established in Quan Hoa processing zone to be near bamboo processing firms.

Bamboo nurseries and experimental plots can be set up anywhere within the cluster, like, for example, the bamboo nurseries and experimental plots established and managed by GRET Vietnam.

d. Financial entities:

Agribank and Bank for Investment and Development in Vietnam (BIDV) have their bank branches in all the districts of the cluster; Vietcombank has only one branch in Thanh Hoa City. In 2012, BIDV Quan Hoa branch granted loans of a total amount of VND 16.7 billion (# USD 750 m) for farmers and firms (GRET report, September 2013).

According to the valid Decree dated April 4, 2010, Vietnamese banks' loans based on business entities are as follows:

Exhibit 9: Vietnamese Banks' loans for business entities

Individuals/agro-forestry farmer households	Agro-forestry traders, agro-forestry service providers	Cooperatives, farm's owners
Max VND 50 million (# USD 2,300)	Max VND 200 million (# USD 9,200)	Max VND 500 million (# USD 23,000)

Source: authors from banks' data

Loans from Vietnamese banks are not adequate for local investors' demands even at a very small scale of business; therefore, outside investors with higher investment capital are essential for boosting the cluster.

e. Education, Training, R&D facilities:

There are some training courses for farmers and managers given by GRET and CRD. Some experiments have been conducted by GRET and Tan Thiet Cooperative on producing mushrooms and semi-active charcoal by TXT from December 2013 to Mars 2014 with positive results (Petit, 2014). There is no Bamboo Faculty in the region but the cluster can cooperate with Ba Thuoc Forestry Company in Ba Thuoc District and Cau Hai Forestry Research Center, a state forestry research center, located in Doan Hung District, Phu Tho Province for R&D experiments on bamboo species.

f. Agro-technologies:

Marking bamboo culms (Neiyu in Chinese and fully applied in Anji), semi-circular platform watering and fertilizing techniques have been conducted by GRET at an experimental scale.

g. Cluster initiators, facilitators and donors:

As defined above, the Thanh Hoa bamboo cluster initiator is GRET with many activities (training, conducting agro-experiments, looking for investors especially foreign investors, helping to establish cooperatives and associations, introducing new agro-techniques, setting-up nurseries, etc.) to kick-start the development of the cluster.

Facilitators: the cluster really needs a cluster processing zone developer to establish a processing zone in an adjacent part of Ba Thuoc District and some foreign investors (e.g. The Bamboo Factory - TBF, a French FDI in Hai Duong Province with a high-tech processing chain producing high-value-added bamboo products for export) with capital, new processing technologies, new equipment and above all new markets for bamboo products. An investor like TBF is a real “pusher” for the development of the whole bamboo cluster. By producing panels and floorings, TBF consumes slats from satellite firms thus generating linkages among firms both vertically (by using slats as inputs) and horizontally. By producing slats the mid-part of bamboo culms is used and the rest can be used for producing chopsticks, paper pulp, etc. by the same firms or sent to other firms for production (horizontal links). Authorities can be considered as facilitators by implementing favorable policies (tax breaks or reductions or low land rents for a certain period for farmers and investors, financial subsidies for exporting products, positive regulations for big projects, etc.). Thanh Hoa State organizations can become cluster facilitators by establishing a Bamboo Faculty, R&D entities in the region or giving training courses on watering, fertilizing, using pesticides and growing techniques with high environmental and natural resources preservation concerns.

Donors: some donors in Thanh Hoa bamboo cluster are Fenetrea Co. (French), Agence Française du Développement (AFD), WorldBank VN, Ford Funds, ADB, German Reconstruction Bank (FKW), etc.

h. Thanh Hoa authorities & State organizations:

According to a Master zoning plan, until 2020 for the industrial/agro sector of Thanh Hoa authorities, there is no plan for setting-up a bamboo processing zone in the concerned districts; this means that a private processing cluster developer is needed for setting-up a concentrated bamboo processing zone in Quan Hoa district or in its adjacent area located in Ba Thuoc district.

The position of Thanh Hoa Province according to the scoring for supporting business activities based on the Provincial Competitiveness Index Vietnam 2014 is the following:

Exhibit 10: Scores for supporting business activities in Thanh Hoa Province over 63 provinces/cities in 2014

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Score: 0-10 (the higher the better); Rank: 1-63 (the lower the better)

Entry Costs	Land Access and Security of Tenure	Time Costs and Regulatory Compliance	Transparency and Access to Information	Informal Charges	Proactivity
8.71	5.79	6.79	6.15	5.32	5.58
Business Support	Labor & Training	Legal Institutions	Provincial Competitiveness Index	Ranking among provinces/cities	Ranking group
5.82	6.3	6.01	60.33	12/63	High

Source: Malesky, 2015

The report is a joint product of the Vietnam Chamber of Commerce and Industry (VCCI) and the US Agency for International Development (USAID/VNCI); the primary author of the research team is Dr. Edmund Malesky, Associate Professor of Political Economy at Duke University. The study was carried out based on surveys of 9,859 private enterprises including 1,491 FDI enterprises operating in 63 provinces and big cities of Vietnam.

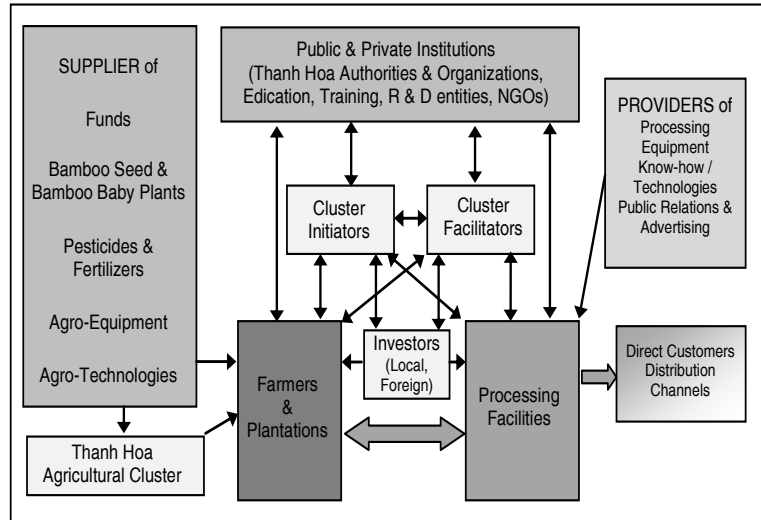
Lessons from Anji county show that success is mostly dependent on government support at the early stage of development (in the 1970s and early 1980s) through subsidized inputs (tax on forest products from 18% to 8% and eventually to 0%), rewarded productivity, active extension services offered and supporting research (Renard, O., 2012). Support for farmers and business entities is weak from the Thanh Hoa Government.

Strong government intervention in bamboo production and exploitation is vital to ensure a reliable supply of good quality bamboo culms and preserve the environment as well as the sustainability of bamboo resources. All are essential for promoting the sector and attracting new investors with sizeable processing plants.

i. Markets for Thanh Hoa bamboo products:

Markets for Thanh Hoa bamboo products are mostly local; there are few entities which can directly export their products, such as Duyet Cuong Company, a FDI Taiwanese company, exporting votive paper to Taiwan and Trieu Son Company, exporting bamboo flooring to Japan. Some finished products, such as single-use chopsticks or semi-detached chopsticks are sold to other companies outside Thanh Hoa and then exported under the brand names of those companies.

Taking into account the aspects contributing to a successful cluster, the model for Thanh Hoa bamboo agro-industrial cluster can be illustrated in this way:



Source: Authors

4. Conclusion

Choosing a location for setting up a cluster is based on the type of cluster: near natural resources for a natural cluster, initiatives based on State policies or long-term projects for a government created cluster and business advantages for a privately created cluster. The role of initiators is paramount to “start” the cluster, especially to attract investors at its early stage. Initiators like NGOs in emerging countries help farmers by offering agricultural training, new techniques, and material aid such as new seeds, fertilizers, and SMEs by giving management training, introducing new equipment, techniques, new investors as well as new markets to improve their business performance. NGOs’ helpful activities, of course, can only be realized thanks to funds from donors. Facilitators are essential, too, to foster and then ensure a steady development of the cluster. Facilitators such as State entities play a key role in supporting the cluster thanks to favorable regional and investment policies, suitable regulations for preserving the environment and natural resources as well as establishing educational and training facilities. In emerging or developing countries, FDI investors are as preferred facilitators and indispensable for boosting up the cluster thanks to their high-tech equipment, know-how, investment capital, potential markets and creation of high value-added products.

Despite having large resources of Luong bamboo, Thanh Hoa inhabitants are still poor; therefore, they really need incentives to develop the bamboo cluster in order to improve their living standard and at the same time preserve their valuable resources and environment. The way to reach a “Full Diamond” (Solvell, 2009) is still ahead with many obstacles

to overcome; therefore, the contributions of all the different actors from farmers, government at different levels to local and foreign investors are required. Finally and above all, the implementation of green supply chain management in any agro-industrial cluster, particularly the Thanh Hoa bamboo cluster, should be strongly encouraged to preserve the environment and natural resources. To do so, strong and persistent government support and intervention in bamboo exploitation and processing are essential and decisive for an enabling environment.

An agro-industrial cluster model as showed above would be helpful for future bamboo project planners, investors, managers and for defining State policies.

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